1988 INSERVICE EXAMINATION OF SELECTED CLASS 1 AND CLASS 2 PIPING AND COMPONENTS AT HOPE CREEK GENERATING STATION

VOLUME I
FINAL REPORT
WITH APPENDICES
SwRI Project 1259

Prepared for

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ABSTRACT

An inservice examination (ISI) of selected Class 1 and Class 2 piping and components of Public Service Electric and Gas Company's (PSE&G) Hope Creek Generating Station was performed by Southwest Research Institute (SwRI) personnel during the Spring 1988 refueling outage. This ISI effort was limited in scope to components selected as a part of the overall examination effort scheduled for the first ISI. The balance of the examination areas scheduled in the Examination Plan for the 1988 Inservice Examination of Hope Creek Generating Station will be scheduled for the upcoming mini-outage in 1989.

The ISI was performed utilizing magnetic particle (MT), liquid penetrant (PT), and manual ultrasonic (UT) nondestructive examination (NDE) techniques.

In addition to the examinations scheduled for the first refueling outage, preservice examinations were performed on four Class 2 piping welds. These additional welds were the result of the placement of flanges in the Residual Heat Removal piping system.

During the MT examination of check valves F074A, F074B, and F074 Spare, linear indications were recorded and reported to PSE&G on Customer Notification Forms 1 through 5. In one area, the PT examination method was utilized at PSE&G's request to substantiate the relevance of the MT indication. These indications were removed by light grinding.

No reportable indications were observed by SwRI personnel as a result of the UT and PT examinations.

In addition to the NDE activities, SwRI performed thickness measurements on the F074A and F074B check valves, and Main Steam Relief Valve AB-PSV-F013A. The thickness measurements taken on these components were for information only. Measurements were used by PSE&G to verify that areas of light grinding did not violate manufacturer's minimum wall thickness.

TABLE OF CONTENTS

ILLUSTRATION

ABBREVIATIONS

AB	-	Main Steam System
AE	-	Feedwater System
ASME	-	American Society of Mechanical Engineers
Aug	-	Augmented Examination
BB	-	Nuclear Boiler and Recirculation System
BC	-	Residual Heat Removal System
Catgy	-	Category
CCW	-	Counterclockwise
CD	-	Containment Drywell
CNF	-	Customer Notification Form
CRC	-	Corrosion Resistant Clad
CRT	-	Cathode-Ray Tube
CW	-	Clockwise
DAC	-	Distance Amplitude Correction
dB	-	Decibel(s)
deg	-	Degree(s)
Dev	-	Deviation
EPRI	-	Electric Power Research Institute
Exam	-	Examination
Geom	-	Geometric
HAZ	-	Heat-Affected Zone
Insig	-	Insignificant
ISI	-	Inservice Examination
LD	-	Longitudinal Seam Weld Extending Downstream
LDI	-	Longitudinal Seam Weld Extending Downstream on the Inside Radius of an Elbow
LDO	-	Longitudinal Seam Weld Extending Downstream on the Outside Radius of an Elbow
Lo	-	Zero Reference Location
LU	-	Longitudinal Seam Weld Extending Upstream
LUI	-	Longitudinal Seam Weld Extending Upstream on the Inside Radius of an Elbow
LUO	-	Longitudinal Seam Weld Extending Upstream on the Outside Radius of an Elbow
MHz	-	Megahertz
MT	-	Magnetic Particle Examination
NDE	-	Nondestructive Examination
NDT	-	Nondestructive Testing
No.	-	Number
NQAP	-	Nuclear Quality Assurance Procedure
NQAPM	-	Nuclear Quality Assurance Program Manual
NRC	-	Nuclear Regulatory Commission
PSE&G	-	Public Service Electric and Gas Co.
PSI	-	Preservice Examination
PT	-	Liquid Penetrant Examination
QA	-	Quality Assurance
Rev	-	Revision
RL	-	Refracted Longitudinal
RPV	-	Reactor Pressure Vessel
Rx	-	Reactor Building
Sect	-	Section
SPC	-	Special
SwRI	-	Southwest Research Institute
UT	-	Manual Ultrasonic Examination

I. INTRODUCTION

During the spring 1988 refueling outage, Southwest Research Institute (SwRI) personnel performed nondestructive examinations (NDE) of selected Class 1 and Class 2 piping and components of the Hope Creek Generating Station. These examinations constitute a part of the first inservice examination (ISI) of the first cycle of the first period of the first inspection interval.

A. Applicable Documents

The ISI was conducted in accordance with the following documents:

- Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, "Rules for Inservice Inspection of Nuclear Power Plant Components," 1983 Edition with Addenda through Summer 1983
- Hope Creek Generating Station Technical Specifications
- SwRI Final Plan 17-1259, "Long-Term Inservice Examination Plan for Class 1 and Class 2 Components and Piping for Hope Creek Generating Station, Revision 1," dated December 1987
- Examination Plan for the 1988 Inservice Examination of Hope Creek Generating Station
- SwRI Nuclear Quality Assurance Program Manual (NQAPM), Revision 2, with all applicable changes
- SwRI Plan 87-PEG-HCP-1-1-0, "Project Plan for the Nondestructive Examinations to be Performed at Hope Creek Generating Station," dated December 1987

B. Examination Areas

Selected piping and components in the following Class 1 and Class 2 systems were examined by SwRI personnel utilizing NDE techniques:

Class 1

Feedwater System
Main Steam System
Reactor Recirculation System

Class 2

Residual Heat Removal System

II. DISCUSSION OF EXAMINATION ACTIVITIES

A. Pre-Outage Planning

In order to assure efficient performance of the ISI, SwRI devoted a concentrated effort toward planning and preparation for the examination activities. This included review of the Long-Term Plan (LTP), determining nondestructive testing (NDT) procedures, reviewing ultrasonic calibration blocks for compliance to Code and procedure requirements, and developing the Examination Plan and Mechanized Scan Plan. Such planning activities were conducted by SwRI's Engineering staff, with assistance provided by the Engineering Analysis Section, the NDE Field Applications Section, and Quality Assurance (QA) Section.

An Examination Plan was developed to provide the basis for the ISI in one comprehensive document. It provided a listing of the examination areas, copies of all procedures, calibration block drawings, weld identification figures, and other information pertinent to the performance of the ISI.

The Examination Plan was reviewed and approved by PSE&G prior to SwRI's arrival on site.

The Class 1 and Class 2 components were selected for examination in accordance with the LTP for Hope Creek. Additional components were scheduled for examination at the request of PSE&G.

B. Examination Procedures and Personnel

The NDE activities were performed using liquid penetrant (PT), magnetic particle (MT), and manual ultrasonic (UT) techniques. These examinations were performed by SwRI personnel in accordance with SwRI procedures which had been preapproved by PSE&G personnel.

SwRI operating procedures were utilized to provide guidelines and controls for performance of onsite examination activities. This included procedures for weld joint identification marking, indication recording, records control, data comparison, and resolution of indications. Copies of these procedures are included in Appendix C.

The SwRI NDT procedures were written to conform to the requirements of the applicable sections of the ASME Boiler and Pressure Vessel Code and SwRI's NQAPM. Some procedures were amended for specific examination purposes with deviations. These deviations were necessary to incorporate examination requirements unique to the Hope Creek Generating Station. The deviations used are noted on the individual examination data sheets, NDE Summary Tables, and copies of the deviations are located with their respective NDT procedures in Appendix D.

SwRI examination personnel were certified in accordance with SwRI Nuclear Quality Assurance Procedure 11-1, "Special Process Control," which incorporates the guidelines of SNT-TC-1A of the American Society for Nondestructive Testing and ASME Section XI. Copies of examiner certifications are included in Appendix F.

C. Examination Activities

This section provides a discussion of the various onsite NDE activities performed during the ISI. A discussion of equipment and materials used for these examinations appears in Subsection E of this report.

1. **Liquid Penetrant Examinations**

Solvent removable, visible dye PT examinations were performed by SwRI personnel on Class 1 piping welds. These examinations were performed on reactor recirculation piping circumferential and longitudinal seams. In addition, the PT method was used to confirm the relevance of an MT indication during feedwater check valve examinations.

2. **Magnetic Particle Examinations**

Both dry MT and fluorescent MT examinations were utilized on components. Fluorescent MT was performed on the inside surfaces of the feedwater check valves. The dry MT examination technique was used on the outside surfaces of the valves and on class 2 piping welds.

3. **Ultrasonic Examinations**

UT examinations were performed by SwRI personnel on components, including feedwater nozzles, valves, and piping. Various UT techniques were used to perform the examinations including the following techniques.

a. A 0-degree lamination scan (UTOL) was used for detection of laminar reflectors which might affect interpretation of angle-beam results. A 0-degree calibration was also used for component thickness determination.

b. A 0-degree scan (UTOW) was used for detection of reflectors in the weld when limitations restrict angle-beam examinations.

c. For austenitic welds, a 45-degree angle-beam scan was used for detection of reflectors oriented parallel to the weld.

For ferritic welds, a UT45 degree scan was used to detect reflectors oriented parallel to the weld. Determination of angle beam to be used was made by the Level II examiner and was based upon which angle provided the best coverage of the examination area.

d. Angle-beam scans, using a 45-degree search unit directed parallel to the weld (UT45T), were used for detection of reflectors oriented transverse to the weld.

e. For corrosion resistant clad austenitic piping, a 45-degree refracted longitudinal, pitch-catch technique was utilized to provide Code coverage of the examination area.

f. Feedwater nozzle bore examinations were performed utilizing a combination of wedges and angles. The determination of angles to provide optimum coverage was obtained through calculation and the application of transducer/wedges to the calibration block. Verification of the technique was performed by maximizing the reflective response from the notch reflectors of known size at various locations along the length of the bore. This technique provided assurance of a quality examination.

D. Examination Results

During the dry MT and fluorescent MT examinations of the feedwater check valves (F074A, F074B, and F074 Spare) 19 linear indications were found on the inside surface of the valves (detected with fluorescent MT) and five linear indications were detected on the outside surfaces of the check valves. These indications were reported to PSE&G under Customer Notification Forms (CNFs) 1 through 5. No recordable indications remained after light grinding.

No reportable indications were found as a result of UT and PT examinations.

During the ISI, certain examination limitations were noted and reported to PSE&G personnel on CNFs 11, 14, and 15. These limitations were the result of welded attachments and support interferences.

A detailed summary table for CNFs generated as a result of manual examinations during the ISI is contained in Appendix H. This table presents information on each CNF, such as the examination area, the nature of the reportable indication, the disposition, and the Section XI evaluation/acceptance criteria.

In accordance with IWB-3120 of Section XI, all examination data were compared with results of the preservice examination. The comparisons were determined to be satisfactory.

Appendix I contains documentation for examinations performed for information only. This appendix contains the data for the F074 spare valve and thickness measurements performed on relief valve AB-PSV-F013A.

E. Equipment

The NDE equipment used during the ISI to perform the examinations of the selected components is discussed below.

1. Manual Equipment

a. Sonic FTS MK I

Sonic FTS MK I ultrasonic instruments were used for the UT examinations and thickness gauging of materials. They were also used as an aid in obtaining acoustic characteristics/properties through measurements of transmission and attenuation of ultrasound in materials.

To assure proper instrument linearity and operation, SwRI certified each Sonic FTS MK I prior to use at Hope Creek, as specified in the NQAPM. Copies of certifications for those instruments utilized at Hope Creek are contained in Appendix G.

b. Transducers

Prior to use at Hope Creek, each transducer was given a frequency profile and beam spectrum analysis and certified to be within SwRI's acceptance standards. This analysis is performed at a minimum of every 6 months to verify that each transducer is performing within standards. A copy of each transducer's certification is contained in Appendix G.

Information on the actual transducer used for any specific examination may be determined by reviewing the data sheets and referenced calibration sheets in the field data volumes.

c. Magnetic Particle Examination Equipment

Hand-held alternating current magnetic particle yokes were used for MT examinations. Fluorescent MT examinations were performed utilizing a portable hand-held black light.

F. Materials

In addition to the equipment previously discussed, certain materials were required to conduct the examinations. All materials contacting the examination surface (i.e., glycerine, pipe marking pencils, penetrants, etc.) were tested and certified to be within acceptable sulfur and halogen limits prior to use at Hope Creek. Certifications for these materials are contained in Appendix G.

G. UT Calibration Blocks

Pipe and vessel calibration blocks were utilized to calibrate the UT instruments prior to examination of the selected welds. Drawings of the various calibration blocks used are contained in Appendix E.

III. SUMMARY OF EXAMINATIONS

This section provides a discussion of the field data records and a summary of the NDE activities performed at Hope Creek.

A. Explanation of Field Data Records

The results of the examinations and calibrations performed by SwRI personnel were recorded on standard SwRI forms. Copies of these completed documents are included as part of this report. The original records will be retained in the SwRI Data Storage Facility.

The field data records for each weld or area are assembled in a package preceded by a summary sheet. The examination areas and summary sheet numbers correspond to those listed in the Summary Table. A general explanation of the individual field data forms follows.

The instruments used in performing UT examinations were calibrated prior to use, then verified again at specified intervals during the examinations and upon completion of the examinations. The calibration parameters were recorded on the appropriate calibration record sheet as specified in the applicable NDT procedure. The documented calibration and calibration verification provide immediate assurance that the examinations were performed using properly calibrated instruments.

The results of the examinations were recorded on the applicable data record sheets as specified in the Examination Plan. The information documented on these forms describes the parameters associated with those indications which were greater than the recording levels specified in the applicable NDT procedures.

The size, location, and nature of reflectors were determined by analyzing the indication parameters recorded on the forms described above. The analysis is documented on SwRI Indication Resolution Record Sheets, which are included as part of each data package.

B. Nondestructive Examination Summary Tables

The following section is the Nondestructive Examination Summary Table (Summary Table). The Summary Table lists the areas that were examined by SwRI personnel during this ISI. See Figure 1 for an explanation of the Summary Table format. Isometric figures depicting the location of Class 1 and Class 2 components are contained in Appendices A and B, respectively.

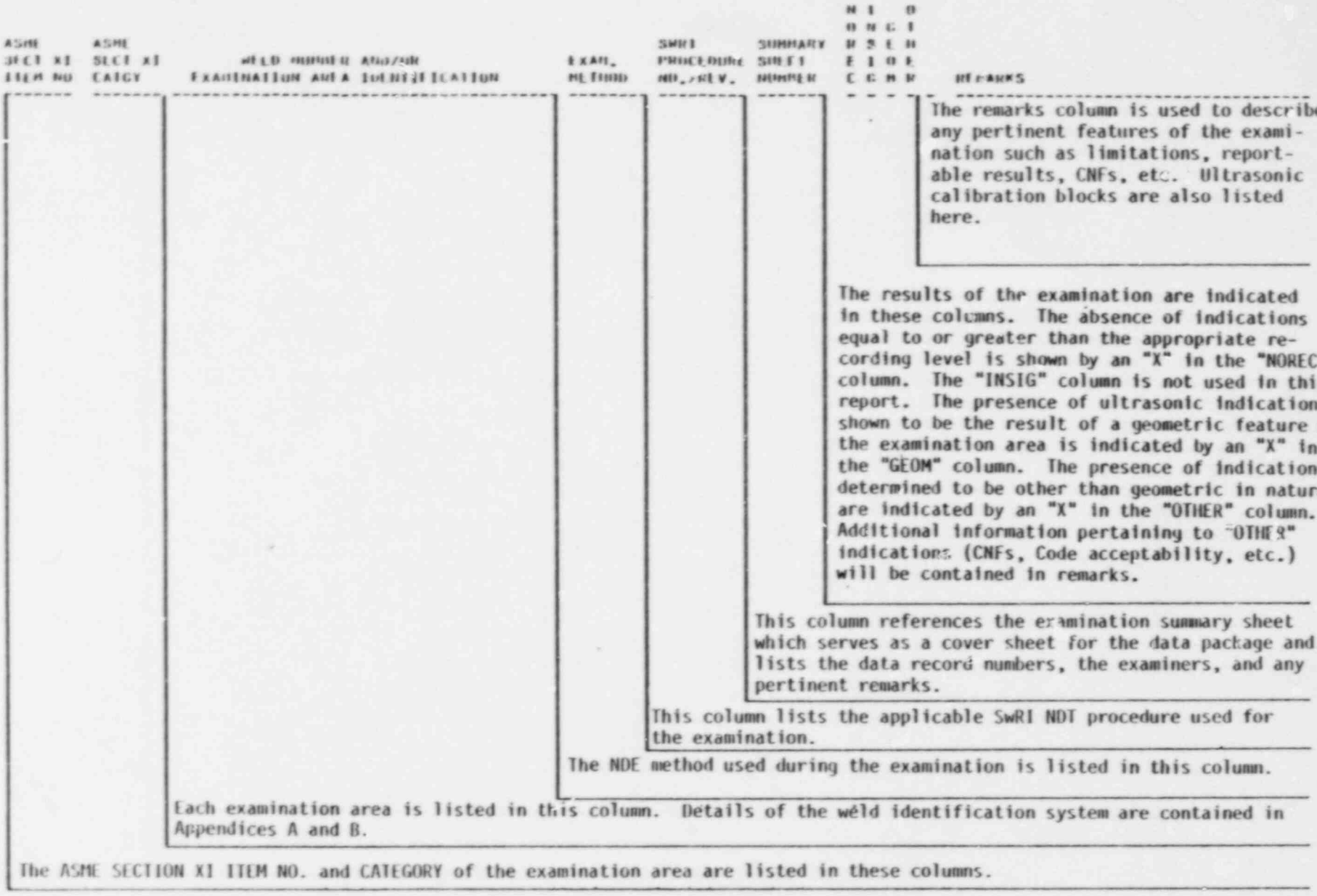

Figure 1. Explanation of Summary Table Format

REACTOR PRESSURE VESSEL (SEE FIGURES A-1 & A-2)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NOZZLE TO SHELT WELD	INSERVICE INSPECTION	OTHER	REMARKS
		NOZZLE TO SHELL WELD							
B3.90	B-D	RPV1-N1A NOZZLE TO SHELL 28" LOOP A RECIRC OUTLET AT 0 DEG.	UTOL UTOW UT45 UT60	700-6/34	100185				SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. EXAMI-NATION TO BE PERFORMED USING MECHANIZED EQUIPMENT. SCAN PLAN EXAMINATION NO. 1. ***BASIC CALIBRATION BLOCK*** VB-CSCL-6.75-38-HPC(#2)
B3.90	B-D	RPV1-N2A NOZZLE TO SHELL 12" RECIRC INLET AT 30 DEG.	UTOL UTOW UT45 UT60	700-6/34	100195				SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. EXAMI-NATION TO BE PERFORMED USING MECHANIZED EQUIPMENT. SCAN PLAN EXAMINATION NO. 2. ***BASIC CALIBRATION BLOCK*** VB-CSCL-6.75-38-HPC(#2)
B3.90	B-D	RPV1-N2B NOZZLE TO SHELL 12" RECIRC INLET AT 60 DEG.	UTOL UTOW UT45 UT60	700-6/34	100200				SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. EXAMI-NATION TO BE PERFORMED USING MECHANIZED EQUIPMENT. SCAN PLAN EXAMINATION NO. 3. ***BASIC CALIBRATION BLOCK*** VB-CSCL-6.75-38-HPC(#2)
B3.90	B-D	RPV1-N2C NOZZLE TO SHELL 12" RECIRC INLET AT 90 DEG.	UTOL UTOW UT45 UT60	700-6/34	100205				SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. EXAMI-NATION TO BE PERFORMED USING MECHANIZED EQUIPMENT. SCAN PLAN EXAMINATION NO. 4. ***BASIC CALIBRATION BLOCK*** VB-CSCL-6.75-38-HPC(#2)

REACTOR PRESSURE VESSEL (SEE FIGURES A-1 & A-2)

(CONTD)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NONE	INSIG	OTHER	REMARKS
		NOZZLE TO SHELL WELD (CONTD)							
B3.90	B-D	RPV1-N2J NOZZLE TO SHELL 12" RECIRC INLET AT 300 DEG.	UTOL UTOW UT45 UT60	700-6/34	100235				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION TO BE PERFORMED USING MECHANIZED EQUIPMENT. SCAN PLAN EXAMINATION NO. 5. ***BASIC CALIBRATION BLOCK*** VB-CSCL-6.75-38-HPC(#2)
B3.90	B-D	RPV1-N2K NOZZLE TO SHELL 12" RECIRC INLET AT 330 DEG.	UTOL UTOW UT45 UT60	700-6/34	100240				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION TO BE PERFORMED USING MECHANIZED EQUIPMENT. SCAN PLAN EXAMINATION NO. 6. ***BASIC CALIBRATION BLOCK*** VB-CSCL-6.75-38-HPC(#2)
B3.90	B-D	RPV1-N5A NOZZLE TO SHELL 10" CORE SPRAY INLET AT 120 DEG.	UTOL UTOW UT45 UT60	700-6/34	100295				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION TO BE PERFORMED USING MECHANIZED EQUIPMENT. SCAN PLAN EXAMINATION NO. 7. ***BASIC CALIBRATION BLOCK*** VB-CSCL-6.75-38-HPC(#2)
B3.90	B-D	RPV1-N5B NOZZLE TO SHELL 10" CORE SPRAY INLET AT 240 DEG.	UTOL UTOW UT45 UT60	700-6/34	100300				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION TO BE PERFORMED USING MECHANIZED EQUIPMENT. SCAN PLAN EXAMINATION NO. 8. ***BASIC CALIBRATION BLOCK*** VB-CSCL-6.75-38-HPC(#2)

REACTOR PRESSURE VESSEL (SEE FIGURES A-1 & A-2)

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ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NONREC	INSIG	OTHER	REMARKS
		NOZZLE INSIDE RADIUS SECTION							
B3.100	B-D	RPV1-N1AIR INSIDE RADIUS SECTION	UT24 UT34	700-6/34	100408				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION TO BE PERFORMED USING MECHANIZED EQUIPMENT. SCAN PLAN EXAMINATION NOS. 9 AND 10. ***BASIC CALIBRATION BLOCK*** IR-CSCL-50-HPC
B3.100	B-D	RPV1-N2AIR INSIDE RADIUS SECTION	UT18 UT23	700-6/34	100410				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION TO BE PERFORMED USING MECHANIZED EQUIPMENT. SCAN PLAN EXAMINATION NOS. 11 AND 12. ***BASIC CALIBRATION BLOCK*** IR-CSCL-50-HPC
B3.100	B-D	RPV1-N2BIR INSIDE RADIUS SECTION	UT18 UT23	700-6/34	100415				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION TO BE PERFORMED USING MECHANIZED EQUIPMENT. SCAN PLAN EXAMINATION NOS. 13 AND 14. ***BASIC CALIBRATION BLOCK*** IR-CSCL-50-HPC
B3.100	B-D	RPV1-N2CIR INSIDE RADIUS SECTION	UT18 UT23	700-6/34	100420				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION TO BE PERFORMED USING MECHANIZED EQUIPMENT. SCAN PLAN EXAMINATION NOS. 15 AND 16. ***BASIC CALIBRATION BLOCK*** IR-CSCL-50-HPC

REACTOR PRESSURE VESSEL (SEE FIGURES A-1 & A-2)

(CONTD)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	N O R E C	I N S I G	G E O M	O T H E R	REMARKS
		NOZZLE INSIDE RADIUS SECTION (CONTD)								
B3.100	B-D	RPV1-N2JIR INSIDE RADIUS SECTION	UT18 UT23	700-6/34	100450					SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. EXAMINATION TO BE PERFORMED USING MECHANIZED EQUIPMENT. SCAN PLAN EXAMINATION NOS. 17 AND 18. ***BASIC CALIBRATION BLOCK*** IR-CSCL-50-HPC
B3.100	B-D	RPV1-N2KIR INSIDE RADIUS SECTION	UT18 UT23	700-6/34	100455					SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. EXAMINATION TO BE PERFORMED USING MECHANIZED EQUIPMENT. SCAN PLAN EXAMINATION NOS. 19 AND 20. ***BASIC CALIBRATION BLOCK*** IR-CSCL-50-HPC
B3.100	B-D	RPV1-N5AIR INSIDE RADIUS SECTION	UT17 UT22	700-6/34	100510					SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. EXAMINATION TO BE PERFORMED USING MECHANIZED EQUIPMENT. SCAN PLAN EXAMINATION NOS. 21 AND 22. ***BASIC CALIBRATION BLOCK*** IR-CSCL-50-HPC

REACTOR PRESSURE VESSEL (SEE FIGURES A-1 & A-2)

(CONTD)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NONE	INSERVICE	GEOMETRY	OTHER *	REMARKS
		NOZZLE INSIDE RADIUS SECTION								
		(CONTD)								
B3.100	B-D	RPV1-N5B1R INSIDE RADIUS SECTION	UT17 UT22	700-6/34	100515					SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION TO BE PERFORMED USING MECHANIZED EQUIPMENT. SCAN PLAN EXAMINATION NO. 23 AND 24. ***BASIC CALIBRATION BLOCK*** IR-CSCL-50-HPC
		NOZZLE TO SAFE-END AND SAFE-END TO NOZZLE WELDS								
B5.10	B-F	RPV1-N1ASE NOZZLE TO SAFE-END	PT AUT45 AUT45T	200-1/70 DEV. 3 800-117/2 DEV. 1	100635					SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. UT EXAMINATION TO BE PERFORMED USING INTRASPECT I/PC-2 SYSTEM. ***BASIC CALIBRATION BLOCK*** SE-CSCL-2.350-59-HPC SE-SS-2.25-60-HPC
B5.10	B-F	RPV1-N2ASE SAFE-END TO NOZZLE	PT AUT45 AUT45T	200-1/70 DEV. 3 800-117/2 DEV. 1	100645					SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. UT EXAMINATION TO BE PERFORMED USING INTRASPECT I/PC-2 SYSTEM. ***BASIC CALIBRATION BLOCK*** SE-CSCL-1.35-57-HPC SE-SS-1.45-58-HPC

REACTOR PRESSURE VESSEL (SEE FIGURES A-1 & A-2)

(CONTD)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NOREC	INSIG	GEOM	OTHER	REMARKS
		NOZZLE TO SAFE-END AND SAFE-END TO NOZZLE WELDS								
		(CONTD)								
B5.10	B-F	RPV1-N2BSE SAFE-END TO NOZZLE	PT AUT45 AUT45T	200-1/70 DEV. 3 800-117/2 DEV. 1	100650					SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. UT EXAMINATION TO BE PERFORMED USING INTRASPECT I/PC-2 SYSTEM. ***BASIC CALIBRATION BLOCK*** SE-CSCL-1.35-57-HPC SE-SS-1.45-58-HPC
B5.10	B-F	RPV1-N2CSE SAFE-END TO NOZZLE	PT AUT45 AUT45T	200-1/70 DEV. 3 800-117/2 DEV. 1	100655					SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. UT EXAMINATION TO BE PERFORMED USING INTRASPECT I/PC-2 SYSTEM. ***BASIC CALIBRATION BLOCK*** SE-CSCL-1.35-57-HPC SE-SS-1.45-58-HPC
B5.10	B-F	RPV1-N2JSE SAFE-END TO NOZZLE	PT AUT45 AUT45T	200-1/70 DEV. 3 800-117/2 DEV. 1	100685					SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. UT EXAMINATION TO BE PERFORMED USING INTRASPECT I/PC-2 SYSTEM. ***BASIC CALIBRATION BLOCK*** SE-CSCL-1.35-57-HPC SE-SS-1.45-58-HPC

REACTOR PRESSURE VESSEL (SEE FIGURES A-1 & A-2)

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NOZZLE TO SAFE-END AND SAFE-END TO NOZZLE WELDS

(CONTD)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NONE	ISI CLASS	OTHER	REMARKS
B5.10	B-F	RPV1-N2KSE SAFE-END TO NOZZLE	PT AUT45 AUT45T	200-1/70 DEV. 3 800-117/2 DEV. 1	100690				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. UT EXAMINATION TO BE PERFORMED USING INTRASPECT I/PC-2 SYSTEM. ***BASIC CALIBRATION BLOCK*** SE-CSCL-1.35-57-HPC SE-SS-1.45-58-HPC
B5.10	B-F	RPV1-N5ASE NOZZLE TO SAFE-END	PT AUT45 AUT45T	200-1/70 DEV. 3 800-117/2 DEV. 1	100745				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. UT EXAMINATION TO BE PERFORMED USING INTRASPECT I/PC-2 SYSTEM. ***BASIC CALIBRATION BLOCK*** SE-CSCL-1.35-52-HPC SE-IN-1.25-53-HPC
B5.10	B-F	RPV1-N5ASEX SAFE-END TO SAFE END EXT	PT AUT45 AUT45T	200-1/70 DEV. 3 800-117/2 DEV. 1	100747				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. UT EXAMINATION TO BE PERFORMED USING INTRASPECT I/PC-2 SYSTEM. ***BASIC CALIBRATION BLOCK*** SE-CSCL-1.35-52-HPC SE-IN-.750-73-HPC

REACTOR PRESSURE VESSEL (SEE FIGURES A-1 & A-2)

(CONTD)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NOREC	INSIG	OTHER	REMARKS
		NOZZLE TO SAFE-END AND SAFE-END TO NOZZLE WELDS							
		(CONTD)							
B5.10	B-F	RPV1-N5BSE NOZZLE TO SAFE-END	PT AUT45 AUT45T	200-1/70 DEV. 3 800-117/2 DEV. 1	100750				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. UT EXAMINATION TO BE PERFORMED USING INTRASPECT I/PC-2 SYSTEM. ***BASIC CALIBRATION BLOCK*** SE-CSCL-1.35-52-HPC SE-IN-1.25-53-HPC
B5.10	B-F	RPV1-N5BSEX SAFE-END TO SAFE END EXT	PT AUT45 AUT45T	200-1/70 DEV. 3 800-117/2 DEV. 1	100752				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. UT EXAMINATION TO BE PERFORMED USING INTRASPECT I/PC-2 SYSTEM. ***BASIC CALIBRATION BLOCK*** SE-CSCL-1.35-52-HPC SE-IN-.750-73-HPC
		CLOSURE HEAD BOLTING							
B6.10	B-G-1	RPV1-1NUTS (1-92) CLOSURE NUTS	MT	300-2/42 DEV. 1,2	100865				SCHEDULED EXAMINATION POSTPONED TO NEXT REFUELING OUTAGE. EXAMINE 30 NUTS.
B6.20	B-G 1	RPV1-STUDS (1-92) CLOSURE STUDS	UT60 UT88	800-20/1 800-104/2	100875				SCHEDULED EXAMINATION POSTPONED TO NEXT REFUELING OUTAGE. UT EXAMINATION TO BE PERFORMED WITH PSE&G TRANSDUCER NO 2719. ***BASIC CALIBRATION BLOCK*** 6-.828-8-CS-43-HPC

REACTOR PRESSURE VESSEL (SEE FIGURES A-1 & A-2)

(CONTD)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NO REC	IN GS	OT HR	REMARKS
		CLOSURE HEAD BOLTING							
		(CONTD)							
B6.40	B-G-1	RPV1-THDF THREADS IN FLANGE	UTO	60°-5/43	100880				SCHEDULED EXAMINATION POST-PONED TO NEXT REFUELING OUTAGE. EXAMINE THREADS IN FLANGE WHERE MADE ACCESSIBLE BY REMOVAL OF STUDS. ***BASIC CALIBRATION BLOCK*** 6-.828-8-CS-43-HPC
B6.50	B-G-1	RPV1-CWB CLOSURE WASHERS	VT-1	900-7/14 DEV. 1	100881				SCHEDULED EXAMINATION POST-PONED TO NEXT REFUELING OUTAGE. EXAMINE 30 WASHERS.

REACTOR RECIRC PUMP A (FIGURE A-3)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NI ONR SEC	IG SE GM	OTH ER	REMARKS
		PUMP BOLTING							
B6.180	B-G-1	RCPA-1BLT (1-16) STUDS	UT0 UT45 UT60 UT70 UT88	800-97/3 800-104/2	101005				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. UT EXAMINATION TO BE PERFORMED WITH PSE&G TRANDUCER NOS. 2665 2666, 2667 AND 3386. ***BASIC CALIBRATION BLOCK*** 3-.500-8-CS-44-HPC RCP-STUD-CS-76-HPC
B6.200	B-G-1	RCPA-1BLT (1-16) NUTS AND WASHERS	VT-1	900-7/14 DEV. 1	101010				

MAIN STEAM SYSTEM PIPING (FIGURES LISTED BELOW)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NO REC	INSIG	OTHER	REMARKS
		LINE 1-AB-8DBA-030C (FIGURE A-4)							
B9.11	B-J	1 BRANCH CONNECTION TO PIPE GE-PS-N-A3-J	MT UT45	300-1/35 DEV. 2 600-41/16 DEV. 1	102005				SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. ***BASIC CALIBRATION BLOCK*** 8-CS-160-.906-32-HPC
B9.11	B-J	2 PIPE TO FLANGE GE-PS-N-A3-K	MT UT45	300-1/35 DEV. 2 600-41/16 DEV. 1	102010				SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. ***BASIC CALIBRATION BLOCK*** 8-CS-160-.906-32-HPC

FEEDWATER SYSTEM PIPING (FIGURES LISTED BELOW)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NONE RECORDABLE	INSERVICE GEOMETRIC	OTHER	REMARKS
		LINE 1-AE-24DLA-035 (FIGURE A-13)							
AUG	N/A	1AUG VALVE (HV-F074B)	MT MT 	300-1/35 DEV. 2 300-2/42 DEV. 1,2	104302	- - - X X - - - - - - X X - - -			AUGMENTED EXAMINATION PERFORMED AT THE REQUEST OF PSE&G. NINE LINEAR INDICATIONS ON THE INSIDE SURFACE OF VALVE BODY AND THREE LINEAR INDICATIONS ON THE OUTSIDE SURFACE. SEE CNF 1 AND 4. REEXAMINATION AFTER LIGHT GRINDING REVEALED NO RECORDABLE INDICATIONS. THICKNESSES ON THE VALVE BODY TAKEN FOR INFORMATION ONLY.
B10.10	B-K-1	3LG LUG	MT	300-1/35 DEV. 2	104715				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE.
		LINE 1-AE-24LA-036 (FIGURE A-14)							
AUG	N/A	1AUG VALVE (HV-F074A)	MT MT 	300-1/35 DEV. 2 300-2/42 DEV. 1,2	104802	- - - X X - - - - - - X X - - -			AUGMENTED EXAMINATION PERFORMED AT THE REQUEST OF PSE&G. NINE LINEAR INDICATIONS ON THE INSIDE SURFACE OF THE VALVE AND TWO LINEAR INDICATIONS ON THE OUTSIDE SURFACE. SEE CNF'S 2 AND 5. REEXAMINATION AFTER LIGHT GRINDING REVEALED NO RECORDABLE INDICATIONS. THICKNESSES ON THE VALVE BODY TAKEN FOR INFORMATION ONLY.

NUCLEAR BOILER AND RECIRCULATION SYSTEM PIPING (FIGURE LISTED BELOW)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NOR EC	ING S	GE O	OTH R	REMARKS
		LINE 1-BB-28VCA-G12 (FIGURE A-18)								
B9.11	B-J	1 SAFE END TO PIPE FSK-P-169-1-R1	PT UT45 UT45T UT45 UT45T	200-1/70 DEV. 3 600-31/23 DEV. 1 800-100/2 DEV. 1	105600					SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. CORROSION RESISTANT CLADDING ON PIPE SIDE. ***BASIC CALIBRATION BLOCK*** SE-SS-2.25-60-HPC 28-SS-CRC-68-HPC
B9.12	B-J	1LD LONGITUDINAL SEAM DOWNSTREAM	PT UT45 UT45T UT45 UT45T	200-1/70 DEV. 3 600-31/23 DEV. 1 800-100/2 DEV. 1	105605					SCHEDULED EXAMINATION POST-PONED TO 1987 OUTAGE. CORROSION RESISTANT CLADDING ADJACENT TO CIRCUMFERENTIAL WELD. ***BASIC CALIBRATION BLOCK*** 28-SS-X-1.200-30-HPC
B9.11	B-J	7 PIPE TO ELBOW 761E350-7-RS-1-A2(A)	PT UT45 UT45T	200-1/70 DEV. 3 600-31/23 DEV. 1	105715	X X	 X 	 	 	 ***BASIC CALIBRATION BLOCK*** 28-SS-X-1.200-30-HPC
B9.12	B-J	7LU LONGITUDINAL SEAM UPSTREAM	PT UT45 UT45T	200-1/70 DEV. 3 600-31/23 DEV. 1	105720	X X	 X 	 	 	 ***BASIC CALIBRATION BLOCK*** 28-SS-X-1.200-30-HPC

NUCLEAR BOILER AND RECIRCULATION SYSTEM PIPING (FIGURE LISTED BELOW) (CONTD)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NONE C	INSIG E	OUTSIG E	OTHER	REMARKS
		LINE 1-BB-28VCA-012 (FIGURE A-18) (CONTD)								
89.12	B-J	7LDI LONG. SEAM DOWNSTREAM ON INSIDE BEND OF ELBOW	PT UT45 UT45T	200-1/70 DEV. 3 600-31/23 DEV. 1	105725	X X X				***BASIC CALIBRATION BLOCK*** 28-SS-X-1.200-30-HPC
89.12	B-J	7LDO LONG. SEAM DOWNSTREAM ON OUTSIDE BEND OF ELBOW	PT UT45 UT45T	200-1/70 DEV. 3 600-31/23 DEV. 1	105730	X X X				***BASIC CALIBRATION BLOCK*** 28-SS-X-1.200-30-HPC
		LINE 1-BB-28VCA-013 (FIGURE A-18)								
89.11	B-J	7 PUMP TO PIPE FSK-P-169-6	PT UTOW UT45 UT45T	200-1/70 DEV. 3 800-100/2 DEV. 1	105800	X X X	 X 			CORROSION RESISTANT CLADDING ON PIPE SIDE. ***BASIC CALIBRATION BLOCK*** 28-SS-CRC-68-HPC
89.12	B-J	1LD LONGITUDINAL SEAM DOWNSTREAM	PT UT45 UT45T UT45 UT45T	200-1/70 DEV. 3 600-31/23 DEV. 1 800-100/2 DEV. 1	105805	X X X X X				CORROSION RESISTANT CLADDING ADJACENT TO CIRCUMFERENTIAL WELD. ***BASIC CALIBRATION BLOCK*** 28-SS-X-1.200-30-HPC 28-SS-CRC-68-HPC

NUCLEAR BOILER AND RECIRCULATION SYSTEM PIPING (FIGURE LISTED BELOW)

(CONTD)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NONE	INCG	OTHER	REMARKS
		LINE 1-BB-12VCA-013J (FIGURE A-19)							
B9.11	B-J	5 PIPE TO SAFE END FSK-P-169-18	PT UT45 UT45T UT45 UT45T	200-1/70 DEV. 3 600-31/23 DEV. 1 800-100/2 DEV. 1	106565				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. CORROSION RESISTANT CLADDING ON PIPE SIDE. ***BASIC CALIBRATION BLOCK*** 12-SS-CRC-47-HPC SE-SS-1.45-58-HPC
B9.12	B-J	5LU LONGITUDINAL SEAM UPSTREAM	PT UT45 UT45T UT45 UT45T	200-1/70 DEV. 3 600-31/23 DEV. 1 800-100/2 DEV. 1	106570				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. CORROSION RESISTANT CLADDING ADJACENT TO CIRCUMFERENTIAL WELD. ***BASIC CALIBRATION BLOCK*** 12-SS-X-.720-13-HPC 12-SS-CRC-47-HPC
		LINE 1-BB-12VCA-013K (FIGURE A-19)							
B9.11	B-J	5 PIPE TO SAFE END FSK-P-169-19	PT UT45 UT45T UT45 UT45T	200-1/70 DEV. 3 600-31/23 DEV. 1 800-100/2 DEV. 1	106665				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. CORROSION RESISTANT CLADDING ON PIPE SIDE. ***BASIC CALIBRATION BLOCK*** 12-SS-CRC-47-HPC SE-SS-1.45-58-HPC

NUCLEAR BOILER AND RECIRCULATION SYSTEM PIPING (FIGURE LISTED BELOW)

(CONTD)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NONE C	INGE M	OTHER	REMARKS
		LINE 1-BB-12VCA-013K (FIGURE A-19)							
		(CONTD)							
B9.12	B-J	5LU LONGITUDINAL SEAM UPSTREAM	PT	200-1/70 DEV. 3	106670				SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. CORROSION RESISTANT CLADDING ADJACENT TO CIRCUMFERENTIAL WELD. ***BASIC CALIBRATION BLOCK*** 12-SS-X-.720-13-HPC 12-SS-CRC-47-HPC
			UT45 UT45T UT45 UT45T	600-31/23 DEV. 1 800-100/2 DEV. 1					
		LINE 1-BB-28VCA-014 (FIGURE A-16)							
B9.11	B-J	5 PIPE TO PIPE 796E916-RD-1-B2(BB)	PT	200-1/70 DEV. 3	106790	X			CORROSION RESISTANT CLADDING UPSTREAM/DOWNSTREAM. ***BASIC CALIBRATION BLOCK*** 28-SS-CRC-68-HPC
			UT45	800-100/2			X		
			UT45T	DEV. 1		X			
B9.12	B-J	5LU LONGITUDINAL SEAM UPSTREAM	PT	200-1/70 DEV. 3	106795	X			CORROSION RESISTANT CLADDING ADJACENT TO CIRCUMFERENTIAL WELD. ***BASIC CALIBRATION BLOCK*** 28-SS-X-1.200-30-HPC 28-SS-CRC-68-HPC
			UT45	600-31/23			X		
			UT45T	DEV. 1		X			
			UT45	800-100/2		X			
			UT45T	DEV. 1		X			

NUCLEAR BOILER AND RECIRCULATION SYSTEM PIPING (FIGURE LISTED BELOW)

(CONTD)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NONE C	INSP G	SEL M	OTH R	REMARKS
		LINE 1-BB-28VCA-014 (FIGURE A-16)								
		(CONTD)								
W.12	B-J	5LD LONGITUDINAL SEAM DOWNSTREAM	PT	200-1/70 DEV. 3	106800	X	-	-	-	EXAMINATION LIMITED TO 7 OF 12 INCHES DUE TO PIPE SUPPORT INTERFERENCE. COVERAGE OF REMAINING PORTION TO BE SCHEDULED FOR A LATER OUTAGE. CORROSION RESISTANT CLADDING ADJACENT TO CIRCUMFERENTIAL WELD. ***BASIC CALIBRATION BLOCK*** 28-SS-X-1.200-30-HPC 28-SS-CRC-68-HPC
			UT45	600-31/23		-	-	X	-	
			UT45T	DEV. 1		X	-	-	-	
			UT45	800-100/2		X	-	-	-	
			UT45T	DEV. 1		X	-	-	-	
		LINE 1-BB-12VCA-014A (FIGURE A-17)								
89.11	B-J	5 PIPE TO SAFE END 761E350-15-15	PT	200-1/70 DEV. 3	107165					SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. CORROSION RESISTANT CLADDING ON PIPE SIDE. ***BASIC CALIBRATION BLOCK*** 12-SS-CRC-47-HPC SE-SS-1.45-58-HPC
			UT45	600-31/23						
			UT45T	DEV. 1						
			UT45	800-100/2						
			UT45T	DEV. 1						
89.12	B-J	5LU LONGITUDINAL SEAM UPSTREAM	PT	200-1/70 DEV. 3	107170					SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. CORROSION RESISTANT CLADDING ADJACENT TO CIRCUMFERENTIAL WELD. ***BASIC CALIBRATION BLOCK*** 12-SS-X-.720-13-HPC 12-SS-CRC-47-HPC
			UT45	600-31/23						
			UT45T	DEV. 1						
			UT45	800-100/2						
			UT45T	DEV. 1						

NUCLEAR BOILER AND RECIRCULATION SYSTEM PIPING (FIGURE LISTED BELOW)

(CONTD)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NI ON REC	I G S I G M	O T H E R	REMARKS
		LINE 1-BB-12VCA-014B (FIGURE A-17)							
B9.11	B-J	5 PIPE TO SAFE END FSK-P-170-16-R4	PT UT45 UT45T UTOW UT45 UT45T	200-1/70 DEV. 3 600-31/23 DEV. 1 800-100/2 DEV. 1	107265				SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. CORROSION RESISTANT CLADDING ON PIPE SIDE. ***BASIC CALIBRATION BLOCK*** 12-SS-CRC-47-HPC SE-SS-1.45-58-HPC
B9.12	B-J	SLU LONGITUDINAL SEAM UPSTREAM	PT UT45 UT45T UT45 UT45T	200-1/70 DEV. 3 DEV. 3 600-31/23 DEV. 1 800-100/2 DEV. 1	107270				SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. CORROSION RESISTANT CLADDING ADJACENT TO CIRCUMFERENTIAL WELD. ***BASIC CALIBRATION BLOCK*** 12-SS-X-.720-13-HPC 12-SS-CRC-47-HPC
		LINE 1-BB-12VCA-014C (FIGURE A-17)							
B9.11	B-J	5 PIPE TO SAFE END FSK-P-170-17	PT UT45 UT45T UT45 UT45T	200-1/70 DEV. 3 600-31/23 DEV. 1 800-100/2 DEV. 1	107365				SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. CORROSION RESISTANT CLADDING ON PIPE SIDE. ***BASIC CALIBRATION BLOCK*** 12-SS-CRC-47-HPC SE-SS-1.45-58-HPC

NUCLEAR BOILER AND RECIRCULATION SYSTEM PIPING (FIGURE LISTED BELOW)

(CONTD)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NOREC	ONSIG	GEOM	OTHER	REMARKS
		LINE 1-BB-12VCA-014C (FIGURE A-17)								
		(CONTD)								
B9.12	B-J	5LU LONGITUDINAL SEAM UPSTREAM	PT UT45 UT45T UT45 UT45T	200-1/70 600-31/23 DEV. 1 800-100/2 DEV. 1	107370					SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. CORROSION RESISTANT CLADDING ADJACENT TO CIRCUMFERENTIAL WELD. ***BASIC CALIBRATION BLOCK*** 12-SS-X-.720-13-HPC 12-SS-CRC-47-HPC

REACTOR CORE SPRAY SYSTEM PIPING (FIGURES LISTED BELOW)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NONE	ISI CLASS	OTHER	REMARKS
		LINE 1-BE-12DLA-001 (FIGURE A-33)							
B9.11	B-J	19 PIPE TO REDUCER 1-P-BE-014-6	MT AUT45 AUT45T	300-1/35 DEV. 2 800-117/2 DEV. 1	109335				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. UT EXAMINATION TO BE PERFORMED USING INTRASPECT I/PC-2 SYSTEM. ***BASIC CALIBRATION BLOCK*** 12-CS-80-.688-14-HPC
		LINE 1-BE-10DLA-001 (FIGURE A-33)							
B9.11	B-J	1 REDUCER TO SAFE-END EXT 1-P-SE-014-7-S1	MT AUT45 AUT45T	300-1/35 DEV. 2 800-117/2 DEV. 1	109350				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. UT EXAMINATION TO BE PERFORMED USING INTRASPECT I/PC-2 SYSTEM. ***BASIC CALIBRATION BLOCK*** 10-CS-80-.594-10-HPC SE-CSCL-1.35-S2-HPC
		LINE 1-BE-12DLA-023 (FIGURE A-34)							
B9.11	B-J	21 PIPE TO REDUCER 1-P-BE-015-6-R2	MT AUT45 AUT45T	300-1/35 DEV. 2 800-117/2 DEV. 1	109530				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. UT EXAMINATION TO BE PERFORMED USING INTRASPECT I/PC-2 SYSTEM. ***BASIC CALIBRATION BLOCK*** 12-CS-80-.688-14-HPC
		LINE 1-BE-10DLA-023 (FIGURE A-34)							
B9.11	B-J	1 REDUCER TO SAFE-END EXT 1-P-BE-015-7-R1	MT AUT45 AUT45T	300-1/35 DEV. 2 800-117/2 DEV. 1	109550				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. UT EXAMINATION TO BE PERFORMED USING INTRASPECT I/PC-2 SYSTEM. ***BASIC CALIBRATION BLOCK*** 10-CS-80-.594-10-HPC

STANDBY LIQUID CONTROL SYSTEM (BH)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NIONREC	ISIGEOM	OTHER	REMARKS
		1-BH-2CCA-011 (FIGURE A-39)							
B9.11	B-J	1 VALVE TO PIPE	PT	200-1/70 DEV. 3	112000				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION.
B9.11	B-J	2 PIPE TO TEE	PT	200-1/70 DEV. 3	112010				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION.
B9.11	B-J	3 TEE TO REDUCER	PT	200-1/70 DEV. 3	112020				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION.
B9.11	B-J	4 VALVE TO PIPE	PT	200-1/70 DEV. 3	112030				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION.
B9.11	B-J	5 PIPE TO ELBOW	PT	200-1/70 DEV. 3	112040				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION.
B9.11	B-J	6 ELBOW TO PIPE	PT	200-1/70 DEV. 3	112050				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION.

STANDBY LIQUID CONTROL SYSTEM (BH)

(CONTD)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NONE	INSIG	OTHER	REMARKS
		1-BH-2CCA-011 (FIGURE A-39)							
		(CONTD)							
B9.11	B-J	7 PIPE TO TEE	PT	200-1/70 DEV. 3	112060				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION.
		1-BH-1.5GCCA-011 (FIGURE A-39)							
B9.11	B-J	1 REDUCER TO PIPE	PT	200-1/70 DEV. 3	112300				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION.
B9.11	B-J	2 PIPE TO TEE	PT	200-1/70 DEV. 3	112310				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION.
B9.11	B-J	4 TEE TO PIPE	PT	200-1/70 DEV. 3	112330				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION.

STANDBY LIQUID CONTROL SYSTEM (BH)

(CONTD)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NI ON RE C	I N S G	O T H E R	REMARKS
		1-BH-1.50CCA-011 (FIGURE A-39)							
		(CONTD)							
B9.11	B-J	5 PIPE TO ELBOW	PT	200-1/70 DEV. 3	112340				SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMI-NATION.
B9.11	B-J	6 ELBOW TO PIPE	PT	200-1/70 DEV. 3	112350				SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMI-NATION.
B9.11	B-J	7 PIPE TO ELBOW	PT	200-1/70 DEV. 3	112360				SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMI-NATION.
B9.11	B-J	8 ELBOW TO PIPE	PT	200-1/70 DEV. 3	112370				SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMI-NATION.
B9.11	B-J	9 PIPE TO ELBOW	PT	200-1/70 DEV. 3	112380				SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMI-NATION.

STANDBY LIQUID CONTROL SYSTEM (BH)

(CONTD)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NONCONFORMING	INCOMPLETE	OTHER	REMARKS
		1-BH-1.50CCA-011 (FIGURE A-39\							
		(CONTD)							
B9.11	B-J	10 ELBOW TO PIPE	PT	200-1/70 DEV. 3	112390				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION.
B9.11	B-J	11 PIPE TO ELBOW	PT	200-1/70 DEV. 3	112400				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION.
B9.11	B-J	12 ELBOW TO PIPE	PT	200-1/70 DEV. 3	112410				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION.
B9.11	B-J	12A PIPE TO PIPE	PT	200-1/70 DEV. 3	112412				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION.
B9.11	B-J	12B PIPE TO PIPE	PT	200-1/70 DEV. 3	112414				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION.

STANDBY LIQUID CONTROL SYSTEM (BH)

(CONTD)

ASME Sect XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NO REC	INT GEO	OTH MR	REMARKS
		1-BH-1.5CCA-011 (FIGURE A-39)							
		(CONTD)							
B9.11	B-J	12C PIPE TO COUPLING	PT	200-1/70 DEV. 3	112416				SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMI-NATION.
B9.11	B-J	12D COUPLING TO PIPE	PT	200-1/70 DEV. 3	112418				SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMI-NATION.
B9.11	B-J	13 PIPE TO ELBOW	PT	200-1/70 DEV. 3	112420				SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMI-NATION.
B9.11	B-J	19 TEE TO PIPE	PT	200-1/70 DEV. 3	112480				SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMI-NATION.
B9.11	B-J	20 PIPE TO VALVE	PT	200-1/70 DEV. 3	112490				SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMI-NATION.

STANDBY LIQUID CONTROL SYSTEM (BH)

(CONTD)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NONE C	INSIG E	OTHER O I G M R	REMARKS
		1-BH-1.50CCA-011 (FIGURE A-39)							
		(CONTD)							
B9.11	B-J	21 VALVE TO PIPE	PT	200-1/70 DEV. 3	112500				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION.
B10.10	B-K-1	21LUG LUG	PT	200-1/70 DEV. 3	112505				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION.
B9.11	B-J	22 PIPE TO ELBOW	PT	200-1/70 DEV. 3	112510				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION.
B9.11	B-J	23 ELBOW TO PIPE	PT	200-1/70 DEV. 3	112520				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION.
B9.11	B-J	23A PIPE TO COUPLING	PT	200-1/70 DEV. 3	112521				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION.

STANDBY LIQUID CONTROL SYSTEM (BH)

(CONTD)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NONREC	INSIG	OTSEM	OTHER	REMARKS
		1-BH-1.50CCA-011 (FIGURE A-39)								
		(CONTD)								
B9.11	B-J	23B COUPLING TO PIPE	PT	200-1/70 DEV. 3	112522					SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION.
B9.11	B-J	23C PIPE TO COUPLING	PT	200-1/70 DEV. 3	112523					SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION.
B9.11	B-J	23D COUPLING TO PIPE	PT	200-1/70 DEV. 3	112524					SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION.
B9.11	B-J	23E PIPE TO COUPLING	PT	200-1/70 DEV. 3	112525					SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION.
B9.11	B-J	23F COUPLING TO PIPE	PT	200-1/70 DEV. 3	112526					SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION.

FEEDWATER NOZZLE BORE SECTION (FIGURE A-1)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NOREC	INSIG	OTHER	REMARKS
NUREG	0619	RPV1-N4A NOZZLE BORE SECTION	UT22RL UT45	800-94/2 DEV. 1	112900	X X	- -	- -	***BASIC CALIBRATION BLOCK*** FW-N4-MOCKUP-75R-HPC
NUREG	0619	RPV1-N4B NOZZLE BORE SECTION	UT22RL UT45	800-94/2 DEV. 1	112905	X X	- -	- -	LIMITED EXAMINATION DUE TO WELDED THERMO PADS AND INSTRUMENTATION WIRE INTERFERENCE. ***BASIC CALIBRATION BLOCK*** FW-N4-MOCKUP-75R-HPC
NUREG	0619	RPV1-N4C NOZZLE BORE SECTION	UT22RL UT45	800-94/2 DEV. 1	112910	X X	- -	- -	***BASIC CALIBRATION BLOCK*** FW-N4-MOCKUP-75R-HPC
NUREG	0619	RPV1-N4D NOZZLE BORE SECTION	UT22RL UT45	800-94/2 DEV. 1	112915	X X	- -	- -	LIMITED EXAMINATION DUE TO WELDED THERMO PAD INTERFERENCE. ***BASIC CALIBRATION BLOCK*** FW-N4-MOCKUP-75R-HPC
NUREG	0619	RPV1-N4E NOZZLE BORE SECTION	UT22RL UT45	800-94/2 DEV. 1	112920	X X	- -	- -	***BASIC CALIBRATION BLOCK*** FW-N4-MOCKUP-75R-HPC
NUREG	0619	RPV1-N4F NOZZLE BORE SECTION	UT22RL UT45	800-94/2 DEV. 1	112925	X X	- -	- -	***BASIC CALIBRATION BLOCK*** FW-N4-MOCKUP-75R-HPC

MAIN STEAM SYSTEM PIPING (FIGURES LISTED BELOW)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NORE C	INSI G	OTHE R	REMARKS
		LINE 1-AB-26088-021 (FIGURE B-4)							
C3.20	C-C	2PS1 PIPE SUPPORT 1-P-AB-01-103-2	MT	300-1/35 DEV. 2	201217				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE.

RESIDUAL HEAT REMOVAL SYSTEM PIPING (FIGURES LISTED BELOW)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NONE	INSIG	OTHER	REMARKS
		LINE 1-BC-18GBB-0048 (FIGURE B-8)							
C3.20	C-C	5PS1 PIPE SUPPORT 1-P-BC-01-H17	MT	300-1/35 DEV. 2	202352				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE.
C5.51	C-F-2	8 PIPE TO ELBOW 1-BC-004-S08-C	MT UT45	300-1/35 DEV. 2 600-41/16 DEV. 1	202358				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. ***BASIC CALIBRATION BLOCK*** 18-CS-X-.500-22-HPC
		LINE 1-BC-16GBB-004 (FIGURE B-11)							
C5.51	C-F-2	1 TEE TO PIPE 1-P-BC-013-6	MT UTOL UT45 UT45T	300-1/35 DEV. 2 600-41/16 DEV. 1	202550				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM IN ACCORDANCE WITH CODE CASE N-408. BASELINE EXAMINATION. ***BASIC CALIBRATION BLOCK*** 16-CS-40-.500-20-HPC
		LINE 1-BC-12GBB-004B (FIGURE B-8)							
C5.51	C-F-2	3 ELBOW TO PIPE 1-P-BC-010-19-C2	MT UT45	300-1/35 DEV. 2 600-41/16 DEV. 1	202810				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. ***BASIC CALIBRATION BLOCK*** 12-CS-STD-.375-12-HPC

RESIDUAL HEAT REMOVAL SYSTEM PIPING (FIGURES LISTED BELOW)

(CONTD)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NONE C	INSERVICE G	SEE M	OTHER R	REMARKS
		LINE 1-BC-18G8B-019A (FIGURE B-13 & B-14)								
C3.20	C-C	23LG(1-4) LUG 1-P-BC-01-H09	MT	300-1/35 DEV. 2	203360					SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE.
		LINE 1-BC-8D8B-025 (FIGURE B-15)								
C5.51	C-F-2	1 VALVE TO PIPE 1-P-FD-001-11	MT UT45	300-1/35 DEV. 2 600-41/16 DEV. 1	203650					SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. ***BASIC CALIBRATION BLOCK*** 8-CS-100-.594-8-HPC
C5.51	C-F-2	3 PIPE TO ELBOW 1-BC-025-S^2-B	MT UT45	300-1/35 DEV. 2 600-41/16 DEV. 1	203660					SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. ***BASIC CALIBRATION BLOCK*** 8-CS-100-.594-8-HPC
C5.51	C-F-2	12B PIPE TO FLANGE	MT UTOL UT45 UT45T	300-1/35 DEV. 2 600-41/16 DEV. 1	2037[illegible]	X X X X	- - - - - - - - - - - -			***BASIC CALIBRATION BLOCK*** 8-CS-100-.594-8-HPC
C5.51	C-F-2	12C FLANGE TO PIPE	MT UTOL UT45 UT45T	300-1/35 DEV. 2 600-41/16 DEV. 1	203756	X X X X	- - - - - - - - - - - -			***BASIC CALIBRATION BLOCK*** 8-CS-100-.594-8-HPC

RESIDUAL HEAT REMOVAL SYSTEM PIPING (FIGURES LISTED BELOW)

(CONTD)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NO REC	INSP GEOM	OTHER	REMARKS
		LINE 1-BC-8DBB-029 (FIGURE B-19)							
C5.51	C-F-2	1A PIPE TO FLANGE	MT UTOL UT45 UT45T	300-1/23 600-41/8 DEV. 1-4	204210	X X X X	- - - - - - - - - - - -		EXAMINATION PERFORMED 10/02/87. ***BASIC CALIBRATION BLOCK*** 8-CS-100-.594-8-HPC
C5.51	C-F-2	1B FLANGE TO PIPE	MT UTOL UT45 UT45T	300-1/23 600-41/8 DEV. 1-4	204215	X X X X	- - - - - - - - - - - -		EXAMINATION PERFORMED 10/02/87. ***BASIC CALIBRATION BLOCK*** 8-CS-100-.594-8-HPC
		LINE 1-BC-20HBB-049 (FIGURE B-23)							
C5.51	C-F-2	3B PIPE TO VALVE 1-P-BC-002-E	MT UTOL UT45 UT45T	300-1/35 DEV. 2 600-41/16 DEV. 1	205455				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM IN ACCORDANCE WITH CODE CASE N-408. BASELINE EXAMINATION. ***BASIC CALIBRATION BLOCK*** 20-CS-STD-.375-23-HPC
		LINE 1-BC-18GBB-0508 (FIGURE B-36)							
C5.51	C-F-2	1 TEE TO PIPE 1-BC-050-S02-J	MT UT45	300-1/35 DEV. 2 600-41/16 DEV. 1	205980				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. ***BASIC CALIBRATION BLOCK*** 18-CS-X-.500-22-HPC

RESIDUAL HEAT REMOVAL SYSTEM PIPING (FIGURES LISTED BELOW)

(CONTD)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NONE REC	INSIG	OTHER	REMARKS
		LINE 1-BC-18G8B-063A (FIGURE B-25)							
C5.51	C-F-2	17 TEE TO PIPE 1-BC-063A-S09-E	MT UTOL UT45 UT45T	300-1/35 DEV. 2 600-41/16 DEV. 1	206280				SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM IN ACCORDANCE WITH CODE CASE N-408. BASELINE EXAMINATION. ***BASIC CALIBRATION BLOCK*** 18-CS-X-.500-22-HPC
		LINE 1-BC-18G8B-066A (FIGURE B-31 & B-32)							
C5.51	C-F-2	3 PIPE TO VALVE 1-P-BC-021-13	MT UT45	300-1/35 DEV. 2 600-41/16 DEV. 1	207060				SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. ***BASIC CALIBRATION BLOCK*** 18-CS-X-.500-22-HPC
C5.51	C-F-2	7 PIPE TO ELBOW 1-P-BC-021-18	MT UT45	300-1/35 DEV. 2 600-41/16 DEV. 1	207080				SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. ***BASIC CALIBRATION BLOCK*** 18-CS-X-.500-22-HPC
C3.20	C-C	18PS1 PIPE SUPPORT 1-P-BC-021-15	MT	300-1/35 DEV. 2	207180				SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE.

