



Tennessee Valley Authority, Post Office Box 2000, Soddy-Daisy, Tennessee 37379

November 17, 1998

10 CFR 50.50a(g)(5)(iii)

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

Gentleman:

In the Matter of ) Docket Nos. 50-327  
Tennessee Valley Authority ) 50-328

**SEQUOYAH NUCLEAR PLANT (SQN) - AMERICAN SOCIETY OF  
MECHANICAL ENGINEERS (ASME) SECTION XI INSERVICE INSPECTION  
(ISI) PROGRAM RELIEF REQUESTS**

- References:
1. NRC letter to TVA dated April 27, 1998, "Evaluation of the Second 10-Year Interval Inspection Program Plan and Associated Requests for Relief for Sequoyah Nuclear Plant, Units 1 and 2 (TAC Nos. M94115 and M94116)"
  2. TVA letter to NRC dated November 21, 1995, "Sequoyah Nuclear Plant (SQN) - American Society of Mechanical Engineers (ASME) - Section XI Programs for the Second Inspection Interval, Units 1 and 2"
  3. NRC letter to TVA dated August 7, 1998, "Safety Evaluation of Relief Requests for the Pump and Valve Inservice Testing Program - Sequoyah Nuclear Plant Units 1 and 2 (TAC Numbers MA0417, MA0418, MA1595, and MA1596)"

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The purpose of this letter is to request NRC review and approval of five ASME code relief requests that were identified in SQN's second 10-year ISI interval for both units. The relief requests are based on limitations that

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preclude full code examination of ASME Class 1 and 2 welds. Code examination of the welds is limited due to design pipe configuration or cast material. SQN's ISI Program has been evaluated and found acceptable by NRC in the referenced letter. Subsequent to NRC review of SQN's ISI Program, five new relief requests were identified during SQN's Unit 2 Cycle 7 and Unit 1 Cycle 8 refueling outages. The relief requests are 1-ISI-9, 1-ISI-10, 2-ISI-8, 2-ISI-9, and 2-ISI-10. The relief requests are submitted in accordance with 10 CFR 50.55a(g)(5)(iii). TVA requests that NRC provide approval in accordance with 10 CFR 50.55a(g)(6)(i).

We are currently planning our inspections for the second period of SQN's 10-year interval (i.e., Cycle 10 and 11 refueling outages). NRC response is requested for the subject relief requests by May 31, 1999. This date will support TVA's schedule for planning inspections during SQN's Cycle 10 refueling outages.

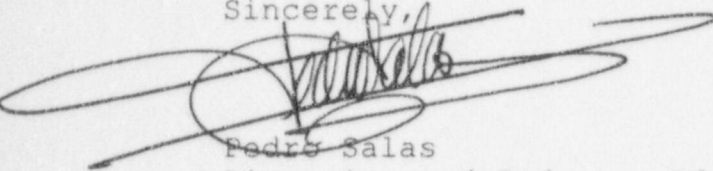
Enclosure 1 provides the Unit 1 relief requests. Enclosure 2 provides the Unit 2 relief requests. Enclosure 3 provides TVA's procedure for calculation of the ASME code coverage for Section XI nondestructive examinations.

In Reference 2, TVA provided SQN's updated second 10-year ASME Section XI Programs (ISI and inservice testing) for NRC review. Reference 2 stated that SQN's second 10-year interval for these programs began on December 16, 1995. At that time, this start date was considered by TVA to be an estimated date that was based on SQN's extended outage time. Extended outage time qualifies as "out of service" time that may shift the start date for 10-year intervals under the provisions of the ASME code. TVA's estimation of the start date was recognized by NRC as an action item (reference Action Item 4.1 of Reference 3) for TVA to establish the exact date for SQN's 10-year interval. In response to this issue, we consider December 16, 1995, to be the exact date for the start of SQN's 10-year interval.

U.S. Nuclear Regulatory Commission  
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November 17, 1998

If you have any questions regarding this response, please contact me at extension (423) 843-7071 or J. D. Smith at extension (423) 843-6672.

Sincerely,



Pedro Salas

Licensing and Industry Affairs Manager

Enclosures

cc (Enclosures):

Mr. R. W. Hernan, Project Manager  
Nuclear Regulatory Commission  
One White Flint, North  
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Rockville, Maryland 20852-2739

NRC Resident Inspector  
Sequoyah Nuclear Plant  
2600 Igou Ferry Road  
Soddy-Daisy, Tennessee 37379-3624

Regional Administrator  
U.S. Nuclear Regulatory Commission  
Region II  
Atlanta Federal Center  
61 Forsyth Street, SW, Suite 23T85  
Atlanta, Georgia 30303-3415

ENCLOSURE 1

SEQUOYAH NUCLEAR PLANT

UNIT 1

ASME REQUESTS FOR RELIEF

1-ISI-9 AND 1-ISI-10

## REQUEST FOR RELIEF 1-ISI-9

### Executive Summary:

This request for relief addresses the pressurizer nozzle full penetration welds. The design configuration of the pressurizer nozzle-to-head welds precludes a 100% ultrasonic examination of the required volume for the following nozzle-to-head welds: RCW-15 (4-inch spray nozzle) and RCW-21 (14-inch surge nozzle). These physical examination limitations occur when the 1989 code examination requirements are applied in areas of components constructed and fabricated to early plant physical designs. Based on the date of SQN's construction permit (May 27, 1970), SQN is exempt from code requirements for examination access as allowed in 10 CFR 50.55a(g)(4).

An ultrasonic examination was performed on accessible areas to the maximum extent practical, given the physical limitations of the subject welds. The design configuration limits ultrasonic examination to approximately 78% of weld RCW-15 and approximately 64% of weld RCW-21. Performance of an ultrasonic examination of essentially 100% of full penetration welds in the pressurizer nozzle-to-vessel head welds, RCW-15 and RCW-21, would be impractical. The performance of the ultrasonic examination of the subject welds to the maximum extent practical, provides reasonable assurance of an acceptable level of quality and safety because the information and data obtained from the volume examined provides sufficient information to judge the overall integrity of the welds.

Therefore, pursuant to 10 CFR 50.55a(g)(5)(iii), it is requested that relief be granted for SQN's second inspection interval.

### Unit:

1

### System:

Reactor Coolant - System 68

### Components:

Two Pressurizer Nozzles, Full Penetration Welds

### ASME Code Class:

ASME Code Class 1 (Equivalent)

Section XI Edition: 1989 Edition

Code Table: IWB-2500-1

Examination Category: B-D, Full Penetration Welds Of Nozzles In Vessels

Examination Item Number: B3.110, Pressurizer Nozzle-to-Vessel Welds

Code Requirement: ASME Section XI, Table IWB-2500-1, Examination Category B-D, Item No. E3.110, Volumetric Examination

Code Requirement From Which Relief Is Requested: Volumetric Examination Coverage

List Of Items Associated With The Relief Request: RCW-15, Pressurizer Nozzle-to-Head Weld  
RCW-21, Pressurizer Nozzle-to-Head Weld

Basis for Relief: The design configuration of the pressurizer precludes an ultrasonic examination of the required volume for the following nozzle-to-head welds: RCW-15 (4-inch spray nozzle) and RCW-21 (14-inch surge nozzle). The design configuration limits ultrasonic examination to approximately 78% of Weld RCW-15 and approximately 64% of Weld RCW-21.

Alternative Examination: In lieu of the code required 100% ultrasonic examination, an ultrasonic examination was performed on accessible areas to the maximum extent practical, given the physical limitations of the pressurizer nozzle-to-head welds. Refer to Attachment 1 for the examination data reports.

Justification For The Granting Of Relief:

- (1) The design configuration of the subject nozzle-to-head welds precludes ultrasonic examination of essentially 100% of the required examination volume. In order to examine the welds in accordance with the code requirements, the pressurizer would require extensive design modifications. The physical arrangement of RCW-21, in conjunction with the close curvature of the outside wall surfaces of the nozzle, precludes ultrasonic examination from

the nozzle side. For scans normal to the weld on the bottom vessel head side, examinations are limited to areas up to approximately 4 inches from the weld centerline. Limitations on the bottom head side of RCW-21 are due to the presence of 78 immersion heaters penetrating the head, which restricts the scanning surface of the transducers. The scans for flaws oriented transverse to the weld are not obstructed. Therefore, 100% of the required examination coverage for flaws transverse to the weld was obtained. Total examination coverage of Weld RCW-21 was approximately 64% of the code required volume.

The physical arrangement of RCW-15, in conjunction with the close curvature of the outside wall surfaces of the nozzle, precludes ultrasonic examination from the nozzle side. Scans normal to the weld from the head side were not obstructed allowing complete coverage of the weld from one side. Examination coverage from the one side provides reasonable assurance that no flaws parallel to the weld are present. In addition, approximately 100% of the required ultrasonic examination volume for flaws transverse to the weld was performed from the vessel head side. Total combined examination coverage of Weld RCW-15 was approximately 78% of the code required volume.

- (2) Radiographic examination, as an alternate volumetric examination method, was determined to be impractical due to the thickness of the component. Gaining access to the in-side surface of the pressurizer to place radiographic film would require extensive personnel protection due to high radiation and contamination levels. The pressurizer manway would have to be removed, decontamination performed, and specialized scaffolding erected to gain access. The additional code coverage gained by radiography and/or ultrasonics from the inner surface is impractical when

weighed against the radiological concerns. The estimated radiological conditions were determined to be:

35-40 rad/hour beta (uncorrected)  
10-12 rem/hour gamma  
1 rad/hour per 100 square cm

Maximum stay time to maintain exposure to less than 1 rem is approximately 5 minutes. Special clothing would be required for protection from the extremely high contamination levels and from the high beta dose rate.

Respiratory protection would be required. Industrial safety would also be a major concern (heat stress, confined space, and climbing/falling hazards). Estimates are based on actual experience inside primary components such as steam generators.

- (3) A percentage sampling approach provided by the ASME Section XI Code, in combination with examinations performed on similar items, provides reasonable assurance that significant degradation, if present, would have been detected.

Performance of an ultrasonic volumetric examination of essentially 100% of full penetration welds in the pressurizer nozzle-to-vessel head (Welds RCW-15 and RCW-21), would be impractical. As previously discussed, TVA determined that it would be impractical to attempt other volumetric examinations in order to increase examination coverage. A maximum extent practical ultrasonic examination of the subject welds provides reasonable assurance of an acceptable level of quality and safety significant degradation, if present, would have been detected during the ultrasonic examination that was performed on the subject welds. As a result, assurance of structural integrity for these welds is provided by the alternative examinations that were performed.



Therefore, pursuant to 10 CFR 50.55a(g)(5)(iii), it is requested that relief be granted for the second inspection interval.

Implementation  
Schedule:

This request for relief is applicable to the second inspection interval for SQN Unit 1. Welds RCW-15 and RCW-21 were examined during the first period of the second 10-year inspection interval.

Background  
Information:

It should be noted that a request for relief for volumetric examination coverage limitations for Welds RCW-15 and RCW-21 was previously submitted as 1-ISI-21 in SQN's first 10-year ISI interval and was approved by the staff with no additional augmented requirements.

Reference:

NRC letter to TVA dated February 7, 1996, "Relief Requests to Close-Out the First 10-Year Inservice Inspection Program Interval - Sequoyah Nuclear Plants Units 1 and 2 (TAC Nos. M92454 and M92455)."

Attachment 1 - Examination Data Reports:  
R-6886 and R-6933.

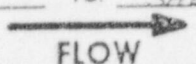
Attachment 2 - ISI Program Drawing:  
ISI-0394-C-01, Revision 5 and  
ISI-0394-C-05, Revision 0.

ATTACHMENT 1

EXAMINATION DATA REPORTS

R-6886

R-6933

PROJECT: <u>SONP</u> UNIT: <u>1/C8</u> SYSTEM: <u>PRESSURIZER</u> WELD I.D.: <u>RCW-21</u> CONFIG: <u>N23LE</u> TO: <u>SHELL</u> <div style="text-align: center;">  </div> PROCEDURE: N- <u>UT19</u> REV.: <u>9</u> TO: <u>N/A</u> NDE METHOD: <input checked="" type="checkbox"/> UT <input type="checkbox"/> PT <input type="checkbox"/> MT <input type="checkbox"/> VT	EXAMINER: <u>J.G. ABBOTT</u> LV: <u>II</u> EXAMINER: <u>C. LITTLEFIELD</u> LV: <u>II</u> EXAMINER: <u>N/A</u> LV: <u>N/A</u> EXAMINER: <u>N/A</u> LV: <u>N/A</u> CAL SHT NO'S: <u>N/A</u>
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THIS REPORT CONTAINS THE DATA ASSOCIATED WITH THE MANUAL ULTRASONIC EXAMINATION OF RCW-21 FOR ASME SECTION XI CREAT.

NO RECORDABLE INDICATIONS WERE NOTED WITH 0°-WAVE, 45°, NOR 60° SHEAR WAVE.

EXAMINATION <sup>of 2111197</sup> LIMITED FROM SCAN 9 SIDE, WITH A W OF 3.75, DUE TO INSTRUMENTATION PENETRATION ON BOTTOM OF PRESSURIZER. NO EXAMINATION FROM NOZZLE SIDE OF WELD DUE TO CONFIGURATION.

63.74% CODE COVERAGE ACHIEVED.

EVALUATOR: <u>[Signature]</u>	LEVEL: <u>II</u>	DATE: <u>3/29/97</u>	ANII <u>TRM</u>
CONCURRENCE: <u>[Signature]</u>	LEVEL: <u>III</u>	DATE: <u>3-30-97</u>	DATE: <u>3/31/97</u>
			PAGE <u>1</u> OF <u>11</u>

TENNESSEE VALLEY AUTHORITY

USN-50 ULTRASONIC  
CALIBRATION  
DATA SHEET

CALIBRATION NO.

C- R-6886

PROJECT: SONP UNIT: 1

CALIBRATION DATE: 28 MAR 97

PROCEDURE: N-UT-19 REV.: 9 TC: N/A

CALIBRATION BLOCK NO.: BNP-79 TEMP.: 75 °F

INSTRUMENT: KBA

SIMULATOR BLOCK NO.: 5105

MODEL/TYPE: USN 50

THERMOMETER SERIAL NO.: E26099

SERIAL NUMBER: E18499

COUPLANT: Utrajel II BATCH: 94125

TRANSDUCER MANUF.: AEROTECH

EXAM TYPE:  SHEAR  LONG  RL

SERIAL NO.: M05955

ANGLE VERIFICATION

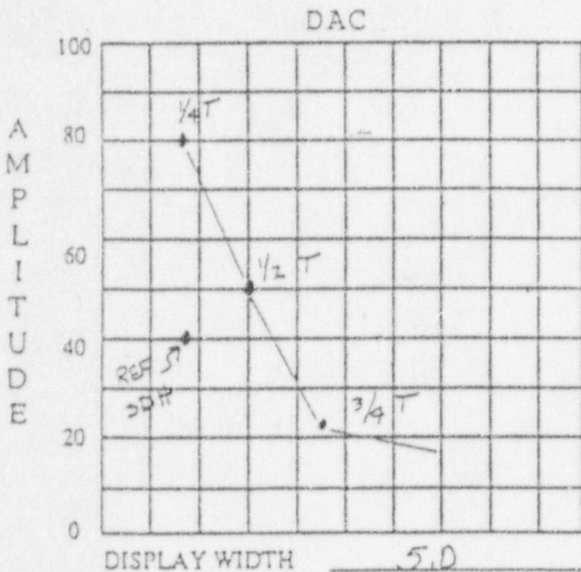
SIZE: 1.0" FREQUENCY: 2.25 MHz

BLOCK TYPE: Rompas SERIAL NO. 5105

CABLE TYPE: RG174 LENGTH: 72"

NOMINAL ANGLE: 0° ACTUAL ANGLE: 0°

INSTRUMENT SETTINGS



REFLECTOR ORIENTATION	REFERENCE SENSITIVITY	DATA SET
AXIAL	36.5	1
CIRC	N/A	N/A

TOF (PEAK / FLANK): PEAK ANGLE: 0 DEG.

DELAY: .359 us ZERO: .580 us

MATL VELOCITY: .2326 us RANGE: 5.000

REJECT: 0 % PULSER: HIGH

DUAL:  ON  OFF

INITIAL CALIBRATION

INITIAL TIME: 1045 FINAL TIME: 1520

REF. REFLECTOR: Rompas SDH GAIN: 36.5 dB

AMPLITUDE: 40 % METAL PATH: .760

VERIFICATION TIMES

1) 1425	2) 1505	3) N/A	4) N/A
5) N/A	6) N/A	7) /A	8) /A

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%  
C  
K

VERTICAL

SIGNAL 1	100	90	80	70	60	50	40	30	20	10
SIGNAL 2	50	45	40	35	30	25	20	15	10	5

ATTENUATOR

GAIN	SET	-6	-12	SET	+12	SET	+6
SIGNAL AMP.	80 %	32 to 48	16 to 24	20 %	64 to 96	40 %	64 to 96
		40	20		80		80

REFER TO CALIBRATION REPORT N/A FOR PREVIOUS SATISFACTORY LINEARITY

COMMENTS: N/A

WELD(S) EXAMINED: RCW-21

EXAMINER: Dancy L. DeLoach LEVEL: II

ANTI: TDm

EXAMINER: W. W. Kling LEVEL: II

DATE: 3/31/97

REVIEWED BY: W. W. Kling LEVEL: II

DATE: 3-30-97 PAGE 2 OF 11

TENNESSEE VALLEY AUTHORITY

USN-50 ULTRASONIC  
CALIBRATION  
DATA SHEET

CALIBRATION NO.

C- R-6886

PROJECT: SONP UNIT: 1

PROCEDURE: N-UT-19 REV.: 9 TC: \_\_\_\_\_

INSTRUMENT: KRAUTKRAMER

MODEL/TYPE: USN-50

SERIAL NUMBER: E21664 10-1-97

TRANSDUCER MANUF.: KB-REBOTECH

SERIAL NO.: E25213

SIZE: .5 x 1.0 FREQUENCY: 2.25 MHz

CABLE TYPE: RG174 LENGTH: 72

CALIBRATION DATE: 29 MAR 97

CALIBRATION BLOCK NO.: BNP-79 TEMP.: 76 °F

SIMULATOR BLOCK NO.: 5105

THERMOMETER SERIAL NO.: E26099

COUPLANT: UTRABEL BATCH: 94125

EXAM TYPE:  SHEAR  LONG.  RL

ANGLE VERIFICATION

BLOCK TYPE: ITW SERIAL NO. 789191

NOMINAL ANGLE: 45 ACTUAL ANGLE: 45

INSTRUMENT SETTINGS

REFLECTOR ORIENTATION	REFERENCE SENSITIVITY	DATA SET
AXIAL	N/A	N/A
CIRC	35 dB	30

TOP (PEAK/FLANK): PEAK ANGLE: 45 DEG.

DELAY: 12.89  $\mu$ S ZERO: 12.873  $\mu$ S

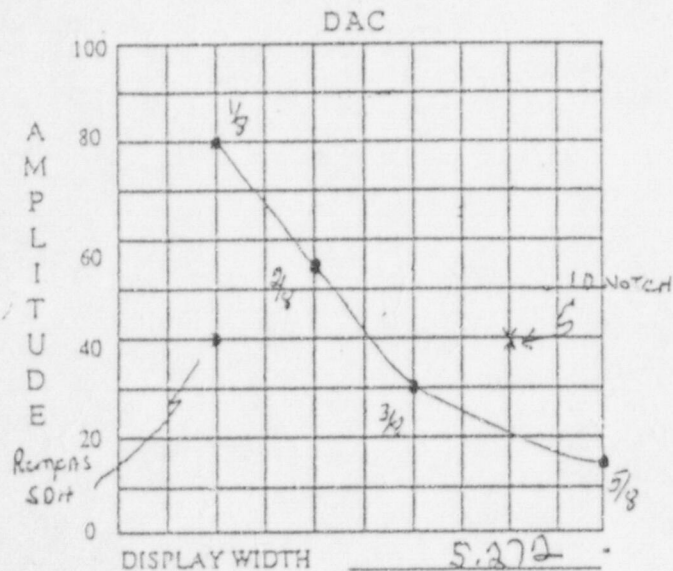
MATL VELOCITY: 1283  $\mu$ S RANGE: 5.272

REJECT: OFF % PULSER: HIGH

DUAL:  ON  OFF

INITIAL CALIBRATION

INITIAL TIME: 0905 FINAL TIME: 1052



REF. REFLECTOR: Ramp 50dB GAIN: 35.0 dB

AMPLITUDE: 40 % METAL PATH: 1.074

VERIFICATION TIMES

1) 0952	2) 1034	3)	4)
5)	6)	7)	8)

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C  
K

VERTICAL

ATTENUATOR

SIGNAL 1	100	90	80	70	60	50	40	30	20	10
SIGNAL 2	50	45	40	35	30	25	20	15	10	5

GAIN	SET	-6	-12	SET	+12	SET	+6
SIGNAL AMP.	80%	32 to 48	16 to 24	20%	64 to 96	40%	64 to 96
		40	20		30		30

REFER TO CALIBRATION REPORT N/A FOR PREVIOUS SATISFACTORY LINEARITY

COMMENTS: 3/8, 5/8 30 DIFFERENCE FROM

CLAD SIDE IS 68A

WELD(S) EXAMINED: RCW-21

EXAMINER: [Signature] LEVEL: I

EXAMINER: [Signature] LEVEL: II

REVIEWED BY: [Signature] LEVEL: III

DATE: 3-30-97

ANTI: 10mm

DATE: 3/31/97

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TENNESSEE VALLEY AUTHORITY

USN-50 ULTRASONIC CALIBRATION DATA SHEET

CALIBRATION NO.

C- 26886

PROJECT: SONP UNIT: 1

PROCEDURE: N-UT-19 REV.: 9 TC: \_\_\_\_\_

INSTRUMENT: KRAUTKRAMER

MODEL TYPE: USN-50

SERIAL NUMBER: E21664 10-7-97

TRANSDUCER MANUF.: KB-ARBO TECH

SERIAL NO.: E25215

SIZE: .50 x 1.0 FREQUENCY: 2.25 MHz

CABLE TYPE: RG174 LENGTH: 72

CALIBRATION DATE: 29 MAR 97

CALIBRATION BLOCK NO.: BHP-79 TEMP: 76 °F

SIMULATOR BLOCK NO.: 5105

THERMOMETER SERIAL NO.: E26099

COUPLANT: ULTRAGEL BATCH: 94135

EXAM TYPE:  SHEAR  LONG  RL

ANGLE VERIFICATION

BLOCK TYPE: 110 SERIAL NO. 739191

NOMINAL ANGLE: 60 ACTUAL ANGLE: 60

INSTRUMENT SETTINGS

REFLECTOR ORIENTATION	REFERENCE SENSITIVITY	DATA SET
AXIAL	1/17	1/4
CIRC	4/0	21

TOF (PEAK/FLANK): PEAK ANGLE: 60 DEG.

DELAY: 15.94 μs ZERO: 15.98 μs

MATL VELOCITY: 1283 μs RANGE: 2.097

REJECT: 0 % PULSER: 1/164

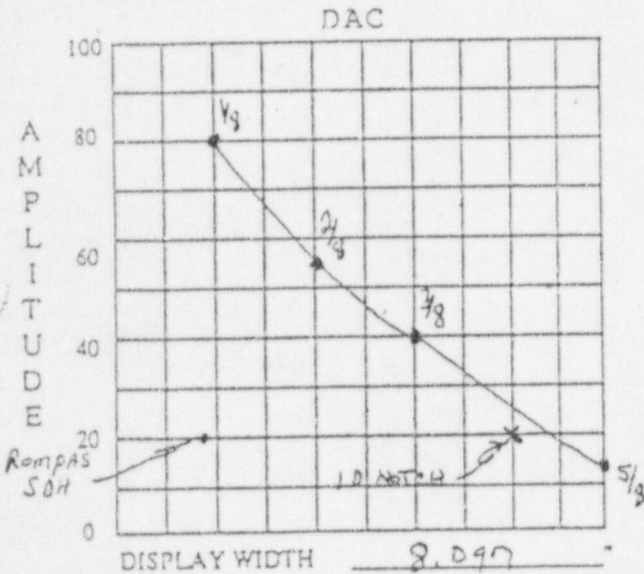
DUAL:  ON  OFF

INITIAL CALIBRATION

INITIAL TIME: 0910 FINAL TIME: 1051

VERIFICATION TIMES

1) 0952	2) 1034	3)	4)
5)	6)	7)	8)



REF. REFLECTOR: Rompas SDH GAIN: 41.0 dB

AMPLITUDE: 20 % METAL PATH: 1.927 1.9 29 MAR 97

VERTICAL ATTENUATOR	SIGNAL 1	100	90	80	70	60	50	40	30	20	10
	SIGNAL 2	50	45	40	35	30	25	20	15	10	5
GAIN	SET	-6	-12	SET	+12	SET	+6				
SIGNAL AMP.	80 %	32 to 48	16 to 24	20 %	64 to 96	40 %	64 to 96				
		40	20		20		20				20

REFER TO CALIBRATION REPORT NA FOR PREVIOUS SATISFACTORY LINEARITY

COMMENTS: 3/3 7/2 RB DIFFERENCE FROM CLAD

SINE IS 988

WELD(S) EXAMINED: RCW-21

EXAMINER: [Signature] LEVEL: II

EXAMINER: [Signature] LEVEL: II

REVIEWED BY: [Signature] LEVEL: #1

ANIL: [Signature]

DATE: 3/31/97

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DATE: 3-30-97



TENNESSEE VALLEY AUTHORITY

MANUAL ULTRASONIC  
VESSEL EXAMINATION  
DATA SHEET

REPORT NO.

R- 6886

PROJECT: SQMP UNIT: 1  
 SYSTEM: PRESSURIZER  
 WELD I.D.: RCW-21  
 CONFIG: NOZZLE TO: SHELL  
 PROCEDURE: N-UT- 19 REV. 9 TC: N/A

W<sub>0</sub> REFERENCE: ♀ OF WELD  
 L<sub>0</sub> REFERENCE: OUTSIDE RADIUS OF BENT PIPE BELOW  
 SURFACE TEMP: F 74  
 PYRO. SERIAL NO. E26099

EXAMINATION DATE: 29 MAR 97  
 START TIME: 0955 END TIME: 1032

CAL. SHT. NO.	ANGLE	SCAN SENSITIVITY
	45	53 dB
	60	59 dB
	N/A	N/A dB

RESULTS: (SCAN NUMBER)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
INDICATION RECORDED (Y/N)									N	N	N									

IND NO	MAX AMP	SCAN NO	ANG	100% (1/2 MAX)			50%			20%			MAX			20%			50%			100% (1/2 MAX)					
				Mp1	W1	L1	Mp1	W1	L1	Mp1	W1	L1	Mp	W	L	Mp2	W2	L2	Mp2	W2	L2	Mp2	W2	L2			
		9	45	NO RECORDABLE INDICATIONS																							
		10	45	NO RECORDABLE INDICATIONS																							
		11	45	NO RECORDABLE INDICATIONS																							
		9	60	NO RECORDABLE INDICATIONS																							
		10	60	NO RECORDABLE INDICATIONS																							
		11	60	NO RECORDABLE INDICATIONS																							
				N																							
				A																							

REMARKS/LIMITATIONS: <sup>29 MAR 97</sup> MAINTAINED T.D. CLAD ROLL AT ~~10~~<sup>15</sup> 5% WHILE SCANNING. NO EXAM ON NOZZLE SIDE OF WELD DUE TO CONFIGURATION. EXAM LIMITED FROM SCAN 9 SIDE, WITH A W-3.75", DUE TO INSTRUMENTATION PENETRATIONS ON BOTTOM OF PRESSURIZER.

EXAMINER: J. M. [Signature] LEVEL: IF  
 EXAMINER: C. LITFIELD [Signature] LEVEL: II

REVIEWED BY: [Signature]  
 LEVEL: III DATE: 3.30.97

ANII  
 T. D. [Signature] 3/31/97  
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TENNESSEE VALLEY AUTHORITY

BEAM SPREAD  
AND RESOLUTION  
DATA SHEET

REPORT NO.

R- 6886

PROJECT: SQNP UNIT: 1

BEAM SPREAD DATE: 3-28-97

SEARCH UNIT

PROCEDURE: N-UT- 19 REV. 9 TO N/A

MANUFACTURER KB-A

CALIBRATION SHEET NO. C- \_\_\_\_\_

SIZE: .5" x 1.0" FREQ.: 2.25 MHz

UT INSTRUMENT

S/N: E25213 NOM. ANGLE 45°

MANUFACTURER: KB

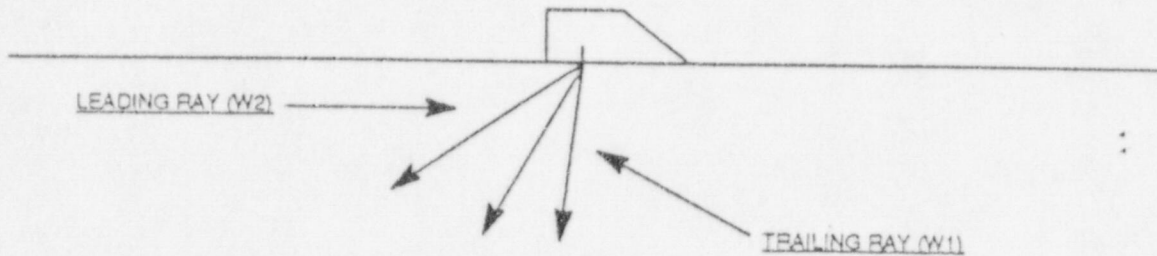
MEASURED ANGLE: 45° DEG.

MODEL NUMBER: USN-50

BEAM SPREAD: 11.5° DEG.

SERIAL NUMBER: E21664 10-1-97

HOLE POSITION	TRAILING RAY (W1)				W MAX		LEADING RAY (W2)			
	20% DAC		50% DAC		100% DAC		50% DAC		20% DAC	
	W	MP	W	MP	W	MP	W	MP	W	MP
1/4T	1.10	1.206	1.05	1.152	.90	1.051	.70	.922	.55	.785
1/2T	2.05	2.405	1.90	2.308	1.62	2.099	1.45	1.971	1.32	1.897
3/4T	3.00	3.717	2.90	3.576	2.35	3.180	2.20	3.037	2.00	2.901



R.G. 1.150 RESOLUTION VERIFICATION

NEAR SURFACE REFLECTOR: N/A DEPTH: N/A IN. SIZE: N/A

FAR SURFACE REFLECTOR: N/A DEPTH: N/A IN. SIZE: N/A

SCANNING (REFLECTORS PROVIDE 50% DAC SIGNALS AT SCANNING SPEED:  YES  NO

REMARKS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

EXAMINER: [Signature] LEVEL: II

ANII TRM

EXAMINER: [Signature] LEVEL: II

DATE: 3/31/97

REVIEWED BY: [Signature] LEVEL: III

DATE: 3.30.97

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TENNESSEE VALLEY AUTHORITY

BEAM SPREAD AND RESOLUTION DATA SHEET

REPORT NO.

R-6886

PROJECT: SQNP UNIT: 1

BEAM SPREAD DATE: 3-28-97

SEARCH UNIT

PROCEDURE: N-UT-19 REV. 9 TC N/A

CALIBRATION SHEET NO. C- \_\_\_\_\_

MANUFACTURER KB-A

UT INSTRUMENT

SIZE: .5" x 1.0" FREQ.: 2.25 MHz

MANUFACTURER: KB

S/N: E25215 NOM. ANGLE 60°

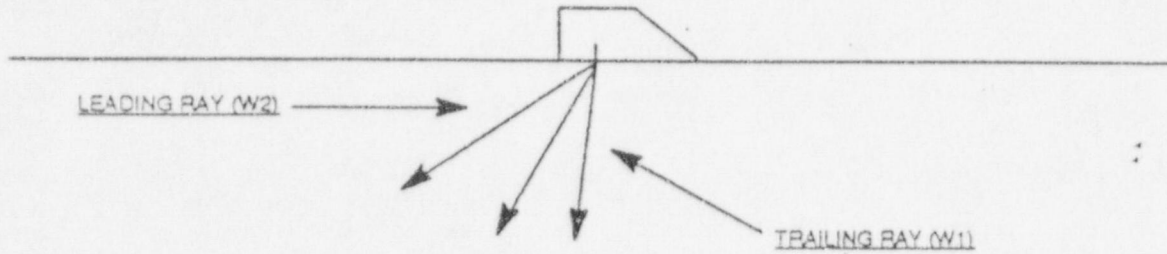
MODEL NUMBER: USN-50

MEASURED ANGLE: 60° DEG.

SERIAL NUMBER: E21664 10-1-97

BEAM SPREAD: 14° DEG.

HOLE POSITION	TRAILING RAY (W1)				W MAX		LEADING RAY (W2)			
	20% DAC		50% DAC		100% DAC		50% DAC		20% DAC	
	W	MP	W	MP	W	MP	W	MP	W	MP
1/4 T	2.1	2.166	1.85	1.92	1.55	1.618	1.22	1.339	1.05	1.174
1/2 T	3.85	4.056	3.45	3.72	2.95	3.223	3.2	2.678	2.20	2.585
3/4 T	6.1	6.406	5.3	5.68	4.45	4.907	3.75	4.305	3.30	3.933



R.G. 1.150 RESOLUTION VERIFICATION

NEAR SURFACE REFLECTOR: N/A DEPTH: N/A IN. SIZE: N/A

FAR SURFACE REFLECTOR: N/A DEPTH: N/A IN. SIZE: N/A

SCANNING (REFLECTORS PROVIDE 50% DAC SIGNALS AT SCANNING SPEED:  YES  NO

REMARKS: N/A

EXAMINER: Joh L. [Signature] LEVEL: II  
 EXAMINER: C. [Signature] LEVEL: II  
 REVIEWED BY: [Signature] LEVEL: II

DATE: 3-30-97  
 ANII TDm  
 DATE: 3/31/97  
 PAGE 8 OF 11

TVA

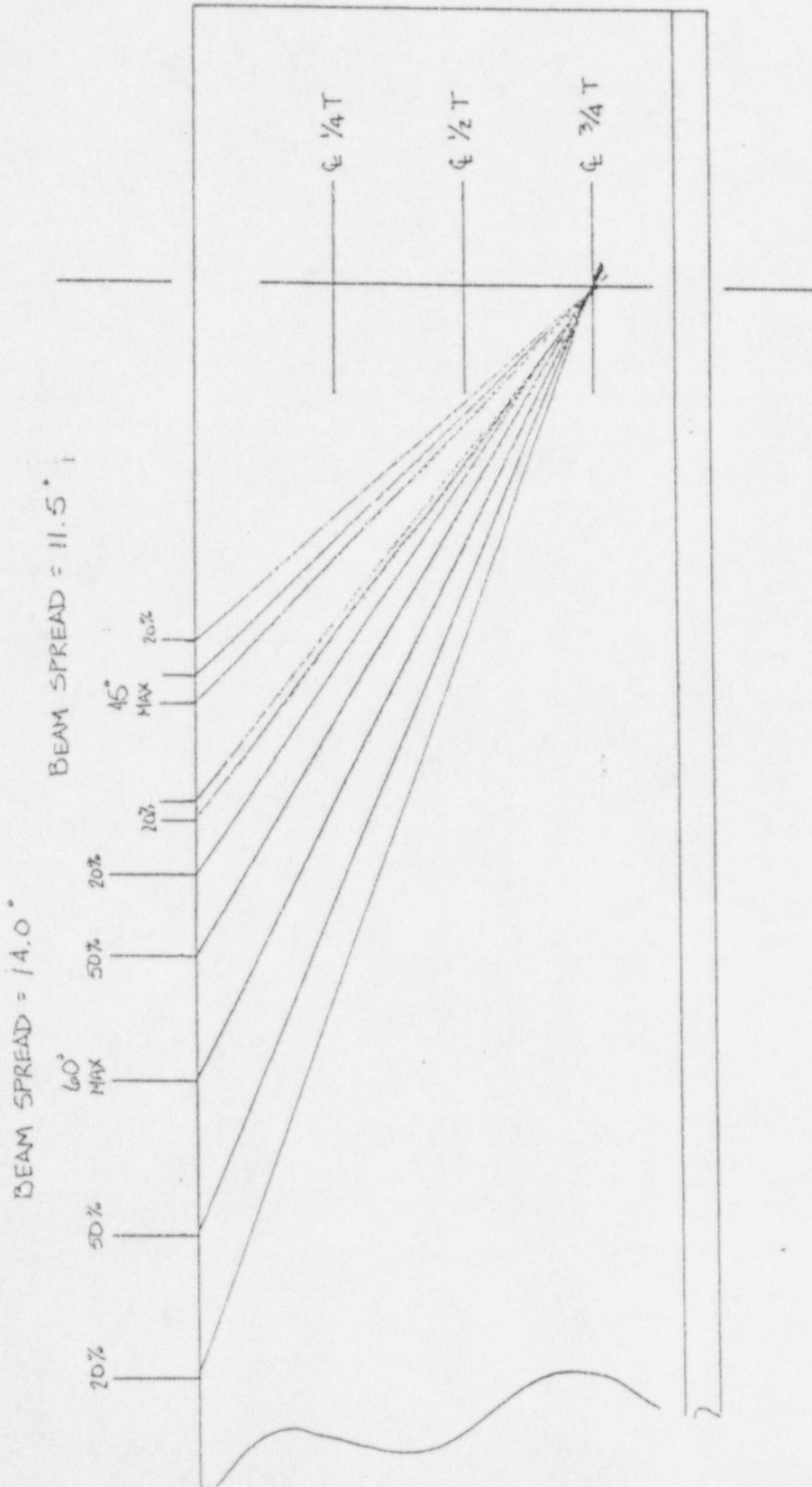
Office of Nuclear Power

PROJECT: SONP SYSTEM: PZR

Unit: 1 WELD NO.: RCW-21

REPORT NO.:

R-6886



BY: *[Signature]*

LEVEL: II

DATE: 3/29/97

PAGE

2

OF

11

TVA

Office of Nuclear Power

PROJECT: SONP

SYSTEM: PZR

REPORT NO.:

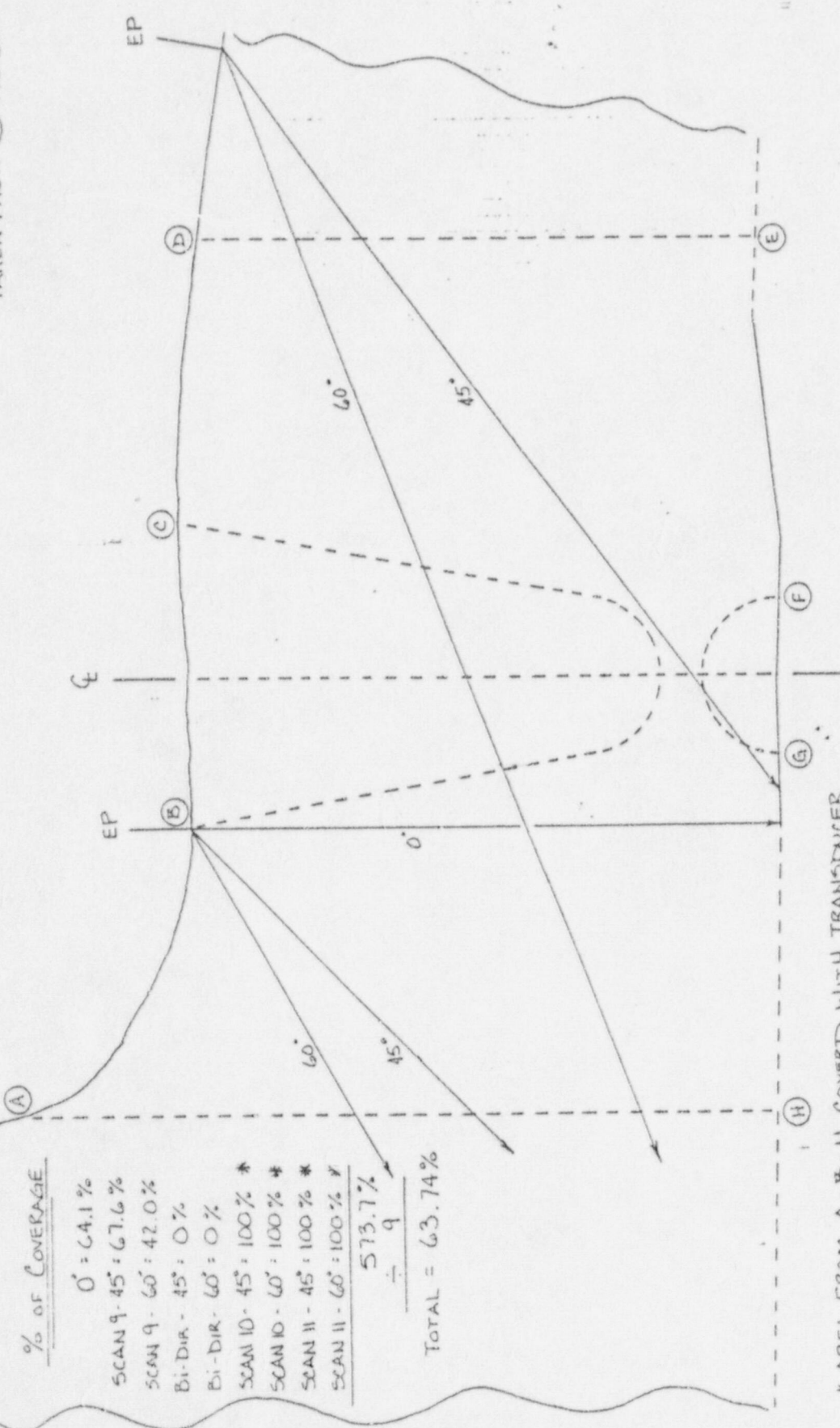
Unit: 1

WELD NO.: RCW-21

18-6886

COVERAGE PLOT

WELD LOCATION AND EDGE PREP.  
TAKEN FROM (W) AS-BUILT DATA.



% of COVERAGE	
0°	64.1%
SCAN 9 - 45°	67.6%
SCAN 9 - 60°	42.0%
Bi-DIR - 45°	0%
Bi-DIR - 60°	0%
SCAN 10 - 45°	100% *
SCAN 10 - 60°	100% *
SCAN 11 - 45°	100% *
SCAN 11 - 60°	100% *
<hr/>	
	573.7%
	÷ 9
TOTAL	= 63.74%

\* AREA FROM A-B-H COVERED WITH TRANSDUCER SKEW AND INNER RADIUS SCANS.

TVA

Office of Nuclear Power

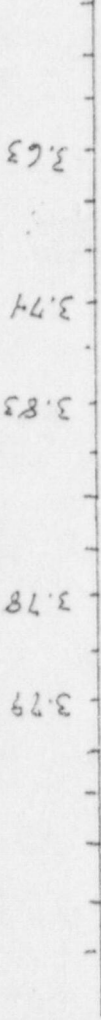
PROJECT: SEQUOYAH SYSTEM: PZR

Unit: 1 WELD NO.: RCW 21

REPORT NO.:

A-6886

NOZZLE



LOWER HEAD  
PRESSURIZER.

BY: Nancy LaSopa

LEVEL: II

DATE: 3.28.97

PAGE 11

OF 11

TENNESSEE VALLEY AUTHORITY

EXAMINATION SUMMARY AND RESOLUTION SHEET

REPORT NO. R-6933

PROJECT: SEQUOYAH UNIT: 1/C8  
 SYSTEM: PZR  
 WELD I.D.: RCW-15  
 CONFIG: NOZZLE TO: PRESSURIZER  
 PROCEDURE: N-UT-19 REV.: 9 TO: N/A  
 NDE METHOD:  UT  PT  MT  VT

EXAMINER: MICHAEL S. SESSOMS LV: II  
 EXAMINER: DOUGLAS M. GROMWOLD LV: II  
 EXAMINER: N/A LV: N/A  
 EXAMINER: N/A LV: N/A  
 CAL SHT NO'S: N/A

THIS REPORT CONTAINS THE DATA ASSOCIATED WITH THE MANUAL ULTRASONIC EXAMINATION OF WELD RCW-15, A CARBON STEEL NOZZLE TO VESSEL WELD CONFIGURATION WITH STAINLESS STEEL CLAD. THE EXAMINATION WAS PERFORMED IN ACCORDANCE WITH N-UT-19 REVISION 9 TO MEET THE REQUIREMENTS OF ASME SECTION XI.

THE EXAMINATION WAS PERFORMED USING A 0°, 45° SHEAR AND 60° SHEAR ANGLE. NO AXIAL SCAN WAS PERFORMED FROM THE NOZZLE SIDE (SCAN 8) DUE TO THE CONFIGURATION OF THE NOZZLE. SCAN 9 WAS CONTINUED ACROSS THE WELD.

NO RECORDABLE INDICATIONS WERE DETECTED.

78% COVERAGE WAS ACHIEVED.

REFERENCE REPORT R-6886 FOR BEAM SPREAD DATA.

EVALUATOR: M.S. SESSOMS LEVEL: II DATE: 4-2-97

CONCURRENCE: 2 Mcwoody LEVEL: III DATE: 4-3-97

ANII DM  
 DATE: 4/3/97  
 PAGE 1 OF 6

TENNESSEE VALLEY AUTHORITY

USN-50 ULTRASONIC  
CALIBRATION  
DATA SHEET

CALIBRATION NO.

