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PARRISH,J.V. Washington Public Power Supply System
RECIP.NAME RECIPIENT AFFILIATION
Document Control Branch (Document Control Desk)

SUBJECT: Transmits results of exam & evaluation of flaw in recirculation piping weld 20RRC(6)-8,per GL 88-01 & results of evaluation of NASCRAC methodology,in response to 930611 request re review of insp rept on flaw in subj piping.

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WASHINGTON PUBLIC POWER SUPPLY SYSTEM

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June 9, 1994
G02-94-135

Docket No. 50-397

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

Gentlemen:

Subject: **WNP-2, OPERATING LICENSE NPF-21**
REPORT ON FLAW IN REACTOR RECIRCULATION PIPING

References: 1) Letter GO2-93-119, dated May 21, 1993, GC Sorensen (SS) to NRC, "Report on Flaw in Reactor Recirculation Piping"

2) Letter dated June 11, 1993, JW Clifford (NRC) to GC Sorensen (SS), "Review of Inspection Report on a Flaw in Reactor Recirculation Piping at WNP-2 (TAC No. M86491)"

In accordance with the guidance of Generic Letter 88-01, the Supply System hereby transmits the results of the examination and evaluation of the flaw in recirculation piping weld 20RRC(6)-8. Attachments 1 and 2 provide the evaluation and examination results, respectively.

In response to the request in Reference 2, the Supply System has completed an evaluation of the use of the NASCRAC computer code which assumes a semi-elliptical circumferential crack and the use of a model which assumes a 360° circumferential crack. Attachment 3 contains the results of the Supply System evaluation of the NASCRAC code and modeling techniques. We have concluded that the NASCRAC elliptical model provides more realistic results than the NUREG-0313 model. Therefore, the Supply System will continue to use (when applicable) the NASCRAC elliptical model as a baseline for the evaluation of indications found during ultrasonic examinations.

140049

A001

Based on the examination results and validation of the computer code and model, the Supply System concludes that the structural integrity of weld 20RRC(6)-8 will be maintained during the next operating cycle of WNP-2. Therefore, staff review and approval is requested by June 29, 1994 to support startup following the R-9 refueling outage.

Should you have any questions or desire additional information regarding this matter, please call me or P. R. Bemis at (509) 377-4027.

Sincerely,

J. V. Parrish (Mail Drop 1023)
Assistant Managing Director, Operations

MGE/sel
Attachments

cc: LJ Callan - NRC RIV
KE Perkins, Jr. - NRC RIV, Walnut Creek Field Office
NS Reynolds - Winston & Strawn
JW Clifford - NRC
DL Williams - BPA/399
NRC Sr. Resident Inspector - 927N

ATTACHMENT 1
REPORT ON FLAW IN REACTOR RECIRCULATION PIPING

The indication in weld 20RRC(6)-8 was found during the 1991 refueling outage (R-6) by examination personnel qualified under the intergranular stress corrosion cracking (IGSCC) Coordination Plan using a manual ultrasonic examination technique. The indication was examined during the 1992 refueling outage (R7) using the manual technique and a mechanized technique. Mechanized ultrasonic testing using a mechanized General Electric "Smart 2000 System" was performed during the 1992, 1993, and 1994 refueling outages (R7, R8, and R9). The manual and mechanized techniques provided comparable results.

The indication depth as measured during R9 was 0.184 inches. The length of the indication remains unchanged at 3.6 inches. The percent increase in the depth of the indication is within the statistical variance of the ultrasonic techniques for indication sizing. The percent increase is also bounded by the fatigue crack evaluation. Therefore, the indication has not exhibited through-wall propagation since it was sized during R7 and R8.

Although the indication does not exhibit the ultrasonic test (UT) signals characteristic of IGCSS, IGSCC is being conservatively assumed as the cause of the indication. Table 1 contains the pertinent data and summarizes previous results.

The 1994 examination results verify that the indication remains bounded by the initial evaluation documented in Reference 1. The initial evaluation predicted an indication depth based on the assumption that IGSCC was the driving mechanism. This analysis estimated a depth of 0.47 inches for the time lapse (3 year) from the initial examination conducted in May 1991. The analysis also predicted that after six years (1997) the depth would exceed the maximum Code allowable depth of 0.62 inches. The presently defined depth of 0.18 inches is approximately 10.6% of the predicted growth. Therefore, the Supply System has concluded from the 1994 examination results that there is no indication of significant flaw growth and that continued operation is acceptable without the repair of the indication.

Reference 2 stated that in the absence of significant indication growth, we would evaluate the examination frequency. The Supply System will continue to monitor this weld indication. The next examination of the weld will be performed during the R10 outage, currently scheduled for the spring of 1995. This weld will remain classified as a category "F" weld in accordance with Generic Letter 88-01 guidance.

REFERENCES

1) Letter GO2-91-098, dated May 15, 1991, GC Sorensen (SS) to NRC, "Report on Flaw in Reactor Recirculation Piping, Additional Information (TAC No. 80358)"

2) Letter GO2-93-119, dated May 21, 1993, GC Sorensen (SS) to NRC, "Report on Flaw in Reactor Recirculation Piping"

Table 1
SUMMARY OF INSERVICE INSPECTION EXAMINATIONS FOR WELD 20RRC(6)-8

Refueling Outage / year	NDE Report No.	Through wall dimension[1]	CE-2 method Length (inches)[2]	Reference gain Length (inches)[3]	Flaw Depth (inches)	% of Predicted Growth[4]	Comments
R6 / 1991	1RRU-157	15%	4.5	NA	0.15	0	Manual Ultrasonic
R7 / 1992	1RRU-166	17%	4.5	3.6	0.17	14.7	Manual Ultrasonic
R7 / 1992	R-R7-55	15%	NA	3.6	0.17	14.7	Mechanized Ultrasonic by General Electric SMART 2000 System
R8 / 1993	R-R8-111	17.5%	NA	3.6	0.175	10.8	Mechanized Ultrasonic by General Electric SMART 2000 System
R9 / 1994	R-R9-001	18.4%	NA	3.6	0.184	10.6	Mechanized Ultrasonic by General Electric SMART 2000 System

Notes:

1. Recirculation piping nominal wall thickness is 1.031 inches. Maximum Code allowable flaw depth is 0.62 inches.
2. Length based on CE-2 signal disappearing into the baseline.
3. Length based on reference gain.
4. $\frac{\text{Measured flaw depth - original flaw depth}}{\text{Calculated flaw depth - original flaw depth}} \times 100\%$

ATTACHMENT 2

NDE Report No. R-R9-001

GE Nuclear Energy

EXAMINATION SUMMARY SHEET

REPORT NO.: R-R9-001

PROJECT: WNP2 RFO9
1D7KJ

PROCEDURE: GE-UT-208 REV: 1 FRR: N/A
N/A
N/A

SYSTEM: RECIRCULATION

GE-UT-207 REV: 0 FRR: N/A
N/A
N/A

WELD NO.: 20RRC(6)-8

CONFIGURATION: PIPE TO VALVE

N/A REV: N/A FRR: N/A
N/A
N/A

EXAMINER: PAUL MICHELSON LEVEL: II

☐ MT ☐ PT ● UT ☐ VT

EXAMINER: BOB PASZKOWSKI LEVEL: II

WELD TYPE: ● CIRCUMFERENTIAL ☐ LONGITUDINAL ☐ OTHER N/A

EXAMINER: N/A LEVEL: N/A

DATA SHEET NO.(S): DA-R9-001 & 002

CAL SHEET NO.(S): CA-R9-001 & 002

During the ultrasonic examination of the above referenced weld, one (1) reportable ID connected planar indication was recorded with the "Smart 2000" system utilizing a 45° shear wave and 60° refracted longitudinal wave search units. This indication has the following parameters:

Ind. No.	Distance from Zero Reference	Total Length	Thru Wall Dimension	Remaining Ligament	Side of Weld	Type of Reflector	Search Unit
* 1.	-1.00"	3.60"	18.4%	.80"	UPST	CIRC	45°S / 60°RL

* The reflector face appears to be smooth and non-faceted without the presence of axial components, which is not typical of IGSCC type indications. This indication straddles "Lo" reference and starts at 1.0" counterclockwise from top dead center.

Supplemental relooks and thru-wall depth sizing were performed with the "Smart 2000" system utilizing the 60° RL search unit. The thru-wall depth of this reflector was determined by the high angle absolute arrival time tip diffraction method. The length of this indication was determined by measurements taken from the "Smart 2000" 60° RL data with allowances for beam spread. This indication was sized per NUREG 0313 requirements which are more stringent than ASME Section XI. This indication has not exhibited any noticable thru-wall propagation since it was sized during the previous ISI outage in 1993.

The 45° shear also recorded non-relevant indications, beam redirect, and root geometry, along with the above referenced indication, from the upstream side of the weld .

The 60° RL also recorded inside surface geometry, along with the above referenced indication, from the upstream side of the weld.

No examination was performed downstream due to the valve configuration.

Previous data was reviewed prior to this summary.

● EXAM COMPLETE ☐ PARTIALLY EXAMINED (EXPLAIN IN COMMENTS) ☐ EXAM COMPLETE IN COMBINATION WITH DATA SHEETS BELOW

ADDITIONAL DATA SHEETS: N/A

COMPARED TO: ☐ PSI ● ISI REPORT NO.(S): R-R8-111 ● NO CHANGE

EXAMINATION RESULTS: ☐ ACCEPTABLE ● UNACCEPTABLE

NO. OF RECORDABLE INDICATIONS: 1

NO. OF REPORTABLE INDICATIONS: 1

RWP NO.: 157

TOTAL DOSE 850 MAN REM

Wes Money	III	5-14-94		5-15-94	
SUMMARY BY	LEVEL	DATE	UTILITY REVIEW	DATE	
E L Bailey	III	5-14-94		5/16/94	
GE REVIEWED BY	LEVEL	DATE	ANI REVIEW	DATE	

FORM UT-08 REV. 5

GE Nuclear Energy

WALL THICKNESS PROFILE SHEET

SITE: WNP UNIT: 2

PROJECT: 1D7KJ

REPORT NO.: R-R9-001

SYSTEM: RECIRCULATION

COMPONENT ID NO.: 20RRC(6)-8

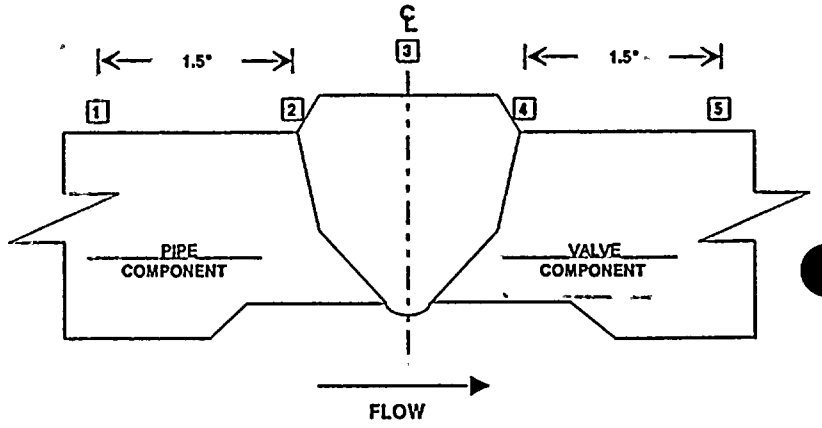
POSITION	0°	90°	180°	270°
1	1.00"	N/A	N/A	N/A
2	.98"	N/A	N/A	N/A
3	1.13"	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A
5	2.06"	N/A	N/A	N/A

