Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381-2000

10 CFR 50.55a

JUN 2 7 2002

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

Gentlemen:

In the Matter of)
Tennessee Valley Authority)

Docket No.50-390

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1 - AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) INSERVICE INSPECTION (ISI) PROGRAM REQUEST FOR RELIEF 1-ISI-13

The purpose of this letter is to request relief from ASME Section XI Code required examinations due to limitations which were identified in the Unit 1 Cycle 4 refueling outage. This relief request is being submitted in accordance with 10 CFR 50.55a(g)(5)(iii).

TVA committed in the ASME Section XI ISI Summary Report for the Fourth Refueling Cycle, dated May 2, 2002, to submit a relief request for an ISI examination performed during Unit 1 Cycle 4 refueling outage because Code required coverage of the reactor vessel head-to-flange weld examination could not be achieved. The Enclosure provides Request for Relief 1-ISI-13 and supporting material is provided in the attachments to the enclosure.

To meet the Inspection Program B minimum/maximum examination requirements for Examination Category B-A as defined in ASME Section XI, IWB-2412, the reactor vessel head-to-flange weld is divided into two sections. One section, designated W08-09-A, was scheduled for examination during the first inspection period and was examined during the Cycle 2 refueling outage. Code coverage

A047

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restrictions were encountered and relief request 1-ISI-06 was submitted for weld W08-09-A after the examination was attempted. The request for relief was granted pursuant to 10 CFR 50.55a (g)(6)(i).

The other section of the weld, designated W08-09-B, was scheduled for examination during the second inspection period and was examined during the Cycle 4 refueling outage. Similar Code coverage restrictions were encountered and request for relief 1-ISI-13 is herein requested.

If you have any questions about this relief request, please contact me at (423) 365-1824.

Sincerely,

P. L. Pace
Manager, Site Licensing
and Industry Affairs

Enclosure
cc (Enclosure):

NRC Resident Inspector
Watts Bar Nuclear Plant
1260 Nuclear Plant Road
Spring City, Tennessee 37381

Mr. L. Mark Padovan, Senior Project Manager
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ENCLOSURE

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1
AMERICAN SOCIETY MECHANICAL ENGINEERS (ASME)
INSERVICE INSPECTION (ISI) PROGRAM
REQUEST FOR RELIEF 1-ISI-13

Summary:

Due to the design configuration of the reactor vessel closure head, volumetric examination of the head-to-flange weld during the Unit 1 Cycle 4 refueling outage resulted in less than essentially 100 percent (%) of ASME code coverage being achieved. The design configuration of the closure head prevents the performance of an ultrasonic scan from the flange side of the head-to-flange weld, thus preventing essentially 100% examination of the required full volume. An acceptable surface examination was performed on the weld. Volumetric examination of this component is required in accordance with ASME Section XI Table IWB-2500-1, Examination Category B-A, Item Number B1.40. The full volume weld examination requirement is illustrated by Figure IWB-2500-5.

To meet the Inspection Program B minimum/maximum examination requirements for Examination Category B-A as defined in ASME Section XI, IWB-2412, the head-to-flange weld is divided into two sections. One section, designated W08-09-A, was scheduled for examination during the first inspection period and was examined during the Cycle 2 refueling outage. The other section, designated W08-09-B, was scheduled for examination during the second inspection period and was examined during the Cycle 4 refueling outage. Request for relief 1-ISI-06 was submitted for weld W08-09-A after examination during the Cycle 2 refueling outage. The request for relief was granted pursuant to 10 CFR 50.55a(g)(6)(i).

In accordance with 10CFR50.55a(g)(5)(iii), an exemption is requested from the extent of examination requirement due to physical restrictions. Relief is requested from these examinations because the code requirement is impractical to implement.

ASME Section XI Code Edition/Addenda:

The Watts Bar Nuclear Plant Unit 1 Code of Record is the 1989 Edition, no addenda.

ENCLOSURE

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1
AMERICAN SOCIETY MECHANICAL ENGINEERS (ASME)
INSERVICE INSPECTION (ISI) PROGRAM
REQUEST FOR RELIEF 1-ISI-13

Component:

Reactor Vessel Head-to-Flange Weld.
Reference ISI drawing CHM-2549-C-01, weld identifier W08-09-B (Attachment 1).

Code Requirement:

ASME Section XI, 1989 Edition, Table IWB-2500-1, Examination Category B-A, Item Number B1.40, examination requirement as defined by Figure IWB-2500-5 (Attachment 2).

Code Requirements From Which Relief Is Requested:

Relief is requested from performing the required volumetric examination on essentially 100% of the full volume of the reactor vessel head-to-flange weld.

Basis for Relief:

The design configuration of the reactor vessel head-to-flange weld precludes an ultrasonic examination of the required volume for the head-to-flange weld. The design configuration limits ultrasonic examination of the code required examination volume to approximately 75%. This percentage is calculated in accordance with TVA Procedure N-GP-28, Calculation of ASME Code Coverage for Section XI NDE Examinations (Attachment 3).

Alternative Examination:

The code required volumetric examination of the full volume of the reactor vessel head-to-flange weld will be performed on accessible areas to the extent practical given the design configuration of the head-to-flange weld. The code required surface examination will be performed on 100% of the weld length for this weld.

To meet the Inspection Program B minimum/maximum examination requirements for Examination Category B-A as defined in ASME Section XI, IWB-2412, the head-to-flange weld is divided into two sections. One section, W08-09-A, was scheduled for examination during the first period and was examined during the Cycle 2 refueling outage. The other section, W08-09-B, was scheduled for examination during the second period and was examined

during the Cycle 4 refueling outage (See Attachment 4 Examination Data Report). Request for relief 1-ISI-06 was submitted for weld W08-09-A after examination during the Cycle 2 refueling outage. The request for relief was granted pursuant to 10 CFR 50.55a(g)(6)(i) by NRC letter "Watts Bar Nuclear Plant - First 10 Year Interval Inservice Inspection Program Plan Requests for Relief Nos. 1-ISI-5 and 1-ISI-6 (TAC No. MA6446)," dated March 24, 2000.

Justification For The Granting Of Relief:

The design configuration of the reactor vessel closure head precludes full ultrasonic examination of essentially 100% of the head-to-flange weld. Examination of the head-to-flange weld is obstructed by the tapered portion of the flange. The design configuration allows for ultrasonic examination of approximately 75% of the required examination volume.

The ASME Section XI code requirements for reflectors oriented parallel to the weld stipulate that the angle beam search units shall be aimed at right angles to the weld axis, with the search unit manipulated so that the ultrasonic beams pass throughout the entire volume of weld metal. The required examination volume A-B-C-D is depicted on ASME Section XI Figure IWB-2500-5. The head-to-flange weld configuration limits bi-directional coverage from the flange side due to the adjacent flange junction. This junction restricts the search unit scan surface.

The weld received 100% one direction coverage from the head side with the sound beam directed toward the flange. No scans were performed from the flange side due to the taper interference, therefore, 0% coverage was obtained from this direction. Scans parallel to the weld were performed to the extent that loss of search unit contact occurred on the flange side of the weld. Based on the extent of coverage obtained, it is reasonable to assure that flaws originating from the inner diameter would be detected.

Ultrasonic examination from the flange face would not provide meaningful results based on the following:

- The geometric configuration of the head-to-flange weld is not amenable for ultrasonic examination from the flange face. This is due to the geometric curvature of the head and the extensive metal path distance required to interrogate the required weld volume. Section A-A of Westinghouse drawing 30738-1535 provides general details of the reactor vessel head. (Attachment 5)

  The flange face contains two o-ring grooves (0.6 inch in width) around the circumference and contains 32 recessed locations for o-ring clips, which limit complete scan coverage from the flange face. Detail I of Westinghouse Drawing 30738-1535 (Attachment 5) provides details of the o-ring grooves and clip locations on the flange face.

- Previous examination results from the preservice examination did not reveal any flaws.

- No industry events have identified flaw initiation in reactor vessel head-to-flange welds.

Conformance with the referenced code requirement is impractical, therefore, this request for relief is submitted pursuant to 10CFR 50.55a(g)(5)(iii). Due to the combined effect of the high percentage of ultrasonic examination coverage (75%), and 100% surface examination coverage, it is requested that relief be approved in accordance with 10CFR 50.55a(g)(6)(i) for the first inspection interval.

Implementation Schedule:

This Request for Relief is applicable to WBN's first inspection interval.

ENCLOSURE

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1
AMERICAN SOCIETY MECHANICAL ENGINEERS (ASME)
INSERVICE INSPECTION (ISI) PROGRAM
REQUEST FOR RELIEF 1-ISI-13

LIST OF ATTACHMENTS

Attachment 1. Weld Location ISI drawing Number CHM-2549-C-01, Revision 3.