C- R6933

PROJECT: SQNP UNIT: 1

CALIBRATION DATE: 1 APR 97

PROCEDURE: N-UT- 19 REV.: 9 TC: N/A

CALIBRATION BLOCK NO.: BNP 79 TEMP.: 70 °F

INSTRUMENT: KRAUTKRAMER

SIMULATOR BLOCK NO.: 790917

MODEL TYPE: USN 50

THERMOMETER SERIAL NO.: E26106

SERIAL NUMBER: E24253

COUPLANT: ULTRAGEL BATCH: 94125

EXAM TYPE:  SHEAR  LONG  RL

TRANSDUCER MANUF.: KB AEROTECH

SERIAL NO.: M05955

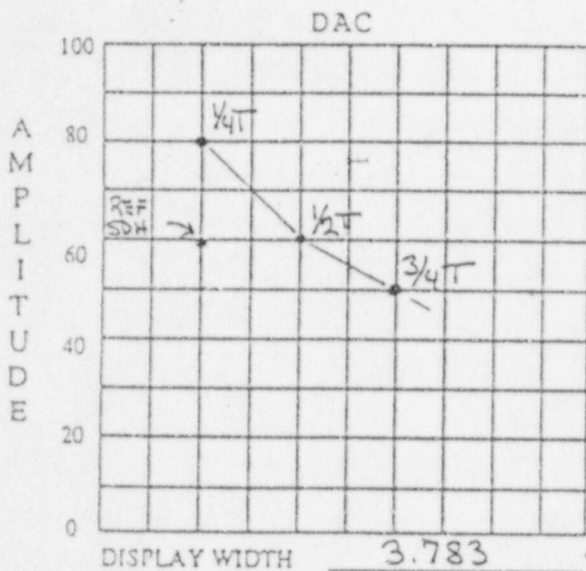
ANGLE VERIFICATION

SIZE: 1.0" FREQUENCY: 2.25 MHz

BLOCK TYPE: ROMPAS SERIAL NO. 790917

CABLE TYPE: RG-174 LENGTH: 72 "

NOMINAL ANGLE: 0 ACTUAL ANGLE: 0



INSTRUMENT SETTINGS

REFLECTOR ORIENTATION	REFERENCE SENSITIVITY	DATA SET
AXIAL	35	5
CIRC	N/A	N/A

TOP (PEAK / FLANK): PEAK ANGLE: OFF DEG.

DELAY: 0.313  $\mu$ S ZERO: -580  $\mu$ S

MATL VELOCITY: .2326  $\mu$ S RANGE: 3.783

REJECT: 0 % PULSER: HIGH

DUAL:  ON  OFF

INITIAL CALIBRATION

INITIAL TIME: 1350 FINAL TIME: 1503

REF. REFLECTOR: Rompas SDH GAIN: 35 dB

AMPLITUDE: 60 % METAL PATH: .77 "

VERIFICATION TIMES

1) <u>1450</u>	2) <u>1503</u>	3) <u>N/A</u>	4) <u>N/A</u>
5) <u>N/A</u>	6) <u>N/A</u>	7) <u>N/A</u>	8) <u>N/A</u>

CHIEF N.C.K.

VERTICAL ATTENUATOR

SIGNAL 1	100	90	80	70	60	50	40	30	20	10
SIGNAL 2	50	45	40	35	30	25	20	15	10	5
GAIN	SET	-6	-12	SET	+12	SET	+6			
SIGNAL AMP.	80%	32 to 48	16 to 24	20%	64 to 96	40%	64 to 96			
		40	20		80		80			

REFER TO CALIBRATION REPORT N/A FOR PREVIOUS SATISFACTORY LINEARITY

COMMENTS: N/A

WELD(S) EXAMINED: RCW-15

EXAMINER: [Signature] LEVEL: II

ANII: TDM

EXAMINER: [Signature] LEVEL: II

DATE: 4/3/97

REVIEWED BY: [Signature] LEVEL: III

DATE: 4-3-97 PAGE 2 OF 6

TENNESSEE VALLEY AUTHORITY

USN-50 ULTRASONIC CALIBRATION DATA SHEET

CALIBRATION NO.

C- R6933

PROJECT: SQNP UNIT: 1

CALIBRATION DATE: 4-1-97

PROCEDURE: N-UT-19 REV.: 9 TC: N/A

CALIBRATION BLOCK NO.: BNP 79 TEMP: 70 °F

INSTRUMENT: KRAUTKRAMER

SIMULATOR BLOCK NO.: 790917

MODEL/TYPE: USN 50

THERMOMETER SERIAL NO.: E26106

SERIAL NUMBER: E24253

COUPLANT: ULTRAGEL BATCH: 94/25

EXAM TYPE:  SHEAR  LONG.  RL

TRANSDUCER MANUF.: KB AEROTECH

SERIAL NO.: E25213

SIZE: .5" x 1.0" FREQUENCY: 2.25 MHz

CABLE TYPE: RG 174 LENGTH: 72"

ANGLE VERIFICATION

BLOCK TYPE: IIW SERIAL NO. 789191

NOMINAL ANGLE: 45° ACTUAL ANGLE: 45°

INSTRUMENT SETTINGS

REFLECTOR ORIENTATION	REFERENCE SENSITIVITY	DATA SET
AXIAL	35	19
CIRC	35	19

TOF (PEAK / FLANK): PEAK ANGLE: 45 DEG.

DELAY: 12.59 us ZERO: 12.371 us

MATL VELOCITY: .1298 us RANGE: 5.272

REJECT: 0 % PULSER: HIGH

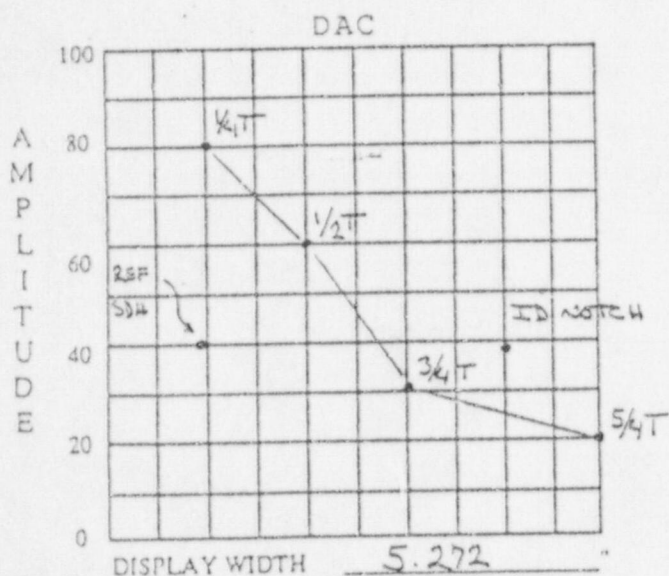
DUAL:  ON  OFF

INITIAL CALIBRATION

INITIAL TIME: 1410 FINAL TIME: 1530

VERIFICATION TIMES

1) 1506	2) 1530	3) N/A	4)
5)	6)	7) N/A	8)



REF. REFLECTOR: Rompas SDH GAIN: 35 dB

AMPLITUDE: 40 % METAL PATH: 1.064

C L I E N C K	VERTICAL ATTENUATOR	SIGNAL										
		SIGNAL 1	100	90	80	70	60	50	40	30	20	10
		SIGNAL 2	50	45	40	35	30	25	20	15	10	5
		GAIN	SET	-6	-12	SET	+12	SET	+6			
		SIGNAL AMP.	80 %	32 to 48	16 to 24	20 %	64 to 96	40 %	64 to 96			
				40	20		80		80			

REFER TO CALIBRATION REPORT N/A FOR PREVIOUS SATISFACTORY LINEARITY

COMMENTS: 3/4T, 5/4T - 4dB DIFFERENCE

WELD(S) EXAMINED: RCW-15

From CW Side

EXAMINER: [Signature] LEVEL: II

ANII: [Signature]

EXAMINER: [Signature] LEVEL: II

DATE: 4/3/97

REVIEWED BY: [Signature] LEVEL: III

DATE: 4-3-97 PAGE 3 OF 6



TENNESSEE VALLEY AUTHORITY

USN-50 ULTRASONIC  
CALIBRATION  
DATA SHEET

CALIBRATION NO.

C- R6933

PROJECT: SQNP UNIT: 1

CALIBRATION DATE: 4-1-97

PROCEDURE: N-UT-19 REV.: 9 TC: N/A

CALIBRATION BLOCK NO.: BNP-79 TEMP.: 76 F

INSTRUMENT: KRAUTZAMER

SIMULATOR BLOCK NO.: 790917

MODEL TYPE: USN 50

THERMOMETER SERIAL NO.: E26106

SERIAL NUMBER: E24253

COUPLANT: ULTRAGEL BATCH: 94125

EXAM TYPE:  SHEAR  LONG.  RL

TRANSDUCER MANUF.: KB AEROTECH

ANGLE VERIFICATION

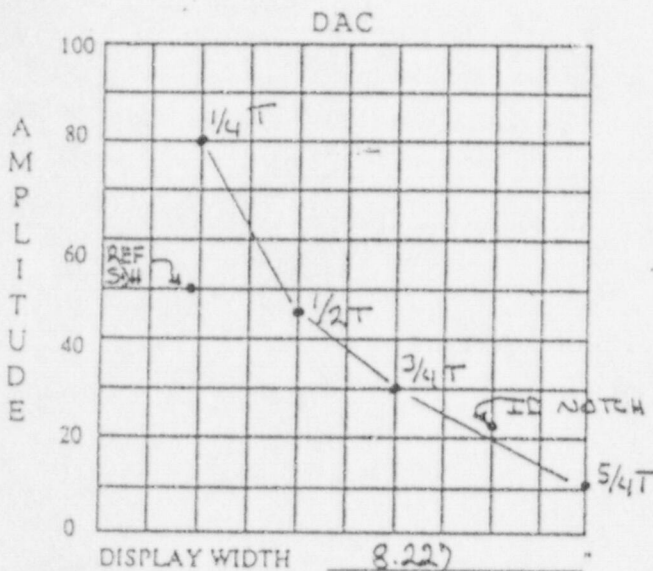
SERIAL NO.: E25215

BLOCK TYPE: I I W SERIAL NO.: 789191

SIZE: 5" x 1.0" FREQUENCY: 2.25 MHz

NOMINAL ANGLE: 60° ACTUAL ANGLE: 60°

CABLE TYPE: RG 174 LENGTH: 72"



INSTRUMENT SETTINGS

REFLECTOR ORIENTATION	REFERENCE SENSITIVITY	DATA SET
AXIAL	42	20
CIRC	42	20

TOF (PEAK / FLANK): PEAK ANGLE: 60 DEG.  
 DELAY: 14.70 us ZERO: 16.364 us  
 MATL VELOCITY: 1285 us RANGE: 8.227  
 REJECT: 0 % PULSER: HIGH  
 DUAL:  ON  OFF

INITIAL CALIBRATION

INITIAL TIME: 1420 FINAL TIME: 1555

REF. REFLECTOR: Romex SDH GAIN: 42 dB

VERIFICATION TIMES

AMPLITUDE: 50 % METAL PATH: 1.418

1) 1534	2) 1555	3)	4) N/A
5)	6)	7) N/A	8)

VERTICAL  
LINEARITY  
CHECK

SIGNAL 1	100	90	80	70	60	50	40	30	20	10
SIGNAL 2	50	45	40	35	30	25	20	15	10	5
GAIN	SET	-6		-12	SET	+12	SET	+6		
SIGNAL AMP.	80 %	32 to 48		16 to 24	20 %	64 to 96	40 %	64 to 96		
		40		20		80		80		

REFER TO CALIBRATION REPORT N/A FOR PREVIOUS SATISFACTORY LINEARITY

COMMENTS: 3/4T, 5/4T - 9dB DIFFERENCE  
From CW SIDE

WELD(S) EXAMINED: RCW-15

EXAMINER: [Signature] LEVEL: II

ANII: TDAM

EXAMINER: [Signature] LEVEL: II

DATE: 4/3/97

REVIEWED BY: [Signature] LEVEL: III

DATE: 4.3.97 PAGE 4 OF 6

TENNESSEE VALLEY AUTHORITY

MANUAL ULTRASONIC  
VESSEL EXAMINATION  
DATA SHEET

REPORT NO.

R-6933

PROJECT: SQNP UNIT: 1  
 SYSTEM: PRESSURIZER  
 WELD I.D.: RCW-15  
 CONFIG: NOZZLE TO: PZR  
 PROCEDURE: N-UT- 19 REV. 9 TC: N/A

W<sub>0</sub> REFERENCE: WELD &  
 L<sub>0</sub> REFERENCE: UNDER SPRAY PIPE \*SEE SKETCH  
 SURFACE TEMP: 75° F  
 PYRO. SERIAL NO. E26106

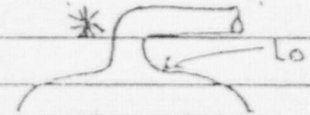
EXAMINATION DATE: 1 APR 97  
 START TIME: 4:40 | 4:50 | 5:00 | 5:10 | 5:20  
 END TIME: 5:30 | 5:40 | 5:50 | 6:00 | 6:10

CAL. SHT. NO.	ANGLE	SCAN SENSITIVITY
<del>1</del>	0°	41 dB
<del>2</del>	45°	49 dB
<del>3</del>	60°	56 dB

RESULTS: (SCAN NUMBER)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
INDICATION RECORDED (Y/N)						N/A			N	N	N					N/A			

IND NO	MAX AMP	SCAN NO	ANG	100% (1/2 MAX)			50%			20%			MAX			20%			50%			100% (1/2 MAX)		
				Mp1	W1	L1	Mp1	W1	L1	Mp1	W1	L1	Mp	W	L	Mp2	W2	L2	Mp2	W2	L2	Mp2	W2	L2
N/A																								

REMARKS/LIMITATIONS: NO SCAN # 8 (NOZZLE SIDE). ALL SCANS PERFORMED ACROSS THE WELD @ 20% NOISE LEVEL. NO RECORDABLE INDICATIONS DETECTED WITH THE 0°, 45° AND THE 60° EXAMS.

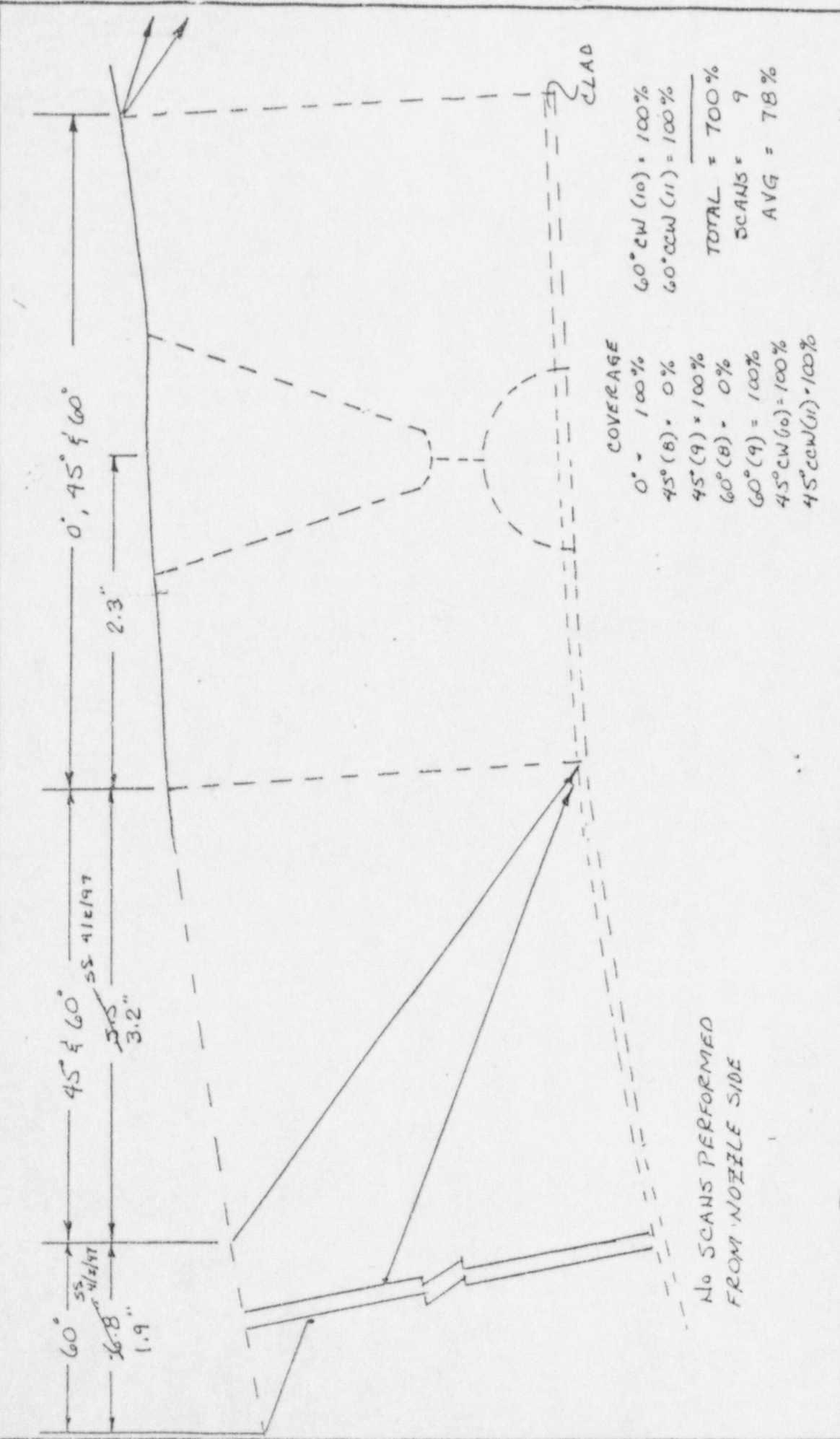


EXAMINER: [Signature] LEVEL: II  
 EXAMINER: [Signature] LEVEL: II

REVIEWED BY: [Signature]  
 LEVEL: III DATE: 4-3-97

ANII [Signature]  
 PAGE 5 OF 6

TVA Office of Nuclear Power  
 PROJECT: SEQUOYAH SYSTEM: PZR  
 Unit: I WELD NO.: RW-15  
 REPORT NO.: 86933



BY: W. S. S. LEVEL: II DATE: 4-1-77 PAGE 6 OF 6

ATTACHMENT 2

ISI PROGRAM DRAWINGS

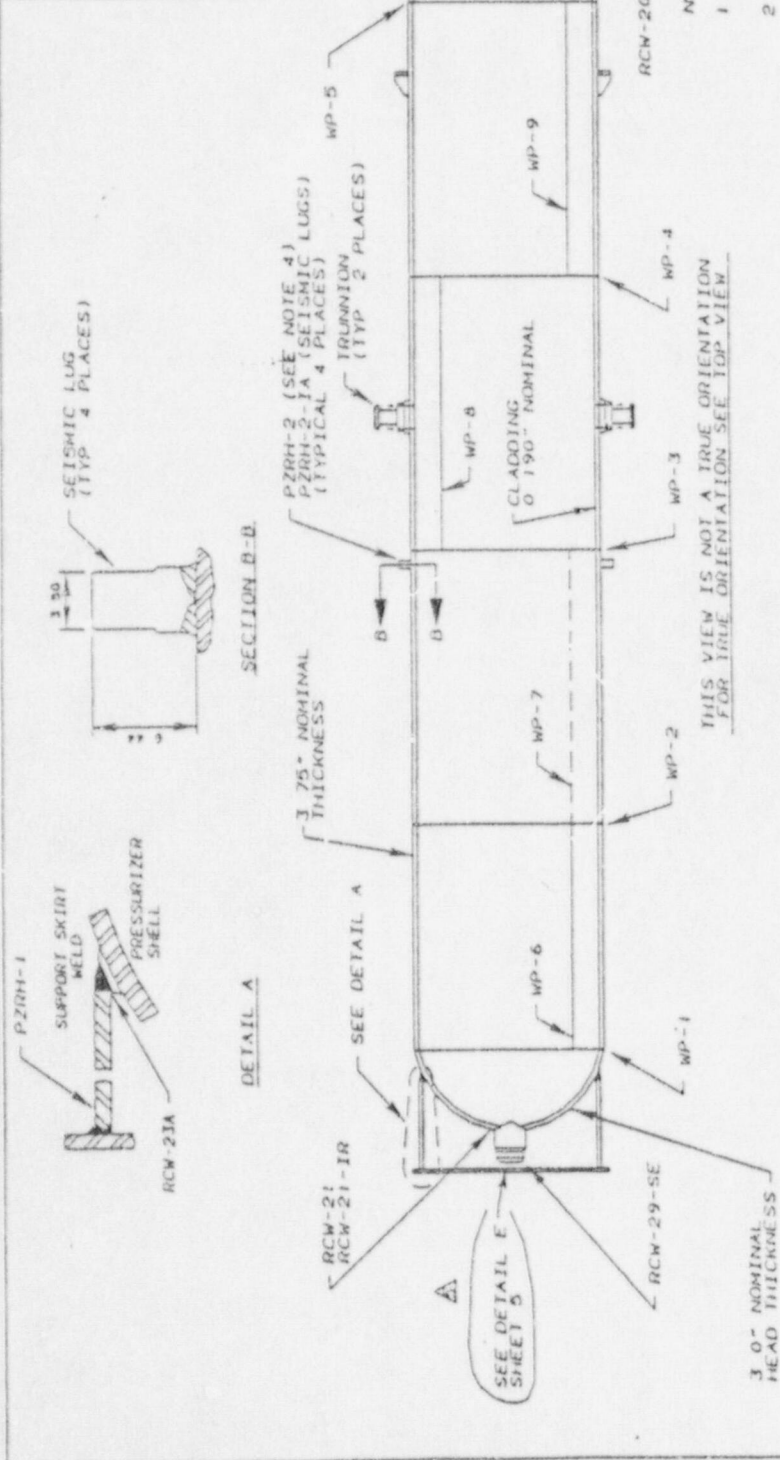
ISI-0394-C-01, REVISION 5

ISI-0394-C-05, REVISION 0

REFERENCE DRAWINGS  
 CONTRACT NO 48C60-91934 (INM-2-6)  
 PRESSURIZER MANUAL (FIGS 5-1, 5-7)

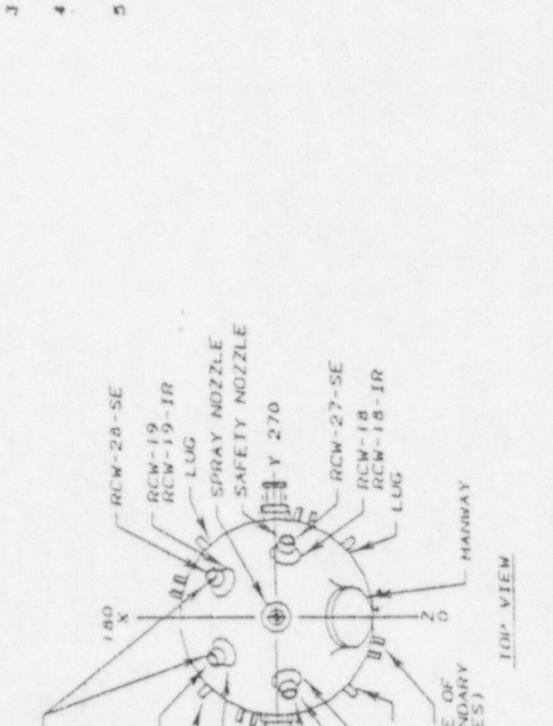
MATERIAL SPECIFICATIONS  
 ALL VESSEL SHELL AND HEAD SECTIONS ARE FABRICATED OF SA-513 CLASS 2 MANGANESE-NICKEL CHROMIUM STEEL AND ARE CLAD WITH AUSTENITIC STAINLESS STEEL. THE NOZZLES ARE FABRICATED OF SA-508 CLASS 2, MANGANESE-NICKEL CHROMIUM STEEL. SAFE END CONNECTIONS ARE SA-102, GR F-316L FORGINGS.

THE SUPPORT SKIRT IS APPROXIMATELY 1.5 INCHES THICK AND IS FABRICATED OF SA-516, GR 70, CARBON STEEL PLATE ASME (CC-1) EQUIVALENT



NOTES

- 1 THIS DWG SUPERCEDES BOTH CHN-2362-A AND CHN-2363-A
- 2 FOR UNIT 2 DWG SEE ISI-0396-C
- 3 0' IS 4 OF HANWAY AND MEASURED CLOCKWISE IN THE TOP VIEW
- 4 SUPPORT CLASSIFIED AS RIGID SUPPORT AT THIS LOCATION SEE DRAWING 48N428 FOR CONFIGURATION
- 5 VESSEL INSIDE SURFACE CLAD 0.190" NOM



AS BUILT DIMENSIONS  
 WELD NO -A-  
 WP-6 -60  
 WP-9 -45

8	APC	EDC	285	Q.W.	9-25-84
9	APC	EDC	285	Q.W.	9-25-84
10	APC	EDC	285	Q.W.	9-25-84
11	APC	EDC	285	Q.W.	9-25-84
12	APC	EDC	285	Q.W.	9-25-84
13	APC	EDC	285	Q.W.	9-25-84
14	APC	EDC	285	Q.W.	9-25-84
15	APC	EDC	285	Q.W.	9-25-84
16	APC	EDC	285	Q.W.	9-25-84
17	APC	EDC	285	Q.W.	9-25-84
18	APC	EDC	285	Q.W.	9-25-84
19	APC	EDC	285	Q.W.	9-25-84
20	APC	EDC	285	Q.W.	9-25-84
21	APC	EDC	285	Q.W.	9-25-84
22	APC	EDC	285	Q.W.	9-25-84
23	APC	EDC	285	Q.W.	9-25-84
24	APC	EDC	285	Q.W.	9-25-84
25	APC	EDC	285	Q.W.	9-25-84
26	APC	EDC	285	Q.W.	9-25-84
27	APC	EDC	285	Q.W.	9-25-84
28	APC	EDC	285	Q.W.	9-25-84
29	APC	EDC	285	Q.W.	9-25-84
30	APC	EDC	285	Q.W.	9-25-84
31	APC	EDC	285	Q.W.	9-25-84
32	APC	EDC	285	Q.W.	9-25-84
33	APC	EDC	285	Q.W.	9-25-84
34	APC	EDC	285	Q.W.	9-25-84
35	APC	EDC	285	Q.W.	9-25-84
36	APC	EDC	285	Q.W.	9-25-84
37	APC	EDC	285	Q.W.	9-25-84
38	APC	EDC	285	Q.W.	9-25-84
39	APC	EDC	285	Q.W.	9-25-84
40	APC	EDC	285	Q.W.	9-25-84
41	APC	EDC	285	Q.W.	9-25-84
42	APC	EDC	285	Q.W.	9-25-84
43	APC	EDC	285	Q.W.	9-25-84
44	APC	EDC	285	Q.W.	9-25-84
45	APC	EDC	285	Q.W.	9-25-84

DATE 8-27-91 SCALE 10:10 SCALE  
 APPROVED PNE [Signature] CHECKED PNB [Signature]  
 SUBMITTED EDC [Signature]

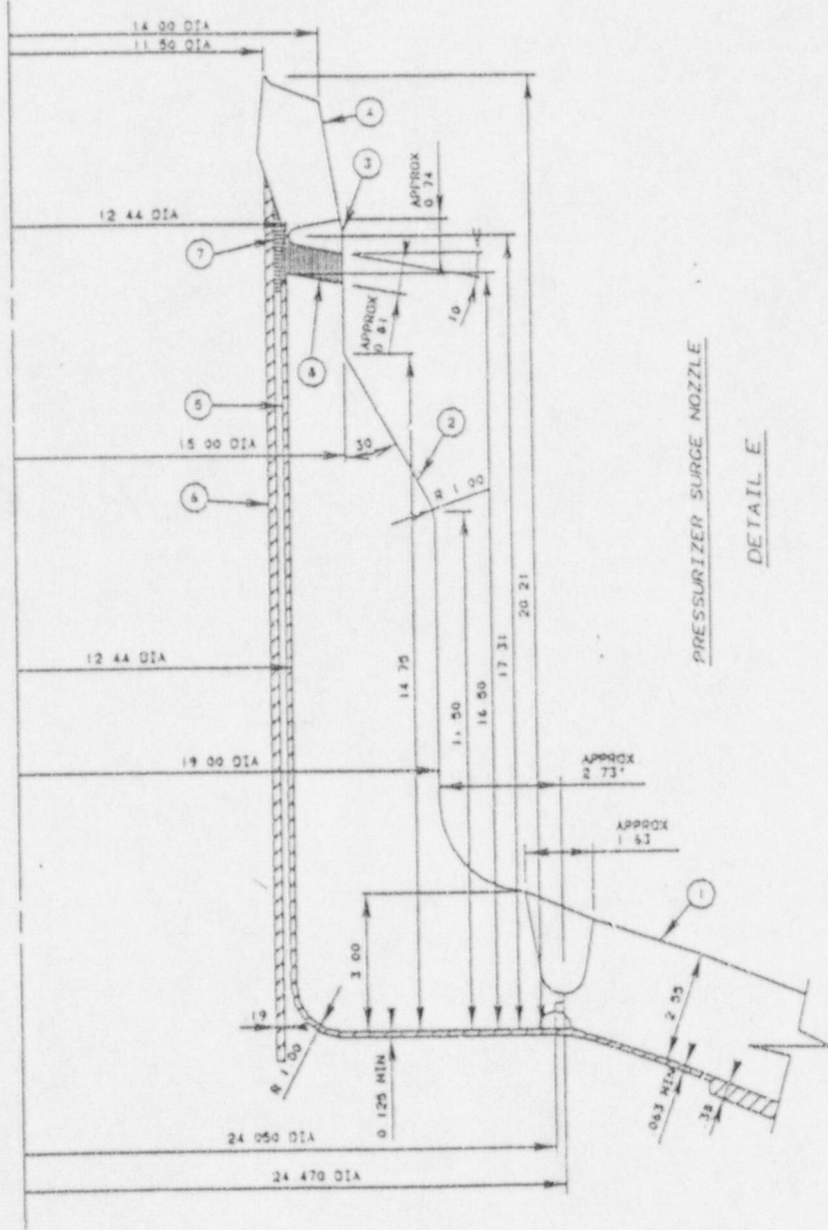
TEPPER PRESSURE VALLET AUTHORITY  
 UNIT 1  
 SECOUYAH NUCLEAR PLANT  
 PRESSURIZER

REFERENCE DRAWINGS  
 MEMO DIMS 538 960527 802  
 1098.09  
 1098.09  
 350897-A  
 1098.094

ASME (CC-1) EQUIVALENT

NOTE: THE DIMENSIONS ON THIS DRAWING  
 ARE FOR INFORMATION ONLY

ITEM	SLURGE NOZZLE MATERIAL	ASME NO
1	SA 533 GR A, CLASS 2	
2	SA 508 CLASS 2	
3	INCONEL WELD	
4	SA 192 GRADE F316L	
5	SST CLADDING	
6	SA 240	
7	INCONEL WELD	
8	INCONEL WELD BUILD-UP	



PRESSURIZER SURGE NOZZLE  
 DETAIL E

REV	BY	CHECKED	SUBMITTED	APPROVED	DATE
1					

TENNESSEE VALLEY AUTHORITY  
 SECOYAH NUCLEAR PLANT  
 UNIT  
 PRESSURIZER  
 SLURGE NOZZLE DETAILS  
 SCALE: NOT TO SCALE  
 DATE: 2/5/68  
 CHECKED: [Signature]  
 APPROVED: [Signature]  
 SUBMITTED: 154 0394-C-05

## Request For Relief 1-ISI-10

### Executive Summary:

This request for relief addresses circumferential pressure retaining welds in the reactor coolant system. The design configuration and materials used in the fabrication of the subject piping welds precludes a 100% ultrasonic examination of the required volume for the following welds: RC-06 (pipe elbow to pump casing) and RC-07 (pump casing to pipe). These physical examination limitations occur when the 1989 code examination requirements are applied in areas of components constructed and fabricated to early plant physical designs. Based on the date of SQN's construction permit (May 27, 1970), SQN is exempt from code requirements for examination access as allowed in 10 CFR 50.55a(g)(4).

A liquid penetrant surface examination was performed on 100% of the subject welds. An ultrasonic examination was performed on accessible areas to the maximum extent practical, given the physical limitations and materials of the subject welds. The design configuration and materials used limited ultrasonic examination to approximately 75% of Weld RC-06 and approximately 75% of Weld RC-07. It was concluded that performance of an ultrasonic examination of essentially 100% of the circumferential pressure retaining welds, RC-06 and RC-07, would be impractical. A surface examination and the maximum extent practical ultrasonic examination of the subject welds provides reasonable assurance of an acceptable level of quality and safety because the information and data obtained from the volume examined provides sufficient information to judge the overall integrity of the welds.

Therefore, pursuant to 10 CFR 50.55a(g)(5)(iii), it is requested that relief be granted for the second inspection interval.

Unit: 1

System: Reactor Coolant - System 68

Components: Two Piping Circumferential Pressure Retaining Welds

ASME Code Class: ASME Code Class 1 (Equivalent)

Section XI Edition: 1989 Edition

Code Table: IWB-2500-1

Examination Category: B-J, Pressure Retaining Welds In Piping

Examination Item Number: B9.11, Circumferential Welds Nominal Pipe Size 4 Inches Or Larger

Code Requirement: ASME Section XI, Table IWB-2500-1, Examination Category B-J, Item No. B9.11 Surface And Volumetric Examinations

Code Requirement From Which Relief Is Requested: Volumetric Examination Coverage

List Of Items Associated With The Relief Request: RC-06, Piping To Reactor Coolant Pump Circumferential Weld  
RC-07, Piping To Reactor Coolant Pump Circumferential Weld

Basis for Relief: The design configuration and materials used in the fabrication of the reactor coolant pump and the reactor coolant piping preclude an ultrasonic examination of the required volume of pressure retaining circumferential Welds RC-06 and RC-07. The design configuration and materials limit ultrasonic examination to approximately 75% of Weld RC-06 and approximately 75% of Weld RC-07.

Alternative Examinations: In lieu of the code required 100% ultrasonic examination, an ultrasonic examination was performed on accessible areas to the maximum extent practical, given the physical limitations of the subject welds. A surface examination (PT) of 100% of Welds RC-06 and RC-07 was also performed. Refer to Attachment 1 for Examination Data Reports.



Justification For The  
Granting Of Relief:

- (1) The design configuration and materials used in the fabrication of the subject piping welds preclude ultrasonic examination of essentially 100% of the required examination volume. In order to examine the welds in accordance with the code requirement, the reactor coolant pump would require extensive redesign along with changing the pump and piping material.

The weld joint detail for Weld RC-06 consists of a pipe elbow welded to a pump casing. The pipe elbow is static cast CF8M material welded to a static cast CF8M material pump casing. The weld joint detail for Weld RC-07 consists of a pump casing to pipe configuration. The pump is static cast CF8M material welded to centrifugal cast CF8M material piping. The examination is limited due to the design configuration and the effects of the anisotropic coarse grain structure of cast stainless material and the weld joint configuration, which limits search unit contact and movement.

Total ultrasonic examination coverage for RC-06 and RC-07 was approximately 75% of the required code coverage for each weld. Due to the anisotropic coarse grain structure of cast stainless CF8M materials, the examination was limited to the 1/2 vee technique using refracted longitudinal waves. Circumferential scans for both welds were unlimited. Both welds received 100% coverage from one side scanning in the axial direction with the sound beam directed toward the pump. No scans were performed from the pump side in the axial direction due to the pump taper interference; therefore, 0% coverage was obtained from this direction. It is reasonable to assume that circumferential flaws would be detected to the degree comparable with industry standards.

- (2) Radiographic examination, as an alternate volumetric examination method, was determined to be impractical due the material thickness (approximately 3 inches) and the pipe

being filled with water. Realignment of the system to drain all water would substantially increase radiation levels.

- (3) Westinghouse plants have no history of pipe cracking failure in the reactor coolant primary loop. For stress corrosion cracking (SCC) to occur, the following three conditions must exist simultaneously: high tensile stresses, a susceptible material, and a corrosive environment. The potential for SCC is minimized in Westinghouse PWR's by material selection and prevention of a corrosive environment (reference Westinghouse RCS Piping Flawbase Handbook, WCAP-13670).
- (4) A percentage sampling approach provided by the ASME Section XI Code, in combination with examinations performed on similar items, provides reasonable assurance that significant degradation, if present, would have been detected.

Performance of an ultrasonic volumetric examination of essentially 100% of the required volume of pressure retaining circumferential Welds RC-06 and RC-07 in the reactor coolant main loop piping would be impractical. As previously discussed, TVA determined that it would be impractical to attempt other volumetric examinations in order to increase examination coverage. The surface examination of 100% of the weld area and adjacent metal and maximum extent practical ultrasonic examination of the subject welds provides reasonable assurance of an acceptable level of quality and safety. Significant degradation, if present, would have been detected during the ultrasonic examination and the surface examination that was performed on the subject welds. As a result, reasonable assurance of operational readiness has been provided.

Therefore, pursuant to 10 CFR  
50.55a(g)(5)(iii), it is requested  
that relief be granted for the second  
inspection interval.

Implementation  
Schedule:

This request for relief is applicable to  
the second inspection interval for SQN  
Unit 1. Welds RC-06 and RC-07 were  
examined during the first period of SQN's  
second 10-year inspection interval.

References:

Attachment 1 - Examination Data Reports:  
R-6824, R-6826, R-6836, and R-6837.

Attachment 2 - ISI Program Drawings:  
ISI-0325-C-02, Revision 2 and  
ISI-0482-C-01, Revision 1.

ATTACHMENT 1

EXAMINATION DATA REPORTS

R-6824

R-6826

R-6836

R-6837

TENNESSEE VALLEY AUTHORITY

RECORD OF LIQUID PENETRANT EXAMINATION

REPORT NO. R-6824

PROJECT: SONP UNIT: 1 / C9

SYSTEM: RX

WELD / COMPONENT I.D.: RC-06

CONFIG: Elbow TO Pump

PROCEDURE: N-PT- 9 REV.: 13 TC: 97-14

ASME SECTION I  ASME SECTION XI

ASME SECTION III  ANSI B31.1

ASME SECTION VIII  ANSI B31.7

AWS D1.1  OTHER N/A

EXAMINATION DATE: 03-26-97

START TIME: 1544 END TIME: 1637

EXAM SURFACE: ID  OD

ORIGINAL EXAMINATION  REEXAMINATION

REFERENCE DRAWING NO. ISI-0482-C S/1

CODE CLASS / CATEGORY B-5 / 1

ACCEPTANCE CRITERIA

N-PT-9 APPENDIX A  APPENDIX B

OTHER N/A

METHOD OF EXAMINATION

METHOD

- WATER-WASHABLE FLUORESCENT DYE
- POST-EMULSIFIABLE FLUORESCENT DYE
- SOLVENT-REMOVABLE FLUORESCENT DYE
- WATER-WASHABLE VISIBLE DYE
- POST-EMULSIFIABLE VISIBLE DYE
- SOLVENT REMOVEABLE VISIBLE DYE

PENETRANT MATERIALS

BRAND NAME: MagnaFlux / Spotcheck

PENETRANT TYPE: SKL-SP BATCH NO. 93A02K

REMOVER TYPE: SKC-S BATCH NO. 96A03K

DEVELOPER TYPE: JKD-NF BATCH NO. 89K135

BLACK LIGHT METER S/N: N/A CAL. DUE DATE: N/A

PART TEMPERATURE: 85 °F PYROMETER S/N: 575364 CAL. DATE DUE: 8-13-97

RESULTS OF EXAMINATION: SATISFACTORY  UNSATISFACTORY  NOI NO.: N/A

EXPLANATION OF UNSATISFACTORY RESULTS: N/A

REMARKS / LIMITATIONS: N/A

EXAMINER: Rancy L. Loya LEVEL: TL

EXAMINER: Tom M. Bick LEVEL: TC

REVIEWED BY: Paul M. Edwards LEVEL: TL

DATE: 3/27/97

ANTI TOP

DATE: 3/28/97

PAGE 1 OF 1

TENNESSEE VALLEY AUTHORITY	RECORD OF LIQUID PENETRANT EXAMINATION	REPORT NO. R-6826
----------------------------	--	----------------------

PROJECT: Sequoyah UNIT: 1/CG  
 SYSTEM: Reactor Coolant  
 WELD / COMPONENT I.D.: RC-07  
 CONFIG: Pump TO pipe  
 PROCEDURE: N-PT- 9 REV. 13 TC: 97-14  
 ASME SECTION I  ASME SECTION XI   
 ASME SECTION III  ANSI B31.1   
 ASME SECTION VIII  ANSI B31.7   
 AWS D1.1  OTHER N/A

EXAMINATION DATE: 3-27-97  
 START TIME: 0920 END TIME: 1010  
 EXAM SURFACE: ID  OD   
 ORIGINAL EXAMINATION  REEXAMINATION   
 REFERENCE DRAWING NO. ISI-0482-C-01  
 CODE CLASS / CATEGORY B-5/1

ACCEPTANCE CRITERIA

N-PT-9 APPENDIX A  APPENDIX B   
 OTHER N/A

**METHOD OF EXAMINATION**

METHOD

WATER-WASHABLE FLUORESCENT DYE  
 POST-EMULSIFIABLE FLUORESCENT DYE  
 SOLVENT-REMOVABLE FLUORESCENT DYE  
 WATER-WASHABLE VISIBLE DYE  
 POST-EMULSIFIABLE VISIBLE DYE  
 SOLVENT REMOVEABLE VISIBLE DYE

PENETRANT MATERIALS

BRAND NAME: MAGNA FLUX  
 PENETRANT TYPE: SKL-SP BATCH NO. 93A02K  
 REMOVER TYPE: SKC-S BATCH NO. 96A03K  
 DEVELOPER TYPE: SKD-NF/ZP-9B BATCH NO. 89K135  
 BLACK LIGHT METER S/N: N/A CAL. DUE DATE: N/A

PART TEMPERATURE: 83 °F PYROMETER S/N: 575364 CAL. DATE DUE: 8-13-97

RESULTS OF EXAMINATION: SATISFACTORY  UNSATISFACTORY  NOI NO: N/A

EXPLANATION OF UNSATISFACTORY RESULTS: N/A

REMARKS / LIMITATIONS: No Relevant Indications were found.

EXAMINER: <u>D. X. M. Carleton</u>	LEVEL: <u>II</u>	ANTI: <u>TCM</u>	
EXAMINER: <u>Joseph C. Stowager</u>	LEVEL: <u>II</u>	DATE: <u>3/27/97</u>	
REVIEWED BY: <u>[Signature]</u>	LEVEL: <u>III</u>	DATE: <u>3/27/97</u>	PAGE <u>1</u> OF <u>1</u>

TENNESSEE VALLEY AUTHORITY

EXAMINATION SUMMARY AND RESOLUTION SHEET

REPORT NO. R-6836

PROJECT: SEQUOYAH UNIT: 1 / C8

SYSTEM: RX

WELD I.D.: RC-07

CONFIG: PUMP TO: PIPE

FLOW →

PROCEDURE: N-UT-33 REV.: 7 TO: 96-08

NDE METHOD:  UT  PT  MT  VT

EXAMINER: MICHAEL S. SESSOMS LV: II

EXAMINER: N/A LV: N/A

EXAMINER: N/A LV: N/A

EXAMINER: N/A LV: N/A

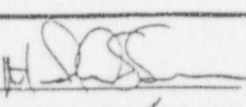
CAL SHT NO'S: N/A

THIS REPORT CONTAINS THE DATA ASSOCIATED WITH THE MANUAL ULTRASONIC EXAMINATION OF WELD RC-07, A 27 1/2" DIAMETER CAST STAINLESS PUMP TO PIPE CONFIGURATION. THE EXAMINATION WAS PERFORMED IN ACCORDANCE WITH N-UT-33 REVISION 7, TC-96-08 TO MEET THE REQUIREMENTS OF ASME SECTION XI.

THE WELD WAS EXAMINED USING A 45° REFRACTED LONGITUDINAL WAVE. DUE TO THE CONFIGURATION OF THE PUMP, NO AXIAL SCAN (SCAN 3) WAS PERFORMED FROM THE UPSTREAM SIDE OF THE WELD. SCAN 4 WAS CONTINUED ACROSS THE WELD TO INCREASE COVERAGE.

NO RECORDABLE INDICATIONS WERE DETECTED

75% COVERAGE WAS OBTAINED

EVALUATOR: M.S. SESSOMS  LEVEL: II DATE: 3-27-97

CONCURRENCE:  LEVEL: II DATE: 3-27-97

ANII Tom

DATE: 3/28/97

PAGE 1 OF 5

TENNESSEE VALLEY AUTHORITY

USN-50 ULTRASONIC CALIBRATION DATA SHEET

CALIBRATION NO.

