



Northern States Power Company

Prairie Island Nuclear Generating Plant

1717 Wakonade Dr. East  
Welch, Minnesota 55089

January 31, 1995

10 CFR Part 50  
Section 50.55a

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

PRAIRIE ISLAND NUCLEAR GENERATING PLANT  
Docket Nos. 50-282 License Nos. DPR-42  
50-306 DPR-60

Steam Generator Weld Indication Evaluations

By letter dated December 30, 1994, we submitted for your review the results of analytical evaluations of flaws detected in #11 and #12 steam generators. These flaws were detected during inspections in accordance with ASME Boiler and Pressure Vessel Code Section XI. The evaluation results were submitted several months after the evaluations had been performed because we had just recently become aware of the Code requirement for submittal of the evaluations. In that submittal, we stated that we would complete a review of other inspections by January 31, 1995; if we determined that other evaluations would have required submittal, we would submit those at that time.

We have completed our review and determined that there are two additional flaws (one on steam generator #12 and the other on steam generator #22) that needed evaluation and need to be submitted. These evaluations are attached to this letter.

In addition, since the December 30, 1994 submittal, discussion with the NRR Project Manager for Prairie Island prompts us to submit two Westinghouse reports which are referenced by the flaw evaluation summaries. These attachments are handbooks on flaw evaluations for Prairie Island steam generators and pressurizers.

Please contact Jack Leveille (612-388-1121, Ext. 4662) if you have any questions related to this letter.

*Michael D. Wadley for*  
Roger O Anderson  
Director

Licensing and Management Issues

c: (see next page)

9502060211 950131  
PDR ADOCK 05000282  
P PDR

*Change NRC PR*  
*Mr. [unclear] [unclear] [unclear]*  
*APOL*  
*11*

USNRC  
January 31, 1995  
Page 2

**NORTHERN STATES POWER COMPANY**

c: Regional Administrator - Region III, NRC  
Senior Resident Inspector, NRC  
NRR Project Manager, NRC  
J E Silberg (w/o the WCAPs)

Attachments:

1. #12 Steam Generator Flaw Evaluation for ISI Report 94-0128, Prairie Island Unit 1, January 31, 1995 (19 pages)
2. #22 Steam Generator Flaw Evaluation for ISI Report 89-364, Prairie Island Unit 2, January 31, 1995 (24 pages)
3. Westinghouse WCAP 13032, Handbook on Flaw Evaluation, Prairie Island Units 1 and 2 Steam Generators, Upper Shell to Dome Weld Region, July 1991
4. Westinghouse WCAP-14166, Handbook on Flaw Evaluation for Prairie Island Units 1 and 2 Steam Generators and Pressurizer, January 1995

#12 Steam Generator Flaw Evaluation for ISI Report 94-0128

Prairie Island Unit 1

January 31, 1995

# ISI Flaw Disposition Worksheet

1. ISI Report Number - 0128 94-6710 (11)	2. Flaw Number 1	3. Item Number C140	14. Total Number of Pages 2
4. ISI Interval <input checked="" type="checkbox"/> OK Reviewer <input type="checkbox"/> second interval <input checked="" type="checkbox"/> third interval <input type="checkbox"/> preservice	5. Code Edition and Addenda <input checked="" type="checkbox"/> OK Reviewer <input type="checkbox"/> 80 W81 <input type="checkbox"/> 8; no addenda <input checked="" type="checkbox"/> 89 no addenda <input type="checkbox"/> other		
6. Acceptance Standard <input checked="" type="checkbox"/> OK Reviewer <input type="checkbox"/> IWB-3510 <input type="checkbox"/> IWB-3511 <input type="checkbox"/> IWB-3512 <input type="checkbox"/> IWB-3514 <input type="checkbox"/> IWB-3515 <input type="checkbox"/> IWB-3516 <input type="checkbox"/> IWB-3518 N/A <input type="checkbox"/> IWB-3522 <input type="checkbox"/> IWB-3523 <input type="checkbox"/> IWC-3510 <input type="checkbox"/> IWC-3511 <input type="checkbox"/> IWC-3512 <input type="checkbox"/> IWC-3513 <input type="checkbox"/> IWC-3514 <input type="checkbox"/> IWC-3515			

7. Calculations ☒ OK Reviewer

From Attached ISI Flaw String Worksheet:  $L = 1.125"$ ,  $a = 0.185"$   
 $t_{nom} = 3.68"$ ,  $S = 0.25"$

Refer to Attachment 1: Flaw Evaluation Chart

Verify  $\frac{2a}{t} \leq 0.25$   $\frac{S}{t} = \frac{0.9350}{3.68}$ ,  $\frac{a}{t} = \frac{0.185}{3.68}$   
 $\frac{2a}{t} = \frac{2 \cdot 0.185}{3.68} = 0.1005$   $\frac{S}{t} = 0.2541$   $\frac{a}{t} = 0.0503$   
 Ranges to 0.10 Ranges to 0.25 Ranges to 0.05  
 $0.10 \leq 0.25$  TRUE

Plot  $\frac{a}{t} = 0.05$  versus  $\frac{S}{t} = 0.25$  (see attached).

Since  $\frac{a}{t}$  vs  $\frac{S}{t}$  is within Acceptable Range

Flaw is Acceptable.

8. Results ☒ OK Reviewer

alt = NA  
 calculated a/t % = 5.0 %  
 Code allowable a/t % = NA  
 laminar flow surface area:  $(0.75 \cdot t \cdot w) = NA$

9. Table used for analysis ☒ OK Reviewer

NA

<input type="checkbox"/> IWB-3510-1	<input type="checkbox"/> IWB-3510-2	<input type="checkbox"/> IWB-3510-3	<input type="checkbox"/> IWB-3511-1	<input type="checkbox"/> IWB-3511-2	<input type="checkbox"/> IWB-3512-1
<input type="checkbox"/> IWB-3512-2	<input type="checkbox"/> IWB-3514-1	<input type="checkbox"/> IWB-3514-2	<input type="checkbox"/> IWB-3514-3	<input type="checkbox"/> IWB-3514-4	<input type="checkbox"/> IWB-3514-6
<input type="checkbox"/> IWB-3515-1	<input type="checkbox"/> IWB-3516-1	<input type="checkbox"/> IWB-3516-2	<input type="checkbox"/> IWB-3518-1	<input type="checkbox"/> IWB-3518-2	
<input type="checkbox"/> IWC-3510-1	<input type="checkbox"/> IWC-3510-2	<input type="checkbox"/> IWC-3510-3	<input type="checkbox"/> IWC-3511-1	<input type="checkbox"/> IWC-3511-2	<input type="checkbox"/> IWC-3512-2
<input type="checkbox"/> IWC-3513-1					

10. Was linear interpolation used? ☐ yes ☒ no If no, why? Not necessary

11. Was IWA-3200 Significant Digits For Limiting Values followed? ☒ yes ☐ no ☒ OK Reviewer If no, why?

12. The correct Code Edition and Addenda was available and used. ☐ yes Preparer ☒ OK Reviewer NA note

13. Statement of acceptability or rejectability with basis ☒ OK Reviewer

☒ Accept. ☐ (a/t) Code allowable  $\geq$  (a/t) calculated  
☐ Reject. ☐ (a/t) Code allowable  $<$  (a/t) calculated  
☒ OEM flaw evaluation handbook (see attached analysis)

15. Prepared by and date Kevin W. Mac 1.5.95 The results are correct and the methodology used is in accordance with applicable codes, standards, specifications and procedures.	16. Engineering review by and date JAW 17/95 This review assures that the results are correct and the methodology used is in accordance with applicable codes, standards, specifications and procedures.	17. Approved by and date J Rick 1/19/95 This approval assures that all involved with this flaw string and flaw disposition were aware of the necessity that the results and the methodology are correct and in accordance with applicable codes, standards, specifications and procedures.
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TAKEN FROM WAP 14166 (DRAFT)

ISI Flaw Disposition  
 RPT # 94-2216 (PI-1)  
 Flaw #1 - 0.128  
 Attachment 1 Page 108  
 Surface/Embedded  
 Flaw Demarkation  
 Line

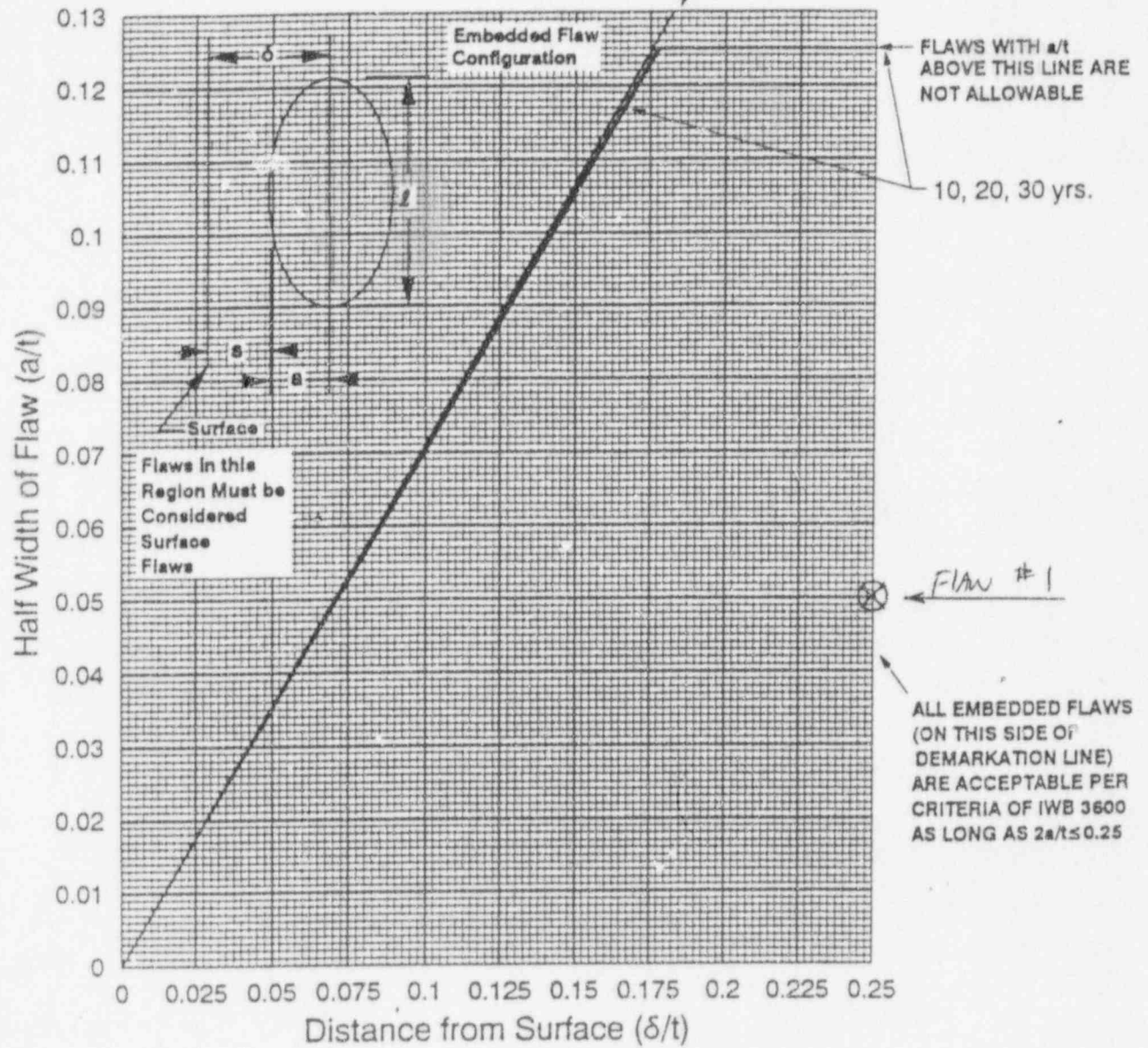


Figure A-6.4 Flaw Evaluation Chart for the Upper Shell-Cone Weld for Prairie Island Units 1 and 2

$\frac{X}{X}$	Inside Surface	$\frac{X}{X}$	Surface Flaw	$\frac{X}{X}$	Longitudinal Flaw
$\frac{X}{X}$	Outside Surface	$\frac{X}{X}$	Embedded Flaw	$\frac{X}{X}$	Circumferential Flaw

# ISI Flaw Disposition Worksheet

1. ISI Report Number 0128 4116  
P11 94-0210 1.2695  
 2. Flaw Number 1  
 3. Item Number C110  
 4. Total Number of Pages 1  
 4. ISI Interval ☒ OK Reviewer 1  
☐ second interval ☒ third interval ☐ preservice  
 5. Code Edition and Addenda ☒ OK Reviewer 1  
☐ 80 W81 ☐ 86 no addenda ☒ 89 no addenda ☐ other

6. Acceptance Standard  
☐ OK Reviewer  
☐ IWB-3510 ☐ IWB-3511 ☐ IWB-3512 ☐ IWB-3514 ☐ IWB-3515 ☐ IWB-3516 ☐ IWB-3518  
☐ IWB-3522 ☐ IWB-3523  
☒ IWC-3510 ☐ IWC-3511 ☐ IWC-3512 ☐ IWC-3513 ☐ IWC-3514 ☐ IWC-3515

7. Calculations ☒ OK Reviewer 1

From Attached ISI Flaw Sizing worksheet:  $L = 1.125"$ ,  $a = 0.185"$ ,  $t_{max} = 3.68"$   
 $S = 0.75"$ , Flaw Type = Subsurface Flaw  
 SA-533 Gr. A Cl. 1 = 50 Ksi Yield

$$\frac{S}{L} = \frac{0.185}{1.125} = 0.1644 \text{ Round to } 0.16$$

$$\frac{a}{t} \% = \frac{0.185}{3.68} \cdot 100 = 5.027 \text{ Round to } 5.0\% \quad Y = S/a = \frac{0.75}{0.185} = 4.05 > 1.0 \text{ Let } Y = 1.0$$

Linear Interpolation:

Round to

From Table IWC 3510-1 for Subsurface

$a/t$	$t = 2.5$	$t = 3.68$	$t = 4.0$	$a/t$
0.15	4.9		2.9	$5.06 \rightarrow 5.1\%$
0.16	5.1	2.4	3.0	$2.9 + \frac{0.16 - 0.15}{0.20 - 0.15} (3.3 - 2.9) = 2.98 \rightarrow 3.0$
0.20	5.7		3.3	$5.1 + \frac{3.68 - 2.5}{4.0 - 2.5} (5.0 - 5.1) = 3.44 \rightarrow 3.4$

Since  $a/t$  calculated is 5.0% is greater than  $a/t$  code allowable = 3.4% for  $t = 3.68$ ,  $a/t = 0.16$   
 This indication is Rejectable using This Method.

8. Results ☒ OK Reviewer 1

$a/t = 0.16$   
 calculated  $a/t \% = 5.0\%$   
 Code allowable  $a/t \% = 3.4\%$   
 laminar flaw surface area:  $(0.75 \cdot t \cdot w) = NA$

9. Table used for analysis ☒ OK Reviewer 1  
☐ IWB-3510-1 ☐ IWB-3510-2 ☐ IWB-3510-3 ☐ IWB-3511-1 ☐ IWB-3511-2 ☐ IWB-3512-1  
☐ IWB-3512-2 ☐ IWB-3514-1 ☐ IWB-3514-2 ☐ IWB-3514-3 ☐ IWB-3514-4 ☐ IWB-3514-6  
☐ IWB-3515-1 ☐ IWB-3516-1 ☐ IWB-3516-2 ☐ IWB-3518-1 ☐ IWB-3518-2  
☒ IWC-3510-1 ☐ IWC-3510-2 ☐ IWC-3510-3 ☐ IWC-3511-1 ☐ IWC-3511-2 ☐ IWC-3512-2  
☐ IWC-3513-1

10. Was linear interpolation used? ☒ yes ☐ no If no, why?

11. Was IWA-3200 Significant Digits For Limiting Values followed? ☒ yes ☐ no ☒ OK Reviewer 1 If no, why?

12. The correct Code Edition and Addenda was available and used. ☒ yes ☐ no ☒ OK Reviewer 1

13. Statement of acceptability or rejectability with basis ☒ OK Reviewer 1

☐ Accept. ☐ (a/t) Code allowable  $\geq$  (a/t) calculated  
☒ Reject. ☒ (a/t) Code allowable  $<$  (a/t) calculated  
☐ OEM flaw evaluation handbook (see attached analysis)

15. Prepared by and date 1.26.95 16. Engineering review by and date Jan 26 95 17. Approved by and date 1.26.95

The results are correct and the methodology used is in accordance with applicable codes, standards, specifications and procedures.