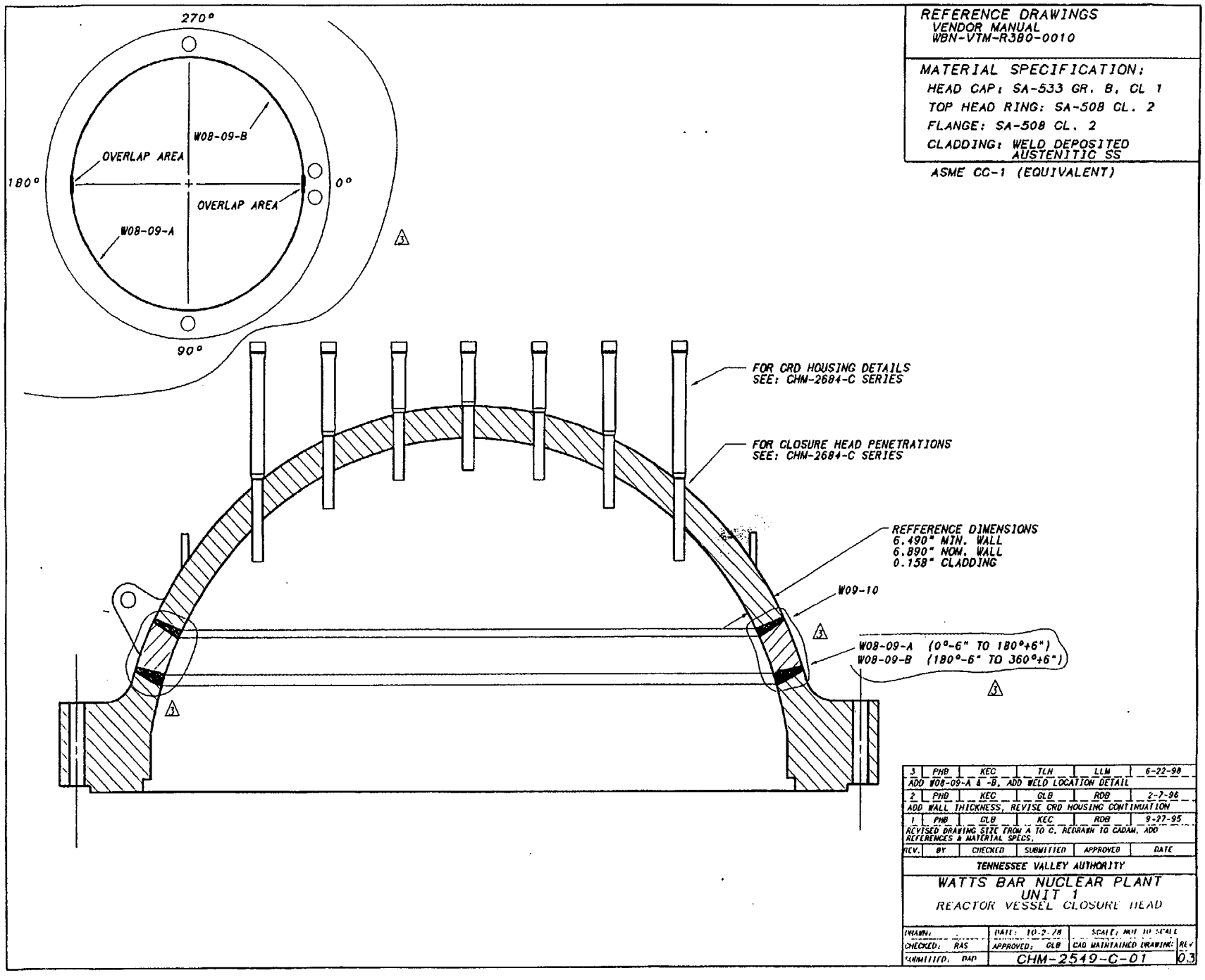
Attachment 2. ASME Section XI, 1989 Edition, Figure IWB-2500-5, Head-to-Flange Weld Joint.

Attachment 3. TVA Procedure N-GP-28, Calculation of ASME Code Coverage for Section XI NDE Examinations (8 pages).

Attachment 4. Examination Data Reports (13 pages).

Attachment 5. Westinghouse Drawing 30738-1535, Closure Head Subassembly.

ENCLOSURE
ATTACHMENT 1
WELD LOCATION ISI DRAWING NUMBER CHM-2549-C-01



ENCLOSURE
ATTACHMENT 2
ASME SECTION XI, 1989 EDITION, FIGURE IWB-2500-5
HEAD-TO-FLANGE WELD JOINT

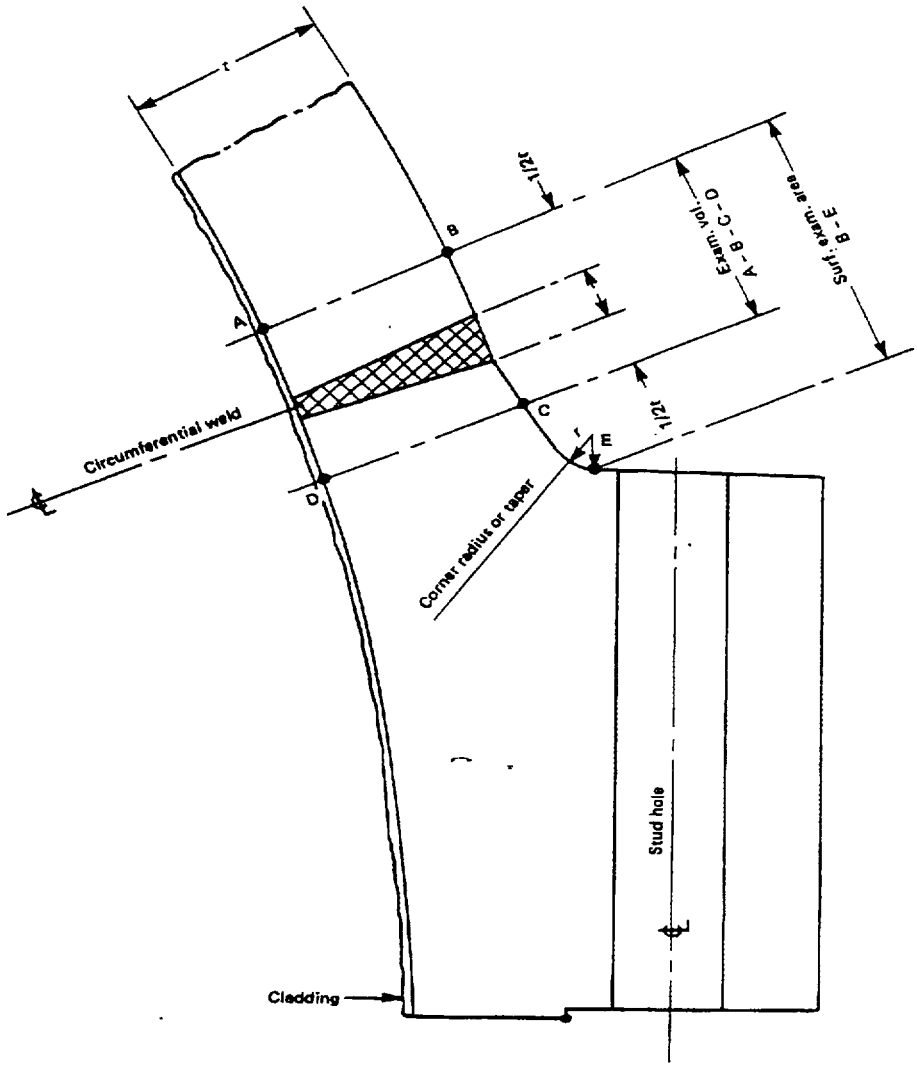


FIG. IWB-2500-5 HEAD-TO-FLANGE WELD JOINT

NONDESTRUCTIVE EXAMINATION PROCEDURE TVA Nuclear Power	Procedure No. N-GP-28 Revision 3 Page 1 of 8

W47 010524 006 **QA RECORD**

CALCULATION OF ASME CODE COVERAGE FOR SECTION XI NDE EXAMINATIONS

"QUALITY RELATED"

Prepared By: Orig. signed by, Joel W. Whitaker Date: 5/24/01

Technical Review: Orig. signed by, N. Roger Bentley NDE Level III, Date: 5/24/01

ISO Approval: Orig. signed by, Frank C. Leonard Date: 5/24/01

I:Shared\N-GP-28 Rev 3 (5-01).doc

Rev. No.	Date	Description
0	4/3/96	Initial issue.
1	8/15/97	Incorporate TC 97-09.
2	10/18/00	General revision to incorporate 10CFR50.55a ruling change which implements Appendix VIII
3	5/24/01	Revised to upgrade procedure to ASME Section XI 1995 Edition with Addenda through 1996

1.0 Scope

The scope of this procedure is to provide generic guidelines for calculating the ASME Section XI code coverage and augmented examination coverage obtained during volumetric and surface examinations. This procedure incorporates the requirements of Code Case N-460 and NRC Information Notice 98-42. This procedure is not applicable for calculating the examination coverage for RPV examinations performed in accordance with Appendix VIII.