2nd 1237  
C R-6836

PROJECT: SEQUOYAH UNIT: 1/C8

CALIBRATION DATE: 3-27-97

PROCEDURE: N-UT-33 REV.: 7 TC: 96-08

CALIBRATION BLOCK NO.: 50-63 TEMP: 82 °F

INSTRUMENT: KRAUTKRAMER

SIMULATOR BLOCK NO.: 790398

MODEL TYPE: USN-50

THERMOMETER SERIAL NO.: 575364 8/13/97

SERIAL NUMBER: E-24253

COUPLANT: ULTRAGEL II BATCH: 94125

EXAM TYPE:  NA SHEAR  NA LONG.  RL

TRANSDUCER MANUF.: KBA

SERIAL NO.: H11820 / H11819

SIZE: 1.0" FREQUENCY: 1.0 MHz

CABLE TYPE: RG-174 LENGTH: 120"

ANGLE VERIFICATION

BLOCK TYPE: 11W SERIAL NO. 791538

NOMINAL ANGLE: 45° ACTUAL ANGLE: 45°

INSTRUMENT SETTINGS

REFLECTOR ORIENTATION	REFERENCE SENSITIVITY	DATA SET
AXIAL	62	16
CIRC	N/A	N/A

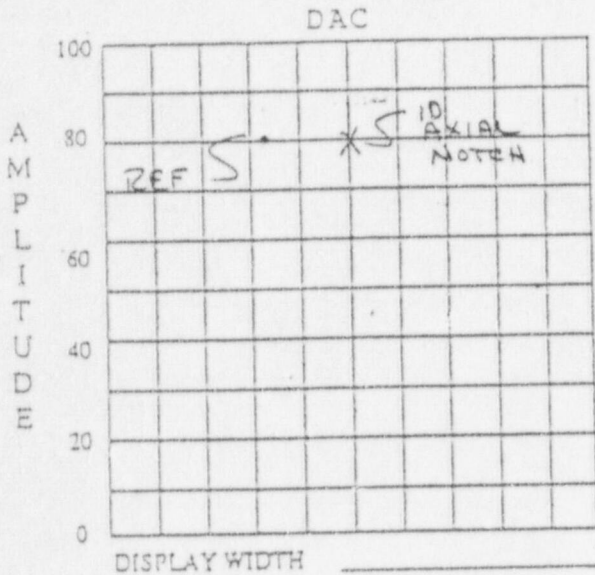
TOF (PEAK / FLANK): PEAK ANGLE: 45° DEG.  
 DELAY: 5.359 μs ZERO: 17.626 μs  
 MATL VELOCITY: 2398 μs RANGE: 10.0  
 REJECT: 0 % PULSER: DUAL  
 DUAL:  ON  OFF

INITIAL CALIBRATION

INITIAL TIME: 0901 FINAL TIME: 1228

VERIFICATION TIMES

1) <u>1028</u>	2) <u>1055</u>	3) <u>N/A</u>	4) <u>N/A</u>
5) <u>N/A</u>	6) <u>N/A</u>	7) <u>N/A</u>	8) <u>N/A</u>



REF. REFLECTOR: 2" RADIUS GAIN: 60 dB

AMPLITUDE: 80 % METAL PATH: 2.038"

C L I E N C K	VERTICAL ATTENUATOR	SIGNAL 1	100	90	80	70	60	50	40	30	20	10
		SIGNAL 2	50	45	40	35	30	25	20	15	10	5
	GAIN	SET	-6		-12	SET	+12	SET	+6			
	SIGNAL AMP.	80%	32 to 48		16 to 24	20%	64 to 96	40%	64 to 96			
			38		18		83		81			

REFER TO CALIBRATION REPORT N/A FOR PREVIOUS SATISFACTORY LINEARITY

COMMENTS: CONTOURED SHOES

WELD(S) EXAMINED: RC-07

N/A

N/A

EXAMINER: M. S. Sessoms LEVEL: II

ANTI: TD

EXAMINER: N/A LEVEL: N/A

DATE: 5/28/97

REVIEWED BY: W. Wood LEVEL: III

DATE: 3-27-98 PAGE 2 OF 5



TENNESSEE VALLEY AUTHORITY

USN-50 ULTRASONIC CALIBRATION DATA SHEET

CALIBRATION NO.

R-6836

PROJECT: SEQUOYAH UNIT: 1/CS

CALIBRATION DATE: 3-27-97

PROCEDURE: N-UT-33 REV.: 7 TC: 96-08

CALIBRATION BLOCK NO.: 50-63 TEMP: 82 °F

SIMULATOR BLOCK NO.: 790398

INSTRUMENT: KRAUTKRAMER

THERMOMETER SERIAL NO.: 575364 8/13/97

MODEL TYPE: USN-50

COUPLANT: ULTRASEL II BATCH: 94125

SERIAL NUMBER: E24253

EXAM TYPE:  N/A SHEAR  LONG  RL

TRANSDUCER MANUF.: KBA

ANGLE VERIFICATION

SERIAL NO.: H11818 / H11817

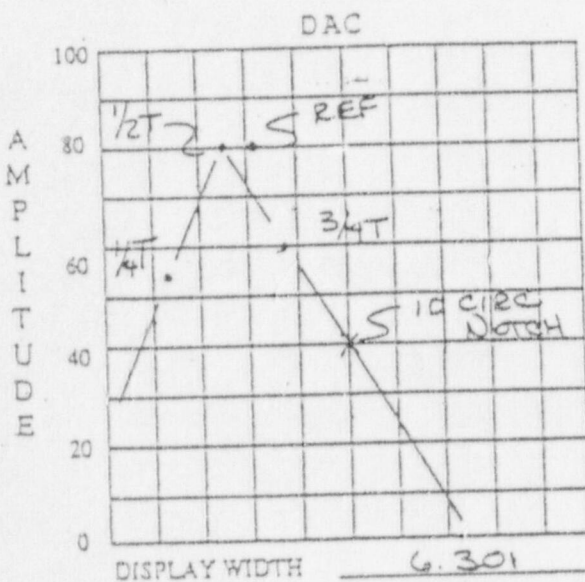
BLOCK TYPE: 11W SERIAL NO. 791538

SIZE: 1.0" Ø FREQUENCY: 1.0 MHz

NOMINAL ANGLE: 45° ACTUAL ANGLE: 45°

CABLE TYPE: RG-174 LENGTH: 120 "

INSTRUMENT SETTINGS



REFLECTOR ORIENTATION	REFERENCE SENSITIVITY	DATA SET
AXIAL	N/A	N/A
CIRC	53	18

TOF (PEAK / FLANK): PEAK ANGLE: 45 DEG.  
 DELAY: 13.28  $\mu$ S ZERO: 13.464  $\mu$ S  
 MAT'L VELOCITY: 2314  $\mu$ S RANGE: 6.301  
 REJECT: 0 % PULSER: DUAL  
 DUAL:  ON  OFF

INITIAL CALIBRATION

INITIAL TIME: 0914 FINAL TIME: 1223

REF. REFLECTOR: 2" RADIUS GAIN: 41 dB

VERIFICATION TIMES

AMPLITUDE: 80 % METAL PATH: 2.006 "

1) <u>1058</u>	2) <u>1115</u>	3) <u>N/A</u>	4) <u>N/A</u>
5) <u>N/A</u>	6) <u>N/A</u>	7) <u>N/A</u>	8) <u>N/A</u>

C L I E N C K	VERTICAL ATTENUATOR	SIGNAL 1	100	90	80	70	60	50	40	30	20	10
		SIGNAL 2	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GAIN		SET	-6	-12		SET	+12	SET	+6			
SIGNAL AMP.		80 %	32 to 43	16 to 24		20 %	64 to 96	40 %	64 to 96			
			N/A	N/A			N/A		N/A			

REFER TO CALIBRATION REPORT N/A FOR PREVIOUS SATISFACTORY LINEARITY

COMMENTS: CONTOURED SHOES

WELD(S) EXAMINED: RC-07

N/A

N/A

EXAMINER: M.S. SASSON LEVEL: II

ANTI: TOM

EXAMINER: N/A LEVEL: N/A

DATE: 3/28/97



TVA

Office of Nuclear Power

PROJECT: SEQUOYAH

SYSTEM: RX

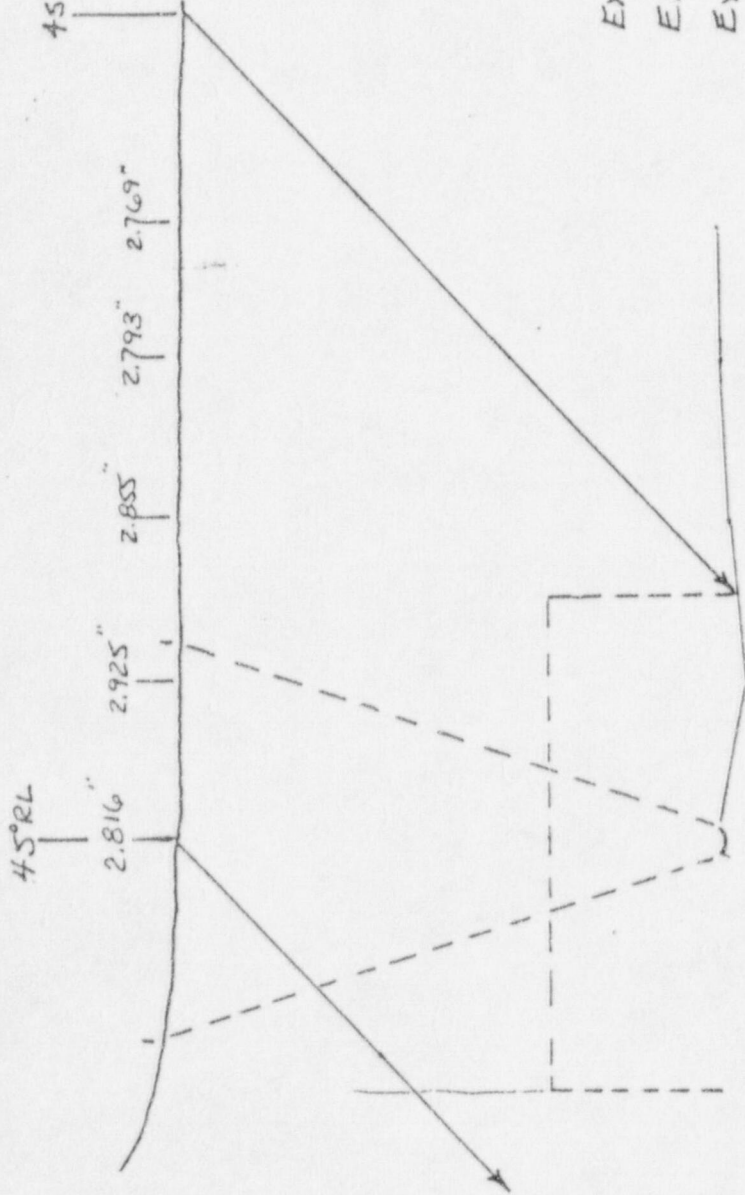
REPORT NO.:

Unit: 1/C8 WELD NO.: 2C-07

R-6836

PUMP

45°RL PIPE



COVERAGE

EXAM 3 = 0%

EXAM 4 = 25%

EXAM 5 = 25%

EXAM 6 = 25%

---

TOTAL = 75%

BY:

*[Signature]*

LEVEL: II

DATE: 3-27-97

PAGE

OF

5

TENNESSEE VALLEY AUTHORITY

EXAMINATION SUMMARY AND RESOLUTION SHEET

REPORT NO.

R-6837

PROJECT: SEQUOYAH UNIT: 1/CS

EXAMINER: MICHAEL S. SESSOMS LV: II

SYSTEM: RX

EXAMINER: N/A LV: N/A

WELD I.D.: RC-06

EXAMINER: N/A LV: N/A

CONFIG: ELBOW TO: PUMP

EXAMINER: N/A LV: N/A

FLOW →

PROCEDURE: N-UT-33 REV.: 7 TC: 96-08

CAL SHT NO'S: N/A

NDE METHOD: ET  UT  PT  MT  VT

THIS REPORT CONTAINS THE DATA ASSOCIATED WITH THE MANUAL ULTRASONIC EXAMINATION OF WELD RC-06, A 31" DIAMETER CAST STAINLESS ELBOW TO PUMP CONFIGURATION. THE EXAMINATION WAS PERFORMED IN ACCORDANCE WITH N-UT-33 REVISION 7, TC-96-08 TO MEET THE REQUIREMENTS OF ASME SECTION XI.

THE WELD WAS EXAMINED USING A 45° REFRACTED LONGITUDINAL WAVE. DUE TO THE CONFIGURATION OF THE PUMP, NO AXIAL SCAN (SCAN 4) WAS PERFORMED FROM THE DOWNSTREAM SIDE OF THE WELD. SCAN 3 WAS CONTINUED ACROSS THE WELD TO INCREASE COVERAGE.

NO RECORDABLE INDICATIONS WERE DETECTED.

75% COVERAGE WAS ACHIEVED

EVALUATOR: [Signature]

LEVEL: II

DATE: 3-27-97

ANII

CONCURRENCE: [Signature]

LEVEL: III

DATE: 3-27-97

[Signature]

DATE: 3/28/97

PAGE 1 OF 5

TENNESSEE VALLEY AUTHORITY

USN-50 ULTRASONIC CALIBRATION DATA SHEET

CALIBRATION NO.

R-6837

PROJECT: SEQUOYAH UNIT: 1/C8  
 PROCEDURE: N-UT. 33 REV.: 7 TC: 96-08

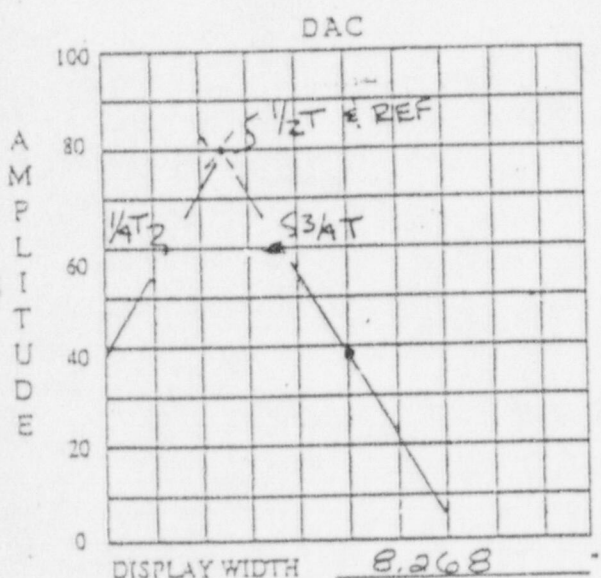
CALIBRATION DATE: 3-27-97  
 CALIBRATION BLOCK NO.: 50-64 TEMP.: 82 °F  
 SIMULATOR BLOCK NO.: 790398

INSTRUMENT: KRAUTKRAMER  
 MODEL TYPE: USN-50  
 SERIAL NUMBER: E24253

THERMOMETER SERIAL NO.: 575364 8/13/97  
 COUPLANT: ULTRAGEL II BATCH: 94125  
 EXAM TYPE:  AXIAL  SHEAR  LONG.  RL

TRANSDUCER MANUF.: KBA  
 SERIAL NO.: H11818 / H11817  
 SIZE: 1.0" φ FREQUENCY: 1.0 MHz  
 CABLE TYPE: ZG-174 LENGTH: 120 "

ANGLE VERIFICATION  
 BLOCK TYPE: 11W SERIAL NO. 791538  
 NOMINAL ANGLE: 45° ACTUAL ANGLE: 45°



INSTRUMENT SETTINGS

REFLECTOR ORIENTATION	REFERENCE SENSITIVITY	DATA SET
AXIAL	N/A	N/A
CIRC	57	17

TOF (PEAK / FLANK): PEAK ANGLE: 45° DEG.  
 DELAY: 13.28 μs ZERO: 13.464 μs  
 MATL VELOCITY: 2318 μs RANGE: 8.218  
 REJECT: 0 % PULSER: DUAL  
 DUAL:  ON  OFF

INITIAL CALIBRATION  
 INITIAL TIME: 0851 FINAL TIME: 1220

REF. REFLECTOR: 2" RADIUS GAIN: 41 dB  
 AMPLITUDE: 80 % METAL PATH: 2.03 "

VERIFICATION TIMES

1) 0940	2) 1005	3) N/A	4) N/A
5) N/A	6) N/A	7) N/A	8) N/A

C L I E N C K	VERTICAL ATTENUATOR	SIGNAL 1	100	90	80	70	60	50	40	30	20	10
		SIGNAL 2	50	45	40	35	30	25	20	15	10	5
	GAIN	SET	-6		-12	SET	+12	SET	+6			
	SIGNAL AMP.	80%	32 to 48		16 to 24	20%	64 to 96	40%	64 to 96			
			38		18		83		81			

REFER TO CALIBRATION REPORT N/A FOR PREVIOUS SATISFACTORY LINEARITY

COMMENTS: CONTOURED SHOES  
N/A

WELD(S) EXAMINED: RC-06  
N/A

EXAMINER: M.S. SASSOMS LEVEL: II  
 EXAMINER: N/A LEVEL: N/A

ANTI: TDm  
 DATE: 3/28/97  
 PAGE: 2 OF 5

DATE: 3-27-97

TENNESSEE VALLEY AUTHORITY

USN-50 ULTRASONIC CALIBRATION DATA SHEET

CALIBRATION NO.

R 683-7

PROJECT: SEQUOYAH UNIT: 1/08

PROCEDURE: N-UT-33 REV.: 7 TC: 96-08

INSTRUMENT: KRAUTKRAMER

MODEL/TYPE: USN-50

SERIAL NUMBER: E24253

TRANSDUCER MANUF.: KBA

SERIAL NO.: H11820 / H11819

SIZE: 1.0" φ FREQUENCY: 1.0 MHz

CABLE TYPE: 26-174 LENGTH: 120"

CALIBRATION DATE: 3-27-97

CALIBRATION BLOCK NO.: 50-64 TEMP.: 82 °F

SIMULATOR BLOCK NO.: 790398

THERMOMETER SERIAL NO.: 575364 8/13/97

COUPLANT: ULTRASEL II BATCH: 94125

EXAM TYPE:  N/A SHEAR  LONG  R/L

ANGLE VERIFICATION

BLOCK TYPE: 11W SERIAL NO. 791538

NOMINAL ANGLE: 45° ACTUAL ANGLE: 45°

INSTRUMENT SETTINGS

REFLECTOR ORIENTATION	REFERENCE SENSITIVITY	DATA SET
AXIAL	63 dB	15
CIRC	N/A	N/A

TOF (PEAK / FLANK): PEAK ANGLE: 45° DEG.

DELAY: 9.570 μs ZERO: 17.626 μs

MATL VELOCITY: 2398 μs RANGE: 10.0

REJECT: 0 % PULSER: DUAL

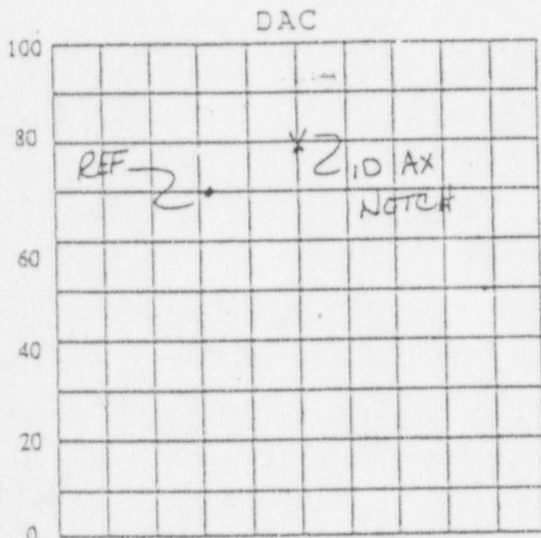
DUAL:  ON  OFF

INITIAL CALIBRATION

INITIAL TIME: 0845 FINAL TIME: 1225

VERIFICATION TIMES

1) 1007	2) 1025	3) N/A	4) N/A
5) N/A	6) N/A	7) N/A	8) N/A



REF. REFLECTOR: 2" RADIUS GAIN: 59 dB

AMPLITUDE: 70 % METAL PATH: 2158"

CHIEF N.C.K.

VERTICAL

ATTENUATOR

SIGNAL 1	100	90	80	70	60	50	40	30	20	10
SIGNAL 2	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GAIN	SET	-6		-12	SET	+12	SET	+6		
SIGNAL AMP.	80 %	32 to 48		16 to 24	20 %	64 to 96	40 %	64 to 96		
		N/A		N/A		N/A		N/A		

REFER TO CALIBRATION REPORT N/A FOR PREVIOUS SATISFACTORY LINEARITY

COMMENTS: CONTOURED SHOES

N/A

WELD(S) EXAMINED: RC-06

N/A

EXAMINER: M.S. SESSIONS / W. LOSS LEVEL: II

EXAMINER: N/A LEVEL: N/A

ANTI: TBM

DATE: 3/30/97

PAGE 3 OF 5

DATE: 3-27-97



TVA

Office of Nuclear Power

PROJECT: SEQUOYAN SYSTEM: RX

Unit: 1 / C8 WELD NO.: 2C-06

REPORT NO.:

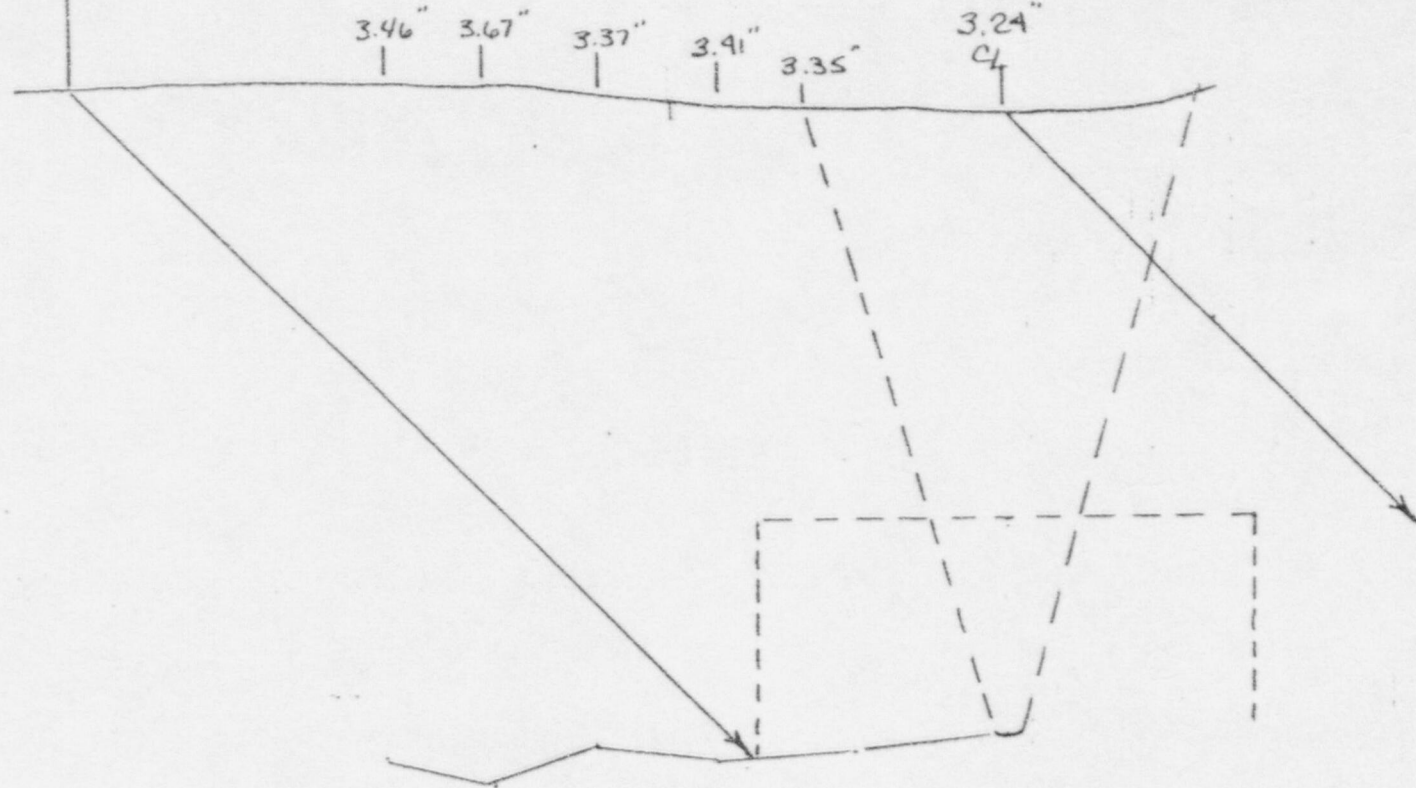
R-6837

ELBOW

45°RL

45°RL

PUMP



COVERAGE

EXAM 3 = 25%

EXAM 4 = 0%

EXAM 5 = 25%

EXAM 6 = 25%

TOTAL = 75%

BY: [Signature]

LEVEL: II

DATE: 3-27-97

PAGE 5 OF 5

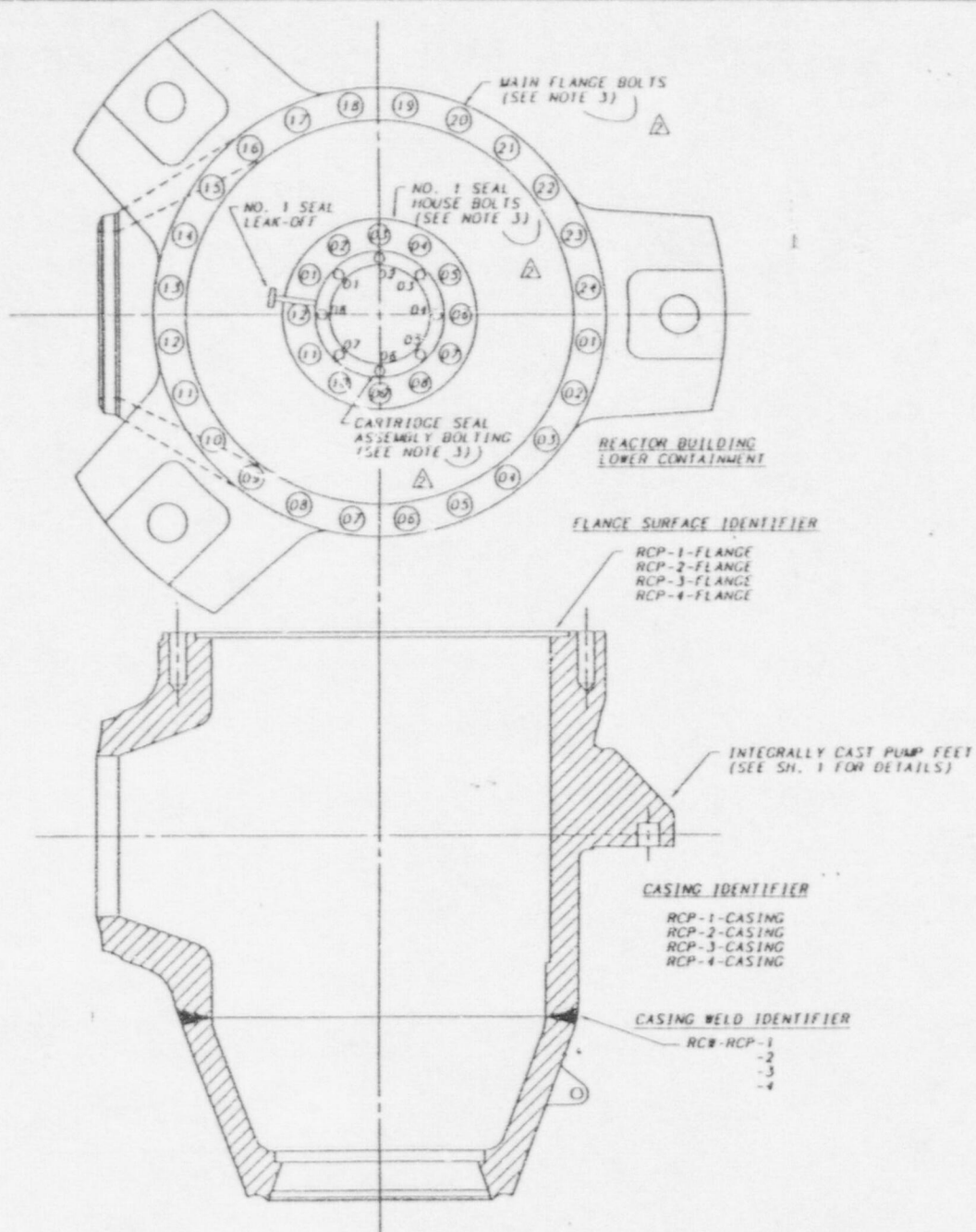


ATTACHMENT 2

ISI PROGRAM DRAWINGS

ISI-0325-C-02, Revision 2

ISI-0482-C-01, Revision 1



REFERENCE DRAWINGS

CONTRACT NO. 68C60-91934 (N2W-2-5)  
 WESTINGHOUSE DWG 618J800

MATERIAL SPECIFICATIONS

ESCO TYPE B 304SS  
 2 PIECE WELDED CASING (REF. 825 910709 008)  
 (UNIT 1 ONLY) 4.50 INCHES MINIMUM  
 THICKNESS (REF. 825 920318 001)

THE MAIN FLANGE BOLTS ARE FABRICATED OF  
 4340 STEEL, HEAT TREATED TO A-540, GR 24,  
 TOTAL LENGTH 30 1/2"

ASME CC-1 (EQUIVALENT)

NOTES:

- SEE D-SI-DX1-000-114.2 FOR RCP CASING AND WELD EXAMINATION INFORMATION.
- THIS DWG SUPERCEDES MSG-0003-C-01 & CIM-2675-C-01.
- CARTRIDGE SEAL ASSEMBLY BOLTING IS 1.5 IN. CLASS 1. NUMBER 1 SEAL HOUSE BOLTS ARE 2 IN. MAIN FLANGE BOLTS ARE 4.5 IN.
- DIMENSIONS ARE FOR INFORMATION ONLY.

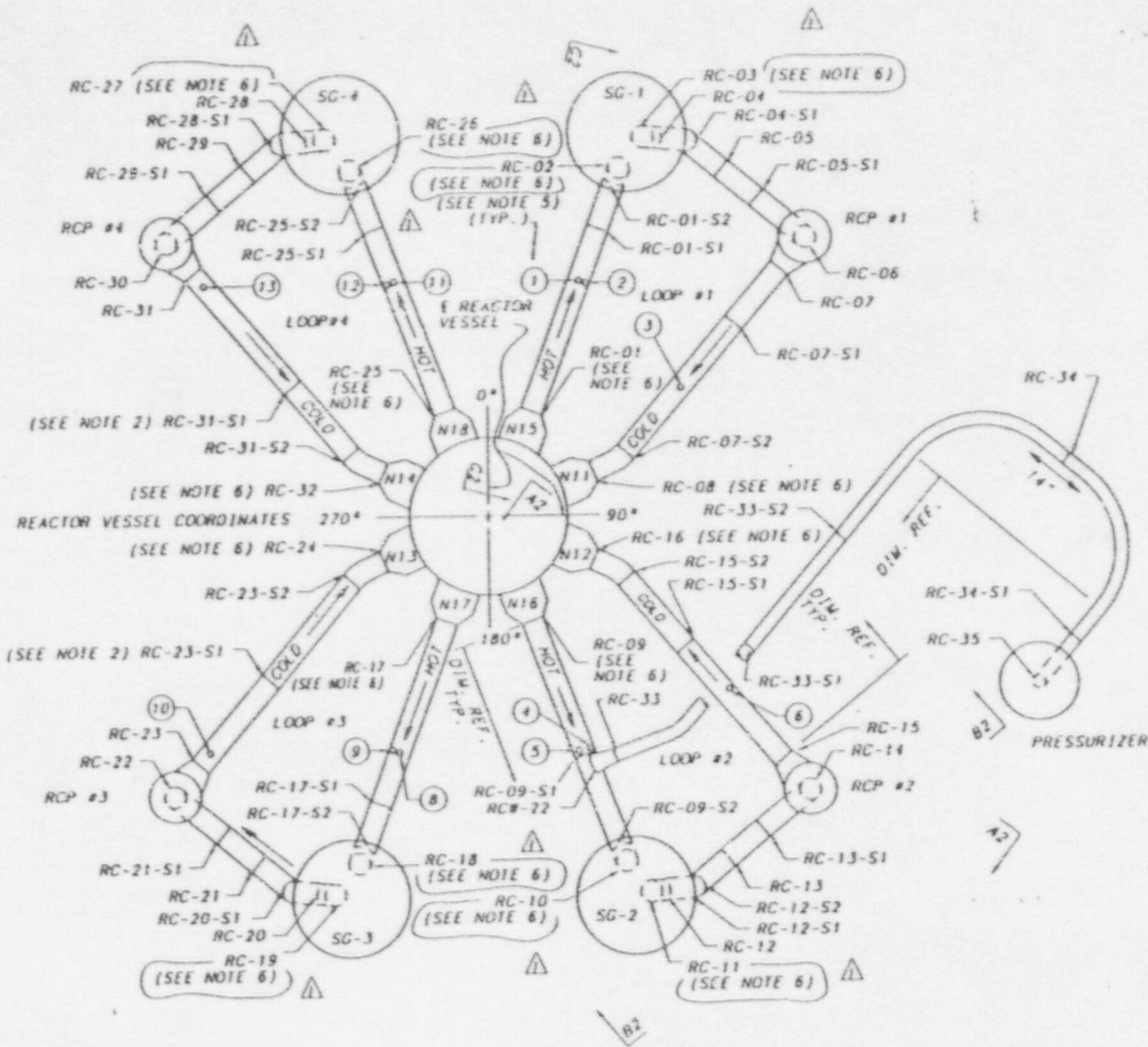
BOLTING IDENTIFIER

RCP2WIBLT-XX  
 RCP2SLIBLT-YY (NO. 1 SEAL HOUSE BOLT)  
 RCP2CSABLT-WW (CARTRIDGE SEAL BOLT)

LIGAMENT IDENTIFIER

RCP2WFLIG-XX  
 WW REPRESENTS LOCATION 01-08  
 XX REPRESENTS LOCATION 01-24  
 YY REPRESENTS LOCATION 01-12  
 Z REPRESENTS PUMP NO. (1-4)

2	RPG	2/11/88	1/11/88	1/11/88	1/11/88	1/11/88	1/11/88	1/11/88	1/11/88
CHANGE NOTE REFERENCE FROM '2' TO '5' PER FEED 17-03									
1	RPG	EDC	JGC	GLB	2-3-88	2-3-88	2-3-88	2-3-88	2-3-88
SUPERCEDES DWG 2475-C-01 PER FEED 18-17, ADD FLANGE ID									
REV	BY	CHECKED	SUBMITTED	APPROVED	DATE	DATE	DATE	DATE	DATE
TENNESSEE VALLEY AUTHORITY									
SENOUYAH NUCLEAR PLANT UNIT 1 REACTOR COOLANT PUMP CASING WELD, FLANGE & BOLT PATTERNS									
DRAWN:	RPG	DATE:	5/31/88	SCALE:	MOF TO SCALE				
CHECKED:	EDC	APPROVED:	GLB	CAD MAINTAINED DRAWING:	REV				
SUBMITTED:	FHS					151-0325-C-02	02		



REFERENCE DRAWINGS

- 47W304-1
- 47W465-1
- 1-RC-001, 1-RC-002
- 1-RC-003, 1-RC-004

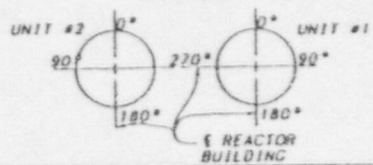
MATERIAL SPECIFICATIONS

- PRESSURIZER SURGE LINE  
14" SCH 160 A-376
- HOT LEG  
29" ID, A-351 CF8M, N.W. 2.84"
- CROSSOVER LEG  
31" ID, A-351 CF8M, N.W. 2.99"
- COLD LEG  
27.5" ID, A-351 CF8M, N.W. 2.69"
- ASME CC-1 (EQUIVALENT)

NOTES:

1. THIS DWG REPLACED CHW-2333-C.
2. INACCESSIBLE
3. REACTOR VESSEL NOZZLE TO SAFE END WELD ID'S ARE SHOWN ON RV DWG CHW-2343-C. THESE ARE ASME SECTION XI EXAM CATEGORY B-F, DISSIMILAR METAL WELDS.
4. STEAM GENERATOR NOZZLE TO SAFE END WELD ID'S ARE SHOWN ON S/G DWG ISI-0399-C. THESE ARE ASME SECTION XI EXAM CATEGORY B-F, DISSIMILAR METAL WELDS.
5. FOR TEMPERATURE ELEMENTS SEE SHEET 2, TAG 1 THRU 13.
6. THE EXAMINATION OF THESE WELDS IS INCLUDED IN THE EXAMINATION OF THE NOZZLE TO SAFE END WELD.

REACTOR BUILDING LOWER CONTAINMENT



1	APC	DATE	12/18/83	SCALE	NOT TO SCALE
PLACED NOTE & REFERENCE ON WELDS PER FCOT 87-03					
REV	BY	CHECKED	SUBMITTED	APPROVED	DATE
TENNESSEE VALLEY AUTHORITY					
SEQUOYAH NUCLEAR PLANT UNIT 1 REACTOR COOLANT PIPING WELD LOCATIONS					
DRAWN:	RPG	DATE:	12-18-83	SCALE:	NOT TO SCALE
CHECKED:	EDC	APPROVED:	GLR	LEAD MAINTAINED DRAWING REV	
SUBMITTED:	JCG	ISI-0482-C-01			01

ENCLOSURE 2

SEQUOYAH NUCLEAR PLANT

UNIT 2

ASME REQUESTS FOR RELIEF

2-ISI-8, 2-ISI-9, AND 2-ISI-10

## Request For Relief 2-ISI-8

### Executive Summary:

This request for relief addresses a branch pipe connection weld in the safety injection system piping. The design configuration and materials used in the fabrication of the weld precludes a 100% ultrasonic examination of the required volume for Weld SIW-07 (10-inch branch connection welded to the outside diameter of 27.5-inch large bore piping). These physical examination limitations occur when the 1989 code examination requirements are applied in areas of components constructed and fabricated to early plant physical designs. Based on the date of SQN's construction permit (May 27, 1970), SQN is exempt from code requirements for examination access as allowed in 10 CFR 50.55a(g)(4).

A liquid penetrant surface examination of essentially 100% of the weld was performed. An ultrasonic examination was performed on accessible areas to the maximum extent practical, given the physical limitations of the subject weld. The design configuration limits ultrasonic examination to approximately 63% of the weld. It is concluded that performance of an ultrasonic examination of essentially 100% of branch pipe connection Weld SIW-07 would be impractical. The performance of the surface examination, and the maximum extent practical ultrasonic examination of the subject weld, provides reasonable assurance of an acceptable level of quality and safety because the information and data obtained from the volume examined provides sufficient information to judge the overall integrity of the weld.

Therefore, pursuant to 10 CFR 50.55a(g)(5)(iii), it is requested that relief be granted for the second inspection interval.

Unit:

2

System:

Safety Injection - System 63

Components: One Pressure Retaining Branch Pipe Weld

ASME Code Class: ASME Code Class 1 (Equivalent)

Section XI Edition: 1989 Edition

Code Table: IWB-2500-1

Examination Category: B-J, Pressure Retaining Welds In Piping

Examination Item Number: B9.31, Branch Pipe Connection Welds, Nominal Pipe Size 4 Inches Or Larger

Code Requirement: ASME Section XI, Table IWB-2500-1, Examination Category B-J, Item No. B9.31, Surface and Volumetric Examinations

Code Requirement From Which Relief Is Requested: Volumetric Examination Coverage

List Of Items Associated With The Relief Request: SIW-07, Branch Pipe Connection Weld

Basis for Relief: The design configuration and materials used in fabrication of the safety injection branch piping Weld SIW-07 precludes a volumetric ultrasonic examination of the required volume. The design configuration and material limits the ultrasonic examination to approximately 63% of Weld SIW-07.

Alternative Examinations: In lieu of the code required 100% ultrasonic examination, an ultrasonic examination was performed on accessible areas to the maximum extent practical, given the physical limitations of the subject weld. A surface examination (PT) of essentially 100% of the weld was also performed. Refer to Attachment 1 for the Examination Data Reports.

Justification For The Granting Of Relief: (1) The design configuration and materials used in fabrication of Weld SIW-07 precludes ultrasonic examination of essentially 100% of the required examination volume. In order to examine the weld in accordance with

the code requirement, the branch connection would require extensive redesign and changing of piping material.

The weld joint detail for Weld SIW-07 is a branch connection welded to a large bore piping configuration with the full penetration weld located in the branch connection (i.e., a branch connection welded to the outside diameter of the large bore reactor coolant system piping). The branch connection is stainless steel material and the large bore reactor coolant system pipe is centrifugal cast CF8M material (Cold Leg Loop #1 piping). The ultrasonic volumetric examination is limited due to the effects of the anisotropic coarse grain structure of cast stainless material of the large bore piping and the weld joint configuration, which limits search unit contact and movement on the branch connection side.

The anisotropic coarse grain structure of centrifugal cast CF8M material, and the examination limitation parameters associated with refracted longitudinal waves, prevented a meaningful scan from the large bore piping side (main loop piping). Weld SIW-07 received 100% of the required coverage with the axial scans from the branch connection side utilizing both 45° shear waves and 60° refracted longitudinal waves. These examinations provide reasonable assurance that circumferential flaws would be detected. Scans for flaws located transverse to the weld were limited due to the weld joint configuration that limited search unit contact and movement. A 31% required coverage was achieved for detection of transverse oriented flaws. The total ultrasonic examination coverage for SIW-07 was approximately 63% of the code required volume.

- (2) Radiographic examination, as an alternative volumetric examination method, was determined to be impractical due to restricted access.

Also, the wide variation in component thickness and joint configuration does not make radiography an amenable option to increase code required coverage.

- (3) A percentage sampling approach provided by the ASME Section XI Code, in combination with examinations performed on similar items, provides reasonable assurance that significant degradation, if present, would have been detected.

Performance of an ultrasonic volumetric examination of essentially 100% of the required volume of the pressure retaining branch connection Weld SIW-07 would be impractical. As previously discussed, TVA determined that it would be impractical to attempt other volumetric examinations in order to increase examination coverage. The surface examination of 100% of the weld, adjacent metal, and the maximum extent practical ultrasonic examination of the subject weld, provides reasonable assurance of an acceptable level of quality and safety. Significant degradation, if present, would have been detected during the ultrasonic examination and the surface examination that was performed on the subject weld. As a result, assurance of structural integrity for this weld is provided by the alternative examinations that were performed.

Therefore, pursuant to 10 CFR 50.55a(g)(5)(iii), it is recommended that relief be granted for the second inspection interval.

Implementation  
Schedule:

This request for relief is applicable to the second inspection interval for SQN Unit 2. Weld SIW-07 was examined during the first period of the second 10-year inspection interval.

References:

Attachment 1 - Examination Data Reports:  
R-5568 and R-5584.

ISI Program Drawing: ISI-0002-C-05,  
Revision 10.



ATTACHMENT 1

EXAMINATION DATA REPORTS

R-5568

R-5584

TENNESSEE VALLEY AUTHORITY

RECORD OF LIQUID PENETRANT EXAMINATION

REPORT NO. R-5568

PROJECT: SQNP UNIT: 2

SYSTEM: SI 63

WELD / COMPONENT I.D.: SIW-07

CONFIG: ~~WELDOLET~~ TO ~~PIPE~~ <sup>weldo-let</sup> <sub>2 in 1/4</sub>

PROCEDURE: N-PT-9 REV: 12 TC: 96-05

- ASME SECTION I  ASME SECTION XI
- ASME SECTION III  ANSI B31.1
- ASME SECTION VIII  ANSI B31.7
- AWS D1.1  OTHER N/A

EXAMINATION DATE: 04-26-96

START TIME: 0405 END TIME: 0630

EXAM SURFACE: ID  OD

ORIGINAL EXAMINATION  REEXAMINATION

REFERENCE DRAWING NO. ISI-0002-C REV 8 SWS

CODE CLASS / CATEGORY BJ/1

ACCEPTANCE CRITERIA

- N-PT-9 APPENDIX A  APPENDIX B
- OTHER N/A

METHOD OF EXAMINATION

METHOD

- WATER-WASHABLE FLUORESCENT DYE
- POST-EMULSIFIABLE FLUORESCENT DYE
- SOLVENT-REMOVABLE FLUORESCENT DYE
- WATER-WASHABLE VISIBLE DYE
- POST-EMULSIFIABLE VISIBLE DYE
- SOLVENT REMOVEABLE VISIBLE DYE

PENETRANT MATERIALS

BRAND NAME: MAGNAFLUX

PENETRANT TYPE: SKL-SP BATCH NO. 93A02K

REMOVER TYPE: SKC-S BATCH NO. 96A03K

DEVELOPER TYPE: SKD-NF BATCH NO. 89K135

BLACK LIGHT METER S/N: N/A CAL. DUE DATE: N/A

PART TEMPERATURE: 88.9 °F PYROMETER S/N: 571996 CAL. DATE DUE: 11-01-96

RESULTS OF EXAMINATION: SATISFACTORY  UNSATISFACTORY  NOI NO: N/A

EXPLANATION OF UNSATISFACTORY RESULTS: N

REMARKS / LIMITATIONS: N

EXAMINER: Stephen T Williams LEVEL: II

EXAMINER: N/A LEVEL: N/A

REVIEWED BY: [Signature] LEVEL: III

DATE: 4/29/96

ANTI TA  
DATE: 4/29/96  
PAGE 1 OF 1

TENNESSEE VALLEY AUTHORITY

EXAMINATION SUMMARY AND RESOLUTION SHEET

REPORT NO. R-5584

PROJECT: SNP UNIT: Z  
SYSTEM: 513(GB) ISI-0002-C-05 Rev. B  
WELD I.D.: 51W-07  
CONFIG: LOSS TO: PIPE  
PROCEDURE: N- UT-10 REV.: 20 TO: N/A  
NDE METHOD:  UT  PT  MT  VT

EXAMINER: M.A. OLIVARES LV: II  
EXAMINER: W.R. MURPHY LV: I  
EXAMINER: N/A LV: N/A  
EXAMINER: A LV: A  
CAL SHT NOS: C-0594, C-0595  
C-0596

FLOW 

THIS REPORT CONTAINS THE DATA ASSOCIATED WITH THE MANUAL ULTRASONIC EXAMINATION OF 51W-07 FOR ASME SEC II CREDIT.