RESIDUAL HEAT REMOVAL SYSTEM PIPING (FIGURES LISTED BELOW) (CONTD)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NONE C	INSIG G	OTHER	REMARKS
		LINE 1-BC-6GBB-074A (FIGURE B-18)							
C5.51	C-F-2	1 BRANCH CONNECTION TO PIPE 1-BC-074-S01-K	MT UT45	300-1/35 DEV. 2 600-41/16 DEV. 1	208000				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. ***BASIC CALIBRATION BLOCK*** 6-CS-160-.719-42-HPC
		LINE 1-BC-18GBB-075 (FIGURE B-34)							
C5.51	C-F-2	3 ELBOW TO PIPE 1-BC-075-S03-F	MT UT45	300-1/35 DEV. 2 600-41/16 DEV. 1	208110				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. ***BASIC CALIBRATION BLOCK*** 18-CS-X-.500-22-HPC
C5.51	C-F-2	5 ELBOW TO VALVE 1-P-BC-017-5	MT UT45	300-1/35 DEV. 2 600-41/16 DEV. 1	208120				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. ***BASIC CALIBRATION BLOCK*** 18-CS-X-.500-22-HPC
C3.20	C-C	11LG (1-8) LUG 1-P-BC-03-H05	MT	300-1/35 DEV. 2	208155				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE.

REACTOR CORE SPRAY SYSTEM PIPING (FIGURES LISTED BELOW)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NONE	ISI	OTHER	REMARKS
		LINE 1-BE-14GBB-008 (FIGURE B-40)							
C5.51	C-F-2	5 PIPE TO ELBOW 1-P-BE-001-1-R3	MT UT45	300-1/35 DEV. 2 600-41/16 DEV. 1	209220				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. ***BASIC CALIBRATION BLOCK*** 14-CS-STD-.375-16-HPC
C5.51	C-F-2	8 ELBOW TO PIPE 1-BE-008-S01-D	MT UT45	300-1/35 DEV. 2 600-41/16 DEV. 1	209235				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. ***BASIC CALIBRATION BLOCK*** 14-CS-STD-.375-16-HPC
C3.20	C-C	12PS1 PIPE SUPPORT 1-P-BE-001-15	MT	300-1/35 DEV. 2	209257				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE.
		LINE 1-BE-12GBB-017 (FIGURE B-47)							
C5.51	C-F-2	4 VALVE TO PIPE 1-P-BE-006-3	MT UT45	300-1/35 DEV. 2 600-41/16 DEV. 1	210115				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. ***BASIC CALIBRATION BLOCK*** 12-CS-STD-.375-12-HPC
C5.51	C-F-2	5 PIPE TO ELBOW 1-BE-017-S02-B	MT UT45	300-1/35 DEV. 2 600-41/16 DEV. 1	210120				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. ***BASIC CALIBRATION BLOCK*** 12-CS-STD-.375-12-HPC

REACTOR CORE SPRAY SYSTEM PIPING (FIGURES LISTED BELOW)

(CONTD)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NONE	INSIG	OTHER	REMARKS
		LINE 1-BE-16HB8-044 (FIGURE B-48)							
C5.51	C-F-2	1 NOZZLE TO ELBOW 1-P-BE-013-7-R1	MT UTOL UT45 UT45T	300-1/35 DEV. 2 600-41/16 DEV. 1	210600				SCHEDULED EXAMINATION POST-PONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM IN ACCORDANCE WITH CODE CASE N-408. BASELINE EXAMINATION. ***BASIC CALIBRATION BLOCK*** 16-CS-STD-.375-19-HPC

HIGH PRESSURE COOLANT INJECTION SYSTEM PIPING (FIGURES LISTED BELOW)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NON REC	INSG IE	OTHER	REMARKS
		LINE 1-BJ-16HBB-001 (FIGURE B-55)							
C5.51	C-F-2	1 VALVE TO PIPE	MT UTOL UT45 UT45T	300-1/35 DEV. 2 600-41/16 DEV. 1	211360				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM IN ACCORDANCE WITH CODE CASE N-408. BASELINE EXAMINATION. ***BASIC CALIBRATION BLOCK*** 16-CS-STD-.375-19-HPC
		LINE 1-BJ-14DBB-003A (FIGURE B-52)							
C5.51	C-F-2	4 ELBOW TO PIPE 1-P-BJ-002-18	MT UT45	300-1/35 DEV. 2 600-41/16 DEV. 1	211415				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. ***BASIC CALIBRATION BLOCK*** 14-CS-100-.938-18-HPC
C3.20	C-C	7LG (1-8) LUG 1-P-BJ-01-H04	MT	300-1/35 DEV. 2	211435				

HPCI SYSTEM - TURBINE STEAM (FIGURES LISTED BELOW)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NONREC	INSIG	GTSEL	OTHER	REMARKS
		LINE 1-FD-10D88-0028 (FIGURE 8-59)								
C5.51	C-F-2	2 PIPE TO ELBOW 1-FD-002-S01-C	MT	300-1/35 DEV. 2	213005					SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE.
			UT45	600-41/16 DEV. 1						***BASIC CALIBRATION BLOCK*** 10-CS-100-.719-11-HPC

CRD SYSTEM-SCRAM DISCHARGE HEADER (FIGURES LISTED BELOW)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NONE	INSIG	OTHER	REMARKS
		LINE 1-BF-12ELB-040 (FIGURE B-62)							
C5.51	C-F-2	1 FLANGE TO PIPE	MT UTOL UT45 UT45T	300-1/35 DEV. 2 600-41/16 DEV. 1	214500				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION. ***BASIC CALIBRATION BLOCK*** 12-CS-80-.688-14-HPC
C5.51	C-F-2	2 PIPE TO TEE	MT UTOL UT45 UT45T	300-1/35 DEV. 2 600-41/16 DEV. 1	214510				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION. ***BASIC CALIBRATION BLOCK*** 12-CS-80-.688-14-HPC
C5.51	C-F-2	3 FLANGE TO PIPE	MT UTOL UT45 UT45T	300-1/35 DEV. 2 600-41/16 DEV. 1	214520				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION. ***BASIC CALIBRATION BLOCK*** 12-CS-80-.688-14-HPC
C5.51	C-F-2	4 PIPE TO TEE	MT UTOL UT45 UT45T	300-1/35 DEV. 2 600-41/16 DEV. 1	214530				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION. ***BASIC CALIBRATION BLOCK*** 12-CS-80-.688-14-HPC

CRD SYSTEM-SCRAM DISCHARGE HEADER (FIGURES LISTED BELOW)

(CONTD)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NONREC	INSIG	OTHER	REMARKS
		LINE 1-BF-12ELB-040 (FIGURE B-62)							
		(CONTD)							
C5.51	C-F-2	5 TEE TO PIPE	MT UTOL UT45 UT45T	300-1/35 DEV. 2 600-41/16 DEV. 1	214540				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION. ***BASIC CALIBRATION BLOCK*** 12-CS-80-.688-14-HPC
C5.51	C-F-2	6 PIPE TO ELBOW	MT UTOL UT45 UT45T	300-1/35 DEV. 2 600-41/16 DEV. 1	214550				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION. ***BASIC CALIBRATION BLOCK*** 12-CS-80-.688-14-HPC
C5.51	C-F-2	7 ELBOW TO PIPE	MT UTOL UT45 UT45T	300-1/35 DEV. 2 600-41/16 DEV. 1	214560				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION. ***BASIC CALIBRATION BLOCK*** 12-CS-80-.688-14-HPC
C5.51	C-F-2	8 PIPE TO CAP	MT UTOL UT45 UT45T	300-1/35 DEV. 2 600-41/16 DEV. 1	214570				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION. ***BASIC CALIBRATION BLOCK*** 12-CS-80-.688-14-HPC

CRD SYSTEM-SCRAM DISCHARGE HEADER (FIGURES LISTED BELOW)

(CONTD)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NONE C	INSIG E	INSIG I	OTHER G	OTHER M	OTHER R	REMARKS
		LINE 1-BF-12ELF-041 (FIGURE B-62)										
C5.51	C-F-2	1 FLANGE TO PIPE	MT UTOL UT45 UT45T	300-1/35 DEV. 2 600-41/16 DEV. 1	214580							SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION. ***BASIC CALIBRATION BLOCK*** 12-CS-80-.688-14-HPC
C5.51	C-F-2	2 PIPE TO TEE	MT UTOL UT45 UT45T	300-1/35 DEV. 2 600-41/16 DEV. 1	214590							SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION. ***BASIC CALIBRATION BLOCK*** 12-CS-80-.688-14-HPC
C5.51	C-F-2	3 FLANGE TO PIPE	MT UTOL UT45 UT45T	300-1/35 DEV. 2 600-41/16 DEV. 1	214600							SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION. ***BASIC CALIBRATION BLOCK*** 12-CS-80-.688-14-HPC
C5.51	C-F-2	4 PIPE TO TEE	MT UTOL UT45 UT45T	300-1/35 DEV. 2 600-41/16 DEV. 1	214610							SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION. ***BASIC CALIBRATION BLOCK*** 12-CS-80-.688-14-HPC

CRD SYSTEM-SCRAM DISCHARGE HEADER (FIGURES LISTED BELOW)

(CONTD)

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NO REC	INSIG	OTSER	REMARKS
		LINE 1-BF-12ELF-041 (FIGURE B-62)							
		(CONTD)							
C5.51	C-F-2	5 TEE TO PIPE	MT UTOL UT45 UT45T	300-1/35 DEV. 2 600-41/16 DEV. 1	214620				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION. ***BASIC CALIBRATION BLOCK*** 12-CS-80-.688-14-HPC
C5.51	C-F-2	6 PIPE TO ELBOW	MT UTOL UT45 UT45T	300-1/35 DEV. 2 600-41/16 DEV. 1	214630				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION. ***BASIC CALIBRATION BLOCK*** 12-CS-80-.688-14-HPC
C5.51	C-F-2	7 ELBOW TO PIPE	MT UTOL UT45 UT45T	300-1/35 DEV. 2 600-41/16 DEV. 1	214640				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION. ***BASIC CALIBRATION BLOCK*** 12-CS-80-.688-14-HPC
C5.51	C-F-2	8 PIPE TO CAP	MT UTOL UT45 UT45T	300-1/35 DEV. 2 600-41/16 DEV. 1	214650				SCHEDULED EXAMINATION POSTPONED TO 1989 OUTAGE. EXAMINATION AREA ADDED TO ISI PROGRAM. BASELINE EXAMINATION. ***BASIC CALIBRATION BLOCK*** 12-CS-80-.688-14-HPC

INFORMATIONAL EXAMINATION PERFORMED AT THE REQUEST OF PSE&G

ASME SECT XI ITEM NO	ASME SECT XI CATGY	WELD NUMBER AND/OR EXAMINATION AREA IDENTIFICATION	EXAM. METHOD	SWRI PROCEDURE NO./REV.	SUMMARY SHEET NUMBER	NONE C	INSIGNIFICANT E	GEOMETRIC I	OTHER O	OTHER R	REMARKS
----	----	VALVE (HV-F074 SPARE)	MT	300-1/35 DEV. 2	990100	X	-	-	-	-	ONE LINEAR INDICATION ON THE INSIDE SURFACE OF THE VALVE.
			MT	300-2/42 DEV. 1,2		X	-	-	-	X	SEE CNF 3. PT EXAMINATION PERFORMED IN AREA OF MT INDI-
			PT	200-1/70 DEV. 3		-	-	-	-	X	CATION FOR INFORMATION ONLY. REEXAMINATION AFTER LIGHT GRINDING REVEALED NO RECORD- ABLE INDICATIONS.
----	----	VALVE (AB-PSV-F013A)	UT		990200						0 DEGREE THICKNESSES TAKEN IN AREA OF GRINDING FOR INFOR- MATION ONLY.

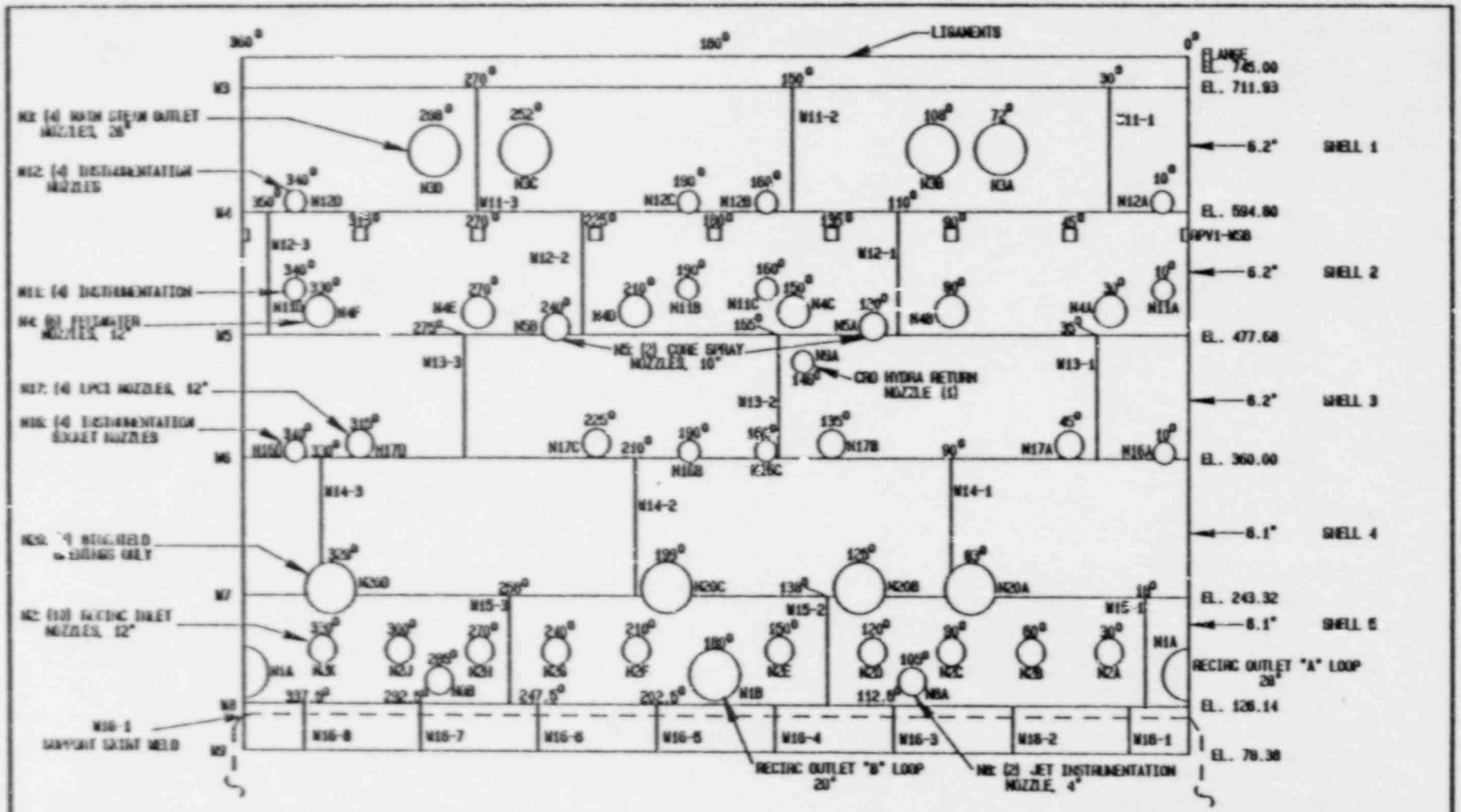
APPENDIX A

WELD IDENTIFICATION DRAWINGS - CLASS 1

APPENDIX A

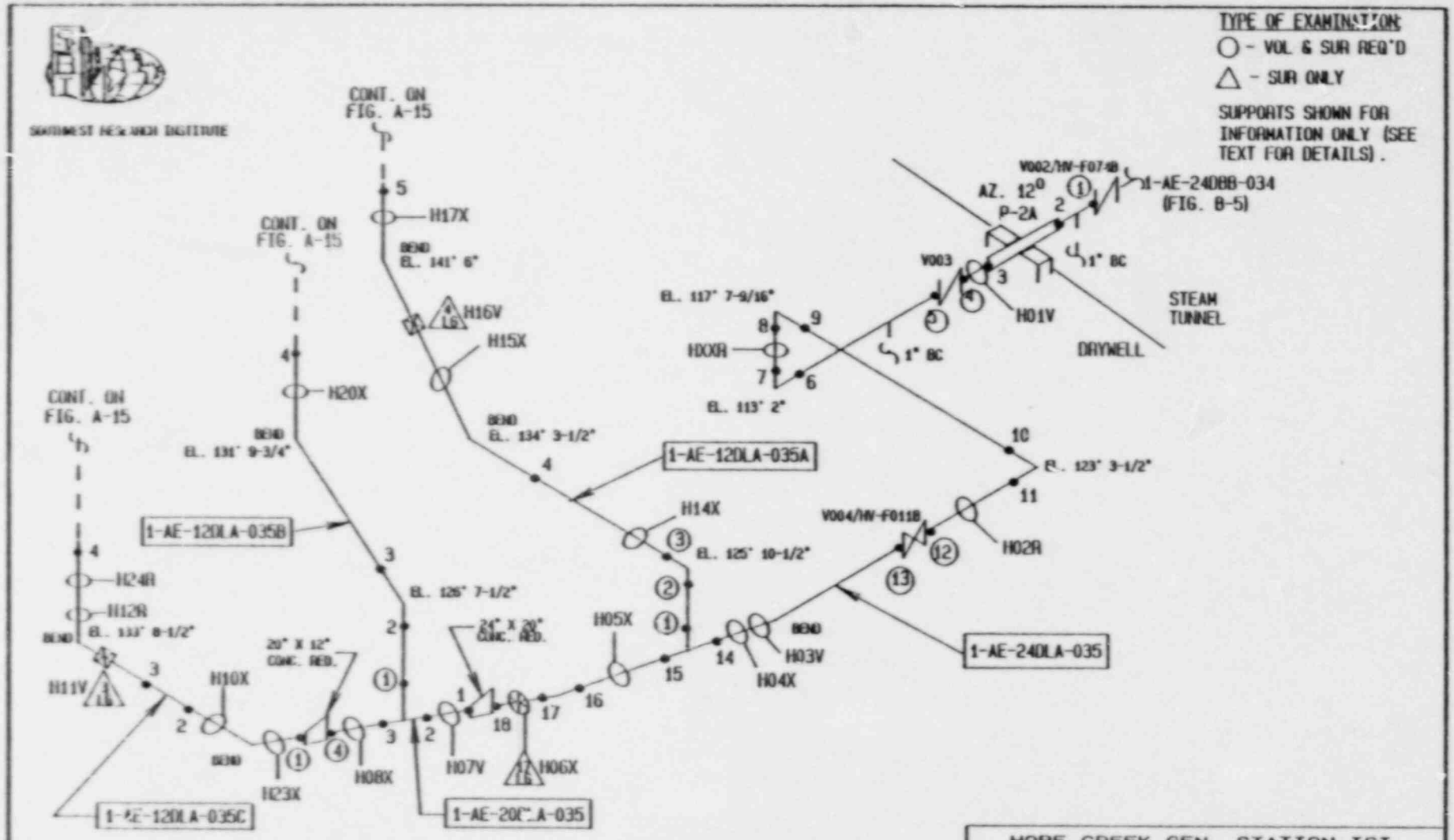
WELD IDENTIFICATION DRAWINGS - CLASS 1

Table of Contents



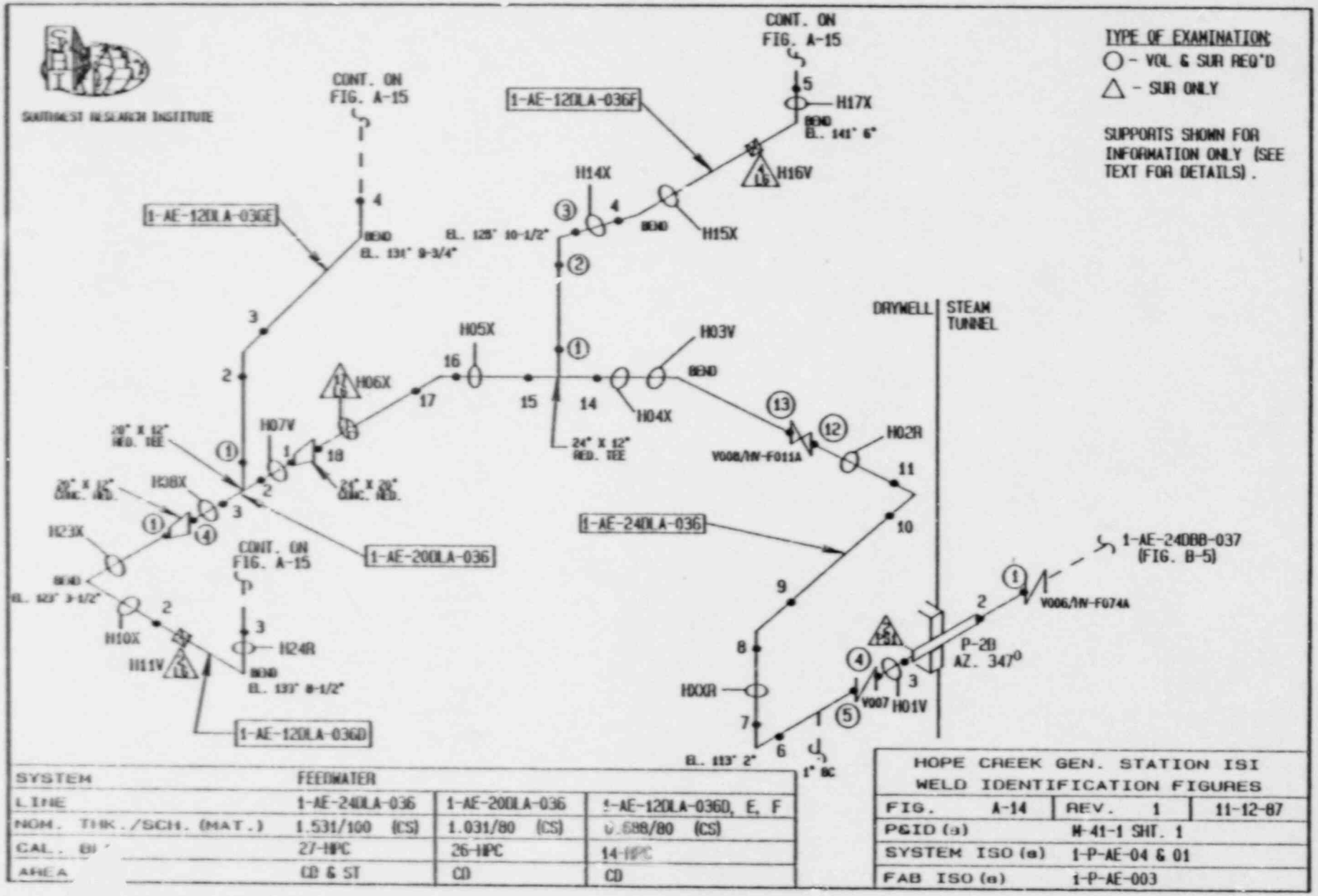
SYSTEM	REACTOR VESSEL
COMPONENT	REACTOR PRESSURE VESSEL
NOM. THK./SCH. (MAT.)	SEE FIGURE (CSCL)
CAL. BLK.	SEE LTP
AREA	CU

HOPE CREEK GEN. STATION ISI WELD IDENTIFICATION FIGURES		
FIG. A-1	REV. 0	3-30-87
P&ID (s)	M-42-1 SHT. 1	
SYSTEM ISO (s)	N/A	
FAB ISO (s)	N/A	



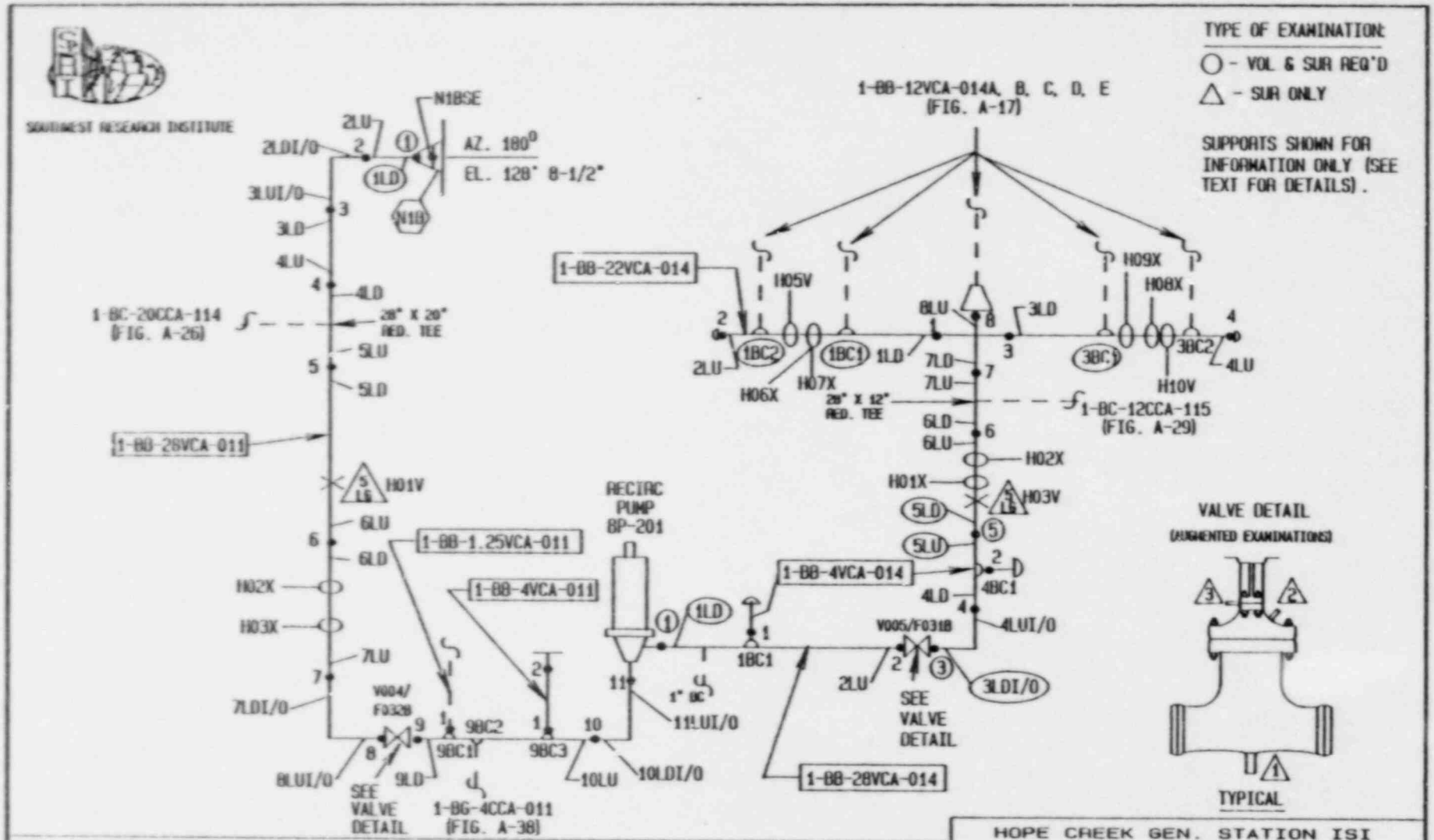
SYSTEM	FEEDWATER		
LINE	1-AE-24DLA-035	1-AE-20DLA-035	1-AE-12DLA-035A, B, C
NOM. THK./SCH. (MAT.)	1.531/100 (CS)	1.031/80 (CS)	0.688/80 (CS)
CAL. BLK.	27-HPC	26-HPC	14-HPC
AREA	CD & ST	CD	CD

HOPE CREEK GEN. STATION ISI WELD IDENTIFICATION FIGURES		
FIG. A-13	REV. 1	11-12-87
P&ID (s)	M-41-1 SHT. 1	
SYSTEM ISO (s)	1-P-AE-04 & 01	
FAB ISO (s)	1-P-AE-004	

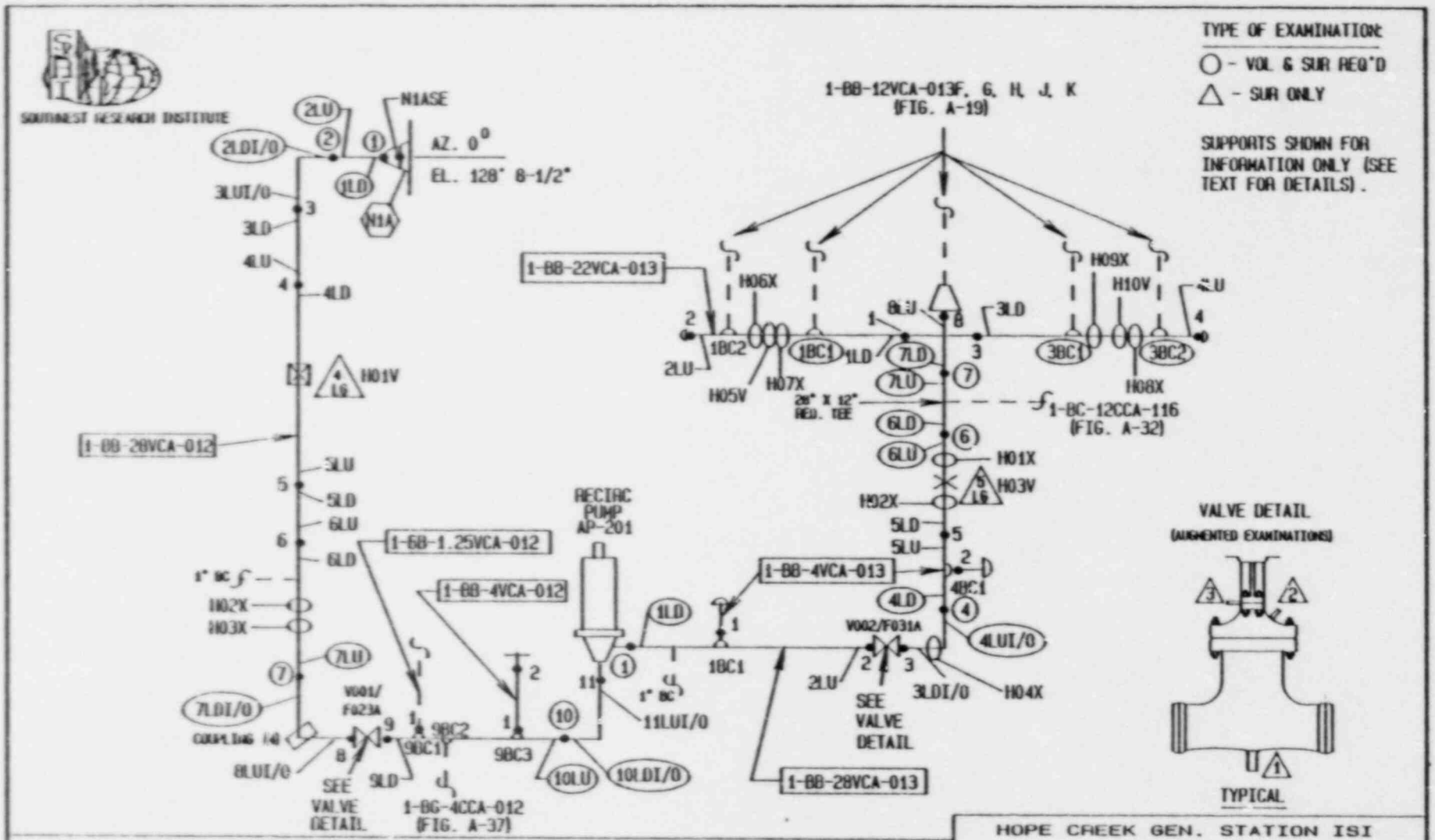


SYSTEM	FEEDWATER		
LINE	1-AE-240LA-036	1-AE-200LA-036	1-AE-120LA-036D, E, F
NOM. THK./SCH. (MAT.)	1.531/100 (CS)	1.031/80 (CS)	0.688/80 (CS)
CAL. BY	27-HPC	26-HPC	14-HPC
AREA	CD & ST	CD	CD

HOPE CREEK GEN. STATION ISI WELD IDENTIFICATION FIGURES		
FIG. A-14	REV. 1	11-12-87
P&ID (a)	M-41-1 SHT. 1	
SYSTEM ISO (a)	1-P-AE-04 & 01	
FAB ISO (a)	1-P-AE-003	



SYSTEM	RECIRCULATION "B" LOOP					HOPE CREEK GEN. STATION ISI WELD IDENTIFICATION FIGURES		
LINE	1-BB-28VCA-011, -014	-22VCA-014	-4VCA-011	-4VCA-014	-1.25VCA-011	FIG. A-16	REV. 1	11-30-87
NOM. THK./SCH. (MAT.)	1.076/SPC (SS)	1.009/SPC (SS)	N/A	.337/80 (SS)	N/A	P&ID (s)	M-43-1 SHT. 1	
CAL. BLK.	30, 60 & 68-HPC	33 & 67-HPC	71-HPC	39-HPC	N/A	SYSTEM ISO (s)	N/A	
AREA	CD	CD	CD	CD	CD	FAB ISO (s)	795E472 (GE)	



SYSTEM	RECIRCULATION "A" LOOP					HOPE CREEK GEN. STATION ISI WELD IDENTIFICATION FIGURES		
LINE	1-BB-28VCA-012, -013	-22VCA-013	-4VCA-012	-4VCA-013	-1.25VCA-012	FIG. A-18	REV. 1	11-30-87
NOM. THK./SCH. (MAT.)	1.076/SPC (SS)	1.009/SPC (SS)	N/A	.337/80 (SS)	N/A	P&ID (s)	M-43-1 SHT. 1	
CAL. BLK.	30, 60 & 68-HPC	33 & 67-HPC	71-HPC	39-HPC	N/A	SYSTEM ISO (s)	N/A	
AREA	CD	CD	CD	CD	CD	FAB ISO (s)	795E472 (GE)	

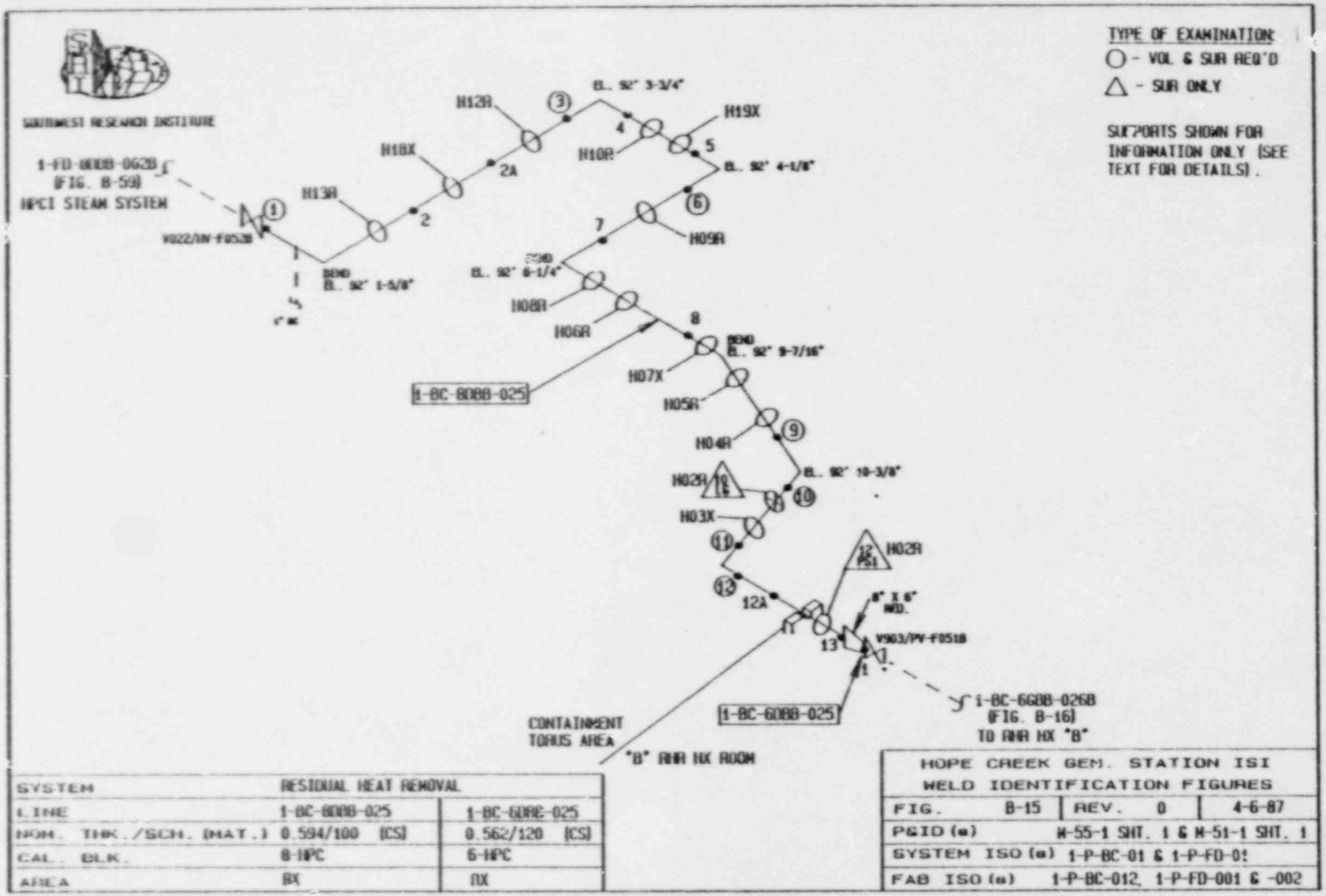
APPENDIX B

WELD IDENTIFICATION DRAWINGS - CLASS 2

APPENDIX B

WELD IDENTIFICATION DRAWINGS - CLASS 2

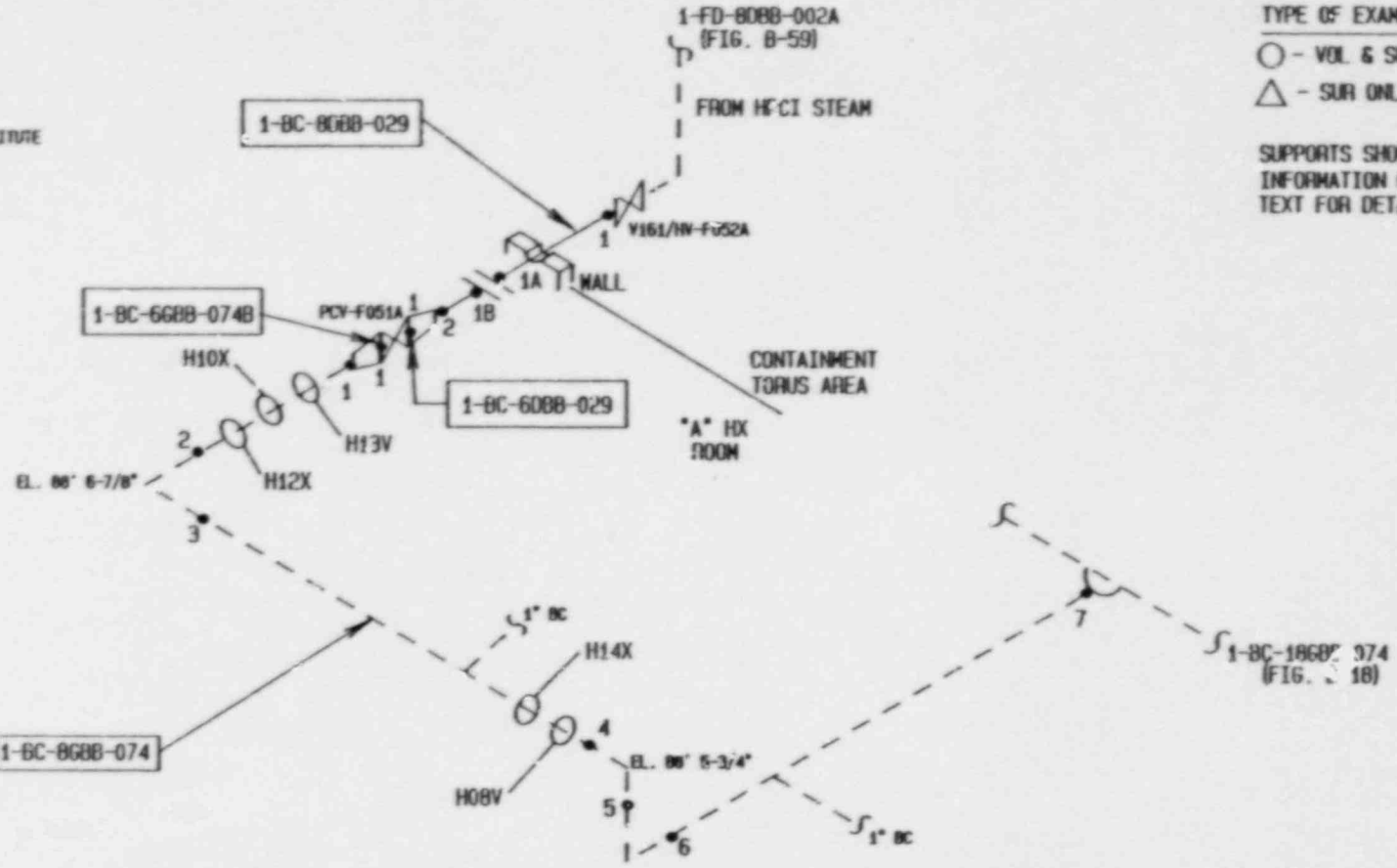
Table of Contents



SYSTEM	RESIDUAL HEAT REMOVAL	
LINE	1-BC-8008-025	1-BC-6008-025
NOM. THK./SCH. (MAT.)	0.594/100 (CS)	0.562/120 (CS)
CAL. BLK.	8-HPC	6-HPC
AREA	BX	BX

HOPE CREEK GEN. STATION ISI WELD IDENTIFICATION FIGURES		
FIG. B-15	REV. 0	4-6-87
P&ID (s)	M-55-1 SHT. 1 & M-51-1 SHT. 1	
SYSTEM ISO (s)	1-P-BC-01 & 1-P-FD-01	
FAB ISO (s)	1-P-BC-012, 1-P-FD-001 & -002	

SOUTHWEST RESEARCH INSTITUTE



TYPE OF EXAMINATION:

○ - VOL & SUR REQ'D

△ - SUR ONLY

SUPPORTS SHOWN FOR INFORMATION ONLY (SEE TEXT FOR DETAILS).

SYSTEM	RESIDUAL HEAT REMOVAL				HOPE CREEK GEN. STATION ISI WELD IDENTIFICATION FIGURES		
LINE	1-BC-8088-029	1-BC-8688-074	1-BC-6088-029	1-BC-6688-074B	FIG. B-19	REV. 1	12-21-87
NOM. THK./SCH. (MAT.)	0.594/100 (CS)	0.322/STD (CS)	0.562/120 (CS)	0.322/STD (CS)	P&ID (s)	M-51-1 SHT. 2	
CAL. BLK.	8-HPC	N/A	6-HPC	N/A	SYSTEM ISO (s)	1-P-BC-03	
AREA	RX	RX	RX	RX	FAB ISO (s)	1-P-BC-015	

APPENDIX C

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECTS OPERATING PROCEDURES

APPENDIX C

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECTS OPERATING PROCEDURES

Table of Contents

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECTS
OPERATING PROCEDURE

Title

DEVIATIONS TO NUCLEAR PROJECTS OPERATING PROCEDURES

EFFECTIVITY AND APPROVAL

Revision 4 of this procedure became effective on July 29, 1986 This procedure consists of the pages and changes listed below.

Page No	Change	Date Effective
1-6	N/A	July 29, 1986

Supersedes Procedure No. IX-FE-101-3

SA FLJ

Approvals

Written By	Date	Technical Review	Date
DW Fawnell	21 July 1986	E Rueschen	23 JUN 1986
Manager of Q.A.	**Date**	**Cognizant Director**	**Date**
[signature]	28 July 1986	Wayne I Flach	7/29/86

SwRI Form QA-408-1

DEVIATIONS TO NUCLEAR PROJECTS OPERATING PROCEDURES

1. PURPOSE

1.1 The purpose of this operating procedure is to establish guidelines and controls for deviations to Nuclear Projects Operating Procedures which may be required due to changing technology, applicable code changes or interpretations, plant or component design, customer requirements, or special cases.

2. SCOPE AND APPLICATION

2.. This procedure applies to Nuclear Projects Operating Procedures.

2.2 Application of deviations shall be as described within the Procedure Deviation (applicable revision of SwRI Form FE-4, sample attached).

3. RESPONSIBILITY

3.1 The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division shall be responsible for the implementation of this procedure, and for the qualification and approval of Operating Procedure Deviations.

3.2 The Project Manager, Project Engineer, Team Supervisor, or other cognizant persons using the procedure shall be responsible for initiating the request for a deviation to the operating procedure.

3.3 The Manager of Quality Assurance shall be responsible for reviewing and approving proposed deviations to operating procedures against the requirements of this procedure.

4. PROCEDURE

4.1 The Assistant Director of the Department of Engineering Services, Nondestructive Evaluation and Technology Division, shall assign responsibility for preparing the procedure deviation.

4.1.1 The Procedure Deviation shall have, but not be limited to the following information:

(1) Procedure Number and Revision

(2) Affected Examination Areas

(3) Paragraphs to be deviated from

(4) Rationale for Deviation

4.1.2 Deviation numbers shall be assigned by the Support and Administration Section and shall be in numerical sequence beginning with "1" for each procedure revision.

4.2 Each Procedure Deviation shall be accompanied by an applicable revision of SwRI Form FE-37 "Certificate of Procedure/Deviation Qualification" (sample attached).

4.3 Procedure deviations shall be reviewed as follows:

(a) NDE procedure deviations shall be reviewed by a Level III to determine relevance, technical accuracy, and effect on procedure qualification. Normally this review shall be by a designated representative of the same group that provided technical review of that procedure. If the deviation is determined to affect the procedure qualification, the deviation shall be qualified in accordance with Procedure IX-FE-107. After his review, the Level III shall sign the Technical Review blocks of both the Procedure Deviation and the accompanying SwRI Form FE-37 and forward them to the Manager of Quality Assurance.

(b) Non-NDE procedure deviations shall be given a technical review by a person having an adequate understanding of the requirements and intent of the deviation, who does not administratively report to the author, and is a representative of the same group that performed technical review of the affected procedure.

4.4 The Manager of Quality Assurance shall verify that the deviation is in compliance with this procedure, sign both the Procedure Deviation and the accompanying SwRI Form FE-37 as reviewed and approved, and forward them to the Department Director.

4.5 If approved, the Department Director shall sign the procedure deviation and forward both the procedure deviation and accompanying SwRI Form FE-37 to the Support and Administration Section representative, who will be responsible for number verification, initialing, reproduction, copy distribution, and filing of the original document.

4.6 The Procedure Deviation may be used upon receipt of the final approved deviation and site approval of the deviation. Alternatively, if necessary, the deviation may be used after obtaining verbal approval by the person performing the Technical Review as well as site approval. As a minimum, a handwritten copy of the deviation identifying the Level III giving verbal approval shall be on site to be used until the approved copy is received. In this case, the date of verbal approval shall be indicated on the procedure deviation. Should the deviation be ultimately not approved, all areas examined using the proposed deviation will then be reexamined utilizing approved procedures.

4.7 The deviation number shall be recorded, where applicable, in conjunction with the appropriate Nuclear Projects Operating Procedure number on those records requiring the recording of the procedure number.

4.9 A copy of the Procedure Deviation shall be attached to the applicable procedure when conducting examinations in accordance with the deviation.

5.0 RECORDS

Operating procedure deviations and any other documents generated in accordance with this procedure controlling the performance of onsite critical services shall be retained for the period specified in the contract with the Client. These records shall be indexed, filed, and maintained in the Data Storage Facility of the Support and Administration Section, Nondestructive Evaluation and Technology Division.

PROCEDURE DEVIATION

Page 1 of

Procedure SwRI-NDT-	Revision	Deviation

The following examination areas are affected by this deviation:

The following paragraphs shall be deviated from as indicated:

Response for deviation:

APPROVALS			
Written by:	Date:	Technical Review:	Date:
		Vendor Approval Given? ☐ Yes ☐ No	Date:
Manager of Q.A.:	Date:	Cognizant Director:	Date:

SwRI FORM FE-4-6

CERTIFICATE OF PROCEDURE/DEVIATION QUALIFICATION

PROCEDURE NO.	PROCEDURE REVISION	DATE OF PROCEDURE

TITLE

APPLICABLE ASME CODE	SECTION	APPENDIX	ADDENDA

OTHER REQUIREMENTS

PART I ☐ NOT APPLICABLE

Deviation No.	Date Effective	Deviation Affects Qualification YES ☐ NO ☐

If deviation affects qualification, explain:

PART II

I certify that:

(CHECK WHERE APPLICABLE)

☒ This procedure ☐ deviation ☐ satisfies the code requirements stated above.

☐ The examinations performed in accordance with this procedure ☐ deviation ☐ satisfy the requirements within its purpose/scope.

☐ Physical demonstrations performed were representative of field conditions and adequately reflect the effectiveness of this procedure ☐ deviation ☐

☐ This procedure ☐ deviation ☐ has been qualified by:

(CHECK)
- ☐ Similarity (Attached)
- ☐ Code Reference (Attached)
- ☐ Confirmed Flaws (Attached)
- ☐ Calibration (Attached)
- ☐ Physical Demonstration (Attached)

SIGNATURE OF LEVEL III _____ DATE _____

PART III

This procedure/deviation conforms to SwRI Quality Assurance Program Manual requirements.

SIGNATURE OF QUALITY ASSURANCE MANAGER _____ DATE _____

SwRI Form PE 27-4

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECTS
OPERATING PROCEDURE

Title

WELD JOINT IDENTIFICATION MARKING ON NUCLEAR POWER PLANT PIPING

EFFECTIVITY AND APPROVAL

Revision 2 of this procedure became effective on Nov. 16,1981. This procedure consists of the pages and changes listed below.

Page No	Change	Date Effective
1 through 6	-	November 16, 1981

SA

Approvals

Written By: Herbert C. Knudsen	Date: 10/30/81	Technical Review: Stan Walker	Date: Nov. 5, 1981
Manager of Q.A.: Lonnie Malcuit	Date: 11/3/81	Cognizant Director: Wayne J. Stachle	Date: 11/4/81

SwRI Form QA-40B-0

WELD JOINT IDENTIFICATION MARKING ON NUCLEAR POWER PLANT PIPING

1.0 PURPOSE

This procedure describes the weld joint identification marking of nuclear power plant piping, attachments and components.

2.0 SCOPE AND APPLICATION

(1) The method of locating weld joints and marking the respective identification numbers and zero reference points (Lo) adjacent to the welds is described herein.

(2) Nuclear power plant piping shall be marked with an electric or pneumatic engraver, low stress punch, or marking pencil as specified by the customer.

2.1 Applicable Documents

SwRI Nuclear Quality Assurance Program Manual (NQAPM).

3.0 RESPONSIBILITY

(1) The Director of the Department of Engineering Services within the Quality Assurance Systems and Engineering Division shall be responsible for preparation, review, and approval of this procedure.

(2) The Project Manager shall be responsible for the implementation of this procedure in accordance with the NQAPM in effect on the date this procedure is approved.

(3) Marking equipment and methods described in this procedure shall be approved by the customer before use.

(4) The examiner shall be responsible for implementing the requirements of this procedure.

4.0 PROCEDURE

4.1 General

In addition to the requirements of this procedure, the policies, practices, and rules of the nuclear plant shall be followed in the execution of the marking operation.

4.2 Personnel

(1) Personnel marking piping and components shall have sufficient instruction and experience in use of the equipment and application of the techniques as specified by the Project Manager.

(2) Personnel shall have received appropriate training and indoctrination for proper control of radioactive materials if the marking is to be conducted after the plant has been in operation.

4.3 Equipment

(1) The equipment to be used shall be a commercial electric or pneumatic engraver, low stress punch, or marking pencil.

(2) The engraver's tip shall be manufactured of commercial-grade diamond or tungsten carbide material.

4.4 Weld Joint Identification

(1) The area to be marked shall be free of weld spatter, rust, rough surfaces, or any other condition which would prevent clear marking.

(2) Each weld joint shall be marked on the main run pipe with the appropriate identification number.

(3) The L_0 reference mark (-0-) for each weld shall be located in accordance with Paragraph 4.6 of this procedure.

(4) The depth of weld joint identification marking and zero reference (L_0) marking shall not exceed the limits established by the customer.

(5) If weld joint inaccessibility prevents use of the equipment or methods described in this procedure, other zero reference or weld joint identification number locations may be used as considered necessary and acceptable by the Team Supervisor or Inspection Engineer. Under these circumstances, the provisions of Paragraph 4.6 will not apply and a description of the zero reference used shall be entered on the examination record for that weld joint.

4.5 Weld Joint Identification Number Placement (W.J.I. No.) (Figure 1)

To the extent practicable, weld joint identification numbers shall be located adjacent to the zero reference point (L_o), but outside the examination area.

4.6 Determination of Zero Reference Location on Welds

The following rules shall be observed in determining the zero reference location (L_o) on circumferential, longitudinal and branch connection piping welds and welded piping lugs and piping supports. If more than one rule is applicable, the lowest numbered rule shall be applied. The term "horizontal component" relates to any pipe positioned at other than 90° from the horizontal.

(1) Rule 1. For any pipe having a horizontal component at the weld, use the top centerline of the pipe.

(2) Rule 2. If a pipe is vertical at the weld (no horizontal component) and the weld is either an elbow-to-Z or a Z-to-elbow, where Z is any piping component other than an elbow, use the centerline of the outside radius of the elbow.

(3) Rule 3. If a pipe is vertical at the weld (no horizontal component) and the weld is a pipe-to-pipe, elbow-to-elbow, Z-to-pipe, or pipe-to-Z, where Z is any piping component other than an elbow, use an extension of the centerline of the outside radius of the elbow above the weld.

(4) Rule 4. If in Rule 3 there is no elbow above the weld, use an extension of the centerline of the outside radius of the elbow below the weld.

(5) Rule 5. If Rule 3 or Rule 4 cannot be used because no elbows are visible, choose the most convenient location. When referring to Rule 5, describe the method for establishing L_o on the examination record.

(6) Rule 6. For branch connection piping welds (sweepolet, weldolet, etc.) and for welded lugs and pipe supports, use the upstream intersection of the weld and the centerline of the branch connection, lug, or support, as applicable.

(7) Rule 7. For a longitudinal weld intersecting a circumferential weld, use the junction (near or inside edge of the circumferential weld) of the longitudinal with the circumferential.

5.0 ACCEPTANCE STANDARDS

The weld will be considered suitably marked after the personnel performing the marking has verified that:

(1) The zero reference mark (-0-) is located in accordance with Paragraph 4.6 and 4.4(5).

(2) The weld identification number is the same as shown on the proper isometric drawing contained in the Examination Plan.

(3) The zero reference mark (-0-) and the weld joint identification number are legible and are within the depth limits established by the customer.

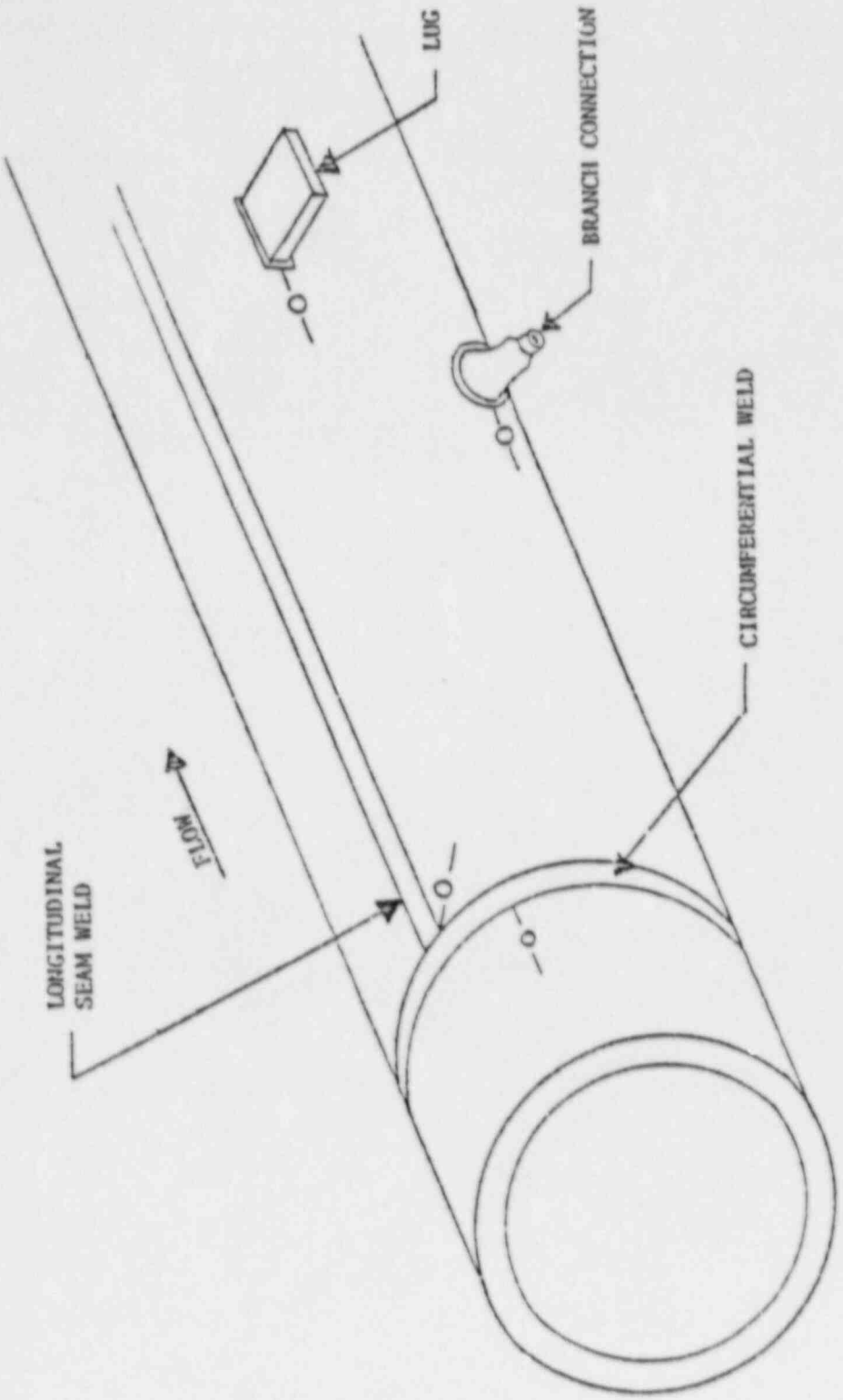

LUG
BRANCH CONNECTION
CIRCUMFERENTIAL WELD
FLOW
LONGITUDINAL
SEAM WELD

FIGURE 1

SOUTHWEST RESEARCH INSTITUTE NUCLEAR PROJECTS OPERATING PROCEDURE	IX-FE-110-3 August 1986 Page 1 of 5

Title

"BLACK LIGHT" INTENSITY MEASUREMENTS

EFFECTIVITY AND APPROVAL

Revision 3 of this procedure became effective on Aug 26, 1986. This procedure consists of the pages and changes listed below.