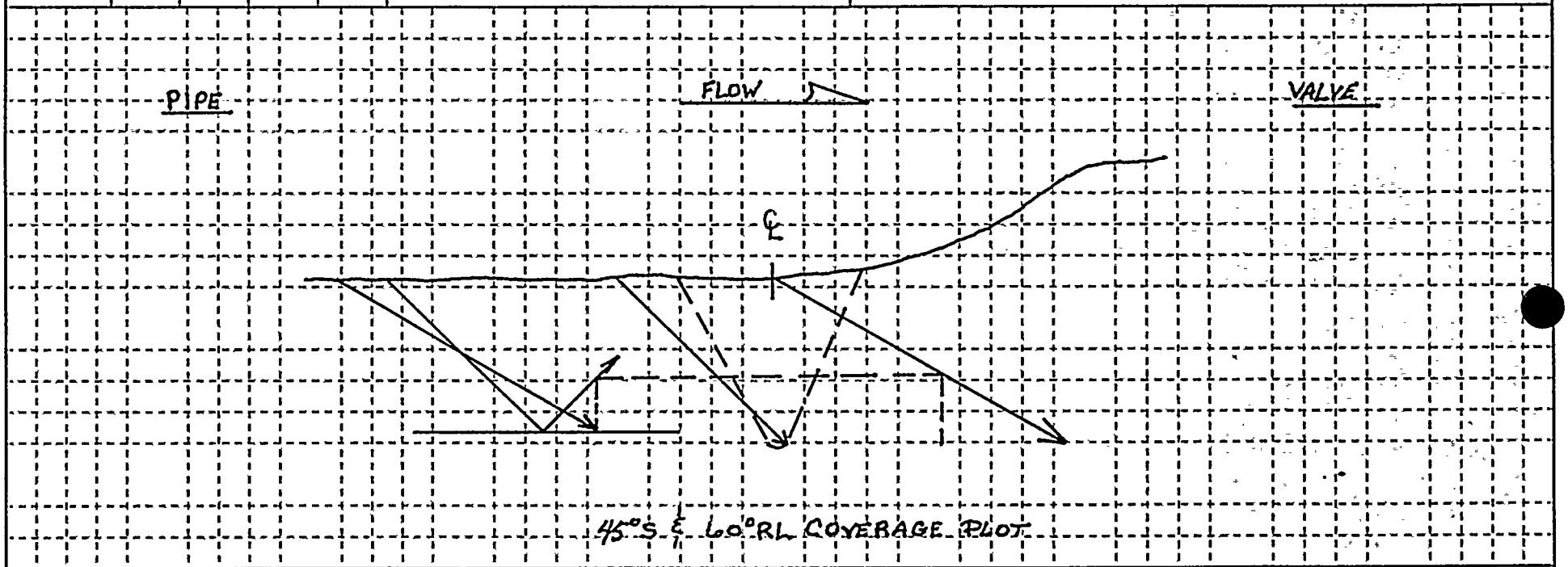
CROWN HEIGHT: FLUSH

CROWN WIDTH: 1.2"

NOM DIAMETER: 20.0"

WELD LENGTH: 63.0"





TAKEN FROM 1992 GE DATA
DRAWN BY LEVEL DATE

GE REVIEWED BY II 5-11-94
LEVEL DATE

UTILITY REVIEW 5-15-94
DATE

ANI REVIEW ANII 5/16/94
DATE

PAGE: 2 OF: 15

FORM UT-G1 REV. 4

GE Nuclear Energy

INDICATION PLOT SHEET

SITE: WNP UNIT: 2

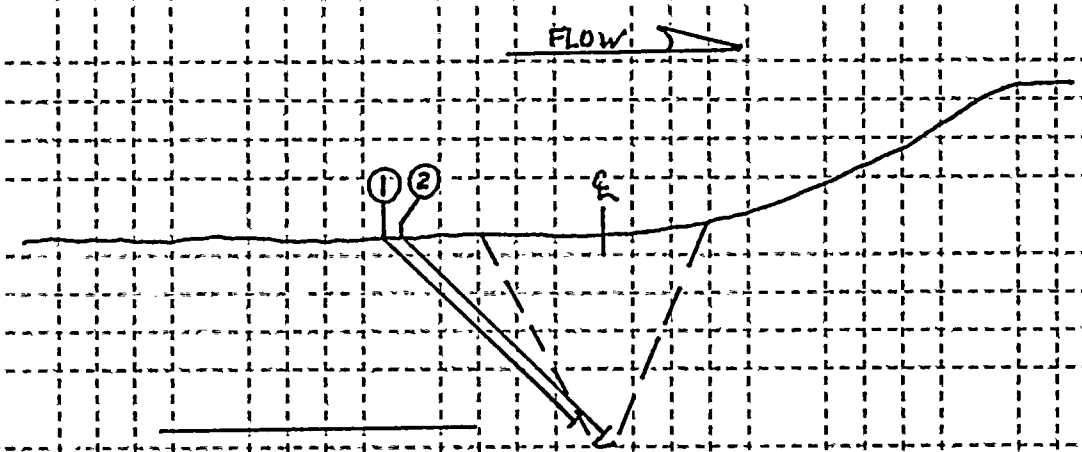
PROJECT: 1D7KJ

REPORT NO.: R-R9-001

SYSTEM: RECIRCULATION

COMPONENT ID NO.: 20RRC(6)-8

CONFIGURATION: PIPE FLOW VALVE



45° SHEAR

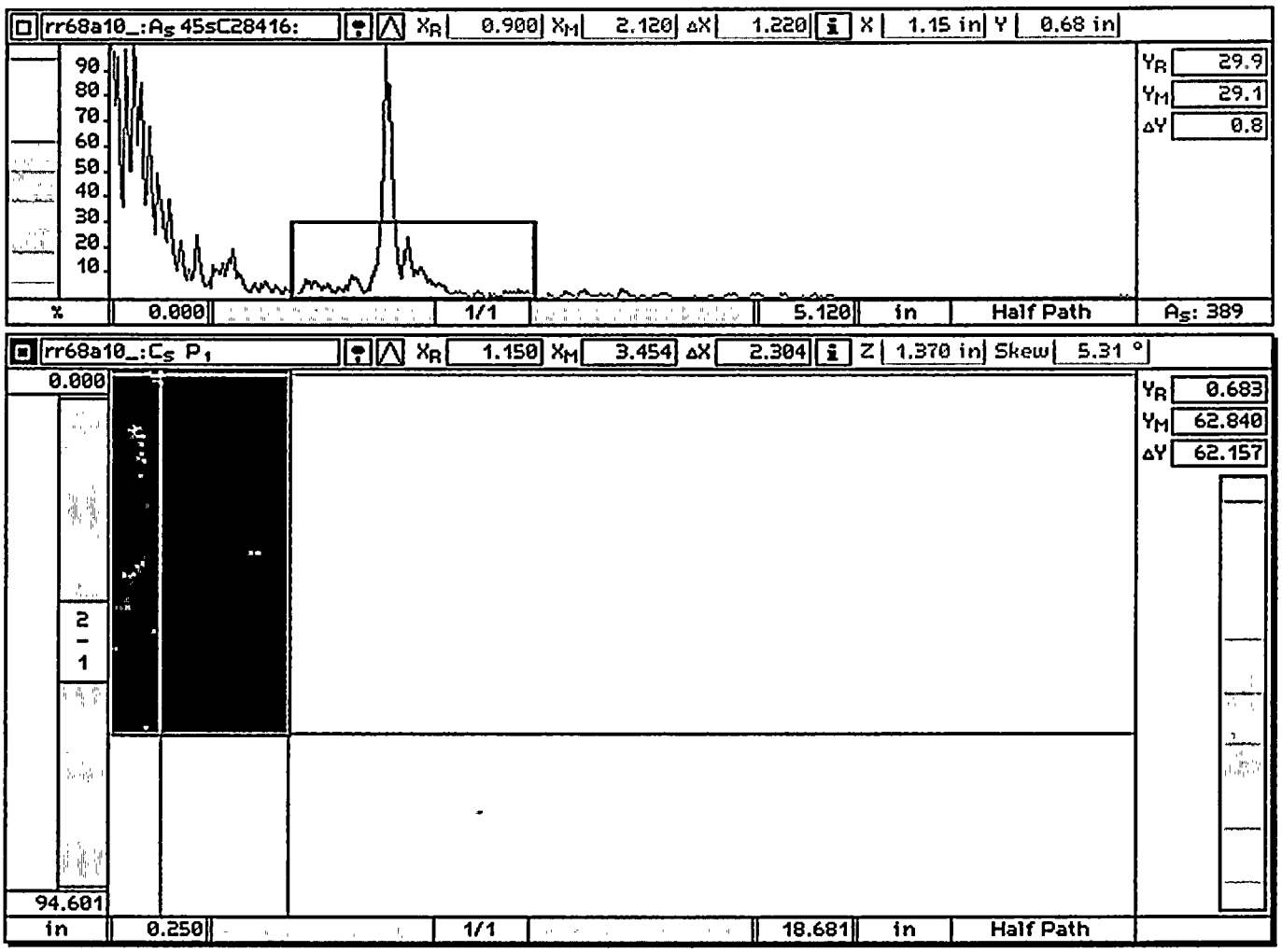
① NON GEOMETRIC INDICATION (PLANAR INDICATION #1)
② ROOT GEOMETRY

DRAWN BY	LEVEL II	DATE 5-11-94	UTILITY REVIEW	DATE 5-15-94	ANII REVIEW Dan Boggarth ANII	DATE 5/16/94
GE REVIEWED BY Wes Money	LEVEL III	DATE 5-14-94				

FORM UT-02 REV. 5

GE Nuclear Energy

ULTRASONIC SCAN DATA PRINT SHEET (AUTOMATED WITH *Smart 2000*)