NO RECORDABLE INDICATIONS WERE NOTED.

NO EXAM FROM SCAN 4 DIRECTION, DUE TO THE ATTENUATIVE NATURE OF CENTRIFUGALLY CAST STAINLESS STEEL AND LOCATION OF WELD JOINT CONFIGURATION. 100% COVERAGE WAS OBTAINED USING 60° RL FROM SCAN 3 SIDE.

62.7% <sup>sws/14%</sup> COVERAGE WAS OBTAINED. THE CIRCUMFERENTIAL SCANS WERE PERFORMED USING 35 DEGREE SHEAR WAVE DUE TO OD/ID RATIO. LONGITUDINAL, CIRCUMFERENTIAL SCANS WERE NOT PERFORMED DUE TO THE <sup>WAVE</sup> REQUIRED ANGLE TO STRIKE ID SURFACE.

*W.R. Murphy 4/30/96*

EVALUATOR: *M.A. Olivares* LEVEL: II DATE: 04/27/96  
CONCURRENCE: *W.R. Murphy* LEVEL: III DATE: 4-30-96

ANII *Tom*  
DATE: 5/2/96  
PAGE 1 OF 6B



R-5584

TENNESSEE VALLEY AUTHORITY

USN-50 ULTRASONIC CALIBRATION DATA SHEET

CALIBRATION NO.

C-0595

PROJECT: SONP UNIT: 2

PROCEDURE: N-UT-18 REV.: 20 TC: N/A

INSTRUMENT: KRAUTERER

MODEL/TYPE: USN-50

SERIAL NUMBER: E18502 1-18-97

TRANSDUCER MANUF.: KBA

SERIAL NO.: 45° 44769 / 38° 33587

SIZE: 0.500 / 0.375 FREQUENCY: 2.25 MHz

CABLE TYPE: RG174 LENGTH: 72

CALIBRATION DATE: 04/27/96

CALIBRATION BLOCK NO.: 50 67 TEMP.: 78 °F

SIMULATOR BLOCK NO.: 792770

THERMOMETER SERIAL NO.: 532186 Cal Due 1-11-97

COUPLANT: ULTRAGEL II BATCH: 093081

EXAM TYPE:  SHEAR  LONG.  RL

ANGLE VERIFICATION

BLOCK TYPE: Rompas SERIAL NO. 792770

NOMINAL ANGLE: 45/38 ACTUAL ANGLE: 44/38

INSTRUMENT SETTINGS

REFLECTOR ORIENTATION	REFERENCE SENSITIVITY	DATA SET
AXIAL 38°	47.5	16
CIRC 45°	36.5	16

TOF (PEAK / FLANK): PEAK ANGLE: 44 DEG.

DELAY: 10.56  $\mu$ S ZERO: 8.075  $\mu$ S

MATL VELOCITY: .1284  $\mu$ S RANGE: 8.465

REJECT: 0 % PULSER: HIGH

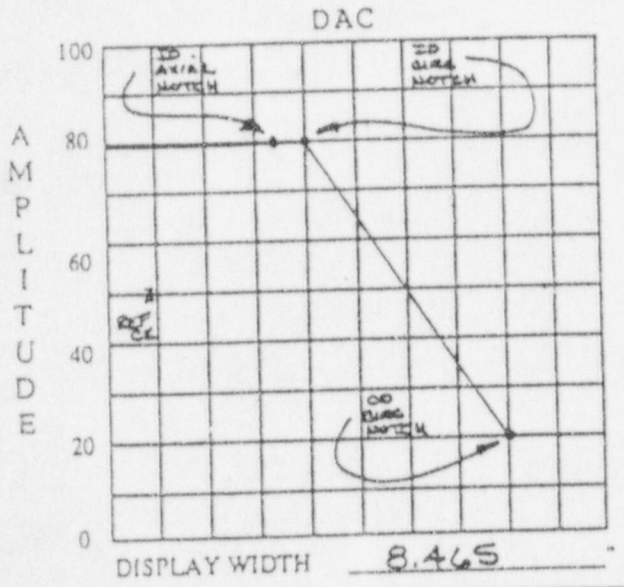
DUAL:  ON  OFF

INITIAL CALIBRATION

INITIAL TIME: 1305 FINAL TIME: 1643

VERIFICATION TIMES

1) 1524	2) 1548	3) N/A	4) N/A
5) N/A	6) N/A	7) N/A	8) N/A



REF. REFLECTOR: Rompas SDH GAIN: 30.5 dB

AMPLITUDE: 50 % METAL PATH: 1.014

VERTICAL ATTENUATOR	SIGNAL 1	100	90	80	70	60	50	40	30	20	10
	SIGNAL 2	50	45	40	35	30	25	20	15	10	05
GAIN	SET	-6	-12	SET	+12	SET	+6				
SIGNAL AMP.	80 %	32 to 48	16 to 24	20 %	64 to 96	40 %	64 to 96				
		40	20		80		80				80

REFER TO CALIBRATION REPORT N/A FOR PREVIOUS SATISFACTORY LINEARITY

COMMENTS:

WELD(S) EXAMINED: 51W-07

EXAMINER: W. B. GUYARES LEVEL: II

EXAMINER: William Murch LEVEL: I

REVIEWED BY: W. Bentley LEVEL: III DATE: 4-30-96

ANTI: TR

DATE: 5/2/96

PAGE 3 OF 68

R - 5584

TENNESSEE VALLEY AUTHORITY	USN-50 ULTRASONIC CALIBRATION DATA SHEET	CALIBRATION NO. C- 0596
----------------------------	--	----------------------------

PROJECT: SONP UNIT: Z

PROCEDURE: N-UT- 18 REV.: 20 TC: N/A

INSTRUMENT: KRAUTKRAMER

MODEL/TYPE: UKN-50

SERIAL NUMBER: E18502 1-18-91

TRANSDUCER MANUF.: KBA

SERIAL NO.: 44769

SIZE: 0.500 FREQUENCY: 2.25 MHz

CABLE TYPE: 26174 LENGTH: 72

CALIBRATION DATE: 04/27/96

CALIBRATION BLOCK NO.: 5067 TEMP.: 78 °F

SIMULATOR BLOCK NO.: 792770

THERMOMETER SERIAL NO.: 552186 Cal Due 1-11-97

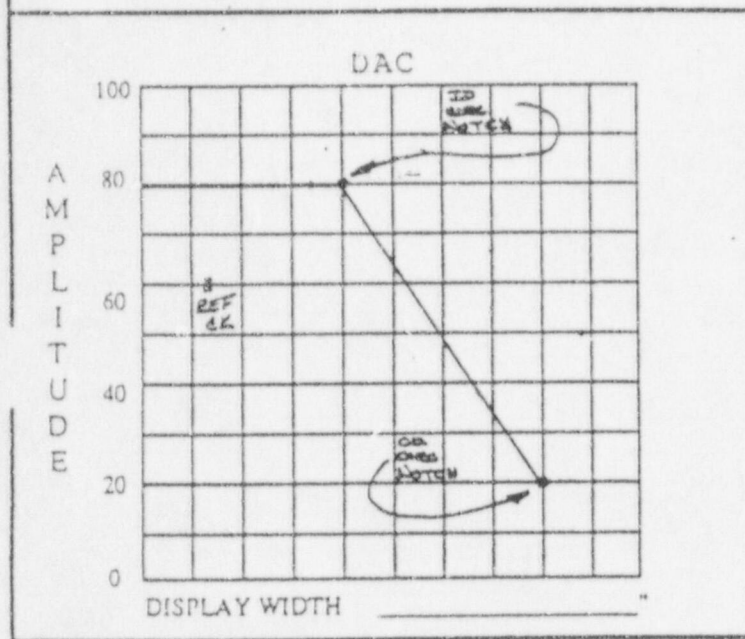
COUPLANT: ULTRAGEL II BATCH: 093081

EXAM TYPE:  SHEAR  LONG  RL

ANGLE VERIFICATION

BLOCK TYPE: Rompas SERIAL NO. 792770

NOMINAL ANGLE: 60 ACTUAL ANGLE: 59



INSTRUMENT SETTINGS

REFLECTOR ORIENTATION	REFERENCE SENSITIVITY	DATA SET
AXIAL	N/A	N/A
CIRC	SA.0	17

TOF (PEAK / FLANK): Peak ANGLE: 59 DEG.

DELAY: 4.109  $\mu$ S ZERO: 8.431  $\mu$ S

MATL VELOCITY: .1252  $\mu$ S RANGE: 11.64

REJECT: 0 % PULSER: High

DUAL:  ON  OFF

INITIAL CALIBRATION

INITIAL TIME: 1325 FINAL TIME: 1640

REF. REFLECTOR: Rompas SDH GAIN: 36.0 dB

AMPLITUDE: 60 % METAL PATH: 1.403

VERIFICATION TIMES

1) <u>1603</u>	2) <u>1620</u>	3) <u>N/A</u>	4) <u>N/A</u>
5) <u>N/A</u>	6) <u>N/A</u>	7) <u>N/A</u>	8) <u>N/A</u>

C L I E N C K	VERTICAL	SIGNAL 1	100	90	80	70	60	50	40	30	20	10
		SIGNAL 2	50	45	40	35	30	25	20	15	10	05
	ATTENUATOR	GAIN	SET	-6	-12	SET	+12	SET	+6			
		SIGNAL AMP.	80 %	32 to 48	16 to 24	20 %	64 to 96	40 %	64 to 96			

REFER TO CALIBRATION REPORT N/A FOR PREVIOUS SATISFACTORY LINEARITY

COMMENTS: \_\_\_\_\_

\_\_\_\_\_

WELD(s) EXAMINED: 51W-07

\_\_\_\_\_

AMINER: <u>[Signature]</u> N.A. CURVARES LEVEL: <u>II</u>	ANI: <u>TD</u>
EXAMINER: <u>William Much</u> LEVEL: <u>I</u>	DATE: <u>5/2/96</u>
REVIEWED BY: <u>[Signature]</u> LEVEL: <u>III</u> DATE: <u>4-30-96</u>	PAGE <u>4</u> OF <u>6B</u>



TVA

WALL THICKNESS  
PROFILE SHEET

REPORT NO:

R-5584

PROJECT: SONP

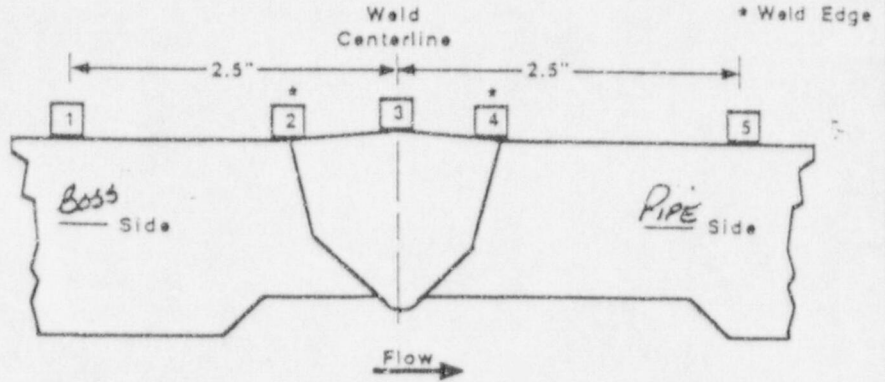
WELD NO: SIW-07

UNIT: Z

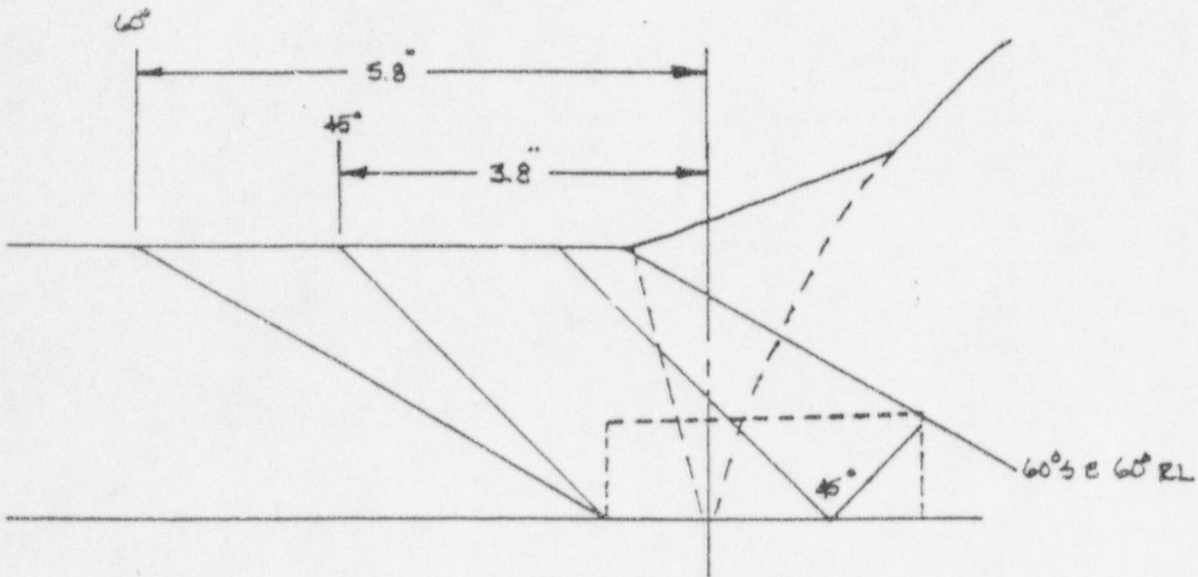
SYSTEM: 63 SIS

Record Thickness Measurements As Indicated, Including Weld Width, Edge-To-Edge At 0°

Position	0°	90°	180°	270°
1	2.767	N		
2	2.768			
3	3.021			
4	W/E			
5	NR			A



CROWN HEIGHT: FLUSH      DIAMETER: 10.0"  
 CROWN WIDTH: 3.0"      WELD LENGTH: 49.3"



DRAWN 1/2 SCALE

M.A. OLIVARES

100% COVERAGE WAS OBTAINED USING 60° RL FROM SCAN 3 SIDE. NO SCAN 4 DUE TO CONFIGURATION OF WELD.

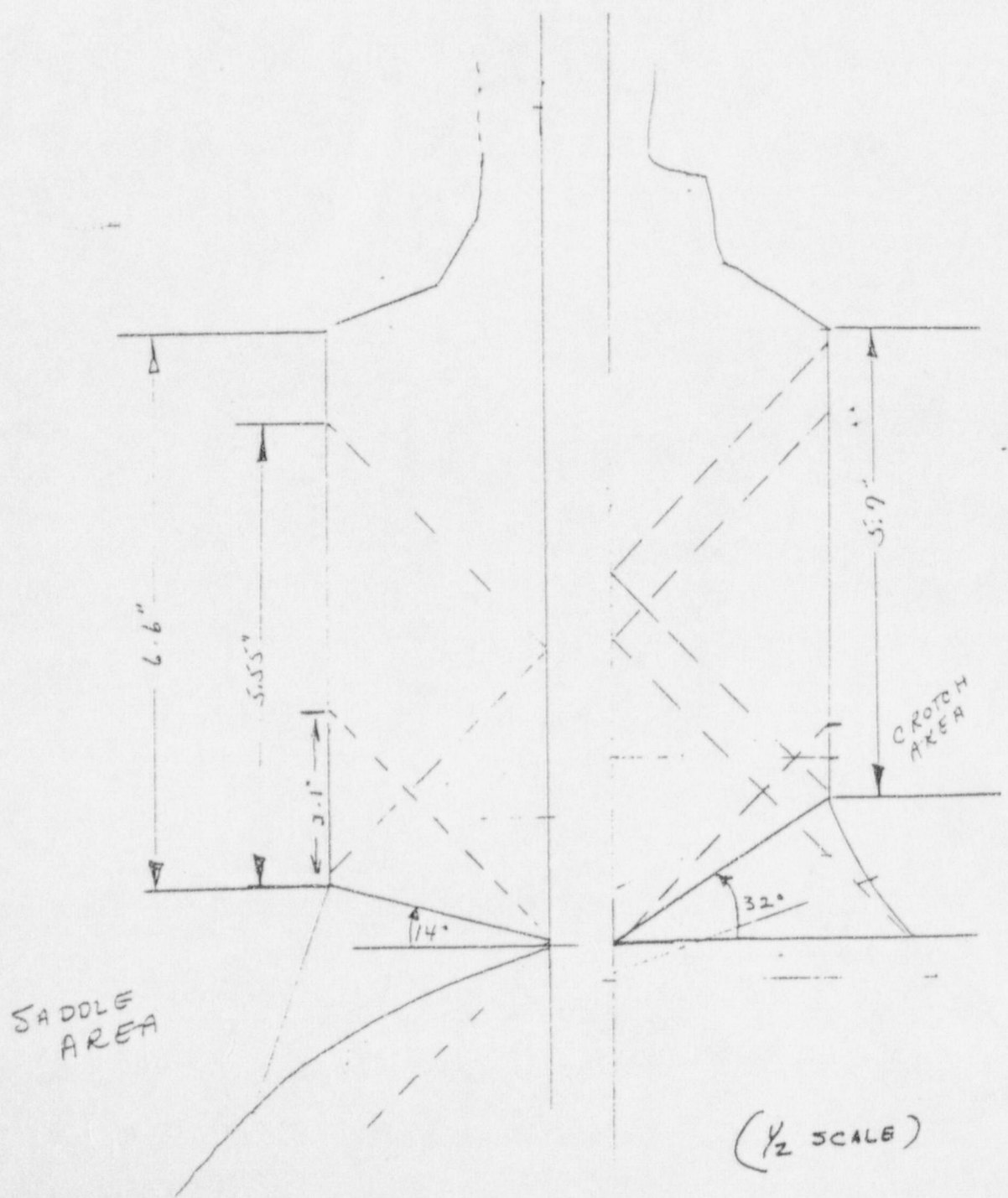
EXAMINER: [Signature]  
 LEVEL: II  
 DATE: 04/27/96

REVIEWED BY: [Signature]  
 LEVEL: II      DATE: 4-30-96

AHI: [Signature]  
 DATE: 5/2/96  
 PAGE 6 OF 60



R5584



11030 (WM-7-75)

120.64

TVA

Office of Nuclear Power

PROJECT: SQN SYSTEM: SIUnit: 2 WELD NO.: SIW-07

REPORT NO.:

K 5584

$$\text{SCAN 3 Limitation } (.5)(.45)(.45) = .10125 \text{ in}^2 \quad \text{Volume} = .10125 \times 49.3 = 4.99 \text{ in}^3$$

$$\text{Extrm Area} = (.55)(1.6) = .88 \text{ in}^2$$

$$\text{Volume} = .88 \times 49.3 = 43.4 \text{ in}^3$$

$$\text{SCAN 5/6 coverage} = (.5)(.55) = .275 \text{ in}^2$$

$$\text{Volume} = (.275)(49.3) = 13.55 \text{ in}^3$$

$$\text{SCAN 3 coverage} = 100\%$$

$$\text{SCAN 4 coverage} = 100 - \left( \frac{4.99}{43.4} \right) (100\%) = 88.5\%$$

$$\text{SCAN 5 coverage} = 13.55/43.4 = 31.22\%$$

$$\text{SCAN 6 coverage} = 13.55/43.4 = 31.22\%$$

Determine coverage

100

88.5

31.22

31.22

---

 250.94

$$\sqrt[4]{250.94} = 62.735\%$$

Total Coverage.

BY: [Signature] LEVEL: [Signature] DATE: 5/14/96 PAGE 6B OF 6B

ATTACHMENT 2

ISI PROGRAM DRAWING

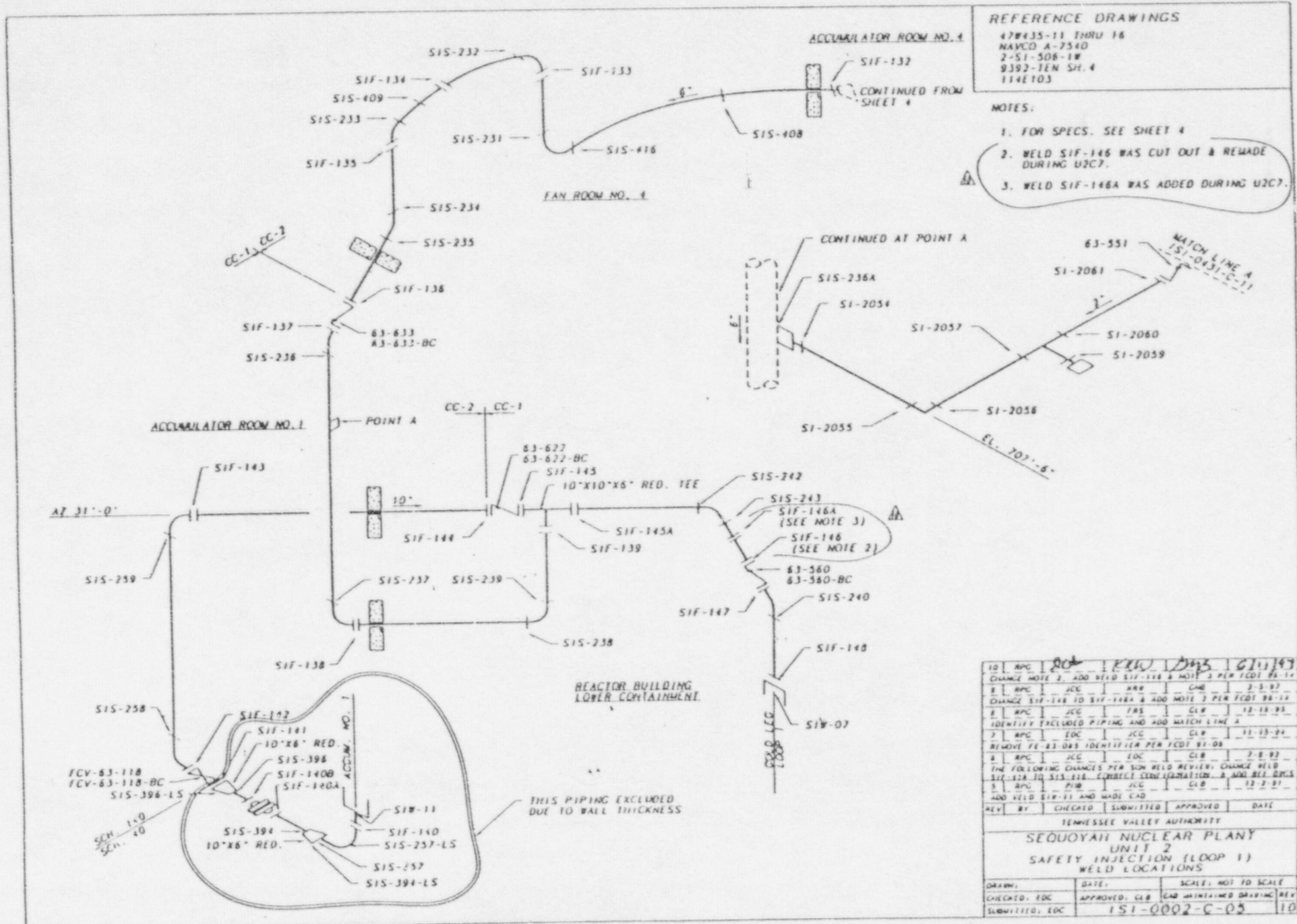
ISI-0002-C-05, REVISION 10

REFERENCE DRAWINGS

47W435-11 THRU 16  
 NAVCO A-254D  
 2-SI-508-1W  
 9392-1EN SH. 4  
 114E103

NOTES:

1. FOR SPECS. SEE SHEET 4
2. WELD SIF-146 WAS CUT OUT & REWELD DURING U2C7.
3. WELD SIF-148A WAS ADDED DURING U2C7.



10	RPC	EDC	JCC	ARR	CMB	6/13/93
CHANGE NOTE 2, ADD WELD SIF-148 & WELD 3 PER FCDT 98-14						
8	RPC	JCC	ARR	CMB	2-3-97	
CHANGE SIF-148 TO SIF-148A & ADD NOTE 2 PER FCDT 98-14						
8	RPC	JCC	ARR	CLB	12-18-95	
IDENTIFY INCLUDED PIPING AND ADD MATCH LINE A						
7	RPC	EDC	JCC	CLB	11-15-94	
REMOVE FE 83-088 IDENTIFIER PER FCDT 91-08						
8	RPC	JCC	EDC	CLB	7-8-93	
THE FOLLOWING CHANGES PER SON WELD REVIEW: CHANGE WELD SIF-148 TO SIF-148A, CORRECT IDENTIFICATION, & ADD REF. DIMS						
5	RPC	PIW	JCC	CLB	12-2-91	
ADD WELD SIF-11 AND MADE CAD						
REV	BY	CHECKED	SUBMITTED	APPROVED	DATE	
TENNESSEE VALLEY AUTHORITY						
SEQUOYAH NUCLEAR PLANT						
UNIT 2						
SAFETY INJECTION (LOOP 1)						
WELD LOCATIONS						
DRAWN:	DATE:	SCALE: NOT TO SCALE				
CHECKED: EDC	APPROVED: CLB	CAD UNINITIATED DRAWING REV				
SUBMITTED: EDC	151-0002-C-05		10			

## Request For Relief 2-ISI-9

### Executive Summary:

This request for relief addresses the pressurizer nozzle full penetration welds. The design configuration of the pressurizer nozzle-to-head welds precludes an 100% ultrasonic examination of the required volume for the following nozzle-to-head welds: RCW-15 (4-inch spray nozzle) and RCW-21 (14-inch surge nozzle). These physical examination limitations occur when the 1989 code examination requirements are applied in areas of components constructed and fabricated to early plant physical designs. Based on the date of SQN's construction permit (May 27, 1970), SQN is exempt from code requirements for examination access as allowed in 10 CFR 50.55a(g) (4).

An ultrasonic examination was performed on accessible areas to the maximum extent practical, given the physical limitations of the subject welds. The design configuration limits ultrasonic examination to approximately 71% of Weld RCW-15 and approximately 60% of Weld RCW-21. Performance of an ultrasonic examination of essentially 100% of full penetration welds in the pressurizer nozzle-to-vessel head welds, RCW-15 and RCW-21, would be impractical. The performance of the ultrasonic examination of the subject welds to the maximum extent practical, provides reasonable assurance of an acceptable level of quality and safety because the information and data obtained from the volume examined provides sufficient information to judge the overall integrity of the welds.

Therefore, pursuant to 10 CFR 50.55a(g) (5) (iii), it is requested that relief be granted for SQN's second inspection interval.

Unit :

2

System:

Reactor Coolant - System 68

Components:

Two Pressurizer Nozzles, Full Penetration Welds

ASME Code Class: ASME Code Class 1 (Equivalent)

Section XI Edition: 1989 Edition

Code Table: IWB-2500-1

Examination Category: B-D, Full Penetration Welds Of Nozzles In Vessels

Examination Item Number: B3.110, Pressurizer Nozzle-to-Vessel Welds

Code Requirement: ASME Section XI, Table IWB-2500-1, Examination Category B-D, Item No. B3.110, Volumetric Examination

Code Requirement From Which Relief Is Requested: Volumetric Examination Coverage

List Of Items Associated With The Relief Request: RCW-15, Pressurizer Nozzle-to-Head Weld  
RCW-21, Pressurizer Nozzle-to-Head Weld

Basis for Relief: The design configuration of the pressurizer precludes an ultrasonic examination of the required volume for the following nozzle-to-head welds: RCW-15 (4-inch spray nozzle) and RCW-21 (14-inch surge nozzle). The design configuration limits ultrasonic examination to approximately 71% of Weld RCW-15 and approximately 60% of Weld RCW-21.

Alternative Examination: In lieu of the code required 100% ultrasonic examination an, ultrasonic examination was performed on accessible areas to the maximum extent practical, given the physical limitations of the pressurizer nozzle-to head welds. Refer to Attachment 1 for the Examination Data Reports.

Justification For The Granting Of Relief: (1) The design configuration of the subject nozzle-to-head welds precludes ultrasonic examination of essentially 100% of the required examination volume. In order to examine the welds in accordance with the code requirements, the pressurizer would require extensive design modifications. The physical arrangement of RCW-21, in conjunction with the close curvature of the

outside wall surfaces of the nozzle, precludes ultrasonic examination from the nozzle side. For scans normal to the weld on the bottom vessel head side, examinations are limited to areas up to approximately 4 inches from the weld centerline. Limitations on the bottom head side of RCW-21 are due the presence of 78 immersion heaters penetrating the head, which restricts the scanning surface of the transducers. The scans for flaws oriented transverse to the weld are not obstructed. Therefore, 100% of the required examination coverage for flaws transverse to the weld was obtained. Total examination coverage of Weld RCW-21 was approximately 60% of the code required volume.

The physical arrangement of RCW-15, in conjunction with the close curvature of the outside wall surfaces of the nozzle, precludes ultrasonic examination from the nozzle side. Scans normal to the weld from the head side were not obstructed, allowing complete coverage of the weld from one side. Examination coverage from the one side provides reasonable assurance that no flaws parallel to the weld are present. In addition, approximately 81% of the required ultrasonic examination volume for flaws transverse to the weld was performed from the vessel head side. Total combined examination coverage of Weld RCW-15 was approximately 71% of the code required volume.

- (2) Radiographic examination, as an alternate volumetric examination method, was determined to be impractical due the thickness of the component. Gaining access to the inside surface of the pressurizer to place radiographic film would require extensive personnel protection due to high radiation and contamination levels. The pressurizer manway would have to be removed, decontamination performed, and specialized scaffolding erected to gain access. The additional code coverage gained by

radiography and/or ultrasonics from the inner surface is impractical when weighed against the radiological concerns. The estimated radiological conditions were determined to be the following:

35-40 rad/hour beta (uncorrected)  
10-12 rem/hour gamma  
1 rad/hour per 100 square cm

Maximum stay time to maintain exposure to less than 1 rem is approximately 5 minutes. Special clothing would be required for protection from the extremely high contamination levels and from the high beta dose rate.

Respiratory protection would be required. Industrial safety would also be a major concern (heat stress, confined space, and climbing/falling hazards). Estimates are based on actual experience inside primary components such as steam generators.

- (3) A percentage sampling approach provided by the ASME Section XI Code, in combination with examinations performed on similar items, provides reasonable assurance that significant degradation, if present, would have been detected.

Performance of an ultrasonic volumetric examination of essentially 100% of full penetration welds in the pressurizer nozzle-to-vessel head (Welds RCW-15 and RCW-21) would be impractical. As previously discussed, TVA determined that it would be impractical to attempt other volumetric examinations in order to increase examination coverage. A maximum extent practical ultrasonic examination of the subject welds provides reasonable assurance of an acceptable level of quality and safety. Significant degradation, if present, would have been detected during the ultrasonic examination that was performed on the welds. As a



result, assurance of structural integrity for these welds is provided by the alternative examinations that were performed.

Therefore pursuant to 10 CFR 50.55a(g)(5)(iii), it is requested that relief be granted for SQN's second inspection interval.

Implementation  
Schedule:

This request for relief is applicable to the second inspection interval for SQN Unit 2. Welds RCW-15 and RCW-21 were examined during the first period of SQN's second 10-year inspection interval.

Background  
Information:

In addition, it should be noted that a request for relief for volumetric examination coverage limitations for Welds RCW-15 and RCW-21 was submitted as 2-ISI-21 for Unit 2 in the first interval and was approved with no additional augmented requirements.

Reference:

NRC letter to TVA dated February 7, 1996, "Relief Requests to Close-Out the First 10-Year Inservice Inspection Program Interval - Sequoyah Nuclear Plants Units 1 and 2 (TAC Nos. M92454 and M92455)."

Attachment 1 - Examination Data Reports:  
R-5668 and R-5673.

Attachment 2 - ISI Program Drawing:  
ISI-0396-C-01, Revision 4.

ATTACHMENT 1

EXAMINATION DATA REPORTS

R-5668

R-5673

TENNESSEE VALLEY AUTHORITY

EXAMINATION SUMMARY AND RESOLUTION SHEET

REPORT NO. R-5668

PROJECT: SONP UNIT: Z  
 SYSTEM: PZR (068) ISI-0396-C-01 REV. 2  
 WELD I.D.: RCW-15  
 CONFIG: Nozzle TO: Shell  
 FLOW  $\rightarrow$   
 PROCEDURE: N-UT-A REV.: 9 TO: N/A  
 NOE METHOD:  UT  PT  MT  VT

EXAMINER: M.A. OLIVARES LV: II  
 EXAMINER: D.W. IVEY LV: I  
 EXAMINER: N/A LV: N/A  
 EXAMINER: A LV: A  
 CAL SHT NO'S: C0702, C0703, C0704  
C0705

THIS REPORT CONTAINS THE DATA ASSOCIATED WITH THE MANUAL ULTRASONIC EXAMINATION OF RCW-15 FOR ASME SECT. II CREDIT.

NO RECORDABLE INDICATIONS WERE NOTED.

<sup>2W</sup> 5.9.96 ~~No~~ LIMITATIONS ARE ASSOCIATED WITH THE EXAMINATION OF THIS WELD DUE TO GEOMETRICAL CONFIGURATION - NOZZLE TO VESSEL WELD.

CALCULATED CODE COVERAGE = 70.79%

EVALUATOR: M.A. OLIVARES LEVEL: II  
 CONCURRENCE: D.W. IVEY LEVEL: II

DATE: 05/04/96  
 DATE: 5-9-96

ANII TDA  
 DATE: 5/10/96  
 PAGE 1 OF 15

R-5668

TENNESSEE VALLEY AUTHORITY USN-50 ULTRASONIC CALIBRATION DATA SHEET CALIBRATION NO. C-0702

PROJECT: SONP UNIT: Z  
 PROCEDURE: N-UT- 19 REV.: 9 TC: N/A  
 INSTRUMENT: KRAUTKRAMER  
 MODEL/TYPE: UN 50  
 SERIAL NUMBER: E1850Z  
 TRANSDUCER MANUF.: AEROTECH  
 SERIAL NO.: M03949  
 SIZE: 1.0 Round FREQUENCY: 2.25 MHz  
 CABLE TYPE: R65AC/U LENGTH: 204

CALIBRATION DATE: 05/02/96  
 CALIBRATION BLOCK NO.: BNP 79 TEMP: 79 °F  
 SIMULATOR BLOCK NO.: 791719  
 THERMOMETER SERIAL NO.: 552186 Cal Due 1-11-97  
 COUPLANT: ULTRAGEL II BATCH: 94125  
 EXAM TYPE:  SHEAR  LONG  RL  
 ANGLE VERIFICATION  
 BLOCK TYPE: IW Type 2 SERIAL NO. 789191  
 NOMINAL ANGLE: 0° ACTUAL ANGLE: 0°

INSTRUMENT SETTINGS

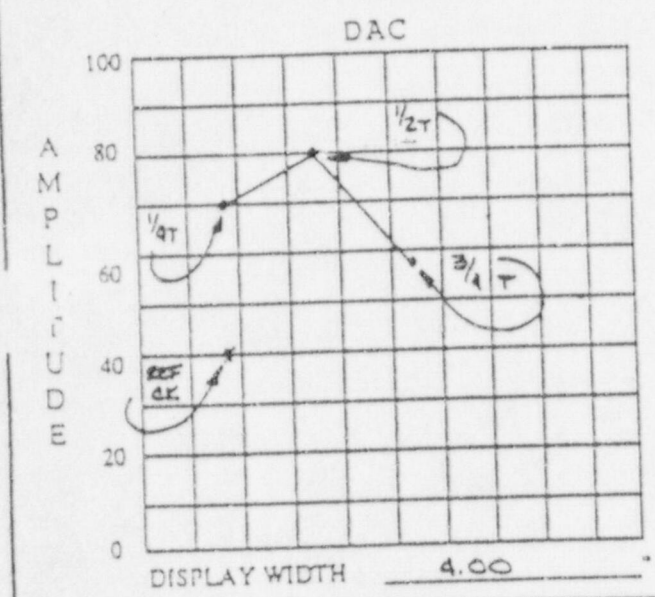
REFLECTOR ORIENTATION	REFERENCE SENSITIVITY	DATA SET
AXIAL	N/A	N/A
CIRC	23.5	8

TOF (PEAK / FLANK): FLANK ANGLE: OFF DEG.  
 DELAY: 0.672 us ZERO: 0.677 us  
 MATL VELOCITY: 2330 us RANGE: 4.00  
 REJECT: 0 % PULSER: High  
 DUAL:  ON  OFF

INITIAL CALIBRATION  
 INITIAL TIME: 1216 FINAL TIME: 1328

VERIFICATION TIMES

1) <u>1315</u>	2) <u>1328</u>	3) <u>N/A</u>	4) <u>N/A</u>
5) <u>N/A</u>	6) <u>N/A</u>	7) <u>N/A</u>	8) <u>N/A</u>



REF. REFLECTOR: Rompas SDH GAIN: 23.5 dB  
 AMPLITUDE: 40 % METAL PATH: 0.737

C L I E N. C K	VERTICAL	SIGNAL 1	100	90	80	70	60	50	40	30	20	10
		SIGNAL 2	50	45	40	35	30	25	20	15	10	05
	ATTENUATOR	GAIN	SET	-6	-12	SET	+12	SET	+6			
		SIGNAL AMP.	80%	32 to 48	16 to 24	20%	64 to 96	40%	64 to 96	80	80	

REFER TO CALIBRATION REPORT N/A FOR PREVIOUS SATISFACTORY LINEARITY

COMMENTS: N/A

WELD(S) EXAMINED: RCW-15

EXAMINER: [Signature] LEVEL: II  
 EXAMINER: [Signature] LEVEL: I  
 REVIEWED BY: [Signature] LEVEL: III DATE: 5/5/96  
 ANTI: TOM  
 DATE: 5/10/96  
 PAGE 2 OF 15

R-5668

TENNESSEE VALLEY AUTHORITY

USN-50 ULTRASONIC CALIBRATION DATA SHEET

CALIBRATION NO. C-0703

PROJECT: SQNP UNIT: 2

CALIBRATION DATE: 05/02/96

PROCEDURE: N-UT-19 REV.: 9 TC: N/A

CALIBRATION BLOCK NO.: BNP-79 TEMP.: 79 °F

INSTRUMENT: KRAUTERAMER

SIMULATOR BLOCK NO.: 791719

MODEL/TYPE: USN 50

THERMOMETER SERIAL NO.: 552186 Cal Box 1-11-97

SERIAL NUMBER: E12502

COUPLANT: Ultragel II BATCH: 94125

TRANSDUCER MANUF.: KB AEROTECH

EXAM TYPE:  SHEAR  LONG  RL

SERIAL NO.: E25215

ANGLE VERIFICATION

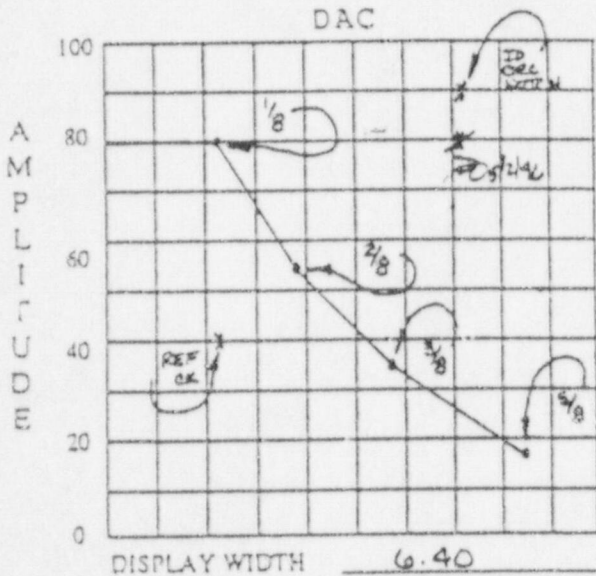
SIZE: .50 X 1.00 FREQUENCY: 2.25 MHz

BLOCK TYPE: IW Type 2 SERIAL NO. 789191

CABLE TYPE: RG 58 C/U LENGTH: 204 "

NOMINAL ANGLE: 45 ACTUAL ANGLE: 46

INSTRUMENT SETTINGS



REFLECTOR ORIENTATION	REFERENCE SENSITIVITY	DATA SET
AXIAL	N/A	N/A
CIRC	36.0	1

TOF (PEAK / FLANK): Peak ANGLE: 46 DEG.  
 DELAY: 5.383 us ZERO: 11.494 us  
 MATL VELOCITY: .1238 us RANGE: 6.40  
 REJECT: 0 % PULSER: HIGH  
 DUAL:  ON  OFF

INITIAL CALIBRATION

INITIAL TIME: 1220 FINAL TIME: 1356

REF. REFLECTOR: Kompag SDH GAIN: 36 dB

VERIFICATION TIMES

AMPLITUDE: 40 % METAL PATH: 1.080 "

1) 1330	2) 1356	3) N/A	4) N/A
5) N/A	6) N/A	7) N/A	8) N/A

VERTICAL ATTENUATOR	SIGNAL 1	100	90	80	70	60	50	40	30	20	10
	SIGNAL 2	50	45	40	35	30	25	20	15	10	05
GAIN	SET	-6			-12	SET	+12	SET	+6		
SIGNAL AMP.	80 %	32 to 48			16 to 24	20 %	64 to 96	40 %	64 to 96		
		40			20		80				80

REFER TO CALIBRATION REPORT N/A FOR PREVIOUS SATISFACTORY LINEARITY

COMMENTS: N/A 5/2/96  
3/8, 5/8 dB DIFF From CRO SIDE IS 6dB

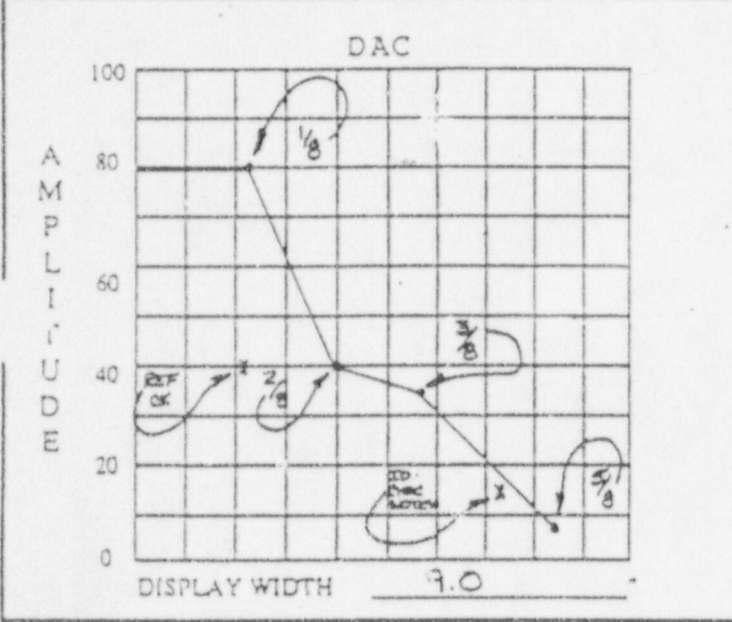
WELD(S) EXAMINED: RCW-15

EXAMINER: [Signature] N.A. OWNERS LEVEL: II ANII: TA  
 EXAMINER: [Signature] LEVEL: I DATE: 5/10/96  
 REVIEWED BY: [Signature] LEVEL: III DATE: 5/5/96 PAGE 3 OF 15

R-5668

TENNESSEE VALLEY AUTHORITY	USN-50 ULTRASONIC CALIBRATION DATA SHEET	CALIBRATION NO.  C-0704
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PROJECT: <u>SONP</u> UNIT: <u>2</u> PROCEDURE: N-UT-19 REV.: 9 TC: N/A	CALIBRATION DATE: <u>05/02/96</u> CALIBRATION BLOCK NO.: <u>2W5596 RJP BEN 79</u> TEMP: <u>79</u> °F SIMULATOR BLOCK NO.: <u>791719</u> THERMOMETER SERIAL NO.: <u>552186 Cal Due 1-11-97</u> COUPLANT: <u>ULTRAGEL II</u> BATCH: <u>94125</u> EXAM TYPE: <input checked="" type="checkbox"/> SHEAR <input type="checkbox"/> LONG. <input type="checkbox"/> RL									
INSTRUMENT: <u>KRAUTKRAMER</u> MODEL TYPE: <u>USN 50</u> SERIAL NUMBER: <u>E18502</u>	ANGLE VERIFICATION BLOCK TYPE: <u>ITW Type 2</u> SERIAL NO. <u>789191</u> NOMINAL ANGLE: <u>60</u> ACTUAL ANGLE: <u>61</u>									
TRANSDUCER MANUF.: <u>KB AEROTECH</u> SERIAL NO.: <u>E25215</u> SIZE: <u>.5X1.00</u> FREQUENCY: <u>2.25</u> MHz CABLE TYPE: <u>26580 Lu</u> LENGTH: <u>204</u>	INSTRUMENT SETTINGS <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th>REFLECTOR ORIENTATION</th> <th>REFERENCE SENSITIVITY</th> <th>DATA SET</th> </tr> <tr> <td>AXIAL</td> <td>N/A</td> <td>N/A</td> </tr> <tr> <td>CIRC</td> <td>42.0</td> <td>2</td> </tr> </table> TOF (PEAK / FLANK): <u>PEAK</u> ANGLE: <u>61</u> DEG. DELAY: <u>7.383</u> μs ZERO: <u>15.557</u> μs MATL VELOCITY: <u>1253</u> μs RANGE: <u>9.0</u> REJECT: <u>0</u> % PULSER: <u>HIGH</u> DUAL: <input type="checkbox"/> ON <input checked="" type="checkbox"/> OFF	REFLECTOR ORIENTATION	REFERENCE SENSITIVITY	DATA SET	AXIAL	N/A	N/A	CIRC	42.0	2
REFLECTOR ORIENTATION	REFERENCE SENSITIVITY	DATA SET								
AXIAL	N/A	N/A								
CIRC	42.0	2								



REF. REFLECTOR: <u>Pompas SDH</u> GAIN: <u>42.0</u> dB AMPLITUDE: <u>40</u> % METAL PATH: <u>1.571</u>	INITIAL CALIBRATION INITIAL TIME: <u>1230</u> FINAL TIME: <u>1415</u> VERIFICATION TIMES <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>1) 1358</td> <td>2) 1415</td> <td>3) N/A</td> <td>4) N/A</td> </tr> <tr> <td>5) N/A</td> <td>6) N/A</td> <td>7) N/A</td> <td>8) N/A</td> </tr> </table>	1) 1358	2) 1415	3) N/A	4) N/A	5) N/A	6) N/A	7) N/A	8) N/A
1) 1358	2) 1415	3) N/A	4) N/A						
5) N/A	6) N/A	7) N/A	8) N/A						

C L I E N. C K	VERTICAL	SIGNAL 1	100	90	80	70	60	50	40	30	20	10
		SIGNAL 2	50	45	40	35	30	25	20	15	10	05
	ATTENUATOR	GAIN	SET	-6	-12	SET	+12	SET	+6			
		SIGNAL AMP.	80 %	32 to 48	16 to 24	20 %	64 to 96	40 %	64 to 96			

REFER TO CALIBRATION REPORT N/A FOR PREVIOUS SATISFACTORY LINEARITY

COMMENTS: <u>3/8, 5/8 db diff from C/AO side in 14db</u>	WELD(s) EXAMINED: <u>RCW-15</u>
--	---------------------------------

EXAMINER: <u>[Signature]</u> N.A. CUYARES LEVEL: <u>II</u>	ANTI: <u>TDm</u>	DATE: <u>5/10/96</u>
EXAMINER: <u>[Signature]</u> LEVEL: <u>I</u>	DATE: <u>5/5/96</u>	
REVIEWED BY: <u>[Signature]</u> LEVEL: <u>IEP</u>	PAGE <u>4</u> OF <u>15</u>	

R-5668

TENNESSEE VALLEY AUTHORITY

USN-50 ULTRASONIC CALIBRATION DATA SHEET

CALIBRATION NO.