Page No	Change	Date Effective
1 - 5		August 1986

Supersedes Procedure No. IX-FE-110-2

SA

Approvals

Written By	Date	Technical Review	Date
DW Tennill	14 Aug 1986	Hector Diaz	18 Aug 1986
Manager of Q.A.	**Date**	**Cognizant Director**	**Date**
R Engelhardt for BEM	8/25/86	Allen L. Whiting for WTF	8/26/86

SwRI Form QA-408-1

"BLACK LIGHT" INTENSITY MEASUREMENTS

1. PURPOSE

This procedure provides the information and detailed steps necessary to ensure proper measurement of the "black light" (long wave ultraviolet light) intensity for fluorescent magnetic particle or penetrant examinations utilizing a black light.

2. SCOPE AND APPLICATION

This procedure shall be used for the measurement of the black light intensity utilizing a Blak-Ray J-221 Long Wave Ultraviolet Intensity Meter.

2.1 Applicable Documents

(1) SwRI Nuclear Quality Assurance Program Manual (NQAPM)

(2) The applicable SwRI Nuclear Projects Operating Procedure for examinations requiring a black light

3. RESPONSIBILITY

(1) The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division, shall be responsible for the preparation, review, approval, and control of this procedure.

(2) The Project Manager shall be responsible for the implementation of this procedure in accordance with the NQAPM specified in the applicable SwRI Project Plan.

(3) The examiner shall be responsible for implementing the requirements of this procedure.

(4) The Manager of the Support and Administration Section, Nondestructive Evaluation Science and Technology Division, shall be responsible for storage of records generated in accordance with this procedure.

4. PROCEDURE

4.1. Personnel

(1) Personnel measuring black light intensity shall be certified in accordance with SwRI NQAP 11-1, "Special Process Control."

(2) Examinations shall be conducted as required by the applicable SwRI Nuclear Projects Operating Procedure.

4.2 Equipment

The following equipment shall be utilized for measurements:

(1) Blak-Ray J-221 Long Wave Ultraviolet Intensity Meter with sensor cell

(2) J-223 Extension Cord (4 foot)

(3) 50107 Contrast Filter

4.3 Measurement

The black light intensity at the surface under examination shall be determined:

(1) At least every 8 hours

(2) Whenever lighting conditions change

(3) Whenever the work location is changed

NOTES

The meter face shall be upright for all readings and meter zero verification. The meter zero shall be checked with the sensor cell unplugged. If the reading is not 0, the calibration screw below the scale shall be used to adjust the scale to zero.

The examiner shall ensure that the sensor cell, filter faces and black light lens are clean before measurements are taken, since any film of dust, oil or other sediment may affect the reading.

The Blak-Ray J-221 Long Wave Ultraviolet Intensity Meter shall be utilized as follows:

(3) Plug the extension cord into the top of the meter housing with the red and black plugs aligned with their corresponding holes for proper polarity.

(4) Repeat step (3) plugging the extension cord into the sensor cell.

(5) Select the "B" scale by moving the switch on top of the meter housing to "B."

(6) Darken the area to the condition that will prevail during the actual examination and place the sensor cell directly on the surface to be examined.

(7) After a black light warm-up time of no less than five minutes, move the black light from a minimum distance of 16 inches to a maximum distance of 22 inches from the sensor cell, while observing the "B" scale, until a reading can be taken.

NOTE

The "B" scale range is incremented from 10 to 60. To obtain a reading in microwatts per square centimeter, multiply the reading by 100. For example, if the reading is 20, multiply 20 by 100 to obtain 2,000 microwatts per square centimeter.

(8) A second reading shall be taken using the 50107 contrast filter over the sensor cell with the black light located the same distance as the first reading.

(9) Subtract the second reading from the first. The difference shall be a minimum of 800 microwatts per square centimeter.

(10) If the second reading on the "B" scale remains at 10 or below, the switch on top of the meter housing shall be moved to "A"; a reading shall be obtained from the "A" scale with the filter over the sensor cell. The black light remains at the same distance as during the first reading.

NOTE

The "A" scale range is incremented from 0 to 12. To obtain a reading in microwatts per square centimeter, multiply the reading by 100. For example, if the reading is 8, multiply 8 by 100 to obtain 800 microwatts per square centimeter.

(11) Repeat step (9).

The distance, during an examination, from the face of the black light to the examination surface shall not exceed the distance at which the black light intensity was measured.

5. RECORDS

The difference of the two readings and the distance from the face of the black light to the sensor cell during the reading shall be recorded on the applicable SwRI Examination Record.

SOUTHWEST RESEARCH INSTITUTE NUCLEAR PROJECTS OPERATING PROCEDURE	IX-FE-116-2 July 1986 Page 1 of 8

Title

RECORDING DATA FROM DIRECT VISUAL, LIQUID PENETRANT, AND MAGNETIC PARTICLE EXAMINATIONS

EFFECTIVITY AND APPROVAL

Revision 2 of this procedure became effective on 29 July 1986. This procedure consists of the pages and changes listed below.

Page No	Change	Date Effective
1 - 8		29 July 1986

Supersedes Procedure No. IX-FE-116-1

SA FLD

Approvals

Written By	Date	Technical Review	Date
D W Fourmell	18 July 1986	E H Rescher	23 July 1986
Manager of Q.A.	**Date**	**Cognizant Director**	**Date**
[signature]	28 July 1986	[signature]	7-29-86

SwRI Form QA-408-1

RECORDING DATA FROM DIRECT VISUAL, LIQUID PENETRANT, AND MAGNETIC PARTICLE EXAMINATIONS

1. PURPOSE

This procedure provides the technical information and detailed steps required for recording data from direct visual, liquid penetrant, and magnetic particle examinations.

2. SCOPE AND APPLICATION

Data from direct visual, liquid penetrant, and magnetic particle examinations of components, welds, heat-affected zones, and adjacent base material shall be recorded in accordance with this procedure.

2.1 Applicable Documents

(1) Southwest Research Institute (SwRI) Nuclear Quality Assurance Program Manual (NQAPM)

(2) The applicable SwRI Nuclear Projects Operating Procedure for the examination being conducted

3. RESPONSIBILITY

(1) The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division, shall be responsible for the preparation, review, approval, and control of this procedure.

(2) The Project Manager shall be responsible for the implementation of this procedure in accordance with the NQAPM specified in the applicable SwRI Project Plan.

(3) The examiner shall be responsible for implementing the requirements of this procedure.

(4) The Manager of Support and Administration, Nondestructive Evaluation Science and Technology Division, shall be responsible for the storage of records generated in accordance with this procedure.

4. PROCEDURE REQUIREMENTS

(1) Personnel utilizing this procedure shall be certified in accordance with Nuclear Quality Assurance Procedure NQAP 11-1 or NQAP 11-2, whichever is applicable.

(2) Examinations shall be conducted as required by the applicable SwRI Nuclear Projects Operating Procedures.

5. PROCEDURE

5.1 Definitions

L measurements - Measurements recorded at the centerline of the weld and parallel to the weld for nontransverse indications.

Lo location - The origin for L measurements.

W measurements - Measurements recorded on either side of the weld, perpendicular to the weld for nontransverse indications.

Wo location - The origin for W measurements.

5.2 Weld Length

Weld length, when required, shall be measured with a steel measuring tape and the distance recorded in inches and common fractions to the nearest 1/16 inch.

5.2.1 Circumferential and Nozzle-to-Shell Welds

Weld length shall be measured along the weld centerline.

5.2.2 Longitudinal Welds

Weld length shall be measured along the weld centerline.

The weld length shall be 12 inches when only 12 inches of the longitudinal weld is required to be examined. Enter the notation "12 inches" in the appropriate space provided on the examination record. For longitudinal welds less than 12 inches, enter the weld length examined.

5.2.3 Branch Connection Welds, Lugs, Supports and Other Similarly Welded Attachments with Fillet Type Weld Surfaces

Weld length shall be measured on the component surface at the junction of the weld fusion line and the component surface, i.e., vessel or pipe surface.

5.3 L Measurements

L measurements shall be recorded in inches and common fractions, to the nearest 1/16 inch.

L measurements for components with a flow direction, other than branch connection and nozzle-to-shell, shall be made clockwise looking in the direction of the flow. Branch connections and nozzle-to-shell measurements shall be made clockwise, as viewed at angle perpendicular to the component to which the branch connection or nozzle is welded to. Measurements for components without a flow direction shall be made clockwise as viewed from above the vertical component or clockwise as viewed from an identified end of a horizontal component. The end of the horizontal component referenced to determine clockwise shall be recorded in the REMARKS section of the applicable SwRI Examination Record.

L measurements for longitudinal welds shall be made along the weld centerline from Lo.

L measurements shall be made clockwise as viewed from the top side of the stud, bolt, nut or washer; or as viewed from an identified end of the component. L measurements for other non-welded components, e.g., cladding patches, shall be made from an Lo described on the appropriate SwRI Examination Record.

5.3.1 Circumferential, Nozzle-to-Shell and Longitudinal Welds

L measurements shall be made along the weld centerline to the geometric center of the indication using one of the following methods:

(1) Measurements shall be made directly from Lo using a steel measuring tape.

(2) Marks shall be made and labeled every 5 inches as measured from Lo using a steel measuring tape. Measurements shall be made from these marks using a 6-inch steel rule or a steel measuring tape.

(3) The steel measuring tape shall be affixed to the weld centerline with zero at Lo. Measurements shall then be made directly.

5.3.2 Branch Connection Welds

L measurements shall be made along the weld fusion line on the component surface, i. e., pipe or vessel surface, to the geometric center of the indication using one of the following methods:

(1) Measurements shall be made directly from Lo using a steel measuring tape.

(2) Marks shall be made and labeled every 5 inches as measured from Lo using a steel measuring tape. Measurements shall be made from these marks using a 6 inch steel rule or steel measuring tape.

5.3.3 Lugs, Supports, and Other Similar Welded Attachments With Fillet Type Weld Surfaces

L measurements shall be made along the weld fusion line on the component surface, i.e., pipe or vessel surface, to the geometric center of the indication using one of the following methods:

(1) Measurements shall be made directly from Lo using a steel measuring tape.

(2) Marks shall be made and labeled every 5 inches as measured from Lo using a steel measuring tape. Measurements shall be made from these marks using a 6 inch steel rule or steel measuring tape.

5.3.4 Studs, Bolts, Nuts, Washers and Other Non-Welded Components

L measurements shall be made directly from Lo to the geometric center of the indication with a steel measuring tape or 6 inch steel rule.

5.4 W Measurements

W measurements shall be recorded in inches and common fractions to the nearest 1/16 inch.

5.4.1 Circumferential, Nozzle-to-Shell and Longitudinal Welds

W measurements shall be made perpendicular to the weld centerline from Wo to the geometric center of the indication using a 6 inch steel rule or steel measuring tape.

5.4.2 Branch Connection Welds

The component surface used to determine Wo shall be identified in the REMARKS section of the applicable SwRI Examination Record. W measurements shall be made perpendicular to the weld fusion line from Wo to the geometric center of the indication using a 6 inch steel rule or steel measuring tape.

5.4.3 Supports and Other Similarly Welded Attachments With Fillet Type Weld Surfaces

The component surface used to determine Wo shall be identified on the applicable SwRI Examination Record. W measurements shall be made perpendicular to the weld fusion line from Wo to the geometric center of the indication using a 6 inch steel rule or steel measuring tape.

5.4.4 Studs, Bolts, Nuts, Washers, and Other Non-Welded Components

W measurements shall be made from Wo to the geometric center of the indication. W measurements for studs or bolts with heater holes, nuts, and washers shall be made with a steel measuring tape or 6 inch steel rule from the top edge of the bore or heater hole and continue down the component. W measurements for studs or bolts without heater holes shall be made with a steel measuring tape or 6 inch steel rule from the top center of the component. Measurements for other types of non-welded components, e.g., cladding patches, shall be made from Wo determined by the examiner and described on the appropriate SwRI Examination Record.

5.5 Indication Types

Indications shall be recorded on the applicable SwRI Examination Record as rounded, linear, or as a group of rounded indications. Further information about the indication shall be recorded under the REMARKS section of the applicable SwRI Examination Record.

5.5.1 Rounded Indications

A rounded indication shall be an indication which is less than three times as long as it is wide.

5.5.2 Linear Indications

A linear indication shall be an indication which is equal to or greater than three times as long as it is wide.

5.5.3 Group of Rounded Indications

The size of the area and the number of rounded indications required to be recorded, when applicable, shall be as stipulated in the applicable SwRI Nuclear Projects Operating Procedure.

5.6 Indication Size

The size of an indication shall be measured to the nearest 1/32 inch with a 6 inch steel scale or steel measuring tape.

5.6.1 Rounded Indications

Round indications or indications closer to being round than elliptical shall be measured at the maximum diameter. Elliptical indications shall be measured across the maximum length and maximum width.

5.6.2 Linear Indications

Linear indications shall be measured along the length of the indication.

5.7 Abbreviations

Appropriate abbreviations (listed below) which describe the indication location with respect to Wo shall be entered on the applicable SwRI Examination Record with the measurements.

(1) Up/Upstream - Up

(2) Down/Downstream - Dn

(3) Clockwise - CW

(4) Counterclockwise - CCW

(5) Centerline - $\mathcal{L}$

(6) Vessel side - V

(7) Lug or support side - L or S

(8) Pipe Side - P

(9) Other symbols with descriptions entered in the Remarks section may be used as approved by the Team Leader.

6. RECORDS

Required records shall be specified in the applicable SwRI Nuclear Projects Operating Procedure.

Documents generated in accordance with this procedure shall be stored as specified in the SwRI Project Plan. The customer shall receive copies of these documents in the Examination Report, unless specified otherwise in the SwRI Project Plan.

Title

RECORDING INDICATIONS DURING ULTRASONIC EXAMINATION OF PRESSURE-RETAINING COMPONENTS

EFFECTIVITY AND APPROVAL

Revision 4 of this procedure became effective on 9/17/85. This procedure consists of the pages and changes listed below.

Page No	Change	Date Effective
1	Change 1	January 1986
2 through 4	---	September 1985
5 through 6	Change 1	January 1986
7 through 8	---	September 1985
9 through 9a	Change 1	January 1986
10 through 12	---	September 1985

Supersedes Procedure No.
IX-FE-117-3

3A
FLD

Approvals

Written By	Date	Technical Review	Date
W. J. Hamm	17 Jan 86	Hector Ortiz	17 Jan 86
Manager of Q.A.	**Date**	**Cognizant Director**	**Date**
James Weeks	21 January 1986	David Frank Rogers for WTF	1/21/86

SwRI Form QA-4u8-1

RECORDING INDICATIONS DURING ULTRASONIC EXAMINATION OF PRESSURE-RETAINING COMPONENTS

1. PURPOSE

This procedure specifies the methods for measuring and recording search unit location and maximum signal amplitude data during ultrasonic examination of pressure-retaining components. When the 1974 ASME Code with respecive Addenda is used for vessel examinaions, it applies to vessels less than 2-1/2 inches in thickness. When the 1977 through 1983 ASME Code with respective Addenda is used for vessel examinations, it applies to vessels 2 inches or less in wall thickness.

2. SCOPE AND APPLICATION

Recording search unit location and maximum signal amplitude data for straight- and angle-beam ultrasonic examinations of ligaments, bolting, vessel and piping welds, heat-affected zones, and adjacent base material using manual, contact, and pulse-echo techniques shall be in accordance with this procedure.

2.1 Applicable Documents

(1) Southwest Research Institute Nuclear Quality Assurance Program Manual (NQAPM)

(2) The SwRI nuclear projects operating procedures for the ultrasonic examinations being conducted

3. RESPONSIBILITY

(1) The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division, shall be responsible for the preparation, review, approval, and control of this procedure.

(2) The Project Manager shall be responsible for the implementation of this procedure in accordance with the NQAPM specified in the applicable SwRI Project Plan.

(3) The examiner shall be responsible for implementing the requirements of this procedure.

(4) The Manager of the Support and Administration Section, Nondestructive Evaluation Science and Technology Division, shall be responsible for storage of records generated in accordance with this procedure.

4. PROCEDURE REQUIREMENTS

(1) Personnel utilizing this procedure shall be certified in accordance with SwRI NQAP 11-1, Special Process Control.

(2) Examinations shall be conducted as required by the applicable SwRI nuclear projects operating procedures.

5. PROCEDURE

5.1 Weld Lengths, and L and W Measurements

(1) Weld lengths, if required, shall be measured with a steel measuring tape and the distance shall be recorded in inches and common fractions to the nearest 1/16 inch. Weld length measurements shall start at L_0.

(2) Weld lengths for circumferential and longitudinal welds shall be measured along the centerline of the weld.

(3) Weld lengths for branch connections and fillet-type welds shall be measured on the examination surface at the junction of the weld and the examination surface.

(4) L and W measurements shall be recorded in inches and common fractions to the nearest 1/16 inch using a steel ruler or a steel measuring tape.

(5) Shear-wave angle-beam L measurements will be made to the axial center of the search unit and W measurements will be made to the search unit exit point.

(6) Straight-beam distance amplitude correction (DAC) L and W measurements shall be made to the axial center of the search unit at the same locations using the same methods as nontransverse angle-beam measurements.

(6) Straight-beam weld examinations will record the search unit location as "on-weld/up" or "on-weld/down" when the search unit is not on the weld centerline.

5.2 Metal Path Measurements

Metal path measurements shall be recorded in inches and decimal fractions to the nearest 0.1 inch.

5.3 Amplitude Movements

(1) Signal amplitude shall be recorded as a percent of DAC at the primary reference level. The percent of DAC shall be determined from Table 2.

(2) Maximum signal amplitude shall be attained by search unit manipulation.

(3) Amplitudes of signals shall be measured in decibels (dB) above or below DAC by adjusting the gain control until the peak indication amplitude coincides with the DAC line.

5.4 Reference Points

For circumferential, longitudinal, and fillet-type welds, reference points shall be made and labeled every 5 inches from L_o.

5.5 Crown Width and Height for Fillet Welds

The crown height and width for fillet welds shall be measured as shown in Sketch 1

5.6 Tangential Scans

The angle-beam search unit to be used for circumferential, longitudinal, and branch connection welds shall be placed on the base metal with the search unit wedge touching the edge of the weld crown and the sound beam directed tangentially into the weld at a 45° ±10° angle. Measurements for tangential scanning are described in Sketch 2 of this procedure.

5.7 Circumferential Welds L and W Measurements

(1) Nontransverse L and transverse W measurements for circumferential welds shall start at L_o or from reference points. Measurements for components with a flow direction shall be made clockwise, looking in the direction of flow. Measurements for components without a flow direction shall be made clockwise, as viewed from above for a vertical component or clockwise as viewed from an identified end of a horizontal component. The end of a horizontal component referenced to determine clockwise shall be recorded on the applicable examination record.

(2) Nontransverse L and transverse W measurements shall be made along the weld centerline from L_o or reference points. Transverse L and nontransverse W measurements shall be made perpendicular to the weld from the weld centerline.

(3) L and W measurements for straight-beam and angle-beam indications shall be made at each location as required in Table 1 and Table 2.

(4) L measurements for straight-beam lamination indications shall be made within 1/4 inch of each edge of the laminar-type reflector and from successive scans across the reflector in increments no greater than 1 inch. A laminar reflector may require L and W measurements from two areas as required by the applicable nuclear projects operating procedure. W measurements shall be made within 1/4 inch of the edges of the laminar-type reflector at each point requiring L measurements.

5.8 Longitudinal Welds L and W Measurements

(1) Nontransverse L and transverse W measurements shall be made along the weld centerline starting from L_o or reference points.

(2) Transverse L and nontransverse W measurements shall be made from the weld centerline perpendicular to the weld.

(3) L and W measurements for straight-beam and angle-beam indications shall be made at each location as required in Table 1 and Table 2.

(4) L measurements for straight-beam lamination indications shall be made within 1/4 inch of each edge of the laminar-type reflector and from successive scans across the reflector in increments no greater than 1 inch. A laminar reflector may require L and W measurements from two areas as required by the applicable nuclear projects operating procedure. W measurements shall be made within 1/4 inch of the edges of the laminar-type reflector at each point requiring L measurements.

5.9 Branch Connection and Fillet-Type Welds L and W Measurements

(1) Nontransverse L and transverse W measurements for branch connections and fillet-type welds shall start at L_o or from reference points, and shall be made clockwise along the examination surface and weld junction. Clockwise shall be determined by viewing the weld perpendicular to the component to which the branch connection or fillet-type attachment is welded.

(2) Transverse L and nontransverse W measurements shall be made perpendicular to the weld fusion line to the axial center of the search unit.

(3) L and W measurements for straight-beam and angle-beam indications shall be made at each location as required in Table 1 and Table 2.

(4) L measurements for straight-beam lamination indications shall be made within 1/4 inch of each edge of the laminar-type reflector and from successive scans across the reflector in increments no greater than 1 inch. A laminar reflector may require L and W measurements from two areas as required by the applicable nuclear projects operating procedure. W measurements shall be made within 1/4 inch of the edges of the laminar-type reflector at each point requiring L measurements.

5.10 Bolting L and W Measurements

(1) L measurements for straight-beam examination of studs and nuts and for angle-beam examination of studs conducted from the heater hole shall be made clockwise from L_o as viewed from above the component or clockwise as viewed from an identified end of the component. W measurements for straight-beam and angle-beam heater hole examinations shall be made from the edge of the bore or heater hole of an identified end or the center of an identified end to the exit point of the angle-beam search unit, or the axial center of the straight-beam search unit.

(2) L measurements for angle-beam examinations of nuts from the outer surface shall be made from the outer edge of an identified end. W measurements for angle-beam examinations of nuts shall be made clockwise from L_o as viewed from an identified end.

(3) L and W measurements for straight-beam and angle-beam indications shall be made at each location as required in Table 1.

5.11 Ligaments L and W Measurements

(1) L measurements shall be made clockwise along the vessel and seal surface junction as viewed from above the vessel to the axial center of the search unit. W measurements shall be made from the edge of the seal surface and the inside surface of the vessel to the axial center of the search unit.

(2) L and W measurements for straight-beam and angle-beam indications shall be made at each location as required in Table 1.

5.12 Examination Limitations

Scanning limitations shall be recorded as required by Paragraphs 5.12.1 and 5.12.2. L measurements shall be made to the axial center of the search unit. W measurements shall be made to the axial center of the straight-beam search unit or to the exit point of the angle-beam search unit.

5.12.1 Straight Beam

Limitations encountered during performance of the straight-beam lamination examination shall be recorded in accordance with the following:

(1) When the lamination examination can be performed from both sides of the weld, the limitations should be recorded on the lamination examination record as "none."

(2) When a weld cannot be examined from one side due to configuration, the limitations should be recorded as "no examination on the (up, down, CW, CCW, etc.) side due to configuration."

(3) When a partial examination is performed from one side or the other of a weld, the limitations for the lamination examination record should refer to the angle-beam examination record. The reference to the angle-beam examination may be recorded as "same as angle beam" or "see angle-beam limitations."

Limitations shall be recorded for straight-beam DAC calibrations. The maximum limitation in the W direction shall be recorded. The minimum point and the maximum point of the limitation shall be recorded in the L direction.

5.12.2 Angle Beam

Limitations shall be recorded for angle-beam examinations. For examinations which utilize two angles, the limitations of the search unit with the larger limitations shall be recorded. The maximum limitation in the W direction shall be recorded. The minimum point and the maximum point of the limitation in the L direction shall be recorded.

5.13 Abbreviations

Appropriate abbreviations (listed below) which describe the search unit location with respect to the weld centerline or edge shall be entered on the applicable SwRI Examination Record with the measurements.

(1) Up/Upstream - Up

(2) Down/Downstream - Dn

(3) Clockwise - CW

(4) Counterclockwise - CCW

(5) Centerline - $\mathbb{C}$

(6) Vessel side - V

(7) Lug or support side - L or S

(8) Pipe side - P

(9) Other symbols with descriptions entered in the REMARKS section may be used as approved by the Team Supervisor.

6. RECORDS

Required records shall be specified in the applicable SwRI nuclear projects operating procedure.

Documents generated in accordance with this procedure shall be stored as specified in the SwRI Project Plan. The customer shall receive copies of these documents in the Examination Report, unless specified otherwise in the SwRI Project Plan.

Table 1

1974 CODE RECORDING REQUIREMENTS

Required L Positions	50% W_1	W_{max}	50% W_2
L_1 10%			
L_1 100%**			
L_{max}		X*	
L_2 100%**			
L_2 50%			

*Metal path also required
**Only required for nongeometric indications

1977 THROUGH 1983 CODE RECORDING REQUIREMENTS

Required L Positions	100% W_1	W_{max}	100% W_2
L_1 50%			
L_1 100%**			
L_{max}	X* **	X*	X* **
L_2 100%**			
L_2 50%			

*Metal path also required
**Only required for nongeometric indications

Table 2

1974 CODE RECORDING REQUIREMENTS

For Notch Calibrations on Thin Wall Piping+

	50% W_1	W_{max}	50% W_2
Required L Positions			
L_1 20%			
L_1 50%**			
L_{max}		X*	
L_2 50%**			
L_2 20%			

*Metal path also required
**Only required for nongeometric indications
+Calibrations to notch sensitivity when holes are stipulated by Code

1977 THROUGH 1983 CODE RECORDING REQUIREMENTS

For Notch Calibrations on Thin Wall Piping+

	50% W_1	W_{max}	50% W_2
Required L Positions			
L_1 20%			
L_1 50%**			
L_{max}	X* **	X*	X* **
L_2 50%**			
L_2 20%			

*Metal path also required
**Only required for nongeometric indications
+Calibrations to notch sensitivity when holes are stipulated by Code

Table 2

DAC vs. dB Conversion Chart

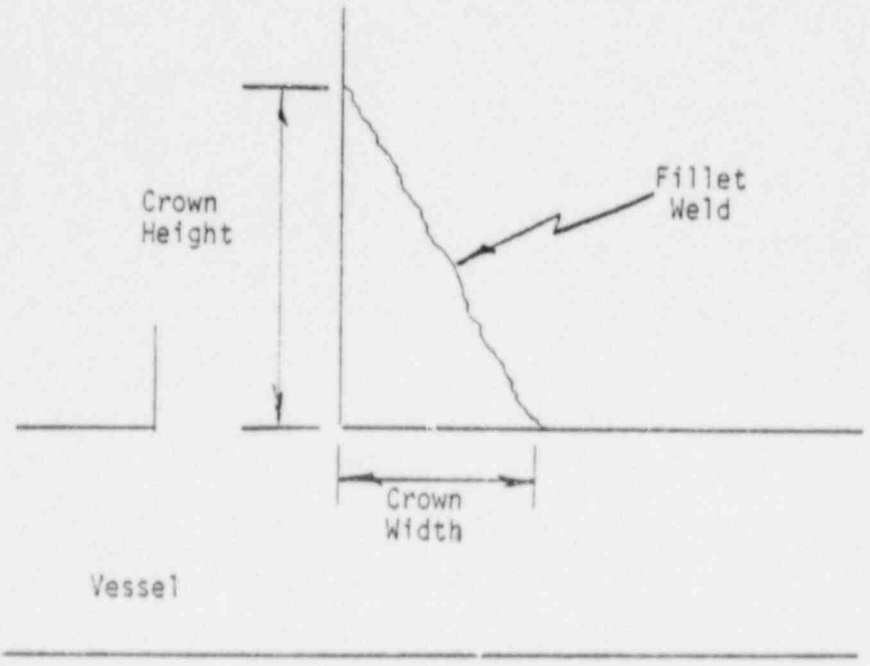
%DAC	dB	%DAC
100	0	100
90	1	112
80	2	125
70	3	141
63	4	159
56	5	178
50	6	200
45	7	224
40	8	251
36	9	282
32	10	316
28	11	355
25	12	400
22	13	447
20	14	501
18	15	562
16	16	631
14	17	708
13	18	794
11	19	891
10	20	1000

Percent DAC of an amplitude below DAC, which must be increased in amplitude by the dB number change to equal DAC, is read in the column on the left.

For example, an indication is increased in amplitude by 13 dB to equal the DAC curve; therefore, the indication is 22 percent of DAC.

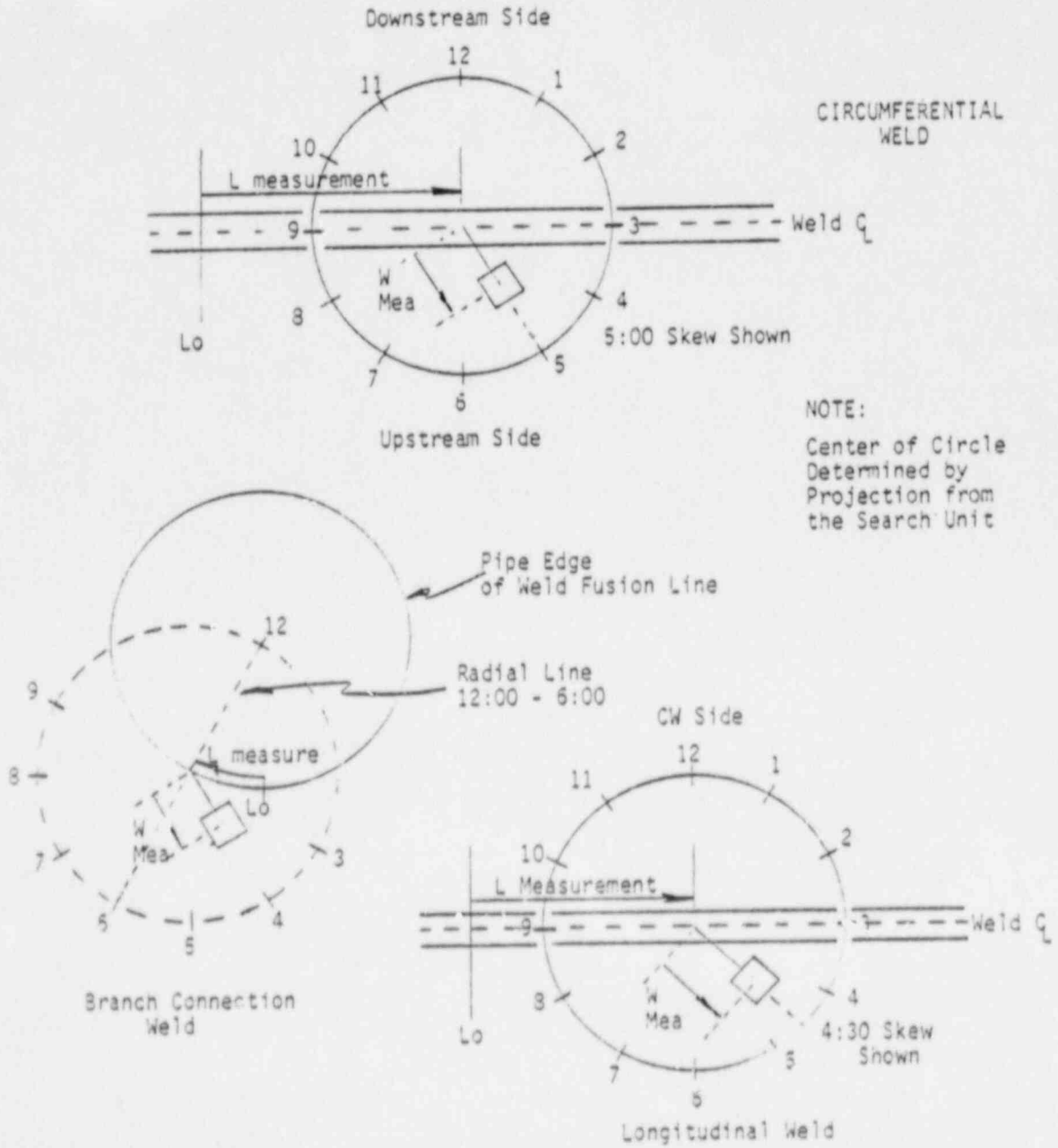
Percent DAC of an amplitude above DAC, which must be decreased in amplitude by the dB number change to equal DAC, is read in the column on the right.

For example, an indication is decreased in amplitude by 13 dB to equal the DAC curve; therefore, the indication is 447 percent of DAC.



FILLET WELD MEASUREMENTS

SKETCH 1



MEASUREMENTS FOR TANGENTIAL SCANNING

SKETCH 2

SOUTHWEST RESEARCH INSTITUTE NUCLEAR PROJECTS OPERATING PROCEDURE	IX-FE-125-0 February 1987 Page 1 of 13

Title

RECORDING INDICATIONS IN ACCORDANCE WITH NRC REGULATORY GUIDE 1.150

EFFECTIVITY AND APPROVAL

Revision 0 of this procedure became effective on Feb 17, 1987. This procedure consists of the pages and changes listed below.

Page No	Change	Date Effective
1 - 13		February 1987

Supersedes Procedure No. N/A			SA FLD
Approvals			
Written By D W Harwell	Date 6 Feb. 1987	Technical Review Hector Ortiz	Date 16 Feb 1987
Manager of Q.A. Bonnie Nichols	Date 16 February 1987	Cognizant Director Wayne J Hoch	Date 2/17/87

SwRI Form QA-408-1

RECORDING INDICATIONS IN ACCORDANCE WITH NRC REGULATORY GUIDE 1.150

1. PURPOSE

This procedure provides the technical information and detailed steps required for measuring and recording search unit location and signal amplitude data during manual ultrasonic examinations of reactor pressure vessel welds in accordance with Nuclear Regulatory Commission (NRC) Regulatory Guide 1.150.

2. SCOPE AND APPLICATION

This procedure is intended to be used only for the recording of search unit locations and signal amplitudes and shall not be used for sizing of indications.

This procedure is applicable to straight- and angle-beam examinations of clad or unclad ferritic reactor pressure vessel welds, heat-affected zones, and adjacent base material using manual, contact, and pulse-echo ultrasonic techniques.

3. APPLICABLE DOCUMENTS

(1) NRC Regulatory Guide 1.150, Revision 1, Appendix A, entitled "Ultrasonic Testing of Reactor Vessel Welds During Preservice and Inservice Examinations"

(2) Southwest Research Institute (SwRI) Nuclear Quality Assurance Program Manual (NQAPM)

(3) The applicable SwRI procedures required for the ultrasonic reactor pressure vessel examinations being conducted

4. RESPONSIBILITY

(1) The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division, shall be responsible for the preparation, review, control, and approval of this procedure.

(2) The Project Manager shall be responsible for the implementation of this procedure in accordance with the NQAPM specified in the applicable SwRI Project Plan.

(3) The examiner shall be responsible for implementing the requirements of this procedure.

(4) The Manager of Support Services, Nondestructive Evaluation Science and Technology Division, shall be responsible for storage of records generated in accordance with this procedure.

5. PROCEDURE REQUIREMENTS

(1) Personnel utilizing this procedure shall be certified in accordance with SwRI NQAP 11-1, "Special Process Control."

(2) Examination shall be conducted as required by the applicable SwRI procedures.

6. PROCEDURE

6.1 Weld Lengths, and L and W Measurements

(1) Weld lengths, if required, shall be measured with a steel measuring tape and the distance shall be recorded in inches and common fractions to the nearest 1/16 inch. Weld length measurements shall start at L_o or at a determined, identifiable reference point.

(2) L and W measurements shall be recorded in inches and common fractions to the nearest 1/16 inch using a 6-inch steel ruler or a steel measuring tape.

(3) Shear-wave angle-beam L measurements will be made to the axial center of the search unit and the W measurements will be made to the search unit exit point.

(4) Straight-beam distance amplitude correction (DAC) L and W measurements shall be made to the axial center of the search unit at the same locations using the same methods as nontransverse angle-beam measurements.

(5) For straight-beam weld examinations, the search unit location shall be recorded as "on weld/up," "on weld/down" or "on weld/cw," "on weld/ccw" when the search unit is not on the weld centerline.

6.2 Metal Path Measurements

Metal path measurements shall be recorded in inches and decimal fractions to the nearest 0.1 inch.

6.3 Amplitude Movements

(1) Signal amplitude shall be recorded in percent of DAC at the primary reference level. The percent DAC shall be determined from Table 1.

(2) Maximum signal amplitude shall be attained by search unit manipulation.

(3) Amplitudes of signals shall be measured in decibels (dB) above or below DAC by adjusting the gain control until the peak indication amplitude coincides with the DAC line.

6.4 Reference Points

NOTE

When the presence of high levels of radiation makes the layout of reference points impracticable, the following steps shall only be performed in areas where indications have been detected. However, the radial lines required by Paragraph 6.4.3 are necessary to maintain the correct search unit orientation.

6.4.1 Circumferential Butt Welds

(1) Reference points with a maximum spacing of 10 inches shall be drawn on the weld centerline, except vessel-to-flange welds examined from the seal surface. Vessel-to-flange welds shall have reference points with a maximum spacing of 10 inches as measured at the junction of the flange seal surface and inside surface of the vessel. Each reference point shall be laid out and identified on the vessel in inches from L_o or from a determined, identifiable reference mark.

6.4.2 Longitudinal Welds

(1) Reference points with a maximum spacing of 10 inches shall be drawn on the weld centerline. The reference points shall be laid out from the centerline of the intersecting circumferential weld above or as designated for horizontal vessels.

(2) Each reference point shall be identified on the vessel in inches from L_o or from a determined, identifiable reference mark.

6.4.3 Nozzle-to-Shell Welds

(1) Two reference circles shall be drawn around each nozzle. The radii of the circles shall be a whole number of inches from the nozzle centerline.

NOTE

The radius of a reference circle can be calculated by measuring the circumference of the nozzle boss and dividing this distance by 6.28. This result is the radius of the nozzle (measured to the outside surface). The distance from the nozzle boss to the reference circle plus the radius of the nozzle equals the reference circle radius.

(2) A concentric reference circle around each nozzle which encompasses the scan area shall be marked on the shell and referenced to the centerline of the respective nozzle by indicating its radius. The location of the 0° azimuth of each nozzle shall be noted on the appropriate SwRI Examination Record. The 0°, 90°, 180°, and 270° azimuths shall be marked on the shell along the concentric reference circle in a clockwise direction as viewed from the vessel exterior. Each 30° of azimuth for nozzle welds with a radius greater than 4 inches, each 15° of azimuth for nozzle welds greater than 12 inches, and each 5° of azimuth for nozzles greater than 24 inches shall be marked along the reference circle. Radial lines extending to the outer reference circle shall be drawn through each azimuth marked. The azimuth points and radial lines shall be used to maintain the correct search unit orientation and not for measurements.

(3) A concentric reference circle shall also be marked within 1/2 inch of the weld centerline. Every 10 inches around this inner circle shall be marked on the vessel and utilized for measurements.

6.5 Circumferential Welds L and W Measurements

(1) Nontransverse L and transverse W measurements for circumferential welds shall start at L_o or at other determined reference points and be made clockwise for outside surface examinations and counterclockwise for inside surface examinations. Clockwise direction shall be determined as viewed from above a vertical vessel or clockwise as viewed from an identified end of a horizontal vessel. The end of the horizontal vessel used shall be recorded in the applicable SwRI Examination Record.

(2) Nontransverse L and transverse W measurements shall be made along the weld centerline from L_o or from other reference points. Transverse L and nontransverse W measurements shall be made perpendicular to the weld from the weld centerline.

(3) L and W measurements for straight-beam and angle-beam indications shall be made at each location as required in Tables 2, 3, and 4.

6.6 Vessel-to-Flange From the Seal Surface L and W Measurements

(1) Nontransverse L measurements shall start at L_o or at other reference points and be made clockwise as viewed from above the vessel or from an identifiable end and will be described on the SwRI Examination Record. Nontransverse W measurements shall be made from the junction of the flange seal surface and the inside surface of the vessel to the axial center of the search unit.

(2) Nontransverse L measurements shall be made along the junction of the flange seal surface and inner surface of the vessel from L_o or from other reference points to the axial center of the search unit.

(3) L measurements shall be made to the maximum amplitude point, at the end points of the indication as determined by 20% of DAC, and, except for geometric indications, from successive scans in increments no greater than 1/4 inch.

(4) L and W measurements for indications shall be made at the W_{max} position. W measurements other than W_{max} shall not be recorded when examining vessel-to-flange welds from the seal surface.

6.7 Longitudinal Welds L and W Measurements

(1) Nontransverse L and transverse W measurements for longitudinal welds shall be made along the weld centerline starting from Lo or from other reference points. L_o for longitudinal welds in vessels shall be the centerline of the intersecting circumferential weld above the longitudinal weld being examined. For longitudinal welds in horizontal vessels, an identified end of the vessel shall be designated as the top and the location recorded on the applicable SwRI Examination Record.

(2) Transverse L and nontransverse W measurements shall be made from the weld centerline perpendicular to the weld.

(3) L and W measurements for straight-beam and angle-beam indications shall be made at each location as required in Tables 2, 3, and 4.

6.8 Nozzle-to-Shell Weld L and W Measurements

(1) Nontransverse L and transverse W measurements for nozzle-to-shell welds shall start at L_o or at other reference points and be made clockwise for examinations from the outside surface and counterclockwise for examinations from the inside surface. Clockwise or counterclockwise shall be determined by viewing the weld from a position which is perpendicular to the vessel surface. Measurements shall be made along the inner reference circle.

(2) L and W measurements shall be made from or along the inner surface reference circle located within 1/2 inch of the weld centerline.

(3) Transverse L and nontransverse W measurements shall be made perpendicular to the weld from the inner reference circle.

(4) L and W measurements for straight-beam and angle-beam indications shall be made as required in Tables 2, 3, and 4.

6.9 Examination Limitations

Scanning limitations shall be recorded as required by 6.9.1 and 6.9.2. W measurements shall be made to the search unit exit point for angle-beam or axial center for straight-beam search units. L measurements shall be made to the axial center of the search unit.

EXCEPTION

Nozzle-to-shell weld examinations conducted from the shell side only shall not be considered limited examinations.

6.9.1 Straight Beam

Limitations encountered during performance of the straight-beam lamination examination shall be recorded in accordance with the following:

(1) When the lamination examination can be performed from both sides of the weld, the limitations should be recorded on the lamination examination record as "none."

(2) When a weld cannot be examined from one side due to configuration, the limitations should be recorded as "no examination on the (up, down, cw, ccw, etc.) side due to configuration."

(3) When a partial examination is performed from one side or the other of a weld, the limitations for the lamination examination record should refer to the angle-beam examination record. The reference to the angle-beam examination may be recorded as "same as angle beam" or "see angle-beam limitations."

Limitations shall be recorded for straight-beam DAC calibrations. The maximum limitation in the W direction shall be recorded. The minimum limitation in the W direction shall only be recorded when necessary. The minimum point and the maximum point of the limitation shall be recorded in the L direction.

6.9.2 Angle Beam

Limitations shall be recorded for angle-beam examinations. For examinations which utilize two angles, the limitations of the search unit with the larger limitations shall be recorded. The maximum limitation in the W direction shall be recorded. The minimum limitation in the W direction shall be recorded only when applicable. The minimum point and the maximum point of the limitation in the L direction shall be recorded.

6.10 Abbreviations

Appropriate abbreviations which describe the search unit location with respect to the weld centerline or edge (listed below) shall be entered on the applicable SwRI Examination Record with the measurements.

(1) Up/Upstream - Up

(2) Down/Downstream - Dn

(3) Clockwise - CW

(4) Centerline - C

(5) Counterclockwise - CCW

(6) Vessel side of centerline - V

(7) Other symbols with descriptions entered in the Remarks section may be used as approved by the Team Supervisor.

7. RECORDS

Required records shall be specified in the applicable SwRI procedure.

Documents generated in accordance with this procedure shall be stored as specified in the SwRI Project Plan. The customer shall receive copies of these documents in the Examination Report, unless specified otherwise in the SwRI Project Plan.

Table 1

DAC vs. dB Conversion Chart

%DAC	DB	%DAC
100	0	100
90	1	112
80	2	125
70	3	141
63	4	159
56	5	178
50	6	200
45	7	224
40	8	251
36	9	282
32	10	316
28	11	355
25	12	400
22	13	447
20	14	501
18	15	562
16	16	631
14	17	708
13	18	794
11	19	891
10	20	1000

Percent DAC of an amplitude below DAC, which must be increased in amplitude by the dB number change to equal DAC, is read in the column on the left.

For example, an indication is increased in amplitude by 13 dB to equal the DAC curve; therefore, the indication is 22 percent of DAC.

Percent DAC of an amplitude above DAC, which must be decreased in amplitude by the dB number change to equal DAC, is read in the column on the right.

For example, an indication is decreased in amplitude by 13 dB to equal the DAC curve; therefore, the indication is 447 percent of DAC.

Table 2

Required L and W Recording for Indications

NOTES

Ultrasonic planar surface reflectors obtained at 50% or greater of the response from the square notch shall be recorded to the L and W limits of 50% of the notch amplitude.

For indications determined to be caused by geometry, the basis for this determination shall be described and documented.

Each location requiring a W measurement shall also have the metal path recorded.

When an examination is performed from the unclad side of a clad vessel with a first half-vee calibration only, indications observed past the 4/8 vee-path shall not be recorded.

Straight-beam indications whose length and depth from the surface are oriented within 10° of a plane parallel to the surface of the component shall be considered laminar flaws and shall be recorded as follows:

L and W Recording for Lamination Indications

L measurements for straight-beam lamination indications shall be made to the edges of the laminar-type reflector and from successive scans across the reflector in increments no greater than 1 inch. A laminar reflector will require measurements from the two areas, where the intermediate indication equals the remaining backwall and at the points, if any, of total loss of backwall. W measurements shall be made to the edges of the laminar-type reflector at each point requiring L measurements.

NOTES

The area of 50% loss of backwall shall be utilized for determining the extent of interference with the angle-beam examination.

The area of total loss of backwall shall be utilized for determining the acceptance/rejection requirements of Section XI of the ASME Code.

Straight-beam indications which are not laminar flaws shall be considered as planar and shall be recorded at 50% DAC.

Table 3

Required L and W Recording for Indications (Cont'd)

All geometric and nongeometric indications detected within the outer 75% of the through-wall thickness of the vessel wall, as measured from the inside surface, and only the geometric indications within the inner 25% of through-wall thickness shall be recorded as follows:

(1) Indications 50% to 100% DAC

	$50\%W_1$	W_{max}	$50\%W_2$
$L_1 50\%$		X	
L_{max}	X	X	X
$L_2 50\%$		X	

(2) Indications Greater Than 100% DAC

	W_1 $1/2$ max	W_{max}	W_2 $1/2$ max
$L_1 50\%$		X	
L_{max}	X	X	X
$L_2 50\%$		X	

X = Positions requiring W measurements

Nongeometric indications shall also be recorded along their length in scan increments no greater than 1/4 inch for angle-beam and every 9/10 of search unit dimension for straight-beam examination. Each location requiring an L measurement shall also have the W measurements and metal paths recorded.

Table 4

Required L and W Recording for Indications (Cont'd)

All nongeometric indications within the inner 25% of through-wall thickness shall be recorded as follows:

	20% DAC	50% DAC	100% DAC	>100 DAC 1/2 Max	WMAX	>100 DAC 1/2 Max	100% DAC	50% DAC	20% DAC
20% L_1	X				X				X
50% L_1	X	X			X			X	X
100% L_1	X	X	X		X		X	X	X
L MAX	X	X	X	X	X	X	X	X	X
100% L_2	X	X	X		X		X	X	X
50% L_2	X	X			X			X	X
20% L_2	X				X				X

X = Positions requiring W measurements

Additionally, these indications shall be recorded along their length in scan increments no greater than 1/4 inch. Each location requiring an L measurement shall also have the W measurements and metal paths recorded.

SOUTHWEST RESEARCH INSTITUTE NUCLEAR PROJECTS OPERATING PROCEDURE	IX-FE-131-0 March 1986 Page 1 of 3

Title

COMPARISON OF INSERVICE EXAMINATION DATA

EFFECTIVITY AND APPROVAL

Revision 0 of this procedure became effective on 7 Mar 1986. This procedure consists of the pages and changes listed below.

Page No	Change	Date Effective
1-4	0	March 1986

Supersedes Procedure No. | SA

Approvals

Written By	Date	Technical Review	Date
John R. Rogers III	3/6/86	Hunter Key	6 Mar 86
Manager of Q.A.	Date	Cognizant Director	Date
Dean Morris	7 March 1986	W. J. Hall	3/4/86

SwRI Form QA-408-1

COMPARISON OF INSERVICE EXAMINATION DATA

IX-FE-131-0

1. PURPOSE

The purpose of this procedure is to provide the technical information and detail steps required for the correlation of inservice examination data results.

2. SCOPE AND APPLICATION

This procedure applies to inservice examination results recorded during direct visual, liquid penetrant, magnetic particle, and ultrasonic examinations. The examination results shall be compared with previous examination results in accordance with this procedure.

Ultrasonic indications shall be resolved in accordance with the applicable revision of SwRI Nuclear Projects Operating Procedure IX-FE-132.

In some cases a comparison may not be practicable due to significant changes in techniques and/or specific variables such as search unit frequency, instruments, examination angle, recording technique, or calibration blocks, or previous data may not be available.

3. APPLICABLE DOCUMENTS

(1) SwRI Nuclear Projects Operating Procedures for the examinations being conducted

(2) ASME Boiler and Pressure Vessel Code, Section XI, the Edition and Addenda specified in the SwRI Project Plan.

(3) SwRI Nuclear Quality Assurance Program Manual (NQAPM)

4. RESPONSIBILITY

(1) The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division, shall be responsible for the preparation, review, approval, and control of this procedure.

(2) The Project Manager shall be responsible for the implementation of this procedure in accordance with the NQAPM specified in the applicable SwRI Project Plan.

(3) The data analyst (Level II or Level III) shall be responsible for implementing the requirements of this procedure.

(4) The Manager of the Support and Administration Section, Nondestructive Evaluation Science and Technology Division, shall be responsible for storage of records generated in accordance with this procedure.

5. PERSONNEL QUALIFICATION

(1) Data Analysts shall be certified as Level II or Level III examiners in accordance with SwRI NQAP 11-1, "Special Process Control," and/or NQAP 11-2, "Procedure for Certifying Visual Examination Personnel," as applicable.

6. DATA COMPARISON

Inservice nondestructive examination results shall be compared with recorded results of the preservice examination and prior inservice examinations (PSI, ISI, special examinations, etc.). As a minimum, the following steps shall be performed.

6.1 Review prior data to determine the presence and location of flaws. If flaws were not present in previous data, confirm the absence of flaws in present data. If flaws were present in previous data, the existence and location of these flaws shall be verified in the current data. The following information shall then be compared to determine growth or stability.

6.1.1 For ultrasonic indications, the length, thru wall, and amplitude data shall be compared.

6.1.2 For surface and visual indications, the length of the flaw indication shall be compared.

7. DOCUMENTATION

The results of the flaw indication comparison shall be documented on the SwRI Indication Resolution Record sheet to the extent necessary.

8. RECORDS

Disposition of documents generated in accordance with this procedure shall be as required by the applicable SwRI Nuclear Projects Operating Procedure utilized for the examination.

SOUTHWEST RESEARCH INSTITUTE NUCLEAR PROJECTS OPERATING PROCEDURE	IX-FE-132-0 February 1986 Page 1 of 4

Title

ULTRASONIC INDICATION RESOLUTION PROCEDURE

EFFECTIVITY AND APPROVAL

Revision 0 of this procedure became effective on 7 Mar 1986. This procedure consists of the pages and changes listed below.

Page No	Change	Date Effective
1-4	0	February 1986

Supersedes Procedure No. | SA

Approvals

Written By	Date	Technical Review	Date
John R. Bowyer III	3/6/86	Hector Ming	6 MAR 86
Manager of Q.A.	**Date**	**Cognizant Director**	**Date**
Susan Nakos	7 March 1986	Wayne F. Hall	3/7/86

SwRI Form QA-408-1

ULTRASONIC INDICATION RESOLUTION PROCEDURE

IX-FE-132-0

1. PURPOSE

The purpose of this procedure is to describe the methodology to be applied for the investigation, evaluation, and resolution of indications recorded during preservice and inservice examinations of nuclear power plant welds, base materials, components, or vessels.

2. SCOPE AND APPLICATION

This procedure applies to indications found during manual ultrasonic examinations performed during a preservice or inservice examination.

3. APPLICABLE DOCUMENTS

(1) ASME Boiler and Pressure Vessel Code, Section XI, the Edition and Addenda specified in the SwRI Project Plan

(2) The Nuclear Projects Operating Procedure (NPOP) applicable to the examination

(3) SwRI Nuclear Quality Assurance Program Manual (NQAPM)

4. RESPONSIBILITY

(1) The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division, shall be responsible for the preparation, review, approval, and control of this procedure.

(2) The Project Manager shall be responsible for the implementation of this procedure in accordance with the NQAPM specified in the applicable SwRI Project Plan.

(3) The data analyst (Level II or III) shall be responsible for implementing the requirements of this procedure.

(4) The Manager of the Support and Administration Section, Nondestructive Evaluation Science and Technology Division, shall be responsible for storage of records generated in accordance with this procedure.

5. PERSONNEL CERTIFICATION

Personnel resolving indications shall be certified as Level II or Level III examiners in accordance with SwRI NQAP 11-1, "Special Process Control."

6. DEFINITIONS

(1) Investigate: Perform the necessary tasks to determine the shape, identity, and location of indications (plotting, review of radiographs, reexaminations, etc.).

(2) Evaluation: Perform the required calculations to determine the acceptance or rejection of indications investigated and found to be the result of a flaw.

(3) Resolution: The formal documentation of investigations and/or evaluations performed on recorded indications.

7. INVESTIGATION

When investigating an indication, the following should be considered where practical and deemed necessary:

7.1 Determine the general location of the indication using L and W measurements, metal path, and measured beam angle.

7.2 Take outside and/or inside surface profiles using a contour gauge and ultrasonic thickness measurements. Profiles should be taken in line with the maximum amplitude position of the indication. Thickness measurements should be taken at maximum intervals of 1/4 inch, except where inside surface contour is essentially flat and can be verified by scanning over the surface.

7.3 Review previous examination data, including construction radiographs.

7.4 Review fabrication drawing for geometry and weld preparation profile.

7.5 Plot the indication location on a scale drawing of component using the surface profiles and ultrasonic thickness measurements taken in the specific area of the indication and the information specified in 7.1 above.

7.6 Determine repair history of component.

7.7 Perform supplemental nondestructive examinations. Use of supplemental examination methods are at the investigator's discretion, but may include radiography, surface methods, visual inspection, or alternative ultrasonic techniques. Some of the ultrasonic techniques which may be considered are:

(1) multiple beam angles
(2) different wave modes
(3) "creeping" wave technique
(4) SLIC-40 technique

8. EVALUATION

The evaluation of indications investigated and determined to be resulting from a flaw shall consist of reviewing the original data and of all data generated in accordance with Section 7 of this procedure. Any investigation and/or calculations necessary to determine whether the recorded indication is acceptable or rejectable shall be documented as described in Section 9 of this procedure.

9. RESOLUTION

The steps used to evaluate and/or investigate an indication shall be documented on the Indication Resolution Record. When used, the following will be referenced:

(1) indication plots
(2) calculations
(3) cross section profiles
(4) supplemental examination data
(5) radiographs
(6) sketches
(7) photographs

The Indication Resolution Record shall contain the signature and level of certification of the individual performing the evaluation and/or resolution and final review by a Level II or Level III.

10. RECORDS

Disposition of documents generated in accordance with this procedure shall be as required by the applicable SwRI Nuclear Projects Operating Procedure utilized for the examination.

SOUTHWEST RESEARCH INSTITUTE NUCLEAR PROJECTS OPERATING PROCEDURE	X-FE-101-3 August 1985 Page 1 of 6

Title

ONSITE NDE RECORDS CONTROL

EFFECTIVITY AND APPROVAL

Revision 3 of this procedure became effective on 8/5/85. This procedure consists of the pages and changes listed below.

Page No	Change	Date Effective
1-6		August 5, 1985

Supersedes Procedure No.
X-FE-101-2

SA
FLD

Approvals

Written By	Date	Technical Review	Date
Alfred R. Anderson	2 Aug 85	[illegible] Ruescher	2 AUG 1985

Manager of Q.A.	Date	Cognizant Director	Date
[signature]	5 August 19 85	Albert R. Whitney [illegible]	8/5/85

SwRI Form QA-408-1

ONSITE NDE RECORDS CONTROL

1. PURPOSE

This procedure describes the onsite control processes for nondestructive examination records (data) generated in the field during preservice (PSI) and inservice (ISI) examinations.

2. SCOPE AND APPLICATION

2.1 This procedure describes the flow of data records used to document the results of nondestructive examinations performed. Data records include original data sheets, summary sheets, resolution sheets, strip charts, magnetic tapes, video tapes, and other information as defined by the Inspection Engineer or Team Supervisor.

2.2 This procedure provides guidance to personnel of the NDE Field Services Section who are assigned the responsibility of preparing, reviewing, or otherwise using data records while in the field performing a preservice or inservice examination.

2.3 Functional steps are provided in this procedure to explain the flow of the records.

3. RESPONSIBILITY

(1) The Director of the Department of Engineering Services, Quality Assurance Systems and Engineering Division, shall be responsible for the preparation, review, approval, and control of this procedure.

(2) The Project Manager shall be responsible for the implementation of this procedure in accordance with the NQAPM specified in the applicable SwRI Project Plan.

(3) The Inspection Engineer shall be responsible for implementing the requirements of and ensuring compliance with this procedure.

(4) The Manager of the Support and Administration Section, Quality Assurance Systems and Engineering Division, shall be responsible for storage of records generated in accordance with this procedure.

4. PROCEDURE

4.1 Original Data Sheets

(1) Original data sheets, are to be serialized either at SwRI or at the site.

(2) Original data sheets shall be filled out at the examination location and during the examination time.

(3) The filled-out original data sheets shall be returned to the team staging area (office, trailer, etc.) on a periodic basis (at meal time, at the end of the day, upon leaving controlled areas) during an ISI or a PSI, and an entry shall be made into a daily log indicating that the examinations have been performed.

(4) The original data sheets shall then be placed into the To-Be-Reviewed File.

(5) The review process is performed as follows:

(a) The original data sheets shall be checked for completeness, accuracy, and consistency of the data.

(b) If clarification or correction of any entry on the original data sheets is required, the original data sheets shall be returned to the examiner.

(c) After clarifications or corrections, if any, have been made and initialed by the examiner, the reviewer shall sign each original data sheet which does not contain indications requiring evaluation/resolution.

(6) The original data sheets which have been reviewed and signed shall be moved to the To-Be-Summarized File. See Paragraph 4.1(9).

(7) Original data sheets which contain indications requiring evaluation/resolution shall be placed in the To-Be-Resolved File.

(a) Original data sheets in the To-Be-Resolved File which document visual or surface examinations shall be handled as follows:

(1) The Original data sheets shall be reviewed, signed by the reviewer, and used to generate a Customer Notification Form (CNF). (The CNF shall be completed according to NQAP 13-1.)