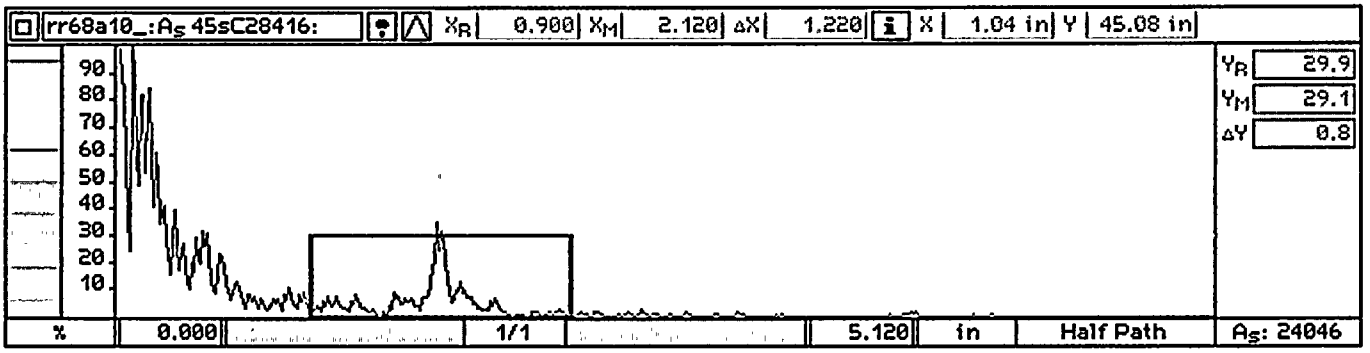
SITE: WNP UNIT: 2 PROJECT NO.: 1D7KJ REPORT NO.: R-R9-001

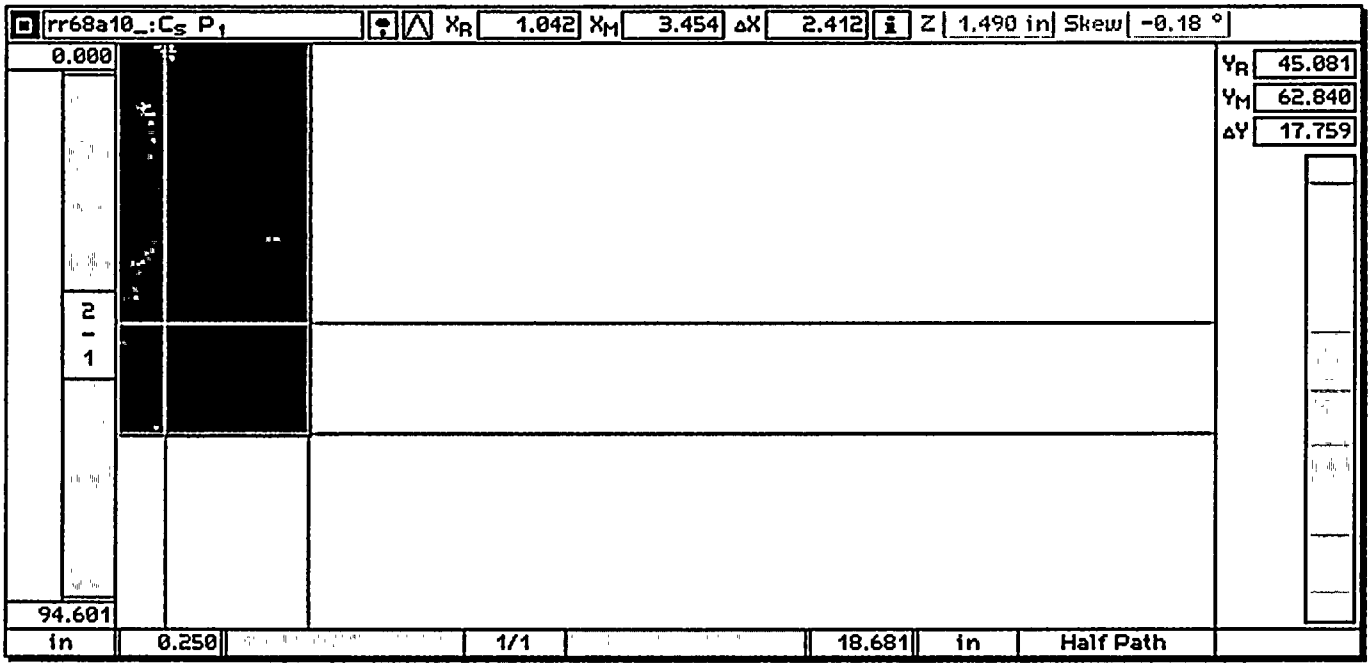
WELD NO.: 20RRC(6)-8 SEARCH UNIT: 45°/SHR INDICATION NO.: 1 PAGE: 4 OF: 15

FORM UT-13 REV. 1

GE Nuclear Energy

ULTRASONIC SCAN DATA PRINT SHEET (AUTOMATED WITH *Smart 2000*)





SITE: WNP UNIT: 2 PROJECT NO.: 1D7KJ REPORT NO.: R-R9-001

WELD NO.: 20RRC(6)-8 SEARCH UNIT: 45°/SHR INDICATION NO.: 2 PAGE: 5 OF: 15

FORM UT-13 REV. 1

GE Nuclear Energy

INDICATION PLOT SHEET

SITE: WNP UNIT: 2

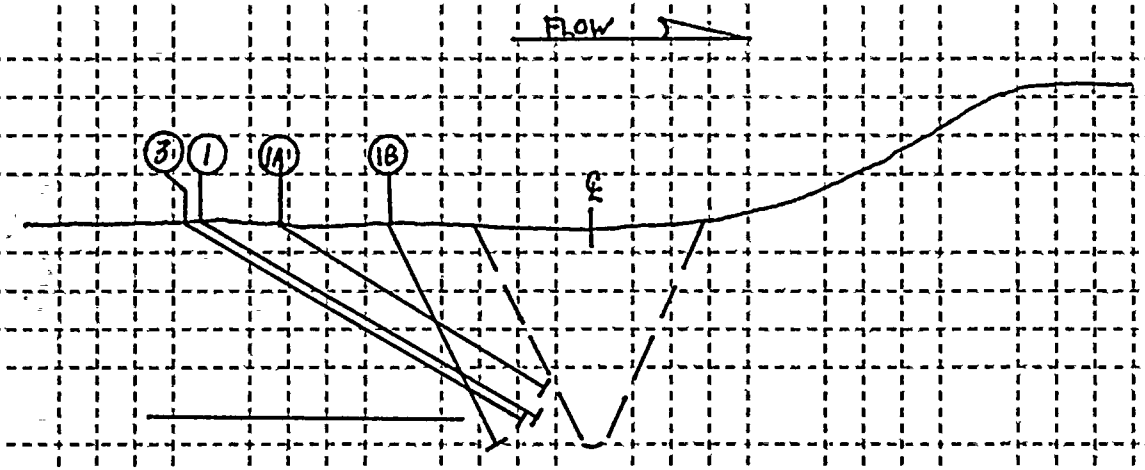
PROJECT: 1D7KJ

REPORT NO.: R-B9-001

SYSTEM: RECIRCULATION

COMPONENT ID NO.: 20RBC(6):8

CONFIGURATION: PIPE FLOW VALVE



60°RL

(1) NONGEOMETRIC INDICATION (PLANAR INDICATION #1 BASE REFLECTOR)
(1A) NONGEOMETRIC INDICATION (PLANAR INDICATION #1 TIP REFLECTOR)
(1B) SHEAR COMPONENT (PLANAR INDICATION #1 BASE REFLECTOR)
(3) INSIDE SURFACE GEOMETRY

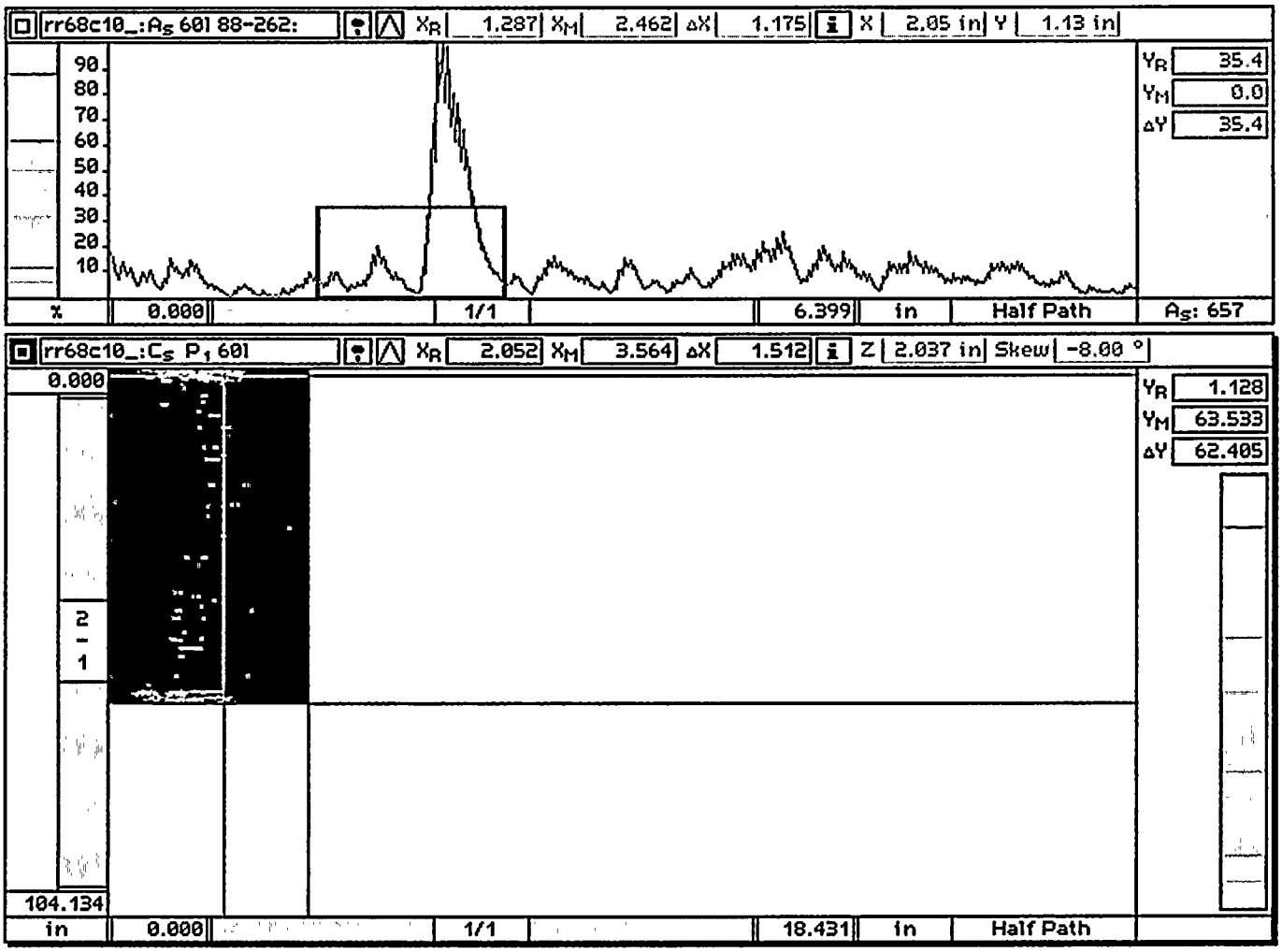
Wes Money	III	5-14-94			
DRAWN BY	LEVEL	DATE			
E P Bailey	III	5-14-94		5-15-94	Dan Hoggarth ANII 5/16/94
GE REVIEWED BY	LEVEL	DATE	UTILITY REVIEW	DATE	ANII REVIEW DATE