2.0 Purpose

This procedure applies to the calculation of ASME Section XI Code coverage for vessel welds (excluding the RPV welds performed in accordance with Appendix VIII) piping welds, and integral attachments. This procedure applies when performing surface or volumetric examinations and may be used as a guide when calculating the examination coverage for preservice and inservice examinations. Coverage limitations may be due to an obstruction, interference, geometric configuration or other applicable reason.

3.0 References

3.1 ASME Code Case N-460

3.2 10CFR 50.55a, as amended by the Federal Register Notice, Vol. 64, No. 183, dated September 22, 1999 (Final Rule)- Implementation of Appendix VIII as executed by the Performance Demonstration Initiative (PDI) Program Description Document, Rev. 1, Change 1.

3.3 Guideline for the Implementation of Appendix VIII and 10CFR 50.55a, Rev. D, April 18, 2000

3.4 NRC Information Notice 98-42

4.0 Definitions

4.1 Examination Coverage- The percentage of the examination surface or volume obtained during the performance of the examination.

4.2 Examination Surface- The surface of the weld and base material required to be examined by ASME Section XI or other requirement using a surface examination method.

4.3 Examination Volume- The volume of weld and base material required to be examined by ASME Section XI or other requirement using a volumetric examination method.

4.4 Scan Limitation- the inability to scan the surface(s) as required by procedure due to interferences.

4.5 Surface Limitation- the inability to perform a surface examination of the required surface(s) because of an interference.

4.6 Volumetric Limitation- the inability to examine the required volume because of the geometric configuration, a physical interference, or a metallurgical condition of the material being examined.

5.0 General

5.1 During the performance of inservice inspections, ASME Section XI requires examination coverage to be essentially 100% of the weld area or volume. For examination coverage less than 100%, TVA has implemented ASME Code Case N-460 which states that when the entire examination volume or area cannot be examined due to interference by another component or part geometry, a reduction in examination coverage for Class 1 or Class 2 welds may be accepted provided the reduction in coverage for that weld is less than 10%. (NRC Information Notice 98-42 further defines the >90% rule to include all welds and other areas required by ASME Section XI.

5.2 Surface examinations are typically conducted on the weld area plus a defined amount of base material on each side of the weld. Volumetric examinations specify a particular volume to be examined. The Section XI required examination volume or surface examination area for each type of weld is depicted in figures of IWB-2500 or IWC-2500 as applicable. As depicted for piping welds, volume width generally constitutes the weld plus 1/4t on each side while volume thickness generally constitutes the lower 1/3 of the piping thickness for the length of the weld. The exception normally includes code category B-O which includes the weld plus 1/2 inch and full volume for the length of the weld. As depicted, for vessel welds, the volume width generally constitutes the weld plus 1/2t on each side of the weld while volume thickness generally constitutes the entire component thickness (i.e. full volume). The volume changes with variations in weld configuration (e.g. transition between different pipe thickness or vessel weld configurations).

Note: Risk-Informed (RI) programs require larger volumes in certain areas.

5.3 The required examination volume or area shall be verified prior to calculation of the limitation.

6.0 Documenting and Calculating Examination Coverage

6.1 While performing a surface or ultrasonic examination, the NDE Examiner shall make every attempt to examine 100 percent of the examination area or volume.

6.2 When practical, the two beam path directions for ultrasonic examinations should be performed from two sides of the weld or additional angles employed in order to maximize coverage.

6.3 If 100% percent of the examination surface or volume cannot be examined, the NDE Examiner should perform the following under the direction of the inspection coordinator or the NDE Level III:

6.3.1 Perform additional examinations with higher angles in order to maximize cover for ultrasonic exams.

6.3.2 Perform another surface method (i.e., PT in lieu of MT) in order to maximize coverage.

6.3.3 Perform alternative NDE methods if applicable.

6.4 The examiner shall accurately document all limitations, obstructions, interferences, geometric configurations or other applicable reasons for not obtaining the required code coverage.

6.5 The examiner shall document the limitation on a sketch. Examination coverage estimates may be performed by the examiner or the reviewer.

7.0 Calculation Basis

7.1 Volumetric Examinations- Piping Welds and Vessels 2 inches and less in thickness

a) Examination volume coverage may be increased as previously discussed or by use of refracted longitudinal wave techniques on stainless steel or dissimilar metal welds. Use of refracted longitudinal waves to penetrate stainless steel weld material will increase the examination volume coverage by the amount depicted on the examination coverage drawing.

b) Estimates shall be derived by estimating coverage based on two-beam path direction coverage of the complete examination. Each scan direction equals 25% (downstream, up-steam, clockwise, counterclockwise.) (Reference Figure 1)

c) The effects of adjacent component interferences (e.g. welded lug attachments) along the weld length are also taken into account with the reduction in coverage identified as a percentage of reduced volume.

8.0 Surface Examinations - Piping Welds And Integral Attachments

8.1 Examination area coverage calculations are based upon one of the following suppositions:

a) The total examination area is calculated, typically length x width, then the total area of limitation or interference is subtracted from the total examination area.

b) The area of achieved coverage is divided by the total examination area for percentage of examination achieved.

9.0 Ultrasonic Examinations - Vessel Welds

NOTE: THIS IS NOT APPLICABLE FOR APPENDIX VIII EXAMINATIONS OF THE RPV WELDS.

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

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

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

9.2 The examination volume achieved for each above examination scan shall be obtained and documented on a percentage basis. This calculation considers the required examination volume required per the ASME Section XI Code.

a) The total examination coverage may be calculated by averaging the exam volume coverage for all nine scans.

10.0 PDI Implementation for Piping Welds

10.1 Where examination from both sides is not possible, full coverage credit may be claimed from a single side for ferritic welds provided the examiner is qualified for single sided examination. Current technology is not capable of reliably detecting or sizing flaws on the far side of an austenitic weld for configurations common to US nuclear applications. Therefore, examination of austenitic material welds shall be performed from both sides or a scan limitation shall be documented.

10.2 The NDE Level III shall make an evaluation in the Weld Resolution document regarding total examination coverage (best effort) as calculated above in Section 7.0. In addition, a coverage evaluation which considers the PDI Implementation Guideline shall also be indicated in the Weld Resolution sheet. These two coverage evaluations shall be reported to the ISI Programs Engineer for incorporation into the Relief Request.

10.3 Typically a one-sided austenitic weld examination with no circumferential restrictions would be indicated as 75% examination coverage or 50% if circumferential scans were limited to one side.

NOTE: These requirements do not apply to augmented examinations of piping welds.

11.0 Responsibilities

11.1 The examiner or designee shall document the amount of code coverage obtained after all necessary steps to perform additional examinations has been completed in order to maximize coverage. The documentation shall become part of the examination weld data package.

11.2 The documentation may be reviewed by another individual with the same or higher NDE certification.

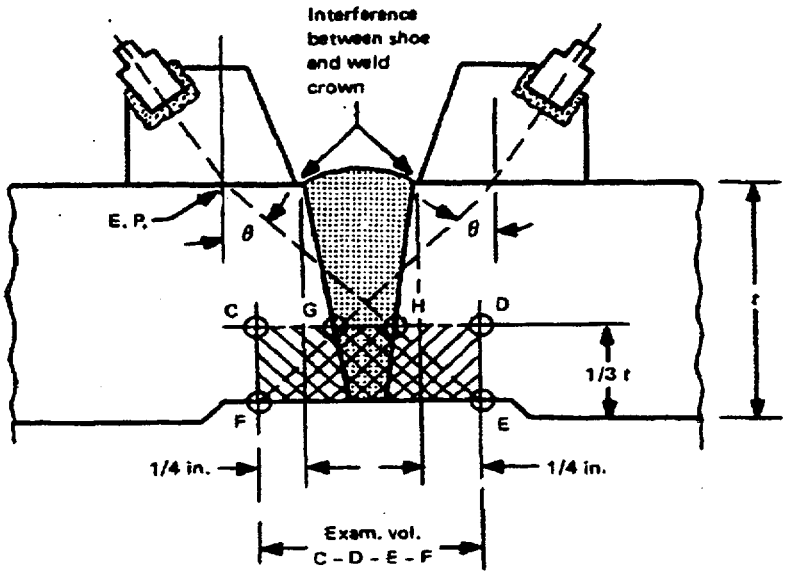
11.3 The NDE Level III or data reviewer may review the calculations in order to verify that the information is accurate and correct.

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

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

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

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



GENERAL NOTE:
For this example of interference with a ½V examination applied from both sides, only the E-F-G-H portion of the examination volume receives two direction coverage, while volumes C-G-F and H-D-E receive one direction coverage. In this case, the examination beam path shall be increased to ¾V (O.D. to I.D. and back towards O.D. for ½*t*) to provide the required two direction coverage over the examination volume. Use of a ¾V examination beam path (O.D. to I.D. to ½*t*) provides additional beam path (past ½*t*) to help in obtaining required coverage when examination part thickness *t* increases.