C-0705

PROJECT: SONP UNIT: 2

CALIBRATION DATE: 05/07/96

PROCEDURE: N-UT-19 REV.: 9 TC: N/A

CALIBRATION BLOCK NO.: 20123 BNP ~~BFH 79~~ TEMP.: 79 °F

INSTRUMENT: KAUTKRANER

SIMULATOR BLOCK NO.: 791719

MODEL/TYPE: USN 50

THERMOMETER SERIAL NO.: 552186 Cal Due 1-11-97

SERIAL NUMBER: E18502

COUPLANT: ULTRAGER II BATCH: 94125

EXAM TYPE:  SHEAR  LONG.  RL

TRANSDUCER MANUF.: KB AGROTECH

ANGLE VERIFICATION

SERIAL NO.: E25215

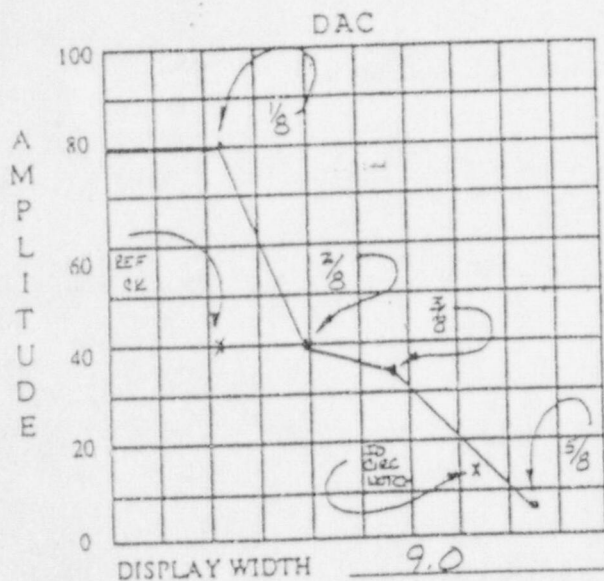
BLOCK TYPE: IN Type 2 SERIAL NO. 789191

SIZE: .5 x 1.00 FREQUENCY: 2.25 MHz

NOMINAL ANGLE: 60 ACTUAL ANGLE: 61

CABLE TYPE: RG58C/U LENGTH: 204 "

INSTRUMENT SETTINGS



REFLECTOR ORIENTATION	REFERENCE SENSITIVITY	DATA SET
AXIAL	N/A	N/A
CIRC	42.0	2

TOF (PEAK / FLANK): PEAK ANGLE: 61 DEG.  
 DELAY: 7.383 us ZERO: 15.557 us  
 MATL VELOCITY: .1253 us RANGE: 9.0  
 REJECT: 0 % PULSER: HIGH  
 DUAL:  ON  OFF

INITIAL CALIBRATION

INITIAL TIME: 0945 FINAL TIME: 1109

VERIFICATION TIMES

1) 1003	2) 1020	3) 1040	4) 1109
5) N/A	6) N/A	7) N/A	8) N/A

REF. REFLECTOR: RENKIS 30H GAIN: 42.0 dB

AMPLITUDE: 40 % METAL PATH: 1.571 "

VERTICAL ATTENUATOR

VERTICAL

SIGNAL 1	100	90	80	70	60	50	40	30	20	10
SIGNAL 2	50	45	40	35	30	25	20	15	10	05

ATTENUATOR

GAIN	SET	-6	-12	SET	+12	SET	+6
SIGNAL AMP.	80%	32 to 48	16 to 24	20%	64 to 96	40%	64 to 96
		40	20		80		80

REFER TO CALIBRATION REPORT N/A FOR PREVIOUS SATISFACTORY LINEARITY

COMMENTS: 3/8, 5/8 dB DIFF FROM CURD SIDE IS 14dB

WELD(S) EXAMINED: RCW-15 & RCW-21

CIRC SCAN ONLY

KAMINER: [Signature]

M.A. SUYARES

LEVEL: II

ANTI: TDm

EXAMINER: [Signature]

LEVEL: I

DATE: 5/19/96

REVIEWED BY: [Signature]

LEVEL: [Signature]

DATE: 5/8/96

PAGE 5 OF 15

TENNESSEE VALLEY AUTHORITY

MANUAL ULTRASONIC  
VESSEL EXAMINATION  
DATA SHEET

REPORT NO.  
R-5668

PROJECT: SGNP UNIT: 2  
 SYSTEM: 068 PZR  
 WELD ID: RCW-15 TO: SHELL  
 CONFIG: NOZZLE TO: N/A  
 PROCEDURE: N-UT-19 REV. 9 TC: N/A

W0 REFERENCE: Ø OF WELD  
 L0 REFERENCE: 0 AS STAMPED ON SHELL  
 SURFACE TEMP: 69° F  
 PYRO. SERIAL NO. 552186  
 CAL. DUE: 1/11/97

EXAMINATION DATE: 5/2/96  
 START TIME: 13:18 / END TIME: 14:13

CAL. SHT. NO. ANGLE SCAN SENSITIVITY dB  
C0702 0° \* 41.5  
C0703 45° \* 54  
C0704 60° \* 60

IND NO	MAX SCAN AMP	SCAN NO	ANG	100% (1/2 MAX)			50%			20%			MAX			100% (1/2 MAX)		
				Mp1	W1	L1	Mp1	W1	L1	Mp1	W1	L1	Mp	W	L	Mp2	W2	L2
			0°															
	9		45°															
	10		45°															
	11		45°															
	9		60°															

REMARKS/LIMITATIONS: \* To MAINTAIN CLAD ROLL @ 10% FSH.

EXAMINER: [Signature] LEVEL: II  
 EXAMINER: [Signature] LEVEL: I  
 REVIEWED BY: [Signature] DATE: 5-9-96  
 LEVEL: II DATE: 5-9-96  
 AMII [Signature] PAGE 6 OF 15





TENNESSEE VALLEY AUTHORITY

BEAM SPREAD AND RESOLUTION DATA SHEET

REPORT NO.

R-5668

PROJECT: SONP UNIT: 2

BEAM SPREAD DATE: 05/01/96

PROCEDURE: N-UT- 19 REV. 9 TO N/A

CALIBRATION SHEET NO. C-0703

SEARCH UNIT

MANUFACTURER KB AEROTECH

UT INSTRUMENT

SIZE: .50 x 1.00 FREQ: 2.25 MHz

S/N: E25215 NOM. ANGLE 45

MANUFACTURER: KRAUTKRAMER

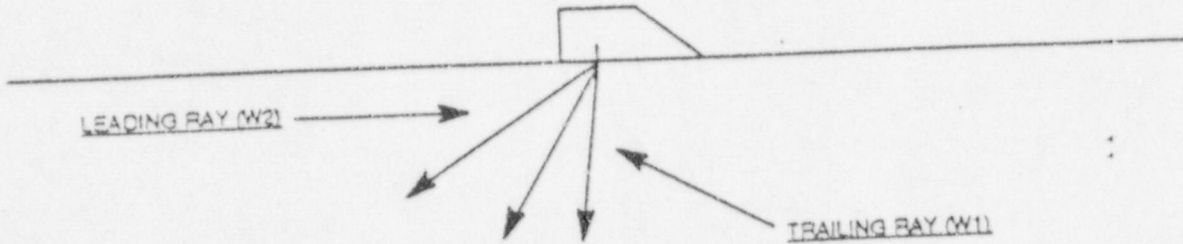
MEASURED ANGLE: 46° DEG.

MODEL NUMBER: USN-50

BEAM SPREAD: 11.0° DEG.

SERIAL NUMBER: E18502

HOLE POSITION	TRAILING RAY (W1)				W MAX		LEADING RAY (W2)			
	20% DAC		50% DAC		100% DAC		50% DAC		20% DAC	
	W	MP	W	MP	W	MP	W	MP	W	MP
1/4 T	0.55	0.869	0.7	0.980	0.85	1.072	1.0	1.184	1.09	1.234
1/2 T	1.35	1.945	1.45	2.013	1.60	2.106	1.87	2.315	2.04	2.405
3/4 T	2.08	2.956	2.18	3.041	2.58	3.307	2.88	3.506	3.05	3.652



R.G. 1.150 RESOLUTION VERIFICATION

NEAR SURFACE REFLECTOR: N/A DEPTH: N/A IN. SIZE: N/A

FAR SURFACE REFLECTOR: A DEPTH: A IN. SIZE: A

SCANNING (REFLECTORS PROVIDE 50% DAC SIGNALS AT SCANNING SPEED):  YES  NO

REMARKS: Cal Blk BNP-79

EXAMINER: [Signature] N.A. SQUARES LEVEL: II

EXAMINER: [Signature] LEVEL: I

REVIEWED BY: [Signature] LEVEL: IBP

ANII TG

DATE: 5/10/96

DATE: 5/5/96

PAGE 8 OF 15

TENNESSEE VALLEY AUTHORITY

BEAM SPREAD  
AND RESOLUTION  
DATA SHEET

REPORT NO.  
R-5668

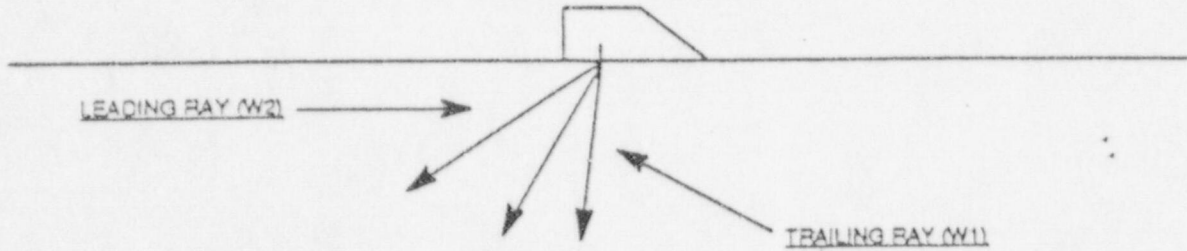
PROJECT: SONP UNIT: Z  
SEARCH UNIT

BEAM SPREAD DATE: 05/01/96  
PROCEDURE: N-UT- 19 REV. 9 TC N/A  
CALIBRATION SHEET NO. C- 0704

MANUFACTURER KB AEROTECH  
SIZE: .8 x 1.0 FREQ.: 2.25 MHz  
S/N: E25215 NOM. ANGLE 60  
MEASURED ANGLE: 61 DEG.  
BEAM SPREAD: 12.5° DEG.

UT INSTRUMENT  
MANUFACTURER: KRAUTERPAUER  
MODEL NUMBER: UN 50  
SERIAL NUMBER: E1850Z

HOLE POSITION	TRAILING RAY (W1)				W MAX		LEADING RAY (W2)			
	20% DAC		50% DAC		100% DAC		50% DAC		20% DAC	
	W	MP	W	MP	W	MP	W	MP	W	MP
1/4T	1.1	1.184	1.2	1.302	1.4	1.487	1.84	1.869	2.05	2.043
1/2T	2.24	2.568	2.4	2.697	2.84	3.071	3.59	3.734	4.0	4.109
3/4T	3.53	4.017	3.75	4.228	4.25	4.668	5.37	5.696	6.1	6.310



R.G. 1.150 RESOLUTION VERIFICATION

NEAR SURFACE REFLECTOR: N/A DEPTH: N/A IN. SIZE: N/A  
FAR SURFACE REFLECTOR: A DEPTH: A IN. SIZE: A

SCANNING (REFLECTORS PROVIDE 50% DAC SIGNALS AT SCANNING SPEED:  YES  NO

REMARKS: Col Box BNP-79

EXAMINER: [Signature] M.S. OUYARES LEVEL: II  
EXAMINER: [Signature] LEVEL: I  
REVIEWED BY: [Signature] LEVEL: III DATE: 5/5/96  
ANII TJGm  
DATE: 5/10/96  
PAGE 9 OF 15

TVA

Office of Nuclear Power

PROJECT: 50NP

SYSTEM: 06B PZR

REPORT NO.:

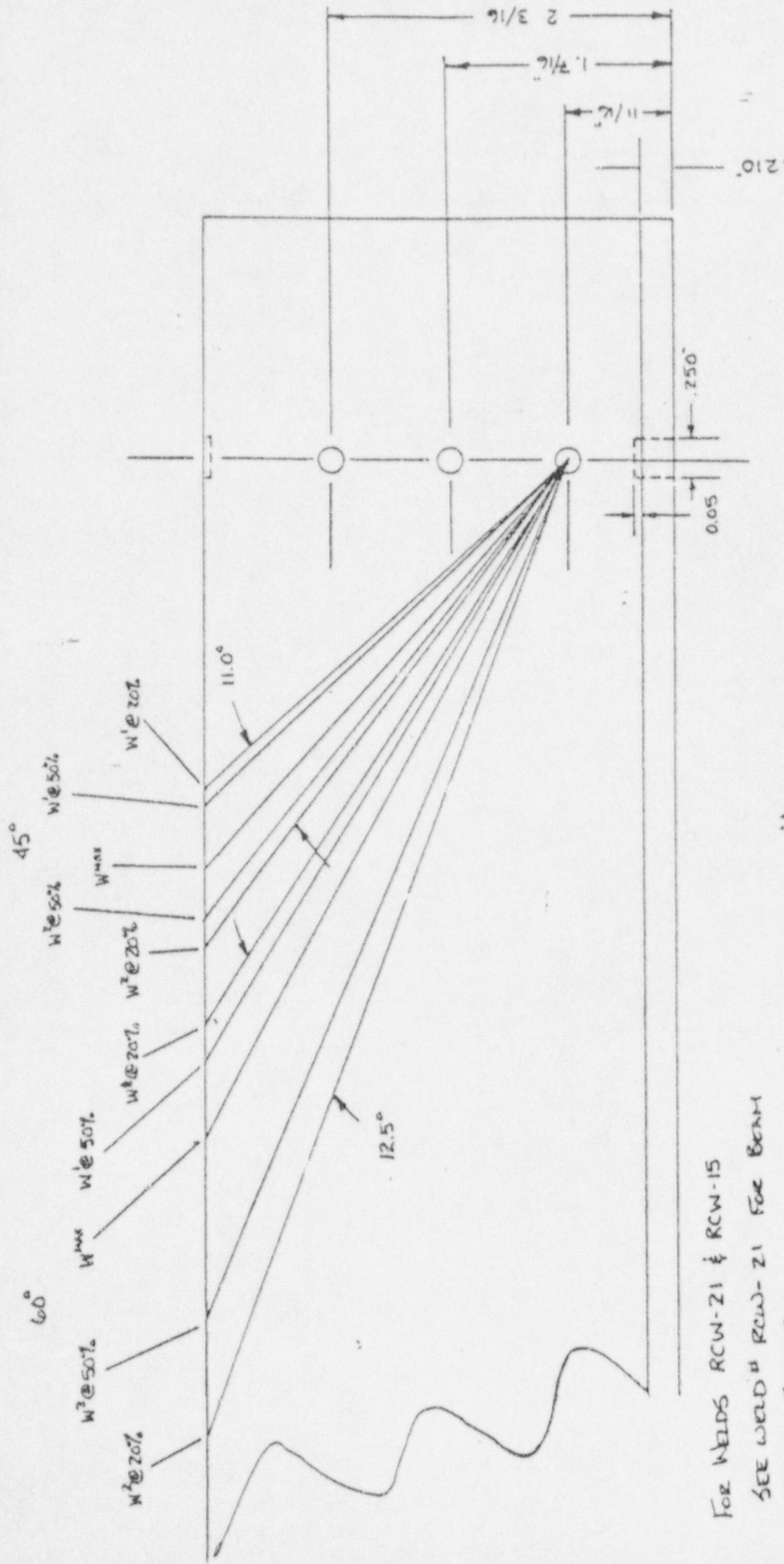
RS268

Unit: 2

WELD NO.: RCW-15

60° BEAM SPREAD = 12.5°

45° BEAM SPREAD = 11.0°



FOR WELDS RCW-21 & RCW-15  
 SEE WELD # RCW-21 FOR BEAM  
 SPREAD SHEETS.

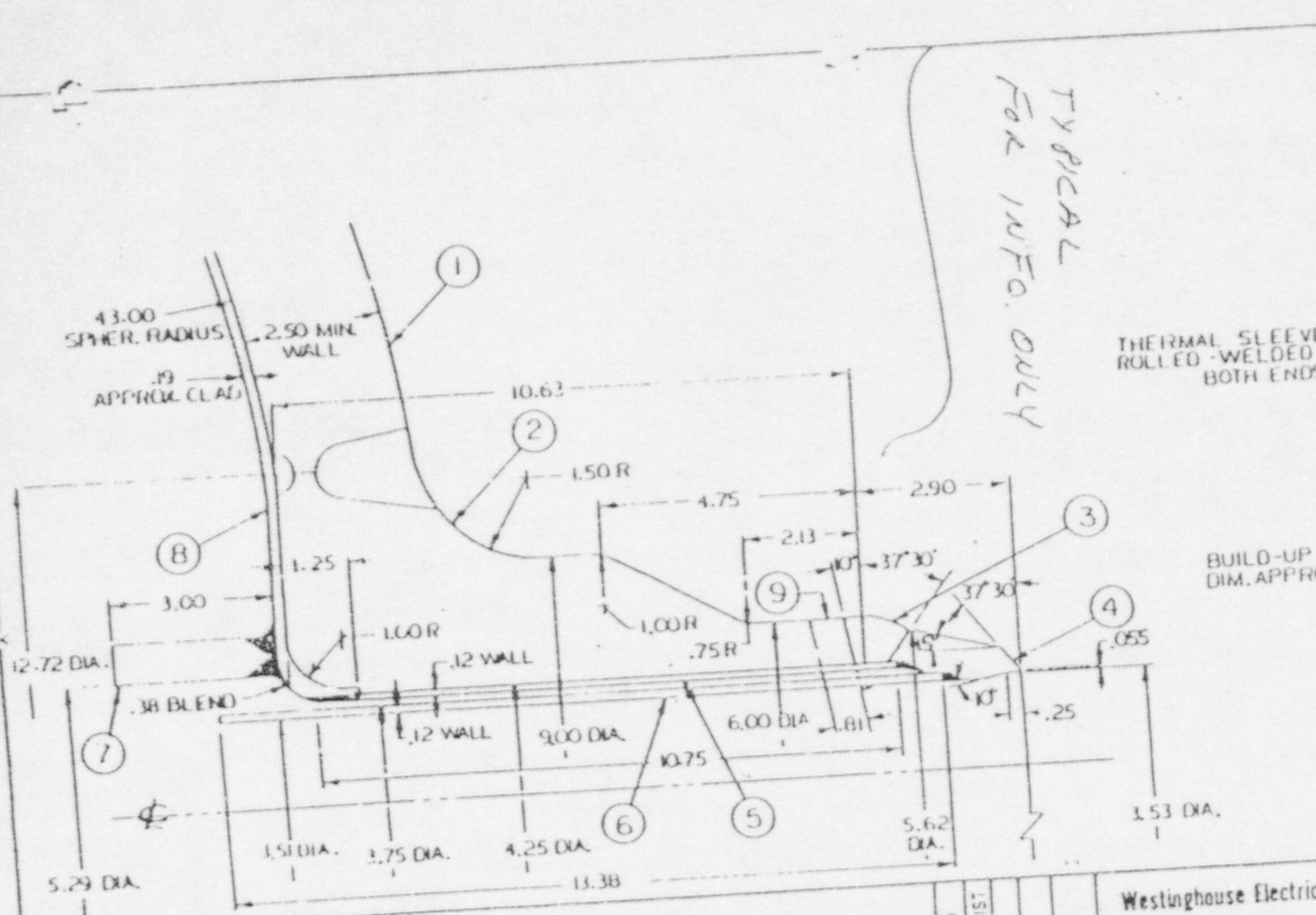
BY: *[Signature]* N.A. OLIVARES

LEVEL: II

DATE: 05/03/96

PAGE 10

OF 15



TYPICAL  
FOR INFO. ONLY

THERMAL SLEEVE  
ROLLED-WELDED  
BOTH ENDS

BUILD-UP  
DIM. APPROX.

ITEM	POS. / DIM. NO.	MATERIAL	ASME NO.
1	2656A90	SA 531	GR. A, CLASS 2
2	393A70B	SA 508	CLASS 2
3		INCONEL WELD	
4	2656A96	SA 182	GRADE F316L
5	398A009	SA 213	GRADE TP 304
6	398A009	SA 213	GRADE TP 304
7	398A004	SA 312	GRADE TP 304
8		SSI CLADDING	
9		INCONEL WELD	BUILD-UP

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ITEM	CHANGE	LAST NUMBER USED	PARTS LIST
1			

Westinghouse Electric Corporation  
TAMPA DIVISION TAMPA FLA.  
APPARATUS PRESSURIZER  
TITLE SPRAY NOZZLE ON FAB HEAD

DATE: 11/14/64  
DRAWN: [Signature]  
CHECKED: [Signature]  
DESIGN APP: [Signature]  
MATERIAL: [Signature]  
WELD APP: [Signature]

DESK: 379346B

EDSK: 379346B

SHEET NO. 1 OF 1 SHEETS

RCW-15

R5268

872C19W01

5170 11

TVA

WALL THICKNESS  
PROFILE SHEET

REPORT NO:

R 5668

PROJECT: SONP

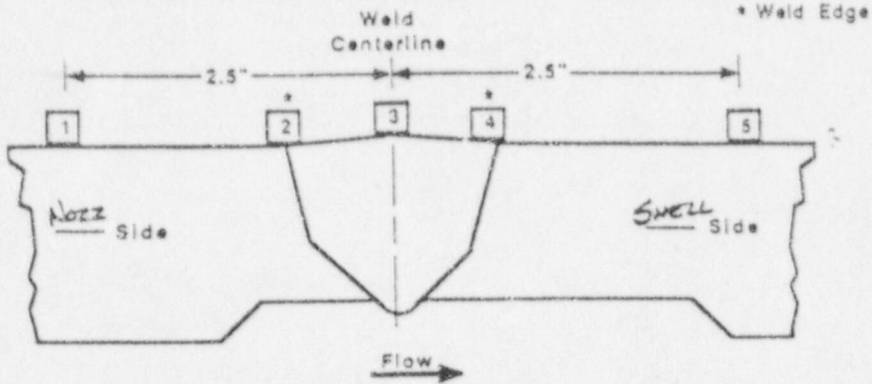
WELD NO: RCW-15

UNIT: Z

SYSTEM: 068 PZR

Record Thickness Measurements As Indicated, Including Weld Width, Edge-To-Edge At 0°

Position	0°	90°	180°	270°
1	NR			
2	3.663			
3	3.399			
4	3.057			
5	2.925			

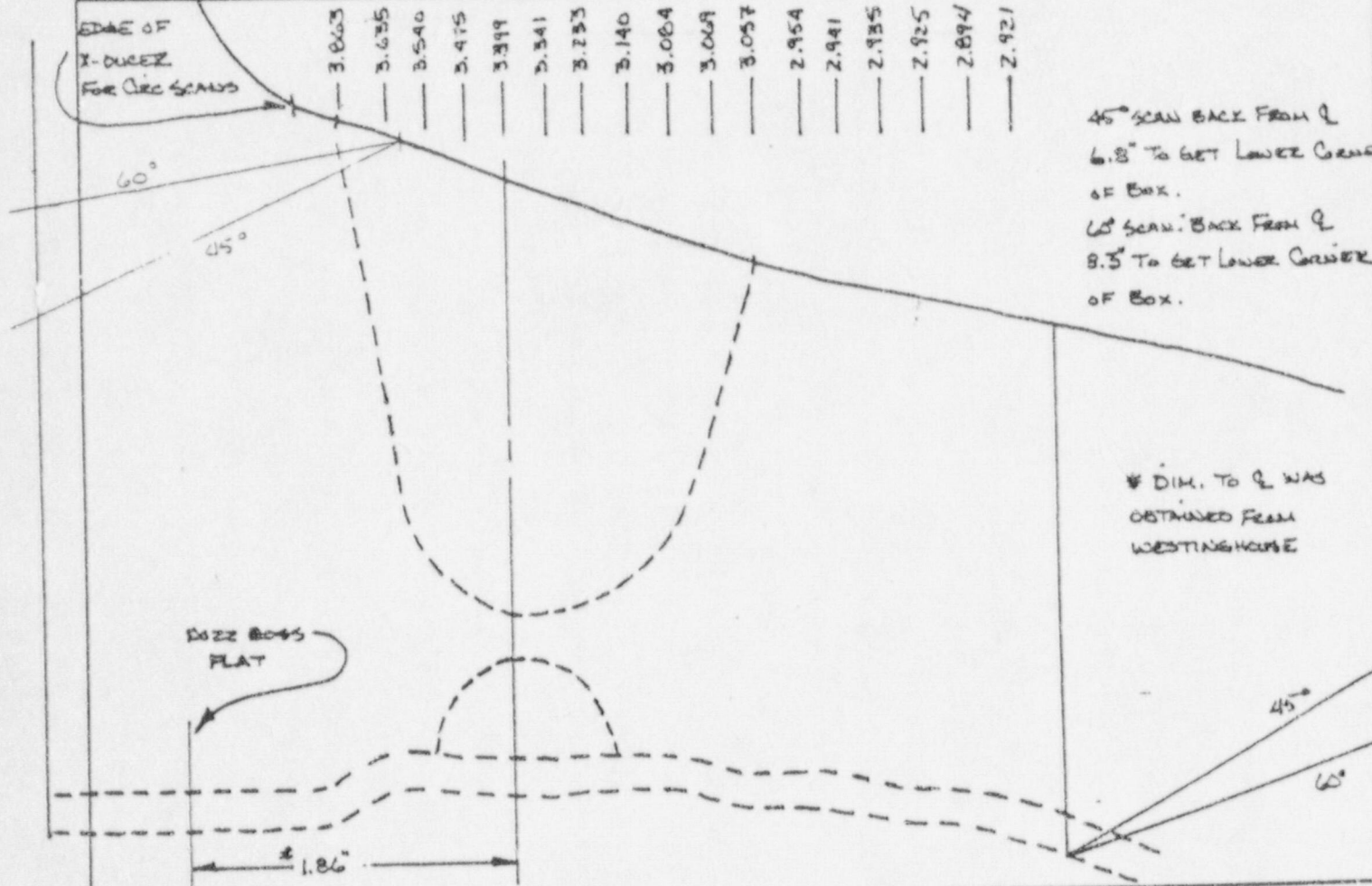


CROWN HEIGHT: FLUSH DIAMETER: 1/2  
 CROWN WIDTH: 2.5" WELD LENGTH: 46.85"

- EDGE OF X-DUCEZ FOR CIRC SCANS
- 3.663
- 3.635
- 3.540
- 3.475
- 3.399
- 3.341
- 3.233
- 3.140
- 3.084
- 3.069
- 3.057
- 2.954
- 2.941
- 2.935
- 2.925
- 2.894
- 2.921

45° SCAN BACK FROM Q  
6.8" TO GET LOWER CORNER OF BOX.  
 60° SCAN BACK FROM Q  
8.3" TO GET LOWER CORNER OF BOX.

\* DIM. TO Q WAS OBTAINED FROM WESTINGHOUSE



EXAMINER: [Signature]  
 LEVEL: II  
 DATE: 05/08/96

REVIEWED BY: [Signature]  
 LEVEL: III DATE: 5-9-96

ANII: 1.9 km  
 DATE: 5/12/96  
 PAGE 13 OF 15

TVA

Office of Nuclear Power

PROJECT: SQN

Unit: 2

SYSTEM: Pressurizer

WELD NO.: RCW-15

REPORT NO.:

R 5668

① Determine area of weld

$A = \frac{1}{2} (.5)(3.3) = .825$

$A = \frac{1}{2} (.55)(2.9) = .7975$

$A = (.95)(2.95) = 2.8025$

$A = \frac{1}{2} (.25)(.95) = .11875$

Area Total (weld) = 4.543 sq. in.

② Determine Area of base material (Shell side)

$A = (.7)(2.7) = 4.59$

$A = \frac{1}{2} (2.8)(.5) = .7$

$A = (.15)(.55) = .0825$

Area Total = 5.3725 sq. in.

Area Total = ① + ② + ③ =

$4.543 + 5.3725 + 6.49 = 16.40 \text{ sq. in.}$

③ Determine Area Nozzle side Base Material

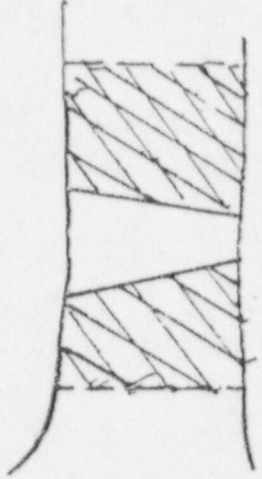
$AF = 3.35 \times 1.65 = 5.5275$

$A = (.5)(1.55)(.65) = .50375$

$A = (.105)(.25) = .02625$

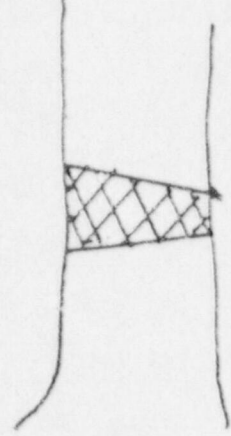
$A = \frac{1}{2} (.25)(.6) = .075$

Area nozzle side (base material) = 6.49 sq. in.



100% - 45°  
Base Material Scan

100% - 60°  
Base Material Scan



100% - Weld coverage  
with 45 + 60°  
Scans  
from both directions

BY: Albert [Signature]

LEVEL: III

DATE: 5/9/66

PAGE 13 OF 15

TVA

Office of Nuclear Power

PROJECT: SQN

SYSTEM: Pressurized

REPORT NO.:

Unit: Z

WELD NO.: RW-15

RS668

④ Determine base material coverage (Total Area)

Shell side  $A_1 + \text{Nozzle side } A_2 =$

$$5.3725 + 6.49 = 11.8625$$

⑤ Determine base material coverage (total volume)

Area  $\times$  Circumference

$$(11.8625)(40.85") = 484.6 \text{ in}^3$$

⑥ Determine Limitation Base Material 45° T SCAN

Area of Limitation  $\times$  Circumference = Total Volume Limitation

$$1.6275 \text{ sq. in} \times 40.85" = 66.48 \text{ in}^3$$

⑦ Determine Limitation Base Material 60° T SCAN

Area of Limitation  $\times$  Circumference = Total Vol. Limitation

$$1.225 \text{ sq. in} \times 40.85" = 50.18 \text{ in}^3$$

⑧ Determine % coverage 45° T scan Base material

$$\frac{45^\circ \text{ Volume Limitation}}{\text{Total Volume Base Material}} = \frac{66.48}{484.6} \times 100 = 13.71\%$$

Limitation

$$100 - 13.71\% = 86.3\%$$

Coverage 45° T S.M.

⑨ Determine % coverage 60° T scan Base material

$$\frac{60^\circ \text{ Limitation}}{\text{Total volume}} = \frac{50.18}{484.6} \times 100 = 10.38\%$$

$$100 - 10.38\% = 89.62\%$$

Coverage 60° T S.M.

BY:

*[Signature]*

LEVEL: III

DATE: 5/9/54

PAGE 14

OF 15



<p><b>TVA</b> Office of Nuclear Power</p>	<p>PROJECT: <u>SQN</u> Unit: <u>2</u></p>	<p>SYSTEM: <u>Pressurizer</u> WELD NO.: <u>RCW-15</u></p>	<p>REPORT NO.: <u>R 5668</u></p>
<p>10.0 Determine Total Coverage</p> <p>45° BM. = 86.37. 60° BM. = 88.82 45° weld = 100.00     SCN3 45° weld = 0     SCN4 60° weld = 100     SCN3 60° weld = 0     SCN4 45° C<sub>w</sub> = 80.5% 45° C<sub>ccw</sub> = 80.5% 60° C<sub>w</sub> = 80.5% 60° C<sub>ccw</sub> = 80.5% 0° = 80.5%</p> <p style="text-align: center;">777.62</p> <p style="text-align: right;">Determine total Average (Coverage) 777.62 / 11 = <u>70.7%</u></p>			
<p>BY: <u>[Signature]</u></p>		<p>LEVEL: <u>III</u></p>	<p>DATE: <u>5/4/66</u>      PAGE <u>15</u> OF <u>15</u></p>

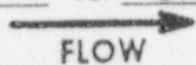
TENNESSEE VALLEY AUTHORITY

EXAMINATION SUMMARY AND RESOLUTION SHEET

REPORT NO. R-5673

PROJECT: SONP UNIT: 2  
 SYSTEM: PZR (068) ISI-0396-C-01 Rev. 2  
 WELD I.D.: RCW-21  
 CONFIG: Nozzle TO: SHELL  
 PROCEDURE: N-UT-19 REV.: 9 TO: N/A  
 NDE METHOD:  UT  PT  MT  VT

EXAMINER: U.A. OLIVARES LV: II  
 EXAMINER: D.W. IVEY LV: I  
 EXAMINER: N/A LV: N/A  
 EXAMINER: A LV: A  
 CAL SHT NOS: CO709, CO710, CO711, CO712



This REPORT CONTAINS THE DATA ASSOCIATED WITH THE MANUAL ULTRASONIC EXAMINATION OF RCW-21 FOR ASME SEC. II CREDIT.

NO RECORDABLE INDICATION WERE NOTED.

EXAMINATION LIMITED FROM SCAN 9 SIDE, WITH A 3.75"  
 DUE TO INSTRUMENTATION PENETRATION ON BOTTOM OF PZR.  
 SCANS LIMITED TO SHELL SIDE DUE TO GEOMETRICAL CONFIGURATION.  
 TOTAL SEC II COVERAGE FOR THIS EXAM IS 59.52%.

EVALUATOR: [Signature] U.A. OLIVARES LEVEL: II DATE: 05/01/96  
 CONCURRENCE: [Signature] LEVEL: III DATE: 5/9/96

ANII [Signature]  
 DATE: 5/16/96  
 PAGE 1 OF 15

R-5673

TENNESSEE VALLEY AUTHORITY

USN-50 ULTRASONIC CALIBRATION DATA SHEET

CALIBRATION NO.

C-0709

OBJECT: SONP UNIT: 2

PROCEDURE: N-UT-19 REV.: 9 TC: N/A

INSTRUMENT: KEUTRENER

MODEL/TYPE: USN-50

SERIAL NUMBER: E18502

TRANSDUCER MANUF.: HEROTECH

SERIAL NO.: M05949

SIZE: 1.0 Round FREQUENCY: 2.25 MHz

CABLE TYPE: R658C/U LENGTH: 204

CALIBRATION DATE: 04/30/96

CALIBRATION BLOCK NO.: BNP79 TEMP.: 79 °F

SIMULATOR BLOCK NO.: 791719

THERMOMETER SERIAL NO.: 552186 Co Due 1-11-97

COUPLANT: ULTRAGEL II BATCH: 94125

EXAM TYPE:  SHEAR  LONG.  RL

ANGLE VERIFICATION

BLOCK TYPE: IN Type 2 SERIAL NO. 729191

NOMINAL ANGLE: 0° ACTUAL ANGLE: 0°

INSTRUMENT SETTINGS

REFLECTOR ORIENTATION	REFERENCE SENSITIVITY	DATA SET
AXIAL	N/A	N/A
CIRC	23.5	8

TOF (PEAK / FLANK): FLANK ANGLE: OFF DEG.

DELAY: 0.672  $\mu$ S ZERO: 0.677  $\mu$ S

MATL VELOCITY: 2330  $\mu$ S RANGE: 4.00

REJECT: 0 % PULSER: HIGH

DUAL:  ON  OFF

INITIAL CALIBRATION

INITIAL TIME: 1030 FINAL TIME: 1148

REF. REFLECTOR: Rampas 50H GAIN: 23.5 dB

AMPLITUDE: 40 % METAL PATH: 0.737

VERIFICATION TIMES

1) 1677	2) 1648	3) N/A	4) N/A
5) N/A	6) N/A	7) N/A	8) N/A

VERTICAL ATTENUATOR

VERTICAL

SIGNAL 1	100	90	80	70	60	50	40	30	20	10
SIGNAL 2	50	45	40	36	30	25	20	15	10	05

GAIN	SET	-6	-12	SET	+12	SET	+6
SIGNAL AMP.	80%	32 to 48	16 to 24	20%	64 to 96	40%	64 to 96
		40	20		80		80

REFER TO CALIBRATION REPORT N/A FOR PREVIOUS SATISFACTORY LINEARITY

COMMENTS: NONE

WELD(S) EXAMINED: RCW-21

MINER: M.A. OLIVARES

LEVEL: II

ANTI: TSM

EXAMINER: [Signature]

LEVEL: I

DATE: 5/16/96

REVIEWED BY: [Signature]

LEVEL: [Signature]

DATE: 5/5/96

PAGE 2 OF 15

R-5673

TENNESSEE VALLEY AUTHORITY

USN-50 ULTRASONIC CALIBRATION DATA SHEET

CALIBRATION NO.

C-0710

PROJECT: SQNP UNIT: 2

PROCEDURE: N-UT-19 REV.: 9 TC: N/A

INSTRUMENT: Kraut Kramer

MODEL TYPE: USN-50

SERIAL NUMBER: E18502

TRANSDUCER MANUF.: KB-AEROTECH

SERIAL NO.: E25215

SIZE: .50 x 1.0 FREQUENCY: 2.25 MHz

CABLE TYPE: R65BC/U LENGTH: 204

CALIBRATION DATE: 04/30/96

CALIBRATION BLOCK NO.: BNP-79 TEMP.: 79 °F

SIMULATOR BLOCK NO.: 791719

TIERMOMETER SERIAL NO.: 552186 caldwell-1-97

COUPLANT: ultragel II BATCH: 94125

EXAM TYPE:  SHEAR  LONG  RL

ANGLE VERIFICATION

BLOCK TYPE: TIW Type 2 SERIAL NO. 789191

NOMINAL ANGLE: 45° ACTUAL ANGLE: 46°

INSTRUMENT SETTINGS

REFLECTOR ORIENTATION	REFERENCE SENSITIVITY	DATA SET
AXIAL	N/A	N/A
CIRC	36 Db	1

TOF (PEAK / FLANK): PEAK ANGLE: 46 DEG.