(2) Copies of original data sheets shall be made and attached to the CNF.

(3) A log shall be maintained of CNFs issued and their status.

(4) The original data sheets are then placed in the To-Be-Summarized File. See Paragraph 4.1(9).

(b) Original data sheets in the To-Be-Resolved File which document ultrasonic examinations shall be used to resolve the indications according to Paragraph 4.3 and shall then be processed as specified in Paragraphs 4.1(5) and 4.1(6).

(8) When a computer is used to record results and generate summary sheets, data shall be fed into the computer. The computer will generate the summary sheets at the completion of all required examinations of an examination area.

(9) If the computer is not used to generate summary sheets, data placed in the To-Be-Summarized File shall be summarized according to Paragraph 4.2 and filed with the summary sheet in the original data volumes.

4.2 Summary Sheets

(1) Summary sheets, are to be serialized either at SwRI or at the site.

(2) Summary sheets shall be completed for each examination area. In certain cases (studs, nuts, etc.), one summary sheet may be used for more than one examination area.

(3) Summary sheets shall be completed prior to the conclusion of site activities for each examination area for which examination requirements have been completed.

(4) Summary sheets shall be filed with the data in the original data volumes.

4.3 Resolution Sheets

(1) Resolution sheets, are to be serialized either at SwRI or at the site.

(2) The Level II or Level III examiner shall take the steps necessary to resolve the ultrasonic indications and complete a resolution sheet describing the results of his analysis. Any additional documentation required to support the resolution shall be attached.

(3) Original data sheets and resolution records with indications requiring no further action shall be placed in the To-Be-Reviewed File and processed as specified in Paragraphs 4.1(5) and 4.1(6).

(4) Data with indications requiring further action shall be handled in a manner established by the Director of the Department of Engineering Services.

(5) Indications which have been deemed reportable and require customer disposition shall be reported on a CNF form. The CNF shall be completed in accordance with SwRI NQAP 13-1.

4.4 Strip Charts, Magnetic Tapes, Video Tapes

(1) Strip charts, magnetic tapes, and video tapes being generated during mechanized ultrasonic examinations shall be identified with a sequence number and with the examination areas for which they contain data.

(2) During the resolution of any indications, the strip charts and tapes may be used by the Level II or Level III examiner, as needed.

(3) The strip charts and tapes are then prepared for transmittal to SwRI.

4.5 Customer Data Review

The customer, at his option, may elect to review and approve the original NDE data prior to its shipment to SwRI.

5. RECORDS

5.1 Prior to departing the site at the completion of a preservice or inservice examination, the original data package with the exception of strip charts, magnetic tapes, and videotapes shall be reproduced and a copy(ies) shall be transmitted to the appropriate site personnel. At no time will data be reproduced for this transmittal before the required examinations for a particular area are complete, the data have been reviewed, and the summary sheets have been completed.

5.2 After completion of site activities (or at other times deemed appropriate by the Inspection Engineer or Team Supervisor), the original data package shall be transmitted to SwRI in accordance with the latest revision of SwRI Nuclear Projects Operating Procedure XVII-AG-101.

SOUTHWEST RESEARCH INSTITUTE NUCLEAR PROJECTS OPERATING PROCEDURE	X-FE-109-0 September 1985 Page 1 of 3

Title

INDICATION EVALUATION GUIDELINES

EFFECTIVITY AND APPROVAL

Revision 0 of this procedure became effective on 9/17/85. This procedure consists of the pages and changes listed below.

Page No	Change	Date Effective
1 through 3		9/17/85

Supersedes Procedure No.			SA FLD
Approvals			
Written By: Alfred R. Anderson	Date: Sept 6, 1985	Technical Review: E.D. Rauscher	Date: 16 SEPT 1985
Manager of Q.A.: [signature]	Date: 16 SEPT 1985	Cognizant Director: Allen R. Whitting for WTF	Date: 9/17/85

SwRI Form QA-408-1

INDICATION EVALUATION GUIDELINES

1. PURPOSE

The purpose of this guideline is to describe the general methodology to be applied for the evaluation of ultrasonic indications detected during preservice or inservice examinations.

2. SCOPE AND LIMITATIONS

This guideline applies to ultrasonic indications found during manual or mechanized examinations of welds and base material in vessels, piping, pumps, valves and bolting.

This guideline is intended to provide a consistent approach to the evaluation of indications. It is recognized that all steps in this guideline may not apply to every indication and in some instances additional steps may be required. Each indication should be evaluated on a case-by-case basis.

Sizing is not considered part of this guideline.

3. PERSONNEL REQUIREMENTS

Personnel evaluating indications shall be certified Level II or Level III in accordance with SwRI NQAP-11-1 "Special Process Control."

For the examination and resolution of IGSCC-susceptible welds in austenitic piping, examiners shall be qualified by EPRI (or equivalent) training.

4. EVALUATION PROCESS

In evaluating an indication, the following should be considered where practical and deemed necessary:

4.1 Evaluate the location of the indication with reference to L_o and W_o measurements and metal path.

4.2 Take outside and inside surface profiles using a contour gage and ultrasonic thickness measurements. Profiles shall be taken in line with the maximum amplitude position of the indication. Thickness measurements shall be taken at maximum intervals of 1/4 inch, except where inside surface contour is essentially flat, and can be verified by scanning over the surface.

4.3 Review previous examination data, including construction radiographs.

4.4 Review fabrication drawing for geometry and weld preparation profile.

4.5 Plot metal path on scale drawing of component.

4.6 Determine repair history of component.

4.7 Perform supplemental nondestructive examinations. Use of supplemental examination methods are at the evaluator's discretion, but may include radiography, surface methods, visual inspection or alternative ultrasonic techniques. Some of the ultrasonic techniques which may be considered are:

(1) multiple beam angles
(2) different wave modes
(3) "creeping" wave technique
(4) SLIC-40 technique

5. RECORDS

The steps used to evaluate an indication shall be documented on the Indication Resolution Record or similar document. When used, the following will be referenced:

(1) indication plots
(2) calculations
(3) cross section profiles
(4) supplemental examination data
(5) radiographs
(6) sketches
(7) photographs

The Indication Resolution Record shall contain the signature and level of certification of the individual performing the evaluation and final approval by a Level II or Level III.

Title

CONTROL OF NUCLEAR INSPECTION EQUIPMENT AND MATERIALS

EFFECTIVITY AND APPROVAL

Revision 2 of this procedure became effective on 10/4/82. This procedure consists of the pages and changes listed below.

Page No	Change	Date Effective
1-12	0	September 1982

SA
CK

Approvals

Written By	Date	Technical Review	Date
Billy G. Hutchinson	23 Sep '82	[illegible signature]	23 Sep 82
Manager of Q.A.	**Date**	**Cognizant Director**	**Date**
[illegible signature]	9/29/82	R. Trigilio	4 Oct 82

CONTROL OF NUCLEAR INSPECTION EQUIPMENT AND MATERIALS

1. PURPOSE

1.1 The purpose of this operating procedure is to provide control for the storage, inventory, issue, shipment, and return to stock of examination equipment and materials.

2. SCOPE AND APPLICATION

2.1 The scope of this procedure is the control of nuclear examination equipment to ensure the integrity of equipment and materials used during the examination of nuclear power plant components. See NPOP VII-AG-102 for control of Search Units.

Controls are further required to ensure that maximum utilization is made of available equipment, i.e., equipment is not "lost" in the Radiation Control facility, delayed or misplaced during transit from job site to maintenance shops, or allowed to remain out of circulation for long periods of time while being used for research and development projects. The flow chart illustrates the control and process of nuclear inspection equipment (Attachment 1).

2.3 This procedure is applicable to, but not limited to, control of the following equipment and materials:

(1) Ultrasonic Examination Materials and Equipment

(2) Plastic Wedges

(3) Penetrant Examination Materials

(4) Magnetic Particle Examination Materials and Equipment

(5) Eddy Current Examination Equipment and Standards

(6) Mechanized Examination Equipment

(7) Data Acquisition Systems

2.4 The following documents form a portion of this procedure as applicable.

2.4.1 SwRI Nuclear Quality Assurance Program Manual (NQAPM).

2.4.2 SwRI Radiological Health and Safety Manual.

3. RESPONSIBILITY

3.1 The Vice President of the Quality Assurance Systems and Engineering Division shall designate one or more secure areas to be used for equipment and materials storage as control facilities.

3.2 Control facilities shall be operated by a Stock Clerk and an Equipment Clerk. The Stock Clerk will be under the supervision of Inventory Control Traffic Manager who will be responsible for inventory storage and issue of examination materials. The Equipment Clerk, under the supervision of the Supervisor, Administration Control, will be responsible for inventory, storage, issue and retrieval of controlled equipment.

3.3 Responsible users, such as Team Supervisors, shall be responsible for compiling a list, using SwRI Form SS-17 Equipment Control/ Shipping List (Attachment 2), of equipment and materials required for each job or project. They shall be responsible for shipment of the equipment to the job site, security while at the job site, reshipment upon completion of the job, documentation of faulty equipment, and turn-in of equipment and unused materials.

3.4 The Division Health Physicist or his representative shall be responsible for accepting equipment and materials returned from an inservice examination, its decontamination, and returned to its proper storage facility.

3.5 The Assistant Manager, Technical Activities Group, or his alternate shall be responsible for providing minimum maintenance turnaround time and for providing current certifications as required for nuclear examination equipment.

4. PROCEDURE

4.1 New Equipment

4.1.1 Newly purchased or fabricated critical equipment shall be inspected in accordance with SwRI Operating Procedure VII-AG-101 prior to being routed to the appropriate control facility.

4.1.2 An identification number (serial number) will be assigned to noncapital equipment which does not have a manufacturer's serial number.

4.1.3 Upon completion of proper identification, new equipment will be listed on the control facility inventory records.

4.1.4 Once new equipment is properly identified and inventoried, it will be issued to the appropriate maintenance facility for an operational check and certification in accordance with NQAPM Procedure NQAP 10-1. The maintenance facility will return the equipment, along with copies of certifications generated, to the control facility. The new equipment may then be issued for nuclear inspection work.

4.2 Equipment and Materials Issue

4.2.1 When it is determined that equipment and/or materials are to be removed from the appropriate control facility, with the exception of equipment routed through the maintenance facilities (Paragraph 4.6.3), the Team Supervisor or Responsible User will compile a list of required equipment and materials needed using Form SS-17. The responsible supervisor shall complete each blank at the top portion of the form with no exceptions. On the second part of the form, he will list quantity and nomenclature of each item of equipment or materials required and indicate those which require certifications.

4.2.2 When the Team Supervisor or Responsible User has initiated Form SS-17, he may assign any technician to draw and pack the equipment. The technician will present Form SS-17 to the appropriate control facility, and the Clerk will issue the material or equipment. The Clerk will enter appropriate serial number and estimated replacement cost of each item on Form SS-17 as the equipment is issued. He will also supply copies of appropriate certifications as required.

4.2.3 When requested equipment and materials have been issued, the technician will sign each Form SS-17, indicating that he has received the items for the responsible supervisor, and shall notify the QA Section so they can review the equipment and certifications.

4.2.4 The Equipment Clerk will distribute Form SS-17 as follows:

(1) Copy 1 (white): Forward to the Division Shipping Agent

(2) Copy 2 (yellow): Give to the person receiving the equipment

(3) Copy 3 (pink): Retain for control purposes

(4) Copy 4 (goldenrod): Will be given to QA when QA inspection is required. If a QA inspection is not required, this copy will be destroyed.

4.3 Equipment Packing and Shipping

4.3.1 If the equipment and/or materials are to be shipped from the Institute grounds, the technician will pack each item in numbered shipping containers. He will then enter the container number in the appropriate Box No. space on Form SS-17.

4.3.2 If the equipment is to be shipped by freight, a box count must be made and each box must be weighed. Shipping labels must be completed and affixed to each shipping container.

4.3.3 When the packing has been completed, the technician will return Copy 2 of Form SS-17 to the responsible supervisor who retains this copy for accountability of equipment while in his possession.

4.3.4 If equipment is to be shipped by freight, the responsible supervisor will contact the Requisitioning Agent, who will arrange for shipping and for the proper shipping documents to be completed.

4.3.5 The responsible supervisor will review Form SS-17, with special emphasis placed on ensuring that appropriate certifications are available for each item that requires certification.

4.4 Onsite Control

4.4.1 The Team Supervisor or Project Engineer shall assume responsibility for the security of equipment once it has been drawn from the control facility. At the job site, he will obtain a secure area to be used for equipment storage

and will arrange for issue of the equipment or materials as the work load demands. He will ensure that equipment placed into onsite storage after use is dry and clean and that any equipment damaged or found to be inoperative or out of tolerance is tagged with a Form SS-19, "Hold Tag", to indicate its condition (Attachment 3).

4.5 Decontamination

4.5.1 Equipment being returned from an inservice inspection must be delivered to a radiation control area immediately upon return to the Institute. This equipment will be controlled in accordance with SwRI Radiological Health and Safety Manual, Paragraph 5.2.

4.6 Equipment/Material Turn-in

4.6.1 Upon completion of a project or the return to the Institute of equipment used off the grounds, the equipment will be returned to the control facility. (See Paragraph 4.6.2 when returning from an inservice examination.) As each item is checked in, the Equipment Clerk will enter the date in the Date Returned block of copy 3 of the Form SS-17. He will also initial in the Date Returned block of copy 2 of the Form SS-17 when requested.

4.6.2 Expendable materials such as Penetrant Examination Material and Magnetic Particle Examination Materials will be returned to the stock room. When the Stock Clerk can determine that the material has not been used and identifying data is available to trace the material to the appropriate certificates and to the original purchase order, he will credit the appropriate job site by processing an appropriate store requisition.

4.6.3 Equipment and material being returned from an inservice examination must be delivered to a radiation control area immediately upon return to the Institute. The Health Physicist representative will inventory equipment and material and acknowledge responsibility for it. Equipment and material that is not contaminated or that is decontaminated will be returned to the appropriate storage facility according to 4.6.1 and 4.6.2 above. Equipment that cannot be decontaminated will be stored in the appropriate control area and the Health Physicist representative will inform the Assistant

Director, Engineering Services Division, and the Equipment Control Clerk in writing of the nomenclature and the serial number of the equipment, and the site the equipment came from.

4.6.4 The Equipment Clerk will check each item for disposition. Equipment requiring repair, cleaning, or recertification/recalibration within the next 30 calendar days will be taken to the appropriate maintenance facility.

4.6.5 When repair and/or certification is completed, the item will be returned to the control facility and placed in stock for reissue.

4.7 Special Issue Requirements

4.7.1 Occasionally it will be necessary for a Team Supervisor who is in the field to request that equipment be checked out and sent to him. When this circumstance arises, he will contact the Examination Activities Coordinator or his alternate and make his needs known. The Examination Activities Coordinator or his alternate will initiate Form SS-17 and draw, pack, and ship the equipment. He will perform the review and enclose Copy 2 of Form SS-17 in the shipping container so that the Team Leader will have a record of what was actually shipped.

4.7.2 If equipment is to be shipped from one job location to another without returning to the Institute, a packing list will be made using Form SS-17. One copy will be retained by the responsible person making the shipment, one copy will be enclosed with the shipment, and one copy will be returned to the control facility at the Institute. The responsible supervisor will review the Form SS-17 to ensure that certificates were included as required.

4.8 Lost or Destroyed Equipment

4.8.1 In the event any item other than normally consumable materials is lost or destroyed while it is signed out of the control facility, the responsible supervisor will initiate a memorandum addressed to the Assistant Director, Engineering Services Division, with a copy to the Manager of Support and Administration and the Supervisor, Administration Control. The memorandum will identify the equipment and describe the circumstances involved with its loss or destruction.

4.9 Recall of Equipment for Recalibration

4.9.1 When notified that a particular piece of equipment is due recalibration, the Equipment Clerk will determine the location of the equipment by reviewing his equipment inventory records. If the equipment is located within the stock room, he will take the equipment to the appropriate certifying facility. When the equipment has been issued, he will notify the Assistant Manager, Technical Activities Group, or other responsible supervisor by completing a Form SS-42 (Attachment 4). The Activity Coordinator or responsible supervisor will ensure the equipment is sent to the Equipment Clerk on or before the recalibration date. The Equipment Clerk will then take it to the appropriate certifying facility.

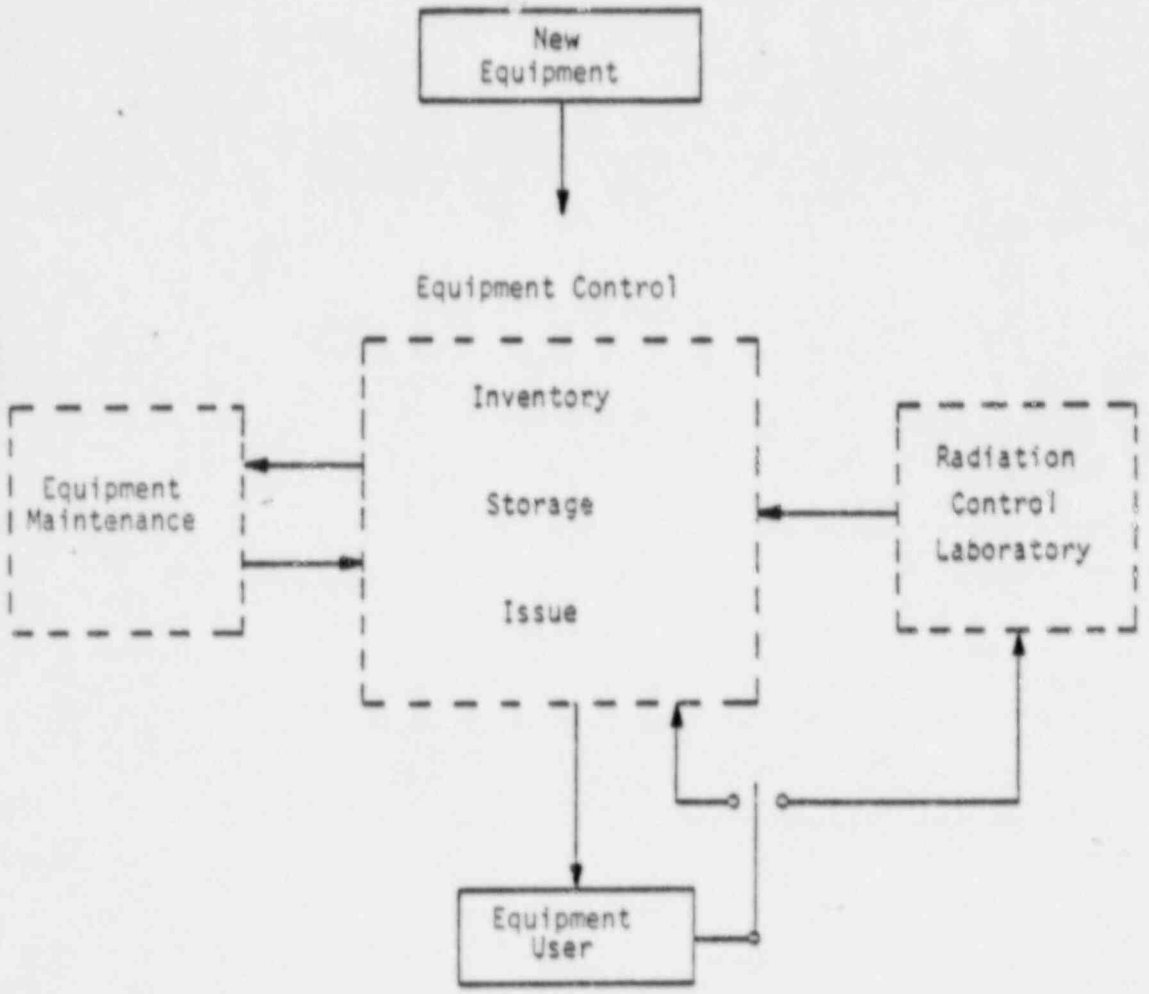
Note: If a particular piece of equipment is being used in a non-critical application, it need not be returned until completion of the project.

5. RECORDS

5.1 Copy 3 of Form SS-17 shall be maintained by the control facility for a minimum of six months after the last item on the form was turned in.

5.2 SwRI Form SS-42 may be destroyed upon return of equipment to the stock room.

5.3 The Equipment Clerk will maintain a file of current equipment certification records. An adequate number of copies will be included for issue during equipment issue.



Attachment 1

PAGE OF PAGES

EQUIPMENT CONTROL / SHIPPING LIST

EQUIPMENT CONTROL / SHIPPING LIST			DATE
PROJECT NO.	SITE	DATE REQUIRED	SHIPPING METHOD
RESPONSIBLE SUPERVISOR			APPROX. RETURN DATE

QUANTITY REQUIRED	SERIAL NUMBER	NOMENCLATURE	QUANTITY ISSUED	BOX NO.	COST	CERTS ENCLOSED	RETURN INVENTORIES		DATE RETURNED

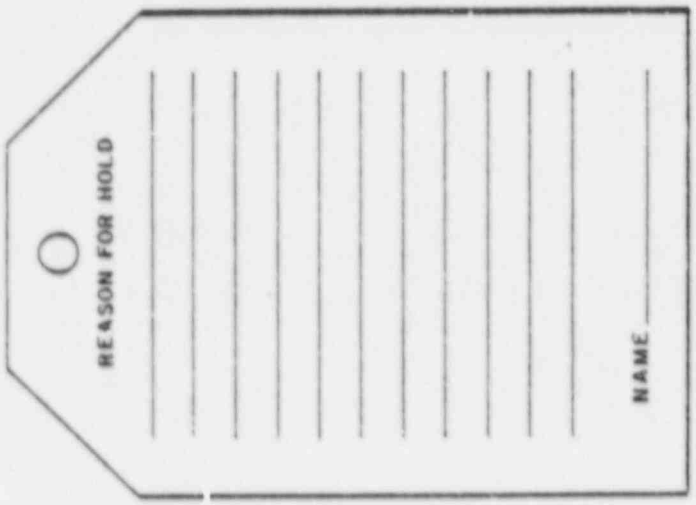
	TOTAL COST:
RECEIVED BY:	AUDITED BY

SwRI FORM 58-17-1

This Form is a 4 copy form, Page 1 is white, Page 2 is yellow, Page 3 is pink, and Page 4 is goldenrod.

Attachment 2

SAMPLE FORM



Attachment 3

SAMPLE FORM

RECALIBRATION NOTICE

TO:	FROM:	DATE:

THE EQUIPMENT LISTED BELOW WILL BE DUE RECALIBRATION AS INDICATED PLEASE RETURN THIS EQUIPMENT TO THE EQUIPMENT ROOM AS SOON AS POSSIBLE

ITEM	SERIAL NUMBER	RECALIBRATION DATE	LOCATION

Recalibration Notice
(SwRI Form SS-42)

Attachment 4
SAMPLE FORM

Title

DATA STORAGE AND RETRIEVAL

EFFECTIVITY AND APPROVAL

Revision 3 of this procedure became effective on 30 Nov 1987. This procedure consists of the pages and changes listed below.

Page No	Change	Date Effective
~~1-6~~	~~1~~	~~November 1987~~
1-7		30 November 1987

11/24/87

Supersedes Procedure No. XVII-AG-101-2			SA FLD
Approvals			
Written By: Donald W. York	Date: 11-17-87	Technical Review: Shirley H. Heller	Date: 11/24/87
Manager of Q.A.: A Engelhardt for	Date: 11/24/87	Cognizant Director: R Fragaszy	Date: 11/30/87

SwRI Form 84-408-1

DATA STORAGE AND RETRIEVAL

1. INTRODUCTION

1.1 This procedure establishes a system for the control and the storage of data for nuclear power plant components classified by ANSI N45.2.9, "Requirements for Collection, Storage, and Maintenance of Quality Assurance Records for Nuclear Power Plants." This operating procedure satisfies the requirements of Appendix B to 10CFR50, Criterion XVII, and the SwRI Nuclear Quality Assurance Program Manual.

1.2 Scope and Application

1.2.1 The scope of this procedure is limited to the documentation of nuclear power plant examinations performed by NDE Field Services, Nondestructive Evaluation Science and Technology Division, and to other documentation as designated by the Vice President, Nondestructive Evaluation Science and Technology Division.

1.2.2 This procedure applies to the Data Control Clerk, Team Supervisors, Inspection Engineers, and all other personnel who enter documents into and receive them from the Data Storage Facility.

1.2.3 Other divisions of the Institute may store quality assurance records for nuclear power plants in the Data Storage Facility. Once these records have been entered in the facility, they will be controlled according to this procedure.

1.3 Responsibility

1.3.1 The Manager of Support and Administrative Services within the Nondestructive Evaluation Science and Technology Division shall be responsible for the implementation and control of this procedure.

1.3.2 The Data Control Clerk for Support and Administrative Services shall be responsible for controlling, filing, and maintaining documentation covered by this procedure in the Data Storage Facilities. The Data Clerk shall assume this responsibility when documents are received in accordance with Paragraphs 2.1, 2.2, and 2.3.

1.3.3 Team Supervisors, Inspection Engineers, or their designated alternates shall be responsible for ensuring completeness and accuracy of documentation being entered into the Data Storage Facility (see Section 2).

1.3.4 The Manager of Support and Administrative Services, or a representative, shall routinely review the performance of the Data Storage Facility against the requirements of this procedure.

1.4 Data Storage Facility Description

The Data Storage Facility for SwRI-retained quality assurance records is located in Building 139. The construction of the facility in Building 139 is concrete block with steel vault door. The facility has a temperature control device to regulate temperature and humidity.

2. PROCEDURE

2.1 Examination data and related material being sent to SwRI will be listed on Form SS-1, "Data Records Transmittal and Receipt" (see page 7). Upon completion of the form and its arrival with the data at the Institute, they will be delivered to the Data Control Clerk.

2.2 Upon receipt of the data, the Data Control Clerk will use the transmittal form as a checklist to ensure that all material listed has been received. The Data Clerk will inventory the data by preparing a listing of Summary Sheet numbers or by entering the Summary Sheet number on a weld table. The Data Clerk will also ensure that each Examination Data Sheet listed on each Summary Sheet is in the Data Package. In those cases where a Summary Sheet is not used or has not been prepared at the time of receipt of the data, the Data Clerk will prepare a listing showing the serialized number of each data sheet received. The completed inventory will be filed in Section A of the file system. In addition, the Data Control Clerk will ensure that all documentation to be stored contains the following:

(1) Reactor Site Name

(2) Date of Record Entry

(3) Description of Material. Video tapes, strip charts, and computer disks will identify the examination to which they relate and will be numbered. This information is entered by the Team Supervisor, the Inspection Engineer, or their designated alternates.

The Data Control Clerk will then enter the data into the Data Storage Facility.

2.3 PSI and ISI reports, other nuclear power plant examination reports, examination plans, etc. relating to a particular reactor will be furnished to the Data Control Clerk by the Report Coordinator.

2.4 Other records may be furnished to the Data Control Clerk for storage when approved by the Vice President, Nondestructive Evaluation Science and Technology Division.

2.5 Items being removed from the Data Storage Facility shall be signed out. Original field data will be returned to the Data Storage Facility at the end of each day. If these data need to be used after normal working hours, special arrangements will be made with the Data Control Clerk. Other items may be signed out for the period required. The individual withdrawing data or other material shall be responsible for its safekeeping and return.

2.6 The Data Storage Facility will be maintained in a neat and orderly manner. Records will be inside file cabinets or bookcases. Loose papers, drawings, etc. shall be placed in folders, binders, or envelopes for filing.

3. RECORDS

3.1 The Data Control Clerk will maintain an up-to-date list of records covered by this procedure and a list of their respective locations.

3.2 Data maintained in the Data Storage Facility will be retained for the periods indicated in Appendix A or according to written instructions furnished to the Data Control Clerk at the time the records are placed into the Data Storage Facility. The period of retention will in no circumstance be shorter than the time specified in the applicable contract.

3.3 Project Managers should review the records in the Data Storage Facility relating to closed projects to determine their ultimate dispositioning; i.e., return of records to client upon termination of contract, continuous storage in the Data Storage Facility, etc. Decisions should be coordinated with the appropriate Director, and the Data Control Clerk should be notified in writing. The Data Control Clerk will comply with the written instructions.

APPENDIX A

The following is a list of documentation and its retention periods as maintained by Data Control in the Data Storage Facilities.

Record Type	Retention Period
(1) PSI, ISI, and other examination reports, which include: Personnel certifications Search unit, material, and instrument certifications Zero reference location Weld identification isometric drawings Calibration standards Nondestructive testing procedures	Lifetime of the Plant or until transferred to the Client
(2) PSI, ISI, and other examination data, which include: Original data Video tapes Computer disks Eddy current data Eddy current tapes Strip charts Equipment calibration sheets	Lifetime of the Plant or until transferred to the Client
(3) PSI, ISI, and other examination plans	Lifetime of the Plant or until transferred to the Client
(4) Logs, drawings, and summaries created by field crews during an ISI or PSI	Lifetime of the Plant or until transferred to the Client
(5) General information that would be of value in conducting future ISIs	Lifetime of the Plant or until transferred to the Client
(6) Photographs relating to nuclear power plants	As determined by the Project Manager

(7)	Copies of procedures; personnel, material, and instrument certifications; and other report data	Destroy 6 months after issuance of Final Report
(8)	Other general information that will not provide valuable information in conducting future ISIs	Destroy after 2 years

DATA RECORDS TRANSMITTAL AND RECEIPT

DATE

FROM	SITE	TO: DATA CONTROL CLERK DIVISION 17 SWR
	PROJECT NO:	

CHECK APPLICABLE BOX	DESCRIPTION OF DATA RECORDS	
	EXAMINATION DATA SHEETS	NO. OF VOLUMES
	CERTIFICATIONS	NO. OF VOLUMES
	EXAMINATION PLAN	NO. OF VOLUMES
	MECHANIZED SCAN PLAN	NO. OF VOLUMES
	VIDEO TAPES	NO. OF TAPES
	STRIP CHARTS	NO. OF ROLLS

OTHER DATA AND COMMENTS:

SIGNATURE:

SWRI FORM 33-1-1

APPENDIX D

SOUTHWEST RESEARCH INSTITUTE
NONDESTRUCTIVE TESTING PROCEDURES

APPENDIX D

SOUTHWEST RESEARCH INSTITUTE
NONDESTRUCTIVE TESTING PROCEDURES

Table of Contents

PROCEDURE DEVIATION

Procedure	Revision No.	Deviation No.
SwRI NDT- 200-1	70	3

The following examination areas are affected by this deviation:

Liquid penetrant examinations to be performed in accordance with this procedure.

The following paragraphs shall be deviated from as indicated:

Change Section 8 Recording Criteria to read as follows:

8. RECORDING CRITERIA

Indications shall be recorded in accordance with the techniques outlined in the applicable revision of SwRI Nuclear Projects Operating Procedure IX-FE-116.

8.1 Linear Indications

Linear indications shall be recorded on the SwRI Liquid Penetrant Examination Record and reported to the customer for disposition in accordance with the recording criteria table below:

Nominal Wall Thickness (Inches)	Overall Indication Length as Defined in Attached Figure 1 (Inches)
Less than 1.0	1/8
1.0 to less than 2.5	3/16
2.5 and greater	1/4

(Continued on Page 2)

Rationale for deviation:

This deviation incorporates recording criteria as requested by Public Service Electric and Gas Company.

Deviation Affects Qualification	YES ☐ NO ☒	If the deviation is determined to affect the procedure qualification, the deviation shall be qualified in accordance with Procedure IX-FE-107.

APPROVALS

SA FLD

Written by:	Date:	Technical Review:	Date:
Edward J. Sage	15FEB 88	Jerry J. McGuckin for EJS	2-15-88
		Verbal Approval Given? ☐ Yes ☒ No	Date:
Manager of Q.A.: for 2/15/88 T.C. Tidwell	Date: 2/15/88	Cognizant Director: Brady C. Cagleden for DFR	Date: 15Feb 88

The following paragraphs shall be deviated from as indicated (Cont.):

NOTE

For Preservice examination, indications with a length of 1/16 inch in ferretic piping less than .312 inches in thickness shall be recorded.

Rounded indications shall be recorded based on diameters corresponding to the linear indication recording criteria and reported to the customer for disposition.

When conditions limit the area of examination, the limitations shall be recorded.

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECTS
OPERATING PROCEDURE

Title

SOLVENT-REMOVABLE LIQUID PENETRANT COLOR CONTRAST EXAMINATION

EFFECTIVITY AND APPROVAL

Revision 70 of this procedure became effective on June 22, 1987. Other revisions of the base document may be effective concurrently.

SA FLD

Approvals			
Written by	Date 10-JUNE 1987	Technical Review	Date 16 June 1987
Manager of Q.A.	Date 18 June 1987	Cognizant Director	Date 6-22-87

The following information may be used for convenience. Completion of this portion is not mandatory.

Deviation No.								
Date Effective								
Procedure Section(s) Affected								

Notes:

SOLVENT-REMOVABLE LIQUID PENETRANT COLOR CONTRAST EXAMINATION

SwRI-NDT-200-1

1. PURPOSE

This procedure provides the technical information and detailed steps required to ensure proper liquid penetrant examination of nonporous austenitic or carbon steel materials in accordance with the applicable American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Codes.

2. SCOPE AND APPLICATION

(1) The color contrast method of solvent-removable liquid penetrant examination shall be employed as specified in this procedure for detection of surface discontinuities in austenitic or carbon steel material.

(2) Components and welds to be examined are specified in the applicable Southwest Research Institute (SwRI) Examination Plan.

3. APPLICABLE DOCUMENTS

(1) ASME Boiler and Pressure Vessel Code, Section XI, 1983 Edition with Addenda through Summer 1983, "Rules for Inservice Inspection of Nuclear Power Plant Components"

(2) ASME Boiler and Pressure Vessel Code, Section V, 1983 Edition with Addenda through Summer 1983, "Nondestructive Examination"

(3) SwRI Nuclear Quality Assurance Program Manual (NQAPM)

3.1 Applicable Examination Record

SwRI-NDTR Form No. 17-11, revision dated 1-3-79

4. RESPONSIBILITY

(1) The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division, shall be responsible for the preparation, review, approval, and control of this procedure.

(2) The Project Manager shall be responsible for the implementation of this procedure in accordance with the NQAPM specified in the applicable SwRI Project Plan.

(3) The examiner shall be responsible for implementing the requirements of this procedure.

(4) The Manager of the Support and Administration Section, Nondestructive Evaluation Science and Technology Division, shall be responsible for storage of records generated in accordance with this procedure.

5. PERSONNEL AND EQUIPMENT

5.1 Personnel Certification

Personnel performing examinations shall be certified in accordance with SwRI NQAP 11-1, "Special Process Control."

5.2 Material/Equipment Certification

The penetrant materials used shall be certified for residual sulfur content and total residual halogens in accordance with SD-129 and SD-808 of Article 24, Section V.

Certified reports for all surface contact materials to be used for penetrant examinations, giving batch numbers and analysis results, shall be obtained from the supplier. Copies of the certified reports shall be retained with the examination records.

Equipment used to measure surface and penetrant temperature shall have been calibrated and certified, and shall display a valid calibration tag as required by NQAP 10-1.

5.3 Materials and Equipment

The following materials and equipment shall be used for examinations performed in accordance with this procedure:

(1) Precleaner - Spotcheck, Type SKC-S
(2) Penetrant - Spotcheck, Type SKL-HF/SKL-S or SKL-HF/S
(3) Penetrant Remover - Spotcheck, Type SKC-S
(4) Developer - Spotcheck, Type SKD-S
(5) A thermometer, certified as described in Paragraph 5.2

5.4 Safety Precautions

Safety precautions in accordance with instructions furnished with each manufacturer's penetrant material shall be observed. Highly volatile solvents shall be used cautiously since the vapors may be toxic and the liquids may irritate the skin. Extreme care should be exercised in handling highly flammable solvents.

6. EXAMINATION METHOD

6.1 Surface Condition

Unless otherwise specified by the customer, all penetrant examinations shall be performed on components in their final surface condition.

The surface to be examined and all adjacent areas within 1 inch shall be dry and free from dirt, grease, lint, scale, welding flux, weld spatter, oil, paint, or any other extraneous matter to the extent that it shall not obscure surface openings or otherwise interfere with the examination.

CAUTION

Blasting with shot or dull sand may peen discontinuities on the surface and shall not be used.

NOTE

Where surface conditions are not in accordance with Paragraph 6.1 and correction is not feasible, SwRI will conduct the examination only at the request of the customer. The specific surface condition and its probable effect on the examination shall be noted on the SwRI Liquid Penetrant Examination Record.

6.2 Preexamination Cleaning

The surface to be examined and adjacent areas within at least 1 inch shall be thoroughly washed with precleaner in such a manner that foreign material and contaminants are removed.

The examination surface shall then be wiped dry with a lint-free cloth or absorbent paper, allowing a minimum of 5 minutes for complete evaporation.

6.3 Temperature Readings

After preexamination cleaning and before application of penetrant, the temperature of the examination surface and penetrant shall be measured and recorded on the SwRI Liquid Penetrant Examination Record. The serial number of the thermometer used shall also be recorded. The temperature of the penetrant and the surface shall not be below 60°F nor above 125°F throughout the examination period.

6.4 Application of Penetrant

The penetrant shall be taken from a pressurized container to ensure its purity. It shall be applied by brushing or spraying and shall evenly cover all areas of the surface being examined.

The allowable minimum and maximum penetrant dwell times shall be as follows:

Component Temperature (°F)	Dwell Time (Minutes)
60-70	20-30
71-90	10-30
91-100	10-20
101-125	10-15

When examinations are to be performed on components whose temperature is below 60°F or above 125°F, this procedure shall be qualified in accordance with the requirements of Section V, Article 6, Subarticle T-647.

The penetrant shall not be allowed to dry. If drying occurs, the penetrant shall be removed and the process repeated, starting with the preexamination cleaning of Paragraph 6.2.

6.5 Removal of Excess Penetrant

Initially, the excess penetrant shall be removed by wiping the surface with clean, dry, lint-free cloths or absorbent paper until most traces of excess penetrant have been removed.

A clean, dry, lint-free cloth or absorbent paper shall then be moistened with penetrant remover, and the surface shall be wiped lightly until all remaining traces of excess penetrant have been removed. Extreme care shall be employed to avoid the use of an excessive amount of remover in order to preclude the removal of penetrant from discontinuities.

The surface shall not be flushed nor receive direct application of remover prior to the application of the developer.

6.6 Drying

The surface shall be completely dry prior to the application of the developer.

Drying time shall be a minimum of 5 minutes to a maximum of 30 minutes after the excess penetrant has been removed.

6.7 Application of Developer

After sufficient agitation of the pressurized container to ensure that the particles in suspension are dispersed, a smooth, uniform layer of the suspended powder shall be sprayed onto the surface.

The developer shall be used sparingly. The proper developer thickness will dry to a thin, translucent layer. If the coating is too thick, it may mask indications. The examination surface shall be observed during the application of the developer to monitor the behavior of indications which tend to bleed-out profusely.

Final interpretation of indications shall be made a minimum of 7 minutes to a maximum of 30 minutes after the developer has been applied.

7. EXAMINATION

7.1 Examination Areas

(1) The examination area for Class 1 and 2 longitudinal and circumferential welds shall be the weld and adjacent base material for a distance of 1/2 inch on each side of the weld as shown in attached Figure 1.

(2) Class 1 longitudinal welds shall be examined along the entire length of the weld during the preservice examination and for at least one pipe-diameter length or 12 inches, whichever is less, from the fusion line of the intersecting circumferential weld during inservice examinations.

(3) Class 2 longitudinal welds shall be examined for at least 2-1/2t length from the fusion line of the intersecting circumferential weld during preservice and inservice examinations.

(4) The examination area for Class 2 branch connections shall be the weld and 1/2 inch of base material on each side of the weld fusion line, and for Class 1 branch connections the examination area shall be as shown in Figure 2.

EXCEPTION

If the Class 2 branch connection is a set-in type, the examination area shall be the weld, 1/2 inch of base material on the main run pipe side from the weld fusion line, and the base material on the branch pipe side from the weld fusion line to the end of the radius section.

(5) The examination area for Class 1 and 2 support attachments, integral attachment welds, and support circumferential weld joints shall be the weld and 1/2 inch of base material on each side of the weld fusion line as shown in Figure 3 or Figure 4, as applicable.

(6) The examination area for Class 1 socket welds in piping shall be the weld, 1/2 inch of base material on the pipe side, and 1.0 inch of base material on the fitting side as shown in attached Figure 1.

(7) The examination area for control rod drive housing welds shall be as shown in attached Figure 5.

(8) The Examination areas for vessel head-to-flange weld joints shall be as shown in Figure 4.

(9) The examination areas for Class 2 nozzles shall be as shown in Figure 6.

7.2 Examination Methods

Examinations shall be performed by placing the eye within 24 inches of the surface to be examined and at an angle no less than 30 degrees with the surface to be examined. A mirror may be used to improve the angle. In addition to general lighting, additional illumination of the examination area shall be provided at right and oblique angles to expose indications. The illumination shall be adequate to ensure no loss of sensitivity.

If the examination surface is sufficiently large to preclude complete examination within the prescribed times, the surface shall be examined in suitable increments.

7.3 Postexamination Cleaning

The developer and penetrant shall be removed by wiping the surface thoroughly with cloths saturated with a suitable solvent. Spraying directly on the examination areas with pressurized containers shall be allowed for postexamination cleaning.

The surface shall then be wiped dry with clean, lint-free cloths or absorbent paper.

7.4 Reexamination

Indications that are believed to be nonrelevant shall be reexamined to verify whether actual defects are present. Surface conditioning may precede the reexamination. Nonrelevant indications and broad areas of pigmentation that would mask indications are unacceptable.

NOTE

Indications that are obviously nonrelevant such as stamp marks or radiograph punch marks, shall only be recorded as a general remark on the SwRI Liquid Penetrant Examination Record.

8. RECORDING CRITERIA

Indications shall be recorded in accordance with the techniques outlined in the applicable revision of SwRI Nuclear Projects Operating Procedure IX-FE-116.

8.1 Linear Indications (Class 1 and Class 2)

Linear indications in welds, base material, and support attachments shall be recorded on the SwRI Liquid Penetrant Examination Record and reported to the customer in accordance with the recording criteria table below:

Nom. Wall Thickness (Inches)	Overall Indication Length As Defined in Attached Figure 7 (Inches)
Less than 1.0	1/8
1.0 to less than 2.5	3/16
2.5 and greater	1/4

EXCEPTION

In Class 2 nozzles, the following linear indications shall be recorded: any linear indication greater than 1/16 inch long for materials less than 5/8 inch thick, greater than 1/8 inch long for materials from 5/8 inch to less than 2 inches thick, and 3/16 inch long for material 2 inches and greater in thickness.

8.2 Rounded Indications (Class 2)

Rounded indications shall be recorded as follows:

(1) Rounded indication with dimensions greater than 1/8 inch for thicknesses less than 5/8 inch and dimensions greater than 3/16 inch for thicknesses 5/8 inch and greater.

(2) Four or more rounded indications in a line separated by 1/16 inch or less.

(3) Ten or more indications in any six square inches of area whose major dimension is no more than 6 inches with the dimensions taken in the most unfavorable location relative to the indications being evaluated.

When conditions limit the area of examination, the limitations shall be recorded.

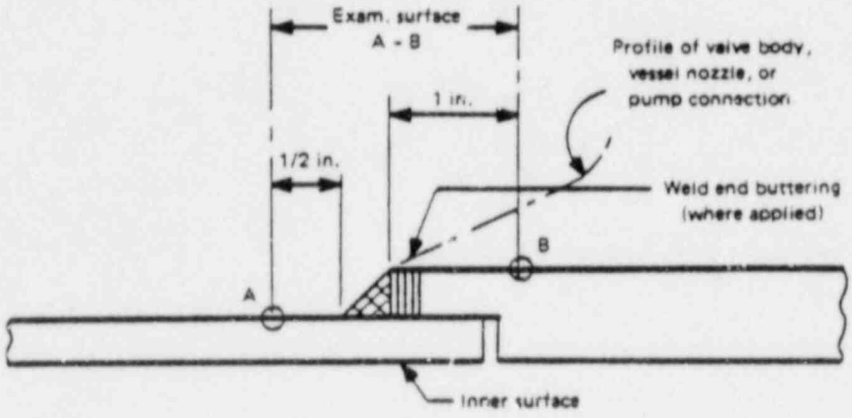
9. EVALUATION

Initial evaluation of reportable indications shall be performed by SwRI personnel, and shall be conducted in accordance with the applicable ASME Boiler and Pressure Vessel Code, Section XI, Article IWA-3000. Final evaluation and disposition of reportable indications shall be the responsibility of the customer.

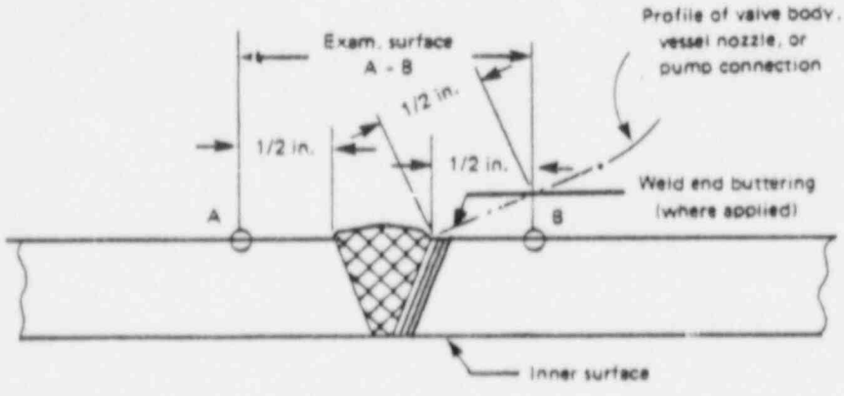
10. RECORDS

Documents generated in accordance with this procedure shall be stored as specified in the SwRI Project Plan. The customer shall receive copies of these documents in the Examination Report, unless specified otherwise in the SwRI Project Plan.

FIGURE 1



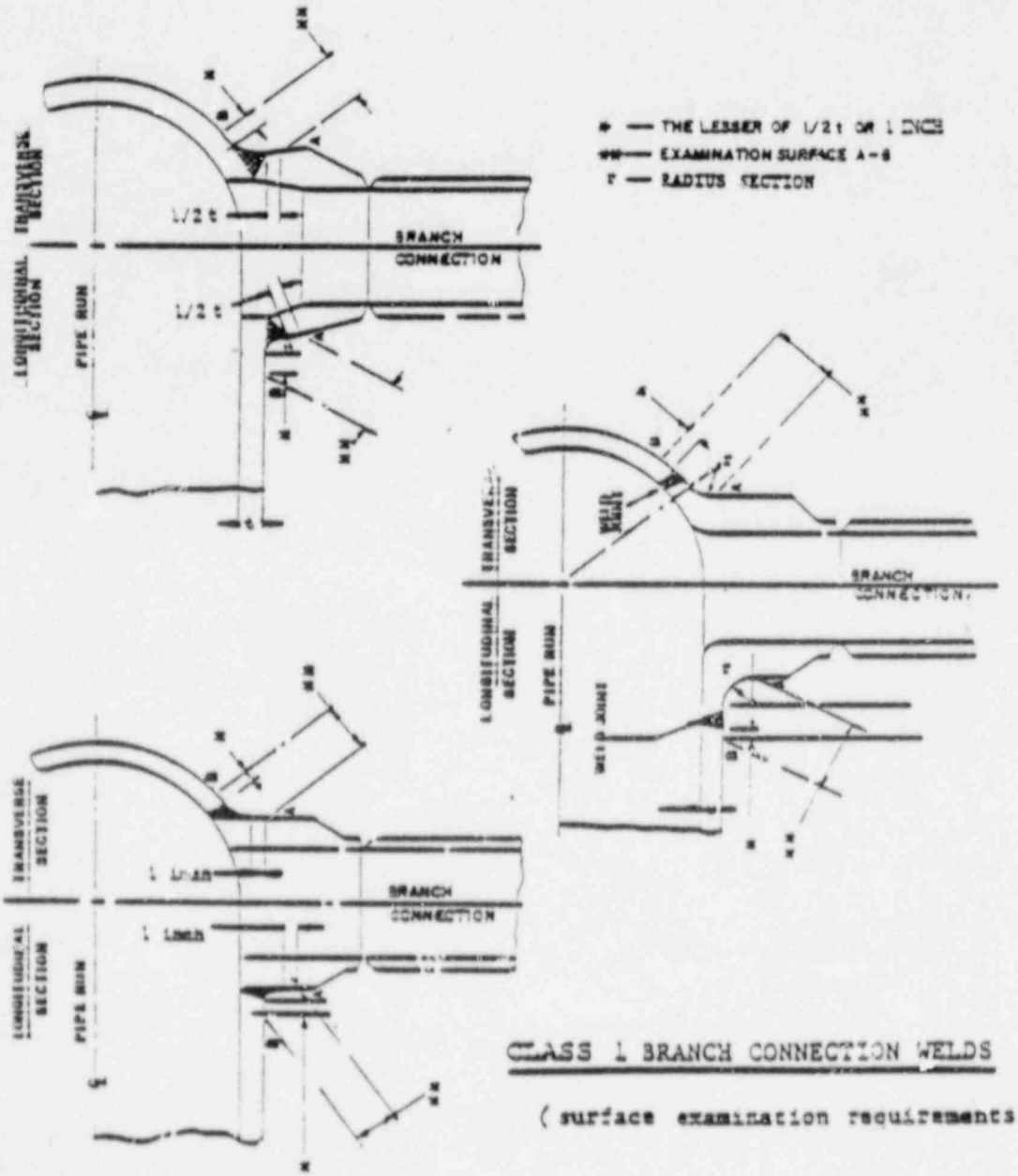
(a) Sockat Weld



(b) Butt Weld

SIMILAR AND DISSIMILAR METAL WELDS IN COMPONENTS AND PIPING

FIGURE 2



CLASS 1 BRANCH CONNECTION WELDS

(surface examination requirements)

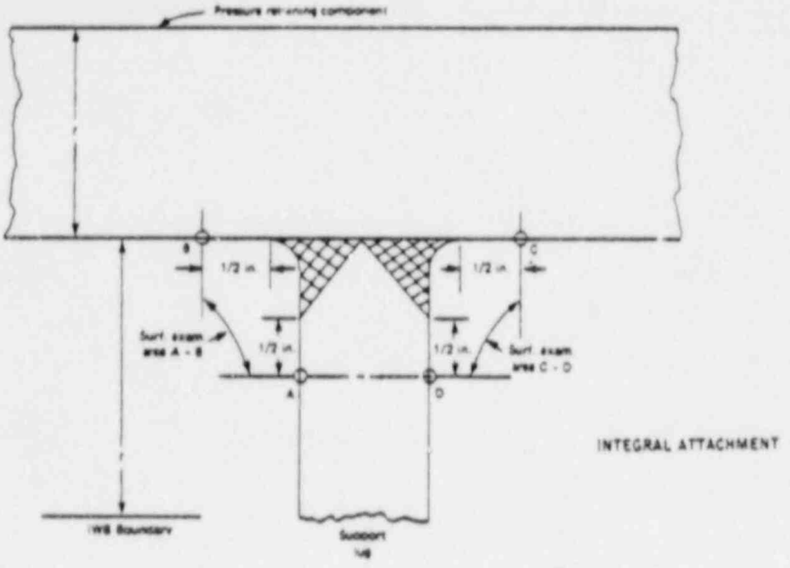
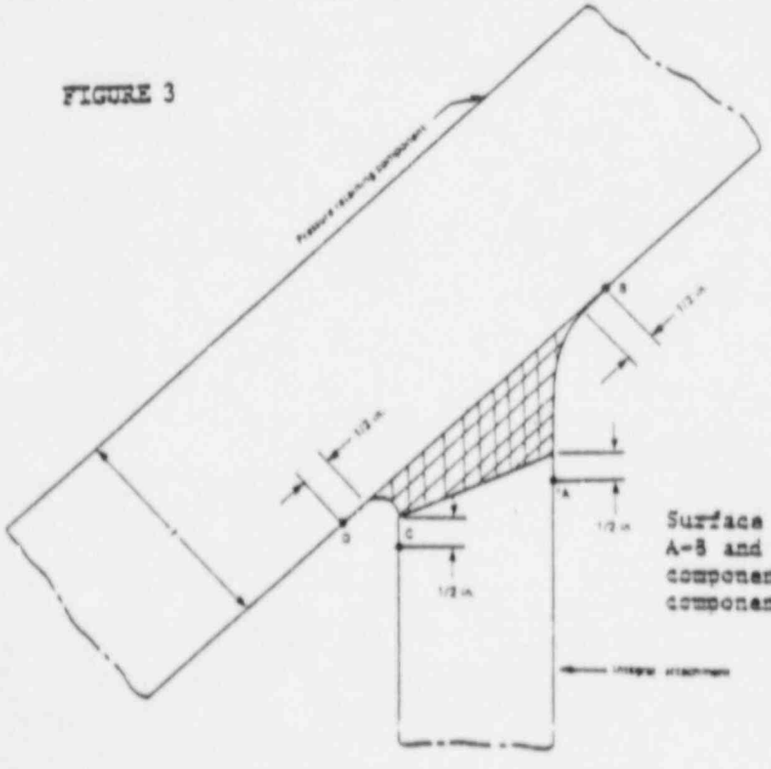


FIGURE 3



Surface examination areas: A-B and C-D for Class 1 components; A-B for Class 2 component

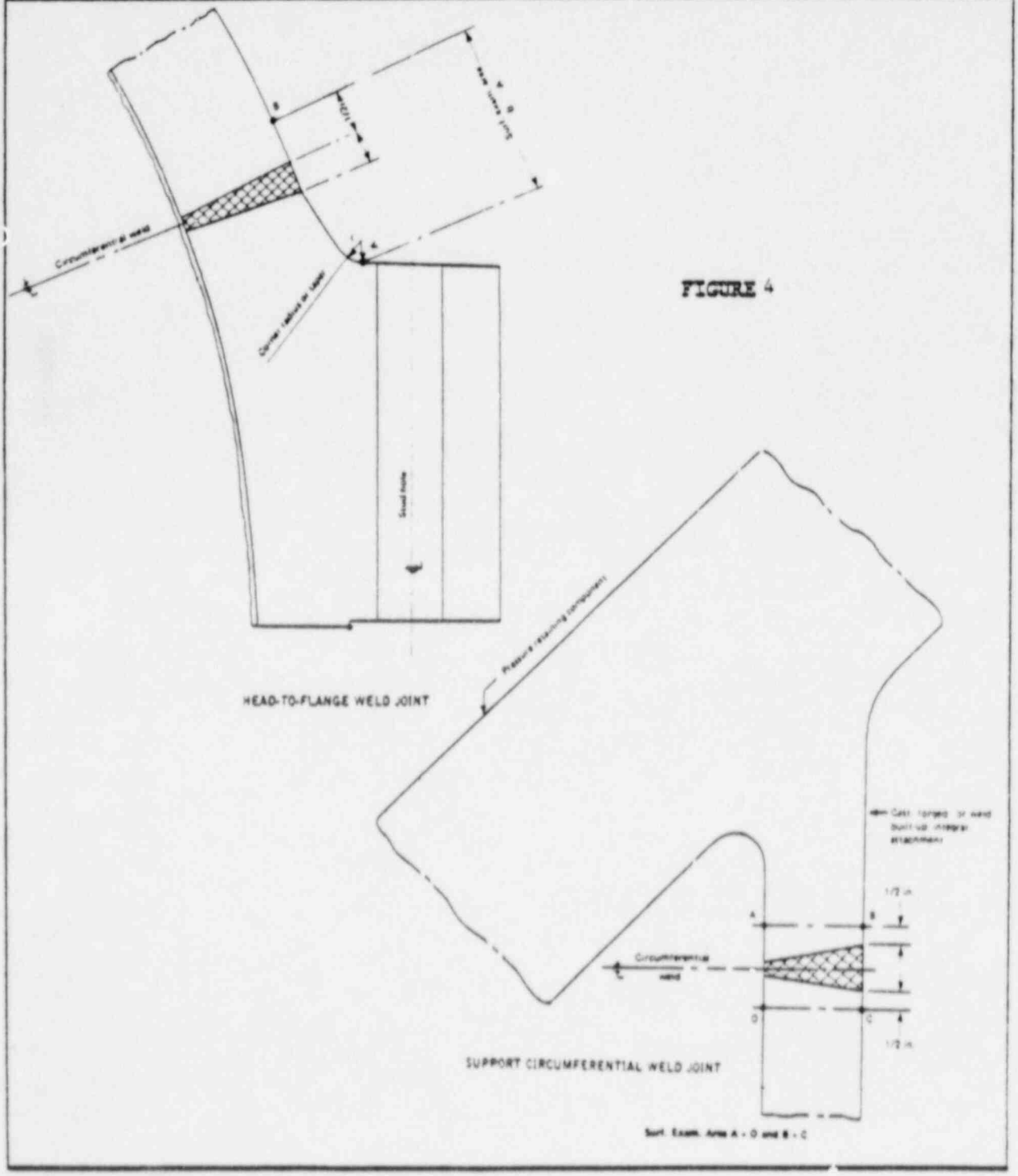
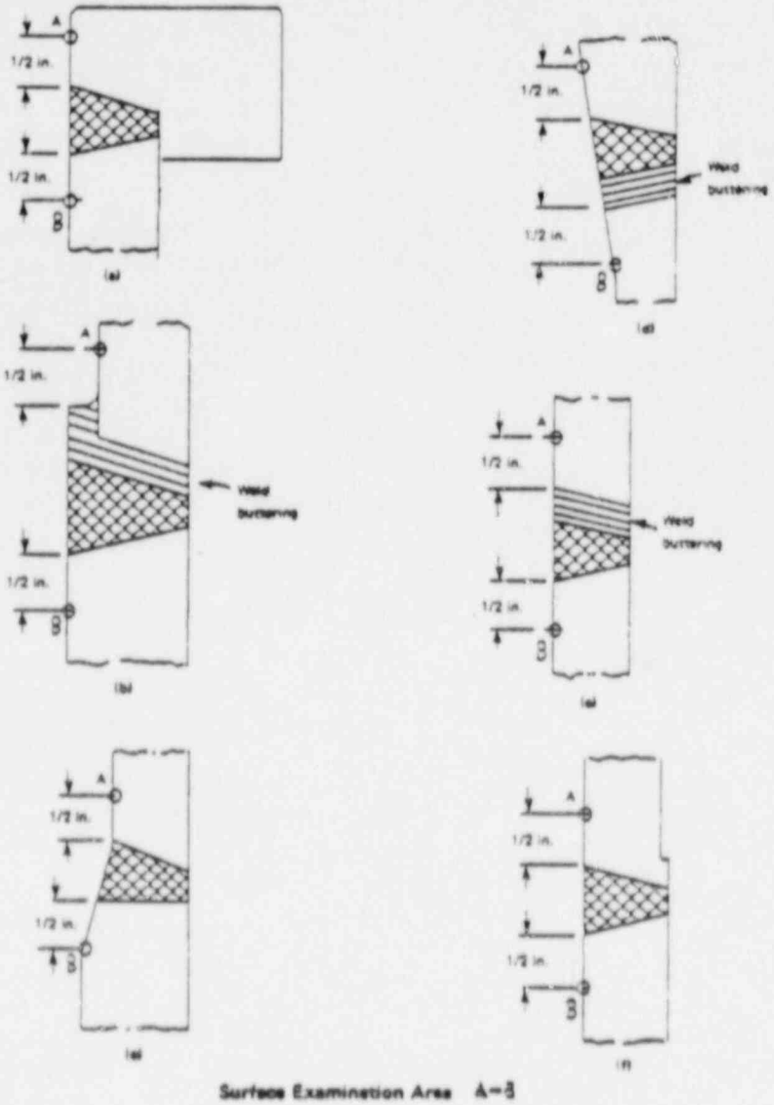

HEAD-TO-FLANGE WELD JOINT
SUPPORT CIRCUMFERENTIAL WELD JOINT

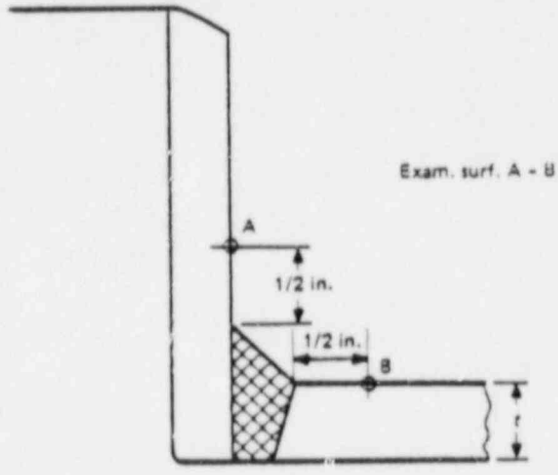
FIGURE 4



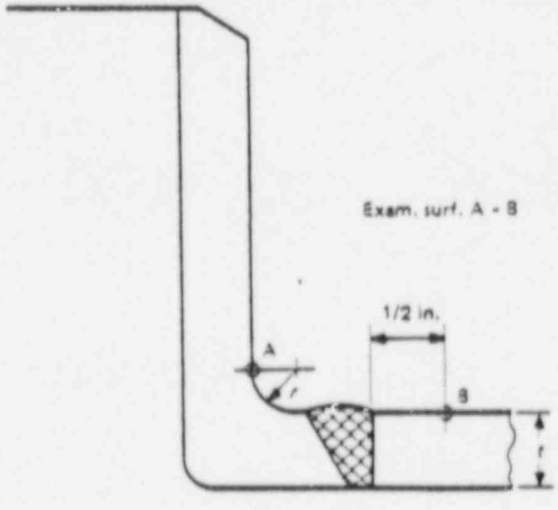
Surface Examination Area A–B

CONTROL ROD DRIVE HOUSING WELDS

FIGURE 5



(a)

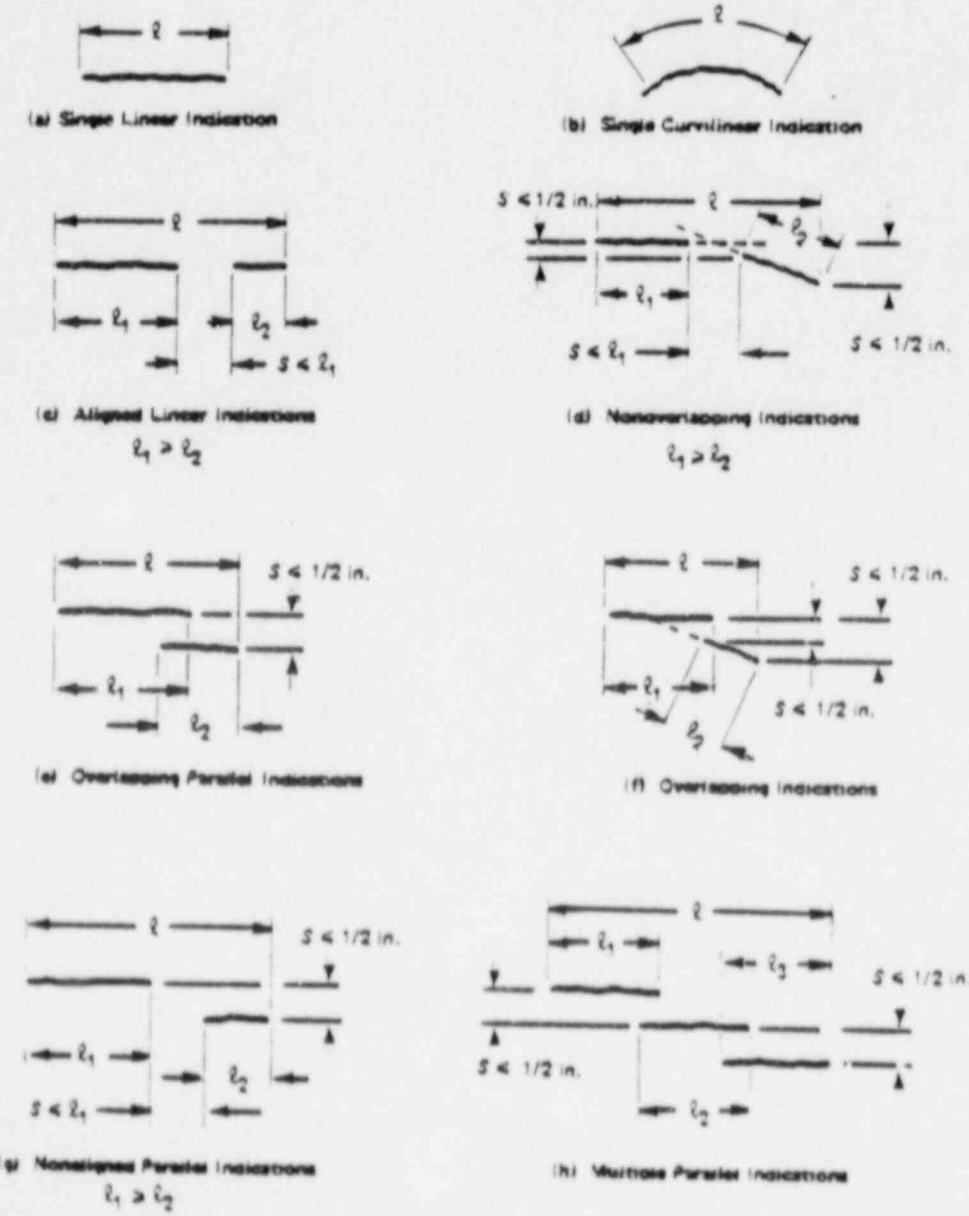


(b)

FIGURE 6

REQUIREMENTS FOR CLASS 1 NOZZLE-TO-VESSEL WELDS

FIGURE 7



LINEAR SURFACE INDICATIONS

Illustrative Flaw Configurations and Determination of Length ℓ

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECTS
OPERATING PROCEDURE

SwRI-NDT-300-1
Revision 23
July 1981

Title

DRY POWDER MAGNETIC PARTICLE EXAMINATION

EFFECTIVITY AND APPROVAL

Revision 23 of this procedure became effective on 29 July 1981. Other revisions of the base document may be effective concurrently.