FIG. III-3230-1 EXAMPLE OF PHYSICAL RESTRICTIONS TO THE WELD EXAMINATION

Figure 1

TENNESSEE VALLEY AUTHORITY	RECORD OF MAGNETIC PARTICAL	REPORT NUMBER R-822

PROJECT: WBN UNIT: 1 CYCLE: 04
SYSTEM: RV
WELD/COMPONENT I.D. W08-09-B
CONFIG.: RUHEAD TO: RFLG
PROCEDURE: N-MT-6 REV 24 TC n/a
EXAMINATION CODE: 89E-01
CODE CLASS: 1 CATEGORY B-A

EXAMINATION DATE: 03/01/2002
EXAM SURFACE: ☐ ID ☑ OD
PRESERVICE ☐ INSERVICE ☑
VISUAL CARD S/N: 070
REFERENCE DWG NO: CHM-2549-C-01

ACCEPTANCE CRITERIA
☐ APPDX. A ☑ APPDX. B
☐ OTHER N A

METHOD OF MAGNETIZATION

EXAMINATION MEDIUM: Dry Powder COLOR: No. 1 Gray BATCH NO.: n/a

YOKE Y5 ☐ Y6 ☑	PRODS: AC ☐ DC ☐	COILS: AC ☐ DC ☐
OTHER: n/a	EQUIP TYPE: n/a	EQUIP TYPE: n/a
EQUIP S/N: 538073	EQUIP S/N: n/a	EQUIP S/N: n/a
CAL. DUE DATE n/a	CAL. DUE DATE n/a	CAL. DUE DATE n/a
POLE SPACING: 8 inches	PROD SPACING: n/a inches	COIL TURNS: n/a
TEST WEIGHT S/N E25394	MAG. CURRENT: n/a amps	MAG. CURRENT: n/a amps

THERMOMETER S/N n/a CALIBRATION DUE DATE n/a
BLACK LIGHT OR LIGHT METER S/N: n/a CALIBRATION DUE DATE n/a

INTENSITY VERIFICATION TIME	INIT.: n/a	1) n/a	2) n/a	3) n/a

EXAMINATION RESULTS: SATISFACTORY ☑ UNSATISFACTORY ☐ NOI NO.:

EXPLANATION OF EXAM RESULTS
No Recordable Indications

COMMENTS / LIMITATIONS
None

ILLUMINATION CHECK ADEQUATE: ☑ MT POWDER CHECK ADEQUATE: ☑

EXAMINER: Jason Polisensky LEVEL: II
EXAMINER: Doug Gronewold LEVEL: II
REVIEWER: LEVEL: III DATE: 3/2/02

ANII: B. Ermigh
DATE: 3/13/02
PAGE: 1 OF 1

ACCESS: FORMS DATABASE 10-22-01

TENNESSEE VALLEY AUTHORITY	EXAMINATION SUMMARY AND RESOLUTION SHEET	REPORT NUMBER: R-0823

PROJECT: *WBN* UNIT: *1* CYCLE *04*				COMPONENT ID: *W08-09-B*	
EXAMINATION METHOD				SYSTEM: *RV*	ISI DWG NO: *CHM-2549-C-01*
MT ☐	PT ☐	UT ☑	VT ☐	CONFIGURATION	CATEGORY
PROCEDURE: *N-UT-9*		REV *9*	TC: *n/a*	*RUHEAD* TO *RFLG*	*B-A*
EXAMINER: *Douglas Gronewold*		EXAMINER: *Jason Polisensky*		EXAMINER: *n/a*	EXAMINER: *n/a*
LEVEL: *II*		LEVEL: *II*		LEVEL: *n/a*	LEVEL: *n/a*

Total coverage calculated to be approximately ~ 75 %

Weld W08-09-B is a RPV top head to Flange weld. A manual examination was performed from 180 thru 270 to 360 degrees.

0 long, 45 and 60 degree shear wave transducers (scans 2, 3, 4) were utilized to obtain maximum coverage.

Limitations due to configuration of flange and lifting lugs.

The near surface resolution for the 45deg. and the 60deg. transducers were performed on the calibration block OD notch. As the transducers were scanned closer to the OD notch a +100% FSH signal responce was observed and discernible from the IP (initial pulse) until this signal walked into the IP as the transducers were scanned over the nothch.
Also the calibration reflectors (side drilled holes) produced a >50% DAC signal responce at scanning sensitivity (reference+6db.) and at normal scanning speeds.

RESOLUTION BY	REVIEWED BY	ANII: B. Earnigh
Jason Polisensky		DATE: 3/13/02
LEVEL *II* DATE: *03/02/02*	LEVEL: III DATE: 3-6-02	Page: 1 OF 12

ACCESS: FORMS DATABASE 10-22-01

TENNESSEE VALLEY AUTHORITY	DIGITAL ULTRASONIC CALIBRATION DATA SHEET	REPORT NUMBER R-0823

PROJECT *WBN* UNIT/CYCLE *1/ 04*
PROCEDURE: *N-UT-9* REV: *9* TC: *N/A*

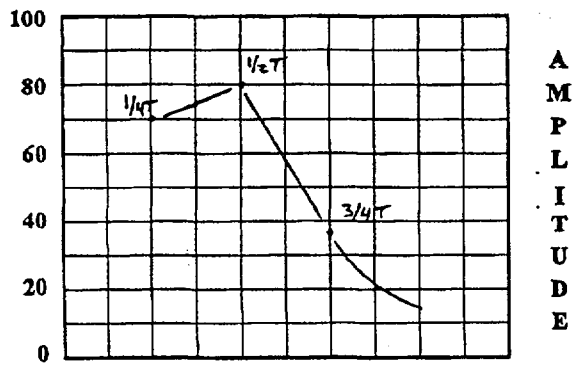
TRANSDUCER
MANUFACTURER *Aerotech*
MODEL: *M5W15* S/N *MO2964*
SIZE: *1.0* FREQ: *2.25 MHz*
SHAPE: *Round* # ELEMENTS: *1* # CONS: *0*
CABLE TYPE *RG-58* LENGTH: *6'*
MODE: ☐ SHEAR ☑ LONG ☐ RL

CALIBRATION DATE: *03/02/02*
CALIBRATION BLOCK NO. *WB 51* TEMP: *75°F*
SIMULATOR BLOCK *n/a*
THERMOMETER S/N *562774* DUE DATE *12-8-02*
COUPLANT: *Ultragel II* BATCH: *00125*

ANGLE VERIFICATION
BLOCK TYPE: *N/A* S/N: *n/a*
NOMINAL ANGLE *0°* ACTUAL ANGLE *n/a°*

INSTRUMENT
MANUFACTURER *Krautkramer* DUE DATE *6/14/02*
MODEL NO.: *USN-52* S/N: *E23946*

DAC



DISPLAY WIDTH *8.381* inches

INSTRUMENT SETTINGS

REFLECTOR			REFERENCE SENSITIVITY	MEMORY NUMBER
SCAN DIRECT.	NTC	SDH		
AXIAL	☐	☑	*28* dB	*10*
CIRC.	☐	☐	*n/a* dB	*n/a*

FREQ: *FIXED* MHz REJECT: *0* %
ANGLE: *OFF* deg DAMPING: *1000* ohms
DELAY *-0.594* msec PULSER: *SINGLE* *
ZERO: *1.373* msec
VELOCITY *.2326* msec PRR/PRF: *HIGH*
RANGE: *8.381* inches TOF: *PEAK*
DISP. MODE: *FULL WAV* POWER: *BATTERY*

REF. REFLECTOR: *n/a* GAIN: *n/a* dB
AMPLITUDE: *n/a* % METAL PATH: *n/a*

CALIBRATION TIMES
INITIAL TIME: *0835* FINAL TIME *1055*

VERIFICATION TIMES 1) *n/a* 2) *n/a* 3) *n/a* 4) *n/a* 5) *n/a* 6) *n/a* 7) *n/a* 8) *n/a* 9) *n/a*

***PDI QUALIFIED INSTRUMENT SETTINGS:**
VERIFY INSTRUMENT SETTINGS AND CALIBRATION SEQUENCE ARE IN ACCORDANCE WITH TABLE 2 OF THE APPLICABLE PDI QUALIFICATION IMPLEMENTATION PROCEDURE!