DELAY: 5.383 us ZERO: 11.494 us

MATL VELOCITY: 1238 us RANGE: 6.4"

REJECT: 0 % PULSER: High

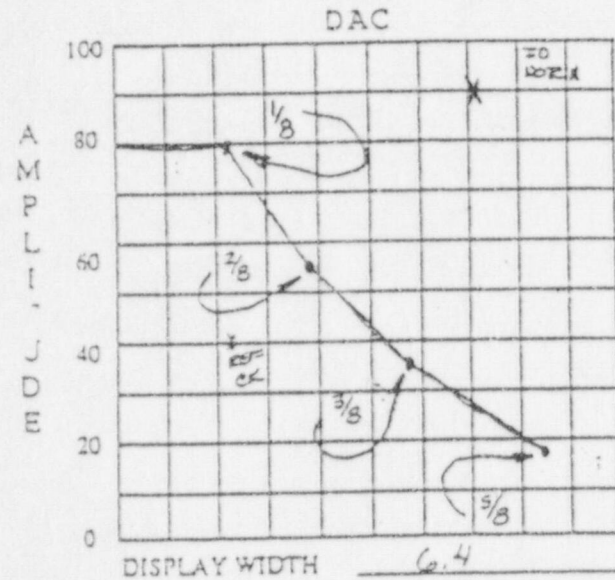
DUAL:  ON  OFF

INITIAL CALIBRATION

INITIAL TIME: 1115 FINAL TIME: 1715

VERIFICATION TIMES

1) 1649	2) 1715	3) N/A	4) N/A
5) N/A	6) N/A	7) N/A	8) N/A



REF. REFLECTOR: Zoupan SDH GAIN: 36 dB

AMPLITUDE: 40 % METAL PATH: 1.080

VERTICAL ATTENUATOR	SIGNAL										
	SIGNAL 1	100	90	80	70	60	50	40	30	20	10
SIGNAL 2	50	45	40	36	30	25	20	15	10	05	
GAIN	SET	-6			-12		SET	+12	SET	+6	
SIGNAL AMP.	80 %	32 to 48			16 to 24		20 %	64 to 96	40 %	64 to 96	
		40			20			80		80	

REFER TO CALIBRATION REPORT \_\_\_\_\_ FOR PREVIOUS SATISFACTORY LINEARITY

COMMENTS: 3/2, 5/8 DB DIFF FROM CLAD SIDE  
is 6db

WELD(S) EXAMINED: RCW-21

AMINER: [Signature] M.A. OUVARES LEVEL: II  
 EXAMINER: [Signature] LEVEL: I  
 REVIEWED BY: [Signature] LEVEL: III DATE: 5/5/96  
 ANTI: T.D.M.  
 DATE: 5/16/96  
 PAGE 3 OF 15

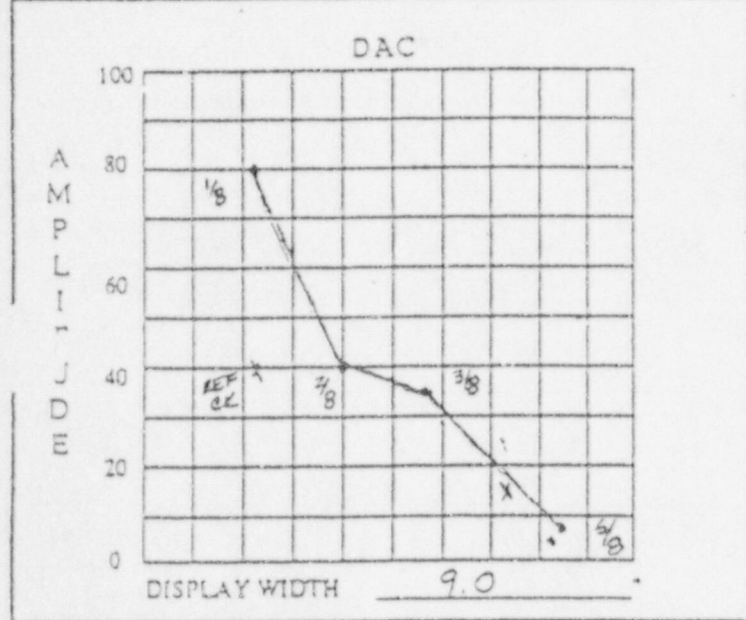
R-5673

TENNESSEE VALLEY AUTHORITY USN-50 ULTRASONIC CALIBRATION DATA SHEET CALIBRATION NO. C-0711

OBJECT: SQNP UNIT: 2  
 PROCEDURE: N-UT-19 REV.: 9 TC: N/A  
 INSTRUMENT: Krautkramer  
 MODEL TYPE: USN-50  
 SERIAL NUMBER: E18502  
 TRANSDUCER MANUF.: KB-AEROTECH  
 SERIAL NO.: E25215  
 SIZE: .5X1.0" FREQUENCY: 2.25 MHz  
 CABLE TYPE: RG-58 C/U LENGTH: 204"

CALIBRATION DATE: 04/30/96  
 CALIBRATION BLOCK NO.: 8FN-79 TEMP.: 77 °F  
 SIMULATOR BLOCK NO.: 791719  
 THERMOMETER SERIAL NO.: 552186 cal due 11-1-97  
 COUPLANT: Ultragel II BATCH: 94125  
 EXAM TYPE:  SIIEAR  LONG.  RL

ANGLE VERIFICATION  
 BLOCK TYPE: IIW Type 2 SERIAL NO. 789191  
 NOMINAL ANGLE: 60° ACTUAL ANGLE: 61°



INSTRUMENT SETTINGS

REFLECTOR ORIENTATION	REFERENCE SENSITIVITY	DATA SET
AXIAL	N/A	N/A
CIRC	42 Db	2

TOF (PEAK / FLANK): Peak ANGLE: 61° DEG.  
 DELAY: 7.383 us ZERO: 15.557 us  
 MATL VELOCITY: 1253 us RANGE: 9.0"  
 REJECT: 0 % PULSER: High  
 DUAL:  ON  OFF

INITIAL CALIBRATION  
 INITIAL TIME: 1200 FINAL TIME: 1730

REF. REFLECTOR: Ranges SDH GAIN: 42 dB  
 AMPLITUDE: 40 % METAL PATH: 1.571"

VERIFICATION TIMES

1) 1716	2) 1730	3) N/A	4) N/A
5) N/A	6) N/A	7) N/A	8) N/A

VERTICAL ATTENUATOR	SIGNAL 1	100	90	80	70	60	50	40	30	20	10
	SIGNAL 2	50	45	40	36	30	25	20	15	10	05
GAIN	SET	-6	-12	SET	+12	SET	+6				
SIGNAL AMP.	80%	32 to 48	16 to 24	20%	64 to 96	40%	64 to 96				
		40	20		80		80				

REFER TO CALIBRATION REPORT FOR PREVIOUS SATISFACTORY LINEARITY

COMMENTS: 3/8, 5/8 DB DIFF FROM CLAD SIDE IS 14db

WELD(S) EXAMINED: RCW-21

AMINER: M.A. OLIVARES LEVEL: II  
 EXAMINER: [Signature] LEVEL: I  
 REVIEWED BY: [Signature] LEVEL: III DATE: 5/5/96  
 ANTI: TIG  
 DATE: 5/16/96  
 PAGE 4 OF 15

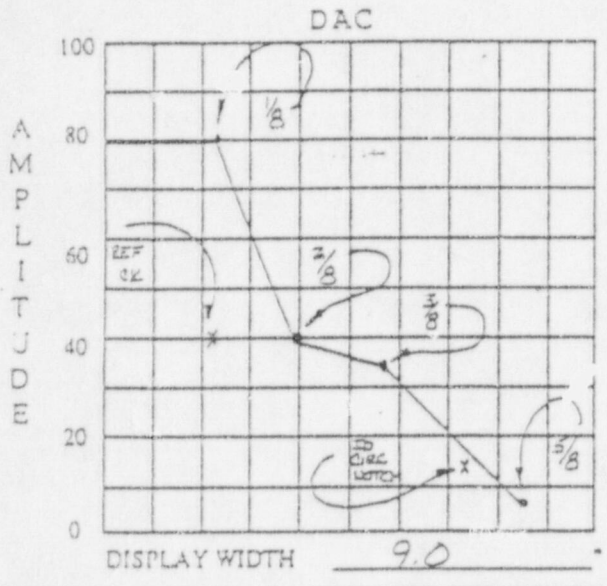
R-5673

TENNESSEE VALLEY AUTHORITY	USN-50 ULTRASONIC CALIBRATION DATA SHEET	CALIBRATION NO. <b>C-0712</b>
----------------------------	--	----------------------------------

PROJECT: <u>SONP</u> UNIT: <u>2</u>	CALIBRATION DATE: <u>05/07/96</u>
PROCEDURE: N-UT- <u>19</u> REV.: <u>9</u> TC: <u>N/A</u>	CALIBRATION BLOCK NO.: <u>AFN 79</u> TEMP.: <u>79</u> °F

INSTRUMENT: <u>CONULTRAFER</u>	SIMULATOR BLOCK NO.: <u>791719</u>
MODEL TYPE: <u>USN 50</u>	THERMOMETER SERIAL NO.: <u>552186 Cal Due 1-11-97</u>
SERIAL NUMBER: <u>E18502</u>	COUPLANT: <u>ULTRAGEL II</u> BATCH: <u>94125</u>
	EXAM TYPE: <input checked="" type="checkbox"/> SHEAR <input type="checkbox"/> LONG. <input type="checkbox"/> RL

TRANSDUCER MANUF.: <u>KB ACCOTECH</u>	ANGLE VERIFICATION
SERIAL NO.: <u>F25215</u>	
SIZE: <u>.5 x 1.00</u> FREQUENCY: <u>2.25</u> MHz	BLOCK TYPE: <u>IW Type 2</u> SERIAL NO. <u>789191</u>
CABLE TYPE: <u>58C/U</u> LENGTH: <u>204</u>	NOMINAL ANGLE: <u>60</u> ACTUAL ANGLE: <u>61</u>



INSTRUMENT SETTINGS		
REFLECTOR ORIENTATION	REFERENCE SENSITIVITY	DATA SET
AXIAL	N/A	N/A
CIRC	42.0	2
TOP (PEAK / FLANK): <u>PEAK</u> ANGLE: <u>61</u> DEG.		
DELAY: <u>7.383</u> us ZERO: <u>15.557</u> us		
MATL VELOCITY: <u>.1253</u> us RANGE: <u>9.0</u>		
REJECT: <u>0</u> % PULSER: <u>HIGH</u>		
DUAL: <input type="checkbox"/> ON <input checked="" type="checkbox"/> OFF		

INITIAL CALIBRATION	
INITIAL TIME: <u>0945</u>	FINAL TIME: <u>1109</u>

REF. REFLECTOR: SONP 50H GAIN: 42.0 dB  
 AMPLITUDE: 40 % METAL PATH: 1.571

VERIFICATION TIMES			
1) <u>1003</u>	2) <u>1020</u>	3) <u>1040</u>	4) <u>1109</u>
5) <u>N/A</u>	6) <u>N/A</u>	7) <u>N/A</u>	8) <u>N/A</u>

C L I E N C K	VERTICAL	SIGNAL 1	100	90	80	70	60	50	40	30	20	10
		SIGNAL 2	50	45	40	35	30	25	20	15	10	05
	ATTENUATOR	GAIN	SET	-6	-12	SET	+12	SET	+6			
		SIGNAL AMP.	80 %	32 to 48	16 to 24	20 %	64 to 96	40 %	64 to 96			
			40	20	80	80						

REFER TO CALIBRATION REPORT N/A FOR PREVIOUS SATISFACTORY LINEARITY

COMMENTS: 3/8, 5/8 dB DIFF FROM CLAD SIDE IS 4dB

WELD(S) EXAMINED: RCW-15 & RCW-21  
Circ Scan Only

EXAMINER: <u>M.A. OLIVARES</u> LEVEL: <u>I</u>	DATE: <u>5/10/96</u>	PAGE: <u>5</u> OF <u>15</u>
EXAMINER: <u>[Signature]</u> LEVEL: <u>I</u>	DATE: <u>5/8/96</u>	
REVIEWED BY: <u>[Signature]</u> LEVEL: <u>III</u>	DATE: <u>5/8/96</u>	

TENNESSEE VALLEY AUTHORITY

MANUAL ULTRASONIC  
VESSEL EXAMINATION  
DATA SHEET

REPORT NO.  
R-5673

EXAMINATION DATE: 04/30/96  
START TIME: 1628 / END TIME: 1731  
CAL. SHT. NO. 20709 ANGLE 0° SCAN SENSITIVITY 29.5 \* dB  
20710 ANGLE 45° SCAN SENSITIVITY 48.0 \* dB  
20711 ANGLE 60° SCAN SENSITIVITY 51.0 \* dB

W<sub>0</sub> REFERENCE: Q OF WELD  
L<sub>0</sub> REFERENCE: OUTSIDE RADII OF ELBOW BELOW  
SURFACE TEMP: 88 F  
PYRO. SERIAL NO. 552186 Cal Due 1-11-97

PROJECT: SONP UNIT: Z  
SYSTEM: O68 PZR  
WELD ID: RCW-21 TC: SHELL  
CONFIG: Nozzle TC: N/A  
PROCEDURE: N-UT-19 REV. 9 TC: N/A

IND NO	MAX SCAN NO	ANG	100% (1/2 MAX)			50%			20%			100% (1/2 MAX)									
			Mp1	W1	L1	Mp1	W1	L1	Mp1	W1	L1	Mp2	W2	L2							
	N/A	0°	NO	RECORDABLE	INDICATIONS																
	9	45°	NO	RECORDABLE	INDICATIONS																
	10	45°	NO	RECORDABLE	INDICATIONS																
	11	45°	NO	RECORDABLE	INDICATIONS																
	9	60°	NO	RECORDABLE	INDICATIONS												A				
RESULTS: (SCAN NUMBER)			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
INDICATION RECORDED (Y/N)											N	N	N								

REMARKS/LIMITATIONS: \* MAINTAINED CLAD ROLL @ 107° WHILE SCANNING. EXAMINATION LIMITED FROM SCAN 9 SIDE, WITH A. W. 215. DUE TO INSTRUMENTATION PENETRATIONS ON BOTTOM OF PZR.  
5/95  
5/96

EXAMINER: [Signature] LEVEL: II  
EXAMINER: [Signature] LEVEL: I  
REVIEWED BY: [Signature] LEVEL: [Blank]  
DATE: 5/19/96  
ANII: [Signature]  
PAGE 6 OF 15





TENNESSEE VALLEY AUTHORITY

BEAM SPREAD AND RESOLUTION DATA SHEET

REPORT NO.  
R-5673

PROJECT: SONP UNIT: 2

BEAM SPREAD DATE: 05/01/96

SEARCH UNIT

PROCEDURE: N-UT- 19 REV. 9 TO N/A

MANUFACTURER KS AEROTECH

CALIBRATION SHEET NO. C- 0710

SIZE: .50 x 1.00 FREQ.: 2.25 MHz

UT INSTRUMENT

S/N: E25215 NOM. ANGLE 45

MANUFACTURER: KRAUTKRAMER

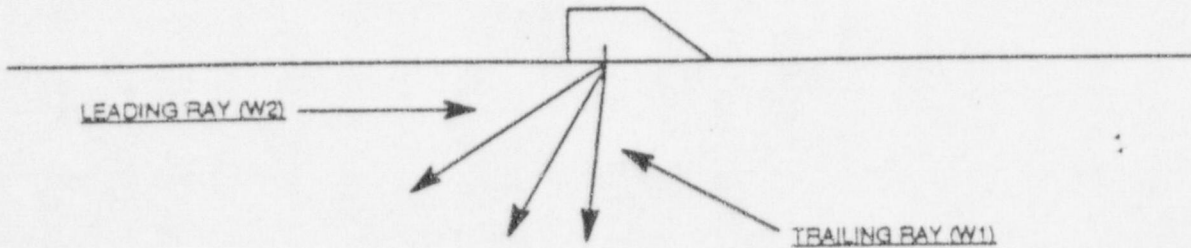
MEASURED ANGLE: 46° DEG.

MODEL NUMBER: USN-50

BEAM SPREAD: 11.0° DEG.

SERIAL NUMBER: E18502

HOLE POSITION	TRAILING RAY (W1)				W MAX		LEADING RAY (W2)			
	20% DAC		50% DAC		100% DAC		50% DAC		20% DAC	
	W	MP	W	MP	W	MP	W	MP	W	MP
1/4 T	0.55	0.869	0.7	0.980	0.85	1.072	1.0	1.184	1.09	1.234
1/2 T	1.35	1.945	1.45	2.013	1.60	2.106	1.87	2.315	2.04	2.405
3/4 T	2.08	2.956	2.18	3.041	2.58	3.307	2.88	3.506	3.05	3.652



R.G. 1.150 RESOLUTION VERIFICATION

NEAR SURFACE REFLECTOR: N/A DEPTH: N/A IN. SIZE: N/A

FAR SURFACE REFLECTOR: A DEPTH: A IN. SIZE: A

SCANNING (REFLECTORS PROVIDE 50% DAC SIGNALS AT SCANNING SPEED:  YES  NO

REMARKS: Cal Blx BNP-79

EXAMINER: [Signature] N. A. CUNARES LEVEL: II ANII: [Signature]  
 EXAMINER: [Signature] LEVEL: I DATE: 5/16/96  
 REVIEWED BY: [Signature] LEVEL: IA DATE: 5/8/96 PAGE 8 OF 15

TENNESSEE VALLEY AUTHORITY

BEAM SPREAD AND RESOLUTION DATA SHEET

REPORT NO. R-5673

PROJECT: SONP UNIT: Z

BEAM SPREAD DATE: 05/01/96

SEARCH UNIT

PROCEDURE: N-UT-19 REV. 9 TO N/A

MANUFACTURER KB AEROTECH

CALIBRATION SHEET NO. C-0711

SIZE: .5 x 1.0 FREQ.: 2.25 MHz

UT INSTRUMENT

S/N: E25215 NOM. ANGLE 60

MANUFACTURER: KRAUTERANER

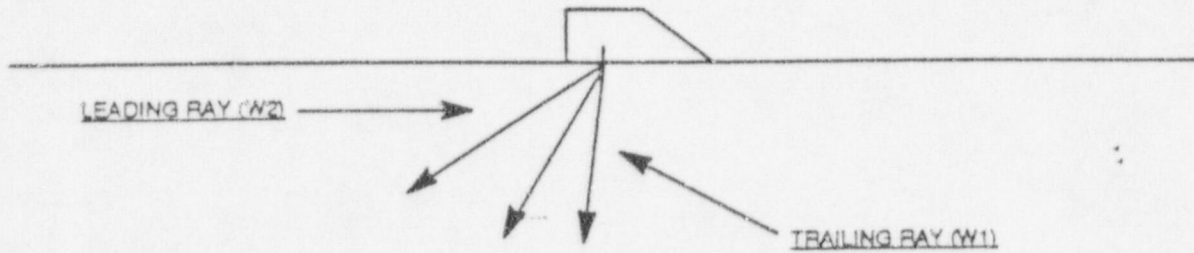
MEASURED ANGLE: 61 DEG.

MODEL NUMBER: USN 50

BEAM SPREAD: 12.5° DEG.

SERIAL NUMBER: E1850Z

HOLE POSITION	TRAILING RAY (W1)				W MAX		LEADING RAY (W2)			
	20% DAC		50% DAC		100% DAC		50% DAC		20% DAC	
	W	MP	W	MP	W	MP	W	MP	W	MP
1/4T	1.1	1.184	1.2	1.302	1.4	1.487	1.84	1.869	2.05	2.043
1/2T	2.24	2.568	2.4	2.697	2.84	3.071	3.58	3.734	4.0	4.109
3/4T	3.53	4.017	3.75	4.228	4.25	4.668	5.37	5.696	6.1	6.310



R.G. 1.150 RESOLUTION VERIFICATION

NEAR SURFACE REFLECTOR: N/A DEPTH: N/A IN. SIZE: N/A

FAR SURFACE REFLECTOR: N/A DEPTH: N/A IN. SIZE: N/A

SCANNING (REFLECTORS PROVIDE 50% DAC SIGNALS AT SCANNING SPEED:  YES  NO

REMARKS: Col Box BNP-79

EXAMINER: [Signature] M.A. OUYARES LEVEL: II  
 EXAMINER: [Signature] LEVEL: I  
 REVIEWED BY: [Signature] LEVEL: [Signature] DATE: 5/5/96

ANII [Signature]  
 DATE: 5/16/96  
 PAGE 9 OF 15

TVA

Office of Nuclear Power

PROJECT: 50MP

SYSTEM: 04B PZR

REPORT NO.:

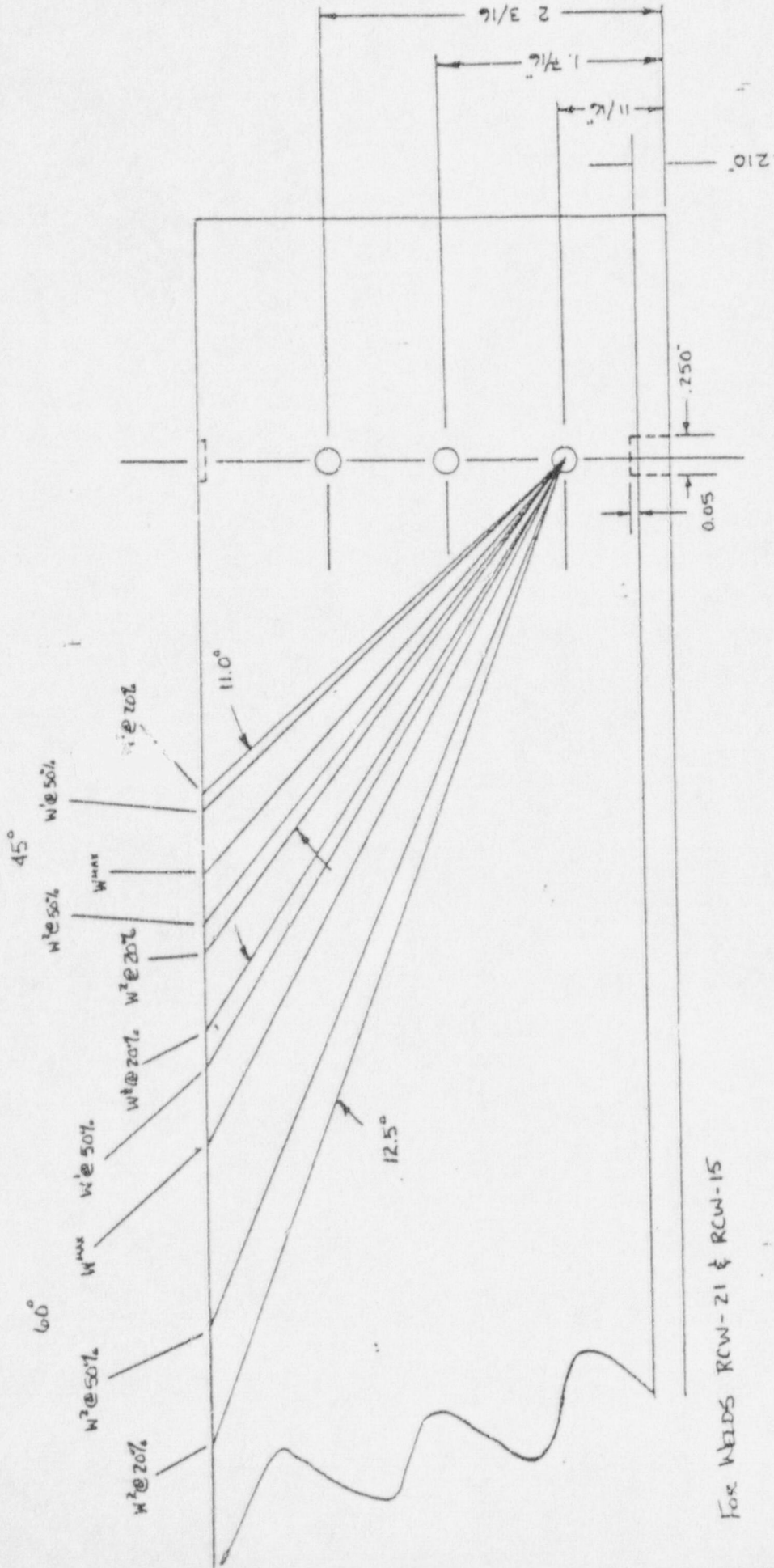
R 5673

Unit: Z

WELD NO.: RCW-21

60° BEAM SPREAD = 12.5°

45° BEAM SPREAD = 11.0°



DRAWN TO SCALE.

FOR WELDS RCW-21 & RCW-15

A.A. OLIVARES

BY: *[Signature]*

LEVEL: II

DATE: 05/03/96

PAGE 10

OF 15

TVA

WALL THICKNESS  
PROFILE SHEET

REPORT NO:

R5673

PROJECT: SONP

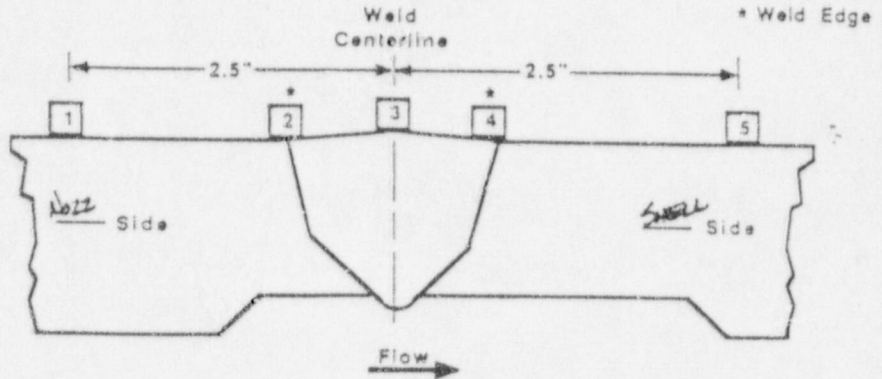
WELD NO: RCW-21

UNIT: Z

SYSTEM: OG8 PZR

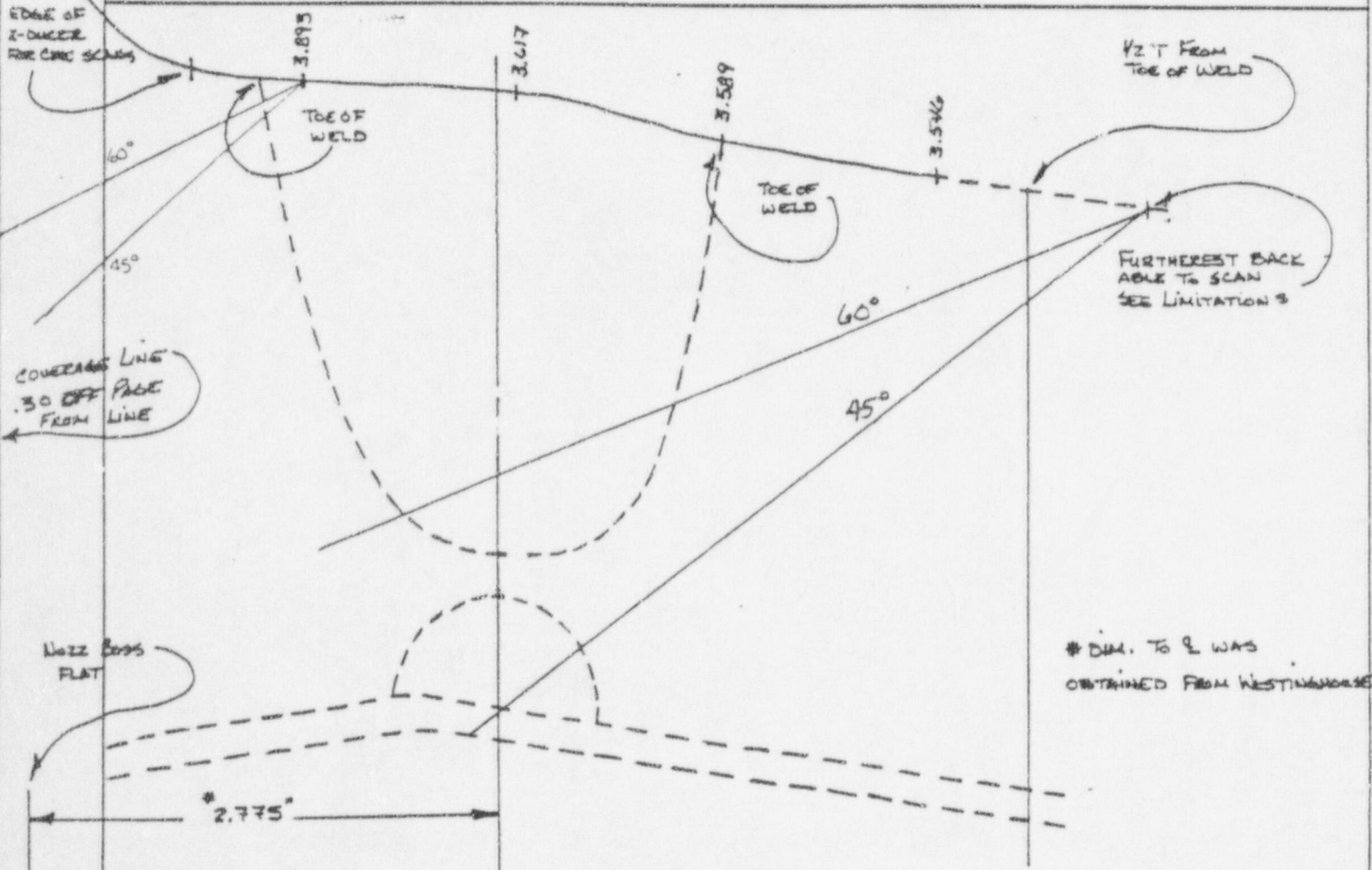
Record Thickness Measurements As Indicated, Including Weld Width, Edge-To-Edge At 0°

Position	0°	90°	180°	270°
1	NR	N		
2	3.895			
3	3.617			
4	3.589			
5	3.646			A



CROWN HEIGHT: FLUSH DIAMETER: N/A

CROWN WIDTH: 2.75" WELD LENGTH: 72.25"



EXAMINER: [Signature]  
LEVEL: II  
DATE: 05/08/96

REVIEWED BY: [Signature]  
LEVEL: II DATE: 5-9-96

ANII: [Signature]  
DATE: 5/16/96  
PAGE 11 OF 15

TVA

Office of Nuclear Power

PROJECT: SQN

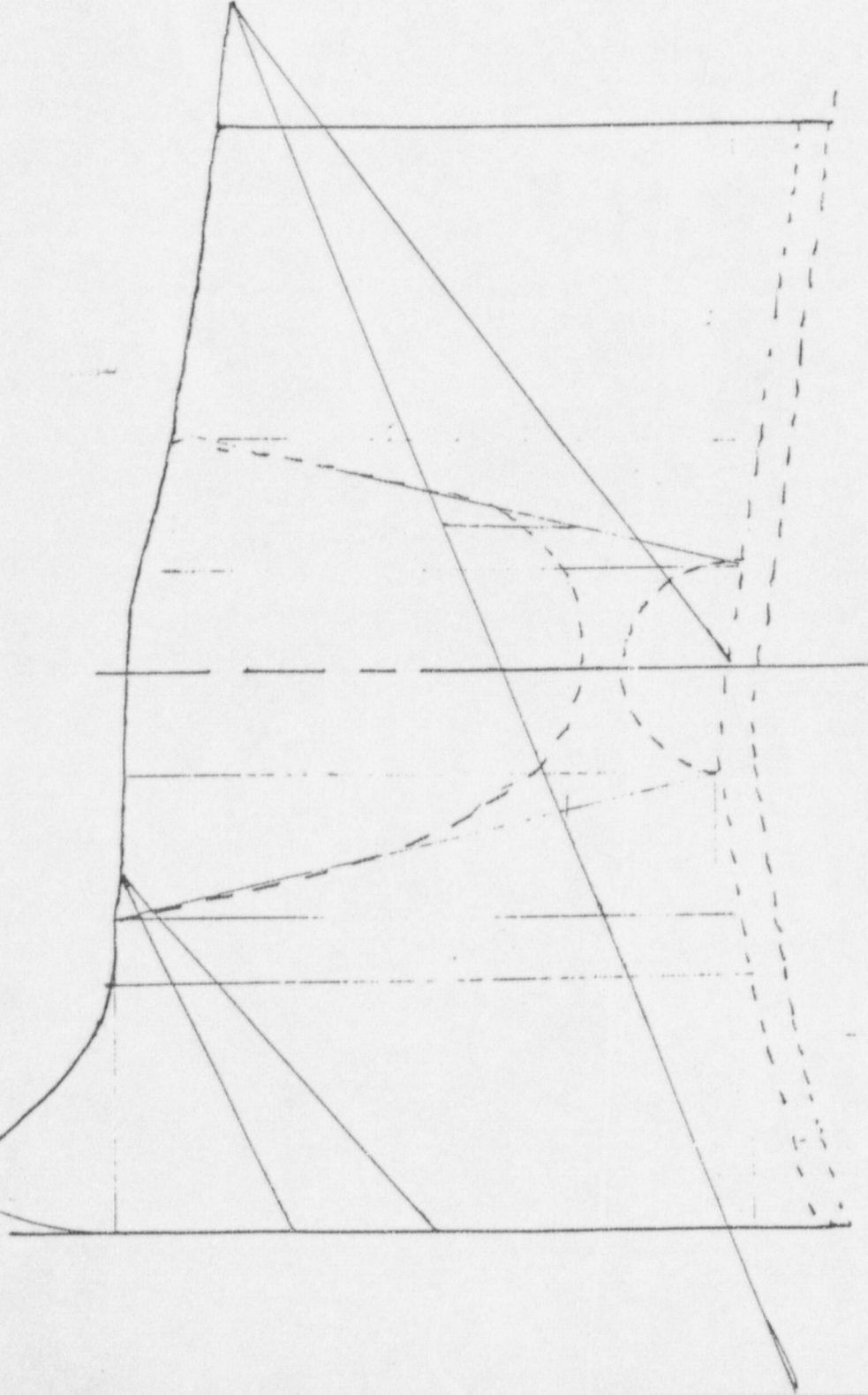
SYSTEM: Pressurizer

Unit: 2

WELD NO.: RCW-21

REPORT NO.:

R 5273



BY: *[Signature]*

LEVEL: *[Signature]*

DATE: 5/5/66

PAGE 12

OF 15

TVA

Office of Nuclear Power

PROJECT: SQW

SYSTEM: Pressurizer

REPORT NO.:

Unit: 2

WELD NO.: RCW-21

RS673

①

Vessel Side  
(Base Method)

$(3.1)(1.8) = 5.58$

$.5(1.8)(3) = 2.7$

$.5(3.1)(.65) = 1.0075$

$.5(2.5)(.4) = .5$

Total = 9.787

$(.5)(.6)(6) = -.18$

$\frac{9.607}{9.607} (9.787) (72.25) =$

Volume = 707.1

Volume = 707.1

707.1

Base Material =

① + ②

$707.1 + 585.94 =$

694.7

$707.1 + 585.94 = 1293.04$

① + ② + ③ = 1804.2

②

Nozzle Side  
(Base Method)

$(3.6)(1.8) = 5.4$

$.5(1.8)(4.5) = 4.05$

$.5(3.6)(8) = 1.44$

$(.5)(.8)(1) = .04$

$(.5)(1.5)(1.1) = .825$

Total = 8.11

Volume =  $(8.11)(72.25) =$

Volume = 585.94

③

Weld  
Material

$(3.5)(1.2) = 4.2$

$.5(3.5)(.8) = 1.4$

$.5(3.3)(.75) = 1.4$

$(.5)(.2)(.75) = .075$

Total 7.075

Volume =  $(7.075)(72.25) =$

Volume = 511.168

④

60°  
Limitation

$(.5)(4.5)(1.1) = .825$

$(.5)(1)(2) = 1$

$(.5)(2.55)(2.25) = 7.97$

$(.5)(2.6)(.5) = .65$

$(.5)(1.1)(5) = .775$

Total = 11.22

Volume =  $(11.22)(72.25) =$

Volume = 810.645

$(1.6)(.8)(.5) = .64$

$(.2)(.8)(.5) = -.08$

$(1.6)(.9) = 1.44$

2.6

$(2.6)(72.25) = 156.06$

810.645

-156.06

654.585

⑤

45°  
Limitation

$(.5)(6.5)(1.1) = .825$

$(.5)(1.9)(2) = 1.9$

$(.5)(2.35)(3.0)(2.825) =$

$(.5)(4)(2.5) = 1.5$

Total = 6.75

Volume =  $(6.75)(72.25) =$

Volume = 487.68

-13.05

474.63

BY: Ad A. [Signature] LEVEL: III

DATE: 5/9/66

PAGE 13

OF 15

TVA

Office of Nuclear Power

PROJECT: SQN

SYSTEM: Pressurizer

REPORT NO.:

Unit: 2

WELD NO.: RCW-21

R5673

① Determine % coverage 45T scan (Base Material)

$$\frac{474.63}{1293.04} = .367 \times 100 = 36.7\% \text{ Limitation}$$

$$100 - 36.7 = 63.3\% \text{ Coverage}$$

② Determine % coverage 60T scan (Base Material)

$$\frac{654.585}{1293.04} = 50.6 \times 100 = 50.6\% \text{ Limitation}$$

$$\text{Coverage} = 100 - 50.6 = 49.4\%$$

③ Determine % coverage weld scan into nozzle

$$\frac{156}{511.168} = 30.5\%$$

$$\text{Coverage} = 100 - 30.5 = 69.5\%$$

④ Determine 45% coverage weld scan into nozzle

$$\frac{13.5}{511.168} = 2.64\%$$

$$\text{Coverage} = 100 - 2.64 = 97.36\%$$

BY: *[Signature]*

LEVEL: *[Signature]*

DATE: 5/9/56

PAGE: 14

OF: 15

TVA

Office of Nuclear Power

PROJECT: SQW

SYSTEM: Pressurizer

REPORT NO.:

Unit: 2

WELD NO.:

RCW-21

R 5673

45' BM = 63.3%

60' BM = 49.4%

45' weld sec 3 = 97.36%

45' weld sec 4 = 0

60' weld sec 3 = 69.5%

60' weld sec 4 = 0

45' C<sub>ew</sub> = 75.05

45' C<sub>ew</sub> = 75.05

60' C<sub>ew</sub> = 75.05

60' C<sub>ew</sub> = 75.05

0' C<sub>ew</sub> = 75.05

654.81

Limitation for 45/60/0  
CIVE CIVE

$$\begin{aligned} (3.7)(1.4) &= 5.18 \\ (.5)(1.4)(4) &= .28 \\ (.5)(1.4)(1.1) &= .77 \\ &= \frac{.77}{6.23} \end{aligned}$$

$$VOL = (6.23)(2.25) = 450.11$$

VOL limitation = 450.11 W3

$$Coverage = \frac{450.11}{100 - 1804.2} =$$

Coverage = 75.05%

$$Total Coverage = \frac{654.81}{11} = 59.52\%$$

BY: *[Signature]*

LEVEL: III

DATE: 5/4/61

PAGE 15

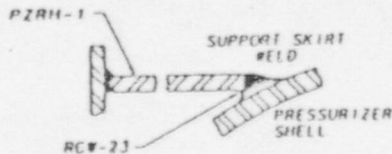
OF 15



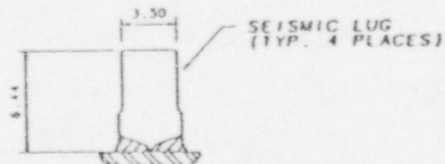
ATTACHMENT 2

ISI PROGRAM DRAWING

ISI-0396-C-01, REVISION 4



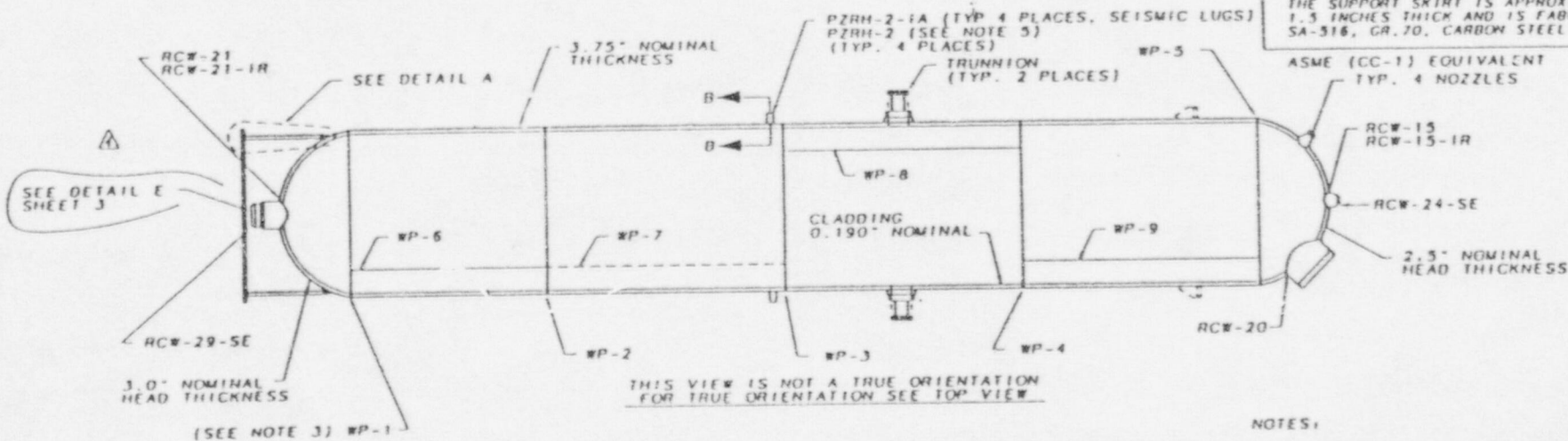
DETAIL A



SECTION B-B

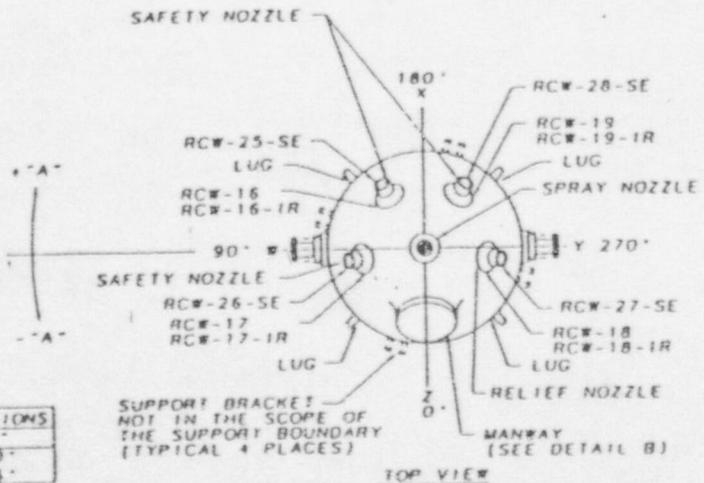
REFERENCE DRAWINGS  
 CONTRACT NO. 68C60-91934 (N2W-2-6)  
 PRESSURIZER MANUAL (FIGS. 3-1, 3-7)

MATERIAL SPECIFICATIONS  
 ALL VESSEL SHELL AND HEAD SECTIONS ARE FABRICATED OF SA-533, CLASS 2, MANGANESE-MOLYBDENUM STEEL AND ARE CLAD WITH AUSTENITIC STAINLESS STEEL.  
 THE NOZZLES ARE FABRICATED OF SA-508, CLASS 2, MANGANESE-MOLYBDENUM STEEL.  
 SAFE END CONNECTIONS ARE SA-182, GR. F-318L FORGINGS  
 THE SUPPORT SKIRT IS APPROXIMATELY 1.5 INCHES THICK AND IS FABRICATED OF SA-516, GR. 70, CARBON STEEL PLATE.

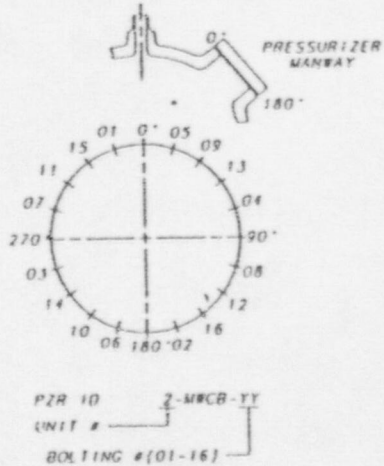


ASME (CC-1) EQUIVALENT  
 TYP. 4 NOZZLES

- NOTES:
1. THIS DWG SUPERCEDES 151-0308-A, 151-0323-A, AND 151-0299-B.
  2. FOR UNIT 1 DWG SEE 151-0394-C.
  3. 0' IS 1/4 OF MANWAY AND MEASURED CLOCKWISE IN THE TOP VIEW.
  4. VESSEL INSIDE SURFACE CLAD - 0.190" NOMINAL.
  5. SUPPORT CLASSIFIED AS RIGID SUPPORT AT THIS LOCATION SEE DRAWING 48N428 FOR CONFIGURATION.



TOP VIEW



DETAIL B

AS BUILT DIMENSIONS	
WELD NO.	"A"
WP-8	-60"
WP-9	-45"

SUPPORT BRACKETS NOT IN THE SCOPE OF THE SUPPORT BOUNDARY (TYPICAL 4 PLACES)

4	RPC	015	1200	0215	8/11/91
CHANGE SURGE NOZZLE DETAIL REFERENCE PER FCD1 88-14					
3	RPC				
ADD MANWAY DETAIL PER FCD1 88-11, REMOVE NOTE					
2	RPC	JCC	FRS	CLB	2-2-88
ADD 1/4 IDENTIFIER & REMOVE MULTIPLE LUG ID'S PER FCD1 88-01					
1	RPC	JCC	FRS	CLB	12-18-85
ADD SUPPORT IDENTIFIERS, ADD NOTE # 2, ADD THICKNESSES, ADD WFT1 SPEC, REMOVE WELD IDENTIFIERS IN SECTIONS					
REV	BY	CHECKED	SUBMITTED	APPROVED	DATE
TENNESSEE VALLEY AUTHORITY					
SEQUOYAH NUCLEAR PLANT					
UNIT 2					
PRESSURIZER					
DRAWN:	RPC	DATE:	12-8-81	SCALE:	NOT TO SCALE
CHECKED:	PHB	APPROVED:	CLB	CLAD MAINTAINING DRAWING	REV
SUBMITTED:	JCC	151-0396-C-01		104	

## Request For Relief 2-ISI-10

### Executive Summary:

This request for relief addresses circumferential pressure retaining welds in the reactor coolant system. The design configuration and materials used in the fabrication of the subject piping welds precludes a 100% ultrasonic examination of the required volume for the following welds: RC-06 (pipe elbow to pump casing) and RC-07 (pump casing to pipe). These physical examination limitations occur when the 1989 code examination requirements are applied in areas of components constructed and fabricated to early plant physical designs. Based on the date of SQN's construction permit (May 27, 1970), SQN is exempt from code requirements for examination access as allowed in 10 CFR 50.55a(g)(4).

A liquid penetrant surface examination was performed on 100% of the subject welds. An ultrasonic examination was performed on accessible areas to the maximum extent practical, given the physical limitations and materials of the subject welds. The design configuration and materials used limits ultrasonic examination to approximately 50% of Weld RC-06 and approximately 50% of Weld RC-07. Performance of an ultrasonic examination of essentially 100% of the circumferential pressure retaining welds, RC-06 and RC-07, would be impractical. A surface examination, and the maximum extent practical ultrasonic examination of the subject welds, provide reasonable assurance of an acceptable level of quality and safety because the information and data obtained from the volume examined provides sufficient information to judge the overall integrity of the welds.

Therefore, pursuant to 10 CFR 50.55a(g)(5)(iii), it is requested that relief be granted for the second inspection interval.

Unit: 2

System: Reactor Coolant - System 68

Components: Two Piping Circumferential Pressure Retaining Welds

ASME Code Class: ASME Code Class 1 (Equivalent)

Section XI Edition: 1989 Edition

Code Table: IWB-2500-1

Examination Category: B-J, Pressure Retaining Welds In Piping

Examination Item Number: B9.11, Circumferential Welds Nominal Pipe

Code Requirement: ASME Section XI, Table IWB-2500-1, Examination Category B-J, Item No. B9.11 Surface And Volumetric Examinations

Code Requirement From Which Relief Is Requested: Volumetric Examination Coverage

List Of Items Associated With The Relief Request: RC-06, Piping To Reactor Coolant Pump Circumferential Weld  
RC-07, Piping To Reactor Coolant Pump Circumferential Weld

Basis for Relief: The design configuration and materials used in the fabrication of the reactor coolant pump and the reactor coolant piping preclude an ultrasonic examination of the required volume of pressure retaining circumferential Welds RC-06 and RC-07. The design configuration and materials limit ultrasonic examination to approximately 50% of weld RC-06 and approximately 50% of weld RC-07.

Alternative Examinations: In lieu of the code required 100% ultrasonic examination, an ultrasonic examination was performed on accessible areas to the maximum extent practical, given the physical limitations of the subject welds. A surface examination (PT) of 100% of Welds RC-06 and RC-07 was also performed. Refer to Attachment 1 for the Examination Data Reports.

Justification For The  
Granting Of Relief:

- (1) The design configuration and materials used in the fabrication of the subject piping welds preclude ultrasonic examination of essentially 100% of the required examination volume. In order to examine the welds in accordance with the code requirement, the reactor coolant pump would require extensive redesign along with changing the pump and piping material.