PAGE: 6 OF: 15

FORM UT-02 REV. 5

GE Nuclear Energy

ULTRASONIC SCAN DATA PRINT SHEET (AUTOMATED WITH *Smart 2000*)



SITE: WNP UNIT: 2 PROJECT NO.: 1D7KJ REPORT NO.: R-R9-001

WELD NO.: 20RRC(6)-8 SEARCH UNIT: 60°/RL INDICATION NO.: 1 PAGE: 7 OF: 15

FORM UT-13 REV. 1

GE Nuclear Energy

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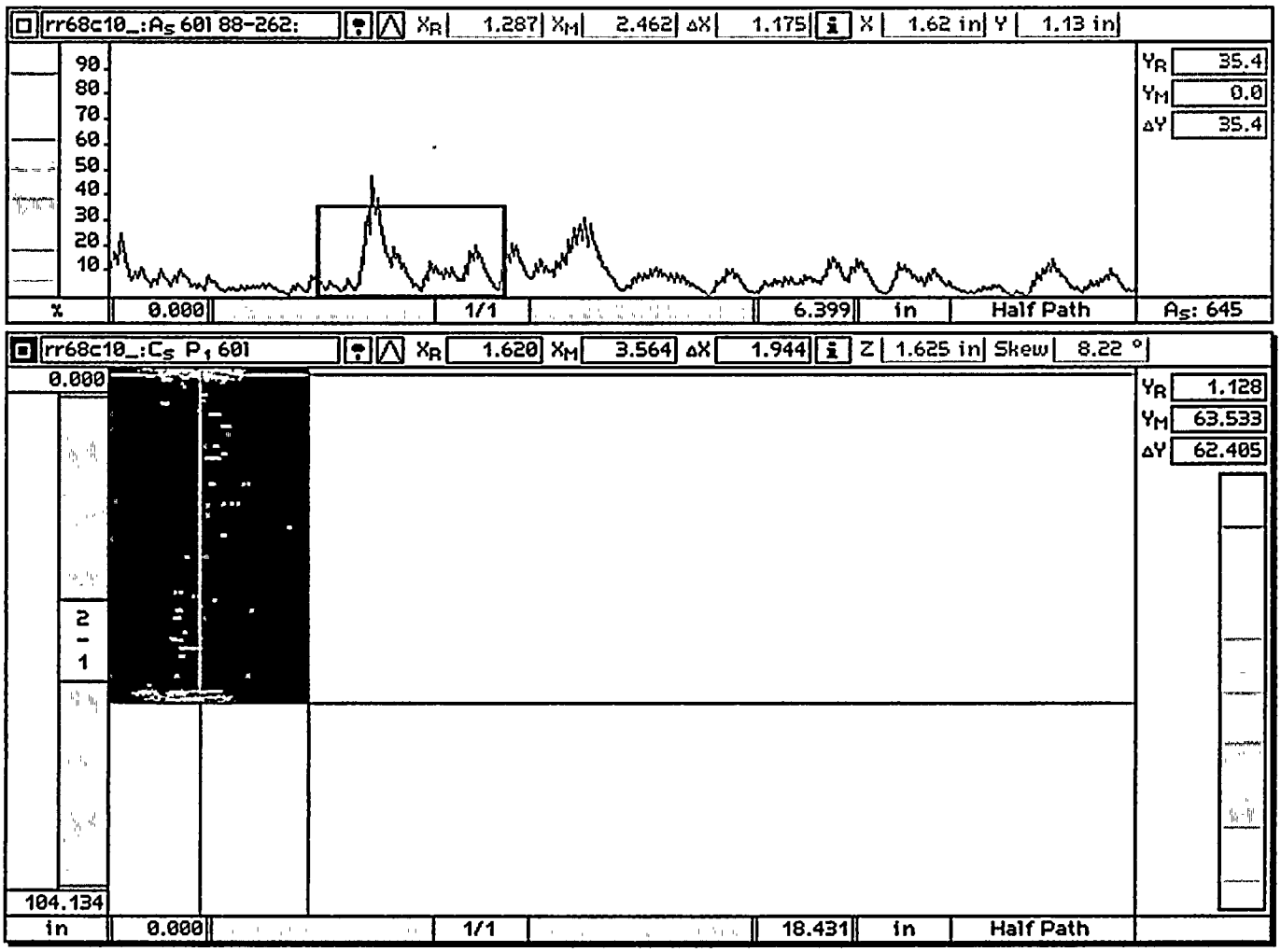

* INDICATION TIP SIGNAL

SITE: WNP UNIT: 2 PROJECT NO.: 1D7KJ REPORT NO.: R-R9-001

WELD NO.: 20RRC(6)-8 SEARCH UNIT: 60°/RL INDICATION NO.: 1A PAGE: 8 OF: 15

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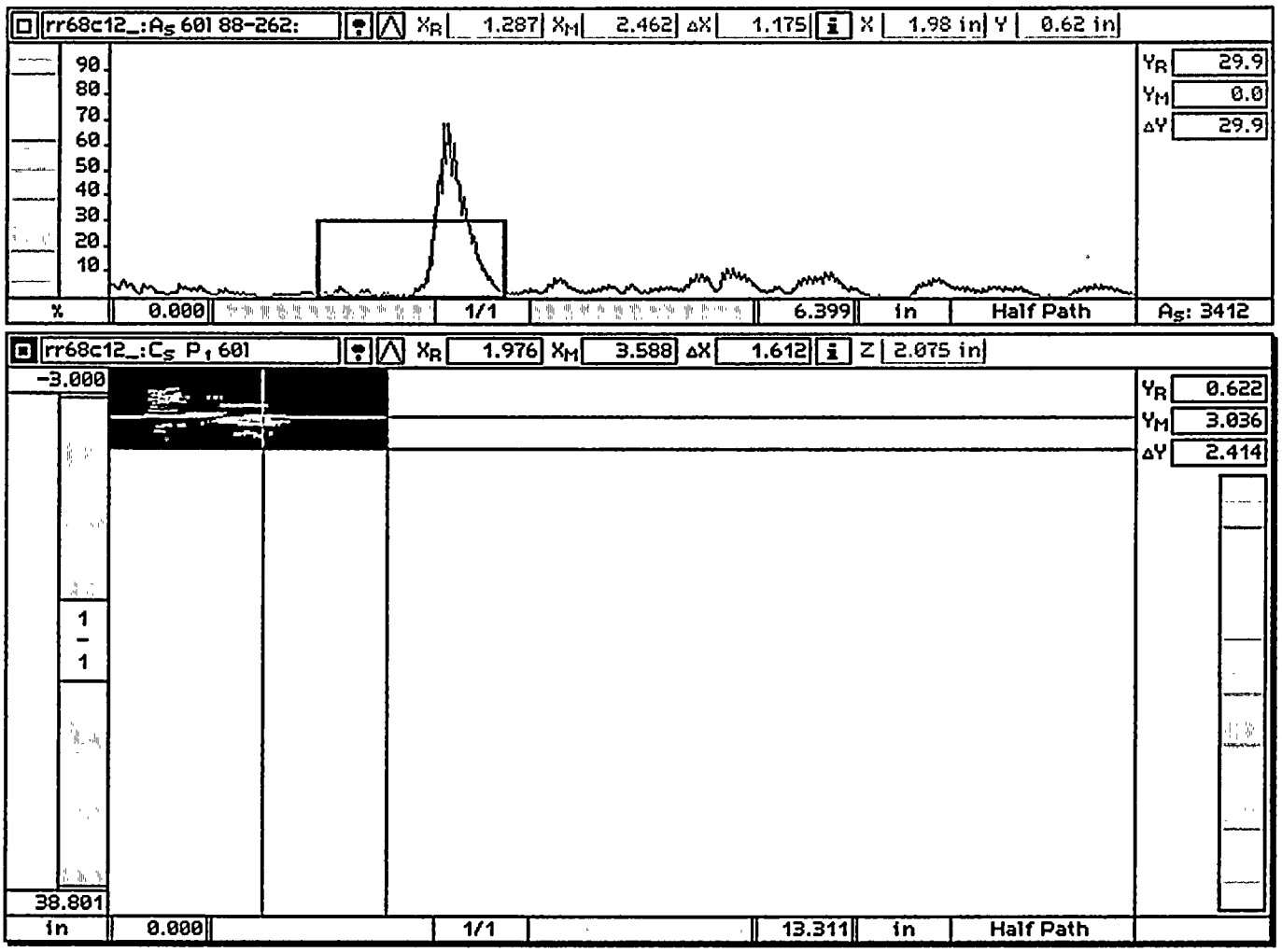