Approvals				SA
Written By: DW Fournell	Date: 21 July 81	Technical Review: [signature]	Date: 27 JULY 81	A.R.
Manager of Q.A.: [signature]	Date: 28 Jul 81	Cognizant Director: Wayne J. Black	Date: 7/24/81	

The following information may be used for convenience. Completion of this portion is not mandatory.

Deviation No.								
Date Effective								
Procedure Section(s) Affected								

Notes:

DRY POWDER MAGNETIC PARTICLE EXAMINATION

SwRI-NDT-300-1

1.0 PURPOSE

This procedure provides the technical information and detailed steps required to ensure proper dry powder magnetic particle examinations of ferromagnetic materials in accordance with the applicable ASME Boiler and Pressure Vessel Codes.

2.0 SCOPE AND APPLICATION

(1) This procedure shall be utilized for the dry powder magnetic particle examination of ferromagnetic materials employing alternating current (AC) yoke techniques.

(2) Areas to be examined shall be components, longitudinal and circumferential welds, butt and fillet welds of branch connections, and support attachments as specified in the applicable SwRI Examination Plan.

2.1 Applicable Documents

The following documents form a part of this procedure as applicable:

(1) ASME Boiler and Pressure Vessel Code, Section XI, 1977 Edition, with Addenda through Summer 1978, "Rules for Inservice Inspection of Nuclear Power Plant Components."

(2) ASME Boiler and Pressure Vessel Code, Section V, 1977 Edition, with Addenda through Summer 1978, "Nondestructive Examination."

(3) SwRI Nuclear Quality Assurance Program Manual (NQAPM).

3.0 RESPONSIBILITY

(1) The Director of the Department of Engineering Services, Quality Assurance Systems and Engineering Division, shall be responsible for the preparation, review, approval, and control of this procedure.

(2) The Project Manager shall be responsible for the implementation of this procedure in accordance with the NQAPM specified in the applicable SwRI Project Plan.

(3) The examiner shall be responsible for implementing the requirements of this procedure.

(4) The Manager of Support and Administration Section of the Quality Assurance Systems and Engineering Division, shall be responsible for storage of records generated in accordance with this procedure.

4.0 CODE AND PROCEDURE REQUIREMENTS

The requirements listed below shall be applied when performing dry powder magnetic particle examinations.

Requirements		Section
(1)	Materials, shapes, or sizes to be examined	2.0 & 7.0
(2)	Type of magnetization to be used	5.0
(3)	Equipment	5.0
(4)	Surface preparation ([illegible] and cleaning)	7.0
(5)	Ferromagnetic particles to be used	5.0
(6)	Magnetization current	2.0 & 5.0
(7)	Demagnetization	7.0

(8) Coverage 7.0

(9) Personnel Certification 5.0

5.0 PERSONNEL AND EQUIPMENT

5.1 Personnel Certification

Personnel shall be certified in accordance with SwRI NQAP 11-1, "Special Process Control."

5.2 Equipment

(1) AC electromagnetic yokes with a minimum lifting power of 10 pounds with a pole spacing of 3 to 6 inches shall be used.

(2) Dry magnetic particles shall be utilized as the examination medium. The color selected shall provide adequate contrast with the background of the examination area.

(3) Dry magnetic particles shall be selected from the following:

(a) Magnaflux Red No. 8A Powder

(b) Magnaflux Gray No. 1 Powder

(c) Magnaflux Black No. 3A Powder

(d) Dry magnetic particles equivalent to those specified above may be used.

(4) Devices normally used for application of dry magnetic particles are listed below.

(a) Magnetic Particle Puffer Bottle, Model PB-1.

(b) Magnaflux Pneumatic Applicator.

5.3 Calibration Block

A calibration block of a ferromagnetic material weighing a minimum of 10 pounds shall be used to confirm the lifting power of AC yokes.

6.0 CALIBRATION METHOD

6.1 Calibration

The applicable calibration block described in Paragraph 5.3 of this procedure shall be used to verify proper operation of the AC electromagnetic yoke:

(1) At the start of a series of examinations

(2) With any substitution of examination personnel

(3) With any substitution of power source

(4) At least every 4 hours during the examination

(5) At the finish of a series of examinations

(6) At any time when, in the opinion of the examiner, there is doubt as to the proper operation of the yoke.

The time that an AC electromagnetic yoke is verified shall be entered on the "SwRI Magnetic Particle Examination Record."

7.0 EXAMINATION

7.1 Examination Area

The examination area for circumferential and longitudinal welds shall be the weld and adjacent base material for 1/2 inch to either side of the weld fusion line.

The examination area for branch connections shall include the weld and the base material on the main run pipe side of the weld for the lesser of 1 inch or 1/2t; the examination area on the branch connection side of the weld shall include the base material for the area shown in Sketch 1.

The examination area for support attachments shall include the weld and base material of the main run pipe for a distance of 1/2 inch and the base material of the support attachment for 1/2 inch.

Examinations shall be performed on components in the final surface condition.

7.2 Surface Preparation

The examination area of welds and adjacent base materials shall be free from sharp surface irregularities such as deep valleys between stringer beads.

The examination area shall be clean and dry. The examination area and minimum of 1 inch on each side of the examination area shall be free from oil, sand, rust, grease, paint, slag, loose scale, or other surface conditions which may mask indications of unacceptable discontinuities.

After slag removal, as-welded surfaces shall be considered suitable, without grinding, if the weld contour blends into the base material without undercutting.

NOTE

Where surface conditions are not in accordance with Paragraph 7.2 and correction is not feasible, SwRI will conduct the examination only at the request of the customer. The specific surface condition and its probable effect on the examination shall be noted in the "SwRI Magnetic Particle Examination Record."

7.3 Examination Method

Variable electromagnetic yoke pole spacing shall be a maximum of 9.0 inches, measured on the material surface between the centerline of the poles. The straight line distance measured between the centerline of the poles shall not exceed 6.0 inches under any circumstances.

The dry magnetic particles used shall be applied by lightly dusting a small quantity over the examination area. If a pneumatic applicator is used, the excess shall be removed with a gentle stream of air.

Examinations shall be conducted using the "Continuous Method." The AC electromagnetic yoke shall remain activated during the application and removal of excess material.

The AC electromagnetic yoke shall be applied twice in the examination area. The second examination shall be conducted with the lines of magnetic flux approximately at right angles to the first application. Overlap shall be sufficient to ensure the entire examination area is covered.

7.4 Postexamination Cleaning

Arrangements shall be made with the customer for postexamination removal of dry magnetic particles.

Demagnetization of the examination area is not required.

8.0 RECORDING CRITERIA

Indications shall be recorded in accordance with the techniques outlined in SwRI Nuclear Projects Operating Procedure IX-PE-116, "Recording Data From Direct Visual, Liquid Penetrant, and Magnetic Particle Examinations."

8.1 Welds and Base Material

The following indications shall be recorded on the appropriate "SwRI Magnetic Particle Examination Record" and reported to the customer:

Nom. Wall Thickness (Inches)	Indication Length or Diameter (Inches)
<1.0	1/8
1.0 to <2.0	3/16
2.0 and greater	1/4

8.2 Support Attachments

The following indications shall be recorded on the appropriate "SwRI Magnetic Particle Examination Record" and reported to the customer:

Nom. Wall Thickness (Inches)	Indication Length or Diameter (Inches)
5/8 to < 2.0	3/16
2.0 and greater	1/4

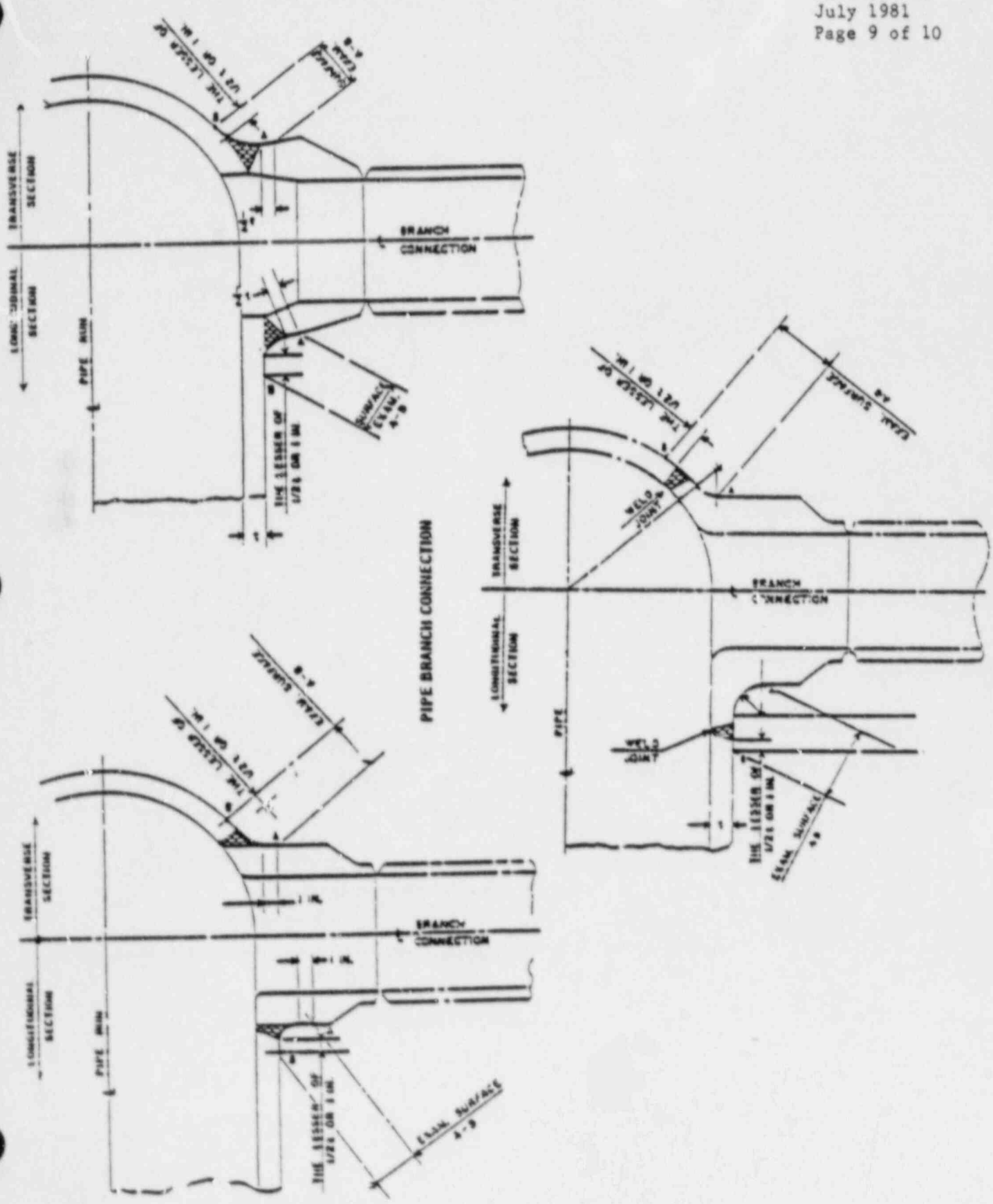
9.0 EVALUATION

Evaluation of reportable indications shall be the responsibility of the customer, or customer's representative, and shall be conducted in accordance with Section XI, Article IWA-3000 of the ASME Boiler and Pressure Vessel Code. The applicable year and Addenda of the Code shall be as specified in Paragraph 2.1.

10.0 RECORDS

The customer shall receive copies of documents generated in accordance with this procedure in the examination report.

Permanent documents generated in accordance with this procedure shall be retained as a portion of the examination report. The examination report shall be stored by the Manager of the Support and Administration Section, Quality Assurance Systems and Engineering Division, in the Data Storage Facility for the period specified by the contractual agreement with the customer.


PIPE BRANCH CONNECTION
TRANSVERSE SECTION
LONGITUDINAL SECTION
BRANCH CONNECTION
PIPE RUN
PIPE

SKETCH 1

Sw. R. I. MAGNETIC PARTICLE EXAMINATION RECORD

PROJECT No.:	SITE:		DATE: (DAY - MO - YR)	TIME: (24 HR. CLOCK) EXAM STARTED: EXAM ENDED:	SHEET No.:
EXAMINATION AREA: (SYSTEM/COMPONENT)	LINE / SUBASSEMBLY:		IDENTIFICATION:	L o LOCATION:	W o LOCATION:
EXAMINER:	SNT LEVEL	PROCEDURE No.	SURFACE FINISH:	WELD TYPE (—FLOW—►)	MAGNETIZATION
EXAMINER:	SNT LEVEL	REV. DEV.	MATERIAL		YOKE SPACING: IN YOKE BRAND: SERIAL No.:
CALIBRATION BLOCK SERIAL No.: WEIGHT:	CALIBRATION VERIFICATION TIME: INITIALS:	DISTANCE FROM BLACK LIGHT TO SENSOR CELL IN	BRAND: BATCH No.: TYPE: COLOR:	WET ☐ DRY ☐ FLUORESCENT ☐ MIXED NO ☐ YES ☐ MIXED WITH	SURFACE TEMP. °F THERMOMETER SERIAL No.:
BLACK LIGHT BRAND: SERIAL No.:	INTENSITY METER BRAND: SERIAL No.:	BLACK LIGHT OUTPUT $\mu w/cm^2$	BLACK LIGHT OUTPUT VERIF. TIME: INITIALS:	MATERIAL APPLICATION:	DUSTING ☐ FLOODING ☐ SPRAYING ☐

IND No.	L	W	LOCATION	ROUND OR LINEAR	SIZE DIA. OR LENGTH	REMARKS:	INI.

EXAMINATION AREA LIMITATION: (IF NONE SO STATE)

REVIEWED BY:	SNT LEVEL	DATE:	PAGE

FORM No. SWRI NDTR 17 - 12 (REV. 11-26-79)

PROCEDURE DEVIATION

Procedure	Revision No.	Deviation No.
SwRI-NDT- 300-1	35	2

The following examination areas are affected by this deviation:

Deviation 2 supersedes Deviation 1.
Magnetic particle examinations to be performed in accordance with this procedure.

The following paragraphs shall be deviated from as indicated:

Change Paragraph 7.3 Examination Method to Read as follows:

7.3 Examination Method

Variable electromagnetic yoke pole spacing shall be a maximum of 9.0 inches, measured on the material surface between the centerline of the poles. the straight line distance measured between the centerline of the poles shall be no greater than 6.0 inches and shall not exceed the distance used during calibration verification.

The dry magnetic particles used shall be applied by lightly dusting a small quantity over the examination areas. If a pneumatic applicator is used, the excess shall be removed with a gentle stream of air.

The AC electromagnetic yoke shall remain activated during the application and removal of excess material.

(Continued on Page 2)

Rationale for deviation:

This deviation incorporates examination technique and recording criteria as requested by Public Service Electric and Gas Company.

Deviation Affects Qualification	YES ☐ NO ☒	If the deviation is determined to affect the procedure qualification, the deviation shall be qualified in accordance with Procedure IX-PE-107.

APPROVALS

SA FLD

Written by:	Date:	Technical Review:	Date:
[signature]	15FEB88	James J. McAllen Level III-T	2-15-88
		Verbal Approval Given? ☐ Yes ☒ No	Date:
Manager of Q.A.: [signature] 2/15/88 T.C. Silcock	Date: 2/15/88	Cognizant Director: Gaddy L. Coffelder for DFR	Date: 15Feb88

The following paragraphs shall be deviated from as indicated (Cont.):

7.3 Examination Method (Cont.)

The AC electromagnetic yoke shall be applied twice in the examination area with the lines of flux at right angles (in the case of welds, the magnetic flux will be induced when the component configuration permits, parallel and transverse to the weld). Overlap shall be sufficient to ensure the entire examination area is covered.

NOTE

Broad areas of particle accumulation which might mask indications from discontinuities are unacceptable, and shall be cleaned and reexamined.

Change Section 8 Recording Criteria to Read as follows:

8. RECORDING CRITERIA

Indications shall be recorded in accordance with the techniques outlined in the applicable revision of SwRI Nuclear Projects Operating Procedure IX-FE-116.

8.1 Linear Indications

Linear indications shall be recorded on the SwRI Magnetic Particle Examination Record and reported to the customer for disposition in accordance with the recording criteria table below:

Nominal Wall Thickness (Inches)	Overall Indication Length as Defined in Attached Figure 1 (Inches)
Less than 1.0	1/8
1.0 to less than 2.5	3/16
2.5 and greater	1/4

NOTE

For Preservice examination, indications with a length of 1/16 inch in ferritic piping less than .312 inches in thickness shall be recorded.

Rounded indications shall be recorded based on diameters corresponding to the linear indication recording criteria and reported to the customer for disposition.

When conditions limit the area of examination, the limitations shall be recorded.

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECTS
OPERATING PROCEDURE

SwRI-NDT-300-1
Revision 35
December 1987

Title

DRY POWDER MAGNETIC PARTICLE EXAMINATION

EFFECTIVITY AND APPROVAL

Revision 35 of this procedure became effective on Dec 11, 1987. Other revisions of the base document may be effective concurrently.

3A FLD

Approvals

Written By DWFarnell	Date 1 Dec. 1987	Technical Review	Date 9 DEC 1987
Manager of Q.A. S C Silvrid	Date 11 Dec 1987	Cognizant Director Wayne J. Black	Date 12/11/87

The following information may be used for convenience. Completion of this portion is not mandatory.

Deviation No.								
Date Effective								
Procedure Section(s) Affected								

Notes:

DRY POWDER MAGNETIC PARTICLE EXAMINATION

SwRI-NDT-300-1

1. PURPOSE

This procedure provides the technical information and detailed steps required to ensure a proper dry powder magnetic particle examination of ferromagnetic material in accordance with the applicable American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Codes.

2. SCOPE AND APPLICATION

(1) This procedure shall be utilized for the dry powder magnetic particle examination of ferromagnetic materials employing alternating current (AC) yoke techniques.

(2) Areas to be examined shall be ferritic components, longitudinal and circumferential welds, support attachments, and butt and fillet welds of branch connections as specified in the applicable Southwest Research Institute (SwRI) Examination Plan.

3. APPLICABLE DOCUMENTS

(1) ASME Boiler and Pressure Vessel Code, Section XI, 1983 Edition with Addenda through Summer 1983, "Rules for Inservice Inspection of Nuclear Power Plant Components"

(2) ASME Boiler and Pressure Vessel Code, Section V, 1983 Edition with Addenda through Summer 1983, "Nondestructive Examination"

(3) SwRI Nuclear Quality Assurance Program Manual (NQAPM)

3.1 Applicable Examination Record

SwRI-NDTR Form No. 17-12, revision dated 11-26-79

4. RESPONSIBILITY

(1) The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division, shall be responsible for the preparation, review, approval, and control of this procedure.

(2) The Project Manager shall be responsible for the implementation of this procedure in accordance with the NQAPM specified in the applicable SwRI Project Plan.

(3) The examiner shall be responsible for implementing the requirements of this procedure.

(4) The Manager of the Support and Administration Section, Nondestructive Evaluation Science and Technology Division, shall be responsible for storage of records generated in accordance with this procedure.

5. PERSONNEL AND EQUIPMENT

5.1 Personnel Certification

Personnel shall be certified in accordance with SwRI NQAP 11-1, "Special Process Control."

5.2 Equipment

(1) AC electromagnetic yokes to be utilized shall have a lifting power of 10 pounds or greater at a pole spacing of 3 to 6 inches. Each yoke shall be calibrated at least once a year, or whenever the yoke has been subjected to any repair, periodic overhaul, or damage, or has not been used for a year or more.

(2) A calibration block of a ferromagnetic material weighing a minimum of 10 pounds shall be used to confirm the lifting power of AC yokes.

(3) Dry magnetic particles shall be utilized as the examination medium. The color selected shall provide adequate contrast with the examination area.

(4) Dry magnetic particles shall be selected from the following:

(a) Magnaflux Red No. 8A Powder

(b) Magnaflux Grey No. 1 Powder

(c) Magnaflux Black No. 3A Powder

(d) Dry magnetic particles equivalent to those specified above may also be used.

(5) Devices normally used for application of dry magnetic particles are listed below:

(a) Magnetic Particle Puffer Bottle, Model PB-1

(b) Magnaflux Pneumatic Applicator

6. CALIBRATION

The applicable calibration block described in Paragraph 5.2 of this procedure shall be used to verify the proper operation of the AC electromagnetic yoke:

(1) Prior to a series of examinations

(2) With any substitution of examination personnel

(3) With any substitution of the AC power source

(4) At least every 4 hours during the examination

(5) At the completion of a series of examinations

(6) When the proper operation of the yoke is in doubt

(7) At the maximum pole spacing to be used during the examination

All electromagnetic yoke verification times shall be entered on the SwRI Magnetic Particle Examination Record.

7. EXAMINATION

7.1 Examination Area

Components, parts, and methods of examination shall be as specified in ASME Boiler and Pressure Vessel Code, Section XI, Tables IWB-2500 and IWC-2500.

(1) The examination area for Class 1 and Class 2 longitudinal and circumferential welds and support attachments shall be the weld and adjacent base material for a distance of 1/2 inch on each side of the weld.

(2) Class 1 longitudinal welds shall be examined along the entire length of the weld during the preservice examination and for at least one pipe-diameter length or 12 inches, whichever is less, from the fusion line of the intersecting circumferential weld during inservice examinations.

(3) Class 2 longitudinal welds shall be examined for at least 2-1/2t length from the fusion line of the intersecting circumferential weld during preservice and inservice examinations.

(4) The examination area for Class 1 branch connections shall be as shown on attached Figure 1.

(5) The examination area for Class 2 branch connections shall be the weld and 1/2 inch of base material on each side of the weld fusion line.

EXCEPTION

If the Class 2 branch connection is a set-in type, the examination area shall be the weld, 1/2 inch of base material on the main run pipe side from the weld fusion line, and the base material on the branch pipe side from the weld fusion line to the end of the radius section.

(6) The examination area for Class 1 and 2 support attachments, integral attachment welds, and support skirt circumferential weld joints shall be the weld and 1/2 inch of base material on each side of the weld fusion line as shown in Figures 2 and 3.

(7) The examination area for Class 1 socket welds in piping shall be the weld, 1/2 inch of base material on the pipe side, and 1.0 inch of base material on the fitting side.

(8) The examination areas for vessel head-to-flange weld joints shall be as shown in Figure 3.

(9) The examination areas for Class 2 nozzles shall be as shown in Figure 4.

7.2 Surface Preparation

Examination shall be performed on components in the final surface condition.

The examination area of welds and adjacent base materials shall be free of sharp surface irregularities such as deep valleys between stringer beads.

The examination area and a minimum of 1 inch on each side of the examination area shall be clean, dry, and free of oil, sand, rust, grease, slag, loose scale, or other surface conditions to the extent that they shall not mask indications of unacceptable discontinuities.

After slag removal, as-welded surfaces shall be considered suitable, without grinding, if the weld contour blends into the base material without undercutting.

NOTE

When surface conditions are not in accordance with the above and correction is not feasible, SwRI will conduct the examination only at the request of the customer. The specific surface condition and its effect on the examination shall be noted on the SwRI Magnetic Particle Examination Record. At the examiner's option, without precluding the requirements of Section 7.2 of this procedure, a magnetic particle indicator as described in Paragraph T-754 of ASME Section V may be used to verify the adequacy of the magnetizing field.

7.3 Examination Method

Variable electromagnetic yoke pole spacing shall be a maximum of 9.0 inches, measured on the material surface between the centerline of the poles. The straight line distance measured between the centerline of the poles shall be no greater than 6.0 inches and shall not exceed the distance used during calibration verification.

The dry magnetic particles used shall be applied by lightly dusting a small quantity over the examination area. If a pneumatic applicator is used, the excess shall be removed with a gentle stream of air.

The AC electromagnetic yoke shall remain activated during the application and removal of excess material.

The AC electromagnetic yoke shall be applied twice in the examination area. The second examination shall be conducted with the lines of magnetic flux approximately at right angles to the first application. Overlap shall be sufficient to ensure the entire examination area is covered.

NOTE

Broad areas of particle accumulation which might mask indications from discon-

7.4 Postexamination Cleaning

Arrangements shall be made with the customer for postexamination removal of dry magnetic particles.

Demagnetization of the examination area is not required.

8. RECORDING CRITERIA

Indications shall be recorded in accordance with the techniques outlined in the applicable revision of SwRI Procedure IX-FE-116.

8.1 Linear Indications (Class 1 and Class 2)

Linear indications shall be recorded on the SwRI Magnetic Particle Examination Record in accordance with the following table and reported to the customer:

Nom. Wall Thickness (Inches)	Overall Indication Length As Defined in Attached Figure 5 (Inches)
Less than 1.0	1/8
1.0 to less than 2.5	3/16
2.5 and greater	1/4

8.2 Rounded Indications (Class 2)

Rounded indications shall be recorded as follows:

(1) Rounded indication with dimensions greater than 1/8 inch for thicknesses less than 5/8 inch and dimensions greater than 3/16 inch for thicknesses 5/8 inch and greater

(2) Four or more rounded indications in a line separated by 1/16 inch or less

(3) Ten or more indications in any six square inches of area whose major dimension is no more than 6 inches with the dimensions taken in the most unfavorable location relative to the indications being evaluated

When conditions limit the area of examination, the limitations shall be recorded.

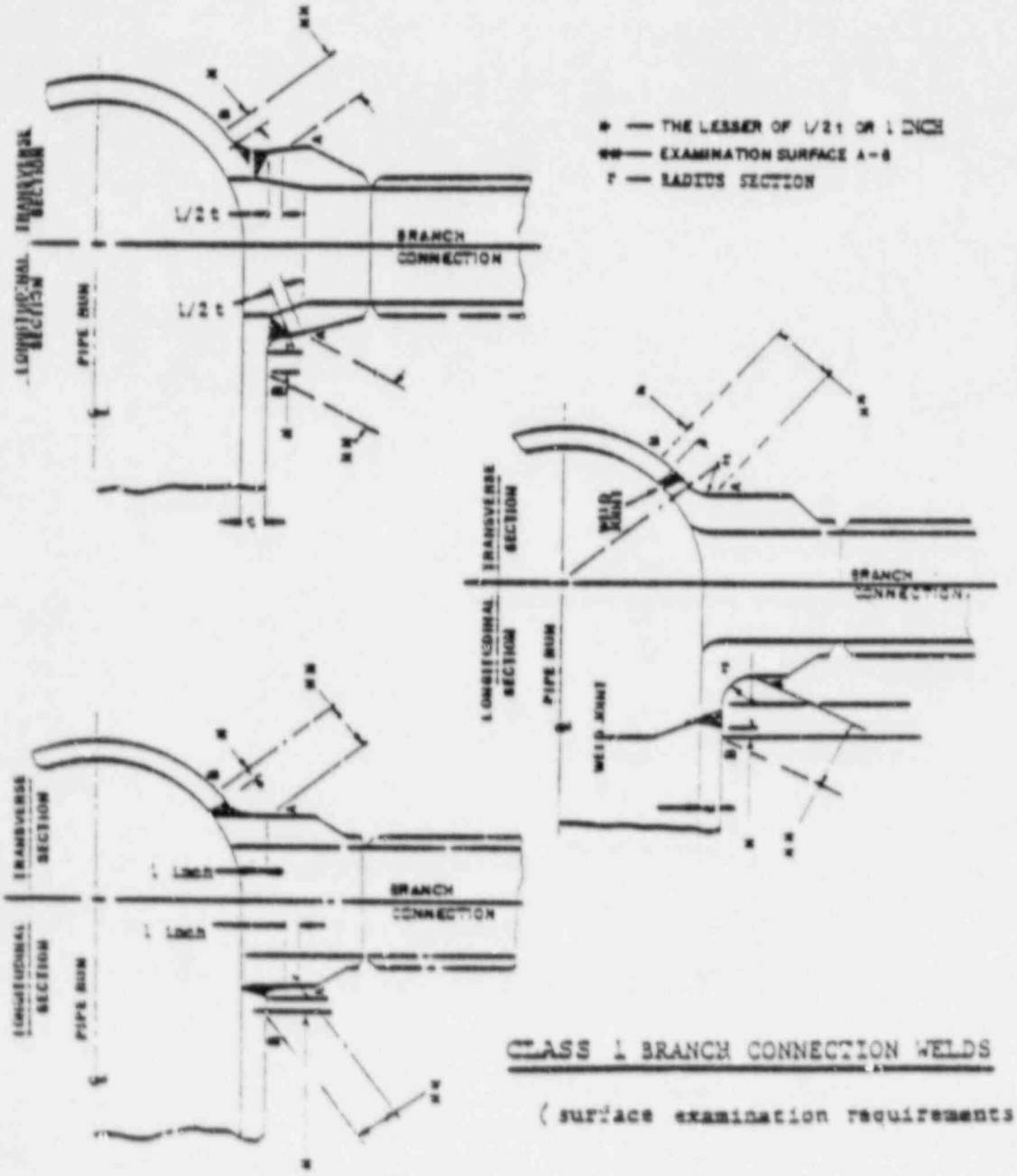
9. EVALUATION

Initial evaluation of reportable indications shall be performed by SwRI personnel, and shall be conducted in accordance with the applicable ASME Boiler and Pressure Vessel Code, Section XI, Article IWA-3000. Final evaluation and disposition of reportable indications shall be the responsibility of the customer.

10. RECORDS

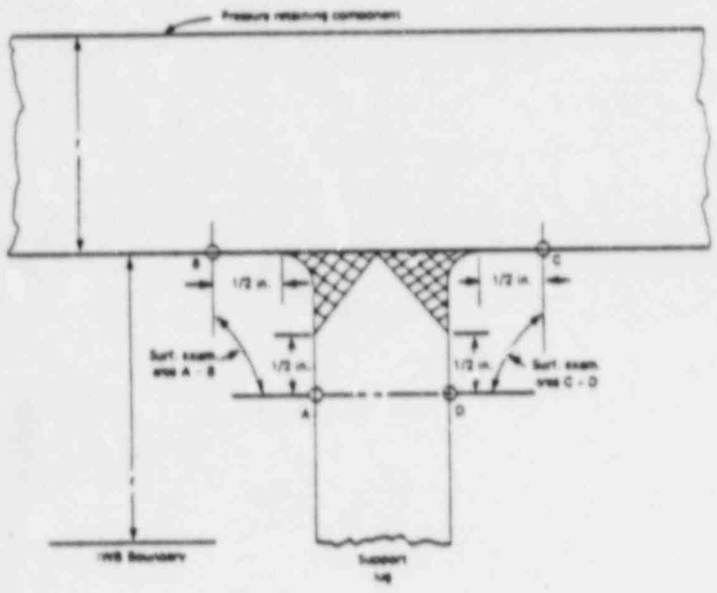
Documents generated in accordance with this procedure shall be stored as specified in the SwRI Project Plan. The customer shall receive copies of these documents in the Examination Report, unless specified otherwise in the SwRI Project Plan.

FIGURE 1



CLASS 1 BRANCH CONNECTION WELDS

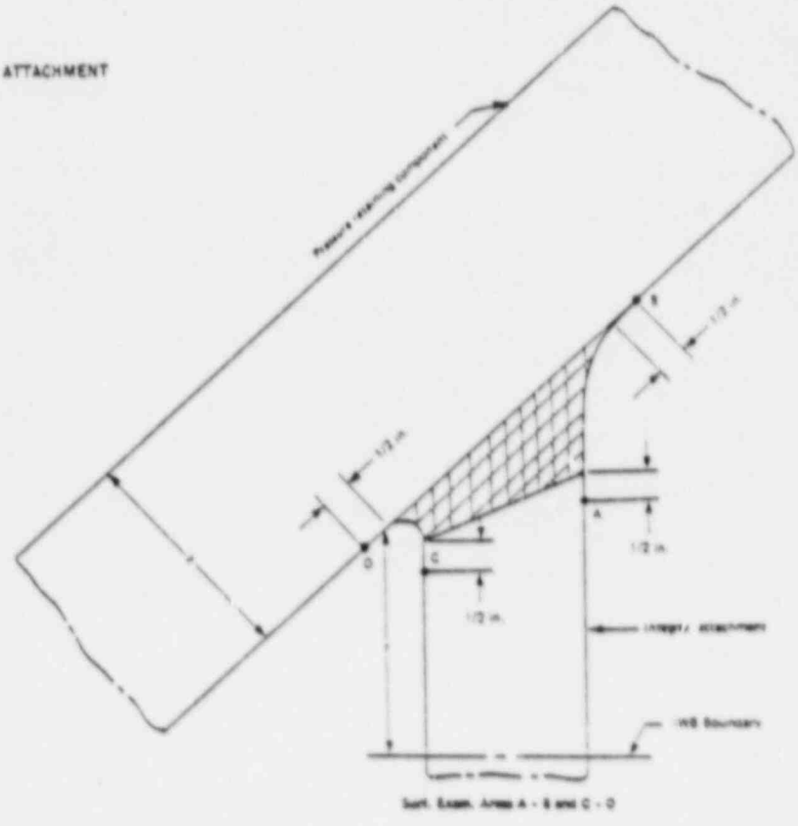
(surface examination requirements)



INTEGRAL ATTACHMENT

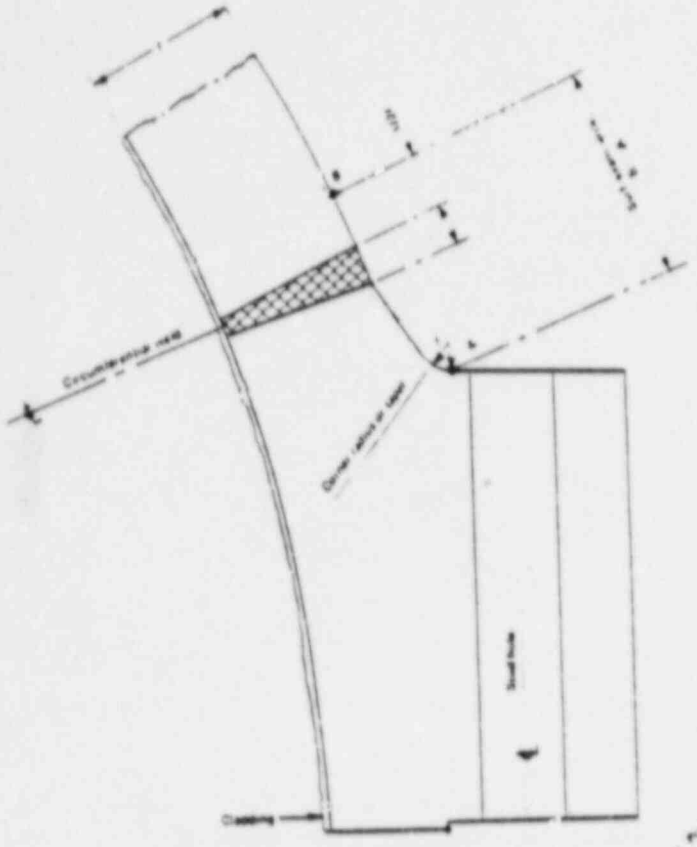
FIGURE 2

Surface examination areas:
A-B and C-D

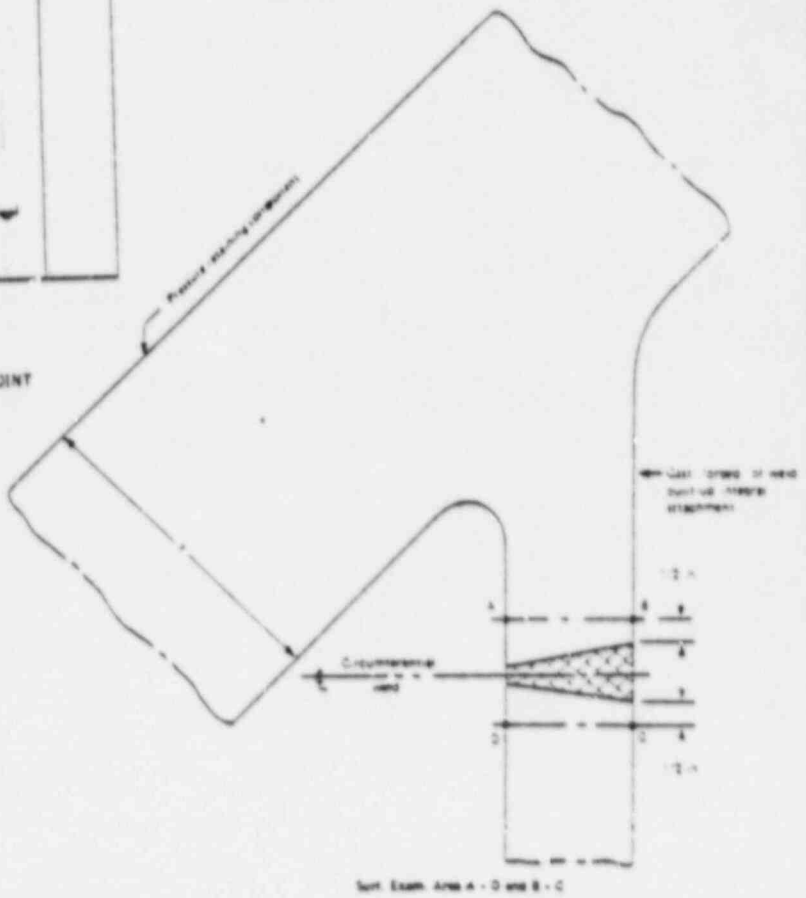


INTEGRAL ATTACHMENT WELD

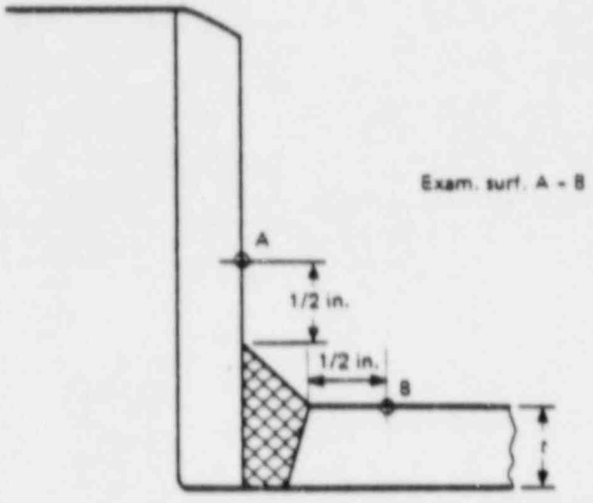
FIGURE 3



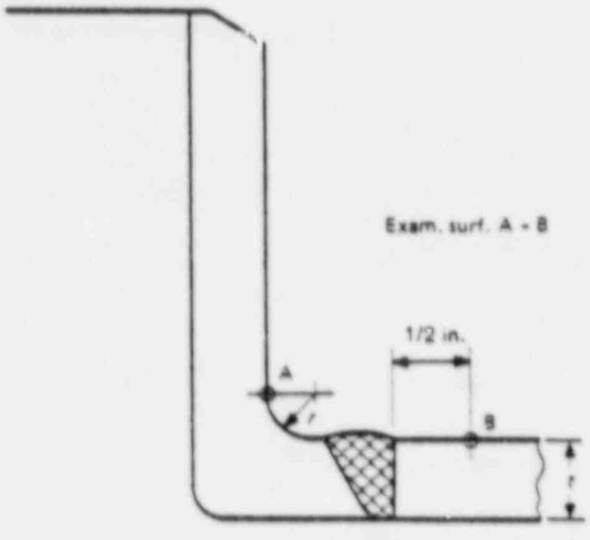
HEAD-TO-FLANGE WELD JOINT



SUPPORT CIRCUMFERENTIAL WELD JOINT



(a)

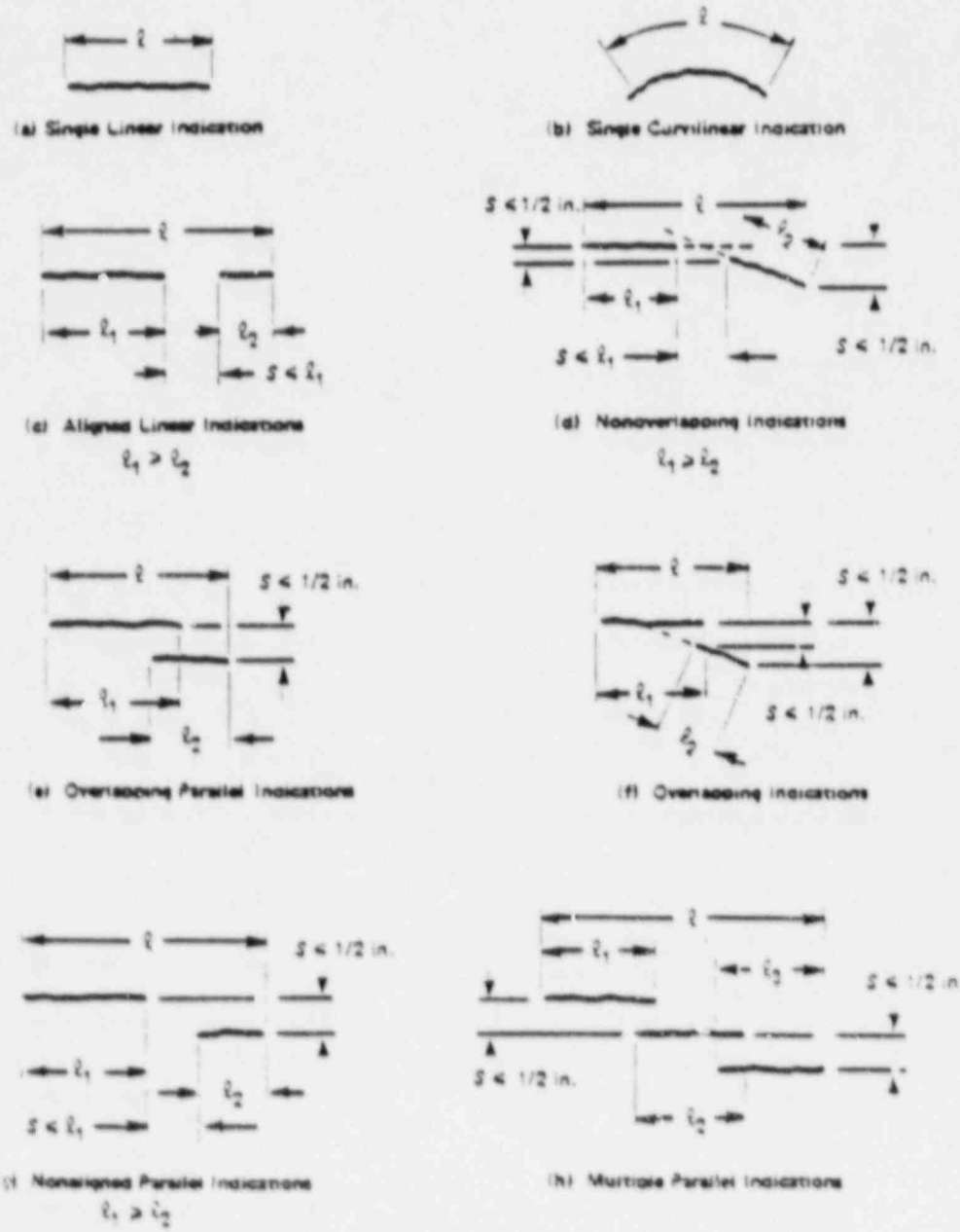


(b)

FIGURE 4

SURFACE EXAMINATION
REQUIREMENTS FOR CLASS 1 NOZZLE-TO-VESSEL WELDS

FIGURE 5



LINEAR SURFACE INDICATIONS

Illustrative Flaw Configurations and Determination of Length ℓ

PROCEDURE DEVIATION

Page 1 of 1 Pages

Procedure	Revision No.	Deviation No.
SwRI-NDT- 300-2	42	1

The following examination areas are affected by this deviation:

Fluorescent magnetic particle examinations performed in accordance with this procedure.

The following paragraphs shall be deviated from as indicated:

Change 5.6 to read as follows:

5.6 Thermometer

The thermometer to be used for measuring the component temperature shall be calibrated and certified and shall display a valid calibration tag as required by NQAP 10-1.

Rationale for deviation:

This change clarifies the temperature requirements of the Code.

Deviation Affects Qualification	YES ☐ NO ☒	If the deviation is determined to affect the procedure qualification, the deviation shall be qualified in accordance with Procedure IX-PE-107.

APPROVALS

SA FLD

Written by:	Date:	Technical Review:	Date:
DW Fawcett	14 Jan. 1988		14 Jan 88
		Verbal Approval Given? ☐ Yes ☒ No	Date: N/A
Manager of Q.A.:	Date:	Cognizant Director:	Date:
TC Edmond	15 Jan 1988	William J. Koch	1-15-88

SwRI FORM PE-4-6

PROCEDURE DEVIATION

Procedure	Revision No.	Deviation No.
SwRI-NDT- 300-2	42	2

The following examination areas are affected by this deviation:

Fluorescent magnetic particle examinations to be performed in accordance with this procedure.

The following paragraphs shall be deviated from as indicated:

Change Paragraph 5.3 Magnetic Particles to read as follows:

5.3 Magnetic Particles

(1) A Fluorescent magnetic suspension shall be utilized as the examination medium. It shall fluoresce with a color that will provide adequate contrast with the area being examined when illuminated by an ultraviolet lamp of suitable characteristics.

(2) Magnetic particles shall be suspended in a suitable liquid medium in the concentration recommended in SE-709, "Standard Recommended Practice for magnetic Particle Examination." Certified reports for magnetic particles, giving batch numbers and analysis results, shall be obtained from the supplier or by sample analysis of the batch to be used. Copies of the certified reports shall be retained with the examination records.

(3) Examination shall be performed utilizing Magnaglo No. 14AM aerosol - packaged fluorescent magnetic particle material.

(Continued on Page 2)

Rationale for deviation:

This deviation changes the material list and incorporates examination technique and recording criteria as requested by Public Service Electric and Gas Company.

Deviation Affects Qualification	YES ☐ NO ☒	If the deviation is determined to affect the procedure qualification, the deviation shall be qualified in accordance with Procedure IX-FE-107.

APPROVALS			SA FLD
Written by: [illegible signature]	Date: [illegible]	Technical Review: [signature]	Date: 2-15-88
		Verbal Approval Given? ☐ Yes ☒ No	Date:
Manager of Q.A. [signature] 2/15/88 S.C. Srbavich	Date: 2/15/88	Cognizant Director: Brady C. [signature] for OFR	Date: 15 Feb 88

The following paragraphs shall be deviated from as indicated (Cont.):

Change 7.3(4) under 7.3 Examination Method to Read as Follows:

7.3(4) The AC electromagnetic yoke shall be applied twice in each examination area with the lines of flux at right angles (in the case of welds, the magnetic flux will be induced when component configuration permits, parallel and transverse to the weld). Sufficient overlap shall ensure the entire examination area is covered.

Change Section 8, Recording Criteria to Read as follows:

8. RECORDING CRITERIA

Indications shall be recorded in accordance with the techniques outlined in the applicable revision of SwRI Nuclear Projects Operating Procedure IX-FE-116.

8.1 Linear Indications

Linear indications shall be recorded on the SwRI Liquid Penetrant Examination Record and reported to the customer for disposition in accordance with the recording criteria table below:

Nominal Wall Thickness (Inches)	Overall Indication Length as Defined in Attached Figure 1 (Inches)
Less than 1.0	1/8
1.0 to less than 2.5	3/16
2.5 and greater	1/4

NOTE

For preservice examinations, indications with a length of 1/16 inch in ferretic piping less than .312 inches in thickness shall be recorded.

Rounded indications shall be recorded based on diameters corresponding to the linear indication recording criteria and reported to the customer for disposition.

When conditions limit the area of examination, the limitations shall be recorded.

8.2 Recording Criteria for Pressure Retaining Bolting

The following indications shall be recorded on the appropriate SwRI Magnetic Particle Examination Record and reported to the customer for disposition:

(1) Nonaxial linear indications greater than 1/4 inch in length

(2) Axial indications greater than 1 inch in length

When conditions limit the area of examination, the limitations shall be recorded.

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECTS
OPERATING PROCEDURE

Title

FLUORESCENT MAGNETIC PARTICLE EXAMINATION

EFFECTIVITY AND APPROVAL

Revision 42 of this procedure became effective on June 22, 1987. Other revisions of the base document may be effective concurrently.

SA FLD

Approvals

Written By	Date 10 June 1987	Technical Review	Date 15 June 1987
Manager of Q.A.	Date 18 June 1987	Cognizant Director	Date 6/22/87

The following information may be used for convenience. Completion of this portion is not mandatory.

Deviation No.								
Date Effective								
Procedure Section(s) Affected								

Notes:

FLUORESCENT MAGNETIC PARTICLE EXAMINATION

SwRI-NDT-300-2

1. PURPOSE

This procedure provides the technical information and detailed steps required to ensure proper fluorescent magnetic particle examinations of ferromagnetic materials in accordance with the applicable American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Codes.

2. SCOPE AND APPLICATION

This procedure shall be utilized for the fluorescent magnetic particle examination of ferromagnetic materials, employing alternating current (AC) yoke techniques.

Areas to be examined shall be studs, nuts, cap screws, and other ferritic components specified in the applicable Southwest Research Institute (SwRI) Examination Plan.

3. APPLICABLE DOCUMENTS

(1) ASME Boiler and Pressure Vessel Code, Section XI, 1983 Edition with Addenda through Summer 1983, "Rules for Inservice Inspection of Nuclear Power Plant Components"

(2) ASME Boiler and Pressure Vessel Code, Section V, 1983 Edition with Addenda through Summer 1983, "Nondestructive Examination"

(3) NRC Regulatory Guide 1.65, entitled "Materials and Inspections for Reactor Vessel Closure Studs"

(4) SwRI Nuclear Quality Assurance Program Manual (NQAPM)

3.1 Applicable Examination Record

SwRI-NDTR Form No. 17-12, revision dated 11-26-79

4. RESPONSIBILITY

(1) The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division, shall be responsible for the preparation, review, approval, and control of this procedure.

(2) The Project Manager shall be responsible for the implementation of this procedure in accordance with the NQAPM specified in the applicable SwRI Project Plan.

(3) The examiner shall be responsible for implementing the requirements of this procedure.

(4) The Manager of the Support and Administration Section, Nondestructive Evaluation Science and Technology Division, shall be responsible for storage of records generated in accordance with this procedure.

5. PERSONNEL AND EQUIPMENT

5.1 Personnel Certification

Personnel performing examinations shall be certified in accordance with SwRI NQAP 11-1, "Special Process Control."

5.2 Yokes

AC electromagnetic yokes to be utilized shall have a lifting power of 10 pounds or greater at the maximum pole spacing that will be used. Each yoke shall be calibrated at least once a year or whenever the yoke has been subjected to any repair, periodic overhaul, damage, or has not been used for a year or more.

5.3 Magnetic Particles

(1) A fluorescent magnetic suspension shall be utilized as the examination medium. It shall fluoresce with a color that will provide adequate contrast with the area being examined when illuminated by an ultraviolet lamp of suitable characteristics.

(2) Magnetic particles shall be suspended in a suitable liquid medium in the concentration recommended in SE-709, "Standard Recommended Practice for Magnetic Particle Examination." Certified reports for magnetic particles, giving batch numbers and analysis results, shall be obtained from the supplier or by sample analysis of the batch to be used. Copies of the certified reports shall be retained with the examination records.

(3) Examinations shall be performed by utilizing one of the materials from the following list:

(a) Magnaglo No. 20A fluorescent powder concentrate in a deionized water suspension

(b) Magnaglo No. 14A fluorescent powder concentrate in a deionized water suspension with water conditioner WA-2A

(c) Magnaglo No. 14AM aerosol-packaged fluorescent magnetic particle material

(4) If not premixed, the magnetic particle suspension shall be mixed in accordance with the manufacturer's instructions.

5.4 Lighting

A black light shall be used when conducting examinations in accordance with this procedure. The black light intensity shall be measured at the examination surface at least every 8 hours and whenever the work location is changed and whenever the power is interrupted. These measurements shall be in accordance with the applicable revision of SwRI Procedure IX-FE-110. The time of the black light intensity measurements shall be entered on the SwRI Magnetic Particle Examination Record.

5.5 Calibration Block

A calibration block of a ferromagnetic material weighing a minimum of 10 pounds shall be used to confirm the lifting power of AC yokes in accordance with Section V, Article 7, Subparagraph T-733.

5.6 Thermometer

The thermometer to be used for measuring the calibration block and component temperatures shall be calibrated and certified and shall display a valid calibration tag as required by NQAP 10-1.

6. CALIBRATION

6.1 Calibration

(1) The applicable calibration block described in Paragraph 5.5 shall be used to verify proper operation of the magnetic particle yoke when any of the following occurs:

(a) Prior to a series of examinations

(b) With any substitution of examination personnel

(c) With any substitution of the AC power source

(d) At least every 4 hours during the examination

(e) At the completion of a series of examinations

(f) When the proper operation of the yoke is in doubt

(g) At the maximum pole spacing to be used for examination

(2) All magnetic particle yoke verification times shall be entered on the SwRI Magnetic Particle Examination Record.

7. EXAMINATION

7.1 Examination Areas

Examinations shall be performed on materials in their completed condition.

The entire surface of studs and bolts or cap screws and the entire outer surface of nuts shall be examined.

The examination area for components other than threaded components, shall be as described in the applicable SwRI Examination Plan.

7.2 Surface Preparation

It shall be the responsibility of the customer to ensure that the examination area and, where required, a minimum of one inch on each side shall be clean, dry, free from oil, sand, rust, grease, paint, slag, loose scale or other conditions to the extent that it shall not mask the indication of unacceptable discontinuities.

NOTE

When surface conditions are not in accordance with the above and correction is not feasible, SwRI will conduct the examination only at the request of the customer. The specific surface condition and its effect on the examination shall be noted on the SwRI Examination Record.

CAUTION

Extreme care should be exercised to prevent damage to threaded components during handling and examination.

7.3 Examination Method

The fluorescent magnetic particle examination shall be conducted as follows:

(1) Examinations shall be made in a darkened area and shall commence approximately 5 minutes after the space is darkened, in order for the examiner's eyes to adjust.