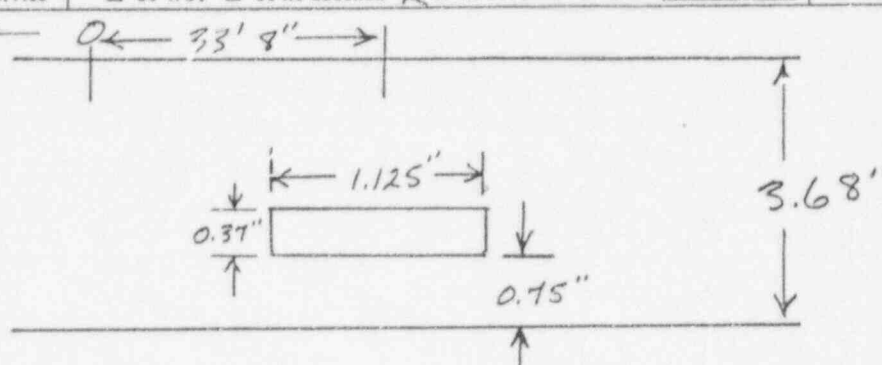
This review assures that the results are correct and the methodology used is in accordance with applicable codes, standards, specifications and procedures.

This approval assures that all involved with this flaw sizing and flaw disposition were aware of the necessity that the results and the methodology are correct and in accordance with applicable codes, standards, specifications and procedures.

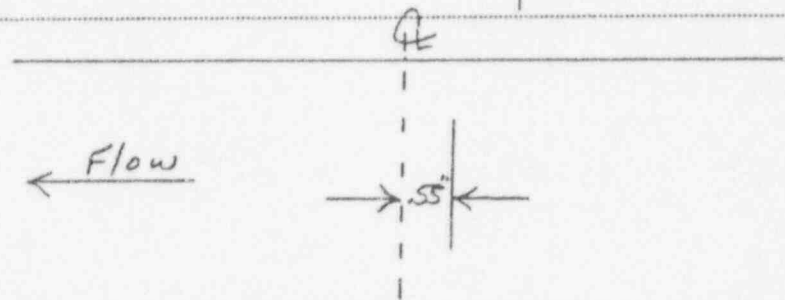
# ISI Flaw Sizing Worksheet

1. ISI Report Number 94-0128 2. Flaw Number 1 3. Item Number C1.10  
 4. ISI Interval ☒ OK Reviewer WJ 5. Code Edition and Addenda ☒ OK Reviewer WJ 6. Method ☒ UT ☐ RT  
☐ 2nd interval ☒ 3rd interval ☐ preservice ☐ 80 W81 ☐ 86 no addenda ☒ 89 no addenda ☐ other \_\_\_\_\_ ☐ PT ☐ MT

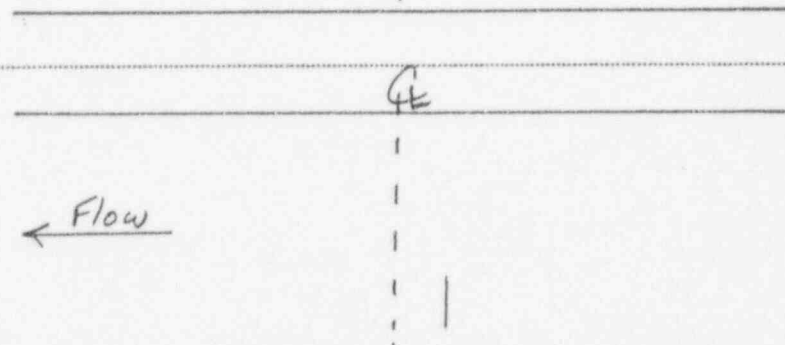
7. Flaw Sketch ☒ OK Reviewer WJ  
 Front View



Top View



Side View



8. Calculations ☒ OK Reviewer WJ  
 Show determination of surface or subsurface

*see attached*

Show determination of type of "a" to use

*see attached*

9. ISI-FE-1 Paragraph 7.0 "Rounding-Off Method" was used. ☒ yes Preparer TMJ ☒ OK Reviewer WJ

10. Code Flaw Dimensions ☒ OK Reviewer WJ  
 "t" = 1.125" "a" = 0.185" "t<sub>nominal</sub>" = 3.68" "t<sub>measured</sub>" = N/A "S" = 0.75" "W" = N/A

11. Flaw Type ☒ OK Reviewer WJ  
☐ Surface Planar (UT/RT) ☒ Subsurface Planar (UT/RT) ☐ Laminar (UT/RT) ☐ Linear (PT/MT/RT)

12. Flaw Characterization Figure ☒ OK Reviewer WJ  
☐ IWA-3310-1 ☐ IWA-3330-1 ☐ IWA-3350-1 ☐ IWA-3380-1 ☐ IWA-3400-1  
☒ IWA-3320-1 ☐ IWA-3340-1 ☐ IWA-3360-1 ☐ IWA-3390-1

13. Flaw Characterization Figure Number ☒ Flaw 1 ☐ Flaw 2 ☐ Flaw 3 ☐ Flaw 4 ☐ Flaw 5

14. Was IWA-3300 Flaw Characterization followed? ☒ yes ☐ no If no, why?

15. The correct Code Edition and Addenda was available and used. ☒ yes Preparer TMJ ☒ OK Reviewer WJ

16. Prepared by and date Tom Jandt 11/22/94 17. Review by and date W. Thomas 12/12/94

The results are correct and the methodology used is in accordance with applicable codes, standards, specifications and procedures. This review assures that the results are correct and the methodology used is in accordance with applicable codes, standards, specifications and procedures.

# Flaw Sizing Calculations for ISI RPT # 94-0128

For surface and subsurface single planar flaws oriented in plane normal to pressure retaining surface

ASME SECT XI 1989 W/ NO ADDENDA TM INITIAL TO VERIFY

ISI Report # 94-0128  
Indication # 1

Evaluation Performed By: TCM 6/21 Date: 11/22/94  
Reviewed By: [Signature] Date: 12/12/94  
WLT: TMC MAS

## Length

Length of the flaw "L" is determined by finding the difference between L1 and L2.

L1 and L2 are from page 4 of the UT report.

$$L = \frac{404.375}{33' 8.875"} (L2) - \frac{403.25}{33' 7.25"} (L1) = \underline{1.125} \text{ inches.}$$

## Thickness

Thickness of the component from nominal wall value.

This value is from page 1 of the UT report.

$$t = \underline{3.68} \text{ inches}$$

## Calibration

From the calibration report (WLT-011), the calibration was performed on a "T" = 3.50 inch thick block.

## Calculations

From page 4 of the UT report the flaw exhibited 50% Peak Amplitude (indication did not reach 50% DAC) at 5.551 and 5.94 inches of metal path at 5.00 and 5.75 inches from the weld center line respectively. A manual plot was made with this information which provided depths for these points as 0.75 and 1.12 inches from the inner surface.

- 1) Determine S in inches.  
S = 0.75 inches (as measured for 50% point closest to surface).
- 2) Determine 2a in inches.  
2a = 1.12 (inches depth at upper 50% pt.) - 0.75 (inches depth at lower 50% pt.) = 0.37 inches.

## Determination of surface or subsurface ("a" and "d" are equivalent)

$$0.4a = (2a / 2) * 0.4 = \underline{0.074}$$

Compare to S (from step 1).

If S is less than 0.4d, the flaw is surface. a = 2d + S = N/A inches.

If S is greater than or equal to 0.4a the flaw is sub-surface. a = 2a / 2 = 0.185 inches.

$$l = \underline{1.125} \text{ (for } a/l > 0.5, l = 2a)$$

$$a = \underline{0.185} \text{ (surf or sub surf circle one)}$$

$$t = \underline{3.68} \text{ (part "T")}$$

$$S = \underline{0.75}$$

NOTE: These values were derived without applying beam width correction.

## PI 1 Indication Review

Rpt # - 94-0128

Iso # - ISI-43A

Item # - W-F

Indication # - 1

New Iso # - ISI-43A

New Item # - W-F

Method - UT 60°

Procedure - NSP-UT-3 Rev 5

Code - ASME Sect XI '89 with No Addenda

### **Discussion -**

This indication is being re-evaluated in response to Audit No. 94-19-OUT, Finding 94-28 on Inappropriate Flaw Analysis for ISI. This action is taken to ensure correctness of the original disposition of this indication and to provide additional OJT for the M&SP personnel in performing flaw evaluations.

The indication was reported as a linear with a length of 1 1/8" and an amplitude of 30% DAC. This weld had been previously examined and reported on report #91-0164. There were no indications noted as a result of that examination. The requirements for recording of indications have become more stringent in the edition of the code required for the third interval. Due to the transition from the cone to the shell on this weld it was decided to use a beam plot to determine the dimensions of the indication for evaluation.

### **Assumptions -**

The evaluation that is provided does not take into account the effect of beam spread on sizing of indications. If this were factored into the calculations it would reduce the through wall dimension and also increase the "S" distance. Our approach is more conservative.

### **Code Requirements -**

ASME Sect XI IWA-2232 refers to Appendix 1 which refers to Sect V Art 4 with supplements. Supplement 10 deals with reporting criteria and requires that "Angle beam reflectors that produce a response greater than 20% of the reference level shall be investigated. The maximum amplitude, location, and extent of these reflectors shall be recorded. The operator shall determine whether the indication originates from a flaw or is a geometric indication in accordance with Supplement 11. When the reflector is determined to be a flaw, the acceptance standards of IWA-3000 apply".

### **Summary -**

The indication noted on this report exhibited an amplitude in excess of 20% of the reference level and requires evaluation to the code acceptance standards.

Prepared By Tam Jacob LV/III

Reviewed By [Signature]

W.L. THOMAS

1 of 3

09 3 of 3



Northern States Power Company Operations & Maintenance Supt Materials & Special Processes			Prairie Island Unit 1 60" ULTRASONIC EXAMINATION REPORT (3rd 10yr)			Report# 94-0128 Source Doc=C 1. 10 S/N 1071		
System STEAM GENERATOR #11		ISO ISI-43A		Item W-F		Item Description TRANSITION - SHELL		
Material <del>SA-533GAC2</del> / <del>SA-533GAC2</del> SA-533GAC2 / SA-533GAC2		Size/Length 175"Ø		Thick/Dia 3.680		Temp 90°F		Surface Condition BLENDED
Procedure ISI-UT-3 Rev 5 Field Change N/A				W R Number 9402190		ISI Contractor LMT		Exam Date 05/18/94
Calibration Report Nmbr WLT-011		Beam Angle 60° (Nominal)		Temp Gauge S/N NSP-030		Exam Start @ 0941 hours Exam End @ 1200 hours		
Evaluation Level 20% DAC		Reporting Level 20% DAC		Cal Block 26 Ref Std LMT-107		Ref Sensitivity 58 dB Scan Sensitivity 70 dB		

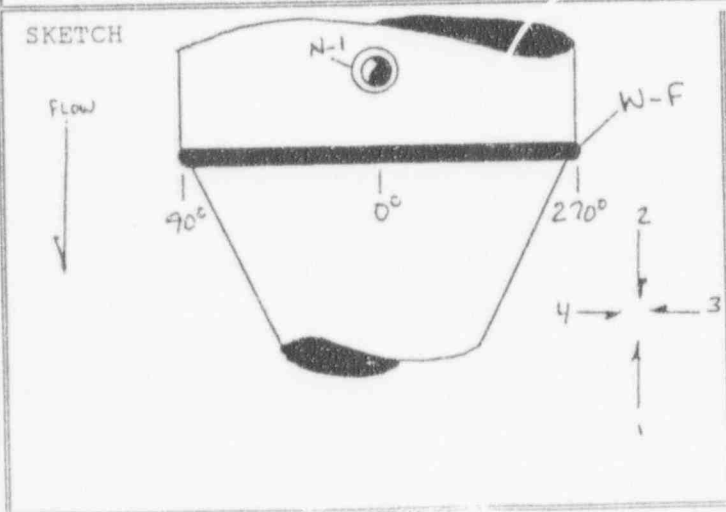
RESULTS NAD = No Apparent Discontinuities; L = Linear; S = Spot; M = Multiple  
GEO = Geometry Visual = Non-Section XI Visual Examination

Scan Nmbr	Res-ults	Indication Type	Sweep Loc'n	Metal Path	Surf Dist	Circ Location	Axial Location	Indication Length	Amp %DAC
1	IND	L	6.8	5.51	4.77	33' 8"	5.0	1-1/8"	30
2	NAD								
3	NAD								
4	NAD								

LIMITATIONS: 5"x8" WELDED PADS D.S. AT 5' 8", 17' 3", 18' 10" AND 14' 2"

REMARKS: E.J. PAVLIC, LEVEL I

Indication reviewed and found acceptable.  
Refer to attach #1.  
6/3/94



PERSONNEL	
Examiner: <u>[Signature]</u>	II Level
Examiner: <u>W.L. THOMAS</u>	II Level
Examiner: <u>[Signature]</u>	II Level
Examiner: <u>J.L. DIVERS</u>	II Level
Contractor Review: <u>[Signature]</u>	5/26/94 Date
NSP Review: <u>[Signature]</u>	6/18/94 Date
ANII Review: <u>[Signature]</u>	6/12/94 Date

Northern States Power Company Operations & Maintenance Supt Materials & Special Processes		Prairie Island Unit 1 60" ULTRASONIC EXAMINATION REPORT (3rd 10yr)		Report# 94-0128R1 Source Doc=C 1. 10 S/N 1071	
System STEAM GENERATOR #11		ISO ISI-43A		Item W-F	
Material SA-533GAC2 / SA-533GAC2		Size/Length 175"ø		Thick/Dia 3.680	
Temp N/A°F		Surface Condition N/A		Item Description TRANSITION - SHELL	
Procedure ISI-UT-3		Rev 5		Field Change N/A	
W R Number 9402190		ISI Contractor LMT		Exam Date 06/08/94	
Calibration Report Nmbr		N/A		Beam Angle N/° (Nominal)	
Temp Gauge S/N N/A		Exam Start @ N/A hours		Exam End @ N/A hours	
Evaluation Level N/A% DAC		Reporting Level N/A% DAC		Cal Block N/A	
Ref Std N/A		Ref Sensitivity N/A dB		Scan Sensitivity N/A dB	

RESULTS NAD = No Apparent Discontinuities; L = Linear; S = Spot; M = Multiple  
GEO = Geometry Visual = Non-Section XI Visual Examination

Scan Nmbr	Res- ults	Indication Type	Sweep Loc'n	Metal Path	Surf Dist	Circ Location	Axial Location	Indication Length	Amp %DAC
1	NAD								
2	NAD								
3	NAD								
4	NAD								

LIMITATIONS: NONE

REMARKS: SEE REMARKS ON ISI 3RD 10-YEAR REPORT #94-0128 FOR EVALUATION.