LINEARITY CHECK

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

COMMENTS	WELD / ITEMS EXAMINED
	W08-09-B

EXAMINER: *Douglas Gronewold* LVL.: *II*
EXAMINER: *Jason Polisensky* LVL.: *II*
REVIEWER: LVL.: *III* DATE: *3.6.02*

ANII: *B. Earnigh*
DATE: *3/13/02*
PAGE *2* OF *12*

ACCESS: FORMS DATABASE 10-27-01

TENNESSEE VALLEY AUTHORITY	DIGITAL ULTRASONIC CALIBRATION DATA SHEET	REPORT NUMBER R-0823

PROJECT *WBN* UNIT/CYCLE *1/04*
PROCEDURE: *N-UT-9* REV: *9* TC: *n/a*

TRANSDUCER
MANUFACTURER *Harsonic*
MODEL: *MSWS* S/N *S3186*
SIZE: *0.5x1.0"* FREQ: *2.25* MHz
SHAPE: *Rectangl* # ELEMENTS: *1* # CONS: *0*
CABLE TYPE *RG-58* LENGTH: *6'*

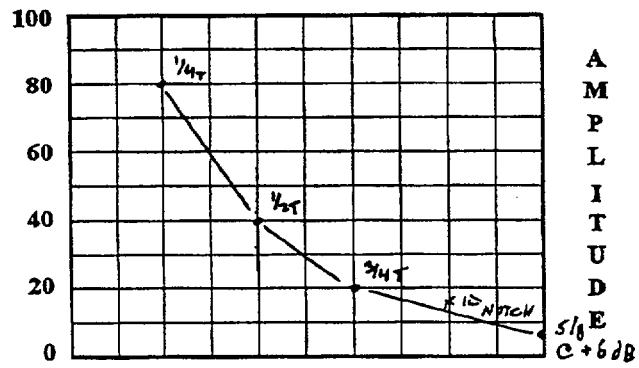
MODE: ☑ SHEAR ☐ LONG ☐ RL

CALIBRATION DATE: *03/02/02*
CALIBRATION BLOCK NO. *WB51* TEMP: *75°F*
SIMULATOR BLOCK: *n/a*
THERMOMETER S/N *562774* DUE DATE *12-8-02*
COUPLANT: *Ultragel II* BATCH: *00125*

ANGLE VERIFICATION
BLOCK TYPE: *CAL* S/N: *WB51*
NOMINAL ANGLE *45°* ACTUAL ANGLE *47°*

INSTRUMENT
MANUFACTURER *Krautkramer* DUE DATE *6/14/02*
MODEL NO.: *USN-52* S/N: *E23946*

DAC



DISPLAY WIDTH *12.91* inches

INSTRUMENT SETTINGS

REFLECTOR SCAN DIRECT.	NTC	SDH	REFERENCE SENSITIVITY	MEMORY NUMBER
AXIAL	☐	☑	*42* dB	*11*
CIRC.	☐	☑	*42* dB	*11*

FREQ: *High* MHz REJECT: = *0* %
ANGLE: *47* deg DAMPING: *1000* ohms
DELAY *0.055* msec PULSER: *SINGLE* *
ZERO: *12.123* msec
VELOCITY *.1251* msec PRR/PRF: *HIGH*
RANGE: *12.91* inches TOF: *PEAK*
DISP. MODE: *FULL WAV* POWER: *BATTERY*

REF. REFLECTOR: *n/a* GAIN: *n/a* dB
AMPLITUDE: *n/a* % METAL PATH: *n/a*

CALIBRATION TIMES
INITIAL TIME: *0840* FINAL TIME *1100*

VERIFICATION TIMES 1) *n/a* 2) *n/a* 3) *n/a* 4) *n/a* 5) *n/a* 6) *n/a* 7) *n/a* 8) *n/a* 9) *n/a*

***PDI QUALIFIED INSTRUMENT SETTINGS:**
VERIFY INSTRUMENT SETTINGS AND CALIBRATION SEQUENCE ARE IN ACCORDANCE WITH TABLE 2 OF THE APPLICABLE PDI QUALIFICATION IMPLEMENTATION PROCEDURE!

LINEARITY CHECK

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

COMMENTS	WELD / ITEMS EXAMINED
6 dB difference between 3/4 T and 5/4 T SDH	*W08-09-B*

EXAMINER: *Douglas Gronewold* LVL.: *II*
EXAMINER: *Jason Polisensky* LVL.: *II*
REVIEWER: LVL.: *III* DATE: *3-6-02*

ANII: *B. Earnest*
DATE: *3/13/02*
PAGE *3* OF *12*

ACCESS: FORMS DATABASE 10-27-01

TENNESSEE VALLEY AUTHORITY	DIGITAL ULTRASONIC CALIBRATION DATA SHEET	REPORT NUMBER R-0823

PROJECT *WBN* UNIT/CYCLE *1/ 04*
PROCEDURE: *N-UT-9* REV: *9* TC: *n/a*

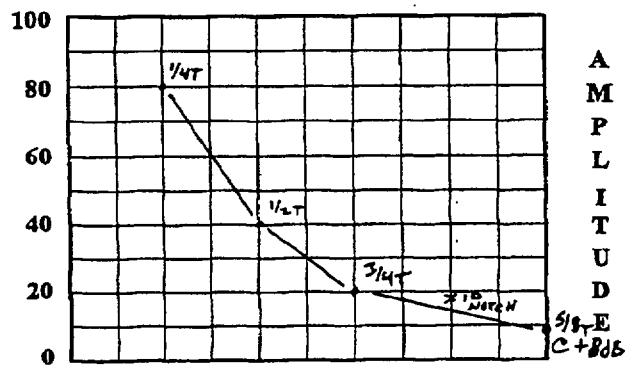
TRANSDUCER
MANUFACTURER *Harsonic*
MODEL: *MSWS* S/N *S3188*
SIZE: *0.5x1.0"* FREQ: *2.25* MHz
SHAPE: *Rectangl* # ELEMENTS: *1* # CONS: *0*
CABLE TYPE *RG-58* LENGTH: *6'*
MODE: ☑ SHEAR ☐ LONG ☐ RL

CALIBRATION DATE: *03/02/02*
CALIBRATION BLOCK NO. *WB51* TEMP: *75°F*
SIMULATOR BLOCK: *n/a*
THERMOMETER S/N *562774* DUE DATE *12-8-02*
COUPLANT: *Ultragel* BATCH: *00125*

ANGLE VERIFICATION
BLOCK TYPE: *CAL* S/N: *WB51*
NOMINAL ANGLE *60°* ACTUAL ANGLE *60.5°*

INSTRUMENT
MANUFACTURER *Krautkramer* DUE DATE *6/14/02*
MODEL NO.: *USN-52* S/N: *E23946*

DAC



DISPLAY WIDTH *18.06* inches

INSTRUMENT SETTINGS

REFLECTOR			REFERENCE SENSITIVITY	MEMORY NUMBER
SCAN DIRECT.	NTC	SDH		
AXIAL	☐	☑	*49* dB	*12*
CIRC.	☐	☑	*49* dB	*12*

FREQ: *High* MHz REJECT: *0* %
ANGLE: *60.5* deg DAMPING: *1000* ohms
DELAY *0.047* msec PULSER: *SINGLE* *
ZERO: *15.408* msec
VELOCITY *.1251* msec PRR/PRF: *HIGH*
RANGE: *18.06* inches TOF: *PEAK*
DISP. MODE: *FULL WAV* POWER: *BATTERY*

REF. REFLECTOR: *n/a* GAIN: *n/a* dB
AMPLITUDE: *n/a* % METAL PATH: *n/a*

CALIBRATION TIMES
INITIAL TIME: *0830* FINAL TIME *1050*

VERIFICATION TIMES 1) *n/a* 2) *n/a* 3) *n/a* 4) *n/a* 5) *n/a* 6) *n/a* 7) *n/a* 8) *n/a* 9) *n/a*

***PDI QUALIFIED INSTRUMENT SETTINGS:**
VERIFY INSTRUMENT SETTINGS AND CALIBRATION SEQUENCE ARE IN ACCORDANCE WITH TABLE 2 OF THE APPLICABLE PDI QUALIFICATION IMPLEMENTATION PROCEDURE!