(2) A black light, as described in Paragraph 5.4 of this procedure, shall be used to illuminate the examination area. A minimum of 5 minutes shall be allowed for warm-up.

(3) The examination surface temperature, which shall be no higher than 135°F, shall be measured and recorded on the SwRI Magnetic Particle Examination Record.

(4) The AC electromagnetic yoke shall be applied twice in each examination area. The second application shall be conducted with the lines of magnetic flux approximately at right angles to those used in the first application. Sufficient overlap shall ensure the entire examination area is covered.

(5) The magnetizing current shall remain on continuously during application of the magnetic suspension medium, while the excess is being drained, and during the observation.

(6) The magnetic particle suspension shall be applied by flooding the surface of the examination area and then allowing the excess to drain off.

(7) After draining, the area being examined shall be observed for indications of discontinuities while the fluorescent lamp is directed from various angles so that the entire surface of the examination area is illuminated.

NOTE

Broad areas of particle accumulation which might mask indications from discontinuities are unacceptable, and shall be cleaned and reexamined.

(8) Variable electromagnetic yoke spacing shall not exceed the distance used during calibration verification.

(9) Demagnetization of the examination area is not required.

7.4 Postexamination Cleaning

Arrangements shall be made with the customer for postexamination removal of fluorescent magnetic particle materials.

8. RECORDING CRITERIA

Indications shall be recorded in accordance with the techniques outlined in the applicable revision of SwRI Procedure IX-FE-116.

8.1 Pressure Retaining Bolting Greater Than 2 Inches in Diameter

The following indications shall be recorded on the appropriate SwRI Magnetic Particle Examination Record and reported to the customer:

(1) Nonaxial linear indications greater than 1/4 inch in length

(2) Axial indications greater than 1 inch in length

8.2 Components Other Than Pressure Retaining Bolting

8.2.1 Linear Indications (Class 1 and Class 2)

Linear indications shall be recorded on the SwRI Magnetic Particle Examination Record in accordance with the following table and reported to the customer:

Nom. Wall Thickness (Inches)	Overall Indication Length As Defined in Attached Figure 1 (Inches)
Less than 1.0	1/8
1.0 to less than 2.5	3/16
2.5 and greater	1/4

8.2.2 Rounded Indications (Class 2)

Rounded indications shall be recorded as follows:

(1) Rounded indication with dimensions greater than 1/8 inch for thicknesses less than 5/8 inch and dimensions greater than 3/16 inch for thicknesses 5/8 inch and greater

(2) Four or more rounded indications in a line separated by 1/16 inch or less

(3) Ten or more indications in any 6 square inches of area whose major dimension is no more than 6 inches with the dimensions taken in the most unfavorable location relative to the indications being evaluated

When conditions limit the area of examination, the limitations shall be recorded.

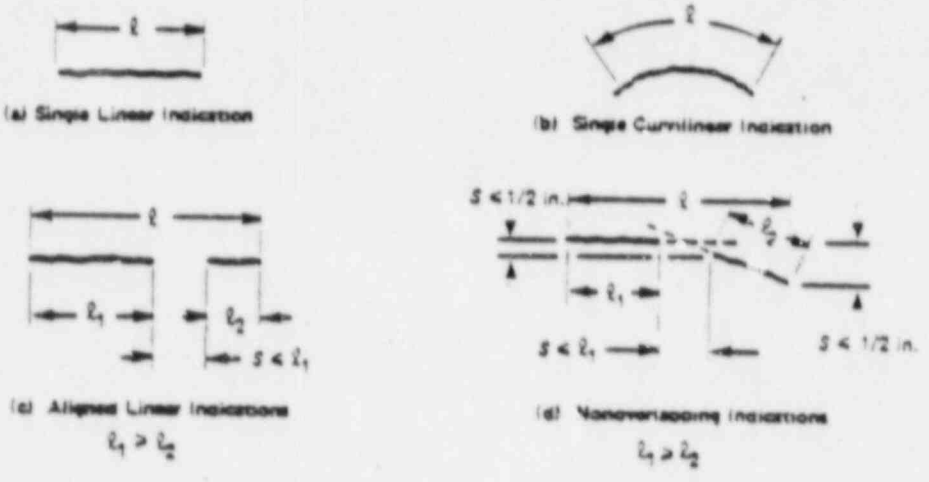
9. EVALUATION

Initial evaluation of reportable indications shall be performed by SwRI personnel, and shall be conducted in accordance with the applicable ASME Boiler and Pressure Vessel Code, Section XI, Article IWA-3000. Final evaluation and disposition of reportable indications shall be the responsibility of the customer.

10. RECORDS

Documents generated in accordance with this procedure shall be stored as specified in the SwRI Project Plan. The customer shall receive copies of these documents in the Examination Report, unless specified otherwise in the SwRI Project Plan.

FIGURE 1



LINEAR SURFACE INDICATIONS

Illustrative Flaw Configurations and Determination of Length ℓ

PROCEDURE DEVIATION

Page 1 of 1 Pages

Procedure	Revision No.	Deviation No.
SwRI-NDT- 600-31	23	1

The following examination areas are affected by this deviation:

Angle beam examinations performed in accordance with this procedure.

The following paragraphs shall be deviated from as indicated.

Change Paragraph 6.6.2 to Read as follows:

6.6.2 Verification of Calibration Reflectors at Scanning Speed and Notch Comparison

(1) The examiner shall verify the presence of the calibration reflector at scanning speed.

It is not necessary to assure that this check confirms the signal amplitude at 100% of reference level, but merely to demonstrate that the signals from the calibration reflectors are readily observable at scanning speed.

The following statement shall be documented on the SwRI Sonic Instrument Calibration Record and initialed:

"Calibration reflectors have been verified at scanning speed."

(2) A notch and side drilled hole comparison shall be performed to verify notch sensitivity. The sensitivity will be established on an inside surface notch by setting the signal amplitude at the level of the DAC curve and marking with an X. Record the gain setting under Instrument Setting.

Rationale for deviation:

This deviation incorporates the comparison of notches and side drilled holes as requested by Public Service and Gas Company.

Deviation Affects Qualification	YES ☐ NO ☒	If the deviation is determined to affect the procedure qualification, the deviation shall be qualified in accordance with Procedure IX-PE-107.

APPROVALS

SA FLD

Written by:	Date:	Technical Review:	Date:
Edward J. Jones	15FEB88	Verbal Approval Given? ☐ Yes ☐ No	Date:
Manager of Q.A.: Robert D. Burgess for TCT	Date: 16Feb88	Cognizant Director: Bradley C. Engleken for DFR	Date: 16Feb-88

SwRI FORM PE-4-6

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECTS
OPERATING PROCEDURE

SwRI-NDT-600-31
Revision 23
December 1987

Title

MANUAL ULTRASONIC EXAMINATION OF AUSTENITIC PRESSURE PIPING WELDS

EFFECTIVITY AND APPROVAL

Revision 23 of this procedure became effective on Dec 22, 1987. Other revisions of the base document may be effective concurrently.

SA FLD

Approvals

Written By	Date	Technical Review	Date
E D Rauscher for DWF	12/22/87	E D Rauscher for JJM	12/22/87
Manager of Q.A.	**Date**	**Cognizant Director**	**Date**
R Engelhardt for TCT	12/22/87	Wayne J Hall	12/22/87

The following information may be used for convenience. Completion of this portion is not mandatory.

Deviation No.								
Date Effective								
Procedure Section(s) Affected								

Notes:

MANUAL ULTRASONIC EXAMINATION OF AUSTENITIC PRESSURE PIPING WELDS

SwRI-NDT-600-31

1. PURPOSE

This procedure provides the technical information and detailed steps required to ensure a proper manual ultrasonic examination of similar or dissimilar metal welds and adjacent base material in clad or unclad austenitic pressure piping in accordance with the applicable American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Codes.

2. SCOPE AND APPLICATION

Manual, contact, pulse-echo, shear-wave angle-beam, and longitudinal-wave straight-beam ultrasonic techniques shall be utilized for the examination of austenitic pressure piping welds and adjacent base material in a nominal thickness range of greater than 0.4 to 5.0 inches.

Welds to be examined in wrought austenitic material shall be similar or dissimilar metal circumferential welds, longitudinal pipe welds, and branch connection full-penetration butt welds as specified in the applicable Southwest Research Institute (SwRI) Examination Plan.

3. APPLICABLE DOCUMENTS

(1) ASME Boiler and Pressure Vessel Code, Section XI, 1983 Edition with Addenda through Summer 1983, "Rules for Inservice Inspection of Nuclear Power Plant Components"

(2) ASME Boiler and Pressure Vessel Code, Section V, 1983 Edition with Addenda through Summer 1983, "Nondestructive Examination"

(3) SwRI Nuclear Quality Assurance Program Manual (NQAPM)

3.1 Calibration and Examination Records

SwRI:NDTR Form No.	Revision Date
17-18	3-14-79
17-19	12-1-83
17-25	7-10-80
17-37	2-13-80
17-89	8-19-80
17-90	8-19-80

4. RESPONSIBILITY

(1) The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division, shall be responsible for the preparation, review, approval, and control of this procedure.

(2) The Project Manager shall be responsible for the implementation of this procedure in accordance with the NQAPM specified in the applicable SwRI Project Plan.

(3) The examiner shall be responsible for implementing the requirements of this procedure.

(4) The Manager of the Support and Administration Section, Nondestructive Evaluation Science and Technology Division, shall be responsible for storage of records generated in accordance with this procedure.

5. PERSONNEL AND EQUIPMENT

5.1 Personnel Certification

Personnel performing ultrasonic examinations shall be certified in accordance with SwRI NQAP 11-1, "Special Process Control."

5.2 Reference Block

Reference blocks used for screen distance calibration and verification shall be of the same material as the production material; i.e., stainless steel or carbon steel, and shall be one of the following: (1) SwRI Half Round, (2) AWS Type DC, (3) IIW, or (4) Rompus Block.

Reference blocks shall be used as follows for screen distance calibration:

(1) Straight-Beam

Screen Distance	Block Type	Block Dimension
1.0", 2.0"	SwRI Half-Round,	1.0"
	AWS Type DC,	0.5" or 1.0"
	IIW	1.0"

2.5", 5.0"	SwRI Half-Round, AWS Type DC IIW	1.0" 1.0" 1.0"
10.0"	IIW	4.0"

(2) Angle-Beam

Screen Distance	Block Type	Block Dimension
2.0", 2.5", 5.0"	SwRI Half-Round AWS Type DC Rompus	1.0" Radius 1.0" and 2.0" Radii
10.0"	SwRI Half-Round AWS Type DC Rompus IIW	1.0" Radius 1.0" and 2.0" Radii 4.0" Radius
20.0"	IIW	4.0" Radius

5.3 Basic Calibration Block

Side-drilled basic calibration hole reflectors, in accordance with Section V of the ASME Boiler and Pressure Vessel Code, shall be placed in a block manufactured from the same product form, and material specification and heat treatment as one of the materials being joined.

The basic calibration block thickness shall be determined by the average weld thickness of the piping to which the search unit is applied and Article 5, Section V. When a basic calibration block of the same thickness as t is not available and where t is 1 inch or less, the basic calibration block thickness shall be no more than 25% thinner than t or shall be closer to t than the 3/4-inch thick alternate calibration block allowed by Article 5.

For calibration blocks for dissimilar metal welds, the material selection shall be based on the material on the side of the weld from which the examination will be conducted. If the examination will be conducted from both sides, calibration reflectors shall be provided in both materials.

Where two or more base material thicknesses are involved, the calibration block thickness shall be of a size sufficient to contain the entire examination metal path.

Where the component material is clad, the block shall be clad by the same welding procedure as the production part. Where the automatic method is impractical, deposition of clad shall be by the manual method.

The surface finish of the basic calibration block shall be representative of the surface finish of the piping to be examined.

Flat basic calibration blocks or blocks of essentially the same curvature as the part to be examined may be used when contact surface curvatures are greater than 20 inches in diameter.

A curved basic calibration block shall be used to establish distance amplitude correction (DAC) curves for examinations on contact surfaces in the range of curvature from 0.9 to 1.5 times the basic calibration block diameter, when contact surface curvature is 20 inches in diameter or less.

The curvature of the main run pipe shall be used to establish the requirements for the basic calibration block curvature for the examination of branch connection welds.

Approved drawings of basic calibration blocks to be used in accordance with this procedure are contained in the applicable SwRI Examination Plan.

5.4 Search Units

Search units shall be selected from the following:

(1) Straight-Beam

Average Weld Thickness	Nominal Search Unit Size
Greater than 0.4" to 2.0"	1/4" Round
1.0" to 3.0"	3/8" Round
2.0" to 4.0"	1/2" Round
3.0" to 5.0"	3/4" to 1" Round

(a) The nominal straight-beam longitudinal-wave search unit frequency for austenitic piping shall be 1.5 MHz or 2.25 MHz, and 2.25 MHz for carbon steel.

(2) Angle-Beam

Average Weld Thickness	Maximum Nominal Search Unit Size
Greater than 0.4" to less than 0.5"	1/4" x 1/4", 1/4" Round
0.5" to 2.0"	3/8" x 3/8", 3/8" Round
0.75" to 4.0"	1/2" x 1/2", 1/2" Round
Greater than 2.0" to 5.0"	1/2" x 1", 3/4" Round

(a) The nominal angle-beam shear-wave search unit frequency for examination of austenitic piping shall be 2.25 MHz for 1/4 inch search units and 1.5 MHz for search units greater than 1/4 inch in size.

(b) The nominal angle-beam shear-wave search unit frequency for the carbon steel side of dissimilar piping welds shall be 2.25 MHz.

(c) Search unit wedges shall be fabricated to produce 45° ±2° refracted shear-wave when examining circumferential piping welds, or branch connections. A 60° ±2° refracted shear-wave shall be used only to augment the examination.

(d) For examination of longitudinal piping welds, search unit wedges shall be fabricated to produce 45° ±2° refracted shear waves.

(e) The exit point of the sound beam and the actual refracted beam angle of shear-wave search units shall be determined on an IIW block or a Rompus block. The exit point shall be marked on the search unit wedge.

(f) 1/4" x 1/4" or 1/4" round search units may be used for angle-beam calibrations when examining 4-inch diameter piping.

5.5 Ultrasonic Instrument

The examiner shall use a Sonic FTS Mark I ultrasonic instrument which shall be aligned and shall display a valid alignment calibration tag as required by NQAP 10-1.

5.6 Couplant

(1) USP-grade glycerine or reactor grade water shall be used when performing ultrasonic calibrations and examinations in accordance with this procedure.

(2) USP-grade glycerine shall be certified for sulfur content and total halogens in accordance with SD-129 and SD-808 of Article 24, Section V. The residual amount of total sulfur or halogens shall not exceed 1% by weight. Reactor grade water, when used, shall be supplied by the customer.

(3) Couplant materials used for examinations shall be the same as used for the calibration.

5.7 Thermometer

The thermometer to be used for measuring the calibration block and component temperatures shall be calibrated and certified and shall display a valid calibration tag as required by NQAP 10-1.

6. CALIBRATION METHOD

6.1 Instrument Linearity

Ultrasonic instrument linearity shall be verified prior to each period of extended use or every 3 months, whichever is less, in accordance with Paragraphs 6.1.1 and 6.1.2. Data required shall be recorded on the SwRI Instrument Linearity Verification Record and the sheet number shall be referenced on each applicable SwRI Sonic Instrument Calibration Record.

NOTE

The setting of the damping control shall be recorded in REMARKS on the SwRI Instrument Linearity Verification Record. The damping control shall be in the same position during linearity verification, calibrations and examinations or a new linearity verification shall be performed.

6.1.1 Screen Height Linearity

(1) Position a shear-wave search unit on a calibration block to obtain indications from the 1/2T and 3/4T holes, or use a straight-beam search unit on any calibration block that provides amplitude differences.

(2) Adjust the search unit position to give a 2:1 ratio between the two indications, with the larger indication set at 80% of full screen height (FSH) and the smaller indication at 40% of FSH.

(3) Without moving the search unit, set the larger indication to 100% of FSH; record the amplitude of the smaller indication, estimated to the nearest 1% of FSH.

(4) Successively set the larger indication from 100% to 20% of FSH in 10% increments (or 2 dB steps if a fine control is not available); observe and record the smaller indication estimated to the nearest 1% of FSH at each setting. The reading must be 50% of the larger amplitude within 5% of FSH.

6.1.2 Amplitude Control Linearity

(1) Position a shear-wave or straight-beam search unit on a calibration block to obtain maximum amplitude from an applicable reflector.

NOTE

The primary reference level sensitivity should be within the highest and lowest gain settings used during amplitude control linearity verifications. The highest and lowest gain settings used during the amplitude control linearity verifications shall be recorded in the Remarks column of the applicable SwRI Linearity Verification Records.

(2) Without moving the search unit, set the indication to the required percent of FSH and increase or decrease the dB as specified below. The estimated signal shall be recorded to the nearest 1% of FSH and shall fall within the limits of the following table:

Indication Set at % of FSH	dB Control Change*	Indication Limits, % of FSH
80%	- 6 dB	32 to 48%
80%	-12 dB	16 to 24%
40%	+ 6 dB	64 to 96%
20%	+12 dB	64 to 96%

*Minus denotes decrease in amplitude; plus denotes increase.

6.2 Calibration

The ultrasonic calibration shall be completed prior to the examination.

The REJECT control shall be maintained in the 0 position.

The FREQ MHz control shall be turned to 1 when a 1.5-MHz search unit is used and to 2 with a 2.25-MHz search unit.

The centerline of the search unit shall be at least 1-1/2 inches from the nearest side of the calibration block. Rotating the beam into the corner formed by the hole and the side of the block may produce a higher amplitude at a longer beam path. This beam path shall not be used for calibration.

The type and length of the search unit cable shall be recorded on the SwRI Sonic Instrument Calibration Record, and all other information blocks on the form shall be filled in.

The average weld thickness shall be used to determine the correct calibration block and search units for examinations with geometric restrictions such as piping or components which may be thicker than the nominal pipe size, examinations limited to one side of the weld or wide weld crowns. The Level II or III examiner shall ensure that complete coverage of the examination volume is obtained. Additional calibration vee-path positions and larger screen sizes may be required to assure this coverage.

6.2.1 Temperature

The calibration block temperature shall be within 25°F of the component temperature and shall be recorded on the SwRI Sonic Instrument Calibration Record for the initial calibration and each verification. The surface temperature of the component to be examined shall be taken prior to and after performing each examination and shall be recorded on the applicable SwRI Examination Record.

6.3 Calibration for Circumferential Butt Welds

6.3.1 Straight-Beam Distance Calibration

The screen distance chosen shall be the shortest applicable size to include at least 1/4t beyond the thickest production material to which the search unit is applied. Observing back reflections from the applicable reference block, set up the required linear sound path distance along the screen baseline.

Screen distance calibration shall be selected from the following sizes: 1.0", 2.0", 2.5", 5.0" and 10.0".

6.3.2 Angle-Beam Distance Calibration

The screen distance chosen shall be the shortest applicable size to include at least 1/8 vee-path past the anticipated examination range. Observing radius echoes from the applicable reference block, set up the required linear sound path distance along the screen baseline.

Screen distance calibration for angle beam shall be selected from the following sizes: 2.0", 2.5", 5.0", 10.0", and 20.0".

If a 60° shear-wave angle-beam is required to augment the examination, and the same instrument is used for both 45° and 60° examinations, the screen distance calibration shall be conducted as follows:

(1) The screen distance size shall be determined by the angle-beam search unit requiring the longer examination range.

(2) Position the 45° search unit on the appropriate reference block and record all required reference block entries on the appropriate SwRI Sonic Instrument Calibration Record.

(3) Without changing the calibrated screen distance, repeat step (2) with the 60° search unit.

(4) No attempt shall be made to compensate for the delay difference between 45° and 60° screen distance calibrations. This difference shall be considered when resolving indications.

6.3.3 Straight-Beam Distance Amplitude Correction

A DAC curve shall be established by utilizing responses from the basic calibration holes.

6.3.3.1 Production Material 1 Inch or Less in Thickness

(1) Position the straight-beam search unit to obtain maximum response from the 1/2T hole, and set this response to 80% ±5% of FSH.

(2) Draw a straight horizontal line on the instrument screen at this amplitude to extend a distance equal to the nominal thickness of the production material.

(3) Signal amplitudes for indications recorded shall be referenced as a percentage of this line.

6.3.3.2 Production Material Greater Than 1 Inch in Thickness

(1) Position the straight-beam search unit to obtain maximum response from the calibration hole selected from the following, that produces the highest amplitude:

Hole
1/4T
1/2T (if present)
3/4T

(2) Set this response to the primary reference level of 80% ±5% of FSH and mark its amplitude on the instrument screen.

(3) Without changing the gain controls, obtain maximum response from the remaining calibration holes; mark and join all amplitude points with a smooth curved line that shall extend 1/4T beyond the last qualified calibration point.

6.3.4 Angle-Beam Distance Amplitude Correction

If a curved block is used, DAC curves for the examination of circumferential welds shall be constructed by utilizing the responses from the holes oriented perpendicular to the axis of the basic calibration block.

6.3.4.1 Unclad Material

(1) Position the 45° search unit to obtain maximum response from the calibration hole and vee-path position selected from a minimum of three vee-path positions required to cover the entire examination area, the first of which must be situated prior to the lower 1/3t volume and the last at the end or after the 1/3t volume.

(2) Set this response to the primary reference level of 80% ±5% of FSH and mark its amplitude on the instrument screen.

(3) Without changing the gain controls, obtain maximum response from the remaining required vee-path positions. Mark and join all amplitude points with a smooth curved line that shall encompass the examination area not to extend more than 1/8 vee-path past the last qualified calibration node.

(4) If a 60° shear-wave angle-beam is required to augment the examination, repeat steps (1) through (3) using a 60° search unit.

EXCEPTION

If the configuration of the weld is such that the above calibration is not the most appropriate to provide coverage from two directions of the examination volume C-D-E-F as depicted in Figure 1, then a calibration may be established which uses any vee-path position required to obtain complete coverage of the examination area. Consideration shall be given to previous examination data to ensure that equivalent calibrations are performed where practicable.

6.3.4.2 Clad Piping

(1) Position the 45° search unit to obtain maximum response from the calibration hole and the vee-path position, selected from the following, that produces the highest amplitude:

Hole	Vee-Path Positions
1/4T	1/8
1/2T (if present)	2/8
3/4T	3/8

(2) Set this response to the primary reference level of 80% ±5% of FSH and mark its amplitude on the instrument screen.

(3) Without changing the gain controls, obtain maximum response from the remaining vee-path positions; mark and join all amplitude points with a smooth curved line that shall extend 1/8 vee-path beyond the last qualified calibration point.

(4) If a 60° shear-wave angle-beam is required to augment the examination, repeat steps (1) through (3) with a 60° search unit.

6.4 Calibration for Branch Connection and Longitudinal Seam Welds

6.4.1 Straight-Beam Distance Calibration

The straight-beam distance calibration shall be the same as that described in Paragraph 6.3.1.

6.4.2 Angle-Beam Distance Calibration

The screen distance chosen shall be the shortest applicable size to include at least 1/8 vee-path past the anticipated examination range. Observing the radius echoes from the applicable reference block, obtain the required linear sound path distance along the screen baseline.

6.4.3 Straight-Beam Distance Amplitude Correction

The straight-beam distance amplitude correction shall be the same as that described in Paragraph 6.3.3.

6.4.4 Angle-Beam Distance Amplitude Correction

If a curved block is utilized, DAC curves shall be constructed by utilizing the responses from the basic calibration holes oriented axially with the basic calibration block.

6.4.4.1 Unclad Material

This calibration shall be the same as that described in Paragraph 6.3.4.1, steps (1) through (3), using only the 45° search unit.

6.4.4.2 Clad Piping

This calibration shall be the same as that described in Paragraph 6.3.4.2, steps (1) through (3), using only the 45° search unit.

6.5 Secondary DAC Calibrations

If any point on the DAC curve (within the examination volume) does not appear at 20% of FSH or greater, a secondary DAC curve shall be constructed as follows:

(1) All secondary DAC curves shall contain at least 2 points.

(2) The DAC point at 20% of FSH or greater, adjacent to a DAC point that falls below 20% of FSH, shall be brought to the primary reference level and marked on the instrument screen. The other point(s), previously at less than 20% of FSH, shall be marked on the screen and all points connected with a smooth curved line. The gain setting for this secondary DAC curve shall be recorded on the appropriate SwRI Sonic Instrument Calibration Record.

EXCEPTIONS

When the first DAC point is the only point above 20% of FSH, the next highest point shall be brought to the primary reference level and marked on the instrument screen. The other points previously at less than 20% of FSH shall be marked on the screen and all points connected with a smooth curved line.

6.6 Calibration Verification

6.6.1 Sweep Range and DAC Curve Verification

Sweep range calibration shall be verified on the appropriate reference block; and DAC curve calibration, if applicable, shall be verified on the appropriate basic calibration block:

(1) Prior to a series of examinations

(2) With any substitution of the same type or length of search unit cable

(3) With any substitution of power utilizing the same type source; e.g., a change of batteries

(4) At least every 4 hours during the examination

(5) At the completion of a series of examinations

(6) Whenever the validity of the calibration is in doubt

6.6.2 Verification of Calibration Reflectors at Scanning Speed

The examiner shall verify the presence of the calibration reflector at scanning speed.

NOTE

It is not necessary to assure that this check confirms the signal amplitude at 100% of reference level, but merely to demonstrate that the signal from the calibration reflectors are readily observable at scanning speed.

The following statement shall be documented on the SwRI Sonic Instrument Calibration Record and initialed:

"Calibration reflectors have been verified at scanning speed."

6.6.3 Calibration Changes

(1) Perform the following if any point on the DAC curve has decreased more than 20% of FSH or 2 dB in amplitude, or any point on the sweep line has moved more than 10% of the sweep division reading or 5% of full sweep whichever is greater:

(a) Void all examinations referring to the calibration in question and performed after the last valid calibration verification.

(b) Conduct a new calibration.

(c) Reexamine the areas for which examinations have been voided.

(2) Perform the following if any point on the DAC curve has increased in amplitude more than 20% of FSH or 2 dB:

(a) Correct the calibration.

(b) Reexamine all indications recorded since the last valid calibration verification.

(c) Enter proper values on a new SwRI Examination Record.

6.6.4 Recalibration

Substitution of any of the following shall be cause for recalibration:

(1) Search unit transducer or wedge

(2) Search unit cable type or length

(3) Ultrasonic instrument

(4) Examination personnel

(5) Couplant

(6) Change in type of power source; e.g., a change from direct to alternating current

7. EXAMINATION

7.1 Examination Volume

7.1.1 Circumferential and Longitudinal Butt Welds in Piping

Scanning of the weld and base material shall be adequate to ensure complete two-directional coverage for 1/3t from the inside surface of the pipe as shown in Figure 1. The base material shall be examined for a distance of 1/4 inch as measured from the outside surface fusion line on each side of the weld.

Class 1 longitudinal welds shall be examined along the entire length of the weld during the preservice examination and for at least one pipe-diameter length or 12 inches, whichever is less, from the fusion line of the intersecting circumferential weld during inservice examinations.

Class 2 longitudinal welds shall be examined for at least 2-1/2t length from the fusion line of the intersecting circumferential weld during preservice and inservice examinations.

7.1.2 Butt Welds of Branch Connections

Scanning of the weld and base material shall be adequate to ensure complete coverage for 1/3t from the inside surface of the pipe as shown in Figure 2. The base material shall be examined for a distance of 1/4 inch measured from the outside surface fusion line on the main run pipe side of the weld.

7.2 Surface Condition

The contact surfaces shall be free from weld spatter, roughness, or other conditions which interfere with free movement of the search unit or impair the transmission of ultrasound.

7.3 Indication Length Zero Reference (Lo) Location

Areas to be examined in accordance with this procedure shall have an Lo marked in accordance with the applicable revision of SwRI Procedure IX-FE-103.

7.4 Scanning

When practicable, scanning shall be performed at a minimum gain setting of 2 times the reference level sensitivity.

Instrument gain setting for scanning shall be determined on the basic calibration block as follows for each primary reference level utilized:

(1) With the instrument at the primary reference level, manipulate the search unit on the basic calibration block to obtain a signal of 40% of FSH from a calibration reflector (side-drilled hole).

(2) Add 6 dB gain by utilizing the 6 dB switch (if present), the fine gain control, or a combination of the fine and coarse gain controls and choose any method that yields a signal response within ±2 dB of 80% FSH.

(3) This amplitude and method shall be recorded on the SwRI Sonic Instrument Calibration Record and shall be used during the valid calibration period for all scanning at 2 times the reference level sensitivity.

Scanning overlap shall be a minimum of 25% of the search unit piezoelectric element dimension perpendicular to the direction of the scan.

The search unit movement rate shall not exceed 3 inches per second. While scanning, the search unit shall be oscillated approximately ±20°.

7.5 Thickness Measurements and Lamination Scan

Screen distance calibration for these examinations shall be conducted in accordance with Paragraph 6.3.1.

7.5.1 Thickness Measurements

Thickness measurements shall be taken at a minimum of three points adjacent to Lo for longitudinal and circumferential welds (on the centerline of the weld and at one point in the base material on each side of the weld). Thickness measurements shall be taken at a minimum of two points adjacent to Lo for branch connection welds (one on the base material of the main run pipe, and one on the base material of the branch connection). If these measurements cannot be taken adjacent to Lo, the location of the measurements shall be recorded on the appropriate SwRI Examination Record.

7.5.2 Base Material Lamination Scan

A lamination scan using longitudinal-wave shall be performed. This scan shall cover as much as practical of the area through which the angle-beam passes. The lamination scan shall be conducted as follows:

(1) Scanning shall be performed at a gain setting that gives an initial backwall amplitude of 80% ±5% FSH.

EXCEPTION

If performed previously, a lamination scan is not required except in the area(s) where a lamination was previously recorded.

(2) To record an intermediate indication, obtain a backwall reflection signal from an indication-free area and adjust this signal to 80% ±5% of FSH. Record the intermediate indication when its amplitude is equal to the remaining backwall reflection. Areas of total loss of backwall reflection accompanying the intermediate echo shall also be recorded.

7.6 Examination of Circumferential and Longitudinal Butt Welds in Piping

7.6.1 Angle-Beam Examination for Indications Parallel with the Weld

Angle-beam examinations for circumferential welds shall be accomplished using the required refracted shear-wave from both sides of the weld. For this examination, the sound-beam shall be directed perpendicularly into the weld to detect indications parallel with the weld. Calibration for these examinations shall be in accordance with Paragraphs 6.3.2 and 6.3.4.

Angle-beam examinations for longitudinal welds shall be accomplished using the required refracted shear-wave from both sides of the weld. For this examination, the sound-beam shall be directed perpendicularly into the weld to detect indications parallel with the weld. Calibration for this examination shall be in accordance with Paragraphs 6.4.2 and 6.4.4.

7.6.2 Alternate Examination

A shear-wave angle-beam examination shall be conducted as required to assure complete coverage from both sides of the circumferential or longitudinal weld. Any areas of the weld not receiving complete coverage from both sides shall be examined from one side of the weld with the required shear-wave(s) and a straight-beam longitudinal-wave applied to the surface of the weld crown in the affected areas. Calibration for the longitudinal wave search unit shall be in accordance with Paragraphs 6.3.1 and 6.3.3.

7.6.3 Angle-Beam Examination for Indications Perpendicular to the Weld

Calibration for these examinations shall be in accordance with Paragraphs 6.3.2 and 6.3.4 for circumferential welds, and Paragraphs 6.4.2 and 6.4.4 for longitudinal and branch connection welds.

A shear-wave angle-beam examination shall be conducted on each weld by placing the search unit on the weld and lt base metal adjacent to each weld with the sound beam directed into and parallel with the weld to detect indications perpendicular to the weld. The entire length of the weld and base material within lt of the weld shall be scanned with the search unit beam directed in this manner from two opposing directions.

The search unit shall then be placed on the base metal with the search unit sound beam directed tangentially into the weld at a 45° ±10° angle. The entire length of the weld and adjacent base material shall be scanned with the search unit beam directed in this manner on each accessible side of the weld from two opposing directions. Geometric root ripple echoes occurring at the same metal path distance as flaws adjacent to the weld root are to be expected. A flaw must be distinguished from root ripple by its greater echo amplitude compared to the amplitude of the root ripple at the same location. A flaw indication adjacent to the weld root tends to mask out several facets of the root ripple and travels along the baseline through the root ripple package.

7.7 Examination of Butt Welds of Branch Connections

7.7.1 Angle-Beam Examination for Indications Parallel with the Weld

A shear-wave angle-beam examination shall be accomplished from the main run pipe side of the weld. For this examination, the sound beam shall be directed perpendicularly into the weld to detect indications parallel with the weld. Calibration for these examinations shall be in accordance with Paragraphs 6.4.2 and 6.4.4.

7.7.2 Angle-Beam Examination for Indications Perpendicular to the Weld

The angle-beam examination for indications perpendicular to the weld shall be the same as the examination described in Paragraph 7.6.3.

7.8 Postexamination Cleaning

Arrangements shall be made with the customer for postexamination removal of couplant materials.

8. RECORDING CRITERIA

Indications shall be recorded in accordance with the techniques outlined in the applicable revision of SwRI Procedure IX-FE-117.

All ultrasonic reflectors, regardless of signal amplitude, not attributable to geometry shall be recorded and investigated by a Level II or a Level III examiner to determine the shape, identity, and location of the reflector. Examples of nongeometric reflectors are those which are slightly removed from the weld root and/or chamfer, mask the root indications, are transverse to the weld, or have linear dimensions with side branches.

Ultrasonic reflectors attributable to geometry and producing a response greater than 50% of the reference level shall be recorded on the appropriate SwRI Ultrasonic Examination Record and investigated. Recordable indications attributable to geometry shall be recorded only once, even if the amplitude of the indication drops below the required recording amplitude along the weld. These indications shall be investigated by a Level II or a Level III examiner to determine the shape, identity, and location of the reflector.

If indications that have been recorded as geometry have been investigated and found to be nongeometric reflectors, the entire weld shall be reexamined and all nongeometric reflectors and other reflectors not previously recorded at least once shall be recorded.

Indications investigated and found to be other than geometrical in nature, regardless of the amplitude, shall be reported to the customer for evaluation.

Scanning limitations shall be recorded.

9. EVALUATION

Initial evaluation of reportable indications shall be performed by SwRI personnel, and shall be conducted in accordance with the applicable ASME Boiler and Pressure Vessel Code, Section XI, Article IWA-3000. Final evaluation and disposition of reportable indications shall be the responsibility of the customer.

10. RECORDS

Documents generated in accordance with this procedure shall be stored as specified in the SwRI Project Plan. The customer shall receive copies of these documents in the Examination Report, unless specified otherwise in the SwRI Project Plan.

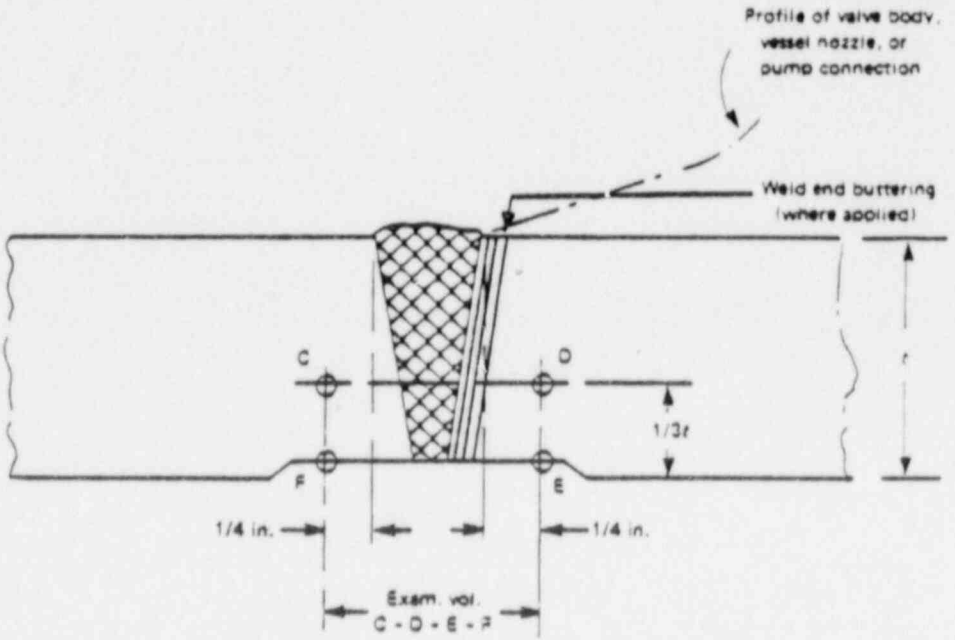


Figure 1

WELDS IN PIPING
(Volumetric Examination Requirements)

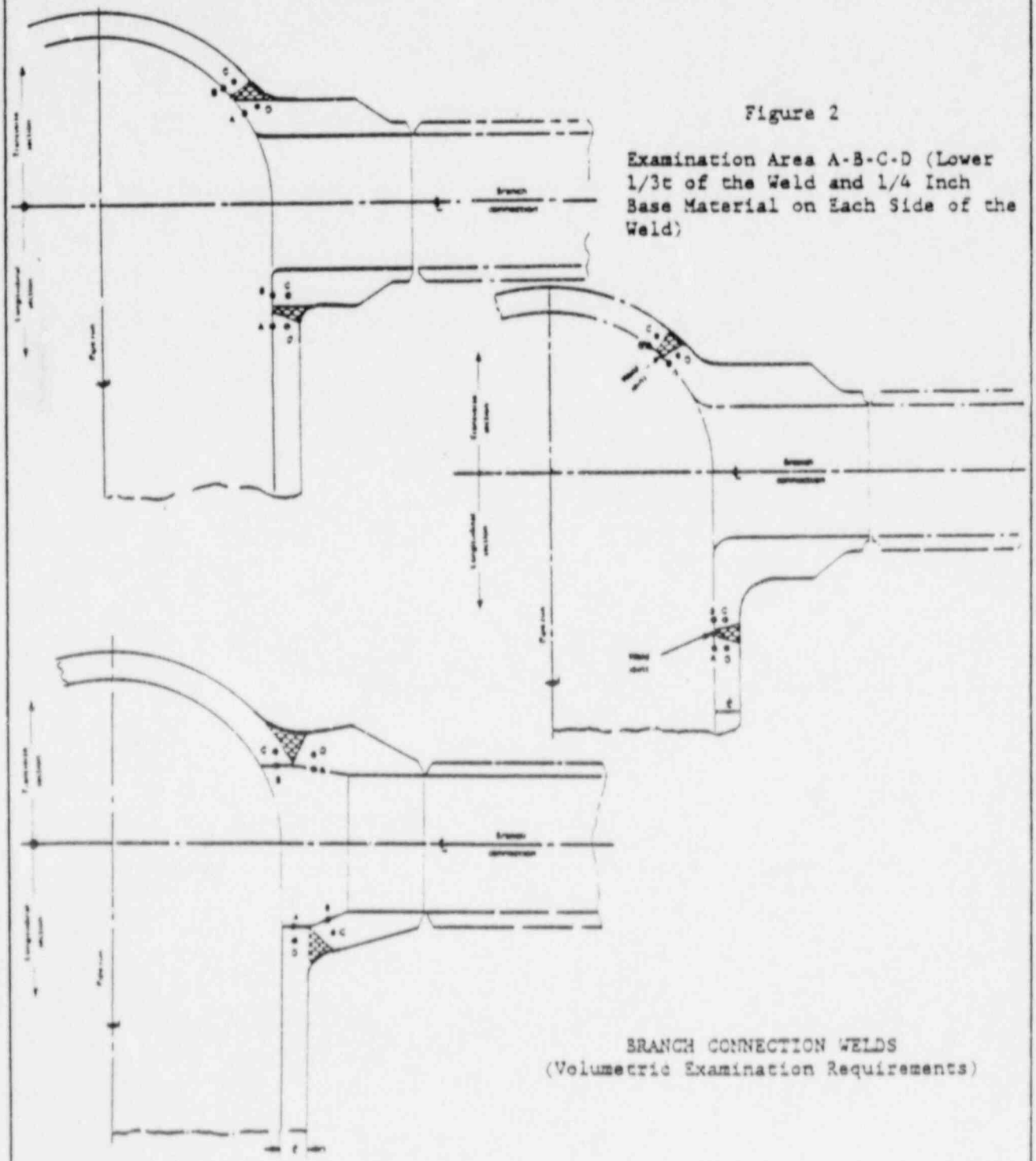


Figure 2

Examination Area A-B-C-D (Lower 1/3t of the Weld and 1/4 Inch Base Material on Each Side of the Weld)

BRANCH CONNECTION WELDS
(Volumetric Examination Requirements)

PROCEDURE DEVIATION

SITE:	PSI [X] ISI [ ]	PROCEDURE/REVISION NO.
Hope Creek		600-41/8

DEVIATION NO.	DEVIATION PAGE NO.:	DATE REQUESTED:	EXAMINATION PERIOD:
1	1 OF 1	30 October 1984	1984

SECTION(S) AFFECTED: 6

PROCEDURE PAGE(S): 11 OF: 19

EXAMINATION AREA(S) AFFECTED:

Ferritic pressure piping welds

DEVIATION: It is requested that the paragraph(s) shown below in the above procedure/ revision be deviated from as follows (use exact wording proposed. additional sheets may be used if necessary):

Add paragraph 6.4.1.1 as follows:

Vertification of Calibration Reflectors at Scanning Speed

The examiner shall verify the presence of the calibration reflector at scanning speed.

NOTE

It is not necessary to assure that this check confirms the signal amplitude at 100% of referance level, but merely to demonstrate that the signal from the calibration reflectors are readily observable at scanning speed.

The following statement shall be documented on the SwRI Sonic Instrument Calibration Record and initialed:

"Calibration Reflectors have been verified at Scanning Speed."

JUSTIFICATION: Reason change is necessary and what it is intended to accomplish (use additional sheets if necessary):

This deviation complies with the NRC's request to verify the detectability of the calibration reflectors under procedural scanning conditions.

SA — DATE — DEPARTMENT DIRECTOR — DATE — QA MANAGER — DATE — TECHNICAL REVIEW — DATE — REQUESTED BY

SwRI FORM FE-4

PROCEDURE DEVIATION

SITE:	PSI ☒ ISI ☐	PROCEDURE/REVISION NO.
Hope Creek		600-41/8

DEVIATION NO.	DEVIATION PAGE NO.:	DATE REQUESTED:	EXAMINATION PERIOD:
2	1 of 2	19 November 84	1984

SECTION(S) AFFECTED: 6

PROCEDURE PAGE(S): 10 and 11 of 19

EXAMINATION AREA(S) AFFECTED:

For components that are significantly thicker than the nominal production material thickness in ferritic pressure piping

DEVIATION: It is requested that the paragraph(s) shown below in the above procedure/revision be deviated from as follows (use exact wording proposed, additional sheets may be used if necessary):

Add the following EXCEPTION under 6.2.3.2:

For components that are significantly thicker than the nominal production material thickness, calibrations shall be established which use the V-path positions required to obtain complete coverage of the examination area.

Change 6.3 to read as follows:

Secondary DAC Calibrations

If all points on the DAC curve do not appear at 70% of FSH or greater, a secondary DAC curve shall be constructed as follows:

(1) All secondary DAC curves shall contain at least 2 points.

JUSTIFICATION: Reason change is necessary and what it is intended to accomplish (use additional sheets if necessary):

This deviation clarifies the examination coverage of components with different thicknesses or geometric restrictions.

SA	FLD	
DEPARTMENT DIRECTOR		DATE
QA MANAGER		DATE 26 Nov 84
TECHNICAL REVIEW		DATE 19 Nov 1984
REQUESTED BY		DATE 19 Nov 1984

SwRI FORM FE-44

(2) The DAC point at 20% of FSH or greater, adjacent to a DAC point that falls below 20% of FSH, shall be brought to the primary reference level and marked on the instrument screen. The adjacent point(s), previously at less than 20% of FSH, shall be marked on the screen and all points connected with a smooth curved line. The gain setting for this secondary DAC curve shall be recorded on the appropriate SwRI Sonic Instrument Calibration Record.

EXCEPTIONS

When the first DAC point is the only point above 20% of FSH, the next highest point shall be brought to the primary reference level and marked on the instrument screen. The other points previously at less than 20% of FSH shall be marked on the screen and all points connected with a smooth curved line.

PROCEDURE DEVIATION

Procedure	Revision	Deviation
SwRI-NDT- 600-41	8	3

The following examination areas are affected by this deviation:

Manual ultrasonic examination of ferritic piping welds to be examined in accordance with this procedure

The following paragraphs shall be deviated from as indicated:

Change (1) of 6.2.3.1 to read as follows:

(1) Position the applicable 45 degree or 60 degree angle-beam search unit on the basic calibration block to obtain maximum response from the vee-path position, selected from the following, which produces the highest amplitude:

Vee-Path Positions

2/8, 3/8, 6/8
1/8, 3/8, 5/8, 7/8 (when 2/8 is not present)
1/8, 2/8, 3/8 only for clad material

Rationale for deviation:

This deviation clarifies the examination coverage of components with different thicknesses or geometric restrictions and complies with the NRC's request to verify the detectability of the calibration reflectors under procedural scanning conditions.

APPROVALS

SA FLD

Written by: DW Fauntleau	Date: 14 March 1995	Technical Review: Walter Livingston	Date: 15 MAR 95
		Verbal Approval Given? ☐ Yes ☒ No	Date: N/A
Manager of Q.A.: R Engelhardt for BEM	Date: 3/15/95	Cognizant Director: Wayne L Clark	Date: 3/15/95

SwRI FORM FE-45

Add the following EXCEPTION under 6.2.3.2:

For components that are significantly thicker than the nominal production material thickness, calibrations shall be established which use the V-path positions required to obtain complete coverage of the examination area.

Change 6.3 to read as follows:

Secondary DAC Calibrations

If all points on the DAC curve do not appear at 20% of FSH or greater, a secondary DAC curve shall be constructed as follows:

(1) All secondary DAC curves shall contain at least 2 points.

(2) The DAC point at 20% of FSH or greater, adjacent to a DAC point that falls below 20% of FSH, shall be brought to the primary reference level and marked on the instrument screen. The adjacent point(s), previously at less than 20% of FSH, shall be marked on the screen and all points connected with a smooth curved line. The gain setting for this secondary DAC curve shall be recorded on the appropriate SwRI Sonic Instrument Calibration Record.

Exceptions

When the first DAC point is the only point above 20% of FSH, the next highest point shall be brought to the primary reference level and marked on the instrument screen. The other points previously at less than 20% of FSH shall be marked on the screen and all points connected with a smooth curved line.

Add paragraph 6.4.1.1 as follows:

Verification of Calibration Reflectors at Scanning Speed

The examiner shall verify the presence of the calibration reflector at scanning speed.

Note

It is not necessary to assure that this check confirms the signal amplitude at 100% of reference level, but merely to demonstrate that the signal from the calibration reflectors are readily observable at scanning speed.

The following statement shall be documented on the SwRI Sonic Instrument Calibration Record and initialed:

"Calibration Reflectors have been verified at Scanning Speed."

PROCEDURE DEVIATION

Procedure SwRI-NDT- 600-41	Revision 8	Deviation 4

The following examination areas are affected by this deviation:

Manual ultrasonic examination of ferritic piping welds to be examined in accordance with this procedure

THIS DEVIATION SUPERCEDES DEVIATION 3.

The following paragraphs shall be deviated from as indicated:

Change (1) of 6.2.3.1 to read as follows:

(1) Position the applicable 45 degree or 60 degree angle-beam search unit on the basic calibration block to obtain maximum response from the vee-path position, selected from the following, which produces the highest amplitude:

Vee-Path Positions

2/8, 3/8, 6/8
1/8, 3/8, 5/8, 7/8 (when 2/8 is not present)
1/8, 2/8, 3/8 only for clad material

Rationale for deviation:

This deviation clarifies the examination coverage of components with different thicknesses or geometric restrictions and complies with the NRC's request to verify the detectability of the calibration reflectors under procedural scanning conditions.

APPROVALS

SA FLD

Written by: DWFarnell	Date: 21 MAY 1985	Technical Review: [illegible]	Date: 21 MAY 85
		Verbal Approval Given? ☐ Yes ☒ No	Date: N/A
Manager of Q.A.: [illegible]	Date: 23 MAY 1985	Cognizant Director: [illegible]	Date: 5/23/85

SwRI FORM FE-46

Add the following EXCEPTION under 6.2.3.1 and 6.2.3.2:

For components that are significantly thicker than the nominal production material thickness, calibrations shall be established which use the V-path positions required to obtain complete coverage of the examination area.

Change 6.3 to read as follows:

Secondary DAC Calibrations

If all points on the DAC curve do not appear at 20% of FSH or greater, a secondary DAC curve shall be constructed as follows:

(1) All secondary DAC curves shall contain at least 2 points.

(2) The DAC point at 20% of FSH or greater, adjacent to a DAC point that falls below 20% of FSH, shall be brought to the primary reference level and marked on the instrument screen. The adjacent point(s), previously at less than 20% of FSH, shall be marked on the screen and all points connected with a smooth curved line. The gain setting for this secondary DAC curve shall be recorded on the appropriate SwRI Sonic Instrument Calibration Record.

Exceptions

When the first DAC point is the only point above 20% of FSH, the next highest point shall be brought to the primary reference level and marked on the instrument screen. The other points previously at less than 20% of FSH shall be marked on the screen and all points connected with a smooth curved line.

Add paragraph 6.4.1.1 as follows:

Verification of Calibration Reflectors at Scanning Speed

The examiner shall verify the presence of the calibration reflector at scanning speed.

Note

It is not necessary to assure that this check confirms the signal amplitude at 100% of reference level, but merely to demonstrate that the signal from the calibration reflectors are readily observable at scanning speed.

The following statement shall be documented on the SwRI Sonic Instrument Calibration Record and initialed:

"Calibration Reflectors have been verified at Scanning Speed."

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECTS
OPERATING PROCEDURE

Title

MANUAL ULTRASONIC EXAMINATION OF FERRITIC PRESSURE PIPING WELDS

EFFECTIVITY AND APPROVAL

Revision 8 of this procedure became effective on Nov 1, 1984. Other revisions of the base document may be effective concurrently.

SA FLD

Approvals

Written By	Date	Technical Review	Date
DW Fennell	31 Oct. 1984	[signature]	31 Oct 1984
Manager of Q.A.	**Date**	**Cognizant Director**	**Date**
[signature] for BCH	11/1/84	Wayne I. Slack	11/1/84

The following information may be used for convenience. Completion of this portion is not mandatory.

Deviation No.								
Date Effective								
Procedure Section(s) Affected								

Notes:

MANUAL ULTRASONIC EXAMINATION OF FERRITIC PRESSURE PIPING WELDS

SwRI-NDT-600-41

1. PURPOSE

This procedure provides the technical information and detailed steps necessary to ensure a complete and accurate manual ultrasonic examination of ferritic pressure piping welds and the adjacent base material in accordance with the applicable ASME Boiler and Pressure Vessel Code.

2. SCOPE AND APPLICATION

Class 1 and Class 2 full-penetration pressure piping butt welds and the adjacent base material in the nominal thickness range of from 0.2- to 6.0-inches shall be examined.

Manual, contact, pulse-echo, shear-wave angle-beam, and longitudinal-wave straight-beam ultrasonic techniques shall be utilized for the examination of clad or unclad piping welds and adjacent base material.

Welds to be examined shall be circumferential and longitudinal ferritic pipe welds and set-in type branch connection butt welds as specified in the applicable SwRI Examination Plan.

3. APPLICABLE DOCUMENTS

(1) ASME Boiler and Pressure Vessel Code, Section XI, 1977 Edition with Addenda through Summer 1978, "Rules for Inservice Inspection of Nuclear Power Plant Components"

(2) SwRI Nuclear Quality Assurance Program Manual (NQAPM)

3.1 Applicable Calibration and Examination Records

SwRI-NDTR Form No.	Revision Date
17-89	8-19-80
17-90	8-19-80
17-25	7-10-80
17-19	12-1-83
17-18	7-31-75
17-37	2-18-80

4. RESPONSIBILITY

(1) The Director of the Department of Engineering Services, Quality Assurance Systems and Engineering Division, shall be responsible for the preparation, review, approval, and control of this procedure.

(2) The Project Manager shall be responsible for the implementation of this procedure in accordance with the NQAPM specified in the applicable SwRI Project Plan.

(3) The examiner shall be responsible for implementing the requirements of this procedure.

(4) The Manager of the Support and Administration Section, Quality Assurance Systems and Engineering Division, shall be responsible for storage of records generated in accordance with this procedure.

5. PERSONNEL AND EQUIPMENT

5.1 Personnel Certification

Personnel performing examinations in accordance with this procedure shall be certified in accordance with SwRI NQAP 11-1, "Special Process Control."

5.2 Reference Block

Reference blocks used for screen distance calibration and verification shall be made of carbon steel and shall be one of the following: (1) SwRI Half-Round, (2) AWS Type DC, or (3) IIW.

5.3 Basic Calibration Block for Circumferential, Longitudinal, and Branch Connection Welds

The basic calibration block shall be fabricated from material of the same nominal diameter and of the same nominal wall thickness or pipe schedule as the pipe to be examined. This material shall be from one of the materials specified for the piping being joined by the weld. The finish on the surfaces of the basic calibration block shall be representative of the surface finishes of the piping.

When the examination is to be performed from only one side of the weld, the calibration block material shall be of the same specification as the material on that side of the weld. If material of the same specification is not available, material of similar chemical analysis, tensile properties, and metallurgical structure may be used.

The curvature of the main run pipe shall be used to establish the requirements for the basic calibration block curvature for the examination of branch connection welds.

Calibration reflectors for 12/8 vee-path (N-path) calibrations shall be notches machined on the outside and inside surfaces of the basic calibration block. The notches shall be in accordance with approved drawings of the basic calibration block and Appendix III of Section XI.

Calibration reflectors for 1/2 vee-path examinations shall be a minimum of two equal-diameter, axially drilled holes located at 1/4T and 3/4T, and the inside surface notch.

Approved drawings of basic calibration blocks to be used in accordance with this procedure are in the applicable SwRI Examination Plan.

5.4 Search Units

(1) Search units shall be selected from the following:

(a) Straight-Beam

Nominal Production Material Thickness	Nominal Search Unit Size
2.0" or less	1/4" Round
1.0" to 3.0"	3/8" Round
2.0" to 4.0"	1/2" Round
3.0" to 6.0"	3/4" or 1" Round

(b) Angle-Beam

Nominal Production Material Thickness	Nominal Search Unit Size
1.0" or less	1/4" x 1/4", 1/4" Round
0.4" to 2.0"	3/8" x 3/8", 3/8" Round
0.75" to 4.0"	1/2" x 1/2", 1/2" Round
2.0" to 6.0"	1/2" x 1", 3/4" Round

(2) Search unit wedges shall be fabricated as required to produce 45° ±2° or 60° ±2° refracted shear-waves.

(3) The exit point of the sound beam and the actual refracted beam angle of shear wave search units shall be determined on an IIW block. The exit point shall be marked on the search unit wedge.

(4) The nominal search unit frequency shall be 2.25 MHz.

5.5 Ultrasonic Instrument

The examiner shall use a Sonic FTS Mark I ultrasonic instrument which shall be aligned and shall display a valid alignment calibration tag as required by NQAP 10-1.

5.6 Thermometer

The thermometer to be used for measuring the calibration block and component temperatures shall be calibrated and certified and shall display a valid calibration tag as required by NQAP 10-1.

5.7 Couplant

(1) USP-grade glycerine or deionized water (with or without wetting agent) shall be used when performing ultrasonic calibrations and examinations in accordance with this procedure.

(2) USP-grade glycerine shall be certified for sulfur content and total halogens in accordance with ASTM D-129-64 and ASTM D-808-63. The residual amount of total sulfur or halogens shall not exceed 1% by weight. Deionized water, when used, shall be supplied by the customer.

(3) Couplant materials used for examinations shall be the same as used for the calibration.

6. CALIBRATION METHOD

The ultrasonic calibration shall be completed prior to the examination.

The FREQ MHz control shall be turned to 2.

The REJECT control shall be maintained in the 0 position during calibration and examination.

The type and length of the search unit cable shall be recorded on the SwRI Sonic Instrument Calibration Record and all other information blocks on this form shall be filled in.

The centerline of the search unit shall be at least 3/4 inch from the nearest side of the block. Rotating the beam into the corner formed by the hole and the side of the block may produce a higher amplitude at a longer beam path. This beam path shall not be used for calibration.

The nominal piping production material thickness shall be used to determine the correct calibration block and search units for the examinations with geometric restrictions such as piping or components which may be thicker than the nominal pipe size, examinations limited to one side of the weld or wide weld crowns. The Level II or Level III examiner shall ensure that complete coverage of the examination area is obtained. Additional calibration vee-path positions, different angles, and larger screen sizes which may be required to assure this coverage, shall be used for the examination from either side of the weld.

6.1 Instrument Linearity

Ultrasonic instrument linearity shall be verified, as a minimum, within one day before and one day after performing all required ultrasonic examinations during a preservice examination, an outage or every three months, whichever is less, in accordance with Paragraphs 6.1.1 and 6.1.2. Data required shall be recorded on the SwRI Instrument Linearity Verification Record and the sheet number shall be referenced on each applicable SwRI Sonic Instrument Calibration Record.

The calibration verification of Paragraph 6.4.1 shall constitute a valid check of the instrument linearity. If a calibration verification does not fall within the tolerances required by Paragraph 6.4.2 due to instrument failure, an instrument linearity check must be performed prior to continuing examinations and all components examined since the last valid calibration verification shall be reexamined.

NOTE

The setting of the damping control shall be recorded in REMARKS on the SwRI Instrument Linearity Verification Record. The damping control shall be in the same position during linearity verification, calibrations, and examinations, or a new linearity verification shall be performed.

6.1.1 Amplitude Linearity

(1) Position a search unit on a basic calibration block and obtain at least two indications on the instrument screen.

(2) Adjust the search unit position to give a 2:1 ratio between the two indications with the larger indication set at 80% of full screen height (FSH) and the smaller indication set at 40% of FSH.

(3) Without moving the search unit, set the larger indication to 100% of FSH and record the amplitude of the smaller indication, estimated to the nearest 1% of FSH.

(4) Successively set the larger indication from 100% to 20% of FSH in 10% increments (or 2 dB steps if a fine control is not available); record the smaller indication estimated to the nearest 1% of FSH at each setting. The reading must be 50% of the larger amplitude within 5% of FSH.

6.1.2 Amplitude Control Linearity

(1) Position a search unit on a basic calibration block to obtain maximum amplitude from an applicable reflector.

(2) Without moving the search unit, set the indication to the required percent of FSH and increase or decrease the dB as specified below. The signal shall be recorded to the nearest 1% of FSH and shall fall within the limits of the following table.

Indication Set at % of FSH	dB Control*	Indication Limits, % of FHS
80%	-6dB	32 to 48%
80%	-12dB	16 to 24%
40%	+6dB	64 to 96%
20%	+12dB	64 to 96%

*Minus denotes decrease in amplitude; plus denotes increase.

6.1.3 Temperature Requirements

The temperature of the basic calibration block shall be within 25°F of the component temperature and shall be recorded on the SwRI Sonic Instrument Calibration Record for the initial calibration and each verification.

The surface temperature of the component to be examined shall be taken prior to performing an examination and shall be recorded on the applicable SwRI Examination Record.

6.2 Calibration

6.2.1 Straight-Beam Distance Calibration

The screen distance chosen shall be the shortest applicable size to include at least 1/4t beyond the thickest production material to which the search unit is applied.

Observing back reflections from the applicable reference block, set up the required linear sound path distance along the screen baseline.

NOTE

A straight beam distance amplitude calibration, using calibration reflectors shall not be established with this procedure.

6.2.2 Angle-Beam Distance Calibration

The screen distance chosen shall be the shortest applicable size to include at least 1/8 vee-path past the anticipated examination range.