SKETCH

PERSONNEL

Examiner: \_\_\_\_\_ Level \_\_\_\_\_  
Examiner: \_\_\_\_\_ Level \_\_\_\_\_

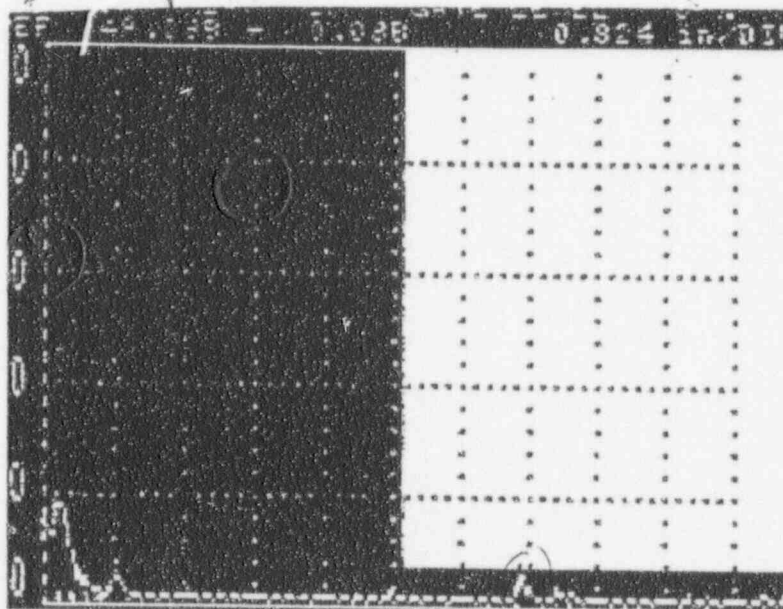
Contractor  
Review: N/A \_\_\_\_\_ Date 6/8/94  
NSP  
Review: [Signature] \_\_\_\_\_ Date 6/8/94  
ANII  
Review: [Signature] \_\_\_\_\_ Date 6/12/94



EXAMINATION PARAMETERS

EF 28.0dB - 0.0dB 0.824 10.000  
VEL 0.1268 in/s - WDR-2.25 THE 0H  
THICKNESS 8.500 in PULSER HIGH- 1500  
ZERO 15.800 in FULL WAVE  
DELAY 0.000 in PULSE-ECHO MODE  
ANGLE 60.0° BATTERY CHARGING  
GATE LEVEL GATE START GATE WIDTH  
13% ↓ 0.8868in 8.0858in

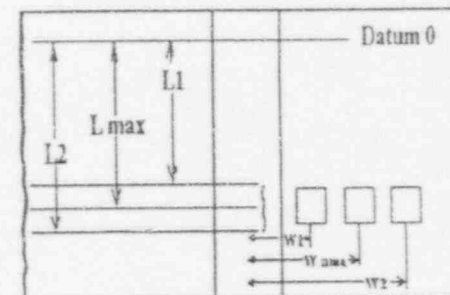
INDICATION # 1



## NSF

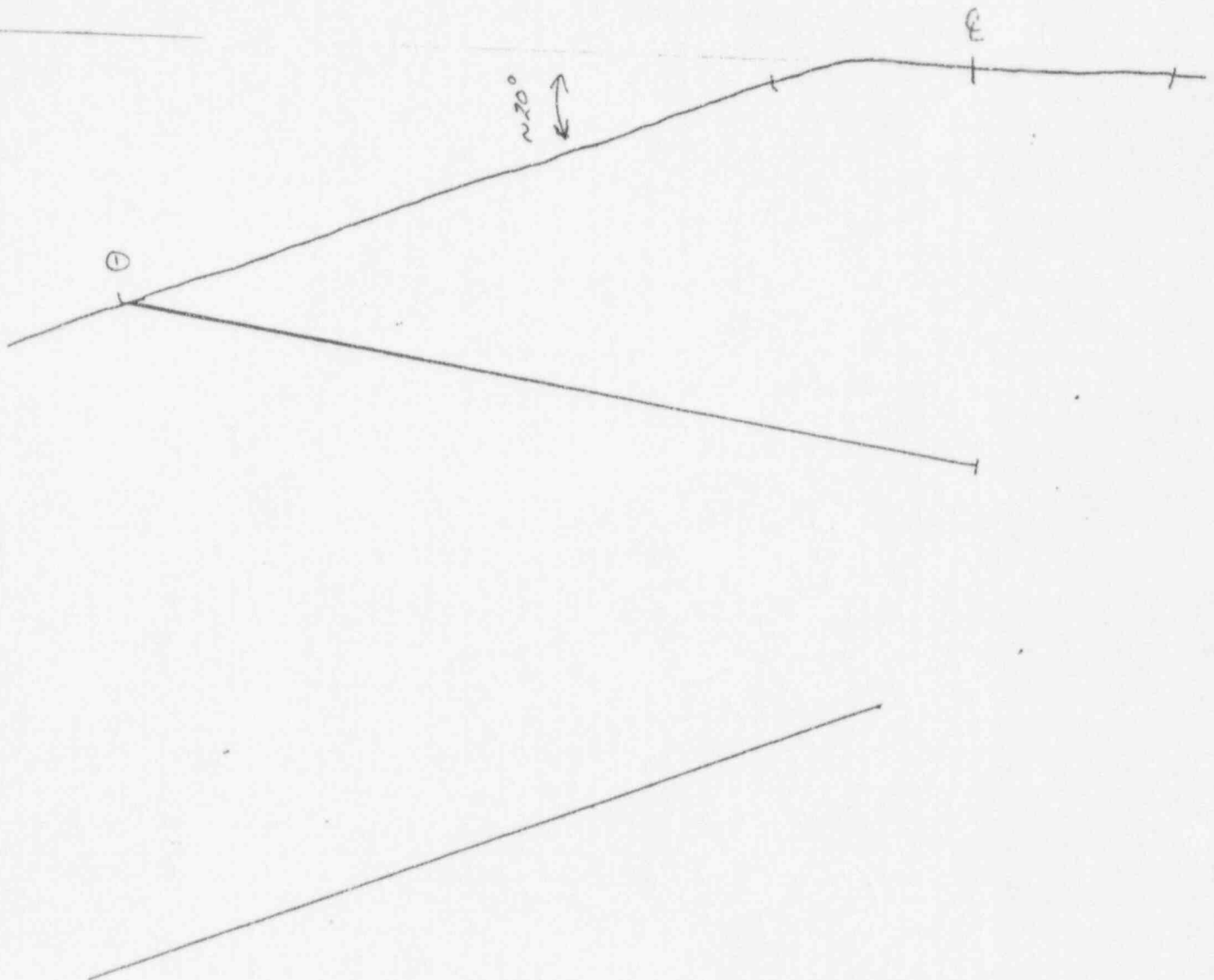
[illegible]

SEE ATTACHED

Date II

Date \_\_\_\_\_

SCALED PLOT



RPT #  
IND #

94-0128

1

REV 1 6/28/94

PLANAR FLAWSa/l (ASPECT) RATIO

## FOR ALL FLAWS

l = 1.13 = LENGTH OF THE FLAW AS DETERMINED BY FINDING  
THE DIFFERENCE BETWEEN L1 AND L2 (50% PTS FOR LENGTH)

## FOR SURFACE PENETRATING FLAWS

a = 0.00 = DISTANCE BETWEEN THE ID/OD SURFACE OF THE COMPONENT AND  
THE POINT OF MAX THROUGH-WALL PROPAGATION OF THE FLAW

a/l = 0.00 = THIS IS THE ASPECT RATIO FOR A SURFACE PENETRATING FLAW

## FOR NON-SURFACE PENETRATING FLAWS

S = 0.90 = SEPARATION DISTANCE BETWEEN THE ID/OD SURFACE AND  
THE CLOSEST APPROACH OF THE FLAW

2d = 0.21 = THROUGH WALL DIMENSION OF A NON-SURFACE  
PENETRATING FLAW

DETERMINATION OF SURFACE vs SUBSURFACE

PRODUCT 0.04 = DIVIDE 2d BY 2 AND THEN MULTIPLY QUOTIENT BY 0.4

a = N/A = IF 'S' IS LESS THAN PRODUCT ABOVE THEN FLAW IS SURFACE  
- ADD 2d TO S

a = 0.10 = IF 'S' IS GREATER THAN PRODUCT ABOVE THEN FLAW IS  
SUB-SURFACE - (2a = 2d) DIVIDE 2a BY 2

a/l = 0.09 = THIS IS THE ASPECT RATIO FOR A SUB-SURFACE FLAW

a/t RATIO

THE ASPECT RATIO IS APPLIED TO THE APPROPRIATE SECT XI TABLE AND THE  
ALLOWABLE a/t PERCENTAGE IS DETERMINED FOR THE SUBJECT FLAW

t = 3.68 = NOMINAL (OR ACTUAL) THICKNESS OF THE COMPONENT

a = 0.10 = EFFECTIVE THROUGH-WALL DIMENSION AS DETERMINED  
FOR THE TYPE OF FLAW ABOVE

a/t% = 2.72 = DIVIDE EFFECTIVE THROUGH-WALL DIMENSION (a) BY THE  
NOMINAL (OR ACTUAL) THICKNESS OF THE COMPONENT


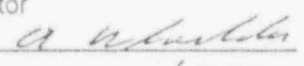
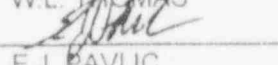

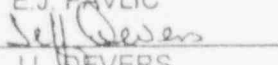

2.815. a/t% ALLOWED BY USE OF LINEAR INTERPOLATION

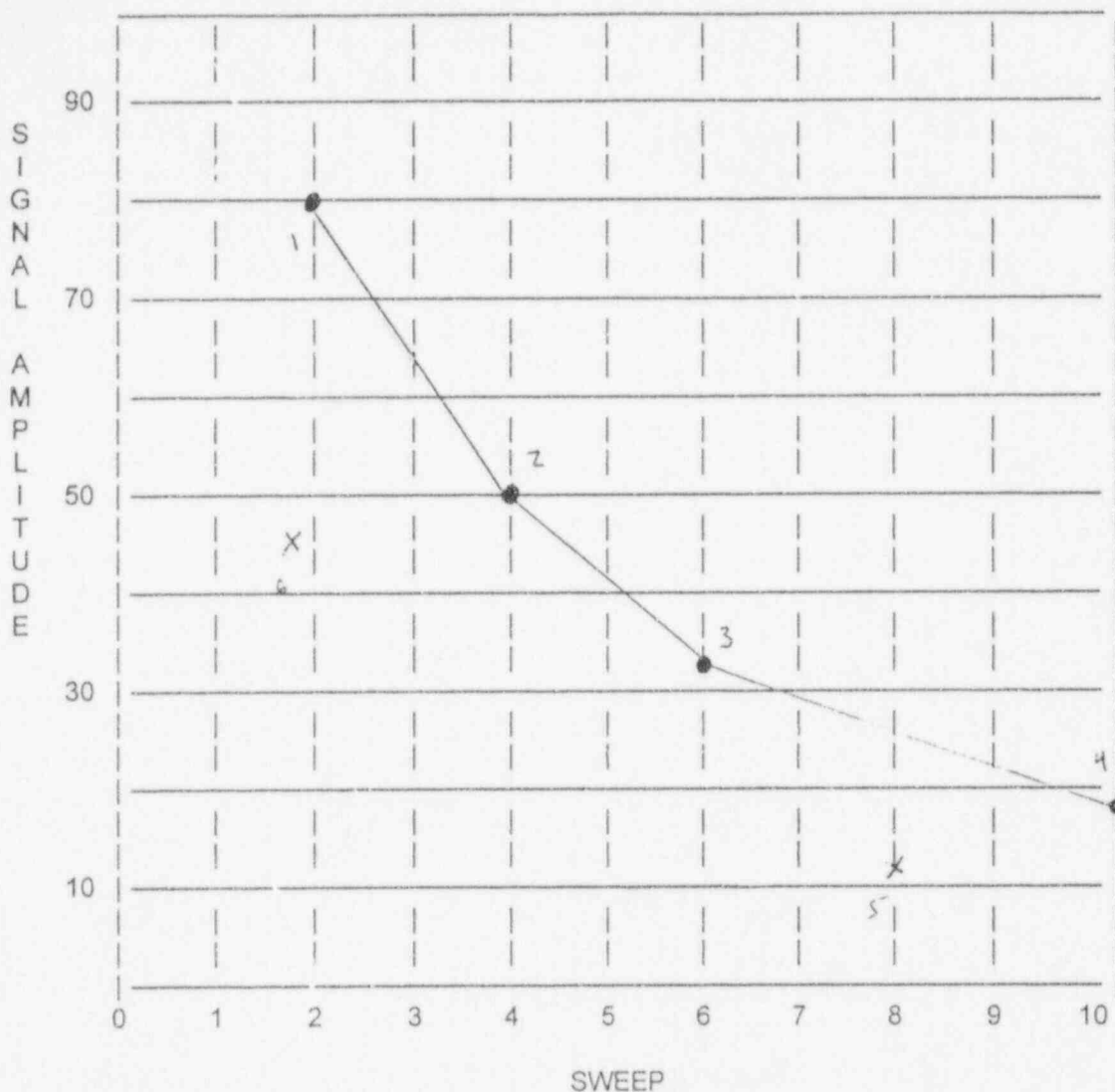
REPORT # 94-0128  
PAGE 6 of 6

*Van Jaars, Reviewed Bracciano - Mailbox 6/28/94*

*CPL 6-29-94*

*New Review  
J.D. Tidd*

Northern States Power Company Operations & Maintenance Support Materials & Special Processes			Ultrasonic Calibration Report				Calibration Number WLT-011 Date: 05/18/94				
Procedure ISI-UT-3      Rev 5      Field Change N/A			ISI Contractor LMT		Initial Cal @ 0801 hrs Check @ 0941 hrs Check @ N/A    hrs Check @ N/A    hrs Check @ N/A    hrs Final Check @ 1630 hrs						
Calibration Block Serial Number 26 Material: C/S Temperature 65°F			Type BASIC Size 6"    Thickness 3.50 Entry Surface N/A								
Reference Block Serial Number LMT-107    Type ROMPAS Temperature 65°F											
Ultrasonic Instrument Manufacturer PANAMETRICS Serial Number 91042006					Model EPOCH 2100 Recalibration Due 7/13/94						
Search Units											
S/N	Angle	Freq	Wave Mode	Mfr	Size	Index-Nose	Wedge Mfr				
R5239	60	2.25	SHEAR	HARISONIC	1"x.5"	N/A	HARISONIC				
N/A	N/A	N/A	N/A	N/A	N/A	/NA	N/A				
Refracted Angle in:			SU#1	SU#2	Search Unit Cable			Temperature			
Calibration Block			58	N/A	Type RG-174			Gauge S/N			
Reference Standard			58	N/A	Length 24'			NSP-030			
						Connectors 1					
AMPLITUDE LINEARITY (Signal 2 shall equal 50% of Signal 1, $\pm 5\%$ F.S.H.)											
Signal 1	(Set)	100	90	80	70	60	50	40	30	20	10
Signal 2	(Read)	50	45	40	35	30	25	20	15	10	5
AMPLITUDE CONTROL ACCURACY											
Amplitude Setting, % F.S.H./db Change			80 / -6		80 / -12		40 / +6		20 / +12		
Acceptable Range, % F.S.H.			32 to 48		16 to 24		64 to 96		64 to 96		
Actual, % F.S.H.			40		20		80		80		
Status Display											
Reject 0 %						Sweep .824 in/div					
Gain/Sensitivity 49.0 dB						Zero 15.300 $\mu$ sec					
Delay 0.00 in						Damping 150 $\Omega$					
Filter 2.25 Mhz						Energy HIGH					
Gate Start 0.886 in						FULL WAVE (Detector)					
Gate Width 8.085 in						P/E Mode					
Gate Level 20.0 %						60.0 (Angle) / 3.50 in (Thick)					
Velocity .1268 in/ $\mu$ sec											
Beam Spread. (UT-3, UT-3A, only) YES					Signal to Noise Ratio (UT-16 only) N/A						
REMARKS: NONE											
PERSONNEL					REVIEW						
Examiner			<u>II</u>		Contractor						
	W.L. THOMAS		Level		Review			5/26/94			
Examiner			<u>I</u>		NSP						
	E.J. PAVLIC		Level		Review			5/26/94			
Examiner			<u>II</u>		ANII						
	J.L. DEVERS		Level		Review			6/2/94			
Examiner	N/A		Level								



Reflector Number	1	2	3	4	5	6	7
Identification	1/4T	1/2T	3/4T	5/4T	PLANAR	ROMPAS SDH	N/A
Amplitude (% fsh)	80	50	32	18	12	45	N/A
Sweep	2.0	4.0	6.0	10.0	8.0	1.8	N/A
Metal Path	1.688	3.297	4.985	8.338	6.594	1.483	N/A
Surface Distance	1.460	2.852	4.312	7.212	5.704	1.283	N/A



Northern States Power Company Operations & Maintenance Support Materials & Special Processes				Ultrasonic Calibration Report Beam Spread			Calibration Report Number WLT-011		
<p style="text-align: center;">Beam Spread Data Surface Distance, Range, Metal Path, at:</p>									
Reflector	Leading Surf	(50% Maximum) Sweep	M. P.	Maximum Amplitude\			Trailing Surf	(50% Maximum) Sweep	M. P.
T/4	1.692	2.3	1.957	1.460	2.0	1.688	1.208	1.7	1.396
2T/4	3.249	4.4	3.757	2.852	4.0	3.297	2.553	3.7	2.952
3T/4	4.630	6.5	5.353	4.312	6.0	4.958	3.798	5.5	4.576
PLANAR	6.062	8.5	7.008	5.704	8.0	6.594	5.272	7.4	6.095
5T/4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<p style="text-align: center;">Near / Far Surface Resolution Data</p>									
Near Surface (Rompas Block)				Amp		Sweep		M.P.	
"Near" Side-Drilled-Hole (~0.3" depth)				N/A		N/A		N/A	
"Far" Side-Drilled-Hole (~0.7" depth)				N/A		N/A		N/A	
<p style="text-align: center;">Straight Beam</p>									
Far Surface (Calibration Block)				Amp		Sweep		M.P.	
Notch				N/A		N/A		N/A	
Back Reflection				N/A		N/A		N/A	
<p style="text-align: center;">Angle Beam</p>									
Far Surface (Calibration Block)				Amp		Sweep		M.P.	
Clad Interface Side Drilled Hole				N/A		N/A		N/A	
<p>Estimate of Near Surface Resolution: N/A inches below front (entry) surface</p> <p>Estimate of Far Surface Resolution: N/A inches below front (entry) surface</p>									