The weld joint detail for Weld RC-06 consists of a pipe elbow welded to a pump casing. The pipe elbow is static cast CF8M material welded to a static cast CF8M material pump casing. The weld joint detail for Weld RC-07 consists of a pump casing to pipe configuration. The pump is static cast CF8M material welded to centrifugal cast CF8M material piping. The examination is limited due to the design configuration and the effects of the anisotropic coarse grain structure of cast stainless material and the weld joint configuration, which limits search unit contact and movement.

Total ultrasonic examination coverage for RC-06 and RC-07 was approximately 50% of the required code coverage for each weld. Due to the anisotropic coarse grain structure of cast stainless CF8M materials, the examination was limited to the 1/2 vee technique using refracted longitudinal waves. Both welds received 100% coverage from one side scanning in the axial direction with the sound beam directed toward the pump. No scans were performed from the pump side in the axial direction due to the pump taper interference; therefore, 0% coverage was obtained from this direction. It is reasonable to assume that circumferential flaws would be detected to the degree comparable with industry standards. Circumferential scans were limited to 50% each, due to the loss of search unit contact associated with the pump taper on the pump side.

- (2) Radiographic examination, as an alternate volumetric examination method, was determined to be impractical due the material thickness (approximately 3 inches) and the pipe being filled with water. Realignment of the system to drain all of the water would substantially increase radiation levels.
- (3) Westinghouse plants have no history of pipe cracking failure in the reactor coolant primary loop. For stress corrosion cracking (SCC) to occur, the following three conditions must exist simultaneously: high tensile stresses, a susceptible material, and a corrosive environment. The potential for SCC is minimized in Westinghouse PWR's by material selection and prevention of a corrosive environment (reference Westinghouse RCS Piping Flawbase Handbook, WCAP-13670).
- (4) A percentage sampling approach provided by the ASME Section XI Code, in combination with examinations performed on similar items, provides reasonable assurance that significant degradation, if present, would have been detected.

Performance of an ultrasonic volumetric examination of essentially 100% of the required volume of pressure retaining circumferential Welds RC-06 and RC-07 in the reactor coolant main loop piping would be impractical. In addition, it would be impractical to perform other volumetric examinations, which may increase examination coverage. The surface examination of 100% of the weld area, adjacent metal, and maximum extent practical ultrasonic examination of the subject welds, provide reasonable assurance of an acceptable level of quality and safety. Significant degradation, if present, would have been detected during the ultrasonic examination and

the surface examination that was performed on the subject welds. As a result, assurance of structural integrity for these welds is provided by the alternative examinations that were performed.

Therefore, pursuant to 10 CFR 50.55a(g)(5)(iii), it is requested that relief be granted for the second inspection interval.

Implementation  
Schedule:

This request for relief is applicable to the second inspection interval for SQN Unit 2. Welds RC-06 and RC-07 were examined during the first period of the second 10-year inspection interval.

References:

Attachment 1 - Examination Data Reports: R-5560, R-5566, R-5590, and R-5591.

Attachment 2 - ISI Program Drawings: ISI-0008-C-01, Revision 6 and ISI-0307-C-01, Revision 8.

ATTACHMENT 1

EXAMINATION DATA REPORTS

R-5560

R-5566

R-5590

R-5591



<b>TENNESSEE VALLEY AUTHORITY</b>	<b>RECORD OF LIQUID PENETRANT EXAMINATION</b>	<b>REPORT NO. R- 5560</b>
-----------------------------------	---	-------------------------------

PROJECT: <u>SON</u> UNIT: <u>2</u> SYSTEM: <u>068</u> WELD / COMPONENT I.D.: <u>RC-06</u> CONFIG: <u>ELBOW</u> TO <u>Pump</u> PROCEDURE: N-PT. <u>9</u> REV.: <u>12</u> TC: <u>96-05</u> ASME SECTION I <input type="checkbox"/> ASME SECTION XI <input checked="" type="checkbox"/> ASME SECTION III <input type="checkbox"/> ANSI B31.1 <input type="checkbox"/> ASME SECTION VIII <input type="checkbox"/> ANSI B31.7 <input type="checkbox"/> AWS D1.1 <input type="checkbox"/> OTHER <u>N/A</u> <input type="checkbox"/>	EXAMINATION DATE: <u>4/27/96</u> START TIME: <u>0900</u> END TIME: <u>1000</u> EXAM SURFACE: ID <input type="checkbox"/> OD <input checked="" type="checkbox"/> ORIGINAL EXAMINATION <input checked="" type="checkbox"/> REEXAMINATION <input type="checkbox"/> REFERENCE DRAWING NO. <u>ISI-0008-C-01R6</u> CODE CLASS / CATEGORY <u>1 / BJ</u>
ACCEPTANCE CRITERIA	
N-PT-9 APPENDIX A <input type="checkbox"/> APPENDIX B <input checked="" type="checkbox"/> OTHER <u>N/A</u>	

**METHOD OF EXAMINATION**

<p style="text-align: center;"><b>METHOD</b></p> <input type="checkbox"/> WATER-WASHABLE FLUORESCENT DYE <input type="checkbox"/> POST-EMULSIFIABLE FLUORESCENT DYE <input type="checkbox"/> SOLVENT-REMOVABLE FLUORESCENT DYE <input type="checkbox"/> WATER-WASHABLE VISIBLE DYE <input type="checkbox"/> POST-EMULSIFIABLE VISIBLE DYE <input checked="" type="checkbox"/> SOLVENT REMOVEABLE VISIBLE DYE	<p style="text-align: center;"><b>PENETRANT MATERIALS</b></p> BRAND NAME: <u>Magnaflux</u> PENETRANT TYPE: <u>SKL-HF</u> BATCH NO. <u>93A02K</u> REMOVER TYPE: <u>SKC-5</u> BATCH NO. <u>96A03K</u> DEVELOPER TYPE: <u>SKD-HF</u> BATCH NO. <u>89K13S</u> BLACK LIGHT METER S/N: <u>N/A</u> CAL. DUE DATE: <u>N/A</u>
---	---

PART TEMPERATURE: 74 °F PYROMETER S/N: 522343 CAL. DATE DUE: 10-4-96  
J10427/96

RESULTS OF EXAMINATION: SATISFACTORY  UNSATISFACTORY  NOI NO.: N/A

EXPLANATION OF UNSATISFACTORY RESULTS: None

REMARKS / LIMITATIONS: None

EXAMINER: <u>James R. Bister</u>	LEVEL: <u>II</u>	ANTI <u>TCM</u>
EXAMINER: <u>Rob Greener</u>	LEVEL: <u>II</u>	DATE: <u>4/29/96</u>
REVIEWED BY: <u>W. Bentley</u>	LEVEL: <u>III</u>	DATE: <u>4-29-96</u>
		PAGE <u>1</u> OF <u>1</u>

TENNESSEE VALLEY AUTHORITY

RECORD OF LIQUID PENETRANT EXAMINATION

REPORT NO. R-5566

PROJECT: SQN UNIT: 2
SYSTEM: REACTOR COOLANT
WELD/COMPONENT I.D.: RC-07
CONFIG: Pump TO PIPE
PROCEDURE: N-PT-9 REV.: 12 TC: 96-05106
ASME SECTION I ASME SECTION XI
ASME SECTION III ANSI B31.1
ASME SECTION VIII ANSI B31.7
AWS D1.1 OTHER N/A

EXAMINATION DATE: 4-27-96
START TIME: 0426 END TIME: 0545
EXAM SURFACE: ID OD
ORIGINAL EXAMINATION REEXAMINATION
REFERENCE DRAWING NO. ISI-0008-C-01
CODE CLASS/CATEGORY BJ-1

ACCEPTANCE CRITERIA
N-PT-9 APPENDIX A APPENDIX B
OTHER N/A

METHOD OF EXAMINATION

METHOD

- Water-washable fluorescent dye
Post-emulsifiable fluorescent dye
Solvent-removable fluorescent dye
Water-washable visible dye
Post-emulsifiable visible dye
Solvent removeable visible dye

PENETRANT MATERIALS

BRAND NAME: MAGNAFLUX
PENETRANT TYPE: SKL-SP BATCH NO. 93A02K
REMOVER TYPE: SKC-S BATCH NO. 96A03K
DEVELOPER TYPE: SKD-NE BATCH NO. 89K13S

BLACK LIGHT METER S/N: N/A CAL. DUE DATE: N/A

PART TEMPERATURE: 82 F PYROMETER S/N: 571996 CAL. DATE DUE: 11-1-96

RESULTS OF EXAMINATION: SATISFACTORY UNSATISFACTORY NOI NO: N/A

EXPLANATION OF UNSATISFACTORY RESULTS: N

REMARKS / LIMITATIONS: N

EXAMINER: Michael E. Sexton LEVEL: II
EXAMINER: [Signature] LEVEL: II
REVIEWED BY: [Signature] LEVEL: III DATE: 4/27/96

ANTI RA
DATE: 4/29/96
PAGE 1 OF 1

TENNESSEE VALLEY AUTHORITY

EXAMINATION SUMMARY AND RESOLUTION SHEET

REPORT NO.

R- 5590

PROJECT: SQNP UNIT: 2  
SYSTEM: RCS 068  
WELD I.D.: RC-07  
CONFIG: PUMP TO: PIPE

EXAMINER: JOHN G. ABBOTT LV: II  
EXAMINER: CAREY LASOYA LV: II  
EXAMINER: N/A LV: N/A  
EXAMINER: N/A LV: N/A

PROCEDURE: N-UT-33 REV.: 7 TO: 96-08  
NDE METHOD:  UT  PT  MT  VT

CAL SHT NO'S: C0603, C0604



THIS REPORT CONTAINS THE DATA ASSOCIATED WITH THE MANUAL ULTRASONIC EXAMINATION OF WELD # RC-07. THIS EXAMINATION WAS PERFORMED IN ACCORDANCE WITH ASME SEC. XI. DUE TO THE ATTENUATIVE NATURE OF CENTRIFUGALLY CAST STAINLESS STEEL, SHEAR WAVE TECHNIQUES COULD NOT BE USED. ALL EXAMINATIONS WERE PERFORMED WITH A 45° REFRACTED LONGITUDINAL WAVE TECHNIQUE.

SCAN # 3 - NOT PERFORMED DUE TO CONFIGURATION  
SCAN # 4 5 & 6 - NRI

APPROXIMATELY 50% OF THE EXAMINATION REQUIRED VOLUME WAS OBTAINED.  
SCAN # 3 - 25%  
SCAN # 5 & 6 - 25%  
TOTAL ACHIEVED - 50%

EVALUATOR: [Signature] LEVEL: II DATE: 4-27-96  
CONCURRENCE: [Signature] LEVEL: III DATE: 4-30-96  
ANII: [Signature]  
DATE: 5/3/96  
PAGE 1 OF 5A

R-5590

TENNESSEE VALLEY AUTHORITY

USN-50 ULTRASONIC CALIBRATION DATA SHEET

CALIBRATION NO.

C-0603

PROJECT: SQNP UNIT: 2

CALIBRATION DATE: 4-27-96

PROCEDURE: N-UT-33 REV.: 7 TC: 96-08

CALIBRATION BLOCK NO.: 50-63 TEMP: 77.2 F

INSTRUMENT: KB

SIMULATOR BLOCK NO.: 93-5723

MODEL TYPE: USN-50

THERMOMETER SERIAL NO.: 552193 DUE 11-13-96

SERIAL NUMBER: E24257

COUPLANT: ULTRAGEL II BATCH: 093081

TRANSDUCER MANUF.: KBA

EXAM TYPE:  N/A SHEAR  N/A LONG  RL

SERIAL NO.: H11818 / H11817

ANGLE VERIFICATION

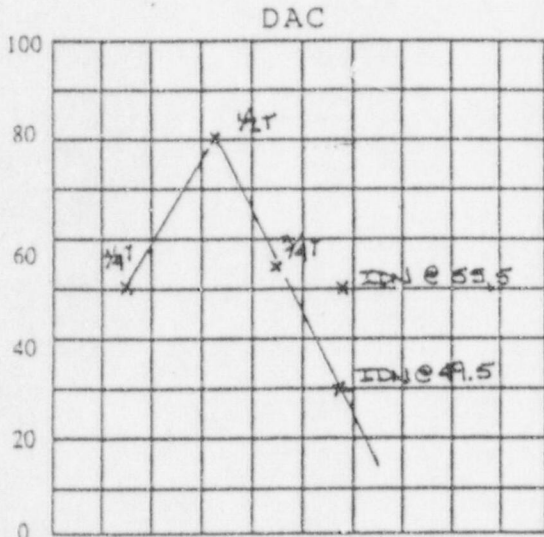
SIZE: 1.0" FREQUENCY: 1.0 MHz

BLOCK TYPE: ROMPAS SERIAL NO. 93-5723

CABLE TYPE: RG-58 LENGTH: 120"

NOMINAL ANGLE: 45 ACTUAL ANGLE: 45

INSTRUMENT SETTINGS



DISPLAY WIDTH 5.0

REFLECTOR ORIENTATION	REFERENCE SENSITIVITY	DATA SET
AXIAL	N/A	N/A
CIRC	55.5	30

TOF (PEAK / FLANK): PEAK ANGLE: 45 DEG.

DELAY: 13.09 uS ZERO: 13.08 uS

MATL VELOCITY: .2187 uS RANGE: 5.0

REJECT: 0% PULSER: DUAL

DUAL:  ON  OFF

INITIAL CALIBRATION

INITIAL TIME: 1208 FINAL TIME: 1430

REF. REFLECTOR: ROMPAS GAIN: 55.5 dB

AMPLITUDE: 70% METAL PATH: 1.09(1)

VERIFICATION TIMES

1) 1245	2) N/A	3) N/A	4) N/A
5) N/A	6) N/A	7) N/A	8) N/A

VERTICAL ATTENUATOR

VERTICAL

SIGNAL 1	100	90	80	70	60	50	40	30	20	10
SIGNAL 2	50	45	40	35	30	25	20	15	10	5

ATTENUATOR

GAIN	SET	-6	-12	SET	+12	SET	+6
SIGNAL AMP.	80%	32 to 48	16 to 24	20%	64 to 96	40%	64 to 96
		40	20		80		80

REFER TO CALIBRATION REPORT N/A FOR PREVIOUS SATISFACTORY LINEARITY

COMMENTS: CAL. FOR AXIAL SCAN

CONTOURED SHOE

WELD(S) EXAMINED:

RC-07

AMINER: [Signature] LEVEL: II

EXAMINER: [Signature] LEVEL: II

REVIEWED BY: [Signature] LEVEL: III

DATE: 4-30-96

ANTI: TIG

DATE: 5/2/96

PAGE 2 OF 5A

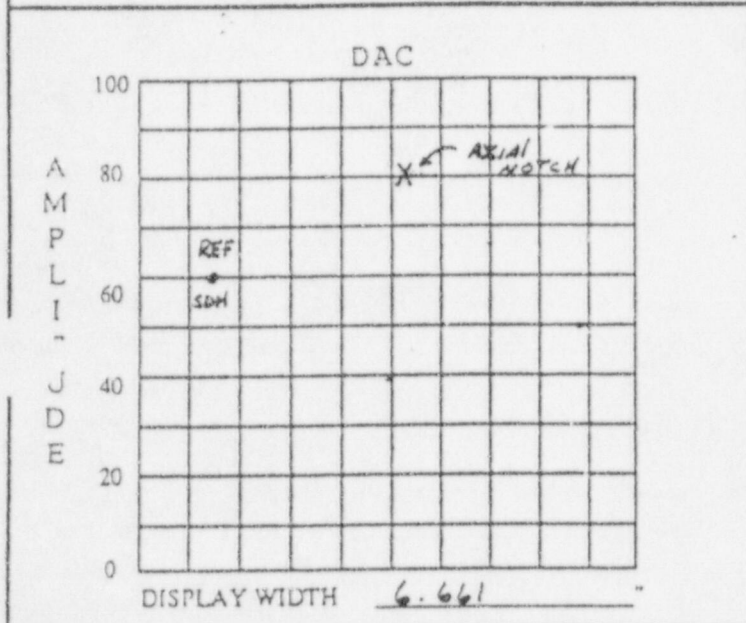
R-5590

TENNESSEE VALLEY AUTHORITY USN-50 ULTRASONIC CALIBRATION DATA SHEET CALIBRATION NO. C-0604

PROJECT: SQNP UNIT: 2  
 PROCEDURE: N-UT-33 REV.: 7 TC: 96-08  
 INSTRUMENT: KB  
 MODEL TYPE: USN 50  
 SERIAL NUMBER: E18500  
 TRANSDUCER MANUF.: KBA  
 SERIAL NO.: DUAL H11819 / H11820  
 SIZE: (2) 1.0" FREQUENCY: 1.0 MHz  
 CABLE TYPE: BNC-BNC LENGTH: 72"

CALIBRATION DATE: 4-27-96  
 CALIBRATION BLOCK NO.: SQ63 TEMP.: 77.2°F  
 SIMULATOR BLOCK NO.: 93-5726  
 THERMOMETER SERIAL NO.: 573201 DUE 11-13-96  
 COUPLANT: ULTRAGEL BATCH: 093081  
 EXAM TYPE:  SHEAR  LONG  RL

ANGLE VERIFICATION  
 BLOCK TYPE: RomPas SERIAL NO. 93-5726  
 NOMINAL ANGLE: 45 ACTUAL ANGLE: 45



INSTRUMENT SETTINGS

REFLECTOR ORIENTATION	REFERENCE SENSITIVITY	DATA SET
AXIAL	62	10
CIRC	N/A	N/A

TOF (PEAK / FLANK): FLANK ANGLE: 45 DEG.  
 DELAY: 16.83 μs ZERO: 16.875 μs  
 MATL VELOCITY: .2474 μs RANGE: 6.661  
 REJECT: 0% PULSER: DUAL  
 DUAL:  ON  OFF

INITIAL CALIBRATION  
 INITIAL TIME: 12:10 FINAL TIME: 14:25

REF. REFLECTOR: RomPas SDH GAIN: 64 dB  
 AMPLITUDE: 60% METAL PATH: .993

VERIFICATION TIMES

1) 13:00	2) 13:25	3)	4)
5)	6)	7)	8)

VERTICAL ATTENUATOR	SIGNAL 1	100	90	80	70	60	50	40	30	20	10
	SIGNAL 2	50	46	40	36	30	26	20	14	10	4
GAIN	SET	-6			-12	SET	+12	SET	+6		
SIGNAL AMP.	80%	32 to 48			16 to 24	20%	64 to 96	40%	64 to 96		
		40			20		80				80

REFER TO CALIBRATION REPORT N/A FOR PREVIOUS SATISFACTORY LINEARITY

COMMENTS: CIRCUMFERENTIAL SCAN  
 CALIBRATION. CONTOURED SHOE

WELD(S) EXAMINED: RC-07  
 N  
 A

AMINER: Casey La Rosa LEVEL: II  
 EXAMINER: John D. Allen LEVEL: III  
 REVIEWED BY: M. W. [Signature] LEVEL: III DATE: 4-30-96  
 ANI: TR DATE: 5/2/96  
 PAGE 3 OF 5A

TENNESSEE VALLEY AUTHORITY

MANUAL ULTRASONIC  
PIPING EXAMINATION  
DATA SHEET

REPORT NO.

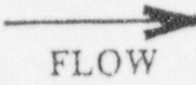
R- 5590

PROJECT: SQNP UNIT: 2

SYSTEM: 068

WELD I.D.: RC-07

CONFIG.: PUMP TO PIPE



PROCEDURE: N-UT- 33 REV.: 7 TC: 96-08

W<sub>0</sub> REFERENCE: WELD 6

L<sub>0</sub> REFERENCE: TDC

EXAMINATION DATE: 4-27-96

START TIME: 1245 END TIME: 1320

EXAM SURFACE:  ID  OD

MATERIAL TYPE:  CS  SS  CSCL  CCSS

SURFACE TEMP: 74.6 °F PYRO NO.: 552193

DUE 11-13-96

CALIBRATION SHEET NO.	C-0603	C-0604
EXAMINATION ANGLE	45 <sub>RL</sub> DEG.	<del>45<sub>RL</sub> DEG.</del>
CIRC. SCAN SENSITIVITY	<del>68.0</del> dB	<del>68</del> dB
AXIAL SCAN SENSITIVITY	61.5 dB	N/A dB

IND NO.	L (in) FROM REF.			AT MAX AMP			MAX AMP % DAC	EXAM NO. 3-14	NOM. ANG.	NRI	INDICATION INFORMATION: TYPE, DAMPING, ETC.
	L1	L Max	L2	W MAX	MP MAX	D MAX					
								4	45 <sub>RL</sub>	✓	NRI
								5	45 <sub>RL</sub>	✓	NRI
								6	45 <sub>RL</sub>	✓	NRI
N/A											

REMARKS/LIMITATIONS: No SCAN 3 DUE TO CONFIG.

EXAMINER: John M. O'Brien LEVEL: II ANII: TO

EXAMINER: Casey M. Lopez LEVEL: II DATE: 5/2/96

REVIEWED BY: 2/W LEVEL: III DATE: 4-30-96 PAGE 4 OF 5A

TVA

WALL THICKNESS  
PROFILE SHEET

REPORT NO:

R-5590

PROJECT: SQNP

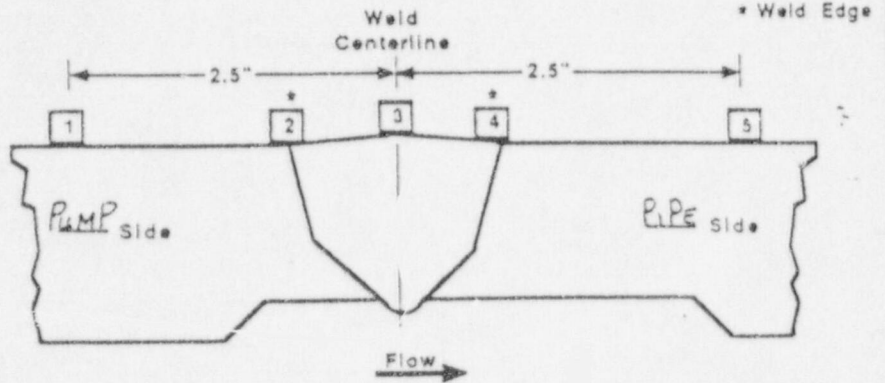
WELD NO: RC-07

UNIT: 2

SYSTEM: 068

Record Thickness Measurements As Indicated, Including Weld Width, Edge-To-Edge At 0°

Position	0°	90°	180°	270°
1	N			
2	A	N		
3	2.275			
4			A	
5	2.730			

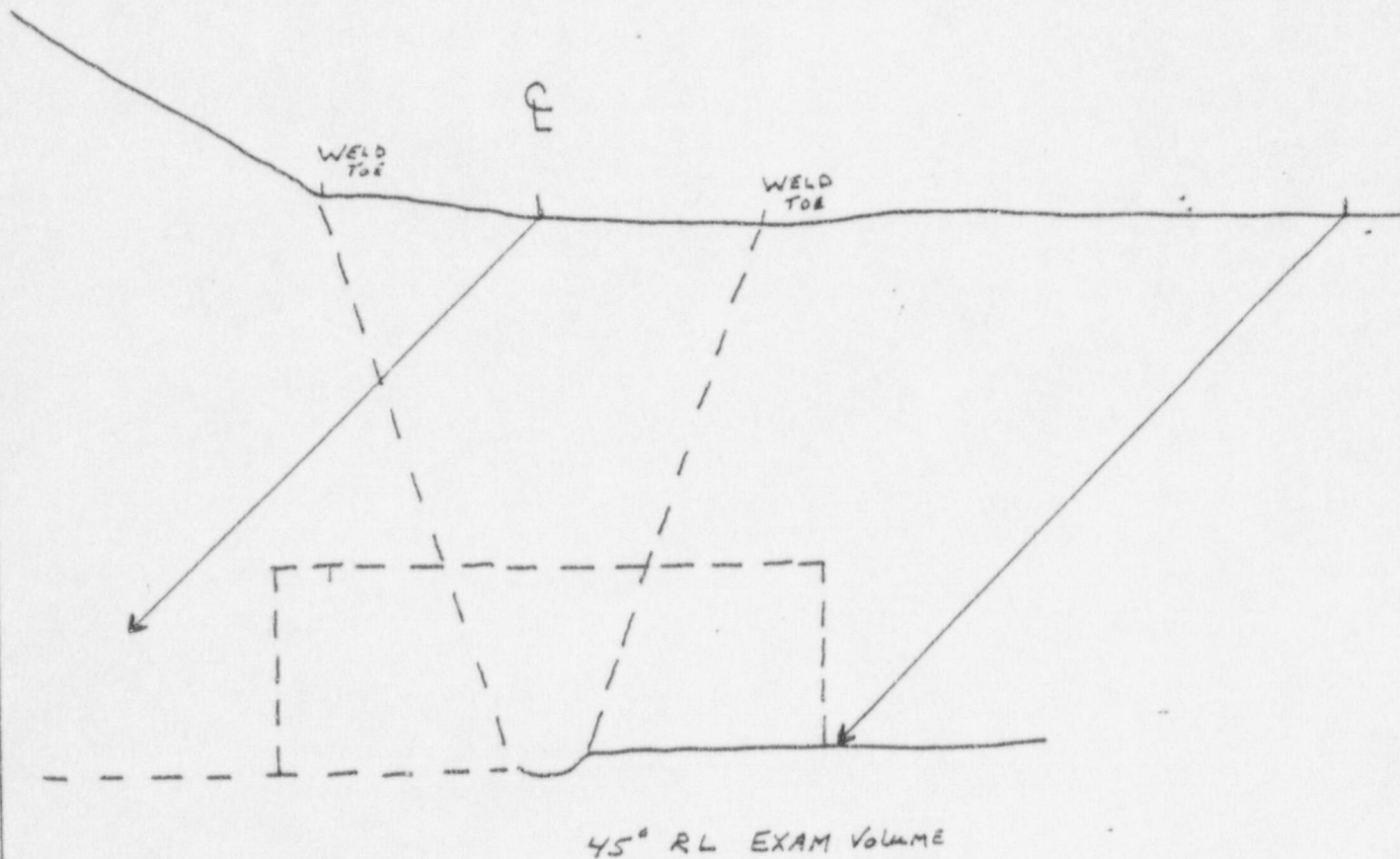


CROWN HEIGHT: 1/16 To Flush

DIAMETER: 27.50"

CROWN WIDTH: 2.25"

WELD LENGTH: 105



EXAMINER: Casey La Roche  
LEVEL: II  
DATE: 4-27-96

REVIEWED BY: J. W. Worky  
LEVEL: III  
DATE: 4-30-96

ANII: J. O.  
DATE: 5/2/96  
PAGE: 5 OF 24

TVA

Office of Nuclear Power

PROJECT: SQN

SYSTEM: RC

REPORT NO.:

Unit: 2

WELD NO.: RC-07

RC-07

Exam Area = (2.9)(1) = 2.9 in<sup>2</sup>

Volume = (2.9)(105) = 304.5 in<sup>3</sup>

Exam Area = 0%  
Limitation  
SCAN 3  
COVERAGE

SCAN 4 = 100%  
Coverage

SCAN 5/6 = (1.45)(1) = 1.45  
Coverage

Volume = (1.45)(105) = 152.25 in<sup>3</sup>

SCAN 5/6 coverage = 152.25 / 304.5 = .5 x 100 = 50%

Total Coverage

SCAN 3 = 0  
SCAN 4 = 100%  
SCAN 5 = 50%  
SCAN 6 = 50%  
200%

4) 200% = 50%  
Total Exam Coverage

BY: *[Signature]*

LEVEL: *[Signature]*

DATE: 5/29/96

PAGE 5A

OF 5A



TENNESSEE VALLEY AUTHORITY

EXAMINATION SUMMARY AND RESOLUTION SHEET

REPORT NO. R-5591

PROJECT: SQNP UNIT: 2  
SYSTEM: 06B  
WELD I.D.: RC-06  
CONFIG: ELBOW TO: PUMP  
PROCEDURE: N-4.33 REV.: 7 TC: 96-08  
NDE METHOD:  UT  PT  MT  VT

EXAMINER: Casey LaToya LV: II  
EXAMINER: JOHN G. ABBOTT LV: II  
EXAMINER: N/A LV: N/A  
EXAMINER: N/A LV: N/A  
CAL SHT NO'S: C0605, C0606

THIS REPORT CONTAINS THE MANUAL ULTRASONIC DATA ASSOCIATED WITH WELD RC-06. THIS EXAMINATION WAS PERFORMED IN ACCORDANCE WITH SECTION IX CODE REQUIREMENTS, (ASME)

EXAMINATIONS WERE PERFORMED FROM THE ELBOW SIDE OF THE WELD ONLY DUE TO CONFIGURATION.

SCAN #3 NRI  
SCAN #4 NO SCAN DUE TO CONFIGURATION  
SCAN #5 NRI  
SCAN #6 NRI

A 45° RL ULTRASONIC TECHNIQUE WAS UTILIZED DUE TO THE CHARACTERISTICS OF CENTRIFUGALLY CAST STAINLESS STEEL. THERE WERE NO RECORDABLE INDICATIONS OBSERVED.

APPROXIMATELY 50% OF THE EXAMINATION REQUIRED VOLUME WAS OBTAINED DURING THIS EXAMINATION.  
SCAN #3 25%  
SCAN #5+6 25%  
TOTAL ACHIEVED = 50%

EVALUATOR: Casey LaToya LEVEL: II DATE: 4-27-96  
CONCURRENCE: J. Wood LEVEL: IV DATE: 4-30-96

ANII TO  
DATE: 5/2/96  
PAGE 1 OF 5A

R-5591

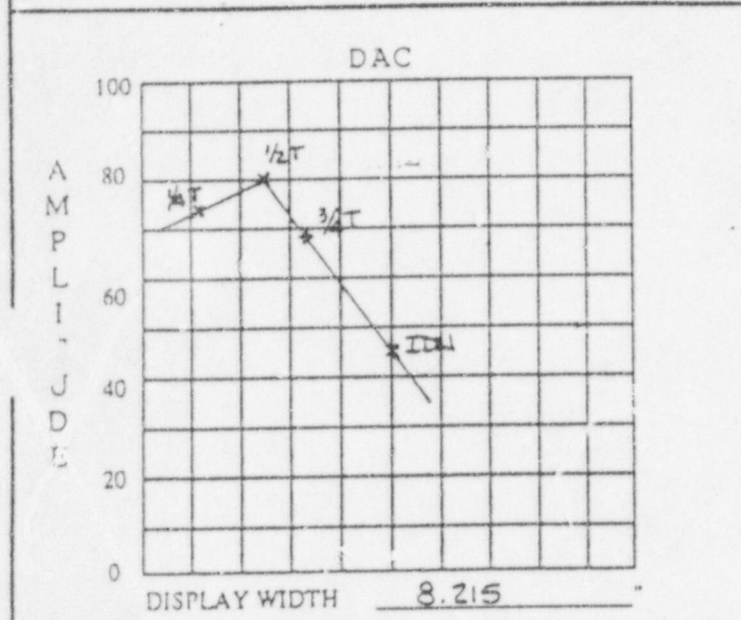
TENNESSEE VALLEY AUTHORITY	USN-50 ULTRASONIC CALIBRATION DATA SHEET	CALIBRATION NO. <b>C-0605</b>
----------------------------	--	----------------------------------

PROJECT: SONP UNIT: 2  
 PROCEDURE: N-UT-33 REV.: 7 TC: 96-08  
 INSTRUMENT: KB  
 MODEL/TYPE: USN-50  
 SERIAL NUMBER: E24257  
 TRANSDUCER MANUF.: KBA  
 SERIAL NO.: H11818 / H11817  
 SIZE: 1.0" FREQUENCY: 1.0 MHz  
 CABLE TYPE: RG-58 LENGTH: 120 "

CALIBRATION DATE: 4-27-96  
 CALIBRATION BLOCK NO.: 50-64 TEMP: 77.2 °F  
 SIMULATOR BLOCK NO.: 93-5723  
 THERMOMETER SERIAL NO.: 552193 DUE 11-13-96  
 COUPLANT: ULTRAGEL II BATCH: 093081  
 EXAM TYPE:  SHEAR  LONG.  RL

ANGLE VERIFICATION

BLOCK TYPE: ROMPAS SERIAL NO. 93-5723  
 NOMINAL ANGLE: 45 ACTUAL ANGLE: 45



INSTRUMENT SETTINGS

REFLECTOR ORIENTATION	REFERENCE SENSITIVITY	DATA SET
AXIAL	N/A	N/A
CIRC	58.5	29

TOF (PEAK / FLANK): PEAK ANGLE: 45 DEG.  
 DELAY: 13.09 μS ZERO: 13.08 μS  
 MATL VELOCITY: .2187 μS RANGE: 8.215  
 REJECT: 0 % PULSER: DUAL  
 DUAL:  ON  OFF

INITIAL CALIBRATION

INITIAL TIME: 1210 FINAL TIME: 1429

REF. REFLECTOR: ROMPAS GAIN: 58.5 dB  
 AMPLITUDE: 75 % METAL PATH: 1.076 "

VERIFICATION TIMES

1) <u>1310</u>	2) <u>N/A</u>	3) <u>N/A</u>	4) <u>N/A</u>
5) <u>N/A</u>	6) <u>N/A</u>	7) <u>N/A</u>	8) <u>N/A</u>

C L I E N C K	VERTICAL	SIGNAL 1	100	90	80	70	60	50	40	30	20	10
		SIGNAL 2	50	45	40	35	30	25	20	15	10	5
	ATTENUATOR	GAIN	SET	-6	-12	SET	+12	SET	+6			
		SIGNAL AMP.	80 %	32 to 48	16 to 24	20 %	64 to 96	40 %	64 to 96	80	80	

REFER TO CALIBRATION REPORT N/A FOR PREVIOUS SATISFACTORY LINEARITY

COMMENTS: CAL FOR AXIAL SCAN  
CONTOURED SHOE

WELD(S) EXAMINED: \_\_\_\_\_  
RC-06

AMINER: <u>[Signature]</u>	LEVEL: <u>II</u>	ANI: <u>72</u>
EXAMINER: <u>[Signature]</u>	LEVEL: <u>II</u>	DATE: <u>5/2/96</u>
REVIEWED BY: <u>[Signature]</u>	LEVEL: <u>III</u>	DATE: <u>4-30-96</u>

PAGE 2 OF 5A

R-5591

TENNESSEE VALLEY AUTHORITY

USN-50 ULTRASONIC CALIBRATION DATA SHEET

CALIBRATION NO.

C-0606

PROJECT: SQNP UNIT: 2

PROCEDURE: N-UT-33 REV.: 7 TC: 96-08

INSTRUMENT: KBA

MODEL/TYPE: USN 50

SERIAL NUMBER: E18500

TRANSDUCER MANUF.: KBA

SERIAL NO. DUAL H11819 / H11820

SIZE: (2) 1.0" FREQUENCY: 1 MHz

CABLE TYPE: BNC-BNC LENGTH: 72"

CALIBRATION DATE: 4-27-96

CALIBRATION BLOCK NO: SQ-64 TEMP: 77.2 F

SIMULATOR BLOCK NO: 93-5726

THERMOMETER SERIAL NO: 573201

COUPLANT: ULTRAGEL BATCH: 093081

EXAM TYPE:  SHEAR  LONG  RL

ANGLE VERIFICATION

BLOCK TYPE: ROMPAS SERIAL NO. 93-5726

NOMINAL ANGLE: 45 ACTUAL ANGLE: 45

INSTRUMENT SETTINGS

REFLECTOR ORIENTATION	REFERENCE SENSITIVITY	DATA SET
AXIAL	64	11
CIRC	N/A	N/A

TOF (PEAK / FLANK): FLANK ANGLE: 45 DEG.

DELAY: 16.83 us ZERO: 16.875 us

MATL VELOCITY: 2474 us RANGE: 6.661

REJECT: 0% PULSER: DUAL:

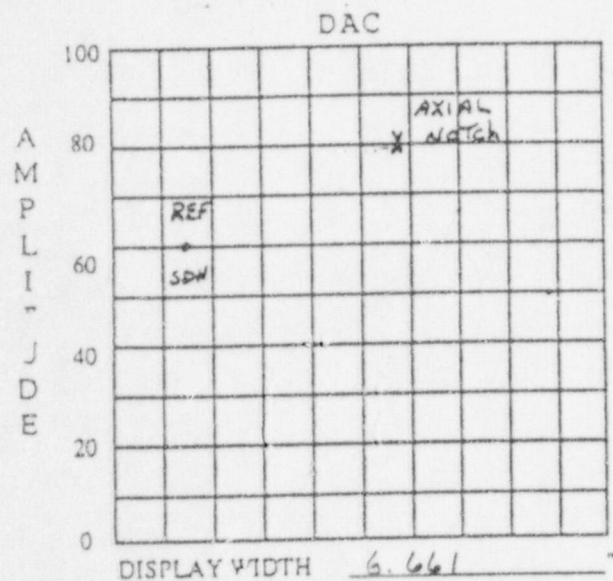
DUAL:  ON  OFF

INITIAL CALIBRATION

INITIAL TIME: 12:11 FINAL TIME: 14:26

VERIFICATION TIMES

1) 13:26	2)	3) N/A	4)
5) N/A	6)	7) A	8)



REF. REFLECTOR: ROMPAS GAIN: 64 dB

AMPLITUDE: 60 METAL PATH: .993

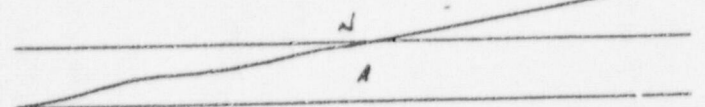
VERTICAL ATTENUATOR	SIGNAL 1	100	90	80	70	60	50	40	30	20	10
	SIGNAL 2	50	46	40	36	30	4626	20	14	10	4
GAIN	SET	-6	-12	SET	+12	SET	+6				
SIGNAL AMP.	80%	32 to 48	16 to 24	20%	64 to 96	40%	64 to 96				
		40	20		80		80				

REFER TO CALIBRATION REPORT #1/A FOR PREVIOUS SATISFACTORY LINEARITY

COMMENTS: CIRCUMFERENTIAL SCAN

Calibration: CONTOURED SHOE

WELD(S) EXAMINED: RC-06



AMINER: Carey L. Doye LEVEL: II ANTI: TD

EXAMINER: J. H. [Signature] LEVEL: II DATE: 5/21/96

REVIEWED BY: J. [Signature] LEVEL: III DATE: 4-30-96 PAGE 3 OF 5A

TENNESSEE VALLEY AUTHORITY

MANUAL ULTRASONIC  
PIPING EXAMINATION  
DATA SHEET

REPORT NO.

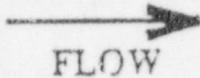
R-5591

OBJECT: SONP UNIT: 2

SYSTEM: 068

WELD ID.: RC-06

CONFIG: ELBOW TO PUMP



PROCEDURE: N-UT. 33 REV.: 7 TC: 96-08

W<sub>0</sub> REFERENCE: WELD E

L<sub>0</sub> REFERENCE: EXTRADOS OF ELBOW

EXAMINATION DATE: 4-27-96

START TIME: 1310 END TIME: 1345

EXAM SURFACE:  ID  OD

MATERIAL TYPE:  CS  SS  CSCL  CCSS

SURFACE TEMP: 74.6 °F PYRO NO: 552193

DUE 11-13-96

CALIBRATION SHEET NO.	C-0605	C-0606
EXAMINATION ANGLE	45 RL DEG.	45 RL DEG.
CIRC. SCAN SENSITIVITY	70.0 dB	70 dB
AXIAL SCAN SENSITIVITY	64.5 dB	n/a dB

IND NO.	L (in) FROM REF.			AT MAX AMP			MAX AMP % DAC	EXAM NO. J-14	NOM. ANG.	NRI	INDICATION INFORMATION: TYPE, DAMPING, ETC.
	L1	L Max	L2	W MAX	MP MAX	D MAX					
								3	45 <sub>RL</sub>	✓	NRI
								5	45 <sub>RL</sub>	✓	NRI
								6	45 <sub>RL</sub>	✓	NRI
N/A											

REMARKS/LIMITATIONS: No SCAN 4 DUE TO CONFIG.