Observing radius echoes from the applicable reference block, set up the required linear sound path distance along the screen baseline.

6.2.3 Angle-Beam Distance Amplitude Correction

Thickness measurements in accordance with Paragraph 7.5 and crown width measurements taken in accordance with the applicable revision of Nuclear Projects Operating Procedure IX-FE-117 shall be used to determine the shear-wave angle that provides the required coverage, as depicted in SKETCH 1. These physical measurements, the angle chosen, determined method of coverage, and identification of the Level II or the Level III examiner shall be recorded on the SwRI Straight Beam Lamination Examination Record.

Only one angle shall be required for the examination. A 45° angle-beam search unit with a 1/2 vee-path calibration shall be utilized if complete coverage is obtained. A 60° angle-beam search unit with a 1/2 vee-path calibration shall be used if the 45° 1/2 vee-path calibration does not obtain complete coverage. A 45° search unit with a calibration extending to the 12/8 vee-path position (N-path) shall be used when the 45° or the 60° 1/2 vee-path calibration does not obtain complete coverage. The 1/2 vee-path calibration may be extended to include additional vee-path positions if the calibration obtained is equal to or better than the N-path calibration.

EXCEPTIONS

For examinations on clad material and for 45° transverse examinations only the 1/2 vee-path calibration shall be used. Only a 45° 1/2 vee-path or N-path calibration shall be utilized for examination of longitudinal or branch connection welds.

6.2.3.1 Angle-Beam Distance Amplitude Correction (1/2 Vee-Path)

NOTE

The slope of the distance amplitude correction (DAC) curve shall be constructed from the holes parallel to the axis of the basic calibration block. The notch perpendicular to the axis of the curved basic calibration block shall be utilized to establish sensitivity when examining circumferential welds or for transverse examinations on longitudinal or branch connection welds. The axial notch shall be used to establish sensitivity when examining longitudinal or branch connection welds or for transverse examinations on circumferential welds.

The 1/2 vee-path DAC calibration shall be constructed as follows:

(1) Position the applicable 45° or 60° angle-beam search unit on the basic calibration block to obtain maximum response from the vee-path position, selected from the following, which produces the highest amplitude:

Vee-Path Positions

2/8, 3/8, 6/8

1/8, 3/8, 5/8, 7/8 (when 2/8 is not present)

1/8, 2/8, 3/8 only for clad material and 45° transverse examination (extrapolated to 4/8)

(2) Set this response to 80% ±5% of FSH. Mark this amplitude on the instrument screen and record these gain settings under REMARKS.

(3) Without adjusting the gain controls obtain maximum response from the remaining applicable hole(s); mark and join all amplitude points with a smooth curved line.

EXCEPTION

When the curvature of the calibration block precludes obtaining a maximum response from each vee-path position, all calibration points need not be utilized, provided that complete coverage can be accomplished with the obtainable calibration points.

(4) Establish the sensitivity from the inside surface notch by setting the indication amplitude at the level of the DAC curve. This is the primary reference level and the notch amplitude shall be marked with an X. Record the primary reference level gain settings under INSTRUMENT SETTINGS.

6.2.3.2 Alternate Angle-Beam DAC (N-Path)

NOTE

The notches perpendicular to the axis of the curved basic calibration block shall be utilized to establish sensitivity when examining circumferential welds. The axial notches shall be used to establish sensitivity when examining longitudinal or branch connection welds.

(1) Position the 45° angle-beam search unit on the calibration block to obtain maximum response from the vee-path position selected from the following, which produces the highest amplitude:

Vee-Path Positions

4/8, 8/8, 12/8

(2) Set this response to 80% ±5% of FSH and mark this amplitude on the screen. The gain controls shall not be adjusted once this primary reference response has been established.

(3) Obtain maximum response from the remaining vee-path positions; mark and join all amplitude points with a smooth curved line which shall not extend more than 1/8 vee-path beyond the last qualified calibration point.

6.3 Secondary DAC Calibrations (N-Path)

If all points on the 12/8 vee-path (N-path) DAC curve do not appear at 20% FSH or greater, a secondary DAC curve shall be constructed as follows:

(1) Secondary DAC curves shall contain at least 2 points.

(2) The DAC point at the 8/8 vee-path position shall be brought to the primary reference level and marked on the instrument screen. The 12/8 vee-path position, previously at less than 20% of FSH, shall be marked on the screen and all points connected with a smooth curved line. The instrument gain settings for this secondary DAC curve shall be recorded on the appropriate SwRI Sonic Instrument Calibration Record.

EXCEPTION

When the 8/8 vee-path position is set at the primary reference level, and the 12/8 vee-path position is below 20% of FSH, a secondary DAC curve is not required.

6.4 Calibration Verification

6.4.1 Sweep Range and DAC Curve Verification

Sweep range calibration shall be verified on the appropriate reference block; and DAC curve calibration, if applicable, shall be verified on the appropriate calibration block:

(1) Prior to a series of examinations

(2) With any substitution of the same type and length of search unit cable

(3) With any substitution utilizing the same type of power source; e.g., a change of batteries

(4) At least every 4 hours during the examination

(5) At the completion of a series of examinations

(6) Whenever the validity of the calibration is in doubt

6.4.2 Calibration Changes

(1) Perform the following if any point on the DAC curve has decreased more than 20% of FSH or 2 dB in amplitude or if any point has moved on the sweep line more than 10% of the sweep division reading:

(a) Void all examinations referring to the calibration in question and performed after the last valid calibration verification.

(b) Conduct a new calibration.

(c) Reexamine the areas for which examinations have been voided.

(2) Perform the following if any point on the DAC curve has increased more than 20% of FSH or 2 dB in amplitude:

(a) Correct the calibration.

(b) Reexamine all indications recorded since the last valid calibration verification.

(c) Enter proper values on a new SwRI Examination Record.

6.4.3 Recalibration

Substitution of any of the following shall be cause for recalibration:

(1) Search unit wedge or transducer

(2) Search unit type or length

(3) Ultrasonic instrument

(4) Examination personnel

(5) Couplant

(6) Change in type of power source; e.g., a change from direct to alternating current

7. EXAMINATION

7.1 Examination Areas

7.1.1 Circumferential and Longitudinal Butt Welds in Piping

Circumferential and longitudinal ferritic butt welds with a nominal thickness of 0.2- to 6.0-inches shall be examined from the outside

surface of the pipe. Product forms to be examined shall include extruded, drawn, and rolled material.

Scanning of the weld and base material shall be adequate to ensure complete coverage for 1/3t from the inside surface of the pipe. The base material shall be examined for a distance of 1/4 inch from the outside surface fusion line on each side of the weld. See attached Sketch 1 for coverage.

Class 1 longitudinal welds shall be examined along the entire length of the weld during the preservice examination and for at least one pipe-diameter length or 12 inches, whichever is less, from the fusion line of the intersecting circumferential weld during inservice examinations.

Class 2 longitudinal welds shall be examined for at least 2-1/2t length from the fusion line of the intersecting circumferential weld during preservice and inservice examinations.

7.1.2 Branch Connection Butt Welds in Piping

Full penetration butt welds of branch connections in pressure piping greater than 0.2 to 6.0 inches nominal thickness shall be examined from the outside surface of the pipe when required. Only set-in branch connections shall be examined with this procedure.

See attached Sketch 2 for examination coverage of branch connection welds.

7.2 Surface Condition

The contact surfaces shall be free from weld spatter, roughness, or other conditions that interfere with free movement of the search unit or impair the transmission of ultrasound.

7.3 Indication Length Zero Reference (Lo) Location

Areas to be examined in accordance with this procedure shall have an Lo marked in accordance with the applicable revision of Nuclear Projects Operating Procedure IX-PE-103.

7.4 Scanning

When practicable, scanning shall be performed at a minimum gain setting of 2 times the reference level sensitivity.

Instrument gain setting for scanning shall be determined on the calibration block as follows for each primary reference level utilized:

(1) With the instrument at the primary reference level, manipulate the search unit on the calibration block to obtain a signal from a reflector of 40% FSH.

(2) Add 6 dB of gain by utilizing the 6 dB switch (if present), the fine control, or a combination of the fine and coarse gain controls and choose any method which yields a signal response within ±2 dB or 80% FSH.

(3) This amplitude and method shall be recorded on the SwRI Sonic Instrument Calibration Record and shall be used during the valid calibration period of all scanning at 2 times the reference level sensitivity.

The search unit movement rate for scanning shall not exceed 6 inches per second.

Scanning overlap shall be a minimum of 10% of the search unit piezoelectric element dimension perpendicular to the direction of scan.

7.5 Thickness Measurements

Thickness measurements shall be taken at a minimum of three points adjacent to Lo for longitudinal and circumferential welds (on the centerline of the weld and at one point in the base material on each side of the weld), and at a minimum of two points adjacent to Lo for branch connection welds (one on the base material of the main run pipe, and one on the base material of the branch connection). Locations of measurements which cannot be taken adjacent to Lo, shall be recorded on the appropriate SwRI Examination Record. The examiner should take additional measurements when the crown height varies significantly or if other thickness changes are observed.

Screen distance calibration for this examination shall be conducted in accordance with Paragraph 6.2.1. Measurements shall be taken and recorded by placing the straight-beam search unit on the examination surface and observing the position of the back-wall reflection on the instrument screen.

7.5.1 Base Material Lamination Scan

Before the initial angle-beam examination, a lamination scan using straight-beam longitudinal-wave shall be performed covering the entire area through which the angle-beam is to be passed. Screen distance calibration

for this examination shall be conducted in accordance with Paragraph 6.2.1. The first back reflection shall be maintained at an amplitude between 50% and 90% of FSH.

Intermediate echoes having an amplitude equal to or greater than the remaining back reflection shall be recorded.

To record an intermediate indication, obtain a back reflection signal from an indication-free area and adjust this signal to 80% ±5% of FSH. Record the intermediate indication when its amplitude is equal to the remaining back reflection. Areas of total loss of back reflection accompanying the intermediate echo shall also be recorded.

NOTE

Attenuation measurements shall not be performed. The crown height and crown width shall be measured and recorded on the appropriate SwRI Examination Record.

7.6 Examination of Circumferential and Longitudinal Butt Welds in Piping

7.6.1 Angle-Beam Examination for Indications Parallel with the Weld

A 1/2 vee-path using a 45° or a 60° refracted shear-wave or a 12/8 vee-path using a 45° refracted shear-wave shall be accomplished, as applicable, from one or both sides of the weld, whichever obtains complete coverage.

The sound beam shall be directed perpendicularly into the weld to detect indications parallel with the weld. Calibration shall be as described in Paragraphs 6.2.2 and 6.2.3.

NOTE

A 45° 12/8 vee-path examination shall be conducted if a 45° or a 60° 1/2 vee-path examination does not obtain complete coverage.

7.6.2 Angle-Beam Examination for Indications Perpendicular to the Weld

The 1/2 vee-path angle-beam examination shall be conducted on each weld by placing the 45° search unit on the weld surface with the sound beam directed into and parallel with the weld. Scanning shall be performed in two directions on the weld.

Calibration shall be as described in Paragraphs 6.2.2 and 6.2.3.

..7 Examination of Branch Connection Butt Welds

7.7.1 Angle-Beam Examination for Indications Parallel with the Weld

A shear-wave angle-beam examination shall be accomplished from the main run pipe side of the weld. For this examination, the sound beam shall be directed perpendicularly into the weld to detect indications parallel with the weld. Calibration for these examinations shall be in accordance with Paragraph 6.2.3.

7.7.2 Angle-Beam Examination for Indications Perpendicular to the Weld

The angle-beam examination for indications perpendicular to the weld shall be the same as the examination described in Paragraph 7.6.2.

7.8 Postexamination Cleaning

Arrangements shall be made with the customer for postexamination removal of couplant materials.

8. RECORDING CRITERIA

Indications shall be recorded in accordance with the techniques outlined in the applicable revision of SwRI Nuclear Projects Operating Procedure IX-FE-117.

Ultrasonic reflectors producing a response greater than 50% of the reference level shall be recorded on the appropriate SwRI Examination Record.

Indications greater than 50% of the reference level attributable to geometry shall be recorded only once, even if the amplitude of the indication fluctuates above and below the required recording amplitude along the weld. These indications shall be investigated by a Level II or a Level III examiner to determine the shape, identity, and location of the reflector.

If indications, which have been recorded as geometry, have been investigated and found to be nongeometric reflectors, the entire weld shall be reexamined, recording all nongeometric reflectors and other reflectors not previously recorded at least once.

Indications greater than 100% of the reference level shall be investigated by a Level II or a Level III examiner to determine the shape, identity, and location of the reflector.

The end points of the indication, as determined by 100% DAC, shall be recorded.

Indications investigated and found to be other than geometrical in nature, shall be reported to the customer for evaluation.

Scanning limitations shall be recorded.

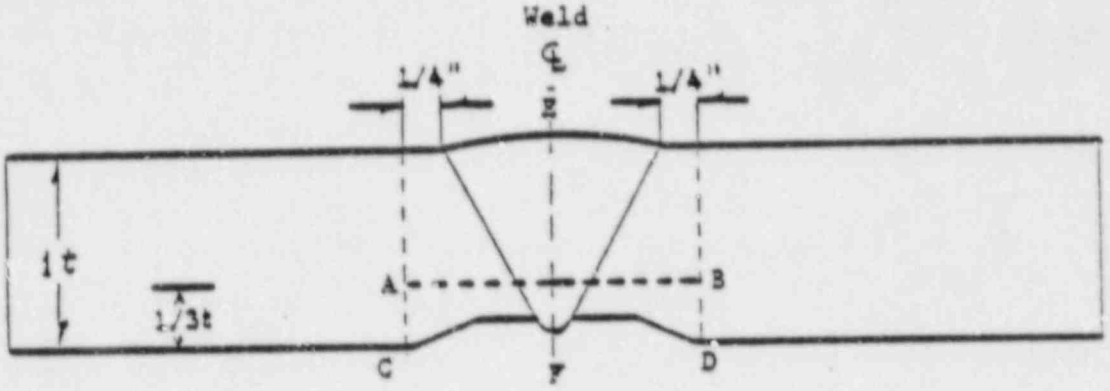
9. EVALUATION

Evaluation of indications shall be the responsibility of the customer and shall be conducted in accordance with Article IWA-3000, Section XI, of the applicable ASME Boiler and Pressure Vessel Code.

10. RECORDS

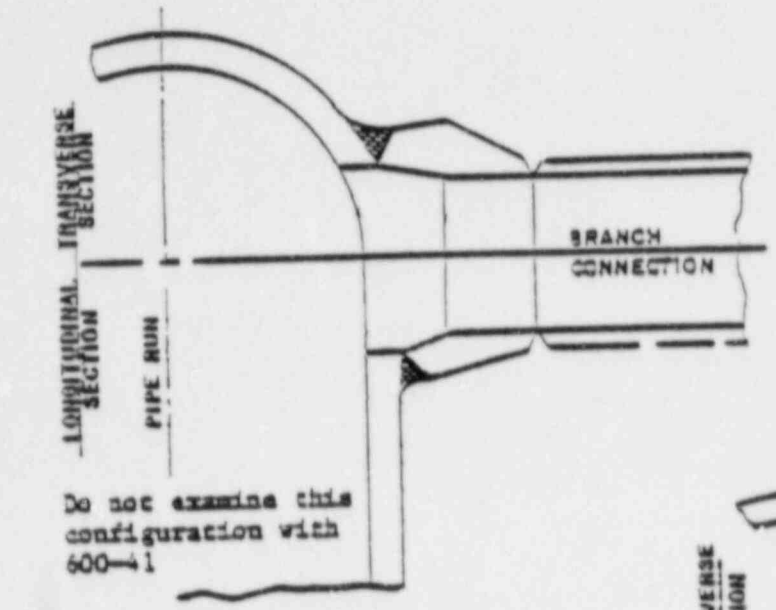
Documents generated in accordance with this procedure shall be stored as specified in the SwRI Project Plan. The customer shall receive copies of these documents in the Examination Report, unless specified in the SwRI Project Plan.

SKETCH 1

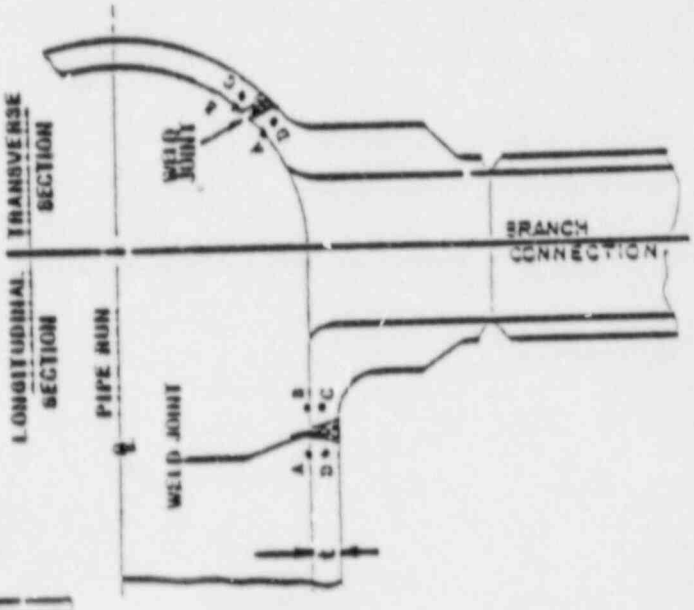


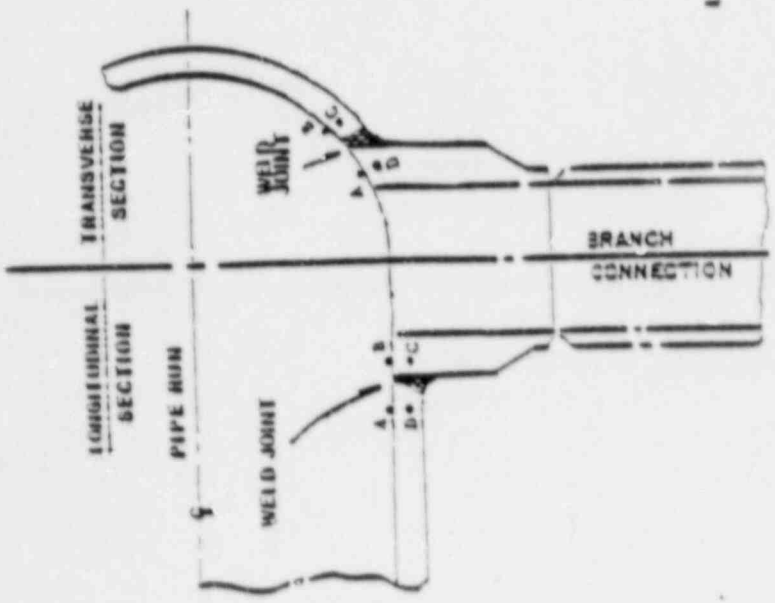
EXAMINATION VOLUME A-B-C-D

Examination Area for
Circumferential and Longitudinal Butt Welds in Piping



Examination Area A-B-C-D (lower 1/3t of the weld and 1/4 inch base material on each side of the weld)





SKETCH 1

BRANCH CONNECTION WELDS

(volumetric examination requirements)

PROCEDURE DEVIATION

Procedure	Revision No.	Deviation No.
SwRI-NDT- 800-94	2	1

The following examination areas are affected by this deviation:

BWR Feedwater nozzle inner bore.

The following paragraphs shall be deviated from as indicated:

Change in Paragraph 5.4:

Average Thickness

1.0" to 7.0"	1/2" x 1/2" or 1/2" round
3/0" to 12.0"	1/2" x 1" or 1" round

Change second paragraph, first sentence to read:

"The wedges for the nozzle taper examination shall be designed to produce a $45^{0} \pm 2^{0}$ refracted shear-wave.

Delete third paragraph entirely.

Delete fourth paragraph, first sentence

Change fourth paragraph, second sentence to read:

"The wedges for the nozzle boss examination shall produce $22^{0} \pm 2^{0}$ reflected longitudinal-wave.

(Continued on following pages)

Rationale for deviation:

Changes in calibration block design requires new calibration techniques.

Deviation Affects Qualification	YES ☒	NO ☐	If the deviation is determined to affect the procedure qualification, the deviation shall be qualified in accordance with Procedure IX-PE-107.

APPROVALS

SA FLD

Written by:	Date:	Technical Review:	Date:
James J. McArdle	3-11-88	E A Burnley	3-15-88
		Verbal Approval Given? ☒ Yes ☐ No	Date: 3-11-88
Manager of Q.A.:	Date:	Cognizant Director:	Date:
L C Tilsovich	3/16/88	David Frank Rosow	3/16/88

The following paragraphs shall be deviated from as indicated (Cont.):

Change Paragraph 6.5 read:

ANGLE-BEAM LONGITUDINAL-WAVE CALIBRATION

The refracted longitudinal-wave search unit described in 5.4 shall be positioned on the nozzle boss to obtain a peak amplitude response from Notch-B (see Sketch 1). Adjust the instrument gain to set the notch amplitude at 80% ± 5% FSH. This shall be the primary reference level.

Mark the position and amplitude of this reflector on the CRT. Position the search unit to obtain a peak amplitude response from Notch-A. Mark the position and amplitude of Notch-A on the CRT.

Draw a horizontal line on the CRT starting 1 inch in metal path before Notch-B and extending across the screen at the reference level line to 1 inch beyond Notch-A.

Change Paragraph 6.6 to read:

ANGLE-BEAM SHEAR-WAVE CALIBRATION

The refracted shear-wave search unit described in 5.4 shall be positioned on the nozzle taper to obtain a peak amplitude response from Notch-D (see Sketch 1). Adjust the instrument gain to set the notch amplitude at 80% ± 5% FSH. This shall be the primary reference level.

Mark the position and amplitude of this reflector on the CRT. Position the search unit to obtain a peak amplitude response from Notch-C. Mark the position and amplitude of this reflector on the CRT. Draw a smooth line joining the two calibration points.

Delete Paragraph 6.7 entirely.

Change Paragraph 7.3.1 to read:

ANGLE-BEAM LONGITUDINAL-WAVE EXAMINATION FOR INDICATIONS PARALLEL TO THE NOZZLE AXIS

Place the 22° search unit on the nozzle boss area with the sound beam direction perpendicular to the nozzle axis. Scan the entire length and circumference of the nozzle boss from two opposing directions.

Change Paragraph 7.3.2 to read:

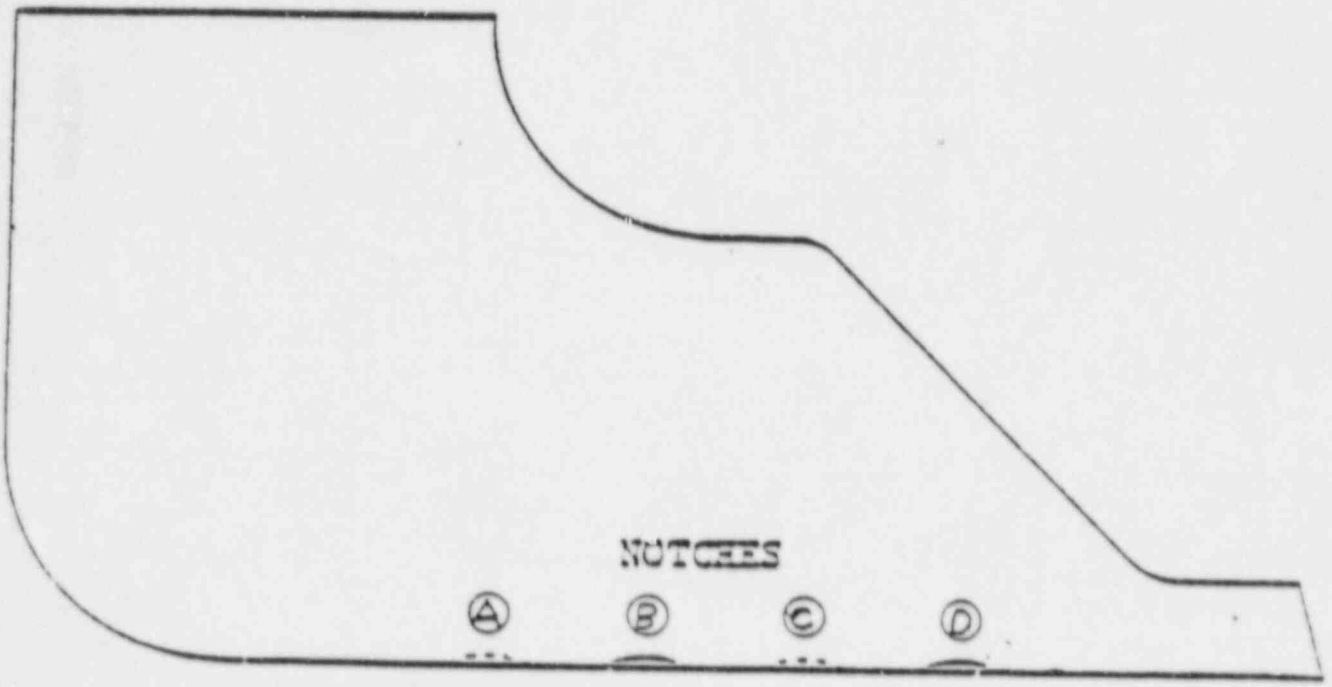
ANGLE-BEAM SHEAR-WAVE EXAMINATION FOR INDICATIONS PARALLEL TO THE NOZZLE AXIS

Place the 45° search unit on the nozzle taper area with the sound beam directed down towards the nozzle inside surface. When the sound beam is normal to the inside surface, back-reflection signals will appear evenly spaced on the CRT.

Skew the search unit off axis 45° and scan the entire tapered surface around the circumference from two opposing directions.

Delete Paragraph 7.3.3 entirely.

Sketch 1



Basic Calibration Block

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECTS
OPERATING PROCEDURE

SwRI-NDT-800-94
Revision 2
February 1988

Title

MANUAL ULTRASONIC EXAMINATION OF CYLINDRICAL AND CONICAL SECTIONS OF BWR FEEDWATER NOZZLES

EFFECTIVITY AND APPROVAL

Revision 2 of this procedure became effective on Feb. 15, 1988. Other revisions of the base document may be effective concurrently.

SA FLD

Approvals

Written By	Date	Technical Review	Date
Lyle Spiess	15Feb88	James J. McArdle Jr.	2-15-88
Manager of Q.A. TAM 2/15/88 T.C. Tahvonen	Date 2/15/88	Cognizant Director Barry L. Englehardt for DFR	Date 15Feb-88

The following information may be used for convenience. Completion of this portion is not mandatory.

Deviation No.								
Date Effective								
Procedure Section(s) Affected								

Notes:

MANUAL ULTRASONIC EXAMINATION OF CYLINDRICAL AND CONICAL SECTIONS OF BWR FEEDWATER NOZZLES

SwRI-NDT-800-94

1. PURPOSE

This procedure provides the technical information and detailed steps necessary to ensure a proper manual ultrasonic examination of cylindrical and conical sections of BWR feedwater nozzles from the outside surface, in accordance with the applicable American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Codes.

2. SCOPE AND APPLICATION

Manual examinations shall be performed using shear-wave and longitudinal-wave angle-beam, contact, pulse-echo, ultrasonic techniques.

The examination of cylindrical sections of feedwater nozzles in the thickness range of 1.0 to 12.0 inches is described in this procedure. Cylindrical sections to be examined shall be as specified in the applicable Southwest Research Institute (SwRI) Examination Plan.

3. APPLICABLE DOCUMENTS

(1) ASME Boiler and Pressure Vessel Code, Section XI, 1983 Edition with Addenda through Summer 1983, "Rules for Inservice Inspection of Nuclear Power Plant Components"

(2) ASME Boiler and Pressure Vessel Code, Section V, 1983 Edition with Addenda through Summer 1983, "Nondestructive Examination"

(3) SwRI Nuclear Quality Assurance Program Manual (NQAPM)

3.1 Applicable Calibration and Examination Records

SwRI NDTR Form No.	Revision Date
17-19	12-1-83
17-89	8-19-80
17-90	8-19-80
17-37	2-18-80

4. RESPONSIBILITY

(1) The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division, shall be responsible for the preparation, review, approval, and control of this procedure.

(2) The Project Manager shall be responsible for the implementation of this procedure in accordance with the NQAPM specified in the applicable SwRI Project Plan.

(3) The examiner shall be responsible for implementing the requirements of this procedure.

(4) The Manager of the Support and Administration Section, Nondestructive Evaluation Science and Technology Division, shall be responsible for storage of records generated in accordance with this procedure.

5. PERSONNEL AND EQUIPMENT

5.1 Personnel Certification

Personnel performing ultrasonic examinations shall be certified in accordance with SwRI NQAP 11-1, "Special Process Control."

5.2 Reference Blocks

Reference blocks used for screen distance calibration shall be of the same basic material as the production material, carbon steel, and shall be one of the following: (1) SwRI Half-Round, (2) AWS Type DC, or (3) IIW.

5.3 Basic Calibration Blocks

Calibration reflectors shall be notches placed in a basic calibration block as shown in Sketch 1. Basic calibration blocks shall be manufactured from one of the following: (1) the component nozzle dropout; (2) the component prolongation; or (3) material of the same specification, product form, and heat treatment as one of the materials being joined. The basic calibration block material shall be determined by the production material to which the search unit is applied. Notch reflectors shall be in accordance with approved drawings contained in the applicable SwRI Examination Plan.

5.4 Search Units

Angle-beam (shear-wave or longitudinal-wave) search units shall be selected from the following table:

Average Thickness	Nominal Search Unit Size
1.0" to 3.0"	(A) 3/8" Round
2.0" to 7.0"	(B) 1/2" x 1/2", 1/2" Round
3.0" to 12.0"	(C) 1/2" x 1"

The wedges for Zone 1 examinations (see Sketch 1) shall be designed to produce a 45° ±2° angle-beam shear wave. The exit point and shear wave angle of the search unit shall be determined on an IIW Block.

The wedges for Zone 2 examinations (see Sketch 1) shall be designed to produce a 55° ±2 angle-beam shear wave. These wedges shall also be designed with a skew angle of 45° and shall be used for both clockwise and counter-clockwise scanning. The exit point and actual shear-wave angle of the search unit shall be determined on an IIW block.

The wedges for Zone 3 examinations (see Sketch 1) shall be designed such, that the contact faces of the wedges for circumferential scans shall conform to the curvature of the cylindrical sections of the nozzle. These wedges shall produce a 22° ±2° angle-beam longitudinal-wave. The exit point of the wedge shall be determined on an IIW or DC reference block. The refracted angle shall be measured on an IIW block or basic calibration block.

The nominal search unit frequency shall be 2.25 MHz.

5.5 Ultrasonic Instrument

The examiner shall use a Sonic FTS Mark I ultrasonic instrument, which shall be aligned and shall display a valid alignment calibration tag as required by NQAP 10-1.

5.6 Couplant

(1) USP-grade glycerine or deionized water shall be used when performing ultrasonic calibrations and examinations in accordance with this procedure.

(2) All couplants other than deionized water shall be certified for sulfur content and total halogens in accordance with D-129 and D-808 of Article 24, Section V. The residual amount of total sulfur or halogens shall not exceed 1% by weight. Deionized water, when used, shall be supplied by the customer.

(3) Couplant materials used for examinations shall be the same as used for the calibration.

5.7 Thermometer

The thermometer to be used for measuring the calibration block and component temperatures shall be calibrated and certified and shall display a valid calibration tag as required by NQAP 10-1.

6. CALIBRATION

6.1 Instrument Linearity

Ultrasonic instrument linearity shall be verified prior to each period of extended use or every three months, whichever is less, in accordance with Paragraphs 6.1.1 and 6.1.2. Data required shall be recorded on the SwRI Instrument Linearity Verification Record and the sheet number shall be referenced on each applicable SwRI Sonic Instrument Calibration Record.

NOTE

The setting of the damping control shall be recorded in REMARKS on the SwRI Instrument Linearity Verification Record. The damping control shall be in the same position during linearity verification, calibrations and examinations or a new linearity verification shall be performed.

6.1.1 Screen Height Linearity

(1) Position a shear-wave search unit on a calibration block to obtain indications from the 1/2T and 3/4T holes or use a straight-beam search unit on any calibration block that provides amplitude differences.

(2) Adjust the search unit position to give a 2:1 ratio between two indications, with the larger indication set at 80% of full screen height (FSH) and the smaller indication at 40% of FSH.

(3) Without moving the search unit, set the larger indication to 100% of FSH; record the amplitude of the smaller indication, estimated to the nearest 1% of FSH.

(4) Successively set the larger indication from 100% to 20% of FSH in 10% increments (or 2 dB steps if a fine control is not available); observe and record the smaller indication estimated to the nearest 1% of FSH at each setting. The reading must be 50% of the larger amplitude within 5% of FSH.

6.1.2 Amplitude Control Linearity

(1) Position an angle-beam or a straight-beam search unit on a calibration block to obtain maximum amplitude from an applicable reflector.

NOTE

The primary reference level sensitivity should be within the highest and lowest gain settings used during amplitude control linearity verifications. The highest and lowest gain settings used during the amplitude control linearity verifications shall be recorded in the Remarks column of the applicable SwRI Linearity Verification Records.

(2) Without moving the search unit, set the indication to the required percent of FSH and increase or decrease the dB as specified below. The estimated signal shall be recorded to the nearest 1% of FSH and shall fall within the limits of the following table:

Indication Set at % of FSH	dB Control Change*	Indication Limits, % of FSH
80%	- 6 dB	32 to 48%
80%	-12 dB	16 to 24%
40%	+ 6 dB	64 to 96%
20%	+12 dB	64 to 96%

*Minus denotes decrease in amplitude; plus denotes increase.

6.1.3 Calibration Method

The ultrasonic calibration shall be completed prior to the examination.

The REJECT control shall be maintained in the 0 position during calibration and examination.

The FREQ MHz control shall be turned to 2.

The type and length of the search unit cable shall be recorded on the SwRI Sonic Instrument Calibration Record, and all other information blocks on the form shall be filled in.

6.2 Temperature

The calibration block temperature shall be within 25°F of the component temperature and shall be recorded on the SwRI Sonic Instrument Calibration Record for the initial calibration and each verification. The surface temperature of the component to be examined shall be taken prior to performing and upon completion of each examination and shall be recorded on the appropriate SwRI Ultrasonic Examination Record.

6.3 Angle-Beam Longitudinal-Wave Distance Calibration

Prior to the preliminary distance calibration, remove the curved wedge from the search unit, described in 5.4(C). Observing back reflections from the 1-inch dimension of an IIW Block, set up a linear sound path distance of 5 inches along the baseline of the instrument screen. Remount and couple the search unit on the curved wedge and position it on the 4-inch radius of the IIW Block. Delay the 4-inch reflection to the 0 major screen division on the instrument screen which now represents 4 to 9 inches.

6.4 Angle-Beam Shear Wave Distance Calibration

Observing the radius echoes from an applicable reference block set up a linear sound path distance of 5, 10, or 20 inches along the screen base line.

6.5 Angle-Beam Longitudinal-Wave Zone 3 Calibration

The angle-beam longitudinal-wave search unit described in 5.4(C) shall be positioned to obtain a response from Notch B (see Sketch 1). This response shall be set to a primary reference level of 80% ±5% FSH. Position the search unit to obtain a response from Notch A. Draw a line joining both calibration points. A line shall be drawn on the instrument screen of at least 1-inch prior to Notch B. Note and verify the presence of Notches C and D.

6.6 Angle-Beam Shear-Wave Zone 2 Calibration

The angle-beam shear-wave search unit described in 5.4(B) shall be positioned to obtain a response from Notch E (Sketch 1). This response shall be set to the primary reference level of 80% ±5% FSH. Position the search unit to obtain a response from Notch D. Draw a line joining both calibration points.

6.7 Angle-Beam Shear-Wave Zone 1 Calibration

The angle-beam shear-wave search unit described in 5.4(A) shall be positioned to obtain maximum response from Notch F (Sketch 1). This response shall be set to the primary reference level of 80% ±5% FSH. Position the search unit to obtain a response from Notch E. Draw a line joining both calibration points.

6.8 Calibration Verification

6.8.1 Frequency of Instrument Calibration Verification

Sweep range and sensitivity calibration shall be verified by using the appropriate basic calibration block, if the wedge does not require removal from the search unit, when any of the following occurs:

(1) Prior to a series of examinations

(2) With any substitution of the same type and length of search unit cable

(3) With any substitution utilizing the same type of power source; e.g., a change of batteries

(4) At least every 4 hours during the examination

(5) At the completion of a series of examinations

(6) Whenever the validity of the calibration is in doubt

6.8.2 Verification of Calibration Reflectors at Scanning Speed

The examiner shall verify the presence of the calibration reflector at scanning speed.

NOTE

It is not necessary to assure that this check confirms the signal amplitude at 100% of reference level, but merely to demonstrate that the signal from the calibration reflectors are readily observable at scanning speed.

The following statement shall be documented on the SwRI Sonic Instrument Calibration Record and initialed:

"Calibration reflectors have been verified at scanning speed."

6.8.3 Calibration Changes

(1) Perform the following if any calibration point has decreased more than 20% or 2 dB in amplitude, or any calibration point has moved on the sweep line more than 10% of the sweep division reading or 5% of full sweep, whichever is greater:

(a) Void all examinations referring to the calibration in question and performed after the last valid calibration verification.

(b) Conduct a new calibration.

(c) Reexamine the areas for which examinations have been voided.

(2) Perform the following if any calibration point has increased in amplitude more than 20% or 2 dB:

(a) Correct the calibration.

(b) Reexamine all indications recorded since the last valid calibration verification.

(c) Enter proper values on a new SwRI Ultrasonic Examination Record.

6.8.4 Recalibration

Substitution of any of the following shall be cause for recalibration:

(1) Search unit wedge or transducer

(2) Search unit cable type or length

(3) Ultrasonic instrument

(4) Examination personnel

(5) Couplant

(6) Change in type of power source; e.g., a change from direct to alternating current

7. EXAMINATION

7.1 Examination Area

The straight and conical cylindrical sections of feedwater nozzles in the thickness range of 1.0 to 12.0 inches shall be examined from the outside surface. Thickness of the straight cylindrical section including cladding shall be the wall thickness of the section of the component containing the nozzle to be examined.

7.2 Surface Conditions

The contact surfaces must be free from weld spatter, roughness, or other conditions which interfere with free movement of the search unit or impair the transmission of ultrasound.

7.3 Examination Method

7.3.1 Angle-Beam Longitudinal-Wave Examination for Indications Parallel to the Nozzle Axis in Zone 3

Examine Zone 3 of the nozzle by utilizing the angle-beam longitudinal-wave search unit with the sound beam directed perpendicular to the axis of the nozzle. The entire length and circumference of Zone 3 shall be examined with the sound beam directed in this manner from two opposing directions. Calibration for this examination shall be in accordance with Paragraphs 6.3 and 6.5.

7.3.2 Angle-Beam Shear-Wave Examination for Indications Parallel to the Nozzle Axis in Zone 2

Examine Zone 2 of the nozzle with the angle-beam shear-wave search unit directing the sound beam tangentially to the axis of the nozzle to ensure proper sound-beam orientation. The entire length and circumference of Zone 2 shall be examined with the sound beam directed in this manner from two opposing directions. Calibration for this examination shall be in accordance with Paragraphs 6.4 and 6.6.

7.3.3 Angle-Beam Shear-Wave Examination for Indications Parallel to the Nozzle Axis in Zone 1

Examine Zone 1 of the nozzle by utilizing the angle-beam shear-wave search unit directing the sound beam perpendicular to the axis of the nozzle. The entire length and circumference of Zone 1 shall be examined with the sound beam directed in this manner from two opposing directions. Calibration for this examination shall be in accordance with Paragraphs 6.4 and 6.7.

NOTE

Skewing the transducer will be required to ensure coverage of all zones.

7.4 Scanning Parameters

When practicable, scanning shall be performed at a minimum gain setting of two times the reference level sensitivity.

Instrument gain setting for scanning shall be determined on the basic calibration block as follows for each primary reference level utilized:

(1) With the instrument at the primary reference level, manipulate the search unit on the basic calibration block to obtain a signal of 40% FSH from a calibration reflector (notch).

(2) Add 6 dB of gain by utilizing the 6 dB switch (if present), the fine gain control, or a combination of the fine and coarse gain controls and choose any method that yields a signal response within ±2 dB of 80% FSH.

(3) This amplitude and method shall be recorded on the SwRI Sonic Instrument Calibration Record and shall be used during the valid calibration period for all scanning at two times the reference level sensitivity.

Scanning overlap shall be a minimum of 10% of the search unit piezoelectric element dimension perpendicular to the direction of scan.

The search unit movement rate for scanning shall not exceed 6 inches per second during the examination unless the calibration is verified at the scanning speed to be used.

7.5 Postexamination Cleaning

Arrangements shall be made with the customer for postexamination removal of couplant materials.

8. RECORDING CRITERIA

Indications shall be recorded in accordance with the techniques outlined in the applicable revision of SwRI Procedure IX-FE-117.

The end points of the indication, as determined by 100% DAC, shall be recorded.

Ultrasonic reflectors producing a response 50% or greater of the reference level shall be recorded on the appropriate SwRI Examination Record.

Indications producing a response 100% or greater of the reference level shall be investigated by a Level II or a Level III examiner to determine the shape, identity, and location of the reflector.

Indications 100% or greater of the reference level investigated and found to be other than geometrical in nature shall be reported to the customer for evaluation.

Scanning limitations shall be recorded.

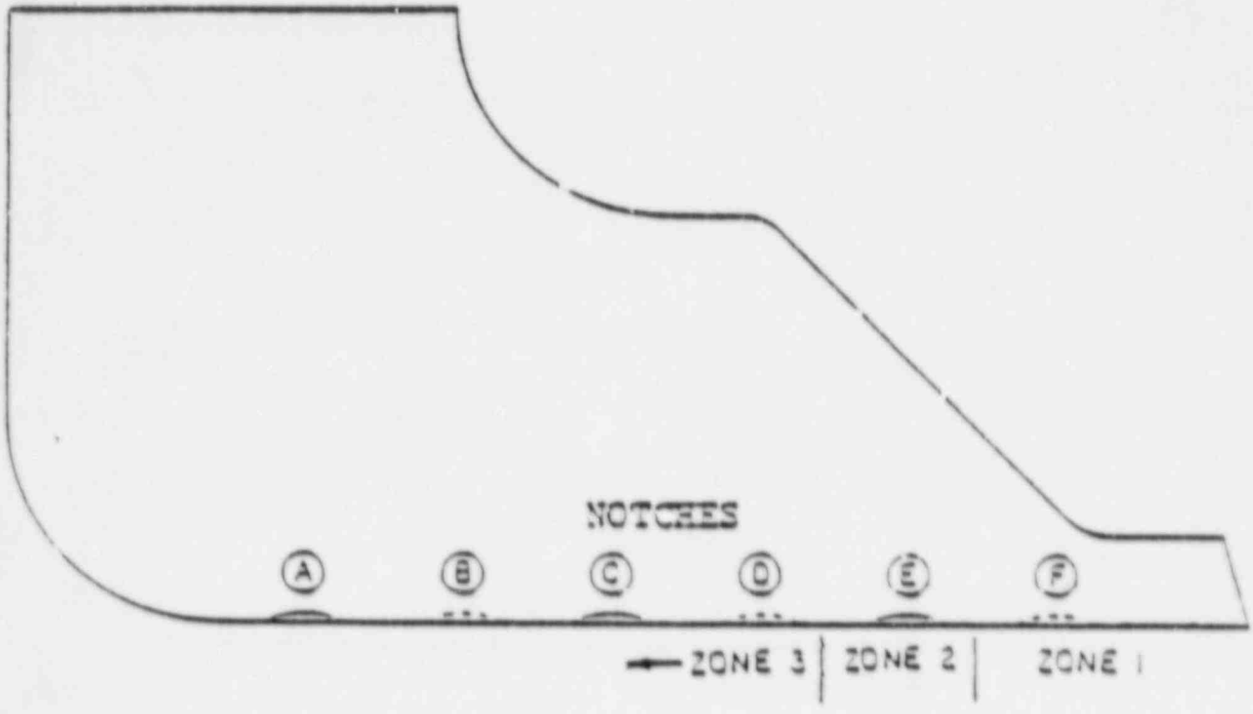
9. EVALUATION

Initial evaluation of reportable indications shall be performed by SwRI personnel, and shall be conducted in accordance with the applicable ASME Boiler and Pressure Vessel Code, Section XI, Article IWA-3000. Final evaluation and disposition of reportable indications shall be the responsibility of the customer.

10. RECORDS

Documents generated in accordance with this procedure shall be stored as specified in the SwRI Project Plan. The customer shall receive copies of these documents in the Examination Report, unless specified otherwise in the SwRI Project Plan.

Sketch 1



Basic Calibration Block

PROCEDURE DEVIATION

Procedure	Revision No.	Deviation No.
SwRI-NDT- 800-100	2	1

The following examination areas are affected by this deviation:

7.1.3 Inservice Examination Areas.

The following paragraphs shall be deviated from as indicated:

Change Paragraph to read as follows:

For inservice examinations, the lower 1/3 volume (base material plus cladding) shall be examined for the length of the cladding plus 1/4 inch on each end. The area defined by E, F, G, and H in Figure 1 is the area to be examined.

Rationale for deviation:

Extent of volume examined changed at the request of Public Service Electric and Gas Company.

Deviation Affects Qualification	YES ☐ NO ☒

If the deviation is determined to affect the procedure qualification, the deviation shall be qualified in accordance with Procedure IX-FE-107.

APPROVALS — SA FLD

Written by:	Date:	Technical Review:	Date:
Edward J. [signature]	4FEB 99	[signature]	4 Feb 88
		Verbal Approval Given? ☐ Yes ☒ No	Date:
Manager of Q.A.: [initials] S.C. Sibovich	Date: 5 Feb 1988	Cognizant Director: David Frank Rosow	Date: 2/6/88

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECTS
OPERATING PROCEDURE

SwRI-NDT-800-100
Revision 2
December 1987

Title

MANUAL ULTRASONIC EXAMINATION OF CORROSION-RESISTANT CLAD PIPING WELDS AT HOPE CREEK

EFFECTIVITY AND APPROVAL

Revision 2 of this procedure became effective on Dec 21, 1987. Other revisions of the base document may be effective concurrently.

SA FLD

Approvals

Written By	Date	Technical Review	Date
DW Farwell	14 Dec. 1987	James J. M. Gable Level III UT	14 Dec 87
Manager of Q.A.	**Date**	**Cognizant Director**	**Date**
R Engelhardt for TCT	12/10/87	Wayne J. Black	12/21/87

The following information may be used for convenience. Completion of this portion is not mandatory.

Deviation No.								
Date Effective								
Procedure Section(s) Affected								

Notes:

MANUAL ULTRASONIC EXAMINATION OF CORROSION-RESISTANT CLAD PIPING WELDS AT HOPE CREEK

SwRI-NDT-800-100

1. PURPOSE

This procedure provides the technical information and detailed steps required to ensure a proper manual ultrasonic examination of welds and adjacent base material in corrosion-resistant clad pressure piping at the Hope Creek Generating Station in accordance with the applicable American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Codes.

2. SCOPE AND APPLICATION

Welds and adjacent base material in corrosion-resistant clad piping with a nominal thickness range of greater than 0.4 to 5.0 inches shall be examined in accordance with this procedure.

Manual, contact, pulse-echo, longitudinal-wave straight-beam and refracted longitudinal-wave angle-beam ultrasonic techniques shall be utilized for these examinations.

Welds to be examined shall be as specified in the applicable Southwest Research Institute (SwRI) Examination Plan.

This procedure is intended to be used only for instrument calibration, examination, and the recording of indications, and shall not be used for the sizing of indications.

3. APPLICABLE DOCUMENTS

(1) ASME Boiler and Pressure Vessel Code, Section XI, 1983 Edition with Addenda through Summer 1983, "Rules for Inservice Inspection of Nuclear Power Plant Components"

(2) ASME Boiler and Pressure Vessel Code, Section V, 1983 Edition with Addenda through Summer 1983, "Nondestructive Examination"

(3) SwRI Nuclear Quality Assurance Program Manual (NQAPM)

3.1 Calibration and Examination Records

SwRI-NDTR Form No.	Revision Date
17-18	3-14-79
17-19	12-1-83
17-25	7-10-80
17-37	2-18-80
17-89	8-19-80
17-90	8-19-80

4. RESPONSIBILITY

(1) The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division, shall be responsible for the preparation, review, approval, and control of this procedure.

(2) The Project Manager shall be responsible for the implementation of this procedure in accordance with the NQAPM specified in the applicable SwRI Project Plan.

(3) The examiner shall be responsible for implementing the requirements of this procedure.

(4) The Manager of the Support and Administration Section, Nondestructive Evaluation Science and Technology Division, shall be responsible for storage of records generated in accordance with this procedure.

5. PERSONNEL AND EQUIPMENT

5.1 Personnel Certification

Personnel performing ultrasonic examinations shall be certified in accordance with SwRI NQAP 11-1, "Special Process Control."

5.2 Reference Block

The reference block used for screen distance calibration and verification shall be of the same material as the production material, stainless steel, and shall be an AWS Type DC.

5.3 Basic Calibration Block

The basic calibration block shall be fabricated from material of the same nominal diameter and of the same nominal wall thickness or pipe schedule as the pipe to be examined. This material shall be from one of the

materials specified for the piping being joined by the weld. The finish on the surfaces of the basic calibration block shall be representative of the surface finishes of the piping.

When the examination is to be performed from only one side of the weld, the calibration block material shall be of the same specification as the material on that side of the weld. If material of the same specification is not available, material of similar chemical analysis, tensile properties, and metallurgical structure may be used.

Calibration reflectors for the examinations shall be three equal-diameter end-drilled holes, three equal-diameter side-drilled holes, located at 1/4T, 1/2T and 3/4T, and two notches (one transverse and one axial) machined on the inside surface of the basic calibration block.

Approved drawings of basic calibration blocks to be used in accordance with this procedure are contained in the applicable SwRI Examination Plan.

5.4 Search Units

Search units shall be selected from the following:

(1) Straight-Beam

Nominal Production Material Thickness	Nominal Search Unit Size
2.0" or less	1/4" Round
1.0" to 3.0"	3/8" Round
2.0" to 4.0"	1/2" Round
3.0" to 5.0"	3/4" or 1" Round

(a) The nominal straight-beam longitudinal-wave search unit frequency for examining austenitic material shall be from 1.5 MHz up to and including 2.5 MHz.

(2) Angle-Beam

(a) Search unit wedges shall be fabricated to produce 45° ±2° refracted longitudinal waves in austenitic material.

(b) The exit point of the sound beam and the actual refracted beam angle of refracted longitudinal-wave search units shall be determined on an IIW block. The exit point shall be marked on the search unit wedge.

(c) The nominal angle-beam refracted longitudinal-wave search unit size shall be 1/4" x 1/2" dual.

(d) The actual angle-beam refracted longitudinal-wave search unit frequency for examining austenitic material shall be from 1.5 up to and including 2.5 MHz. Other search unit frequencies may be used only if they produce equivalent or superior results.

(e) The transducer used for each thickness and diameter shall be selected from Appendix 1.

5.5 Ultrasonic Instrument

The examiner shall use a Sonic FTS Mark I ultrasonic instrument which shall be aligned and shall display a valid alignment calibration tag as required by NQAP 10-1.

5.6 Couplant

(1) USP-grade glycerine shall be used when performing ultrasonic calibrations and examinations in accordance with this procedure.

(2) USP-grade glycerine shall be certified for sulfur content and total halogens in accordance with D-129 and D-808 of Article 24, Section V. The residual amount of total sulfur or halogens shall not exceed 1% by weight.

(3) Couplant materials used for examinations shall be the same as used for the calibration.

5.7 Thermometer

The thermometer to be used to measure the calibration block and component terperatures shall be calibrated and certified and shall display a valid calibration tag as required by NQAP 10-1.

6. CALIBRATION METHOD

6.1 Instrument Linearity

Ultrasonic instrument linearity shall be verified prior to each period or extended use or every three months, whichever is less, in accordance with Paragraphs 6.1.1 and 6.1.2. Data required shall be recorded on the

applicable SwRI Instrument Linearity Verification Record, and the sheet number shall be referenced on each applicable SwRI Sonic Instrument Calibration Record.

NOTE

The setting of the damping control shall be recorded in REMARKS on the SwRI Instrument Linearity Verification Record. The damping control shall be in the same position during linearity verification, calibrations, and examinations or a new linearity verification shall be performed.

6.1.1 Amplitude Linearity

(1) Position an angle-beam search unit on a basic calibration block to obtain indications from the 1/2T and 3/4T holes or use a straight-beam search unit on any calibration block that provides amplitude differences.

(2) Adjust the search unit position to give a 2:1 ratio between two reflectors, with the larger reflector set at 80% of full screen height (FSH) and the smaller reflector set at 40% of FSH.

(3) Without moving the search unit, set the larger reflector to 100% of FSH, and record the amplitude of the smaller reflector, estimated to the nearest 1% of FSH.

(4) Successively set the larger reflector from 100% to 20% of FSH in 10% increments (or 2 dB steps if a fine control is not available); observe and record the smaller reflector estimated to the nearest 1% of FSH at each setting. The reading must be 50% of the larger amplitude within 5% of FSH.

6.1.2 Amplitude Control Linearity

(1) Position a straight-beam or angle-beam search unit on a calibration block to obtain maximum amplitude from an applicable reflector.

NOTE

The primary reference level sensitivity should be within the highest and lowest gain settings used during amplitude control linearity verifications. The highest and lowest gain settings used during the amplitude control linearity verifications shall be recorded in the Remarks column of the applicable SwRI Linearity Verification Records.

(2) Without moving the search unit, set the indication to the required percent of FSH and increase or decrease the dB as specified below. The estimated signal shall be recorded to the nearest 1% of FSH and shall fall within the limits of the following table:

Indication Set at % of FSH	dB Control Change*	Indication Limits, % of FSH
80%	-6dB	32 to 48%
80%	-12dB	16 to 24%
40%	+6dB	64 to 96%
20%	+12dB	64 to 96%

*Minus denotes decrease in amplitude; plus denotes increase.

6.2 Calibration

The ultrasonic calibration shall be completed prior to the examination.

The REJECT control shall be maintained in the 0 position during calibration and examination.

The FREQ MHz control shall be turned to the setting of 1 for 1.5 MHz search units and to 2 for the 2.25 to 2.5 MHz search units for straight-beam calibrations and examinations.

The FREQ MHz control shall be turned to the setting of 5 for all angle-beam calibrations and examinations.

The instrument gain controls shall not be changed once the primary reference response has been established.

Rotating the beam into the corner formed by the hole and the side of the calibration block while setting up the distance amplitude correction may produce a higher amplitude at a longer beam path. This beam path shall not be used for calibration.

The type and length of the search unit cable shall be recorded on the SwRI Sonic Instrument Calibration Record, and all other information blocks on the form shall be filled in.

6.2.1 Temperature

The temperature of the calibration block shall be within 25°F of the component temperature and shall be recorded on the SwRI Sonic Instrument Calibration Record for the initial calibration and each verification.

The surface temperature of the component to be examined shall be taken prior to performing and after completion of an examination and shall be recorded on the applicable SwRI Examination Record.

6.3 Calibration Method

6.3.1 Straight-Beam Distance Calibration

The screen distance chosen shall be the shortest applicable size to include at least 1/4t beyond the thickest production material to which the search unit is applied. Observing back reflections from the applicable reference block, set up the required linear sound path distance along the screen baseline.

6.3.2 Longitudinal-Wave Angle-Beam Distance Calibration

(1) Position an appropriate straight-beam longitudinal-wave search unit described in Paragraph 5.4(1) on the AWS DC reference block. Observe the back reflection on the instrument screen and set up the required linear sound path distance along the baseline of the screen, which shall be the shortest applicable size to include at least 1/8 vee-path past the anticipated examination range.

(2) Using the same instrument, position the angle-beam refracted longitudinal-wave search unit described in Paragraph 5.4(2) on the AWS DAC reference block and observe the signal from the radius. Using only the delay control, adjust this signal to the appropriate location on the instrument screen baseline.

NOTES

Examiners should be able to identify the required longitudinal-wave signal, since a shear-wave signal may also be present on the screen.

The longitudinal waves will damp on the radius. The shear component of the ultrasonic waves generated will not damp on the radius.

6.3.3 Straight-Beam Distance Amplitude Correction

A DAC curve shall be established by utilizing responses from the basic calibration holes.

(1) Position the straight-beam search unit to obtain maximum response from the calibration hole selected from the following, that produces the highest amplitude:

Hole
1/4T
1/2T
3/4T

(2) Set this response to the primary reference level of 50% ±5% of FSH and mark its amplitude on the instrument screen.

(3) Without changing the gain controls, obtain maximum response from the remaining calibration holes; mark and join all amplitude points with a smooth curved line which shall extend 1/4T beyond the last qualified calibration point.

6.4 Angle-Beam Distance Amplitude Correction (1/2 Vee-Path)

NOTE

The slope of the distance amplitude correction (DAC) curve shall be constructed from the holes parallel to the axis of the basic calibration block. The notch perpendicular to the axis of the curved basic calibration block shall be utilized to establish sensitivity when examining circumferential welds or for transverse examinations on longitudinal welds. The axial notch shall be used to establish sensitivity when examining longitudinal welds or for transverse examinations on circumferential welds.

(1) Position the 45° search unit to obtain a maximum response from the vee-path position selected from the following, that produces the highest amplitude:

Vee-Path Positions
1/8
2/8
3/8

(2) Set this signal to 50% ±5% of FSH and mark its amplitude on the screen.

(3) Obtain maximum response from the remaining vee-path positions; mark and join all amplitude points with a smooth curved line which shall extend 1/8 vee-path beyond the last qualified calibration point.

(4) Establish the sensitivity from the inside surface notch by setting the indication amplitude at the level of the DAC curve. This primary reference amplitude shall be marked with an X and recorded under INSTRUMENT SETTINGS.

6.5 Calibration Verification

6.5.1 Sweep Range and DAC Curve Verification

Sweep range calibration shall be verified on the appropriate reference block; DAC curve calibration, if applicable, shall be verified on the appropriate basic calibration block:

(1) Prior to a series of examinations

(2) With any substitution of the particular search unit cable used in calibration

(3) With any substitution utilizing the same type of power source; e.g., a change of batteries

(4) At least every 4 hours during the examination

(5) At the completion of a series of examinations

(6) Whenever the validity of the calibration is in doubt

6.5.2 Verification of Calibration Reflectors at Scanning Speed

The examiner shall verify the presence of the calibration reflectors at scanning speed.

NOTES

It is not necessary to assure that this check confirms the signal amplitude at 100% of reference level, but merely to demonstrate that the signals from the calibration reflectors are readily observable at scanning speed.

The following statement shall be documented on the SwRI Sonic Instrument Calibration Record and initialed:

"Calibration reflectors have been verified at scanning speed."

6.5.3 Calibration Changes

(1) Perform the following if any point on the DAC curve has decreased more than 20% of FSH or 2 dB in amplitude, or any point on the sweepline has moved more than 10% of sweep division reading or 5% of full sweep, whichever is greater:

(a) Void all examinations referring to the calibration in question and performed after the last valid calibration verification.

(b) Conduct a new calibration.

(c) Reexamine the areas for which examinations have been voided.

(2) Perform the following if any point on the DAC curve has increased in amplitude more than 20% of FSH or 2 dB:

(a) Correct the calibration.

(b) Reexamine all indications recorded since the last valid calibration verification.

(c) Enter proper values on a new SwRI Examination Record.

6.5.4 Recalibration

Substitution of any of the following shall be cause for recalibration:

(1) Search unit transducer or wedge

(2) Search unit cable type or length

(3) Ultrasonic instrument

(4) Examination personnel

(5) Couplant

(6) Change in type of power source; e.g., a change from direct to alternating current

7. EXAMINATION

7.1 Examination Areas

7.1.1 Welds in Corrosion-Resistant Clad Piping

Welds in corrosion-resistant clad piping with a nominal thickness of greater than 0.4 inches shall be examined from the outside surface of the pipe.