# CALIBRATION PARAMETERS

REFLECTED 24V  
49.0000 + 0.0000  
LEVEL 0.1288 in  
THICKNESS 0.500 in  
ZERO 15.300 in  
DELAY 0.0000 in  
ANGLE 60.00  
GATE LEVEL - GATE START - GATE WIDTH  
20% 4.11 0.8868 in 3.0858 in

GENERAL COMPUTATION SHEET

Form 17-2494 (4-91)



Northern States Power Company

PROJECT UT Report # 94-0128

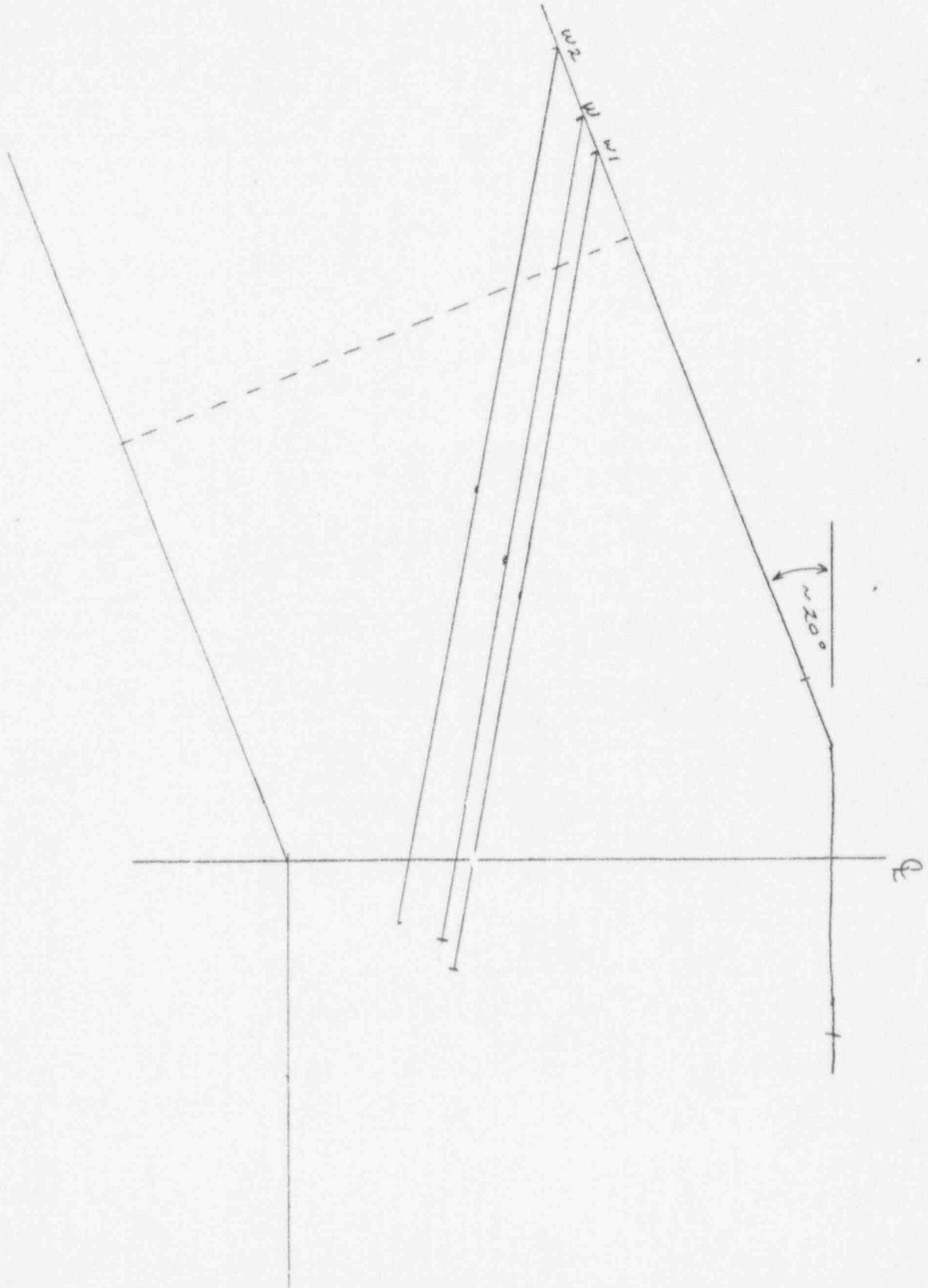
SUBJECT \_\_\_\_\_

E NO. \_\_\_\_\_

SHEET NO \_\_\_\_\_ OF \_\_\_\_\_

DATE \_\_\_\_\_

COMP. BY \_\_\_\_\_ C'K'D BY \_\_\_\_\_



#22 Steam Generator Flaw Evaluation for ISI Report 89-364

Prairie Island Unit 2

January 31, 1995

## PI 2 Indication Review

Rpt # - 89-364

Iso # - 2-ISI-37

Item # - W-A (12' to 22' 3")

Indication # - 1 through 4

New Iso # - 2-ISI-37B

New Item # - W-A

Method - UT 60°

Procedure - NSP-UT-3 Rev 4 w/FC-1

Code - ASME Sect XI '80 through Winter '81

### **Discussion -**

These indications are being re-evaluated in response to Audit No. 94-19-OUT, Finding 94-28 on Inappropriate Flaw Analysis for ISI. This action is taken to ensure correctness of the original disposition of this indication and to provide additional OJT for the M&SP personnel in performing flaw evaluations.

The three indications were reported as "Linear". The maximum amplitudes for these indications were 40%, 20%, 45% and 40% of DAC respectively. The depth of these was approximately 28%, 31%, 43% and 28% respectively from the O. D.

### **Assumptions -**

None

### **Code Requirements -**

ASME Sect XI IWA-2232 (a) references ASME Sect V Article 4 for conduct of the examination. Paragraph T-441.8 (a) states "Record all reflectors that produce a response equal to or greater than 50% of the distance-amplitude correction (DAC)" and "Record surface reflectors that produce a response equal to or exceeding the calibration amplitude established per T-432.3.1 (d)". The last is a reference to the amplitude of the notch in the far surface of the calibration block.

### **Summary -**

The indications (1 through 4) noted on report #89-364 are not surface related and therefore the requirements for recording in relation to the DAC apply. These indications are acceptable and require no further evaluation.

**Calculations -** From calibration report KJL-001 the ID notch is at 8.3 screen divisions and 11.33" metal path with a measured angle of 61 deg in the cal block.

Ind #1 -  $\cos 61 \text{ deg} = 0.4848$        $0.4848 * 3.02" \text{ MP} = \underline{1.4641" \text{ depth from outer surface}}$   
 $1.4641" / 5.312" = 0.2756 \text{ or } \underline{27.56\% \text{ depth}}$


Ind #2 -  $\cos 61 \text{ deg} = 0.4848$        $0.4848 * 3.36" \text{ MP} = \underline{1.6289" \text{ depth from outer surface}}$   
 $1.6289" / 5.312" = 0.3066 \text{ or } \underline{30.66\% \text{ depth}}$

Ind #3 -  $\cos 61 \text{ deg} = 0.4848$        $0.4848 * 4.67" \text{ MP} = \underline{2.2640" \text{ depth from outer surface}}$   
 $2.2640" / 5.312" = 0.4262 \text{ or } \underline{42.62\% \text{ depth}}$

## PI 2 Indication Review

Ind #4 -  $\cos 61 \text{ deg} = 0.4848$        $0.4848 * 3.02" \text{ MP} = \underline{1.4641" \text{ depth from outer surface}}$   
 $1.4641" / 5.312" = 0.2756 \text{ or } \underline{27.56\% \text{ depth}}$

Prepared By Tom Jones Lvl II

Reviewed By   
12/21/94

ISI Flaw Disposition Worksheet					
1. ISI Report Number <u>P12 87-364</u>		2. Flaw Number <u>5</u>		3. Item Number <u>B 2.40</u>	
4. ISI Interval <input checked="" type="checkbox"/> OK Reviewer <u>[Signature]</u> <input checked="" type="checkbox"/> second interval <input type="checkbox"/> third interval <input type="checkbox"/> preservice		5. Code Edition and Addenda <input checked="" type="checkbox"/> OK Reviewer <u>[Signature]</u> <input type="checkbox"/> JWB1 <input type="checkbox"/> 86 no addenda <input type="checkbox"/> 89 no addenda <input checked="" type="checkbox"/> other <u>N/A</u>			
6. Acceptance Standard <u>N/A</u> <input checked="" type="checkbox"/> OK Reviewer <u>[Signature]</u> <input type="checkbox"/> IWB-3510 <input type="checkbox"/> IWB-3511 <input type="checkbox"/> IWB-3512 <input type="checkbox"/> IWB-3514 <input type="checkbox"/> IWB-3515 <input type="checkbox"/> IWB-3516 <input type="checkbox"/> IWB-3518 <input type="checkbox"/> IWB-3512 <input type="checkbox"/> IWB-3523 <input type="checkbox"/> IWB-3512 <input type="checkbox"/> IWB-3513 <input type="checkbox"/> IWB-3514 <input type="checkbox"/> IWB-3515 <input type="checkbox"/> IWC-3510 <input type="checkbox"/> IWC-3511 <input type="checkbox"/> IWC-3512 <input type="checkbox"/> IWC-3513 <input type="checkbox"/> IWC-3514 <input type="checkbox"/> IWC-3515					
7. Calculations <input checked="" type="checkbox"/> OK Reviewer <u>[Signature]</u>					
<p>From Attached ISI Flaw Sizing worksheet: <math>L = 0.7402</math>, <math>q = 0.3201</math>  <math>t_{min} = 5.312</math>, <math>S = 0.0027</math></p> <p>Refer to Attached Flaw Evaluation chart: Flaw type = <u>Surface planar</u></p> <p><math>\frac{q}{L} = \frac{0.3201}{0.7402} = 0.5000</math> Rounded to <u>0.50</u></p> <p><math>\frac{q}{t} \% = \frac{0.3201}{5.312} \cdot 100 = 6.9672</math> Rounded to <u>7.0 %</u></p> <p>Plot of <math>\frac{q}{t} \%</math> versus <math>\frac{q}{L}</math> using values above (see Attached).</p> <p>Plot of <math>\frac{q}{t} = 7.0 \%</math> versus <math>\frac{q}{L} = 0.50</math> is within <u>Sub-3600</u> Acceptable region.</p>					
8. Results <input checked="" type="checkbox"/> OK Reviewer <u>[Signature]</u>					
$a/t = 0.50$ calculated $a/t \% = 7.0 \%$ Code allowable $a/t \% = N/A$ laminar flow surface area: $(0.75 \cdot t \cdot w) = N/A$					
9. Table used for analysis <input checked="" type="checkbox"/> OK Reviewer <u>[Signature]</u> <u>N/A</u> <input type="checkbox"/> IWB-3510-1 <input type="checkbox"/> IWB-3510-2 <input type="checkbox"/> IWB-3510-3 <input type="checkbox"/> IWB-3511-1 <input type="checkbox"/> IWB-3511-2 <input type="checkbox"/> IWB-3512-1 <input type="checkbox"/> IWB-3512-2 <input type="checkbox"/> IWB-3514-1 <input type="checkbox"/> IWB-3514-2 <input type="checkbox"/> IWB-3514-3 <input type="checkbox"/> IWB-3514-4 <input type="checkbox"/> IWB-3514-6 <input type="checkbox"/> IWB-3515-1 <input type="checkbox"/> IWB-3516-1 <input type="checkbox"/> IWB-3516-2 <input type="checkbox"/> IWB-3518-1 <input type="checkbox"/> IWB-3518-2 <input type="checkbox"/> IWB-3518-3 <input type="checkbox"/> IWC-3510-1 <input type="checkbox"/> IWC-3510-2 <input type="checkbox"/> IWC-3510-3 <input type="checkbox"/> IWC-3511-1 <input type="checkbox"/> IWC-3511-2 <input type="checkbox"/> IWC-3512-2 <input type="checkbox"/> IWC-3513-1					
10. Was linear interpolation used? <input type="checkbox"/> yes <input checked="" type="checkbox"/> no If no, why? <u>Not necessary</u>					
11. Was IWA-3200 Significant Digits For Limiting Values followed? <input checked="" type="checkbox"/> yes <input type="checkbox"/> no <input checked="" type="checkbox"/> OK Reviewer <u>[Signature]</u> If no, why?					
12. The correct Code Edition and Addenda was available and used <input checked="" type="checkbox"/> yes <input type="checkbox"/> no <input checked="" type="checkbox"/> OK Reviewer <u>[Signature]</u> <input checked="" type="checkbox"/> N/A <u>[Signature]</u>					
13. Statement of acceptability or rejectability with basis <input checked="" type="checkbox"/> OK Reviewer <u>[Signature]</u>					
<input checked="" type="checkbox"/> <b>Accept.</b> <input type="checkbox"/> $(a/t)_{Code\ allowable} \geq (a/t)_{calculated}$ <input type="checkbox"/> <b>Reject.</b> <input type="checkbox"/> $(a/t)_{Code\ allowable} < (a/t)_{calculated}$ <input checked="" type="checkbox"/> OEM flaw evaluation handbook (see attached analysis)					
15. Prepared by and date <u>Kevin W. Mc</u> <u>01.09.95</u>		16. Engineering review by and date <u>[Signature]</u> <u>JAN 17 95</u>		17. Approved by and date <u>[Signature]</u> <u>1/19/95</u>	
<p>The results are correct and the methodology used is in accordance with applicable codes, standards, specifications and procedures.</p> <p>This approval assures that all involved with this flaw sizing and flaw disposition were aware of the necessity that the results and the methodology are correct and in accordance with applicable codes, standards, specifications and procedures.</p>					



# LEGEND

A - The 10, 20, 30 year acceptable flaw limits.