LINEARITY CHECK

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

COMMENTS	WELD/ITEMS EXAMINED
8 dB difference between 3/4 T and 5/4 T SDH	*W08-09-B*

EXAMINER: *Douglas Gronewold* LVL.: *II*
EXAMINER: *Jason Polisensky* LVL.: *II*
REVIEWER: LVL.: *III* DATE: *3-6-02*

ANII: *B. Eamigh*
DATE: *3/13/02*
PAGE *4* OF *12*

ACCESS: FORMS DATABASE 10-27-01

ENCLOSURE
ATTACHMENT 4
EXAMINATION DATA REPORTS

TENNESSEE VALLEY AUTHORITY	MANUAL ULTRASONIC VESSEL EXAMINATION DATA SHEET	REPORT NO. R- 0823

PROJECT: WBN UNIT: 1
SYSTEM: RPV
WELD I.D.: W08-09-B
CONFIG: HEAD TO: FLANGE
PROCEDURE: N-UT- 9 REV. 9 TC: N/A

Wo REFERENCE: WELD ℄
Lo REFERENCE: 0° STAMP ON FLANGE
SURFACE TEMP: F 75°
PYRO. SERIAL NO. 562774

EXAMINATION DATE: 3-2-02
START TIME: 0900 END TIME: 1040

CAL. SHT. NO.	ANGLE	SCAN SENSITIVITY
N/A	45°	60 dB
	60°	73 dB
	0°	* dB

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

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

N/A

REMARKS/LIMITATIONS: LIMITATIONS ON ALL SCANS DUE TO CONFIGURATION AND FROM 2 LIFTING LUGS, 7" UP FROM FLANGE AND 6" WIDE
*0° SCAN WAS PERFORMED @ VARIOUS dB SENSITIVITY TO MAINTAIN 80% FSH BACK WALL REFLECTION

EXAMINER: Douglas Gronewald LEVEL: II
EXAMINER: [signature] LEVEL: II

REVIEWED BY: [signature]
LEVEL: III DATE: 3-6-02

ANI B. Earigh 3/13/02

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TVA 19670B (NP 7/92)

TENNESSEE VALLEY AUTHORITY	BEAM SPREAD AND RESOLUTION DATA SHEET	REPORT NUMBER R-0823

PROJECT WBN UNIT/CYCLE 1/4

BEAM SPREAD DATE 3-1-02

PROCEDURE: ~~N-UT~~ CP 18 REV. 11 T N/A

CALIBRATION SHEET NO. C- DL 3-1-02

SEARCH UNIT

MANUFACTURE HARISONIC

SIZE: 1" x .5" FREQ.: 2.25 Mh

S/N: ~~53186~~ 53186 NOM. ANGLE 45°

MEASURED ANGLE: 47° DEG.

BEAM SPREAD: 11° DEG.

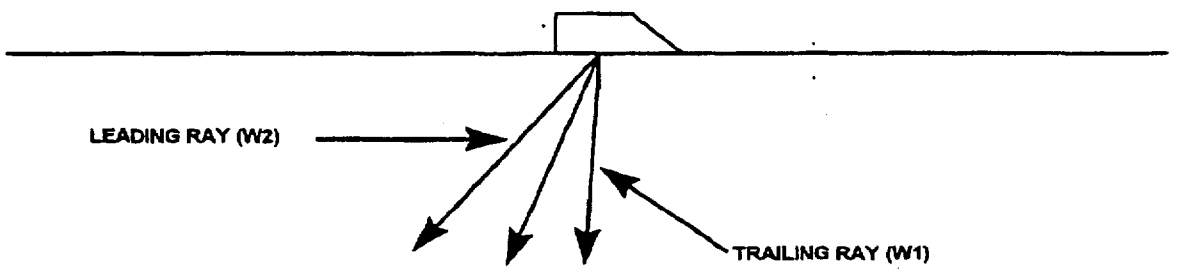
UT INSTRUMENT

MANUFACTURER: KB

MODEL NUMBER: USN 52

SERIAL NUMBER: E23946

HOLE POSITION	TRAILING RAY (W1)				W MAX		LEADING RAY (W2)			
	20% DAC		50% DAC		100% DAC		50% DAC		20% DAC	
	W	M	W	M	W	M	W	M	W	MP
1/4 T	1.58	2.14	1.5	2.19	1.9	2.40	2.1	2.55	2.2	2.66
1/2 T	3.2	4.52	3.4	4.67	4.2	5.23	4.4	5.40	4.6	5.56
3/4 T	4.6	6.73	4.75	6.82	5.3	7.14	6.15	7.81	6.5	8.06



R.G. 1.150 RESOLUTION VERIFICATION

NEAR SURFACE REFLECTOR: PERFORMED ON THE CAL BLOCK OD NOTCH DEPTH: .139 IN. SIZE: 1/4" x 2.0"

FAR SURFACE REFLECTOR: PERFORMED ON THE CAL BLOCK ID NOTCH DEPTH: 0.700 IN. SIZE: 1/4" x 2.0"

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

REMARKS

EXAMINER: Douglas Greenwell LEVEL: II

EXAMINER: N/A LEVEL: N/A

REVIEWED BY [signature] LEVEL: III DATE: 3.6.02

ANII: B. Earnigh

DATE: 3/13/02

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ACCESS: FORMS DATABASE 10/3/00

TENNESSEE VALLEY AUTHORITY	BEAM SPREAD AND RESOLUTION DATA SHEET	REPORT NUMBER R-0823

PROJECT WBN UNIT/CYCLE 1/4

BEAM SPREAD DATE 3-1-02

PROCEDURE: ~~N-UT-18~~ CP DC 3-1-02 REV. ~~18~~ 11 T N/A

CALIBRATION SHEET NO. C-

SEARCH UNIT

MANUFACTURE HARISONIC

SIZE: 1" X .5" FREQ.: 2.25 Mh

S/N: ~~53180~~ S 3188 NOM. ANGLE 60°

MEASURED ANGLE: 60.5 DEG. (WMB 3-6-02)

BEAM SPREAD: 13 DEG.

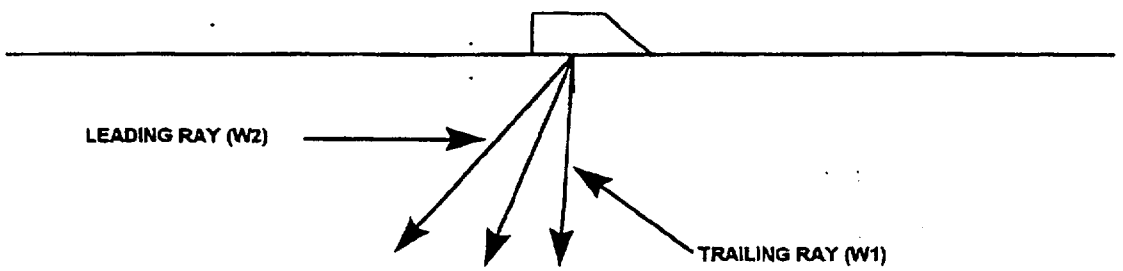
UT INSTRUMENT

MANUFACTURER: KB

MODEL NUMBER: 4SN 52

SERIAL NUMBER: E23946

HOLE POSITION	TRAILING RAY (W1)				W MAX		LEADING RAY (W2)			
	20% DAC		50% DAC		100% DAC		50% DAC		20% DAC	
	W	M	W	M	W	M	W	M	W	MP
1/4 T	2.6	2.97	2.85	3.13	3.2	3.31	3.55	3.73	3.8	3.92
1/2 T	5.5	6.24	6.0	6.09	6.8	7.4	7.2	7.72	8.15	8.56
3/4 T	7.7	9.01	8.0	9.25	9.3	10.38	10.0	11.00	10.9	11.6



R.G. 1.150 RESOLUTION VERIFICATION

NEAR SURFACE REFLECTOR: PERFORMED ON THE CAL BLOCK OD NOTCH DEPTH: .139 IN SIZE: 1/4" X 2.0"

FAR SURFACE REFLECTOR: PERFORMED ON THE CAL BLOCK ID NOTCH DEPTH: 0.200" IN SIZE: 1/4" X 2.0"

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

REMARKS

EXAMINER: [signature] LEVEL: II

EXAMINER: N/A LEVEL: N/A

REVIEWED BY [signature] LEVEL: III DATE: 3-6-02

ANII: B. Earnigh

DATE: 3/13/02

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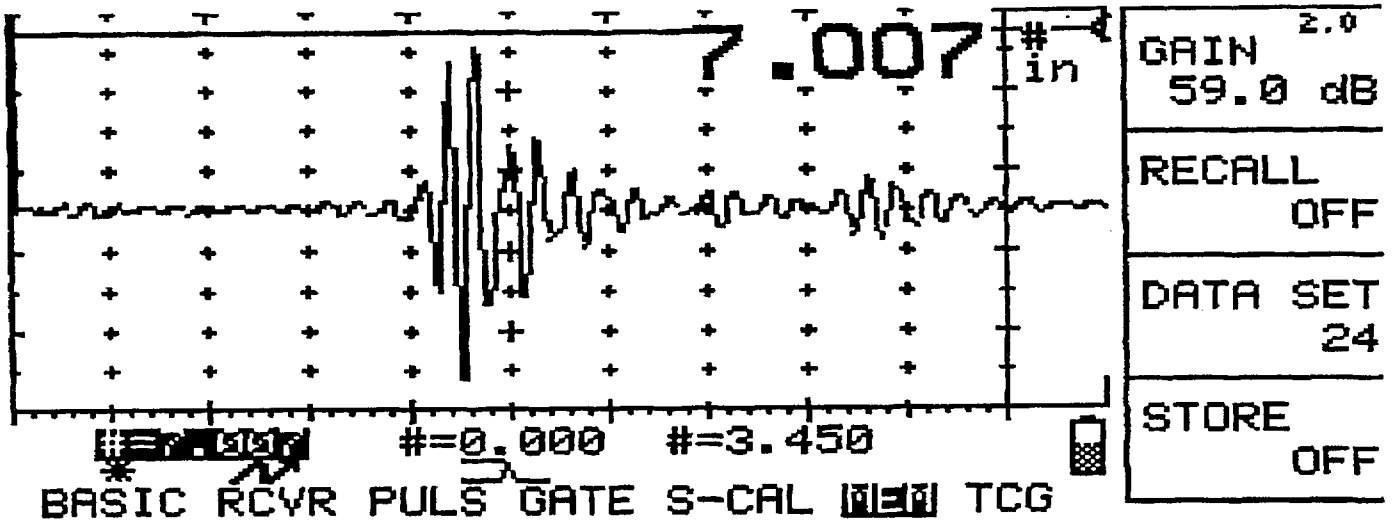
ACCESS: FORMS DATABASE 10/3/00