AMINER: [Signature] LEVEL: II

EXAMINER: [Signature] LEVEL: II

REVIEWED BY: [Signature] LEVEL: III DATE: 4-30-96

ANII: TR

DATE: 5/2/96

PAGE 4 OF 5A

TVA

WALL THICKNESS  
PROFILE SHEET

REPORT NO:

R-5591

PROJECT: SQNP

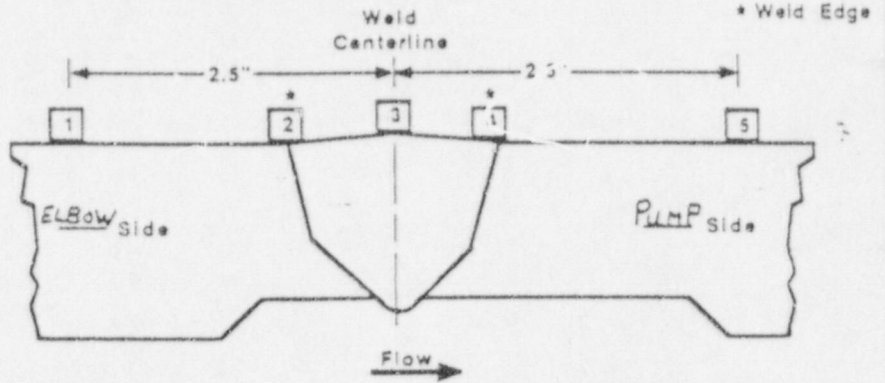
WELD NO: RC-6

UNIT: 2

SYSTEM: O68

Record Thickness Measurements As Indicated, Including Weld Width, Edge-To-Edge At 0°

Position	0°	90°	180°	270°
1	N			
2	A	N		
3	3.120			
4	N		A	
5	3.500			

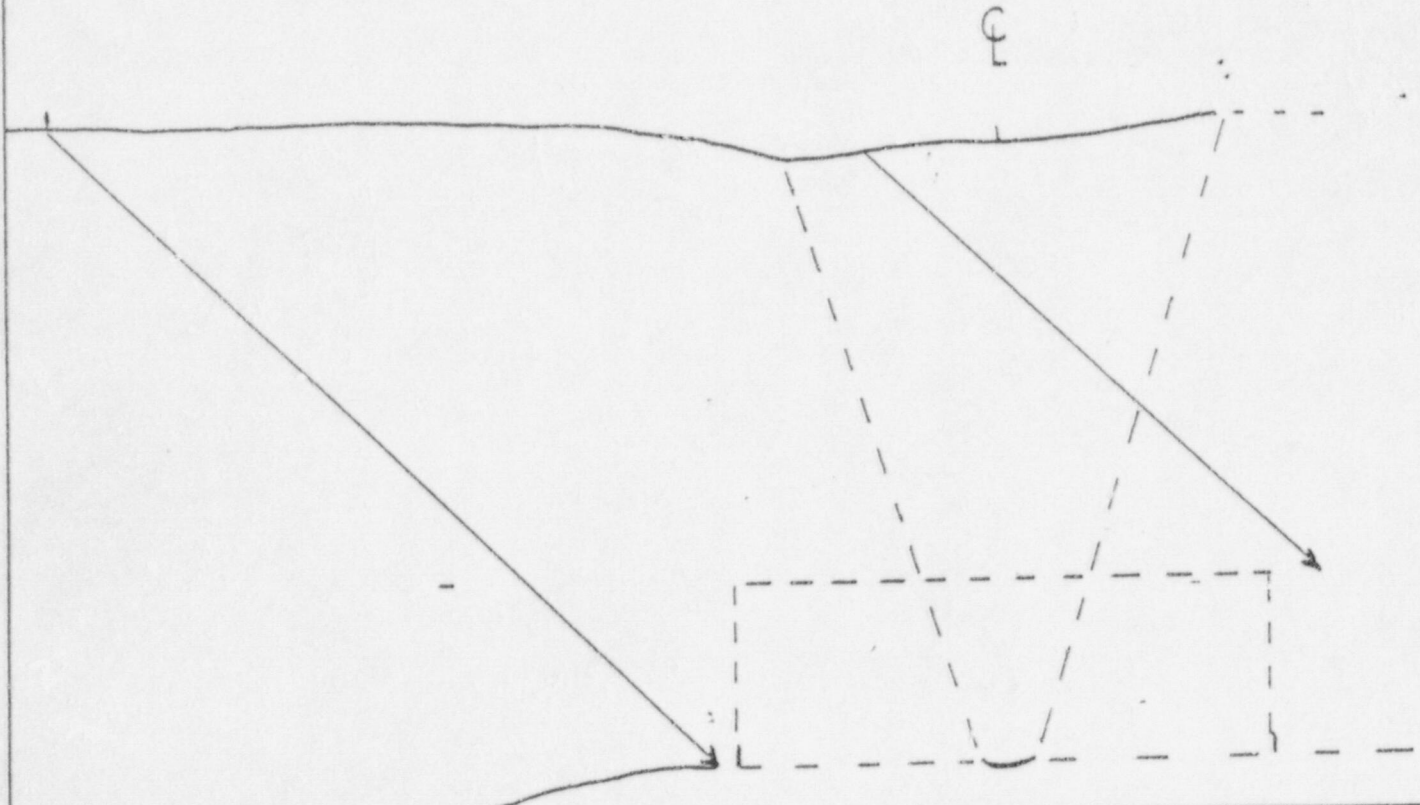


CROWN HEIGHT: 2"      DIAMETER: 31"  
 CROWN WIDTH: 2.2"      WELD LENGTH: 117"

45° RL EXAM VOLUME

ELBOW

PUMP



EXAMINER: Carey L. Doza  
 LEVEL: #  
 DATE: 4-27-96

REVIEWED BY: JM Woodley  
 LEVEL: #      DATE: 4-30-96

ANII: T.D.  
 DATE: 5/2/96  
 PAGE 5 OF 5

TVA

Office of Nuclear Power

PROJECT: SQN

SYSTEM: RC

REPORT NO.:

Unit: 2

WELD NO.: RC-06

Exam Area = (2.75)(.9) = 2.475

Volume = (2.475)(117) = 289.575

Exam Area = 0%  
coverage insufficient  
SCAN 4

Exam Area = 100%  
coverage  
SCAN 3

Exam Area  
coverage  
SCAN 5 5/6 = (1.375)(.9) = 1.2375 m<sup>2</sup>

Volume = (1.2375)(117) = 144.78 m<sup>3</sup>

SCAN 5 5/6 coverage =  $\frac{144.78}{289.575} = .5(100) = 50\%$

Total coverage = SCAN 4 = 0%

SCAN 3 = 100%

SCAN 5 = 50%

SCAN 6 = 50%

200%

Total coverage =  $\frac{200}{4} = 50\%$

BY:

*[Signature]*

LEVEL:

*[Signature]*

DATE:

5/24/96

PAGE

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OF

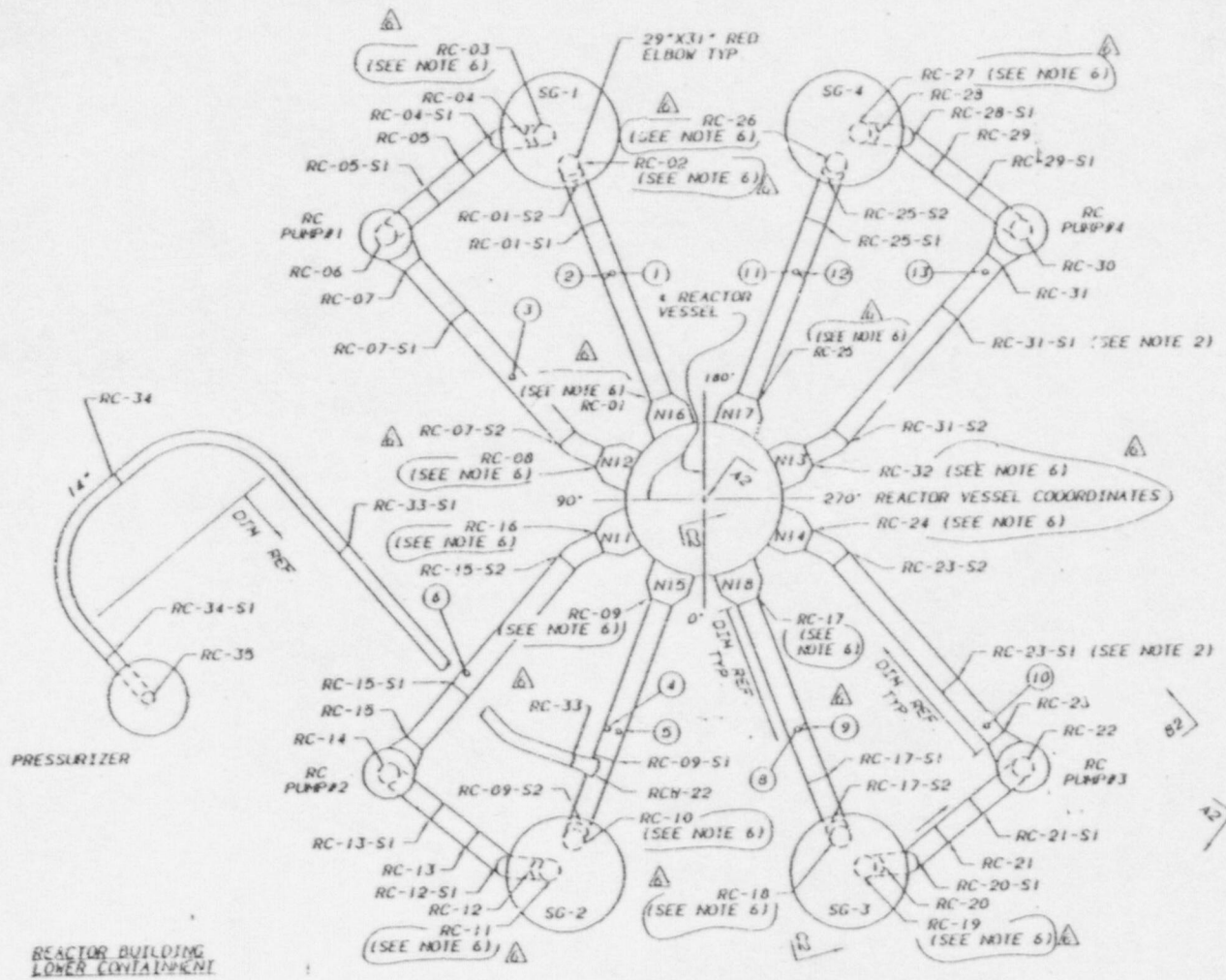
5A

ATTACHMENT 2

ISI PROGRAM DRAWINGS

ISI-0008-C-01, REVISION 6

ISI-0307-C-01, REVISION 8



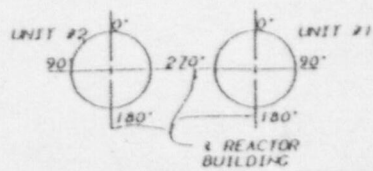
REFERENCE DRAWINGS  
 47W304-1  
 2-RC-005W (LOOP 1)  
 2-RC-006W (LOOP 2)  
 2-RC-007W (LOOP 3)  
 2-RC-008W (LOOP 4)  
 47W465-1  
 CONTRACT: 91934  
 DRAWING: 9392-TEN  
 SHOP SHTS: TEN-1 THRU TEN-18F

MATERIAL SPECIFICATIONS  
 PRESSURIZER SURGE LINE  
 14" SCH 160 A-376  
 HOT LEG  
 29" ID, A-351 CF8M, N W 2 84"  
 CROSSOVER LEG  
 31" ID, A-351 CF8M, N W 2 99"  
 COLD LEG  
 27 5/8" ID, A-351 CF8M, N W 2 69"  
 ASME CC-1 (EQUIVALENT)

- NOTES:
- INACCESSIBLE
  - REACTOR VESSEL NOZZLE TO SAFE END WELD ID'S ARE SHOWN ON RV DWG ISI-0298-C. THESE ARE ASME SECTION XI EXAM CATEGORY B-F, DISSIMILAR METAL WELDS
  - STEAM GENERATOR NOZZLE TO SAFE END WELD ID'S ARE SHOWN ON S/G DWG ISI-0401-C. THESE ARE ASME SECTION XI EXAM CATEGORY B-F, DISSIMILAR METAL WELDS
  - FOR TEMPERATURE ELEMENTS SEE SHEET 2 TAGS 1-13
  - THE EXAMINATION OF THESE WELDS IS INCLUDED IN THE EXAMINATION OF THE NOZZLE TO SAFE END WELD

PRESSURIZER

REACTOR BUILDING LOWER CONTAINMENT



1	APG	BJB	2/24/92	2/24/92	2/24/92	2/24/92	2/24/92
CHANGE NOTES 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000							
REV	BY	CHECKED	SUBMITTED	APPROVED	DATE		
TENNESSEE VALLEY AUTHORITY							
SECOYAH NUCLEAR PLANT							
UNIT 2							
REACTOR COOLANT PIPING							
WELD LOCATIONS							
DRAWN	DATE	SCALE	NOT TO SCALE	REV			
CHECKED	EDK	APPROVED	GLB	CAD	REVISIONS	REV	
SUBMITTED	EDK	DATE	1/11/00	08			



**MATERIAL SPECIFICATIONS**

THE MAIN FLANGE BOLTS ARE FABRICATED OF 4340 STEEL, HEAT TREATED TO A-540, GR 24, TOTAL LENGTH 30 1/2"

ASME CC-1 (EQUIVALENT)

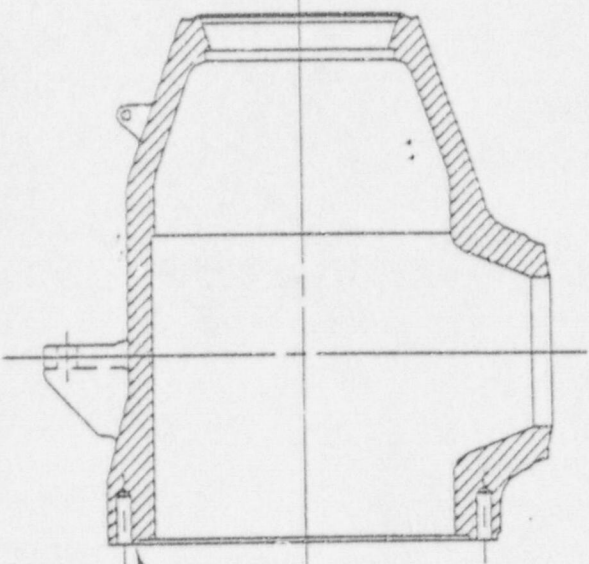
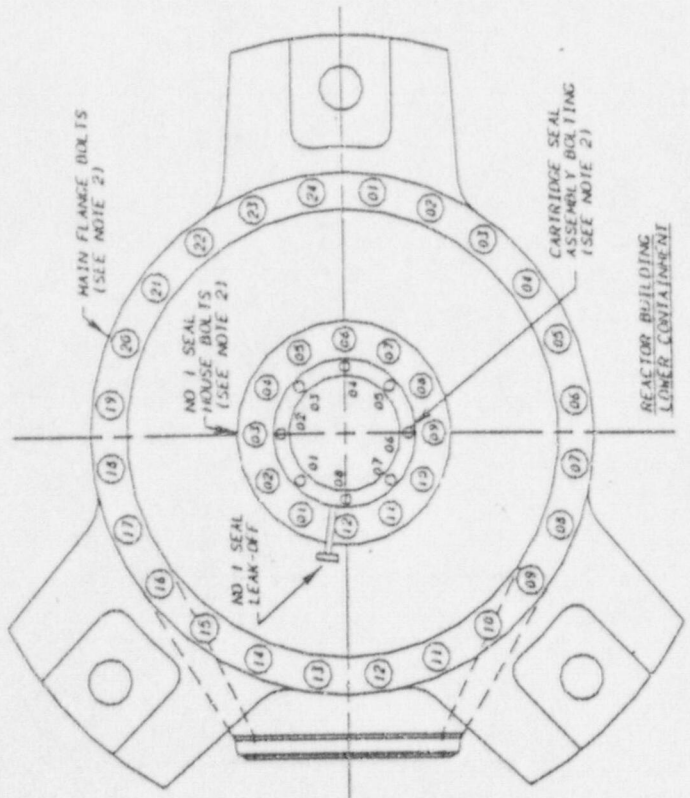
**NOTES**

1. FOR UNIT 1 DWG SEE ISI-0325-C
2. CARTRIDGE SEAL ASSEMBLY BOLTING IS 1 5 IN CLASS 1 NUMBER 1 SEAL HOUSE BOLTS ARE 2 IN MAIN FLANGE BOLTS ARE 4 5 IN
3. EXAMINATION OF BASE MATERIAL TRANSITION (RCP-304-20C-023) ADJACENT TO WELD NUMBER 20C-023 ON REACTOR COOLANT PUMP NUMBER 3 WELD LEG WAS AUGMENTED EXAMINING DURING THE FIRST INSPECTION INTERVAL IN ACCORDANCE WITH 2-SI-SXI-000-114 D
4. DIMENSIONS ARE FOR INFORMATION ONLY

**BOLTING IDENTIFIER**

RCP204-BOLT-XX  
RCP251-BOLT-YY (NO 1 SEAL HOUSE BOLT)  
RCP235-BOLT-WW (CARTRIDGE SEAL BOLT)

WW REPRESENTS LOCATION 01-08  
XX REPRESENTS LOCATION 01-24  
YY REPRESENTS LOCATION 01-12  
Z REPRESENTS PUMP NO (1-4)



**CASING THICKNESS AND INTERIOR IDENTIFIER**

- RCP-1-CASING
- RCP-2-CASING
- RCP-3-CASING
- RCP-4-CASING

8	REV	8-68	WAL	AWB	215147
7	CONTRACT NOTE	1 PER FIG 2	84-22		
6	REV	1-68	WAL	AWB	9-31-84
5	ADD BOLT LENGTH AND BOLT # PER FIG 1	84-13			
4	REV	1-68	WAL	AWB	2-22-84
3	ADD FLANGE SURFACE IDENTIFIER	TO "NO 1 SEAL HOUSE" SURFACE IDENTIFIER PER FIG 1	84-02		
2	REV	1-68	WAL	AWB	12-16-83
1	CHANGE "NO 1 SEAL LEAK-OFF" TO "NO 1 SEAL LEAK-OFF" TO CASING IDENTIFIER, NAME ADDED				
	APPROVED	DATE	APPROVED	DATE	
	DESIGNED		APPROVED		
TENNESSEE VALLEY AUTHORITY					
SECOYAH NUCLEAR PLANT					
UNIT 2					
REACTOR COOLANT PUMP					
MAIN FLANGE AND LOWER SEAL HOUSE BOLT PA: JERRY					
DRAWN	APR	DATE	4-14-88	SCALE	NOT TO SCALE
CHECKED	MRA	APPROVED	GB	CAD	MAINTAINED DRAWING REV
SUBMITTED	REC			ISI-0307-C-01	08

ENCLOSURE 3

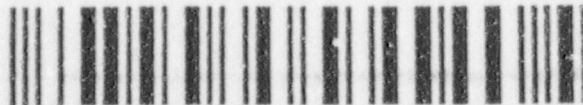
TVA PROCEDURE  
FOR CALCULATION OF  
ASME CODE COVERAGE  
FOR SECTION XI  
NONDESTRUCTIVE EXAMINATIONS

# QA RECORD

W47 970815 271

CALCULATION OF ASME CODE COVERAGE  
FOR SECTION XI NDE EXAMINATIONS

"QUALITY RELATED"



0352290533  
CHAT ISOPM-SEC02  
N-GP-28  
082997 1

Prepared By: Thomas L. Stocklem Date: 8-11-97  
Technical Review: Paul W. Tuttle NDE level III, Date: 8-11-97  
ISO Approval: Paul W. Tuttle Date: 8-15-97

NONDESTRUCTIVE EXAMINATION PROCEDURE  
TVA Nuclear Power

Procedure No. N-GP-28  
Revision 1  
Page 2 of 16

<u>Rev. No</u>	<u>Date</u>	<u>Description</u>
0	4/3/96	Initial issue.
1	8/15/97	Incorporate TC 97-09.

## 1.0 Scope

The scope of this procedure is to provide generic guidelines for calculating the ASME Section XI code coverage obtained during volumetric and surface examinations. This procedure incorporates the requirements of Code Case N-460.

## 2.0 Purpose

This procedure applies to the calculation of ASME Section XI Code coverage for vessel welds, piping welds, and integral attachments. This procedure applies to personnel performing surface or volumetric examinations and may be used as a guide when calculating the examination coverage for preservice and inservice examinations when the coverage is less than that required by ASME Section XI. Coverage limitations may be due to an obstruction, interference, geometric configuration or other applicable reason.

## 3.0 References

3.1 ASME Section XI 1989 Edition

3.2 ASME Code Case N-460

## 4.0 Definitions

- 4.1 Examination Coverage- The percentage of the examination surface or volume obtained during the performance of the examination.
- 4.2 Examination Surface- The surface of the weld and base material required to be examined by ASME Section XI using a surface examination method.
- 4.3 Examination Volume- The volume of weld and base material required to be examined by ASME Section XI using a volumetric examination method.
- 4.4 Scan Limitation- A limit on the ability to scan the surface(s) as required by procedure.
- 4.5 Surface Limitation- A limit on the ability to perform a surface examination of the required surface(s) because of an interference.
- 4.6 Volumetric Limitation- A limit on the ability to scan the required examination volume because of the geometric configuration, a physical interference, or a metallurgical condition of the material being examined.

5.0 General

- 5.1 During the performance of inservice inspections, ASME Section XI requires examination coverage to be essentially 100% of the weld area or volume. For examination coverage less than 100%, TVA has implemented ASME Code Case N-460 which states that when the entire examination volume or area cannot be examined due to interference by another component or part geometry, a reduction in examination coverage for Class 1 or Class 2 welds may be accepted provided the reduction in coverage for that weld is less than 10%.
- 5.2 Surface examinations are typically conducted on the weld area plus a defined amount of base material on each side of the weld. Volumetric examinations specify a particular volume to be examined. The Section XI required examination volume or surface examination area for each type of weld is depicted in figures of IWB-2500 or IWC-2500 as applicable. As depicted for piping welds, volume width generally constitutes the weld plus  $1/4t$  on each side while volume thickness generally constitutes the lower  $1/3$  of the piping thickness for the length of the weld. The exception normally includes code category B-O which includes the weld plus  $1/2$  inch and full volume for the length of the weld. As depicted, for vessel welds, the volume width generally constitutes the weld plus  $1/2t$  on each side of the weld while volume thickness generally constitutes the entire component thickness (i.e. full volume). The volume changes with variations in weld configuration (e.g. transition between different pipe thickness or vessel weld configurations).
- 5.3 The Section XI required examination volume or area shall be verified prior to calculation of the limitation.

6.0 Documenting and Calculating Examination Coverage

- 6.1 While performing a surface or ultrasonic examination, the NDE Examiner shall make every attempt to examine 100 percent of the examination area or volume.
- 6.2 When practical, the two beam path directions for ultrasonic examinations should be performed from two sides of the weld or additional angles employed in order to maximize coverage.
- 6.3 If 100% percent of the examination surface or volume cannot be examined, the NDE Examiner should perform the following under the direction of the inspection coordinator or the NDE Level III:
- 6.3.1 Perform additional examinations with higher angles in order to maximize cover for ultrasonic exams.
- 6.3.2 Perform another surface method (i.e., PT in lieu of MT) in order to maximize coverage.
- 6.3.3 Perform alternative NDE methods if applicable.

- 6.4 The examiner shall accurately document all limitations, obstructions, interferences, geometric configurations or other applicable reasons for not obtaining the required code coverage.
- 6.5 The examiner shall document the limitation on a sketch. Examination coverage estimates may be performed by the examiner or the reviewer.

#### 7.0 Calculation Basis

- 7.1 Volumetric Examinations- Piping Welds and Vessels less than 2 inches in thickness
- a) For welds with access from both sides, each of the four required scans are equal to 25%.
  - b) For welds with access from one side only due to interference/configuration (e.g. pipe to valve), the axial scan (scan 3 or 4) equals 50% and the circumferential scans (scan 5 and 6) each equal 25% for total of 100%.
  - c) Examination volume coverage may be increased as previously discussed or by use of refracted longitudinal wave techniques on stainless steel or dissimilar metal welds. Use of refracted longitudinal waves to penetrate stainless steel weld material will increase the examination volume coverage by the amount depicted on the examination coverage drawing.
  - d) The effects of adjacent component interferences (e.g. welded lug attachments) along the weld length are also taken into account with the reduction in coverage identified as a percentage of reduced volume.
- 7.2 A typical method for calculating coverage due to ultrasonic piping limitations is contained in Attachments 2 and 2A.

#### 8.0 Surface Examinations - Piping Welds And Integral Attachments

- 8.1 Examination area coverage calculations are based upon one of the following suppositions:
- a) The total examination area is calculated, typically length x width, then the total area of limitation or interference is subtracted from the total examination area.
  - b) The area of achieved coverage achieved is divided by the total examination area for percentage of examination achieved.
- 8.2 A typical method for calculating surface examinations is contained in Attachment 4.

9.0 Ultrasonic Examinations - Vessel Welds

9.1 Examination volume coverage calculations are based upon the following suppositions:

a) To achieve full examination coverage nine different scans are required for a typical nozzle examination. The following may be used for other vessel configurations:

- 1) 0 degree (weld metal scan)
- 2) 45 degree Transverse-scan from vessel side of the weld
- 3) 45 degree Transverse-scan from nozzle side of the weld
- 4) 60 degree Transverse-scan from vessel side of the weld
- 5) 60 degree Transverse-scan from nozzle side of the weld
- 6) 45 degree Parallel-scan CW direction
- 7) 45 degree Parallel-scan CCW direction
- 8) 60 degree Parallel-scan CW direction
- 9) 60 degree Parallel-scan CCW direction

9.2 Attachment 3 describes ASME code compliance for full volume examination coverage for transverse scans in vessel applications.

9.3 Typical methods for calculating coverage due to ultrasonic vessel limitations is contained in Attachments 3A, 3B, 3C, and 3D.

10.0 Responsibilities

10.1 The examiner or designee shall document the amount of code coverage obtained on Attachment 1 after all necessary steps to perform additional examinations has been completed in order to maximize coverage.

10.2 Attachment 1 shall be reviewed by another individual with the same or higher NDE certification.

10.3 The NDE Level III or data reviewer shall review Attachment 1 in order to verify that the information is accurate and correct.

10.4 The NDE Level III may recalculate the examination coverage to obtain a more accurate value of the examination surface or volume examined. The calculation shall be documented on the exam report.

10.5 The NDE Level III may require an alternate examination technique or method, or request that the interference be removed. For nozzle examinations, supplemental scans from the nozzle bore or flange face may provide complete coverage of the weld.

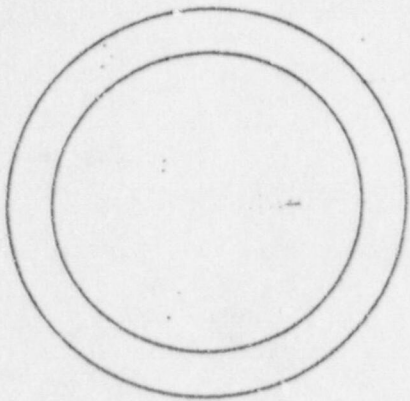
10.6 If the examination coverage indicates less than 90 percent of the required examination volume or surface, the site ISI supervisor shall be notified.

10.7 The site ISI supervisor shall ensure that examination results are accurately documented and incorporate results into a Request for Relief if necessary.

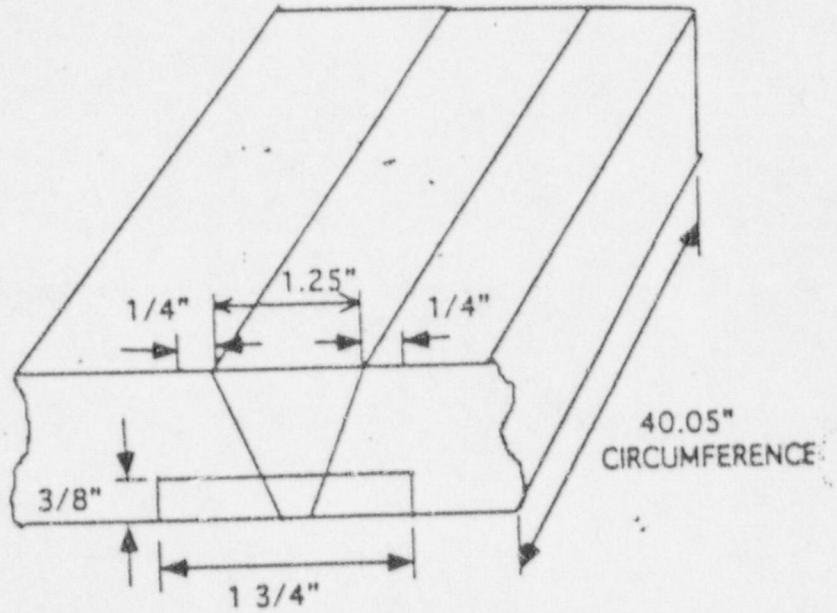




ATTACHMENT 2



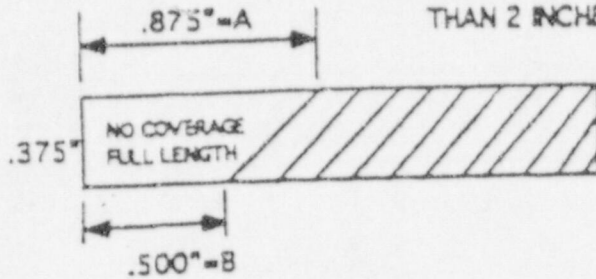
12" Schedule 140  
Outside Diameter= 12.75"  
Wall thickness= 1.125"  
Circumference= 40.05"



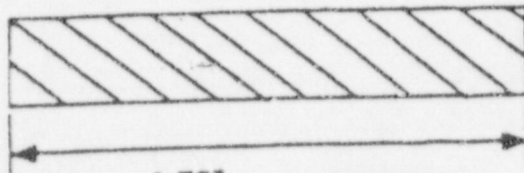
$$\text{TOTAL VOLUME} = (.375)(1.75)(40.05)$$
$$\text{TOTAL VOLUME} = 26.28 \text{ cu. inches}$$

ATTACHMENT 2A

ATTACHMENT 2A - PIPING/VESSELS-LESS  
THAN 2 INCHES IN THICKNESS



45 DEGREE  
COVERAGE  
DOWNSTREAM



45 DEGREE  
COVERAGE  
UPSTREAM



45 CIRC SCAN=100%



45 CIRC SCAN=100%

EXAMPLE 2

NO COVERAGE FOR 6 INCHES IN  
LENGTH DUE TO ATTACHMENT

$$A = .2578 \text{ SQ. IN.}$$

$$\text{VOL.} = (.2578)(6")$$

$$\text{VOL.} = 1.5468 \text{ CU. IN.}$$

$$\text{NO COVERAGE} = 1.5468 / 26.28$$

$$\text{NO COVERAGE} = .0525(100) = 5.88\%$$

$$\text{COVERAGE} = 100 - 5.25 = 94.75\%$$

- 100%
- 100%
- 100%
- 94.75%

EXAMPLE 1

NO COVERAGE, FULL LENGTH ASSUME ALL OTHER SCANS = 100%

$$100\% + 100\% + 100\% + 60.74 = 360.74$$

98.69% TOTAL COVERAGE

$$A = H/2(A+B)$$

$$A = .375 / 2(.875 + .5)$$

$$A = .2578$$

$$\text{VOL.} = (.2578)(40.05)$$

$$\text{VOL.} = 10.32 \text{ CU. IN.}$$

$$360.74 / 4 = 90.185\% \text{ TOTAL EXAM COVERAGE}$$

EXAMPLE 1

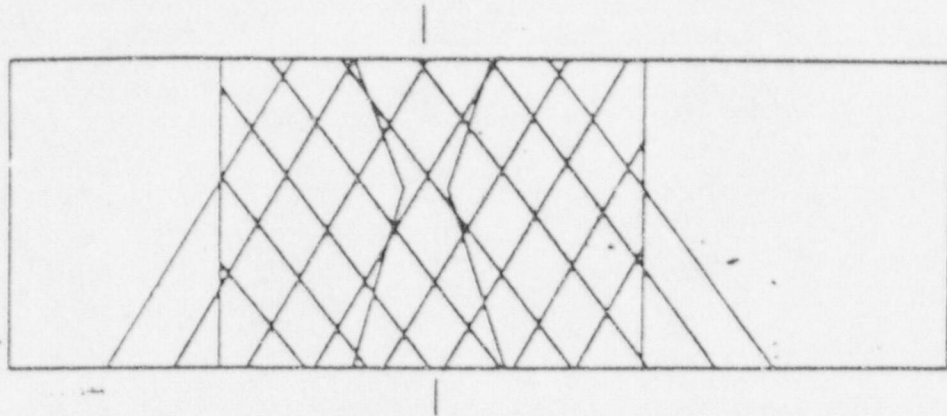
$$\text{FULL COVERAGE} = (.375)(1.75)(40.05) = 26.28 \text{ CU. IN.}$$

$$\text{NO COVERAGE} = 10.32 / 26.28$$

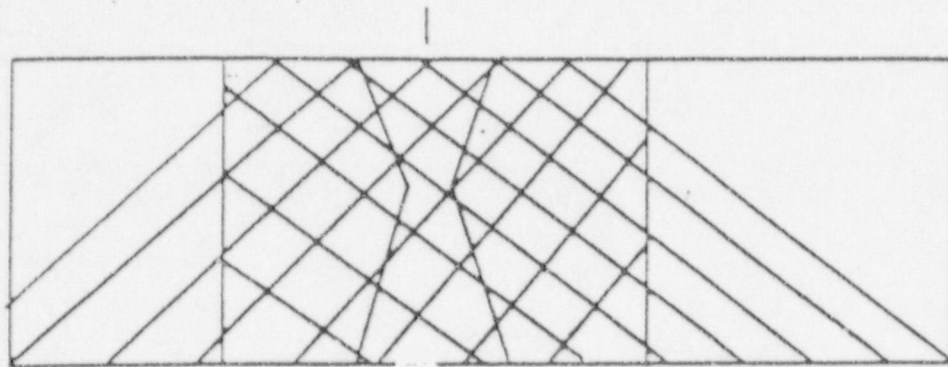
$$\text{NO COVERAGE} = .3926(100) = 39.26\%$$

$$\text{COVERAGE} = 100 - 39.26 = 60.74\%$$

ATTACHMENT 3



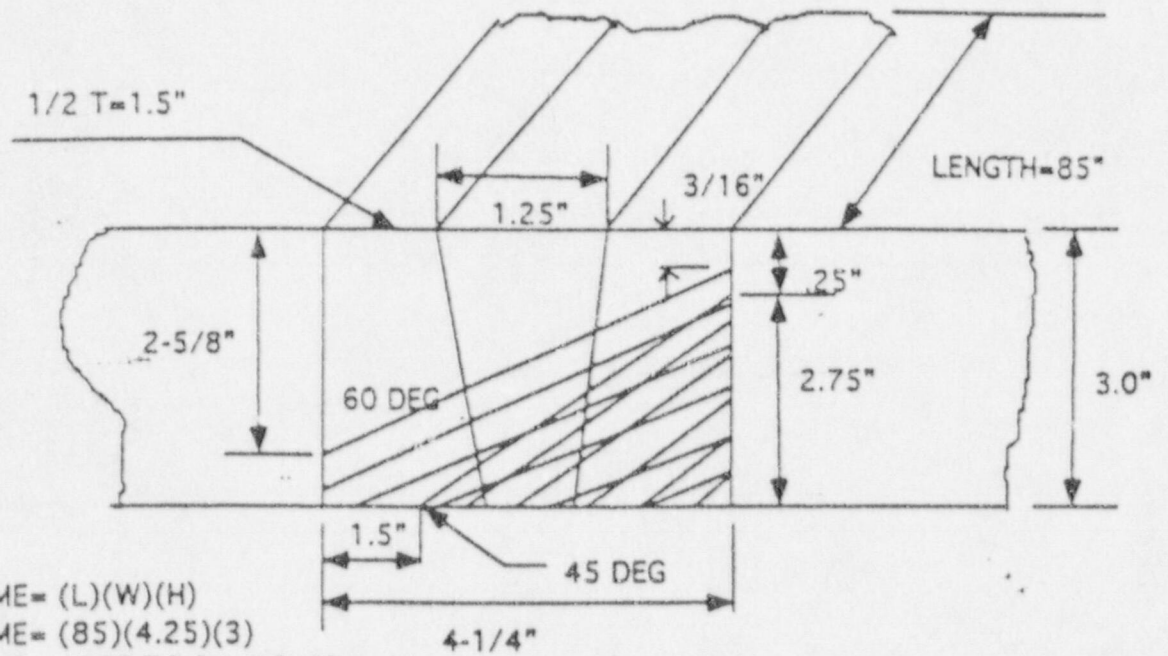
45 DEGREE-100% ASME SECTION XI COVERAGE (T-SCAN)



60 DEGREE-100% ASME SECTION XI COVERAGE (T-SCAN)

THE ASME SECTION XI CODE REQUIRES THE WELD TO BE COMPLETELY EXAMINED IN TWO DIRECTIONS. THE ABOVE ARE EXAMPLES OF 100% BIDIRECTIONAL COVERAGE (T-SCANS).

ATTACHMENT 3A

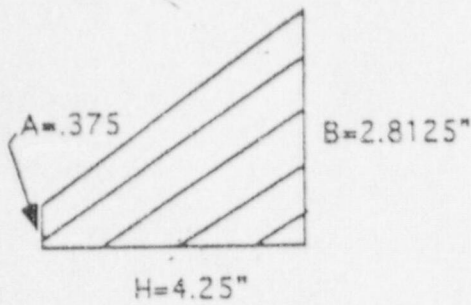


TOTAL VOLUME = (L)(W)(H)  
TOTAL VOLUME = (85)(4.25)(3)  
TOTAL VOLUME = 1083.75 CU. INCHES

EXAMPLE 1 - 45T AND 60T SCANS AS SHOWN LIMITED FOR FULL LENGTH.  
EXAMPLE 2 - 45T AND 60T SCANS AS SHOWN LIMITED FOR A LENGTH OF 12 INCHES.

ATTACHMENT 3C

EXAMPLE 1



1.0-DETERMINE AREA EXAMINED.

$$A = H/2(A+B)$$

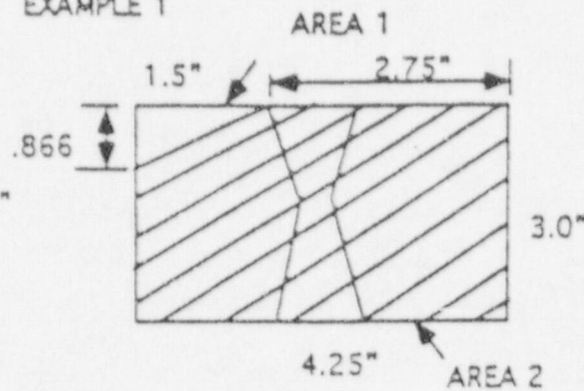
$$A = 4.25/2(.375 + 2.8125) = 6.77 \text{ SQ. IN.}$$

$$\text{VOL.} = (6.77)(85 \text{ IN.}) = 575.45 \text{ CUBIC IN.}$$

2.0 DETERMINE 45 DEGREE COVERAGE

COVERAGE = VOLUME COVERED / VOLUME REQUIRED

$$45 \text{ DEGREE COVERAGE} = 575.45 / 1028.585 = .559(100) = 55.9\%$$



$$\text{TOTAL AREA} = (3)(4.25) = 12.75$$

$$\text{VOL.} = (12.75)(85) = 1083.75 \text{ CU. IN.}$$

DETERMINE AREA REQUIRED TO BE EXAMINED BY THE CODE.

$$\text{AREA 1} = 1/2BH = 1/2(.866)(1.5) =$$

$$\text{AREA} = .649 \text{ SQ. IN.}$$

$$\text{VOL.} = (.649)(85) = 55.165 \text{ CU. IN.}$$

$$\text{AREA 2} = \text{TOTAL AREA} - \text{AREA 1}$$

$$\text{AREA 2} = 12.75 \text{ SQ. IN.} - .649 \text{ SQ. IN.} = 12.10 \text{ SQ. IN.}$$

$$\text{VOL. AREA 2} = (12.10)(85) = 1028.585 \text{ CU. IN.}$$

DETERMINE TOTAL EFFECTIVE COVERAGE

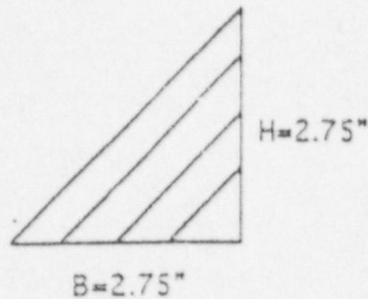
- 0- 100%
- 45T-29.76%
- 45T-100%
- 60T-55.9%
- 60T-100%
- 45Pcw-100%
- 45Pccw-100%
- 60Pcw-100%
- 60Pccw-100%

$$\text{TOTAL} = 785.66$$

$$\text{AVERAGE} = 785.66 / 9$$

$$\text{AVERAGE} = 87.29\%$$

ATTACHMENT 3B



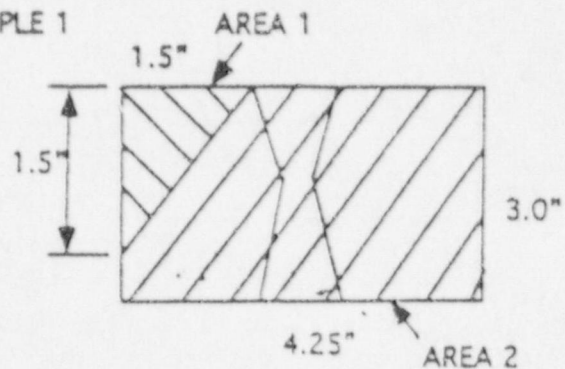
1.0-DETERMINE AREA EXAMINED.

$$A = 1/2(B)(H)$$

$$A = 1/2(2.75)(2.75) = 3.78 \text{ SQ. IN.}$$

$$\text{VOL.} = (3.78)(85 \text{ IN.}) = 321.3 \text{ CUBIC IN.}$$

EXAMPLE 1



$$\text{TOTAL AREA} = (3)(4.25) = 12.75$$

$$\text{VOL.} = (12.75)(85) = 1083.75 \text{ IN}$$

DETERMINE AREA REQUIRED TO BE  
EXAMINED BY THE CODE.

$$\text{AREA 1} = 1/2BH = 1/2(1.5)(1.5) = 1.125$$

$$\text{AREA 2} = \text{TOTAL AREA} - \text{AREA 1}$$

$$\text{AREA 2} = 12.75 - 1.125 = 11.625 \text{ SQ. IN.}$$

$$\text{VOLUME AREA 2} = (11.625)(85)$$

$$\text{VOLUME AREA 2} = 988.125 \text{ CU. IN.}$$

2.0 DETERMINE 45 DEGREE COVERAGE

$$\text{COVERAGE} = \text{VOLUME COVERED} / \text{VOLUME REQUIRED}$$

$$45 \text{ DEGREE COVERAGE} = 321.3 / 988.125 = .3251(100) = 32.51\%$$

ATTACHMENT 3D

EXAMPLE 2

45 DEGREE

AREA NOT COVERED= (AREA 2)-(AREA EXAMINED)

AREA NOT COVERED= 11.625 SQ.IN.-3.78 SQ.IN.=7.845 SQ.IN.

VOLUME NOT COVERED= (7.845 SQ.IN.)(12IN.)=94.14 CU.IN.

45 DEG. (NO COVERAGE)= 94.14/1083.75\*100=8.68%

60 DEG. (NO COVERAGE)= 67.44/1083.75\*100=6.22%

45 DEG. (COVERAGE)= 100-8.68=91.32%

60 DEG. (COVERAGE)=100-6.22=93.78%

DETERMINE TOTAL  
COVERAGE FOR  
WELD

0= 100%

45T=91.32%

45T=100

60T=93.78%

60T=100%

45Pcw=100%

45Pccw=100%

60Pcw=100%

60Pccw=100%

TOTAL =885.1

TOTAL AVERAGE=88.51/9

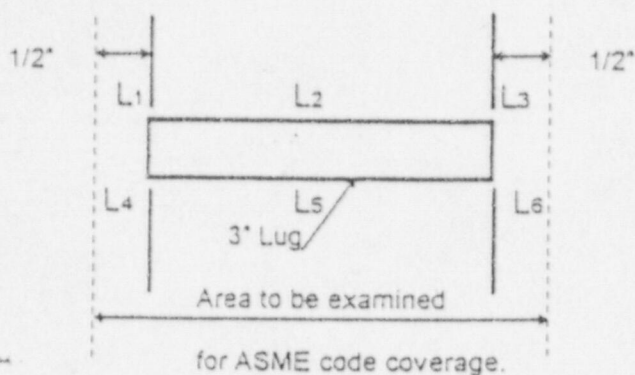
TOTAL AVERAGE=98.34%



ATTACHMENT 4

Examples for calculating code coverage when examining integral attachments:

EXAMPLE 1: Lug welded on Two sides!



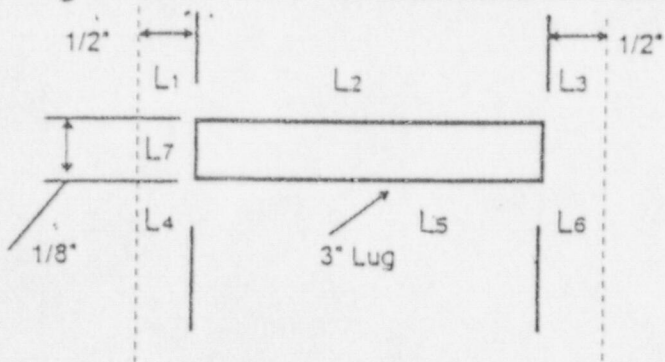
Hanger clamp around pipe on this side of Lug.

Total weld length to be examined =  $L_1 + L_2 + L_3 + L_4 + L_5 + L_6$   
 Total weld length to be examined =  $1/2 + 3 + 1/2 + 1/2 + 3 + 1/2 = 8"$

Total weld length inaccessible =  $L_3 + L_6$   
 Total weld length inaccessible =  $1/2 + 1/2 = 1"$

Therefore, 7 inches were examined out of 8 giving a "per-cent coverage" of  $7/8 = 87.5\%$

EXAMPLE 2: Lug welded on Three sides!



Clamp around pipe on this side of lug!

Total weld length to be examined =  $L_1 + L_2 + L_3 + L_7 + L_4 + L_5 + L_6$   
 Total weld length to be examined =  $1/2 + 3 + 1/2 + 1/8 + 1/2 + 3 + 1/2 = 8 \frac{1}{8}" (8.125")$

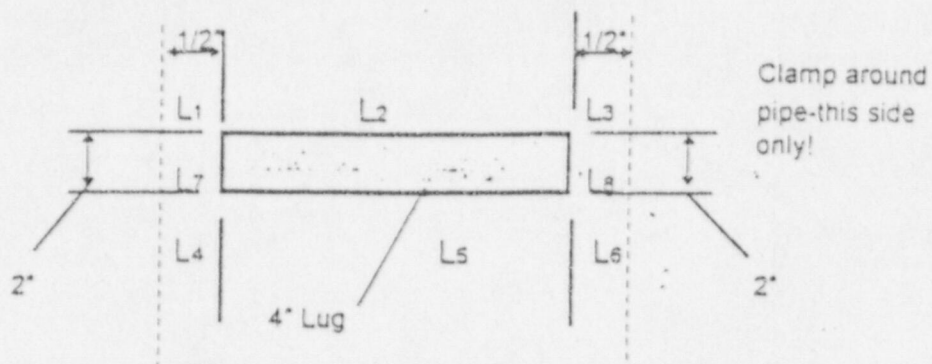
Total weld length inaccessible =  $L_3 + L_6$   
 Total weld length inaccessible =  $1/2 + 1/2 = 1"$

Therefore,  $8.125"$  were examined out of  $9"$  so code coverage is  $8.125/9 = 90.28\%$

ATTACHMENT 4A

Examples for calculating code coverage when examining integral attachments(cont.):

Example 3: Full penetration lugs



Total weld length to be examined =  $L_1 + L_2 + L_3 + L_7 + L_4 + L_5 + L_6 + L_8$

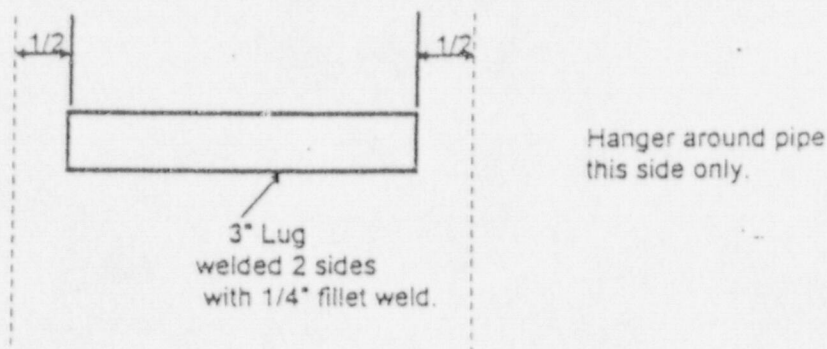
Total weld length to be examined =  $1/2 + 4 + 1/2 + 2 + 1/2 + 4 + 1/2 + 2 = 14"$

Total weld length inaccessible =  $L_3 + L_8 + L_6$

Total weld length inaccessible =  $1/2 + 2 + 1/2 = 3"$

Therefore, 11" were examined out of 14", so code coverage is  $11/14 = 78.57\%$

Example 4: Lug coverage computation using area versus length. Use measurements in example 1 above!



From first example, total length = 8"

The width of weld face for this example is .350" plus 1/2" above and below weld toes, for a total of 1.350" weld width.

The required area of examination is then 8 long x 1.350 wide = 10.8 sq. in.

The length inaccessible is ( $1/2 + 1/2 = 1"$  length) so total area that is inaccessible is 1" x 1.350" (width) = 1.350 sq. in.

Therefore, calculate code coverage by dividing total area examined (9.45 sq in) by total area which should be examined (10.8 sq. in.) equals 87.5%. Same as in first example using length.