B - Within this zone, the surface flaw is acceptable by ASME Code analytical criteria in IWB-3600

C - ASME Code allowable since 1983 Winter Addendum

D - ASME Code allowable prior to 1983 Winter Addendum

SEE Flaw Disposition p.2  
Rept # 89-364, Flaw 5  
Attachment 1, Page 1 of 1

( $\frac{a}{t} = 2.0\%$ ,  $\frac{a}{l} = 0.50$ )

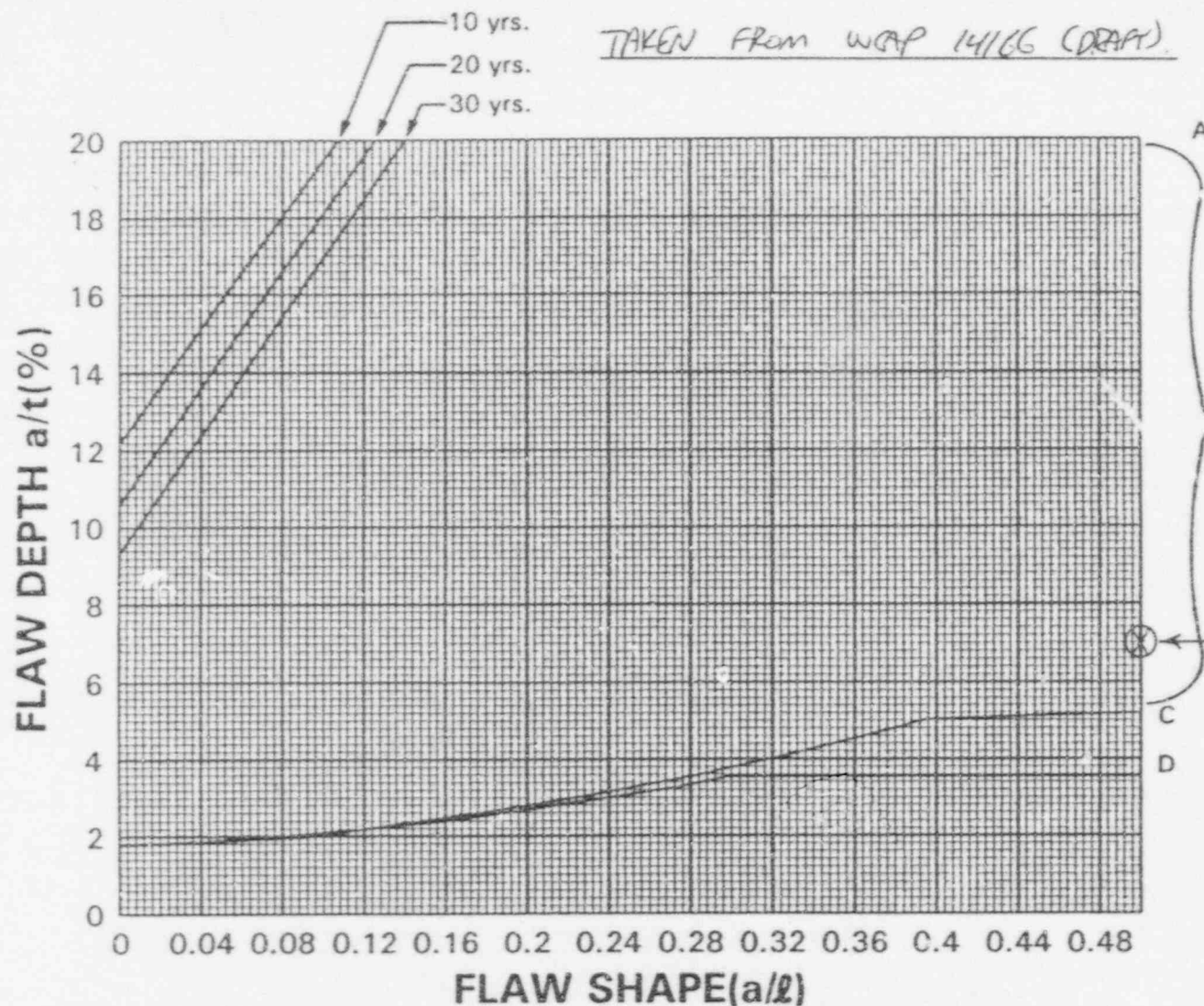


Figure A-2.2 Flaw Evaluation Chart for the Tubesheet Channel Head Junction for Prairie Island Units 1 and 2

X Inside Surface    X Surface Flaw    X Longitudinal Flaw  
— Outside Surface    — Embedded Flaw    X Circumferential Flaw  
 per telecon with Warren Easton  
 of Westinghouse on 01-17-95  
 JLM

# ISI Flaw Disposition Worksheet

1. ISI Report Number <b>FE 2 89-364</b>	2. Flaw Number <b>5</b>	3. Item Number <b>D 2.40</b>	14. Total Number of Pages <b>1</b>
4. ISI Interval <input checked="" type="checkbox"/> OK Reviewer <u>Mike</u> <input checked="" type="checkbox"/> second interval <input type="checkbox"/> third interval <input type="checkbox"/> preservice		5. Code Edition and Addenda <input checked="" type="checkbox"/> OK Reviewer <u>Mike</u> <input checked="" type="checkbox"/> 80 W81 <input type="checkbox"/> 86 no addenda <input type="checkbox"/> 89 no addenda <input type="checkbox"/> other	
6. Acceptance Standard <input checked="" type="checkbox"/> OK Reviewer <u>Mike</u> <input type="checkbox"/> IWB-3510 <input checked="" type="checkbox"/> IWB-3511 <input type="checkbox"/> IWB-3512 <input type="checkbox"/> IWB-3514 <input type="checkbox"/> IWB-3515 <input type="checkbox"/> IWB-3516 <input type="checkbox"/> IWB-3518 <input type="checkbox"/> IWB-3522 <input type="checkbox"/> IWB-3523 <input type="checkbox"/> IWC-3510 <input type="checkbox"/> IWC-3511 <input type="checkbox"/> IWC-3512 <input type="checkbox"/> IWC-3513 <input type="checkbox"/> IWC-3514 <input type="checkbox"/> IWC-3515			

7. Calculations ☒ OK Reviewer Mike

From ATTACHED F&F FLAW SIZING WORKSHEET  $l = 0.7402$   $a = 0.3701$   
 $c_{max} = 5.312$   $S = 0.0027$   
 FLAW TYPE = SURFACE PUNCTURE  
 SA-216 GR 602 - 40 KSI MIN YIELD  
 SA-508 CL 2 - 50 KSI MIN YIELD

$$\frac{a}{l} = \frac{0.3701}{0.7402} = 0.500 \text{ Round to } 0.50$$

$$\frac{a}{c} \% = \frac{0.3701}{5.312} = 0.0697 \text{ Round to } 7.0\%$$

$$Y = \frac{S}{a} = \frac{0.0027}{0.3701} = 0.0073$$

From TABLE RWB-3511-1

$\frac{a}{l}$	$\frac{a}{c} \%$
0.5	3.7

BY OBSERVATION  $\frac{a}{c} \%$  CODE ALLOWABLE IS LESS THAN  $\frac{a}{c} \%$  CALCULATION

THUS THE FLAW IS REJECTABLE BY CODE ALLOWABLE

8. Results ☒ OK Reviewer Mike

$$a/l = 0.50$$

$$\text{calculated } a/t \% = 7.0$$

$$\text{Code allowable } a/t \% = 3.7$$

$$\text{laminar flaw surface area: } (0.75 \cdot l \cdot w) = \text{NA}$$

9. Table used for analysis ☒ OK Reviewer Mike

<input type="checkbox"/> IWB-3510-1	<input type="checkbox"/> IWB-3510-2	<input type="checkbox"/> IWB-3510-3	<input checked="" type="checkbox"/> IWB-3511-1	<input type="checkbox"/> IWB-3511-2	<input type="checkbox"/> IWB-3512-1
<input type="checkbox"/> IWB-3512-2	<input type="checkbox"/> IWB-3514-1	<input type="checkbox"/> IWB-3514-2	<input type="checkbox"/> IWB-3514-3	<input type="checkbox"/> IWB-3514-4	<input type="checkbox"/> IWB-3514-6
<input type="checkbox"/> IWB-3515-1	<input type="checkbox"/> IWB-3516-1	<input type="checkbox"/> IWB-3516-2	<input type="checkbox"/> IWB-3518-1	<input type="checkbox"/> IWB-3518-2	
<input type="checkbox"/> IWC-3510-1	<input type="checkbox"/> IWC-3510-2	<input type="checkbox"/> IWC-3510-3	<input type="checkbox"/> IWC-3511-1	<input type="checkbox"/> IWC-3511-2	<input type="checkbox"/> IWC-3512-2
<input type="checkbox"/> IWC-3513-1					

10. Was linear interpolation used? ☐ yes ☒ no If no, why? BY OBSERVATION

11. Was IWA-3200 Significant Digits For Limiting Values followed? ☒ yes ☐ no ☒ OK Reviewer Mike If no, why?

12. The correct Code Edition and Addenda was available and used. ☒ yes Preparer Mike ☒ OK Reviewer Mike

13. Statement of acceptability or rejectability with basis ☒ OK Reviewer Mike

☐ Accept.

☒ Reject.

☐ (a/t) Code allowable  $\geq$  (a/t) calculated

☒ (a/t) Code allowable  $<$  (a/t) calculated

☐ OEM flaw evaluation handbook (see attached analysis)

15. Prepared by and date

16. Engineering review by and date

17. Approved by and date

Mike JAN 26 95  
 The results are correct and the methodology used is in accordance with applicable codes, standards, specifications and procedures.

Mike 1.26.95  
 This review assures that the results are correct and the methodology used is in accordance with applicable codes, standards, specifications and procedures.

Mike 1/26/95  
 This approval assures that all involved with the flaw sizing and flaw disposition were aware of the necessity that the results and the methodology are correct and in accordance with applicable codes, standards, specifications and procedures.

# ISI Flaw Sizing Worksheet

1. ISI Report Number <u>P12 89-364</u>	2. Flaw Number <u>5</u>	3. Item Number <u>B 2.40</u>
4. ISI Interval <input checked="" type="checkbox"/> OK Reviewer <u>WJS</u> <input type="checkbox"/> 2nd interval <input type="checkbox"/> 3rd interval <input type="checkbox"/> preservice	5. Code Edition and Addenda <input checked="" type="checkbox"/> OK Reviewer <u>WJS</u> <input checked="" type="checkbox"/> 80 W81 <input type="checkbox"/> 86 no addenda <input type="checkbox"/> 89 no addenda <input type="checkbox"/> other	6. Method <input checked="" type="checkbox"/> UT <input type="checkbox"/> RT <input type="checkbox"/> PT <input type="checkbox"/> MT

7. Flaw Sketch ☒ OK Reviewer WJS

Front View

Top View

Btm. Head

Side View

Btm. Head

8. Calculations ☒ OK Reviewer WJS

Show determination of surface or subsurface

see attached

Show determination of type of "a" to use

see attached

9. ISI-FE-1 Paragraph 7.0 "Rounding-Off Method" was used. ☒ Yes Preparer WJS ☒ OK Reviewer WJS

10. Code Flaw Dimensions ☒ OK Reviewer WJS

"l" = 0.7402 "a" = 0.3701 "t<sub>nominal</sub>" = 5.312 "t<sub>measured</sub>" = N/A "S" = 0.0027 "W" = N/A

11. Flaw Type ☒ OK Reviewer WJS

☒ Surface Planar (UT/RT) ☐ Subsurface Planar (UT/RT) ☐ Laminar (UT/RT) ☐ Linear (PT/MT/RT)

12. Flaw Characterization Figure ☒ OK Reviewer WJS

☒ IWA-3310-1 ☐ IWA-3330-1 ☐ IWA-3350-1 ☐ IWA-3380-1 ☐ IWA-3400-1  
☐ IWA-3320-1 ☐ IWA-3340-1 ☐ IWA-3360-1 ☐ IWA-3390-1

13. Flaw Characterization Figure Number ☐ Flaw 1 ☐ Flaw 2 ☒ Flaw 3 ☐ Flaw 4 ☐ Flaw 5

14. Was IWA-3300 Flaw Characterization followed? ☒ Yes ☐ No If no, why?

15. The correct Code Edition and Addenda was available and used. ☒ Yes Preparer WJS ☒ OK Reviewer WJS

16. Prepared by and date Tom Jones 12/7/94

17. Review by and date WJS 12/21/94

The results are correct and the methodology used is in accordance with applicable codes, standards, specifications and procedures.

This review assures that the results are correct and the methodology used is in accordance with applicable codes, standards, specifications and procedures.

# Flaw Sizing Calculations Using Metal Path for Fe Vessels $\geq 2"$

For surface and subsurface single planar flaws oriented in plane normal to pressure retaining surface

ASME SECT XI 1980 W/ ADDENDA THRU WINTER '81 <sup>9th</sup> INITIAL TO VERIFY

ISI Report # 89-364  
Flaw # 5

Evaluation Performed By: Tom Jones Date: 12/2/94  
Reviewed By: [Signature] Date: 12/11/94  
12/21/94

## Length

Length of the flaw "l" is determined by finding the difference between L1 and L2.

L1 and L2 are from page 4 of the UT report. (L max position is given, L1 & L2 are calculated based on L max being centered)  
 $l = \underline{1.6875} (L2) - \underline{1.3125} (L1) = \underline{0.375}$  inches.

## Thickness

Thickness of the component at the location of the flaw, using UT or nom wall (circle one).

This value is from page 1 of the UT report.

"t" = 5.312 inches (used in step 3 and step 6)

## Calibration

From the calibration report (KJL-001), the calibration was performed on a "T" = 5.550 inch thick block.

The ID notch was set at 11.33 inches metal path (used in step <sup>2</sup><sub>3</sub>)

## Calculations using metal path

From page 4 of the UT report the flaw exhibited 50% DAC at 11.60 and 10.85 inches MP. (Use of 50% DAC instead of 50% max amp for indications over 100% DAC is more conservative).

- 1) Determine the calibration block to part thickness ratio.

$$\underline{5.550} \text{ (calibration block thickness)} / \underline{5.312} \text{ (part thickness)} = \underline{1.0448}$$

- 2) Determine the thickness of the part in metal path.

$$\underline{11.33} \text{ (ID notch metal path)} / \underline{1.0448} \text{ (from step 1)} = \underline{10.8442} \text{ inches MP.}$$

- 3) Determine inches of metal path for equivalent inches of depth

$$\underline{10.8442} \text{ (part "t" in MP)} / \underline{5.312} \text{ (part "t" in inches)} = \underline{2.0415} \text{ inches of MP per inch of depth}$$

- \* 4) Determine the <sup>Lower</sup>upper depth of the flaw from the exam surface.

$$\underline{10.85} \text{ (metal path at 50% upper)} / \underline{2.0415} \text{ (from step 3)} = \underline{5.3147} \text{ inches depth. - } \underline{5.312} = 0.00 \text{ Part "t"}$$

- \* 5) Determine the <sup>Upper</sup>lower depth of the flaw from the exam surface.

$$\underline{11.60} \text{ (metal path at 50% lower)} / \underline{2.0415} \text{ (from step 3)} = \underline{5.6821} \text{ inches depth. - } \underline{5.312} = 0.370 \text{ Part "t"}$$

- 6) Determine S by picking the smaller of the following;

S = 0.0027 (result of 4) = distance between exam surface and the <sup>Lower</sup>upper flaw tip

>> OR <<

S = 5.312 (part "t") - 0.3701 (result of 5) = 4.9419 distance between the side opposite exam surface and the <sup>Lower</sup>upper flaw tip

- 7) Determine 2d in through wall thickness.

$$\underline{0.3701} \text{ (from step 5)} - \underline{0.0027} \text{ (from step 4)} = \underline{0.3674} \text{ inches.}$$

## Determination of surface or sub-surface

$$0.4d = (2d / 2) * 0.4 = \underline{0.0735}$$

Compare to S (from step 6)

If S is less than 0.4d, the flaw is surface. a = 2d + S = 0.3701 inches.

If S is greater than or equal to 0.4a the flaw is sub-surface. a = 2a / 2 = 1/1 inches.

$$l = \underline{0.7402} \text{ (for all } l > 0.5 \text{ (} l = 2a \text{))}$$

$$a = \underline{0.3701} \text{ (surf or sub surf, circle one)}$$

$$t = \underline{5.312} \text{ (part thickness)}$$

$$S = \underline{0.0027}$$

\* the indication is evident on the second leg of  
in conf

## PI 2 Indication Review

Rpt # - 89-364

Iso # - 2-ISI-37

Item # - W-A (12' to 22' 3")

Indication # - 5 & 6

New Iso # - 2-ISI-37B

New Item # - W-A

Method - UT 60°

Procedure - NSP-UT-3 Rev 4 w/FC-1

Code - ASME Sect XI '80 through Winter '81

### **Discussion -**

These indications are being re-evaluated in response to Audit No. 94-19-OUT, Finding 94-28 on Inappropriate Flaw Analysis for ISI. This action is taken to ensure correctness of the original disposition of this indication and to provide additional OJT for the M&SP personnel in performing flaw evaluations.

The indications were reported as "Linear". The maximum amplitudes for these indications were 75% and 75% of DAC respectively. In performing the evaluation it was noted that for indication #5 the movement of the indication on the baseline between 50% points was less than 2/3 the movement noted for the 2% notch during the calibration. Using the notch comparison would reduce the flaw through wall dimension (which was determined by calculations based on recorded metal path for the 50% points) by a factor of more than four.

### **Assumptions -**

None

### **Code Requirements -**

ASME Sect XI IWA-2232 (a) references ASME Sect V Article 4 for conduct of the examination. Paragraph T-441.8 (a) states "Record all reflectors that produce a response equal to or greater than 50% of the distance-amplitude correction (DAC)" and "Record surface reflectors that produce a response equal to or exceeding the calibration amplitude established per T-432.3.1 (d)". The last is a reference to the amplitude of the notch in the far surface of the calibration block.