SITE: WNP UNIT: 2 PROJECT NO.: 1D7KJ REPORT NO.: R-R9-001

WELD NO.: 20RRC(6)-8 SEARCH UNIT: 60°/RL INDICATION NO.: 1 PAGE: 9 OF: 15

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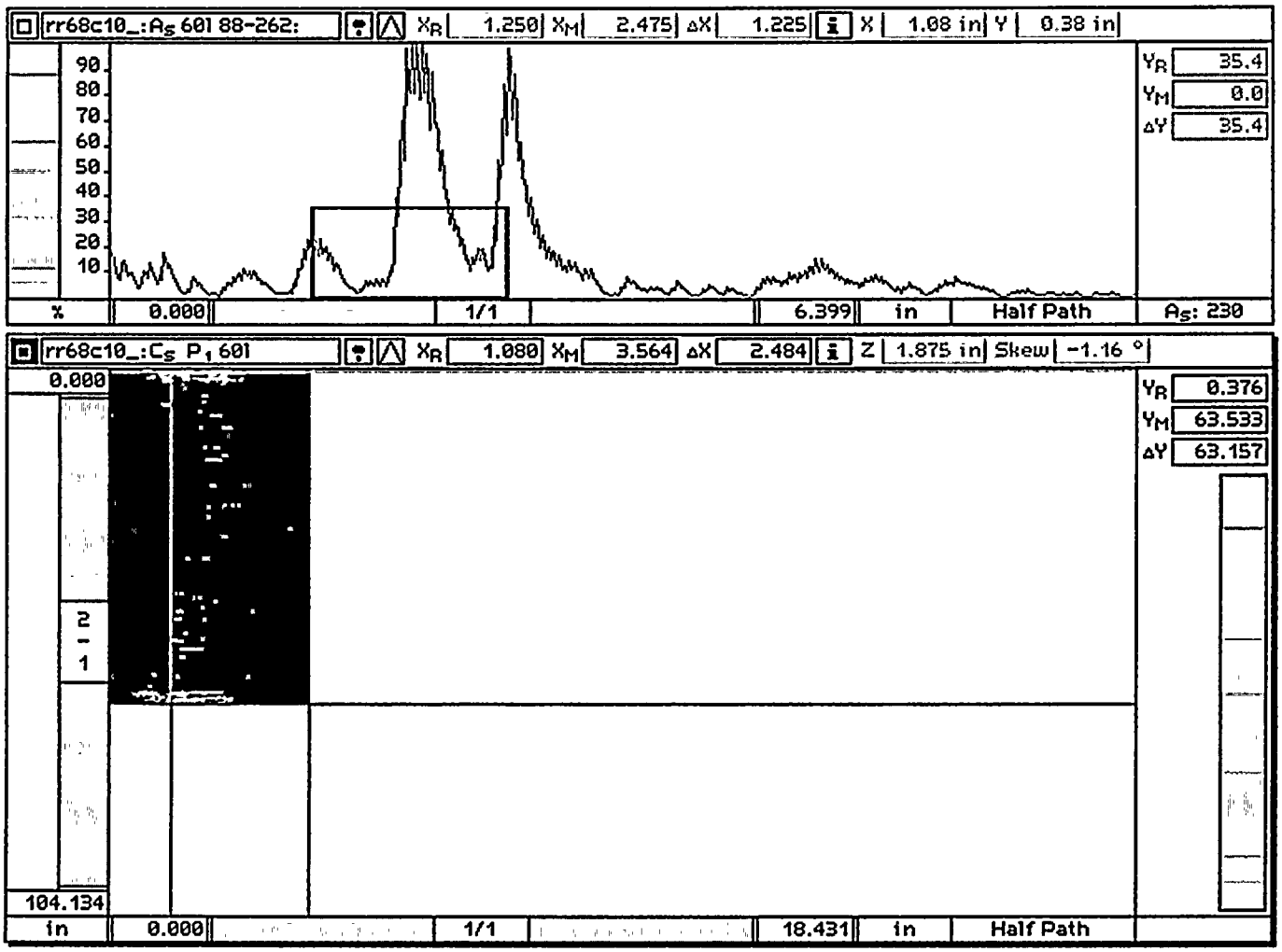

SITE: WNP UNIT: 2 PROJECT NO.: 1D7KJ REPORT NO.: R-R9-001

WELD NO.: 20RRC(6)-8 SEARCH UNIT: 60°/RL INDICATION NO.: 1B PAGE: 10 OF: 15

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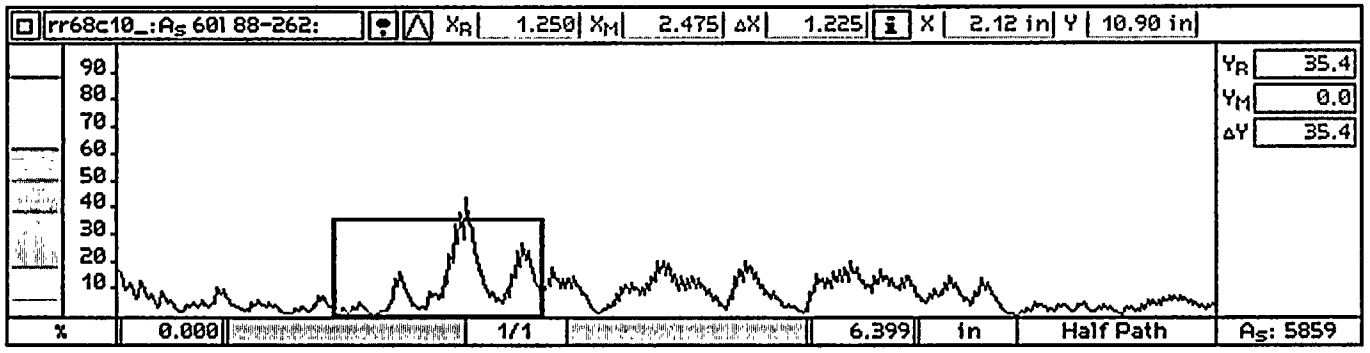

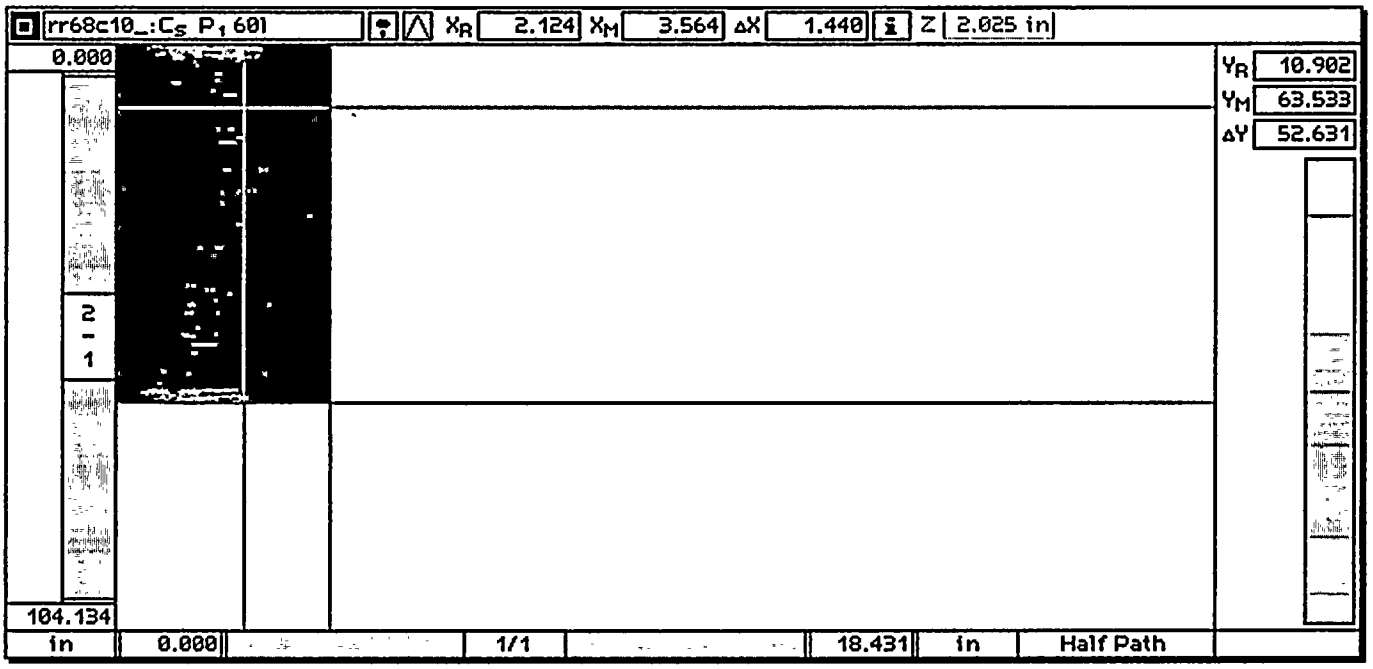

SITE: WNP UNIT: 2 PROJECT NO.: 1D7KJ REPORT NO.: R-R9-001

WELD NO.: 20RRC(6)-8 SEARCH UNIT: 60°/RL INDICATION NO.: 3 PAGE: 11 OF: 15

FORM UT-13 REV. 1

GE Nuclear Energy

ULTRASONIC EXAMINATION DATA SHEET
(AUTOMATED WITH *Smart 2000*)

SITE: WNP
UNIT: 2
PROJECT NO.: 1D7KJ

PROCEDURE NO.: GE-UT-208
REVISION NO.: 1
FRR NO.: N/A

REPORT NO.: R-R9-001
DATA SHEET NO.: DA-R9-001
CALIBRATION SHEET NO.: CA-R9-001

SYSTEM: RECIRCULATION EXAM SURFACE TEMP: 79 °F COUPLANT: SOUNDSAFE EXAM START: 04:20
WELD ID: 20RRC(6)-8 THERMOMETER S/N: 130691 BATCH NO.: 20922 EXAM END: 07:20
SEARCH UNIT: 45° / SHR EXAMINATION SURFACE: OD COMPONENT: PIPE FLOW VALVE

SCAN: A10 | SCAN DIRECTION: AXUP | GAIN(dB): 28.0

DISK/SIDE: D-01/A FILENAME(S): RR68A10
N/A

EXAMINATION RESULTS:

- ☐ NO RECORDED INDICATIONS
- ● ROOT GEOMETRY
- ☐ COUNTERBORE GEOMETRY
- ☐ NON-RELEVANT INDICATIONS
- ☐ ACOUSTIC INTERFACE
- ☐ INSIDE SURFACE GEOMETRY
- ● NON-GEOMETRIC INDICATIONS
- ● OTHER: BEAM REDIRECT

COMMENTS: See note 1

SCAN: A11 | SCAN DIRECTION: AXUP | GAIN(dB): 28.0

DISK/SIDE: D-01/A FILENAME(S): RR68A11
N/A

EXAMINATION RESULTS:

- ☐ NO RECORDED INDICATIONS
- ● ROOT GEOMETRY
- ☐ COUNTERBORE GEOMETRY
- ☐ NON-RELEVANT INDICATIONS
- ☐ ACOUSTIC INTERFACE
- ☐ INSIDE SURFACE GEOMETRY
- ● NON-GEOMETRIC INDICATIONS
- ☐ OTHER: N/A

COMMENTS: Supplemental scan to enhance indication.

SCAN: A50 | SCAN DIRECTION: CWUP | GAIN(dB): 27.0

DISK/SIDE: D-01/A FILENAME(S): RR68A50
N/A

EXAMINATION RESULTS:

- ☐ NO RECORDED INDICATIONS
- ☐ ROOT GEOMETRY
- ☐ COUNTERBORE GEOMETRY
- ● NON-RELEVANT INDICATIONS
- ☐ ACOUSTIC INTERFACE
- ☐ INSIDE SURFACE GEOMETRY
- ☐ NON-GEOMETRIC INDICATIONS
- ☐ OTHER: N/A

COMMENTS: N/A

SCAN: A70 | SCAN DIRECTION: CCUP | GAIN(dB): 27.0

DISK/SIDE: D-01/A FILENAME(S): RR68A70
N/A

EXAMINATION RESULTS:

- ☐ NO RECORDED INDICATIONS
- ☐ ROOT GEOMETRY
- ☐ COUNTERBORE GEOMETRY
- ● NON-RELEVANT INDICATIONS
- ☐ ACOUSTIC INTERFACE
- ☐ INSIDE SURFACE GEOMETRY
- ☐ NON-GEOMETRIC INDICATIONS
- ☐ OTHER: N/A

COMMENTS: N/A

SCAN: N/A | SCAN DIRECTION: N/A | GAIN(dB): N/A

DISK/SIDE: N/A FILENAME(S): N/A

EXAMINATION RESULTS:

- ☐ NO RECORDED INDICATIONS
- ☐ ROOT GEOMETRY
- ☐ COUNTERBORE GEOMETRY
- ☐ NON-RELEVANT INDICATIONS
- ☐ ACOUSTIC INTERFACE
- ☐ INSIDE SURFACE GEOMETRY
- ☐ NON-GEOMETRIC INDICATIONS
- ☐ OTHER: N/A

COMMENTS: N/A

SCAN: N/A | SCAN DIRECTION: N/A | GAIN(dB): N/A

DISK/SIDE: N/A FILENAME(S): N/A

EXAMINATION RESULTS:

- ☐ NO RECORDED INDICATIONS
- ☐ ROOT GEOMETRY
- ☐ COUNTERBORE GEOMETRY
- ☐ NON-RELEVANT INDICATIONS
- ☐ ACOUSTIC INTERFACE
- ☐ INSIDE SURFACE GEOMETRY
- ☐ NON-GEOMETRIC INDICATIONS
- ☐ OTHER: N/A

COMMENTS: N/A

REMARKS: Note 1: No examination was performed downstream due to the valve configuration.