R-0823



45° PRE-EXAMINATION WAVEFORM

MMBentley
3-6-02

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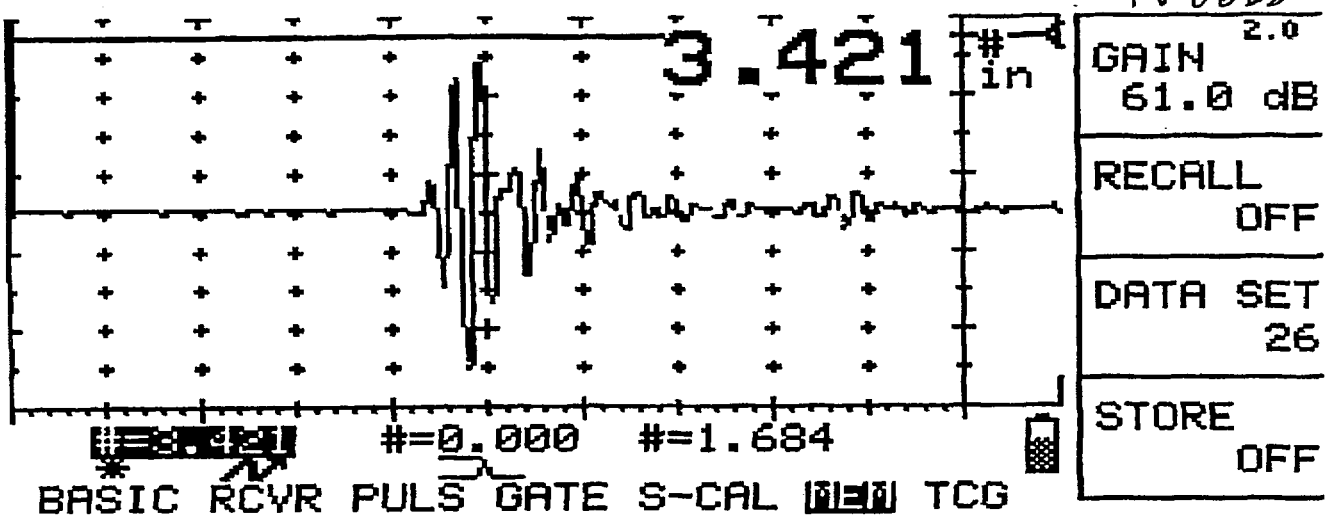
R-DB23



60° PRE-EXAMINATION W/AVE FORM

W W Bentley
3-6-02

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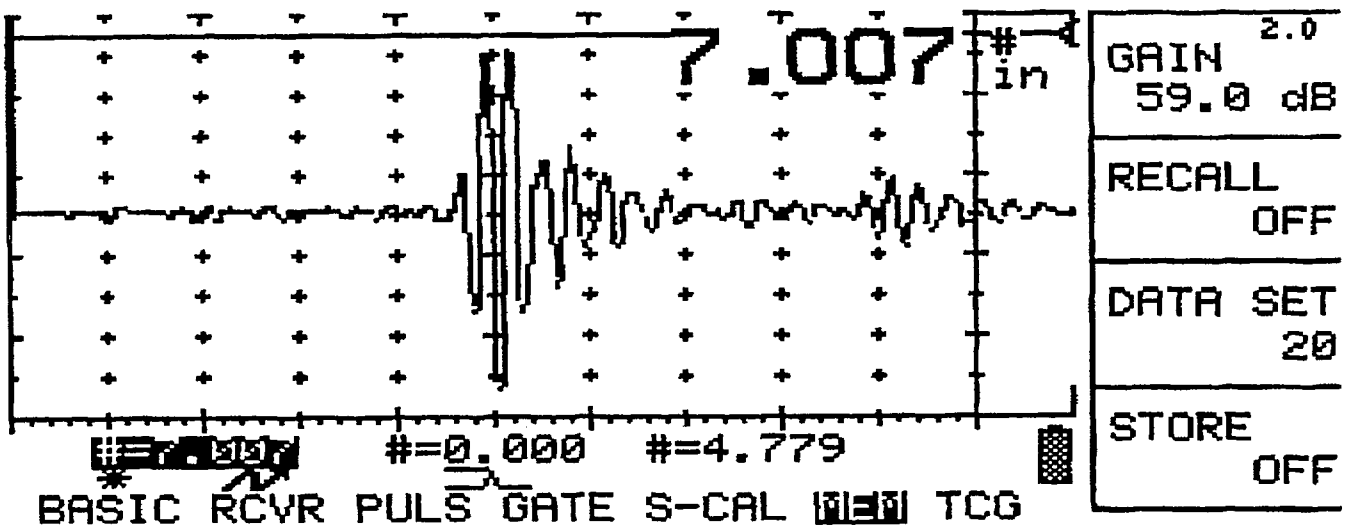
R-0823



45° Post Examination Wave Form

W M Bentley
3-6-02

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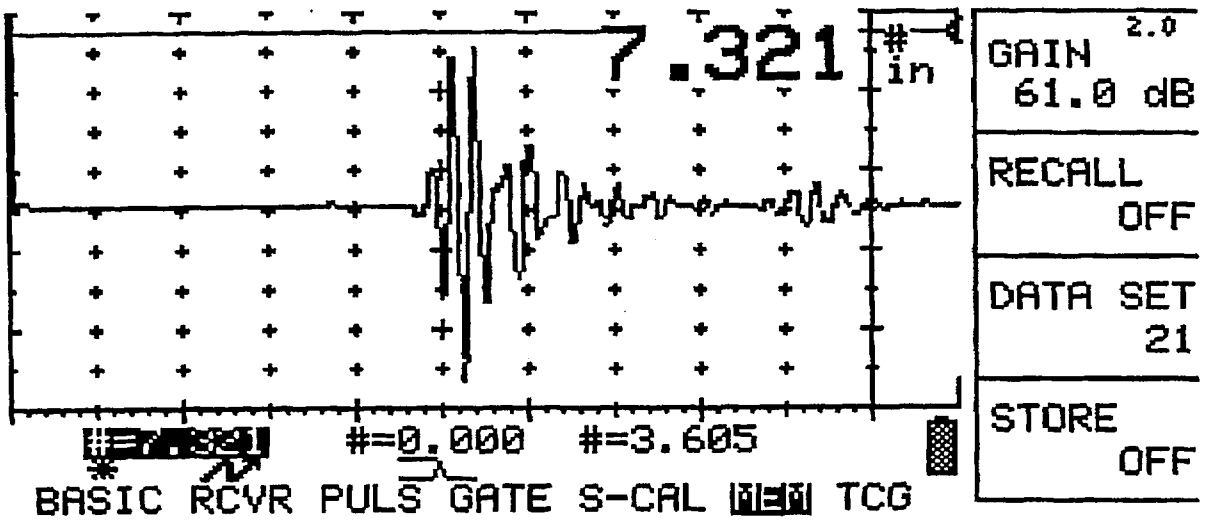
R-0823