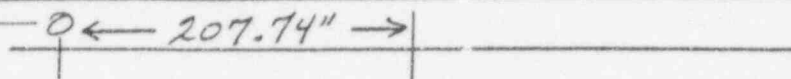
# ISI Flaw Disposition Worksheet

1. ISI Report Number <b>PIZ 89-364</b>		2. Flaw Number <b>6</b>		3. Item Number <b>B 2140</b>		14. Total Number of Pages <b>1</b>	
4. ISI Interval <input checked="" type="checkbox"/> OK Reviewer <u>the</u> <input checked="" type="checkbox"/> second interval <input type="checkbox"/> third interval <input type="checkbox"/> preservice				5. Code Edition and Addenda <input checked="" type="checkbox"/> OK Reviewer <u>the</u> <input checked="" type="checkbox"/> 80 W81 <input type="checkbox"/> 86 no addenda <input type="checkbox"/> 89 no addenda <input type="checkbox"/> other			
6. Acceptance Standard <input checked="" type="checkbox"/> OK Reviewer <u>the</u> <input type="checkbox"/> IWB-3510 <input checked="" type="checkbox"/> IWB-3511 <input type="checkbox"/> IWB-3512 <input type="checkbox"/> IWB-3514 <input type="checkbox"/> IWB-3515 <input type="checkbox"/> IWB-3516 <input type="checkbox"/> IWB-3518 <input type="checkbox"/> IWB-3522 <input type="checkbox"/> IWB-3523 <input type="checkbox"/> IWC-3510 <input type="checkbox"/> IWC-3511 <input type="checkbox"/> IWC-3512 <input type="checkbox"/> IWC-3513 <input type="checkbox"/> IWC-3514 <input type="checkbox"/> IWC-3515							
7. Calculations <input checked="" type="checkbox"/> OK Reviewer <u>the</u> <p>FROM ATTACHED ISI FLOWERING WORKSHEET</p> <div style="display: flex; justify-content: space-between;"> <div> <math display="block">\frac{a}{l} = \frac{0.1518}{0.5} = 0.3036 \text{ Round to } 0.30</math> <math display="block">\frac{a}{t} \% = \frac{0.1518}{5.312} = .0286 \text{ Round to } 2.9\%</math> </div> <div> <math display="block">l = 0.5 \quad a = 0.1518</math> <math display="block">t_{nom} = 5.312 \quad s = 0.5361</math> <p>FLAW TYPE = SUB SURFACE PLANE  SA-216 GR WCC - 40 KSF MIN YIELD  SA-508 CL 2 - 50 KSF MIN YIELD</p> </div> </div> <p>From TABLE IWB-3511-1</p> <div style="display: flex; justify-content: space-around;"> <div> <math display="block">\frac{a}{l} \quad \frac{a}{t} \%</math> <p>0.30    4.6</p> </div> <div> <math display="block">Y = \frac{s}{a} = \frac{0.5361}{0.1518} = 3.53 \therefore Y = 1.0</math> </div> </div> <p>BY OBSERVATION <math>\frac{a}{t}</math> CODE ALLOWABLE IS GREATER THAN <math>\frac{a}{t}</math> CALCULATED  THEREFORE INSPECTION IS ACCEPTABLE BY CODE ALLOWABLE.</p>							
8. Results <input checked="" type="checkbox"/> OK Reviewer <u>the</u> <div style="text-align: right;"> alt = <u>0.30</u>  calculated a/t % = <u>2.9</u>  Code allowable a/t % = <u>4.6</u>  laminar flow surface area: <math>(0.75 \cdot l \cdot w) =</math> <u>NA</u> </div>							
9. Table used for analysis <input checked="" type="checkbox"/> OK Reviewer <u>the</u> <input type="checkbox"/> IWB-3510-1 <input type="checkbox"/> IWB-3510-2 <input type="checkbox"/> IWB-3510-3 <input checked="" type="checkbox"/> IWB-3511-1 <input type="checkbox"/> IWB-3511-2 <input type="checkbox"/> IWB-3512-1 <input type="checkbox"/> IWB-3512-2 <input type="checkbox"/> IWB-3514-1 <input type="checkbox"/> IWB-3514-2 <input type="checkbox"/> IWB-3514-3 <input type="checkbox"/> IWB-3514-4 <input type="checkbox"/> IWB-3514-6 <input type="checkbox"/> IWB-3515-1 <input type="checkbox"/> IWB-3516-1 <input type="checkbox"/> IWB-3516-2 <input type="checkbox"/> IWB-3518-1 <input type="checkbox"/> IWB-3518-2 <input type="checkbox"/> IWB-3518-6 <input type="checkbox"/> IWC-3510-1 <input type="checkbox"/> IWC-3510-2 <input type="checkbox"/> IWC-3510-3 <input type="checkbox"/> IWC-3511-1 <input type="checkbox"/> IWC-3511-2 <input type="checkbox"/> IWC-3512-2 <input type="checkbox"/> IWC-3513-1							
10. Was linear interpolation used? <input type="checkbox"/> yes <input checked="" type="checkbox"/> no If no, why? <u>BY OBSERVATION</u>							
11. Was IWA-3200 Significant Digits For Limiting Values followed? <input checked="" type="checkbox"/> yes <input type="checkbox"/> no <input checked="" type="checkbox"/> OK Reviewer <u>the</u> If no, why?							
12. The correct Code Edition and Addenda was available and used. <input checked="" type="checkbox"/> yes Preparer <u>the</u> <input checked="" type="checkbox"/> OK Reviewer <u>the</u>							
13. Statement of acceptability or rejectability with basis <input checked="" type="checkbox"/> OK Reviewer <u>the</u> <div style="display: flex;"> <div style="flex: 1;"> <input checked="" type="checkbox"/> Accept.  <input type="checkbox"/> Reject. </div> <div style="flex: 2;"> <input checked="" type="checkbox"/> (a/t) Code allowable <math>\geq</math> (a/t) calculated  <input type="checkbox"/> (a/t) Code allowable <math>&lt;</math> (a/t) calculated  <input type="checkbox"/> OEM flaw evaluation handbook (see attached analysis) </div> </div>							
15. Prepared by and date <u>JM 2695</u>		16. Engineering review by and date <u>26091</u>		17. Approved by and date <u>1/26/95</u>			
The results are correct and the methodology used is in accordance with applicable codes, standards, specifications and procedures.		This review assures that the results are correct and the methodology used is in accordance with applicable codes, standards, specifications and procedures.		This approval assures that all involved with this flaw sizing and flaw disposition were aware of the necessity that the results and the methodology are correct and in accordance with applicable codes, standards, specifications and procedures.			

# ISI Flaw Sizing Worksheet

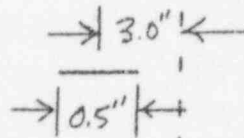
1. ISI Report Number <u>PI 2 89-364</u>	2. Flaw Number <u>6</u>	3. Item Number <u>B 2.40</u>
4. ISI Interval <input checked="" type="checkbox"/> OK Reviewer <u>W</u> <input checked="" type="checkbox"/> 2nd interval <input type="checkbox"/> 3rd interval <input type="checkbox"/> preservice	5. Code Edition and Addenda <input checked="" type="checkbox"/> OK Reviewer <u>W</u> <input checked="" type="checkbox"/> 80 W81 <input type="checkbox"/> 86 no addenda <input type="checkbox"/> 89 no addenda <input type="checkbox"/> other	6. Method <input checked="" type="checkbox"/> UT <input type="checkbox"/> RT <input type="checkbox"/> PT <input type="checkbox"/> MT

7. Flaw Sketch ☒ OK Reviewer W  
Front View



Top View

Btm. Head



Side View

Btm. Head



8. Calculations ☒ OK Reviewer W  
Show determination of surface or subsurface

see attached

Show determination of type of "a" to use

see attached

9. ISI-FE-1 Paragraph 7.0 "Rounding-Off Method" was used. ☒ yes Preparer W ☒ OK Reviewer W

10. Code Flaw Dimensions ☒ OK Reviewer W  
"t" = 0.5" "a" = 0.1518" "t<sub>nominal</sub>" = 5.312" "t<sub>measured</sub>" = N/A "S" = 0.5361 "W" = N/A

11. Flaw Type ☒ OK Reviewer W  
☐ Surface Planar (UT/RT) ☒ Subsurface Planar (UT/RT) ☐ Laminar (UT/RT) ☐ Linear (PT/MT/RT)

12. Flaw Characterization Figure ☒ OK Reviewer W  
☒ IWA-3310-1 ☐ IWA-3330-1 ☐ IWA-3350-1 ☐ IWA-3380-1 ☐ IWA-3400-1  
☒ IWA-3320-1 ☐ IWA-3340-1 ☐ IWA-3360-1 ☐ IWA-3390-1

13. Flaw Characterization Figure Number ☒ Flaw 1 ☐ Flaw 2 ☐ Flaw 3 ☐ Flaw 4 ☐ Flaw 5

14. Was IWA-3300 Flaw Characterization followed? ☒ yes ☐ no If no, why?

15. The correct Code Edition and Addenda was available and used. ☒ yes Preparer W ☒ OK Reviewer W

16. Prepared by and date

Tom Jones 12/7/94

17. Review by and date

12/14/94

The results are correct and the methodology used is in accordance with applicable codes, standards, specifications and procedures.

This review assures that the results are correct and the methodology used is in accordance with applicable codes, standards, specifications and procedures.



# Flaw Sizing Calculations Using Metal Path for Fe Vessels $\geq 2"$

For surface and subsurface single planar flaws oriented in plane normal to pressure retaining surface

ASME SECT XI 1980 W/ ADDENDA THRU WINTER '81 INITIAL TO VERIFY

ISI Report # 89-364  
Flaw # 10

Evaluation Performed By: T. J. Ladd Date: 12/2/94  
Reviewed By: [Signature] Date: 12/21/94

## Length

Length of the flaw "l" is determined by finding the difference between L1 and L2.  
L1 and L2 are from page 5 of the UT report. ( $L_{max}$  position is given. L1 & L2 position are  
 $l = \underline{3.25}$  (L2) - 2.75 (L1) = 0.5 inches. calculated based on  $L_{max}$  being centered)

## Thickness

Thickness of the component at the location of the flaw, using UT or nom wall (circle one).

This value is from page 1 of the UT report.

"t" = 5.312 inches (used in step 3 and step 6)

## Calibration

From the calibration report (KJL-001), the calibration was performed on a "T" = 5.550 inch thick block.

The ID notch was set at 11.33 inches metal path (used in step 2)

## Calculations using metal path

From page 5 of the UT report the flaw exhibited 50% DAC at 9.75 and 9.13 inches MP.  
(Use of 50% DAC instead of 50% max amp for indications over 100% DAC is more conservative).

- 1) Determine the calibration block to part thickness ratio.  
5.550 (calibration block thickness) / 5.312 (part thickness) = 1.0448
- 2) Determine the thickness of the part in metal path.  
11.33 (ID notch metal path) / 1.0448 (from step 1) = 10.8442 inches MP.
- 3) Determine inches of metal path for equivalent inches of depth  
10.8442 (part "t" in MP) / 5.312 (part "t" in inches) = 2.0415 inches of MP per inch of depth
- 4) Determine the upper depth of the flaw from the exam surface.  
9.13 (metal path at 50% upper) / 2.0415 (from step 3) = 4.4722 inches depth.
- 5) Determine the lower depth of the flaw from the exam surface.  
9.75 (metal path at 50% lower) / 2.0415 (from step 3) = 4.7759 inches depth.
- 6) Determine S by picking the smaller of the following;  
S = 4.4722 (result of 4) = distance between exam surface and the upper flaw tip  
    >> OR <<  
S = 5.312 (part "t") - 4.7759 (result of 5) = 0.5361 distance between the side opposite exam surface and the lower flaw tip
- 7) Determine 2d in though wall thickness.  
4.7759 (from step 5) - 4.4722 (from step 4) = 0.3037 inches.

## Determination of surface or subsurface

$$0.4d = (2d / 2) * 0.4 = \underline{0.607}$$

Compare to S (from step 6)

If S is less than 0.4d, the flaw is surface.  $a = 2d + S = \underline{N/A}$  inches.

If S is greater than or equal to 0.4a the flaw is sub-surface.  $a = 2a / 2 = \underline{0.1518}$  inches.

$$l = \underline{0.5} \text{ (for } a/t > 0.5, l = 2a)$$

$$a = \underline{0.1518} \text{ (surf or sub surf, circle one)}$$

$$t = \underline{5.312} \text{ (part thickness)}$$

$$S = \underline{0.5361}$$

## PI 2 Indication Review

Rpt # - 89-364

Iso # - 2-ISI-37

Item # - W-A (12' to 22' 3")

Indication # - 5 & 6

New Iso # - 2-ISI-37B

New Item # - W-A

Method - UT 60°

Procedure - NSP-UT-3 Rev 4 w/FC-1

Code - ASME Sect XI '80 through Winter '81

### **Discussion -**

These indications are being re-evaluated in response to Audit No. 94-19-OUT, Finding 94-28 on Inappropriate Flaw Analysis for ISI. This action is taken to ensure correctness of the original disposition of this indication and to provide additional OJT for the M&SP personnel in performing flaw evaluations.

The indications were reported as "Linear". The maximum amplitudes for these indications were 75% and 75% of DAC respectively. In performing the evaluation it was noted that for indication #5 the movement of the indication on the baseline between 50% points was less than 2/3 the movement noted for the 2% notch during the calibration. Using the notch comparison would reduce the flaw through wall dimension (which was determined by calculations based on recorded metal path for the 50% points) by a factor of more than four.

### **Assumptions -**

None

### **Code Requirements -**

ASME Sect XI IWA-2232 (a) references ASME Sect V Article 4 for conduct of the examination. Paragraph T-441.8 (a) states "Record all reflectors that produce a response equal to or greater than 50% of the distance-amplitude correction (DAC)" and "Record surface reflectors that produce a response equal to or exceeding the calibration amplitude established per T-432.3.1 (d)". The last is a reference to the amplitude of the notch in the far surface of the calibration block.



E NO. \_\_\_\_\_

SHEET NO. \_\_\_\_\_ OF \_\_\_\_\_

DATE \_\_\_\_\_

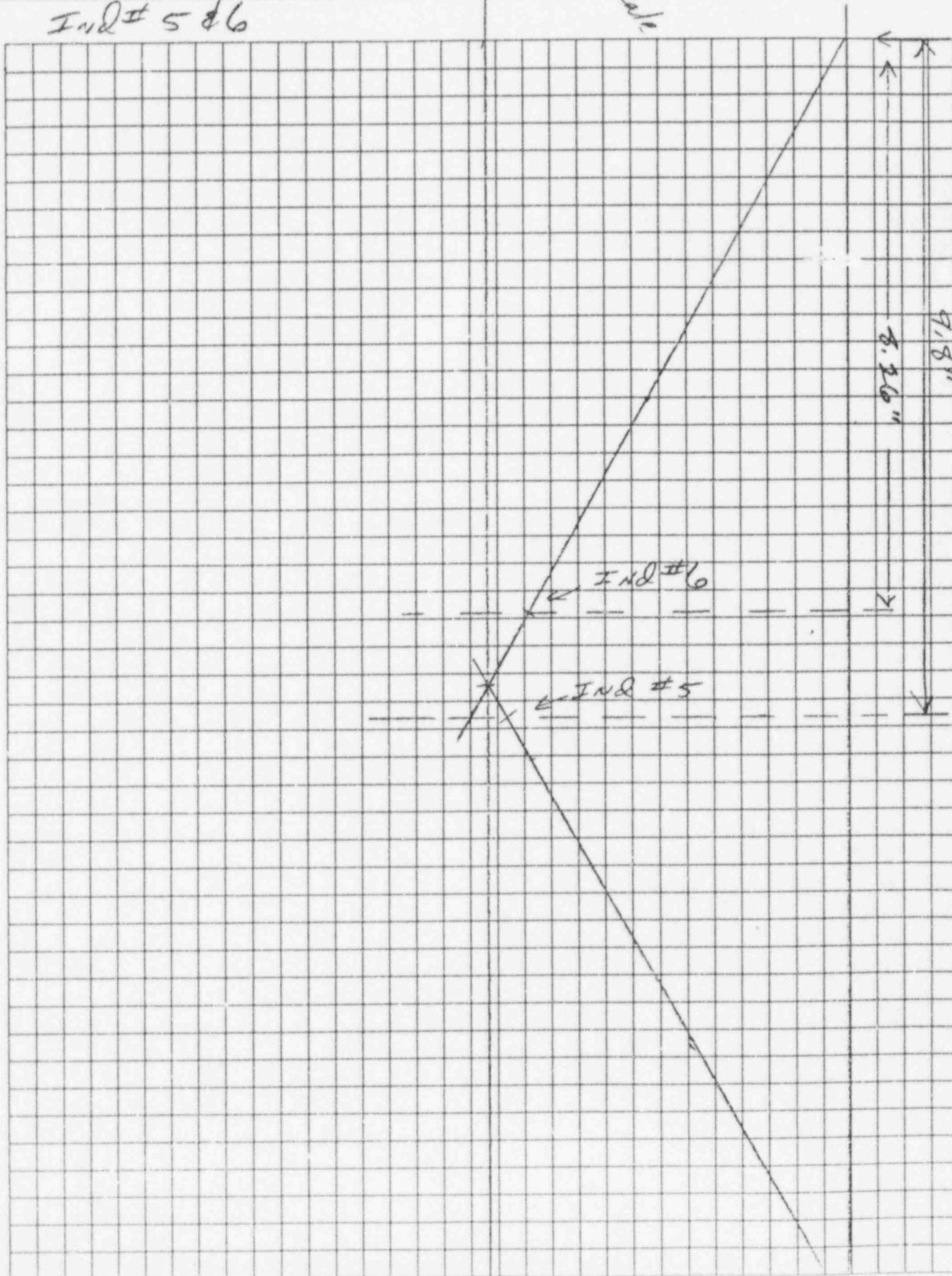
COMP. BY DRH C'K'D BY \_\_\_\_\_

PROJECT \_\_\_\_\_

SUBJECT \_\_\_\_\_

RPT 89-364  
IND # 5 & 6

1/2" Scale



NORTHERN STATES POWER COMPANY  
Power Production Department

REPORT  
NUMBER: 89-364

TURBINE SHOOT SA-508 CL2

HEAD SA-216 GRUCC ULTRASONIC EXAMINATION REPORT

System  
STEAM GENERATOR 22

ISO  
2-ISI-37

Item Ident  
W-A 12'-22'3"

Calib'n Report  
Number: KJL--001

Material  
~~SA-53360C1~~

Size

Thickness  
5.312

Exam  
From: 0D

Surf Type  
UNCLAD

Plant: PI UNIT II

Procedure # / Rev  
NSP-UT-3 / 4  
FCI

Beam Angle  
60 deg(Nom)

Surface Temp  
84 °F

Exam  
Company: LMT, Inc.