Paul W. Michelson II	II	5-11-94			5-15-94
EXAMINER	LEVEL	DATE	UTILITY REVIEW		DATE
GE REVIEWED BY	II	5-11-94			5/16/94
	LEVEL	DATE	UTILITY REVIEW		DATE

FORM UT-07 REV. 0

ULTRASONIC EXAMINATION DATA SHEET
(AUTOMATED WITH *Smart 2000*)

GE Nuclear Energy

SITE: WNP	PROCEDURE NO.: GE-UT-208	REPORT NO.: R-R9-001
UNIT: 2	REVISION NO.: 1	DATA SHEET NO.: DA-R9-002
PROJECT NO.: 1D7KJ	FRR NO.: N/A	CALIBRATION SHEET NO.: CA-R9-002

SYSTEM: RECIRCULATION EXAM SURFACE TEMP: 79 °F COUPLANT: SOUNDSAFE EXAM START: 10:35

WELD ID: 20RRC(6)-8 THERMOMETER S/N: 130691 BATCH NO.: 20922 EXAM END: 12:30

SEARCH UNIT: 60° / RL EXAMINATION SURFACE: OD COMPONENT: PIPE FLOW VALVE

SCAN: C10 **SCAN DIRECTION:** LKDN **GAIN(dB):** 39.0

DISK/SIDE: D-01/A FILENAME(S): RR68C10, N/A

EXAMINATION RESULTS:

- ☐ NO RECORDED INDICATIONS
- ☐ ROOT GEOMETRY
- ☐ COUNTERBORE GEOMETRY
- ● NON-RELEVANT INDICATIONS
- ☐ ACOUSTIC INTERFACE
- ● INSIDE SURFACE GEOMETRY
- ● NON-GEOMETRIC INDICATIONS
- ● OTHER: SHEAR COMPONENT

COMMENTS: See note 1

SCAN: C12 **SCAN DIRECTION:** LKDN **GAIN(dB):** 31.0

DISK/SIDE: D-01/A FILENAME(S): RR68C12, N/A

EXAMINATION RESULTS:

- ☐ NO RECORDED INDICATIONS
- ☐ ROOT GEOMETRY
- ☐ COUNTERBORE GEOMETRY
- ● NON-RELEVANT INDICATIONS
- ☐ ACOUSTIC INTERFACE
- ☐ INSIDE SURFACE GEOMETRY
- ● NON-GEOMETRIC INDICATIONS
- ● OTHER: SHEAR COMPONENT

COMMENTS: Supplemental scan to enhance indication.

SCAN: N/A **SCAN DIRECTION:** N/A **GAIN(dB):** N/A

DISK/SIDE: N/A FILENAME(S): N/A

EXAMINATION RESULTS:

- ☐ NO RECORDED INDICATIONS
- ☐ ROOT GEOMETRY
- ☐ COUNTERBORE GEOMETRY
- ☐ NON-RELEVANT INDICATIONS
- ☐ ACOUSTIC INTERFACE
- ☐ INSIDE SURFACE GEOMETRY
- ☐ NON-GEOMETRIC INDICATIONS
- ☐ OTHER: N/A

COMMENTS: N/A

SCAN: N/A **SCAN DIRECTION:** N/A **GAIN(dB):** N/A

DISK/SIDE: N/A FILENAME(S): N/A

EXAMINATION RESULTS:

- ☐ NO RECORDED INDICATIONS
- ☐ ROOT GEOMETRY
- ☐ COUNTERBORE GEOMETRY
- ☐ NON-RELEVANT INDICATIONS
- ☐ ACOUSTIC INTERFACE
- ☐ INSIDE SURFACE GEOMETRY
- ☐ NON-GEOMETRIC INDICATIONS
- ☐ OTHER: N/A

COMMENTS: N/A

SCAN: N/A **SCAN DIRECTION:** N/A **GAIN(dB):** N/A

DISK/SIDE: N/A FILENAME(S): N/A

EXAMINATION RESULTS:

- ☐ NO RECORDED INDICATIONS
- ☐ ROOT GEOMETRY
- ☐ COUNTERBORE GEOMETRY
- ☐ NON-RELEVANT INDICATIONS
- ☐ ACOUSTIC INTERFACE
- ☐ INSIDE SURFACE GEOMETRY
- ☐ NON-GEOMETRIC INDICATIONS
- ☐ OTHER: N/A

COMMENTS: N/A

SCAN: N/A **SCAN DIRECTION:** N/A **GAIN(dB):** N/A

DISK/SIDE: N/A FILENAME(S): N/A

EXAMINATION RESULTS:

- ☐ NO RECORDED INDICATIONS
- ☐ ROOT GEOMETRY
- ☐ COUNTERBORE GEOMETRY
- ☐ NON-RELEVANT INDICATIONS
- ☐ ACOUSTIC INTERFACE
- ☐ INSIDE SURFACE GEOMETRY
- ☐ NON-GEOMETRIC INDICATIONS
- ☐ OTHER: N/A

COMMENTS: N/A

REMARKS: No examination was performed downstream due to the valve configuration.
Note 1: Scan performed at gain level below primary reference sensitivity in order to maintain 10-30% average ID noise level.

[signature]	II	5/11/94	[signature]	5-15-94
EXAMINER	LEVEL	DATE	UTILITY REVIEW	DATE
[signature]	II	5-11-94	[signature]	5/16/94
GE REVIEWED BY	LEVEL	DATE	ANII REVIEW	DATE

PAGE: 13 OF: 15

FORM UT-07 REV. 0

GE Nuclear Energy

ULTRASONIC SCAN PARAMETER SHEET
(AUTOMATED WITH *Smart 2000*)

SITE: WNP | PROCEDURE NO.: GE-UT-208 | REPORT NO.: R-R9-001
UNIT: 2 | REVISION NO.: 1 | DATA SHEET NO.: DA-R9-001
PROJECT NO.: 1D7KJ | FRR NO.: N/A | CALIBRATION SHEET NO.: CA-R9-001

SYSTEM: RECIRCULATION WELD ID: 20RRC(6)-8 MOTOR STEPS: CIR: 755.45 / in TRA: 500.00 / in

WELD REFERENCE, (GE-ADM-1005): Lo: TOP DEAD CENTER Wo: WELD CENTERLINE SEARCH UNIT: 45° / SHR

EXAMINATION SETUP

COMPONENT DIA: 20.0" WELD LENGTH: 63.0" TRACK DIA: 24.0" ARM LENGTH: 12.0" TRACK LOCATION: 9.0" UPST FROM WELD CENTERLINE

SCAN PARAMETERS

SCAN: A10 SCAN DIRECTION: AXUP SKEW: 0±10°

	SCANNING "X":	INDEXING "Y":
START:	0.25"	0"
SIZE:	3.25"	63.5"
OFFSET:	0"	0"
RESOLUTION:	.0360"	.1707"
MOTOR DIR.:	INVERSE	NORMAL

SCANNER ZERO POSITIONS:
CIR: TOP DEAD CENTER
TRA: WELD CENTERLINE
ROT: LOOKING DOWNSTREAM

SCAN: A11 SCAN DIRECTION: AXUP SKEW: 0° *

	SCANNING "X":	INDEXING "Y":
START:	0.25"	0"
SIZE:	3.25"	8.0"
OFFSET:	0"	-3.0"
RESOLUTION:	.0200"	.1509"
MOTOR DIR.:	INVERSE	NORMAL

SCANNER ZERO POSITIONS:
CIR: 3.0" CCW FROM TOP DEAD CENTER
TRA: WELD CENTERLINE
ROT: LOOKING DOWNSTREAM

SCAN: A50 SCAN DIRECTION: CWUP SKEW: 50±10°

	SCANNING "X":	INDEXING "Y":
START:	0"	0"
SIZE:	63.5"	2.6"
OFFSET:	0"	0"
RESOLUTION:	.0359"	.2000"
MOTOR DIR.:	NORMAL	INVERSE

SCANNER ZERO POSITIONS:
CIR: TOP DEAD CENTER
TRA: WELD CENTERLINE
ROT: LOOKING DOWNSTREAM

SCAN: A70 SCAN DIRECTION: CCUP SKEW: -50±10°

	SCANNING "X":	INDEXING "Y":
START:	0"	0"
SIZE:	63.5"	2.6"
OFFSET:	0"	0"
RESOLUTION:	.0359"	.2000"
MOTOR DIR.:	NORMAL	INVERSE

SCANNER ZERO POSITIONS:
CIR: TOP DEAD CENTER
TRA: WELD CENTERLINE
ROT: LOOKING DOWNSTREAM

SCAN: N/A SCAN DIRECTION: N/A SKEW: N/A

	SCANNING "X":	INDEXING "Y":
START:	N/A	N/A
SIZE:	N/A	N/A
OFFSET:	N/A	N/A
RESOLUTION:	N/A	N/A
MOTOR DIR.:	N/A	N/A

SCANNER ZERO POSITIONS:
CIR: N/A
TRA: N/A
ROT: N/A

SCAN: N/A SCAN DIRECTION: N/A SKEW: N/A

	SCANNING "X":	INDEXING "Y":
START:	N/A	N/A
SIZE:	N/A	N/A
OFFSET:	N/A	N/A
RESOLUTION:	N/A	N/A
MOTOR DIR.:	N/A	N/A

SCANNER ZERO POSITIONS:
CIR: N/A
TRA: N/A
ROT: N/A

REMARKS: * No skew oscillation during scan A11 to enhance indication signal response.
No examination was performed downstream due to the valve configuration.