60° Post Examination Wave Form

MMBentley 3-6-02

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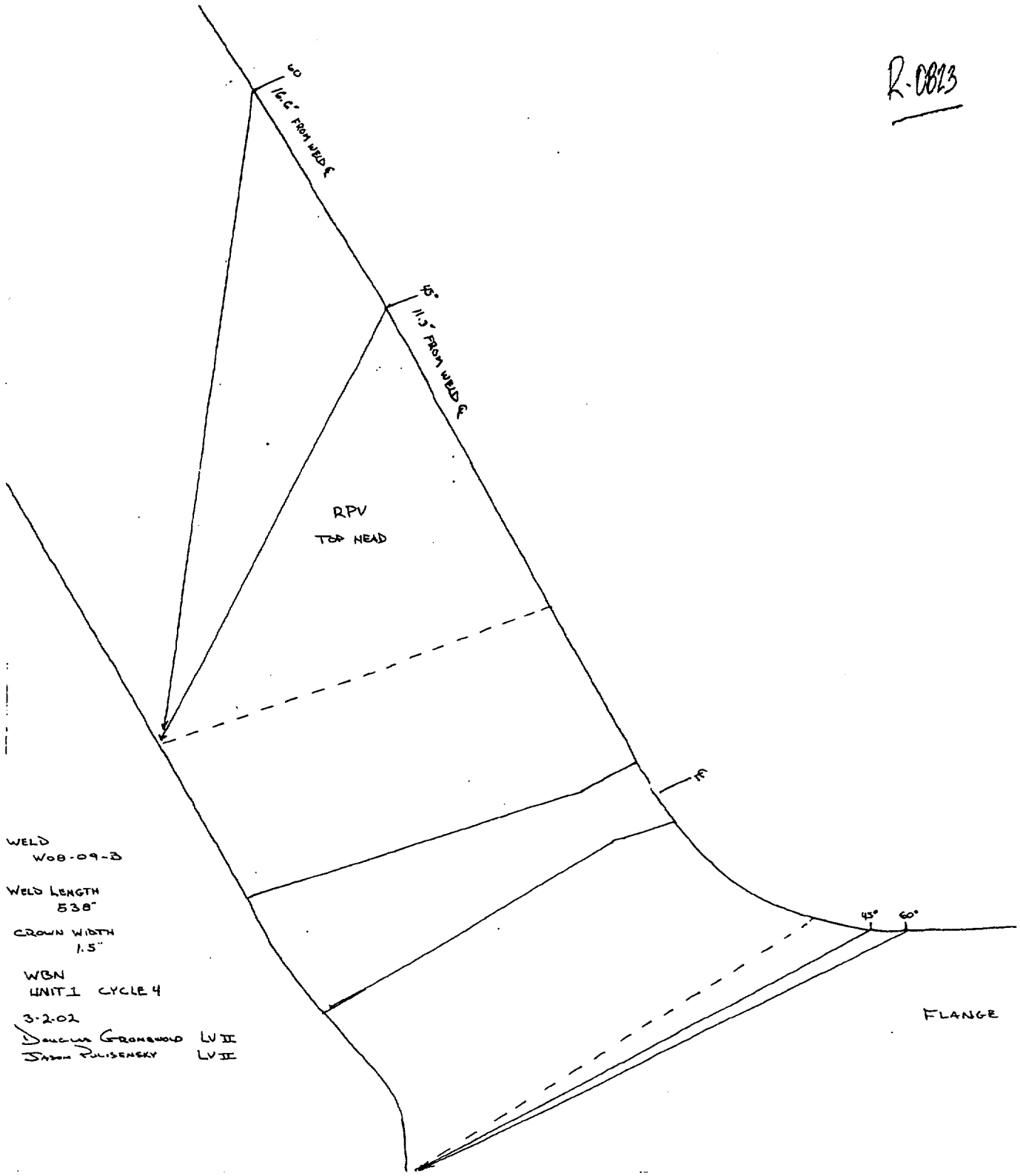
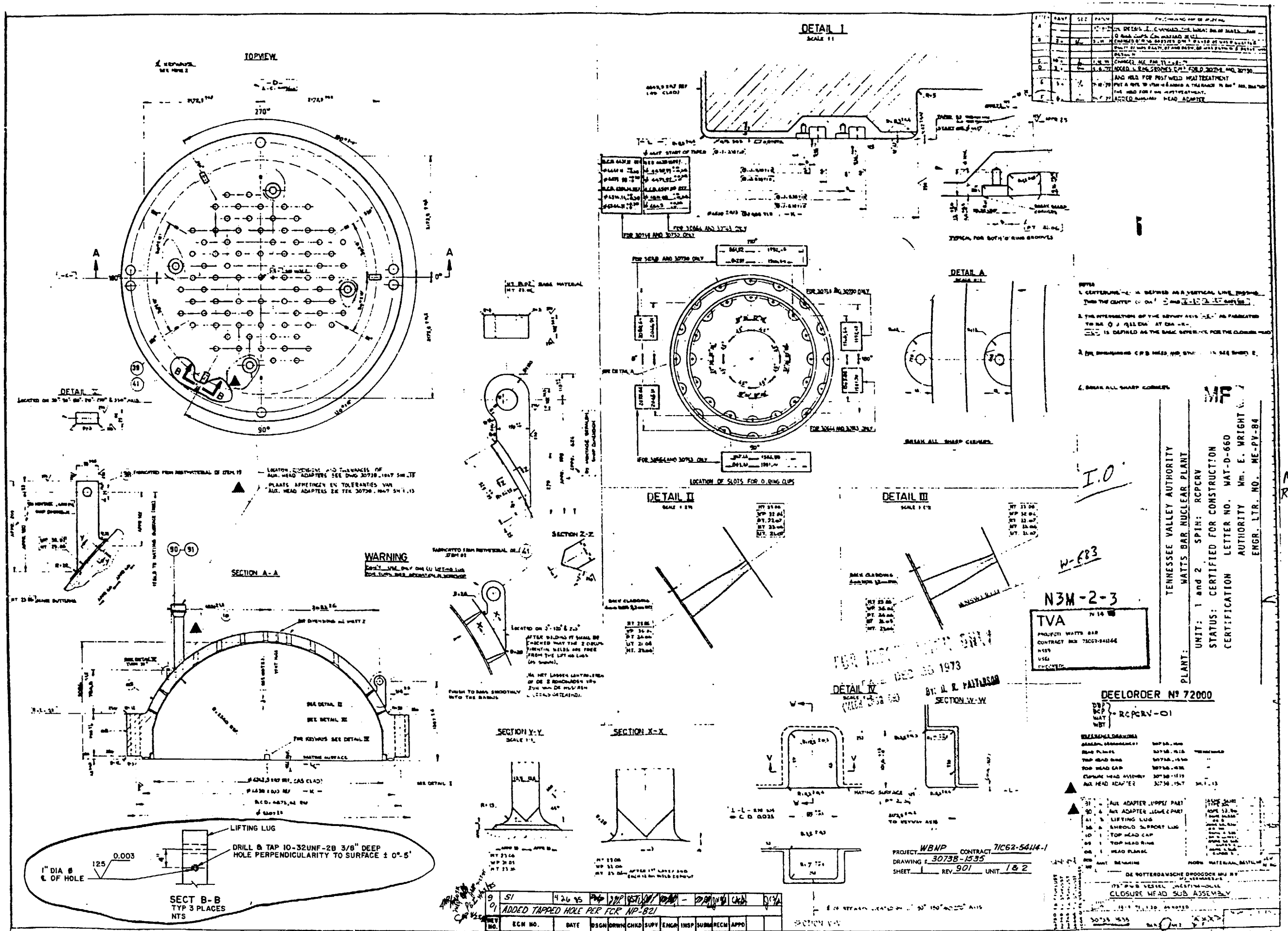
R-0823


60
16.6" FROM WELD ℄
45°
11.3" FROM WELD ℄
RPV
TOP HEAD
FF
45°
60°
FLANGE
WELD
W08-09-B
WELD LENGTH
538"
CROWN WIDTH
1.5"
WBN
UNIT 1 CYCLE 4
3-2-02
Douglas Gronewold LV II
Jason Pulisensky LV II

ENCLOSURE
ATTACHMENT 5
WESTINGHOUSE DRAWING 30738-1535, CLOSURE HEAD SUBASSEMBLY


TOPVIEW
DETAIL I
DETAIL A
DETAIL II
DETAIL III
DETAIL IV
SECTION A-A
SECTION Y-Y
SECTION X-X
SECTION Z-Z
SECTION W-W
WARNING
LIFTING LUG
DRILL & TAP 10-32UNF-2B 3/8" DEEP
HOLE PERPENDICULARITY TO SURFACE ± 0°-5'
1" DIA @ ℄ OF HOLE
SECT B-B
TYP 3 PLACES
NTS
LOCATION OF SLOTS FOR O RING CLIPS
TENNESSEE VALLEY AUTHORITY
WATTS BAR NUCLEAR PLANT
PLANT:
UNIT: 1 and 2 SPIN: RCPCRV
STATUS: CERTIFIED FOR CONSTRUCTION
CERTIFICATION LETTER NO. WAT-D-660
AUTHORITY Wm. E. WRIGHT
ENGR. LTR. NO. ME-PV-84
N3M-2-3
TVA
DEELORDER Nº 72000
RCPCRV-01
PROJECT WBNP CONTRACT 71C62-54114-1
DRAWING 30738-1535
SHEET 1 REV 901 UNIT 1 & 2
CLOSURE HEAD SUB ASSEMBLY
ADDED TAPPED HOLE PER FCR NP-821
REV NO. ECN NO. DATE DSGN DRWN CHKD SUPV ENGR INSP SUBM RECM APPD
TVA R 900 = VENDOR R F
71-54114-1-3 (MD)