Evaluation Level  
20 % DAC

Reporting Level  
20 % DAC

Exam Start Time  
1100

W R  
Number: N1610-RC-Q

Cal Standard  
25A

Ref Standard  
404

Exam Finish Time  
1218

Exam  
Date: 04/12/89

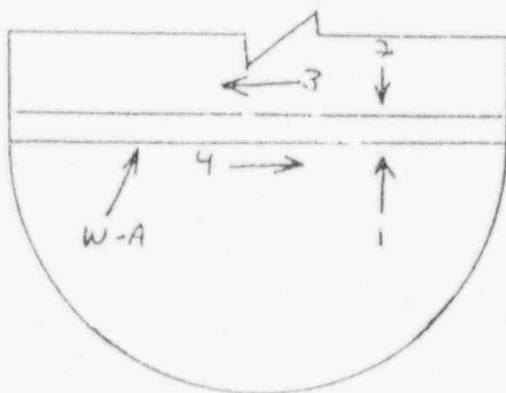
Description of Results at Reference Level: GEO = Geometry; IND = Indication  
L = Linear; M = Multiple; S = Spot; NAD = No Apparent Discontinuities.

Scan nmbr	Res- ults	Indication Type	Sweep Loc'n	Metal Path	"A" Dist	Max Amp	Location		Indication Length
							Circ.	Axial	
1	NAD								
2	NAD								
3	IND	LINEAR	2.2	3.02	1.65	40	16'	-2.5"	3/8" 1
3	IND	LINEAR	2.4	3.36	3.0	20	18'	-4.5"	.55" 2
4	IND	LINEAR	3.3	4.67	2.9	45	13'	-2.9"	.5" 3
4	IND	LINEAR	2.2	3.02	10.5	40	14'	-4"	5/8" 4
4	IND	LINEAR	8.1	11.3	10	75	17'	-1.5"	.375" 5
4	IND	LINEAR	6.9	9.54	1.0	75	18'	-3"	.5" 6

Limitations: 2"x2" pads upstrm, 9" @ 21' 8", 19' 8", 12' 6", 14' 6", 16' 4, 18' 9". Pads at 14' 3" from weld centerline upstream and dnstream side scan area due to insulation ring.

Remarks: INDICATIONS RECORDED ARE EVALUATED AS POROSITY AND INCLUSIONS IN THE CAST MATERIAL (HEAD SIDE).

SKETCH & SCAN DIRECTIONS



PERSONNEL

Examiner: K.J. Levesque II LEVEL

Examiner: W.L. Thomas I LEVEL

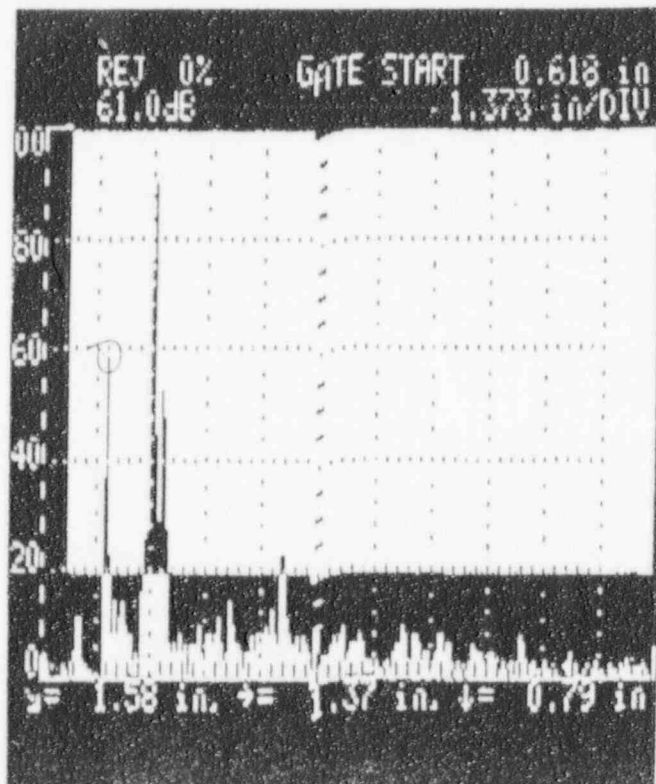
Contractor  
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Date

NSP  
Review: SA-Mac 4-18-89  
Date

ANII  
Review: P.D. Fisher 4/19/89  
Date

JAN 25 1989

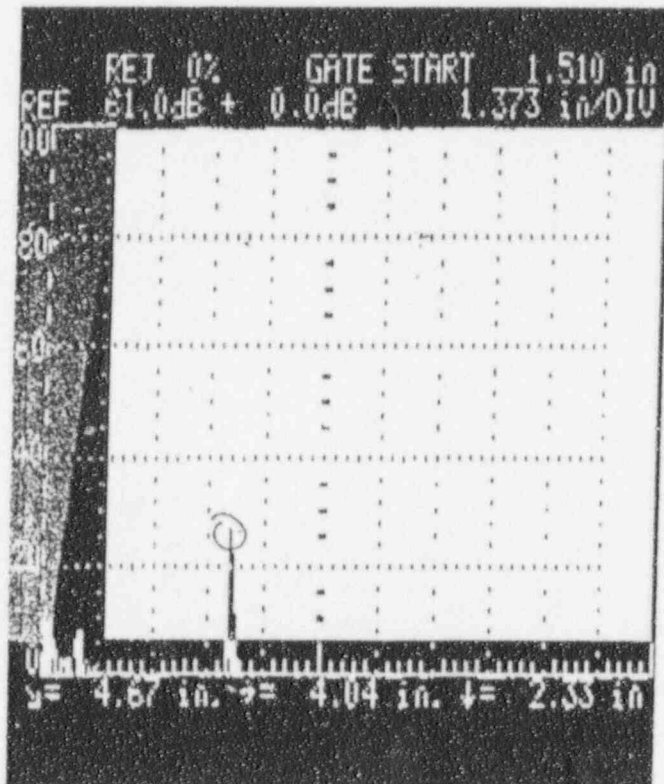
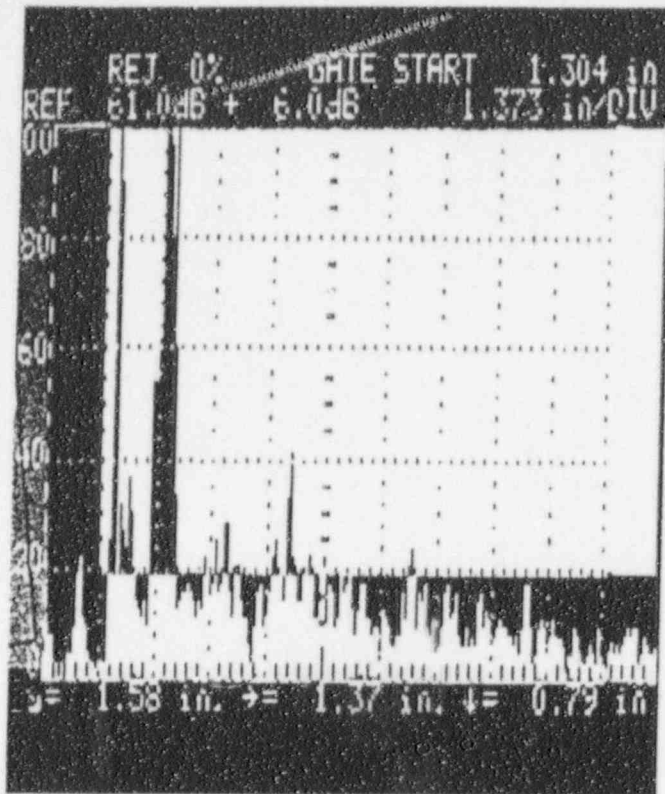
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 61.0dB 1.373 in/DIV  
 DELAY 0.000 in ZERO 16-10 us  
 FILTER 2-4 MHz DAMPING 400 OHMS  
 GATE START 1.304 in ENERGY LOW  
 GATE WIDTH 14.37 in FULL WAVE  
 GATE LEVEL 19% T/R MODE  
 VEL 0.1253 in/us 4 60.0" 5.500 in  
 MEMORY SELECT  $\rightarrow$   $\blacksquare$  1 2 3 4 5 6 7 8 9 10  
 X = OCCUPIED  $\rightarrow$  X X X X X X



PRE-CAL. CHECK  
 ROMPAS @ RIF.  
 1100



ROMPAS @+6DB

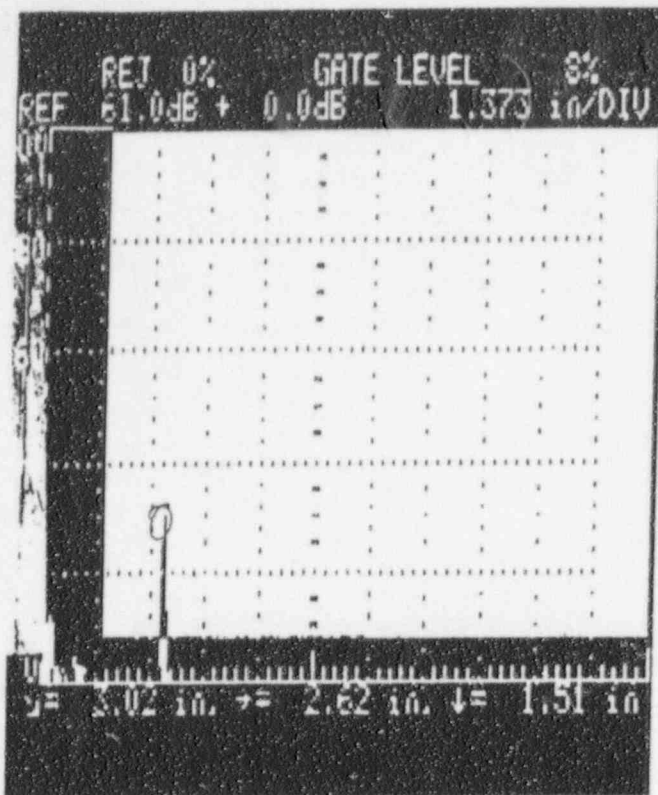


SCAN 4 INDICATION  
UPSTREAM

#3

L	M	T	
3.0	2.9	3.5	W
3.7	3.3	2.9	DIV
5.15	4.67	3.98	MP

W'S TAKEN FROM 13'  
L MAX 4" FROM WELD &  
LENGTH 3.95" TO 4.45"

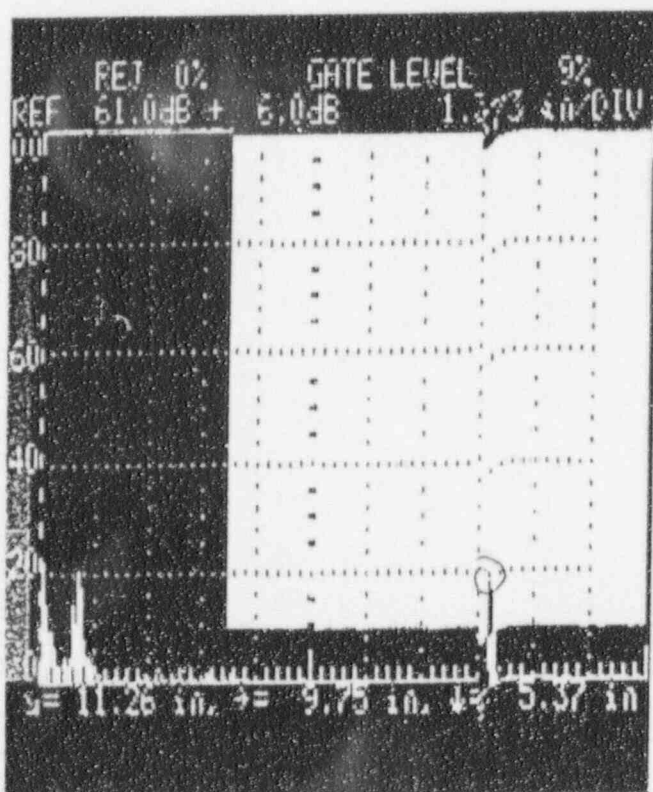


SCAN 4 INDICATION  
 UPSTREAM SIDE

#4

L	M	T	
9.75	10.5	10.9	W
2.3	2.2	2.0	DIV
3.29	3.02	2.81	MP

W'S TAKEN FROM 14'  
 L MAX 4" FROM WELD &  
 LENGTH 3 7/8 TO 4 1/2"



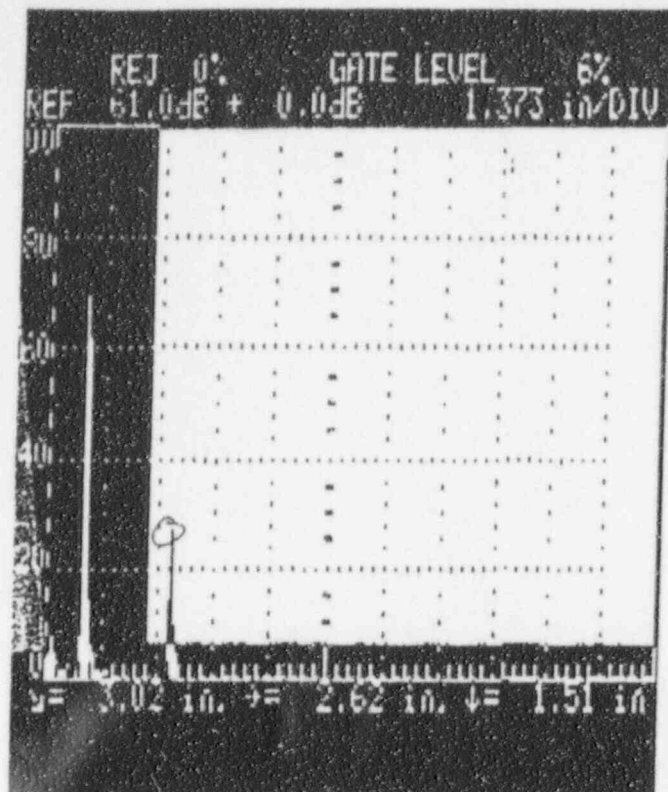
SCAN 4 INDICATION  
 U.S. SIDE

#5

L	M	T	
9.9	10.0	10.9	W
9.4	8.1	7.8	DIV
11.60	11.26	10.35	MP

W'S TAKEN FROM 17'  
 L MAX 1.5" FROM WELD &  
 LENGTH .375" LONG





#1

INDICATION SCAN 3

U.S. SIDE

L M T

2.0 1.65 1.25 W

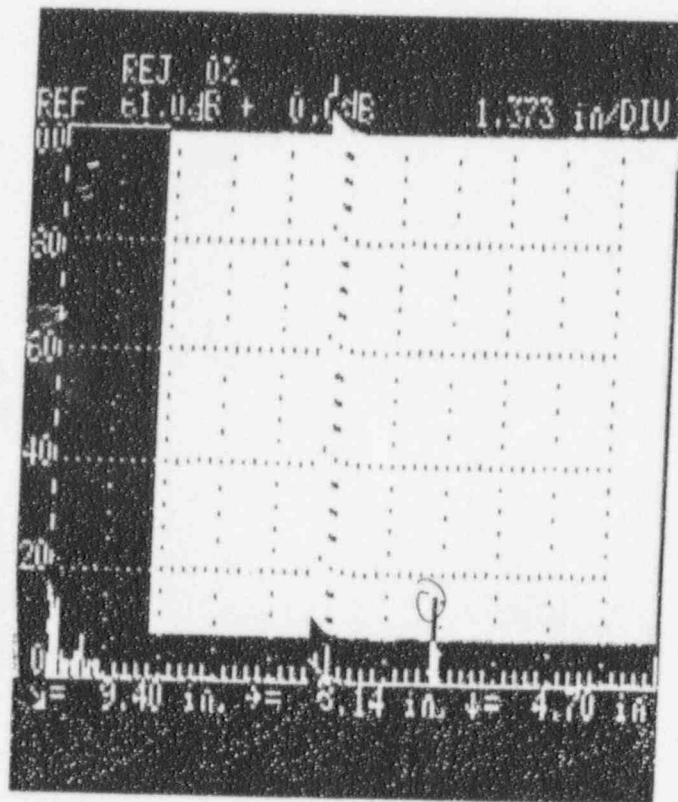
2.4 2.2 2.0 DIV

3.36 3.02 2.81 MP

W'S TAKEN FROM 16'