Paul W. Nicholson	II	5-11-94		5-15-94	
EXAMINER	LEVEL	DATE	UTILITY REVIEW	DATE	
GE REVIEWED BY	II	5-11-94	ANI REVIEW	5/16/94	
	LEVEL	DATE		DATE	

GE Nuclear Energy

ULTRASONIC SCAN PARAMETER SHEET
(AUTOMATED WITH *Smart 2000*)

SITE: WNP | PROCEDURE NO.: GE-UT-208 | REPORT NO.: R-R9-001
UNIT: 2 | REVISION NO.: 1 | DATA SHEET NO.: DA-R9-002
PROJECT NO.: 1D7KJ | FRR NO.: N/A | CALIBRATION SHEET NO.: CA-R9-002

SYSTEM: RECIRCULATION WELD ID: 20RRC(6)-8 MOTOR STEPS: CIR: 755.45 / in TRA: 500.00 / in

WELD REFERENCE, (GE-ADM-1005): Lo: TOP DEAD CENTER Wo: WELD CENTERLINE SEARCH UNIT: 60° / RL

EXAMINATION SETUP

COMPONENT DIA: 20.0" WELD LENGTH: 63.0" TRACK DIA: 24.0" ARM LENGTH: 12.0" TRACK LOCATION: 9.0" UPST FROM WELD CENTERLINE

SCAN PARAMETERS

	SCANNING "X":	INDEXING "Y":		SCANNING "X":	INDEXING "Y":
SCAN: C10			SCAN: C12		
SCAN DIRECTION: LKDN			SCAN DIRECTION: LKDN		
SKEW: 0±10°			SKEW: 0° *		
START:	0"	0"	START:	0"	0"
SIZE:	3.5"	63.5"	SIZE:	3.5"	6.0"
OFFSET:	0"	0"	OFFSET:	0"	-3.0"
RESOLUTION:	.0360"	.1880"	RESOLUTION:	.0260"	.1509"
MOTOR DIR.:	INVERSE	NORMAL	MOTOR DIR.:	INVERSE	NORMAL
SCANNER ZERO POSITIONS:			SCANNER ZERO POSITIONS:		
CIR: TOP DEAD CENTER			CIR: 3.0" CCW FROM TOP DEAD CENTER		
TRA: WELD CENTERLINE			TRA: WELD CENTERLINE		
ROT: LOOKING DOWNSTREAM			ROT: LOOKING DOWNSTREAM		

	SCANNING "X":	INDEXING "Y":		SCANNING "X":	INDEXING "Y":
SCAN: N/A			SCAN: N/A		
SCAN DIRECTION: N/A			SCAN DIRECTION: N/A		
SKEW: N/A			SKEW: N/A		
START:	N/A	N/A	START:	N/A	N/A
SIZE:	N/A	N/A	SIZE:	N/A	N/A
OFFSET:	N/A	N/A	OFFSET:	N/A	N/A
RESOLUTION:	N/A	N/A	RESOLUTION:	N/A	N/A
MOTOR DIR.:	N/A	N/A	MOTOR DIR.:	N/A	N/A
SCANNER ZERO POSITIONS:			SCANNER ZERO POSITIONS:		
CIR: N/A			CIR: N/A		
TRA: N/A			TRA: N/A		
ROT: N/A			ROT: N/A		

	SCANNING "X":	INDEXING "Y":		SCANNING "X":	INDEXING "Y":
SCAN: N/A			SCAN: N/A		
SCAN DIRECTION: N/A			SCAN DIRECTION: N/A		
SKEW: N/A			SKEW: N/A		
START:	N/A	N/A	START:	N/A	N/A
SIZE:	N/A	N/A	SIZE:	N/A	N/A
OFFSET:	N/A	N/A	OFFSET:	N/A	N/A
RESOLUTION:	N/A	N/A	RESOLUTION:	N/A	N/A
MOTOR DIR.:	N/A	N/A	MOTOR DIR.:	N/A	N/A
SCANNER ZERO POSITIONS:			SCANNER ZERO POSITIONS:		
CIR: N/A			CIR: N/A		
TRA: N/A			TRA: N/A		
ROT: N/A			ROT: N/A		

REMARKS: * No skew oscillation during scan C12 to enhance indication signal response.
No examination was performed downstream due to the valve configuration.

Robert Gonzalowski	III	5/11/94		5-15-94	
EXAMINER	LEVEL	DATE	UTILITY REVIEW	DATE	
GE REVIEWED BY	II	5-11-94	ANII REVIEW	5/16/94	
	LEVEL	DATE		DATE	

GE Nuclear Energy

ULTRASONIC CALIBRATION DATA SHEET
(AUTOMATED WITH *Smart 2000*)

SITE: WNP UNIT: 2 CALIBRATION SHEET NO.: CA-R9-001

PROJECT NO.: 1D7KJ LINEARITY SHEET NO.: L-009

PROCEDURE NO.: GE-UT-208 REVISION: 1 FRR: N/A

Instrument: TECRAD / TOMOSCAN (Manufacturer / Model) TTS10091109 (System Serial No.)

Search Unit: KBA (Manufacturer) C28416 (Serial No.) .50" (Size) 2.25 MHz (Freq.) 45° / SHR (Angle/Mode) .50" (Incident to wedge front)

Cable: RG-58, RG-58, RG-174 (Type) 250', 25', 3' (Length) 4 (No. of Connectors)

Calibration Standard: UT-09 (Serial No.) SS (Material) 1.031" (Thickness) 85 °F (Temp.)

Thermometer: 130691 (Serial No.)

Couplant: SOUNDSAFE (Type) 20922 (Batch No.)

CALIBRATION

ORIENTATION:	CIRC	AXIAL
TYPE:	ID NOTCH	ID NOTCH
DEPTH:	1.15"	1.15"
AMPLITUDE:	80%	80%
SWEEP:	1.620"	1.680"
GAIN: (dB)	21.0	25.0

☐ TIME ☐ DEPTH ● METAL PATH

FIELD SIMULATOR: ROMPAS S/N: CAL-RHOM-004

REFLECTOR:	NEAR SDH	FAR SDH
MAX AMPLITUDE:	80%	80%
SWEEP:	.420"	1.010"
GAIN: (dB)	22.0	23.0

CALIBRATION VERIFICATION

	TIME	DATE	OPER.	COMP.	REPORT NO
INITIAL	04:00	05/11/94	PWM	20RRC(6)-8	RR9-001
VERIFIED					
VERIFIED					
VERIFIED					
VERIFIED					
FINAL	07:30	05/11/94	PWM	20RRC(6)-8	RR9-001

BASIC SETTINGS

1. DELAY: .5781 in
2. TIMEBASE: 5.1200 in
3. FREQUENCY: (MHz) 6.25
4. RATE: /S 20.0
5. UNITS: ☐ DISTANCE ● HALF PATH ☐ TIME
6. VELOCITY: 124999 in/s
7. SAMPLES: 512

PULSER / RECEIVER

1. MODE: ● PULSE ECHO ☐ THRU-TRANSMISSION
2. PULSER: P1 TO P1
3. VOLTAGE: (v) 400
4. WIDTH: (Ns) 244
5. FILTER: ☐ NONE ☐ 0.5 - 2 MHz ● 1 - 5 MHz ☐ 2 - 10 MHz ☐ 5 - 15 MHz
6. RECTIFICATION: ☐ NONE ☐ UNIPOLAR + ☐ UNIPOLAR - ● BIPOLAR
7. SMOOTHING: ☐ NONE ☐ FAST ☐ MEDIUM ● SLOW

Paul W Nicholson	II	5-11-94		5-15-94	
EXAMINER	LEVEL	DATE	UTILITY REVIEW	DATE	
GE REVIEWED BY	II	5-11-94	ANI REVIEW	5/16/94	PAGE: 1 OF: 1
	LEVEL	DATE		DATE	FORM UT-08 REV. 5

GE Nuclear Energy

ULTRASONIC CALIBRATION DATA SHEET
(AUTOMATED WITH *Smart 2000*)

SITE: WNP UNIT: 2 CALIBRATION SHEET NO.: CA-R9-002

PROJECT NO.: 1D7KJ LINEARITY SHEET NO.: L-010

PROCEDURE NO.: GE-UT-208 REVISION: 1 FRR: N/A

Instrument: TECRAD / TOMOSCAN (Manufacturer / Model) TTS10091109 (System Serial No.)

Search Unit: RTD (Manufacturer) 88-262 (Serial No.) 2(10x18)mm (Size) 2.0 MHz (Freq.) 60° / RL (Angle/Mode) .50" (Incident to wedge front)

Cable: 2(RG-58, RG-58, RG-174) (Type) 2(250', 25', 3') (Length) 8 (No. of Connectors)

Calibration Standard: UT-09 (Serial No.) SS (Material) 1.031" (Thickness) 85 °F (Temp.)

Thermometer: 130691 (Serial No.)

Couplant: SOUNDSAFE (Type) 20922 (Batch No.)

CALIBRATION

ORIENTATION:	CIRC	N/A
TYPE:	ID NOTCH	N/A
DEPTH:	1.15"	N/A
AMPLITUDE:	80%	N/A
SWEEP:	2.300"	N/A
GAIN: (dB)	41.0	N/A

☐ TIME ☐ DEPTH ● METAL PATH

FIELD SIMULATOR: ROMPAS S/N: CAL-RHOM-004

REFLECTOR:	NEAR SDH	FAR SDH
MAX AMPLITUDE:	80%	80%
SWEEP:	.637"	1.425"
GAIN: (dB)	31.0	30.0

CALIBRATION VERIFICATION

	TIME	DATE	OPER.	COMP.	REPORT NO
INITIAL	09:30	05/11/94	PAZ	20RRC(6)-8	RR9-001
VERIFIED					
VERIFIED					
VERIFIED					
VERIFIED					
FINAL	12:40	05/11/94	PAZ	20RRC(6)-8	RR9-001

BASIC SETTINGS

1. DELAY: 1.4435 in
2. TIMEBASE: 6.3990 in
3. FREQUENCY: (MHz) 10.0
4. RATE: /S 20.0
5. UNITS: ☐ DISTANCE ● HALF PATH ☐ TIME
6. VELOCITY: 249960 in/s
7. SAMPLES: 512

PULSER / RECEIVER

1. MODE: ☐ PULSE ECHO ● THRU-TRANSMISSION
2. PULSER: P2 TO R2
3. VOLTAGE: (v) 400
4. WIDTH: (Ns) 228
5. FILTER: ☐ NONE ☐ 0.5 - 2 MHz ● 1 - 5 MHz ☐ 2 - 10 MHz ☐ 5 - 15 MHz
6. RECTIFICATION: ☐ NONE ☐ UNIPOLAR + ☐ UNIPOLAR - ● BIPOLAR
7. SMOOTHING: ☐ NONE ☐ FAST ☐ MEDIUM ● SLOW

Robert Pazbrodski	II	5/11/94		5-15-94	
EXAMINER	LEVEL	DATE	UTILITY REVIEW	DATE	
GE REVIEWED BY	II	5-11-94	ANI REVIEW	5/16/94	PAGE: 1 OF: 1
	LEVEL	DATE		DATE	FORM UT-08 REV. 5

ATTACHMENT 3
EVALUATION OF SUPPLY SYSTEM METHODOLOGY

EXECUTIVE SUMMARY

In Reference 1, the Supply System reported to the NRC that an indication had been discovered in pipe to valve weld 20RRC(6)-8. The inspections performed to date have not confirmed that the indication is a flaw. For the purpose of this discussion, the indication is conservatively assumed to be a flaw and is identified as such. Further correspondence on the issue is identified by References 2 through 8. In conversations with the staff following the submittal of Reference 7, the NRC staff reviewer raised a concern regarding the Supply System methodology (NASCRAC elliptical model) used to evaluate the piping flaw. Reference 8 requested that the Supply System evaluate the code and model used for evaluation of the flaw.