L MAX 25" FROM WELD

LENGTH -  $\frac{3}{8}$ " LONG



#6

INDICATION SCAN 4

UP STREAM SIDE

L M T

.85 1.0 1.15 W

7.1 6.9 6.6 DN

9.75 9.54 9.13 MP

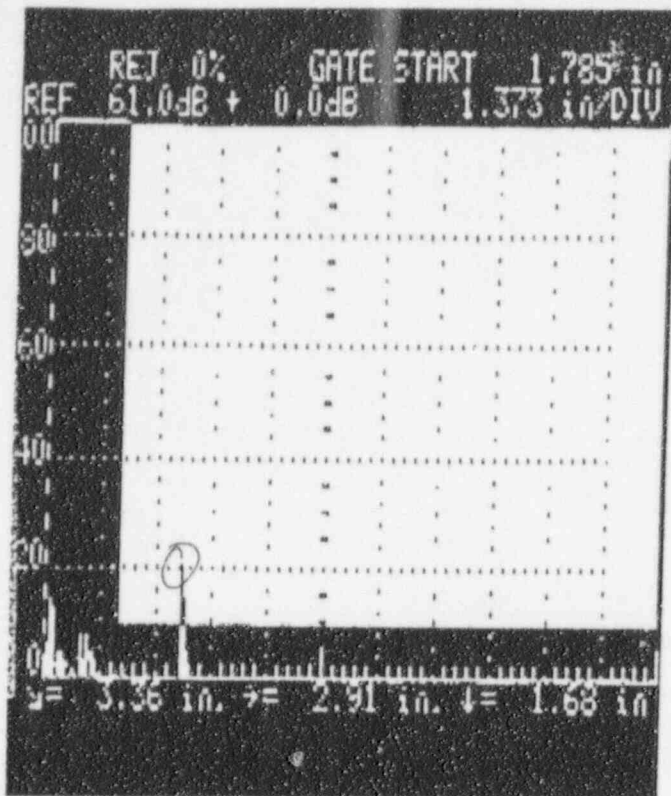
W'S TAKEN AT 18'

L MAX 3" FROM WELD

LENGTH -  $\frac{1}{2}$ " LONG

Report # 89-364

Page 5 of 9



SCAN 3 INDICATION  
U.S. SIDE

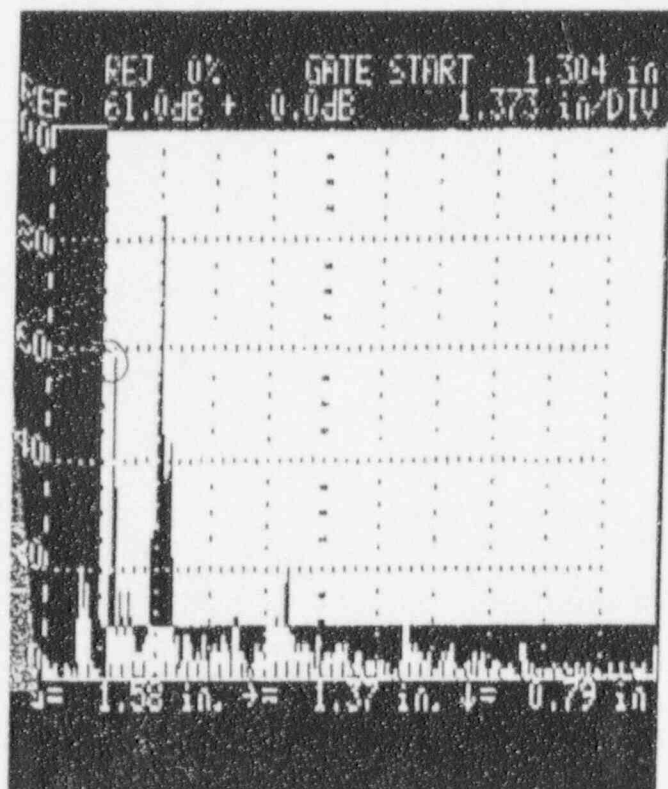
12

L	M	T
3.75	3.0"	2.65 W
2.6	2.4	2.2 DIV
3.57	3.36	3.09 MP

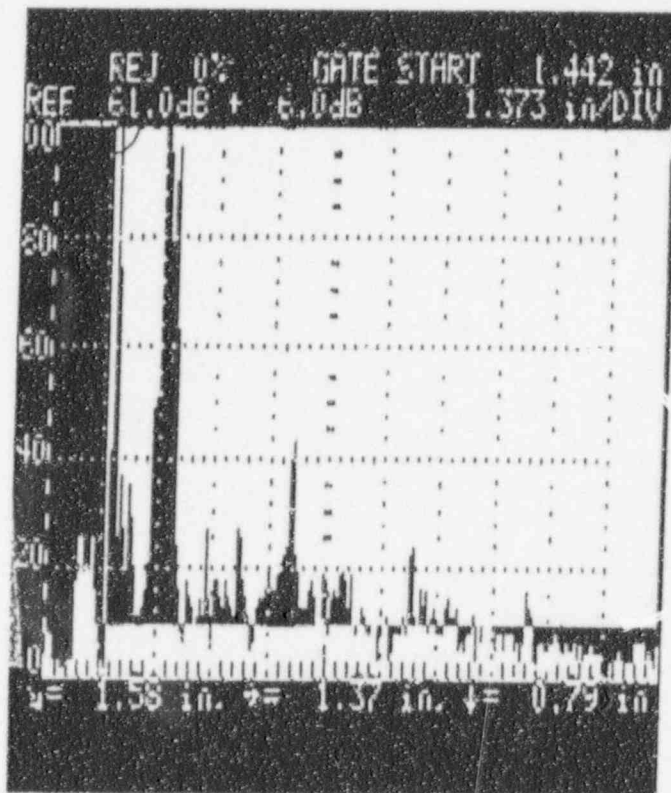
W'S TAKEN FROM 18'

L MAX 4.5" FROM WELD &

LENGTH - .55" LONG



ROMPAS @ REF 1218



ROMPAS e +6dB

NORTHERN STATES POWER COMPANY  
Power Production Department

CAL REPORT  
NUMBER: KJL-001

ULTRASONIC CALIBRATION REPORT

CALIBRATION BLOCK: Type VESSEL  
S/N 25A Material CS Size N/A  
Thickness 5.550 Temp 79 °F Entry Surf OD

Procedure # / Rev

NSP-UT-3 / 4 FC1

REFERENCE BLOCK

Type ROMPAS S/N 404 Temp 79 °F

Plant PI UNIT II

ULTRASONIC INSTRUMENTS:

Mfr PANAMTRICS Mfr NOT USED  
Model 2002 Model N/A  
S/N 864 S/N N/A  
Recal 10/07/89 Recal N/A

RECORDER:  
Mfr NOT USED  
Model N/A  
S/N N/A  
Recal N/A

Exam  
Company LMT, Inc.

Calibration Data:  
Date 04/12/89

SEARCH UNIT CABLE:

Type BNC/BNC Length 12'

COUPLANT:  
B/N 5488

Start @ 1030  
Check @ N/A  
Final @ 1247

SEARCH UNITS:

S/N	Angle	Freq.	Wave Mode	Mfr	Size	Wedge Mfr.
A52	60	2.25	SW	HSC	.50 x 1.0	HARISONIC

BEAM ANGLE DATA:

Serial Number	Index Check	Refracted Angle In Reference Block	Calibration Block
A52	OK	60 deg	61 deg

AMPLITUDE LINEARITY (Signal 2 Shall Equal 50% of Signal 1,  $\pm 5\%$  F.S.H.)

Signal 1 (Set)	100	90	80	70	60	50	40	30	20	10
MASTER: Signal 2 (Read)	50	45	40	36	30	25	20	15	10	5

AMPLITUDE CONTROL ACCURACY

Amplitude Setting:	80% /- 6dB	80% /-12dB	40% /+ 6dB	20% /+12dB
Acceptable Range:	32% to 48%	16% to 24%	64% to 96%	64% to 96%
MASTER, Actual:	40% F.S.H.	20% F.S.H.	80% F.S.H.	80% F.S.H.

INSTRUMENT SETTINGS AT REFERENCE SENSITIVITY

	Straight Beam	Angle Beam
Gain	N/A	61 dB
Frequency	N/A	2.25MHz
Sweep	N/A	1.373
Delay	N/A	0
Damping	N/A	400
Reject	N/A	0
Rep. Rate	N/A	N/A
Filter	N/A	2-4

FLAW GATE SETTING

Start 1.5 div  
End 10 div

Beam Spread Page 2

Signal to Noise  
Ratio N/A

REMARKS: ID NOTCH 15% @ + 6 dB

PERSONNEL:

Examiner K.J. Levesque II Level

Examiner W.L. Thomas I Level

Examiner NA Level

Examiner NA Level

Contractor

Review J.B. Mac 4-18-89 Date

NSP Review L. Salama 4-18-89 Date

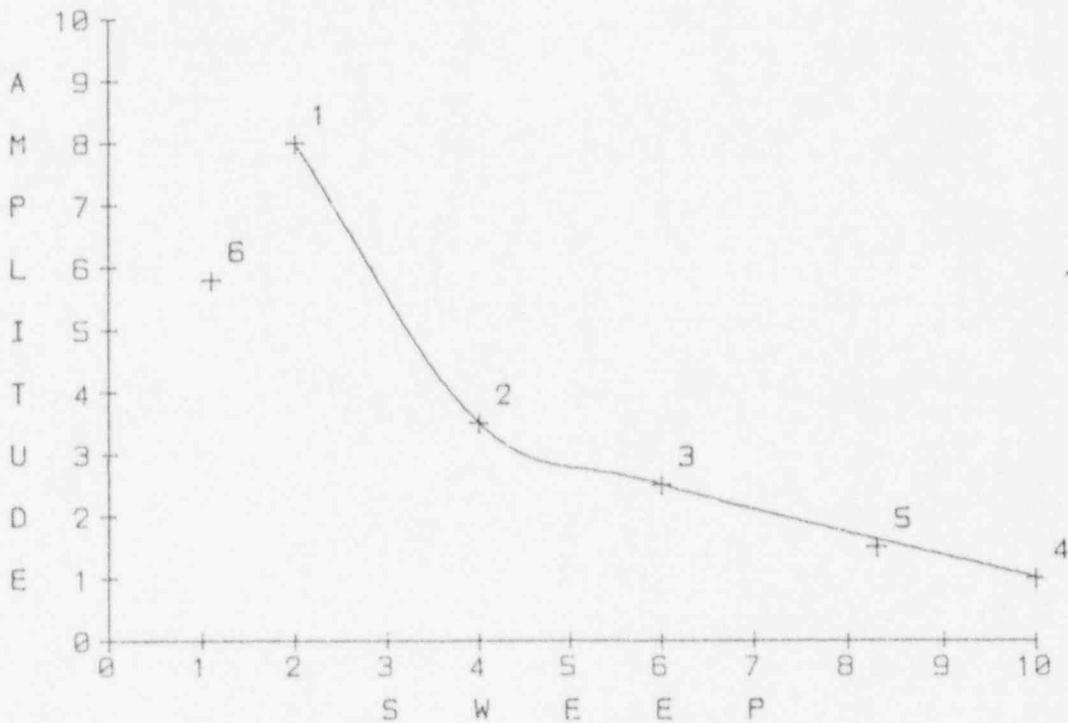
ANII Review P.D. Fisher 4/14/89 Date

ULTRASONIC CALIBRATION REPORT

BEAM SPREAD DATA: Surface Distance, Range, and Metal Path at:

	Leading (50% Maximum)			Maximum Amplitude			Trailing (50% Maximum)		
	Surf	Sweep	M.P.	Surf	Sweep	M.P.	Surf	Sweep	M.P.
T/4	2.73	2.3	3.10	2.37	2.0	2.75	2.12	2.7	2.48
2T/4	5.53	4.5	6.51	4.68	4.0	5.40	4.40	3.5	5.07
3T/4	8.06	6.7	9.23	7.19	6.0	8.36	6.67	5.5	7.70
5T/4	0.00	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00
PLANAR	10.30	8.6	11.82	9.81	8.3	11.33	9.01	7.6	10.62

DISTANCE-AMPLITUDE CORRECTION (DAC) CURVE PLOT  
(AT REFERENCE SENSITIVITY)



Reflector	1	2	3	4	5	6	7
Number:	1	2	3	4	5	6	7
Ident:	T/4	2T/4	3T/4	5T/4	NOTCH	ROMP	N/A
Amplitude:	80	35	25	10	15	58	N/A
Sweep:	2	4	6	10.0	8.3	1.1	N/A
Metal Path:	2.75	5.40	8.36	N/A	11.33	1.65	N/A
Surf. Dist:	2.37	4.68	7.19	N/A	9.81	N/A	N/A

```

    RET 0% ** STOR MEMORY #10 **
    61.0dB 1.373 in/DIV

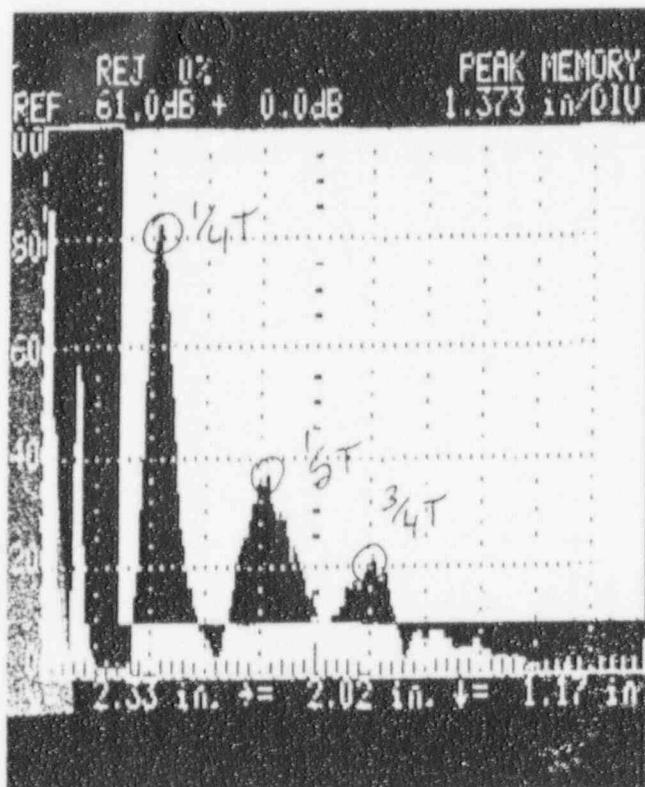
    DELAY 0.000 in ZERO 16.10 us
    FILTER 2-4 MHz DAMPING 400 OHMS
    GATE START 1.304 in ENERGY LOW
    GATE WIDTH 14.37 in FULL WAVE
    GATE LEVEL 19% 1/R MODE
    VEL 0.1258 in/us 60.0° / 5.500 in

    MEMORY SELECT → ■ 1 2 3 4 5 6 7 8 9 10
    X = OCCUPIED → X X X X X X X X X X
  
```

PRE CAL  
60°

CAL BLOCK 25A

DATE 4-12-89



PEAK MEMORY

1/4T, 1/2T, 3/4T 50H

⊙ REF