Based upon the results of the equivalent model developed using the equations provided in NUREG-0313, Revision 2, Appendix A, the Supply System has concluded that the NASCRAC elliptical model provides more conservative results than the NUREG-0313, Revision 2, Appendix A model. Therefore, the Supply System believes that the methods used meet the intent of the recommendations identified in NUREG-0313, Revision 2.

HISTORY

In May of 1991, during ultrasonic examination of weld 20RRC(6)-8, an indication was discovered. Reference 1 documented this discovery and identified the methodology used to perform the flaw evaluation. The evaluation summary attached to the letter identified the NASCRAC computer model used and details of the applied stress state. Strict adherence was observed in applying the technical requirements identified in NUREG-0313, Revision 2 (e.g., modeling, weld residual stresses and crack growth rates). This NASCRAC evaluation predicted a remaining life of approximately six years.

Reference 2 provided the staff additional information about the loads (stresses) and NDE results. The indication did not appear to be IGSCC due to the lack of axial components that are normally seen with IGSCC; however, the Supply System treated the indication as an IGSCC flaw and evaluated it as such. The weld in question had undergone Induction Heat Stress Improvement (IHSI) in 1983 and the residual stress distribution would be compressive due to this treatment. The Supply System did not take credit for these compressive stresses (approximately 40 ksi compressive) and treated the weld as if it were in the as-welded condition using the stress distribution identified in the NUREG when performing the analysis. The staff concluded in Reference 3 that there was reasonable assurance that structural integrity of the piping would be maintained and that WNP-2 could restart.

In Reference 4, the staff provided a detailed safety evaluation of the flaw evaluation performed by the Supply System. The staff safety evaluation discussed the Supply System use of the computer code NASCRAC and the applied stress states. The staff also conducted an independent analysis and concluded that the plant could operate until R7.

In May of 1992 during R7, the flaw was reexamined using qualified ultrasonic techniques. This information was provided to the staff in Reference 5. The Supply System determined that the flaw had not changed in length or significantly in depth; that the flaw remained bounded by the evaluation in Reference 2; and that the flaw had not propagated. Reference 6 documented the staff review of the flaw evaluation and determined that the plant could restart following R7.

During R8 the flaw was examined again and the Supply System determined that the flaw depth had not changed. The only change noted was in the length, originally reported as 4.5 inches. We have concluded the length of the flaw is actually 3.6 inches. This difference was the result of a change in the EPRI practice for detection of length based on reference gain. This information was provided to the staff in Reference 7. The flaw remained bounded by the earlier evaluations and had not grown in depth.

Following conversations between the staff and the Supply System, the NRC requested in Reference 8 that the Supply System:

- use a model that provides the equivalent results to the model in NUREG-0313, Revision 2, Appendix A that assumes a 360° circumferential crack and;

- evaluate the NASCRAC computer code based upon the different results obtained between the code used by the Supply System and the code used as discussed in NUREG-0313, Revision 2.

EQUIVALENT MODEL USING APPENDIX A

The Supply System evaluation (NASCRAC) was performed using an influence function model for an elliptical crack in a cylinder. The use of the influence function is discussed in Appendix A of NUREG-0313 Revision 2. The staff has requested the Supply System use a model that provides equivalent results to the model in NUREG-0313, Revision 2, Appendix A. This would require the 3.6 inch long flaw (measured length) be evaluated as a full internal circumferential flaw of approximately 56 inches in length. As stated in NUREG-0313, Revision 2, Section 4.3, multiple cracks less that 20% the circumference in total length, may be treated as one crack with the length equivalent to the sum of the lengths. In addition, cracks with a total length which remain less than 30% of the circumference, after crack growth, may be treated as one crack provided each crack is separated by at least 20% of the circumference from all other cracks.

If multiple cracks may be treated as one crack with a total length less than the full circumference, it would be inappropriate to consider a single indication of 3.6 inches as if it were a full circumferential flaw and to use the circumferential flaw shape in the model to predict crack growth. The two model methods, elliptical flaw shape and circumferential flaw shape, are different approaches which will result in different maximum crack depths and time to failure.

The Supply System developed an equivalent model by writing a computer program which rigorously applies the IGSCC propagation methodology outlined by Appendix A of the NUREG. Using a refined integration time step, the Supply System determined that the remaining life as determined by the NUREG Appendix A evaluation would be approximately eight operating years.

REEVALUATION OF THE NASCRAC COMPUTER CODE

When the Supply System first reviewed NUREG-0313, it was determined that there was a need for a more sophisticated computer code for performing flaw evaluations. The Supply System was using the EPRI BIGIF code at the time, but wanted a code that would allow the modeling of stress corrosion cracking using ASME Code stresses superimposed on the weld residual stresses.

The stresses applied in the WNP-2 Reactor Recirculation Cooling (RRC) System model are those required by the ASME Code for flaw evaluation. These stresses are deadweight, thermal, pressure, weld residual stresses and (conservatively) seismic. The Appendix A methodology only takes into account the stresses due to welding and pressure. The Supply System believes this to be an approximation which may not always yield conservative results. In piping systems, some of the highest continuously applied stresses are due to thermal bending and these stresses also contribute to IGSCC failures. Because of the need for modeling flexibility and the acceptance of the influence function by the staff as an evaluation method, the Supply System purchased the NASCRAC computer code from Failure Analysis Associates.

The Supply System compared the NASCRAC code to the PRAISE code, a probabilistic fracture mechanics code for piping reliability, developed by Lawrence Livermore National Labs under funding from the NRC. (This code was presented at a workshop at the NRC Training Center in Bethesda, Maryland May 4 and 5, 1992). The PRAISE code is used to predict the initiation of IGSCC and predicts growth rates. The elliptical flaw model that is used in the PRAISE code is identical to the influence function (elliptical model) used by the Supply System in the NASCRAC code. This was taken into consideration by the Supply System when deciding to use NASCRAC.

The Supply System has invested significant resources in developing procedures which we believe comply with the NUREG-0313 Revision 2 evaluation criteria. This effort has resulted in a verified computer code which has demonstrated an ability to evaluate flaws more realistically than the Appendix A methodology. Therefore, based upon our evaluations, the Supply System has concluded that the NASCRAC computer code and our methods of evaluation meet the intent of NUREG-0313 Revision 2 and are in compliance with the ASME Code requirements.

THE STAFF'S EVALUATION

Reference 8 indicated that the staff's calculations showed a crack depth of 0.62 inches after about four years of operation. When the Supply System calculated the predicted crack growth using the NUREG-0313, Revision 2, Appendix A evaluation methodology, the result estimated about eight years. It appears the four year life predicted by the staff was determined in one of two following methods:

- using a very coarse time step size in the evaluation methodology to predict the crack growth, or

- by substituting the Supply System's applied loads (pressure, deadweight, thermal, seismic) in the Appendix A equation in lieu of the membrane stress caused by pressure.

In either case, the maximum flaw depth of 0.62 inches was used. This maximum flaw depth is taken from ASME Code Section XI, Table IWB-3641.5; however, this value is for elliptical flaws, not the circumferential flaw used in the staff evaluation. It appears to the Supply System that the staff evaluation used a mixture of stresses different from those used in NUREG-0313, Revision 2, Appendix A equations or an acceptance criteria for the circumferential flaws which differed from the ASME Code criteria accepted by the industry. These techniques could explain the differences between the results obtained by the staff and the Supply System when predicting the time to exceed the maximum allowable depth of 0.62 inches.

REGULATORY POSITION

NUREG-0313, Revision 2 is the NRC staff recommendation for crack evaluation. The Supply System has evaluated the guidance provided by the staff in the NUREG-0313 and in Generic Letter (GL) 88-01, "NRC Position on IGSCC in BWR Austentic Stainless Steel Piping." In Reference 4 the staff concluded, based in part upon the NASCRAC evaluation performed by the Supply System, that there was a reasonable assurance that the structural integrity of the piping would be maintained until R7. Therefore, the Supply System believes that the NASCRAC evaluation has been accepted as an alternate measure as allowed by NUREG-0313 and GL 88-01.

CONCLUSION

After completing the evaluations requested in Reference 8, the Supply System has reached the following conclusions:

1. The use of the NASCRAC code, which predicted about six years of remaining life, is more conservative than the results obtained by using the methodology exactly as described in NUREG-0313.

2. The methods used by the Supply System in predicting crack growth are consistent with the guidance in NUREG-0313 and are in compliance with the requirements of the ASME Code.

3. The methods used by the Supply System in the evlauation of the flaw present an acceptable alternative to the methodology in Appendix A of NUREG-0313.

REFERENCES

1) Letter GO2-91-096, dated May 5, 1991, GC Sorensen (SS) to NRC, "Report on Flaw in Reactor Recirculation Piping (TAC No. 80358)"

2) Letter GO2-91-098, dated May 15, 1991, GC Sorensen (SS) to NRC, "Report on Flaw in Reactor Recirculation Piping, Additional Information (TAC No. 80358)"

3) Letter dated May 23, 1991, PL Eng (NRC) to GC Sorensen (SS), "Flaw in Reactor Recirculation Piping at WNP-2 (TAC No. 80358)"

4) Letter dated February 14, 1992, PL Eng (NRC) to GC Sorensen (SS), "Safety Evaluation of a Flaw in the Reactor Recirculation Piping at the Washington Public Power Supply System (WPPSS) Nuclear Project Number 2 (TAC No. M80358)"

5) Letter GO2-92-123, dated May 14, 1992, GC Sorensen (SS) to NRC, "Report on Flaw in Reactor Recirculation Piping (TAC NO. 80358)"

6) Letter dated June 25, 1992, RR Assa (NRC) to GC Sorensen (SS), "Review of Updated Report on Reactor Recirculation Piping Flaw at Washington Public Power Supply System (WPPSS) Nuclear Reactor Number 2 (TAC No. M83721)"

7) Letter GO2-93-119, dated May 21, 1993, GC Sorensen (SS) to NRC, "Report on Flaw in Reactor Recirculation Piping"

8) Letter dated June 11, 1993, JW Clifford (NRC) to GC Sorensen (SS), "Review of Inspection Report on a Flaw in Reactor Recirculation Piping at WNP-2 (TAC No. M86491)"