7.1.2 Preservice Examination Areas

When specified in the applicable examination plan for preservice examinations only, the lower 1/3 volume (base material plus cladding) shall be examined for the length of the cladding plus 1/4 inch on each end. This is to provide a complete baseline data package for comparison with any inservice examinations of this volume. The area defined by E, F, G, and H in Figure 1 is the area to be examined.

NOTE

The I.D. clad/base material fusion line should be determined with an angle-beam technique.

7.1.3 Inservice Examination Areas

For inservice examinations, the required weld volume and 1/4 inch of material from the outside surface weld fusion line on each side of the weld, defined by A, B, C, and D in Figure 1, shall be examined.

NOTE

The metal path corresponding to the lower 1/3 examination volume shall be clearly marked on the instrument screen. Determination of this volume shall be made for each weld based on the preservice or inservice examination requirements and on thickness measurements taken in accordance with Paragraph 7.5.

7.1.4 Longitudinal Welds in Corrosion-Resistant Clad Piping

In conjunction with the examination of circumferential welds, any portion of an intersecting longitudinal weld located under the clad overlay adjacent to the circumferential weld will be examined and the results entered on a separate SwRI Examination Report.

7.2 Surface Condition

The contact surfaces shall be free from weld spatter, roughness, or other conditions which interfere with free movement of the search unit or impair the transmission of ultrasound.

7.3 Indication Length Zero Reference (L_o) Location

Areas to be examined in accordance with this procedure shall have an L_o marked in accordance with the applicable revision of SwRI Procedure IX-FE-103.

7.4 Scanning

When possible, scanning shall be performed at a minimum gain setting of 2 times the reference level sensitivity.

Instrument gain setting for scanning shall be determined on the basic calibration block as follows for each primary reference level utilized:

(1) With the instrument at the primary reference level, manipulate the search unit on the basic calibration block to obtain a signal of 40% of FSH from a calibration reflector (side-drilled hole).

(2) Add 6 dB gain by utilizing the 6 dB switch (if present), the fine gain control, or a combination of the fine and coarse gain controls, and choose any method which yields signal response within ±2 dB of 80% FSH.

(3) This amplitude and method shall be recorded on the SwRI Sonic Instrument Calibration Record and shall be used for all scanning during the valid calibration period.

Scanning overlap shall be a minimum of 25% of the search unit piezoelectric element dimension perpendicular to the direction of the scan.

The search unit movement rate shall not exceed 3 inches per second.

7.5 Lamination Scan and Thickness Measurements

EXCEPTION

If performed previously, a lamination scan is not required except in the area(s) where a lamination was previously recorded.

A straight-beam longitudinal-wave lamination scan shall be performed covering the entire area through which the angle beam passes. Screen distance calibration for this examination shall be conducted at a gain setting that produces an initial backwall amplitude of 80% ±5% FSH.

Intermediate echoes having an amplitude equal to or greater than the remaining back reflection shall be recorded as follows:

Obtain a back reflection signal from an indication-free area and adjust this signal to 80% ±5% of FSH. Record all intermediate indications with amplitudes equal to or greater than the remaining back reflection on the appropriate SwRI Examination Record. Areas of total loss of back reflection accompanying the intermediate echo shall also be recorded.

Thickness measurements shall be taken at a minimum of three points adjacent to L_o (on the centerline of the weld and at one point in the base material on each side of the weld) and shall be recorded on the appropriate SwRI Examination Record. Locations of measurements which cannot be taken adjacent to L_o shall also be recorded.

NOTE

Due to the cladding, attenuation measurements shall not be performed.

7.6 Examination of Butt Welds in Piping

7.6.1 Angle-Beam Examination for Indications Parallel with the Weld

Angle-beam examinations for circumferential welds shall be accomplished using the required angle-beam search unit from both sides of the weld. For this examination, the sound-beam shall be directed perpendicularly into the weld to detect indications parallel with the weld. Calibration for these examinations shall be in accordance with Paragraphs 6.3.2 and 6.4.

7.6.2 Alternate Examination

Any areas of the weld not receiving complete coverage from each side of the weld shall be examined from the accessible side of the weld with the required angle-beam search unit, and with a straight-beam search unit applied to the surface of the weld crown in the affected areas. Calibration for the straight-beam longitudinal-wave search unit shall be in accordance with Paragraphs 6.3.1 and 6.3.3.

7.6.3 Angle-Beam Examination for Indications Perpendicular to the Weld

A refracted longitudinal-wave angle-beam examination shall be conducted on each weld by placing the required search unit on the weld crown

with the sound beam directed into and parallel with the weld to detect indications perpendicular to the weld. The entire length and width of the weld shall be scanned with the search unit beam directed in this manner from two opposing directions.

7.6.4 Angle-Beam Examination for Indications in Base Material Perpendicular to the Weld

A refracted longitudinal-wave angle-beam examination shall be conducted on the adjacent base material on each side of the weld by placing the required search unit on the base material with the sound beam directed parallel with the weld to detect indications perpendicular to the weld. The base material area as described in Paragraphs 7.1.2 and 7.1.3 shall be scanned with the search unit directed in this manner from two opposing directions.

7.7 Postexamination Cleaning

Arrangements shall be made with the customer for postexamination removal of couplant materials.

8. RECORDING CRITERIA

CAUTION

The minimum shear metal path shall be determined prior to the examination. Extreme care shall be exercised in recording signals at or past this metal path to preclude recording of shear indications.

Indications shall be recorded in accordance with the techniques outlined in the applicable revision of SwRI Procedure IX-FE-117.

Ultrasonic reflectors within the examination volume as marked on the instrument screen in accordance with Paragraph 7.1.2 or 7.1.3 that produce a response greater than 50% of the reference level shall be recorded on the appropriate SwRI Ultrasonic Examination Record.

Indications greater than 50% of the reference level attributable to geometry shall be recorded only once, even if the amplitude of the indication drops below the required recording amplitude along the weld. These indications shall be investigated by a Level II or a Level III examiner to determine the shape, identity, and location of the reflector.

If indications that have been recorded as geometry have been investigated and found to be nongeometric reflectors, the entire weld shall be reexamined, recording all nongeometric reflectors and other reflectors not previously recorded at least once.

Indications investigated and found to be other than geometrical in nature, regardless of the amplitude, shall be reported to the customer for evaluation.

Sizing of indications shall not be conducted with the procedure.

Scanning limitations shall be recorded.

9. EVALUATION

Initial evaluation of reportable indications shall be performed by SwRI personnel, and shall be conducted in accordance with the applicable ASME Boiler and Pressure Vessel Code, Section XI, Article IWA-3000. Final evaluation and disposition of reportable indications shall be the responsibility of the customer.

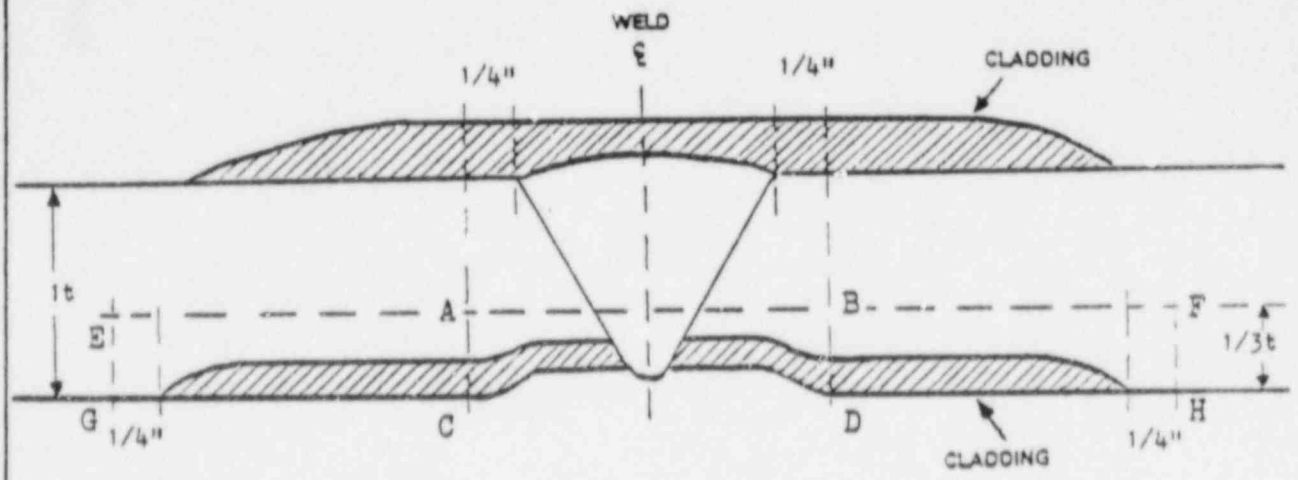
10. RECORDS

Documents generated in accordance with this procedure shall be stored as specified in the SwRI Project Plan. The customer shall receive copies of these documents in the Examination Report, unless specified otherwise in the SwRI Project Plan.

APPENDIX 1

Pipe Diameter	Nominal Pipe Thickness	Crossover (Focus) Depth
12"	.68"	.75"
20"	1.0"	.75" to 1.5"
22"	1.08"	1.0" to 1.5"
28"	1.08"	1.5"

FIGURE 1



CORROSION-RESISTANT CLAD PIPING WELD
EXAMINATION VOLUME A-B-C-D & E-F-G-H

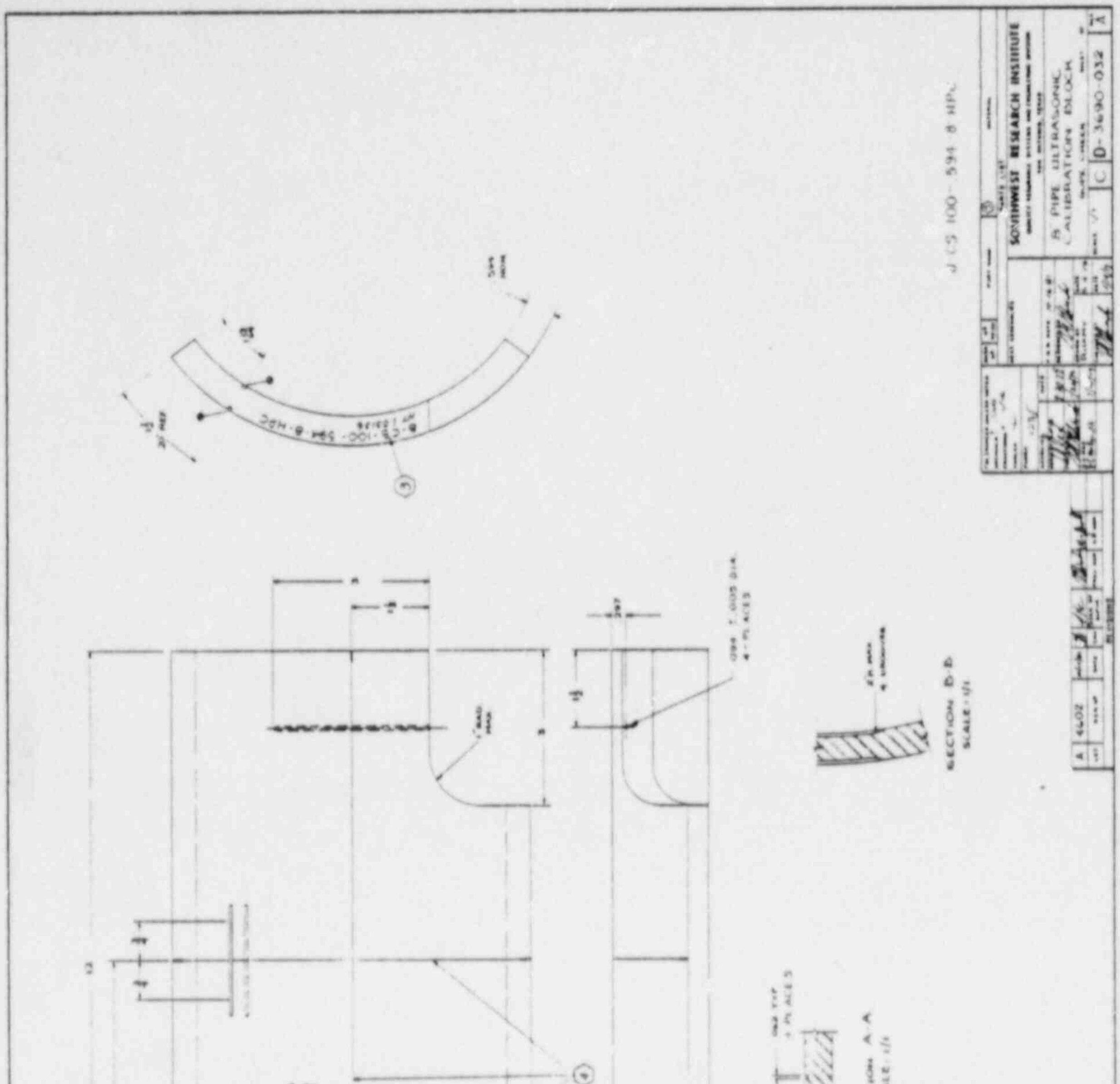
APPENDIX E

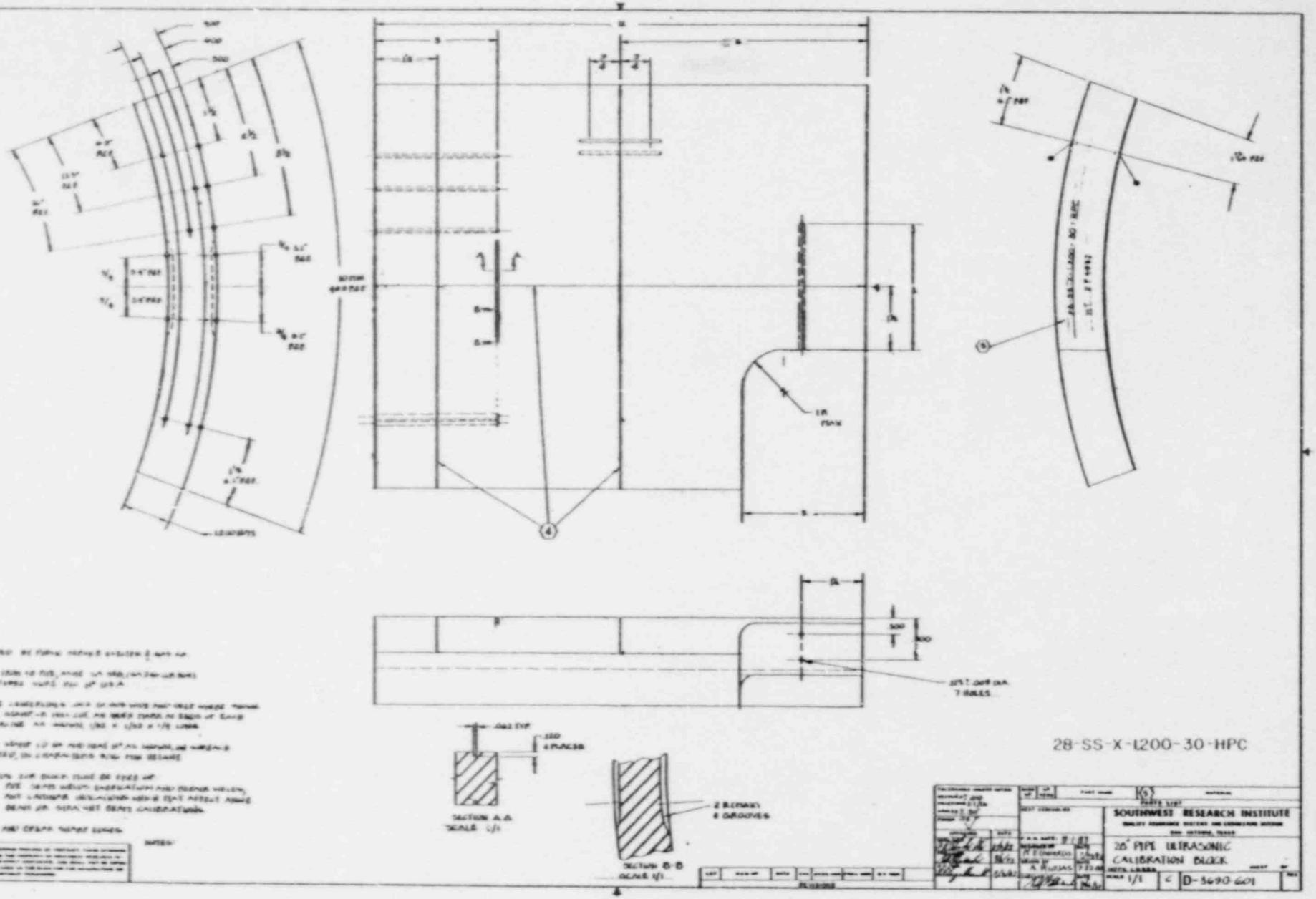
ULTRASONIC CALIBRATION BLOCK DRAWINGS

APPENDIX E

ULTRASONIC CALIBRATION BLOCK DRAWINGS

Table of Contents


SECTION A-A
SCALE 1/1
SECTION B-B
SCALE 1/1
J-CS-100-594-8-HPC
SOUTHWEST RESEARCH INSTITUTE
8 PIPE ULTRASONIC CALIBRATION BLOCK
D-3690-032

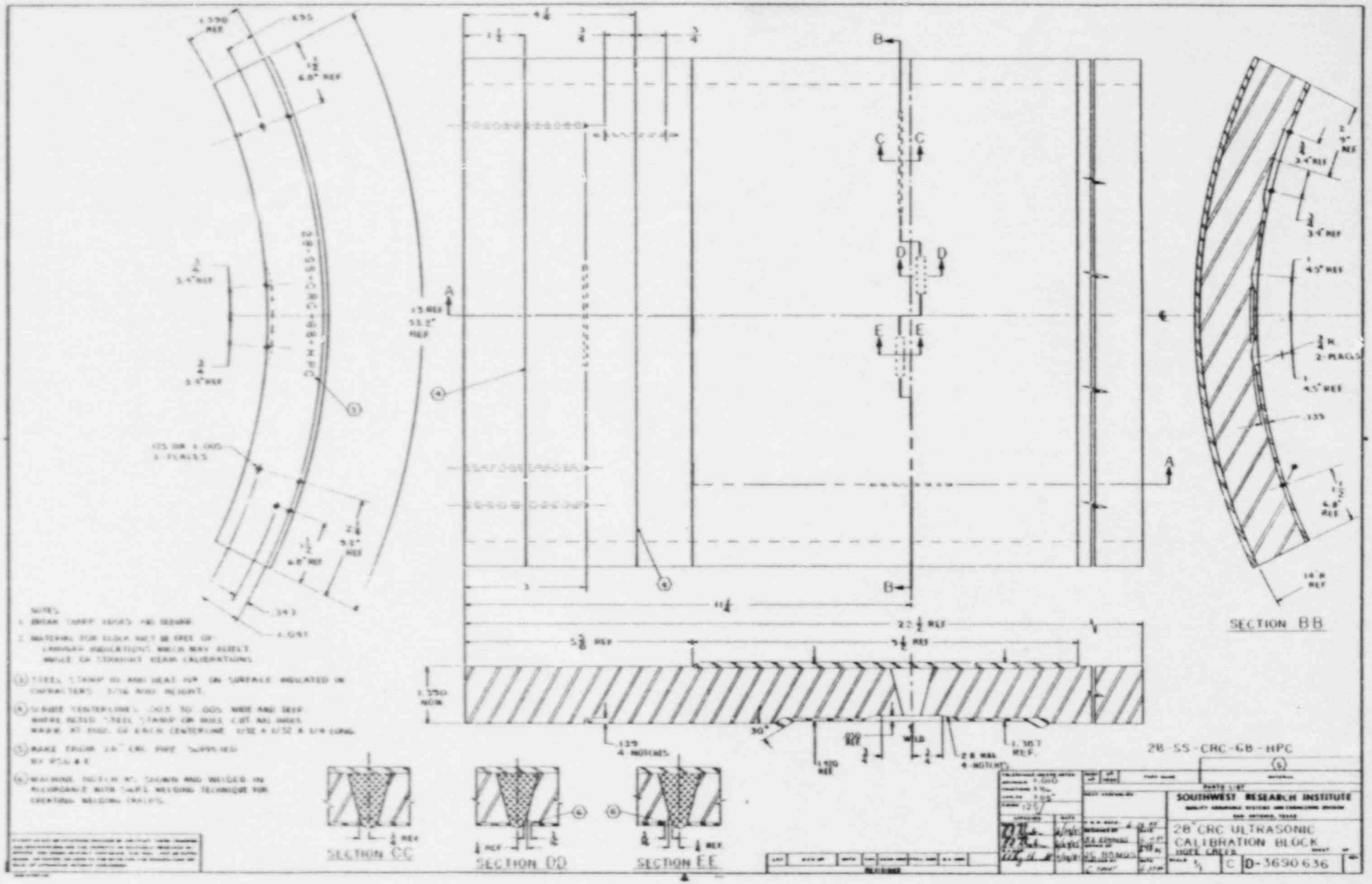


28-SS-X-1200-30-HPC

SOUTHWEST RESEARCH INSTITUTE

26" PIPE ULTRASONIC CALIBRATION BLOCK

D-3690-601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SECTION CC
SECTION DD
SECTION EE
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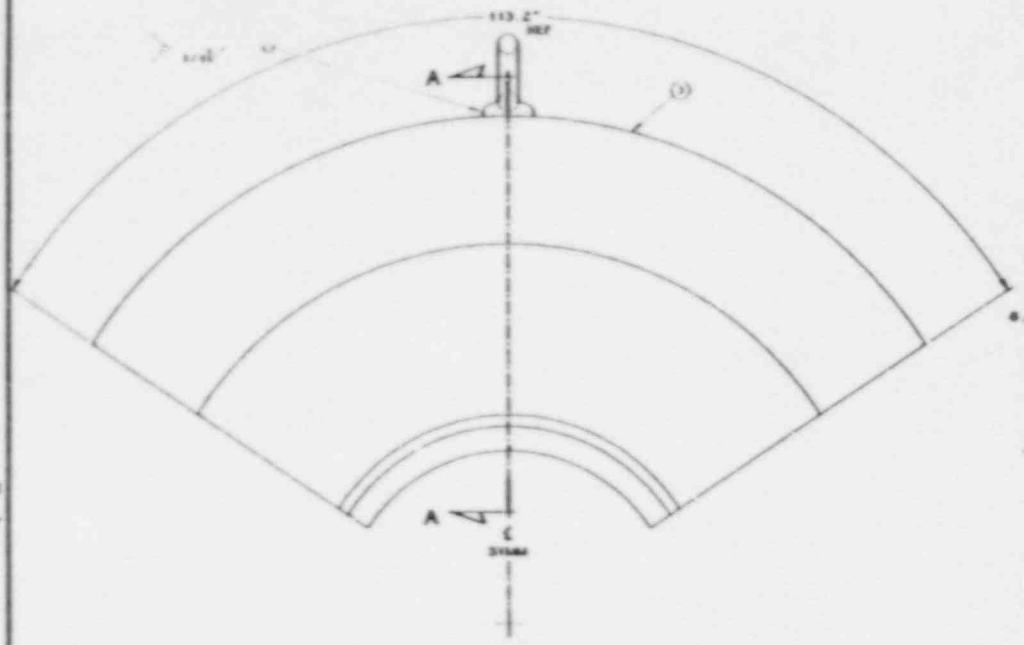
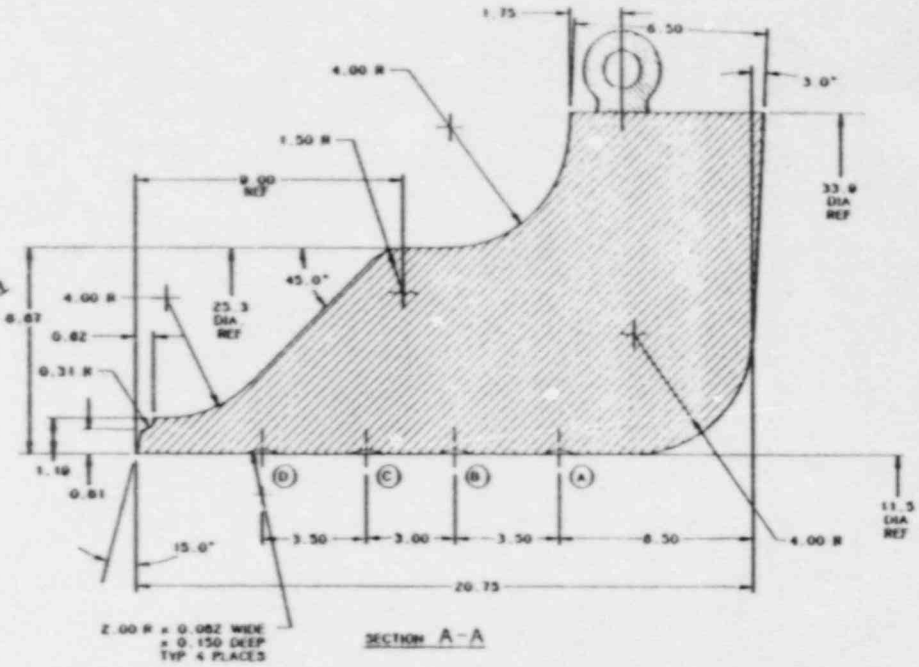
SOUTHWEST RESEARCH INSTITUTE
28" CRC ULTRASONIC CALIBRATION BLOCK
D-3690636





SECTION A-A

NOTES:

1. SAW CUT TO SIZE AND DESIGN.
2. MADE FROM EXISTING NOZZLE FWB-Z-1 A508, CL 2. EOG No. N/O HEAT No. 02G3107.
3. STEEL STAMP ID No. AND HEAT No. ON SURFACE INDICATED BY CHARACTERS 3/16 MIN HEIGHT.

FW-N4-MOCKUP-75R-HPC

2	1	LIFTING EYE	McMASTER-CARR #3024T26
1	1	(2) NOZZLE FORGING	

SOUTHWEST RESEARCH INSTITUTE

EDWATER NOZZLE BORE CALIBRATION BLOCK

SCALE 1/2 | C | D-3690-645 | A

APPENDIX F

CERTIFICATES OF PERSONNEL QUALIFICATIONS

APPENDIX F

CERTIFICATES OF PERSONNEL QUALIFICATIONS

Table of Contents

*Level I Trainee

SOUTHWEST RESEARCH INSTITUTE
NONDESTRUCTIVE EXAMINATION
STATEMENT OF CERTIFICATION

The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division, certifies that Leroy Duran is qualified as Level I Trainee in Magnetic Particle Testing in accordance with the requirements of SwRI Nuclear Quality Assurance Procedure 11-1, which incorporates the guidelines of SNT-TC-1A, 1975 and 1980 Editions.

Certification Limitations: Certification valid only while employed by SwRI

Special Qualifications (if any): None

Expiration Date: 10/19/90

Signed: Wayne J. Ebach Date: 10/19/87

Director, Department of Engineering Services

EDUCATION, TRAINING, AND EXPERIENCE HISTORY

EDUCATION:	NAME	YEARS	DEGREE
High School	Commonwealth of VA	4	GRAD
Additional:			
Major Field of Study			

TRAINING (This method and level):

Date Completed: 10/04/84

Hours: 6 Location: SwRI

Date employed by SwRI: 07/30/84

The individual has been credited with N/A months of experience in this examination method on the date of certification. Some of the experience may have been accrued simultaneously with other NDE methods (at least 25% was in this method).

Previous NDE experience (if used for qualification):

COMPANY	FROM	TO
None		

VISUAL ACUITY AND COLOR PERCEPTION

The individual is capable of reading Jaeger Number 1 letters at 12 inches in at least one eye (using corrective lenses if specified below), and can distinguish and differentiate contrast between colors used in this method.

Date	Corr. Req.	Verified by	Date	Corr. Req.	Verified by
07/17/87	No	Heidi Gutierrez			

MOST RECENT EXAMINATION GRADES

	SCORES	WEIGHT
General:	N/A	
Specific:	N/A	
Practical:	N/A	
Composite	N/A	

Date: N/A

Responsible Level III: N/A

CERTIFICATION HISTORY: THIS LEVEL

	DATE
Initial Certification:	10/23/84
Recertification:	10/19/87
Recertification:	
Recertification:	
Recertification:	
Recertification:	
Recertification:	

REMARKS

SwRI Form QA-11-7

SOUTHWEST RESEARCH INSTITUTE
NONDESTRUCTIVE EXAMINATION
STATEMENT OF CERTIFICATION

The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division, certifies that Leroy Duran is qualified as Level II in Ultrasonic Testing in accordance with the requirements of SwRI Nuclear Quality Assurance Procedure 11-1, which incorporates the guidelines of SNT-TC-1A 1975 and 1980 Editions.

Certification Limitations: Certification valid only while employed by SwRI

Special Qualifications (if any): None

Expiration Date: 01/23/90

Signed: Wayne I. Fleck Date: Jan 23, 1987

Director, Department of Engineering Services

EDUCATION, TRAINING, AND EXPERIENCE HISTORY

EDUCATION:	NAME	YEARS	DEGREE
High School	Commonwealth of Va.	4	GRAD
Additional:			
Major Field of Study			

TRAINING (This method and level):

Date Completed 1/15/87

Hours: 44 Location: SwRI

Date employed by SwRI: 7/30/84

The individual has been credited with 11 months of experience in this examination method on the date of certification. Some of the experience may have been accrued simultaneously with other NDE methods (at least 25% was in this method).

Previous NDE experience (if used for qualification):

COMPANY	FROM	TO
None		

VISUAL ACUITY AND COLOR PERCEPTION

The individual is capable of reading Jaeger Number 1 letters at 12 inches in at least one eye (using corrective lenses if specified below) and can distinguish and differentiate contrast between colors used in this method.

Date	Corr. Req.	Verified by	Date	Corr. Req.	Verified by
8/15/86	No	Heidi Gutierrez			
7/17/87	No	Heidi Gutierrez			

MOST RECENT EXAMINATION GRADES

	SCORES	WEIGHT
General:	* 70.00	0.3
Specific:	** 75.00	0.3
Practical:	*** 92.00	0.4
Composite	80.30	1.0

Date: *1/7/87; **1/15/87; ***1/16/87

Responsible Level III: E. B. Boecker 1/26/87
E. B. Boecker

CERTIFICATION HISTORY: THIS LEVEL

	DATE
Initial Certification:	1/23/87
Recertification:	
Recertification:	
Recertification:	
Recertification:	
Recertification:	
Recertification:	

REMARKS

SwRI Form QA-11-7

SOUTHWEST RESEARCH INSTITUTE
NONDESTRUCTIVE EXAMINATION
STATEMENT OF CERTIFICATION

The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division, certifies that Edward J. Feige is qualified as Level II in Magnetic Particle Testing in accordance with the requirements of SwRI Nuclear Quality Assurance Procedure 11-1, which incorporates the guidelines of SNT-TC-1A, 1975 and 1980 Editions.

Certification Limitations: Certification valid only while employed by SwRI

Special Qualifications (if any): None

Expiration Date: 01/14/88

Signed: Wayne J. Flack Date: 1/15/87

Director, Department of Engineering Services

EDUCATION, TRAINING, AND EXPERIENCE HISTORY

EDUCATION:	NAME	YEARS	DEGREE
High School	Winthrop P.S. (Minn)	4	GRAD
Additional*	Mankato St. Univ. (Minn)	4	B.S.
Major Field of Study	Business Adm. w/ a concentration in Construction Management		

TRAINING (This method and level): 6/12/81;
Date Completed 5/29/84; 1/6/87
Hours: 12; 0 Location: SwRI

Date employed by SwRI: 4/07/80

The individual has been credited with 4 months of experience in this examination method on the date of certification. Some of the experience may have been accrued simultaneously with other NDE methods (at least 25% was in this method).

Previous NDE experience (if used for qualification):

COMPANY	FROM	TO
None		

VISUAL ACUITY AND COLOR PERCEPTION

The individual is capable of reading Jaeger Number 1 letters at 12 inches in at least one eye (using corrective lenses if specified below), and can distinguish and differentiate contrast between colors used in this method.

Date	Corr. Req.	Verified by	Date	Corr. Req.	Verified by
10/02/86	Yes	Heidi Gutierrez			
10/09/87	Yes	Bonnie Caudle			

MOST RECENT EXAMINATION GRADES

	SCORES	WEIGHT
General:	90.00	0.3
Specific:	85.00	0.3
Practical:	85.00	0.4
Composite:	86.50	1.0

Date: 1/06/87

Responsible Level III: R. R. Kuebler for

CERTIFICATION HISTORY: THIS LEVEL

	DATE
Initial Certification:	07/01/81
Recertification:	05/30/84
Recertification:	01/14/87
Recertification:	
Recertification:	
Recertification:	
Recertification:	

REMARKS

* Hutchinson Area Voc. Tech. Institute
Nondestructive Testing Technology, 2 yrs.

SwRI Form QA-11-7

SOUTHWEST RESEARCH INSTITUTE
NONDESTRUCTIVE EXAMINATION
STATEMENT OF CERTIFICATION

The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division, certifies that Edward J. Feige is qualified as Level II in Liquid Penetrant Testing in accordance with the requirements of SwRI Nuclear Quality Assurance Procedure 11-1, which incorporates the guidelines of SNT-TC-1A, 1975 and 1980 Editions.

Certification Limitations: Certification valid only while employed by SwRI

Special Qualifications (if any): None

Expiration Date: 08/26/89

Signed: Albert R. Whitney for WTF Date: 8/27/86
Director, Department of Engineering Services

EDUCATION, TRAINING, AND EXPERIENCE HISTORY

EDUCATION:	NAME	YEARS	DEGREE
High School	Winthrop P.S. (Minn)	4	GRAD
Additional:	Mankato St. Univ. (Minn)	4	B.S.
Major Field of Study	Business Admin. w/ a concentration		
*Remarks	in construction Management		

TRAINING (This method and level):
Date Completed 07/29/81; 06/17/86
Hours: 12; 6 Location: SwRI

Date employed by SwRI: 04/07/80

The individual has been credited with 3 months of experience in this examination method on the date of certification. Some of the experience may have been accrued simultaneously with other NDE methods (at least 25% was in this method).

Previous NDE experience (if used for qualification):

COMPANY	FROM	TO
SwRI	4/77	8/78
Peabody Testing	1/76	10/76

VISUAL ACUITY AND COLOR PERCEPTION

The individual is capable of reading Jaeger Number 1 letters at 12 inches in at least one eye (using corrective lenses if specified below), and can distinguish and differentiate contrast between colors used in this method.

Date	Corr. Req.	Verified by
10/13/85	Yes	Heidi Gutierrez
10/02/86	Yes	Heidi Gutierrez
10/09/87	Yes	Bonnie Caudle

Date	Corr. Req.	Verified by

MOST RECENT EXAMINATION GRADES

	SCORES	WEIGHT
General:	86.67	0.3
Specific:	100.00	0.3
Practical:	99.00	0.4
Composite	95.60	1.0

Date: 06/17/86

Responsible Level III: E. H. Buescher

CERTIFICATION HISTORY: THIS LEVEL

	DATE
Initial Certification:	05/11/82
Recertification:	08/26/86
Recertification:	
Recertification:	
Recertification:	
Recertification:	
Recertification:	

REMARKS

*Hutchinson Area Voc. Tech. Institute
Nondestructive Testing Technology, 2 years

SwRI Form QA-11-7

SOUTHWEST RESEARCH INSTITUTE
NONDESTRUCTIVE EXAMINATION
STATEMENT OF CERTIFICATION

The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division, certifies that Russell H. Fine is qualified as Level II in Magnetic Particle Testing in accordance with the requirements of SwRI Nuclear Quality Assurance Procedure 11-1, which incorporates the guidelines of SNT-TC-1A, 1975 and 1980 Editions.

Certification Limitations: Certification valid only while employed by SwRI

Special Qualifications (if any): None

Expiration Date: 06/23/90

Signed: Wayne J. Ebach Date: 6/25/87

Director, Department of Engineering Services

EDUCATION, TRAINING, AND EXPERIENCE HISTORY

EDUCATION:	NAME	YEARS	DEGREE
High School	Dover H.S. (NJ)	4	GRAD
Additional:	Phoenix School of Welding	2 mo	C/COMP

Major Field of Study: Welding

TRAINING (This method and level):

Date Completed: 6/11/81; 6/16/87

Hours: 12; 10 Location: SwRI

Date employed by SwRI: 02/14/77

The individual has been credited with 3 months of experience in this examination method on the date of certification. Some of the experience may have been accrued simultaneously with other NDE methods (at least 25% was in this method).

Previous NDE experience (if used for qualification):

COMPANY	FROM	TO
None		

VISUAL ACUITY AND COLOR PERCEPTION

The individual is capable of reading Jaeger Number 1 letters at 12 inches in at least one eye (using corrective lenses if specified below), and can distinguish and differentiate contrast between colors used in this method.

Date	Corr. Req.	Verified by	Date	Corr. Req.	Verified by
6/23/87	Yes	Heidi Gutierrez			

MOST RECENT EXAMINATION GRADES

	SCORES	WEIGHT
General:	86.68	0.3
Specific:	75.00	0.3
Practical:	96.00	0.4
Composite	86.90	1.0

Date: 6/16/87

Responsible Level III: James J. McQuillan for E. E. Ruescher

CERTIFICATION HISTORY: THIS LEVEL

	DATE
Initial Certification:	09/01/81
Recertification:	09/10/84
Recertification:	06/23/87
Recertification:	
Recertification:	
Recertification:	
Recertification:	

REMARKS

SwRI Form QA-11-7

SOUTHWEST RESEARCH INSTITUTE
NONDESTRUCTIVE EXAMINATION
STATEMENT OF CERTIFICATION

The Director of the Department of Engineering Services, Quality Assurance Systems and Engineering Division, certifies that Russell H. Fine is qualified as Level II in Liquid Penetrant Testing in accordance with the requirements of SwRI Nuclear Quality Assurance Procedure 11-1, which incorporates the guidelines of SNT-TC-1A, 1975 and 1980 Editions.

Certification Limitations: Certification valid only while employed by SwRI

Special Qualifications (if any): None

Expiration Date: 10/03/88

Signed: Wayne J. Ehrich Date: 10/6/85
Director, Department of Engineering Services

EDUCATION, TRAINING, AND EXPERIENCE HISTORY

EDUCATION:	NAME	YEARS	DEGREE
High School	Dover H.S. (NJ)	4	GRAD
Additional:	Phoenix School of Welding	2 mo.	C/COMP

Major Field of Study: Welding

TRAINING (This method and level):
Date Completed: 12/5/78; 10/11/82; 10/1/85
Hours: 8; 1; Location: SwRI

Date employed by SwRI: 02/14/77

The individual has been credited with 3 months of experience in this examination method on the date of certification. Some of the experience may have been accrued simultaneously with other NDE methods (at least 25% was in this method).

Previous NDE experience (if used for qualification):

COMPANY	FROM	TO
None		

VISUAL ACUITY AND COLOR PERCEPTION

The individual is capable of reading Jaeger Number 1 letters at 12 inches in at least one eye (using corrective lenses if specified below), and can distinguish and differentiate contrast between colors used in this method.

Date	Corr. Req.	Verified by
07/31/85	Yes(near) No(far)	Heidi Gutierrez
06/18/86	Yes(near) No(far)	Bonnie Caudle
6/23/87	Yes	Heidi Gutierrez

Date	Corr. Req.	Verified by

MOST RECENT EXAMINATION GRADES

	SCORES	WEIGHT
General:	*78.12	0.3
Specific:	*90.00	0.3
Practical:	*r 5.00	0.4
Composite:	88.45	1.0

Date: *09/30/85; **10/01/85
Responsible Level III: E.H. Ruescher

CERTIFICATION HISTORY: THIS LEVEL

	Date
Initial Certification:	10/19/79
Recertification:	10/12/82
Recertification:	10/03/85
Recertification:	
Recertification:	
Recertification:	

REMARKS

SwRI Form QA-11-8

SOUTHWEST RESEARCH INSTITUTE
NONDESTRUCTIVE EXAMINATION
STATEMENT OF CERTIFICATION

The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division, certifies that Russell H. Fine is qualified as Level II in Ultrasonic Testing in accordance with the requirements of SwRI Nuclear Quality Assurance Procedure 11-1, which incorporates the guidelines of SNT-TC-1A 1975 and 1980 Editions.

Certification Limitations: Certification valid only while employed by SwRI

Special Qualifications (if any): None

Expiration Date: 1/19/91

Signed: Wayne J. Flach Date: 1-19-88
Director, Department of Engineering Services

EDUCATION, TRAINING, AND EXPERIENCE HISTORY

EDUCATION:	NAME	YEARS	DEGREE
High School	Dover H.S.(NJ)	4	GRAD
Additional:	Phoenix School of Welding 2 mos		C/COMP
Major Field of Study	Welding		

TRAINING (This method and level):
Date Completed: 12/21/78; 2/5/82; 1/11/85; 1/13/88
Hours: 56; 8; 11 Location: SwRI

Date employed by SwRI: 2/14/77

The individual has been credited with 58 months of experience in this examination method on the date of certification. Some of the experience may have been accrued simultaneously with other NDE methods (at least 25% was in this method).

Previous NDE experience (if used for qualification):

COMPANY	FROM	TO
None		

VISUAL ACUITY AND COLOR PERCEPTION

The individual is capable of reading Jaeger Number 1 letters at 12 inches in at least one eye (using corrective lenses if specified below), and can distinguish and differentiate contrast between colors used in this method.

Date	Corr. Req.	Verified by	Date	Corr. Req.	Verified by
6/23/87	Yes	Bonnie Caudle			

MOST RECENT EXAMINATION GRADES

	SCORES	WEIGHT
General:	88.37	0.3
Specific:	94.00	0.3
Practical:	97.50	0.4
Composite	93.71	1.0

Date: 1/10/88

Responsible Level III: E. H. Rueschner 1/11/88
E. H. Rueschner

CERTIFICATION HISTORY: THIS LEVEL

	DATE
Initial Certification:	2/26/79
Recertification:	2/15/82
Recertification:	1/25/85
Recertification:	1/19/88
Recertification:	
Recertification:	
Recertification:	

REMARKS

SwRI Form QA-11-7

SOUTHWEST RESEARCH INSTITUTE
NONDESTRUCTIVE EXAMINATION
STATEMENT OF CERTIFICATION

The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division, certifies that Randall O. Forman is qualified as Level II in Magnetic Particle Testing in accordance with the requirements of SwRI Nuclear Quality Assurance Procedure 11-1, which incorporates the guidelines of SNT-TC-1A, 1975 and 1980 Editions.

Certification Limitations: Certification valid only while employed by SwRI

Special Qualifications (if any): None

Expiration Date: 10/15/89

Signed: Wayne I. Flack Date: 10/20/86

Director, Department of Engineering Services

EDUCATION, TRAINING, AND EXPERIENCE HISTORY

EDUCATION:	NAME	YEARS	DEGREE
High School	Stuttgart American H.S.*3		GRAD
Additional:	Moore Head State Univ.	2	NO
Major Field of Study	General Academics *Germany		

TRAINING (This method and level): 7/13/82;
Date Completed 10/29/85; 10/6/86
Hours: 12; 6 Location: SwRI

Date employed by SwRI: 12/06/76

The individual has been credited with 3 months of experience in this examination method on the date of certification. Some of the experience may have been accrued simultaneously with other NDE methods (at least 25% was in this method).

Previous NDE experience (if used for qualification):

COMPANY	FROM	TO
None		

VISUAL ACUITY AND COLOR PERCEPTION

The individual is capable of reading Jaeger Number 1 letters at 12 inches in at least one eye (using corrective lenses if specified below), and can distinguish and differentiate contrast between colors used in this method.

Date	Corr. Req.	Verified by	Date	Corr. Req.	Verified by
8/18/86	Yes	Heidi Gutierrez LEA			
7/17/87	Yes	Heidi Gutierrez LEA			

MOST RECENT EXAMINATION GRADES

	SCORES	WEIGHT
General:	86.67	0.3
Specific:	95.00	0.3
Practical:	94.50	0.4
Composite	93.30	1.0

Date: 10/6/86

Responsible Level III: [signature] 10/6/86

CERTIFICATION HISTORY: THIS LEVEL

	DATE
Initial Certification:	8/04/82
Recertification:	10/31/85
Recertification:	10/16/86
Recertification:	
Recertification:	
Recertification:	
Recertification:	

REMARKS

SwRI Form QA-11-7

SOUTHWEST RESEARCH INSTITUTE
NONDESTRUCTIVE EXAMINATION
STATEMENT OF CERTIFICATION

The Director of the Department of Engineering Services, Quality Assurance Systems and Engineering Division, certifies that Randall O. Forman is qualified as Level II in Ultrasonic Testing in accordance with the requirements of SwRI Nuclear Quality Assurance Procedure 11-1, which incorporates the guidelines of SNT-TC-1A, 1975 and 1980 Editions.

Certification Limitations: Certification valid only while employed by SwRI

Special Qualifications (if any): None

Expiration Date: 01/20/83

Signed: Wayne T Ebeck Date: 1/20/85
Director, Department of Engineering Services

EDUCATION, TRAINING, AND EXPERIENCE HISTORY

EDUCATION:	NAME	YEARS	DEGREE
High School	Stuttgart American H.S.*	3	GRAD
Additional:	Moore Head State Univ.	2	NO
Major Field of Study	General Academics		

*Germany

TRAINING (This method and level): 12/21/78;
Date Completed 04/23/82; 01/24/85
Hours: 56; 6 Location: SwRI

Date employed by SwRI: 12/06/76

The individual has been credited with 16 months of experience in this examination method at the date of certification. Some of the experience may have been accrued simultaneously with other NDE methods (at least 25% was in this method).

Previous NDE experience (if used for qualification):

COMPANY	FROM	TO
None		

VISUAL ACUITY AND COLOR PERCEPTION

The individual is capable of reading Jaeger Number 1 letters at 12 inches in at least one eye (using corrective lenses if specified below), and can distinguish and differentiate contrast between colors used in this method.

Date	Corr. Req.	Verified by
08/08/84	Yes	Heidi Gutierrez A.I.
08/05/85	Yes	Heidi Gutierrez A.I.
8/18/86	Yes	Heidi Gutierrez A.I.
7/17/87	Yes	Heidi Gutierrez A.I.

MOST RECENT EXAMINATION GRADES

	SCORES	WEIGHT
General:	95.56	0.2
Specific:	90.25	0.3
Practical:	98.00	0.4
Composite:	94.95	1.0

Date: 01/24/85
Responsible Level III: R.W. Russner

CERTIFICATION HISTORY: THIS LEVEL

	Date
Initial Certification:	05/11/79
Recertification:	04/27/82
Recertification:	01/20/85
Recertification:	
Recertification:	
Recertification:	

REMARKS

Note! This individual has received ISSCC detection training by EPRI and the ISSCC statement of Qualification is on file at SwRI.

SwRI Form QA-11-6

SOUTHWEST RESEARCH INSTITUTE
NONDESTRUCTIVE EXAMINATION
STATEMENT OF CERTIFICATION

The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division, certifies that Charles R. Littlefield is qualified as Level II in Magnetic Particle Testing in accordance with the requirements of SwRI Nuclear Quality Assurance Procedure 11-1, which incorporates the guidelines of SNT-TC-1A 1975 and 1980 Editions.

Certification Limitations: Certification valid only while employed by SwRI

Special Qualifications (if any): None

Expiration Date: 02/15/91

Signed: Bobby C. Tagleder for DFR Date: 15 Feb 88
Director, Department of Engineering Services

EDUCATION, TRAINING, AND EXPERIENCE HISTORY

EDUCATION:

	NAME	YEARS	DEGREE
High School	Highlands H.S.	3	GRAD
Additional:	San Antonio College	1	No
Major Field of Study	Basic Studies		

TRAINING (This method and level):

Date Completed 09/11/85; 01/19/88
Hours: 16; 4 Location: SwRI

Date employed by SwRI: 07/30/84

The individual has been credited with 3 months of experience in this examination method on the date of certification. Some of the experience may have been accrued simultaneously with other NDE methods (at least 35% was in this method).

Previous NDE experience (if used for qualification):

COMPANY	FROM	TO
None		

VISUAL ACUITY AND COLOR PERCEPTION

The individual is capable of reading Jaeger Number 1 letters at 12 inches in at least one eye (using corrective lenses if specified below), and can distinguish and differentiate contrast between colors used in this method.

Date	Corr. Req.	Verified by	Date	Corr. Req.	Verified by
09/11/87	No	Barry Aldridge			

MOST RECENT EXAMINATION GRADES

	SCORES	WEIGHT
General:	93.40	0.3
Specific:	75.00	0.3
Practical:	97.00	0.4
Composite	89.32	1.0

Date: 02/15/88

Responsible Level III: E. J. Ruegner

CERTIFICATION HISTORY: THIS LEVEL

	DATE
Initial Certification:	02/15/88
Recertification:	
Recertification:	
Recertification:	
Recertification:	
Recertification:	
Recertification:	

REMARKS

SOUTHWEST RESEARCH INSTITUTE
NONDESTRUCTIVE EXAMINATION
STATEMENT OF CERTIFICATION

The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division, certifies that Charles R. Littlefield is qualified as Level II in Ultrasonic Testing in accordance with the requirements of SwRI Nuclear Quality Assurance Procedure 11-1, which incorporates the guidelines of SNT-TC-1A, 1975 and 1980 Editions.

Certification Limitations: Certification valid only while employed by SwRI

Special Qualifications (if any): None

Expiration Date: 01/23/90

Signed: Wayne T. Black Director, Department of Engineering Services Date: Jan 23, 1987

EDUCATION, TRAINING, AND EXPERIENCE HISTORY

EDUCATION:	NAME	YEARS	DEGREE
High School	Highlands H.S. (Tx)	3	GRAD
Additional:	San Antonio College	1	NO
Major Field of Study	Basic Studies		

TRAINING (This method and level):

Date Completed: 1/16/87
Hours: 52 Location: SwRI

Date employed by SwRI: 7/30/84

The individual has been credited with 11 months of experience in this examination method on the date of certification. Some of the experience may have been accrued simultaneously with other NDE methods (at least 25% was in this method).

Previous NDE experience (if used for qualification):

COMPANY	FROM	TO
None		

VISUAL ACUITY AND COLOR PERCEPTION

The individual is capable of reading Jaeger Number 1 letters at 12 inches in at least one eye (using corrective lenses if specified below), and can distinguish and differentiate contrast between colors used in this method.

Date	Corr. Req.	Verified by	Date	Corr. Req.	Verified by
9/12/86	No	Heidi Gutierrez			
9/11/87	No	Heidi Gutierrez			

MOST RECENT EXAMINATION GRADES

	SCORES	WEIGHT
General:	* 87.50	0.3
Specific:	** 85.00	0.3
Practical:	*** 97.50	0.4
Composite	90.80	1.0

Date: *1/7/87; **1/15/87; ***1/16/87

Responsible Level III: E. R. Goodson 1/26/87

CERTIFICATION HISTORY: THIS LEVEL

	DATE
Initial Certification:	01/23/87
Recertification:	
Recertification:	
Recertification:	
Recertification:	
Recertification:	
Recertification:	

REMARKS

SwRI Form QA-11-7

SOUTHWEST RESEARCH INSTITUTE
NONDESTRUCTIVE EXAMINATION
STATEMENT OF CERTIFICATION

The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division, certifies that Barbara A. Roberds is qualified as Level II in Magnetic Particle Testing in accordance with the requirements of SwRI Nuclear Quality Assurance Procedure 11-1, which incorporates the guidelines of SNT-TC-1A, 1975 and 1980 Editions.

Certification Limitations: Certification valid only while employed by SwRI

Special Qualifications (if any): None

Expiration Date: 1/21/90

Signed: Wayne J. Bloch Date: Jan 21, 1987

Director, Department of Engineering Services

EDUCATION, TRAINING, AND EXPERIENCE HISTORY

EDUCATION:

	NAME	YEARS	DEGREE
High School	Mason H.S.	4	GRAD
Additional:	AC; St. Mary's Univ.	2	NO
Major Field of Study	Accounting		

TRAINING (This method and level):

Date Completed 1/26/84; 1/9/87

Hours: 12 Location: SwRI

Date employed by SwRI: 01/12/81

The individual has been credited with 3 months of experience in this examination method on the date of certification. Some of the experience may have been accrued simultaneously with other NDE methods (at least 25% was in this method).

Previous NDE experience (if used for qualification):

COMPANY	FROM	TO
None		

VISUAL ACUITY AND COLOR PERCEPTION

The individual is capable of reading Jaeger Number 1 letters at 12 inches in at least one eye (using corrective lenses if specified below), and can distinguish and differentiate contrast between colors used in this method.

Date	Corr. Req.	Verified by	Date	Corr. Req.	Verified by
9/22/86	Yes	Heidi Gutierrez			
9/16/87	Yes	Heidi Gutierrez			

MOST RECENT EXAMINATION GRADES

	SCORES	WEIGHT
General:	*73.33	0.3
Specific:	*80.00	0.3
Practical:	**89.00	0.4
Composite	81.59	1.0

Date: *1/8/87; **1/9/87

Responsible Level III: L. R. Rueschen, FAR

CERTIFICATION HISTORY: THIS LEVEL

	DATE
Initial Certification:	02/03/84
Recertification:	01/21/87
Recertification:	
Recertification:	
Recertification:	
Recertification:	
Recertification:	

REMARKS

SwRI Form QA-11-7

SOUTHWEST RESEARCH INSTITUTE
NONDESTRUCTIVE EXAMINATION
STATEMENT OF CERTIFICATION

The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division, certifies that Barbara A. Roberds is qualified as Level II in Ultrasonic Testing in accordance with the requirements of SwRI Nuclear Quality Assurance Procedure 11-1, which incorporates the guidelines of SNT-TC-1A, 1975 and 1980 Editions.

Certification Limitations: Certification valid only while employed by SwRI

Special Qualifications (if any): None

Expiration Date: 06/27/89

Signed: Wayne I. Hach, Director, Department of Engineering Services Date: 6/27/86

EDUCATION, TRAINING, AND EXPERIENCE HISTORY

EDUCATION:	NAME	YEARS	DEGREE
High School	Mason High School	4	GRAD
Additional:	SAC; St.Mary's Univ.	2	No

Major Field of Study: Accounting

TRAINING (This method and level):
Date Completed: 06/24/83; 06/11/86
Hours: 64; 20 Location: SwRI

Date employed by SwRI: 01/12/81

The individual has been credited with 24 months of experience in this examination method on the date of certification. Some of the experience may have been accrued simultaneously with other NDE methods (at least 25% was in this method).

Previous NDE experience (if used for qualification):

COMPANY	FROM	TO
None		

VISUAL ACUITY AND COLOR PERCEPTION

The individual is capable of reading Jaeger Number 1 letters at 12 inches in at least one eye (using corrective lenses if specified below), and can distinguish and differentiate contrast between colors used in this method.

Date	Corr. Req.	Verified by	Date	Corr. Req.	Verified by
10/21/85	Yes	Heidi Gutierrez			
9/22/86	Yes	Heidi Gutierrez			
9/16/87	Yes	Heidi Gutierrez			

MOST RECENT EXAMINATION GRADES

	SCORES	WEIGHT
General:	* 91.11	0.3
Specific:	* 75.99	0.3
Practical:	**98.00	0.4
Composite	88.73	1.0

Date: *06/04/86; **05/30/86

Responsible Level III: E. H. Boeschen

CERTIFICATION HISTORY: THIS LEVEL

	DATE
Initial Certification:	07/13/83
Recertification:	06/27/86
Recertification:	
Recertification:	
Recertification:	
Recertification:	
Recertification:	

REMARKS

Note! This individual has received IGSCC detection training by EPRI and the IGSCC statement of Qualification is on file at SwRI.

SwRI Form QA-11-7

SOUTHWEST RESEARCH INSTITUTE
NONDESTRUCTIVE EXAMINATION
STATEMENT OF CERTIFICATION

The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division, certifies that Lyle D. Spiess is qualified as Level II in Magnetic Particle Testing in accordance with the requirements of SwRI Nuclear Quality Assurance Procedure 11-1, which incorporates the guidelines of SNT-TC-1A, 1975 and 1980 Editions.

Certification Limitations: Certification valid only while employed by SwRI

Special Qualifications (if any): None

Expiration Date: 02/15/91

Signed: Bobby C. Eagleton for DFR Date: 15 Feb 88

Director, Department of Engineering Services

EDUCATION, TRAINING, AND EXPERIENCE HISTORY

EDUCATION:	NAME	YEARS	DEGREE
High School	John Jay H.S. (TX)	4	GRAD
Additional:	Hallmark Aero	1	A&P
Major Field of Study	Airframe & Power Plant		

TRAINING (This method and level):
Date Completed: 01/31/85
Hours: 8 Location: SwRI

Date employed by SwRI: 05/16/83

The individual has been credited with 3 months of experience in this examination method on the date of certification. Some of the experience may have been accrued simultaneously with other NDE methods (at least 25% was in this method).

Previous NDE experience (if used for qualification):

COMPANY	FROM	TO
None		

VISUAL ACUITY AND COLOR PERCEPTION

The individual is capable of reading Jaeger Number 1 letters at 12 inches in at least one eye (using corrective lenses if specified below), and can distinguish and differentiate contrast between colors used in this method.

Date	Corr. Req.	Verified by
08/21/84	No	Betty Aldridge
07/22/85	No	Betty Aldridge
07/29/86	No	Betty Aldridge
07/01/87	No	Betty Aldridge

MOST RECENT EXAMINATION GRADES

	SCORES	WEIGHT
General:	96.7	0.3
Specific:	95.0	0.3
Practical:	90.0	0.4
Composite	93.51	1.0

Date: 02/15/88

Responsible Level III: [signature] 3/15/88

CERTIFICATION HISTORY: THIS LEVEL

	DATE
Initial Certification:	02/11/85
Recertification:	02/15/88
Recertification:	
Recertification:	
Recertification:	
Recertification:	
Recertification:	

REMARKS

SwRI Form QA-11-7

SOUTHWEST RESEARCH INSTITUTE
NONDESTRUCTIVE EXAMINATION
STATEMENT OF CERTIFICATION

The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division, certifies that Lyle D. Spiess is qualified as Level II in Liquid Penetrant Testing in accordance with the requirements of SwRI Nuclear Quality Assurance Procedure 11-1, which incorporates the guidelines of SNT-TC-1A, 1975 and 1980 Editions.

Certification Limitations: Certification valid only while employed by SwRI

Special Qualifications (if any): None

Expiration Date: 02/15/91

Signed: Bobby L. Cagleden for D.R. Director, Department of Engineering Services Date: 15 Feb 88

EDUCATION, TRAINING, AND EXPERIENCE HISTORY

EDUCATION:	NAME	YEARS	DEGREE
High School	John Jay H.S. (Tx)	4	GRAD
Additional:	Hallmark Aero	1	A&P
Major Field of Study	Airframe & Power Plant		

TRAINING (This method and level):
Date Completed: 01/29/85
Hours: 10 Location: SwRI

Date employed by SwRI: 05/16/83

The individual has been credited with 4 years, ____ months of experience in this examination method on the date of certification. Some of the experience may have been accrued simultaneously with other NDE methods (at least 25% was in this method).

Previous NDE experience (if used for qualification):

COMPANY	FROM	TO
None		

VISUAL ACUITY AND COLOR PERCEPTION

The individual is capable of reading Jaeger Number 1 letters at 12 inches in at least one eye (using corrective lenses if specified below), and can distinguish and differentiate contrast between colors used in this method.

Date	Corr. Req.	Verified by
08/21/84	No	Betty Aldridge
07/22/85	No	Betty Aldridge
07/29/86	No	Betty Aldridge
07/01/87	No	Betty Aldridge

MOST RECENT EXAMINATION GRADES

	SCORES	WEIGHT
General:	93.4	0.3
Specific:	90.0	0.3
Practical:	90.0	0.4
Composite	91.02	1.0

Date: 02/15/88
Responsible Level III: D.R. Forrester 2/15/88

CERTIFICATION HISTORY: THIS LEVEL

	DATE
Initial Certification:	02/11/85
Recertification:	02/15/88
Recertification:	
Recertification:	
Recertification:	
Recertification:	
Recertification:	

REMARKS

SwRI Form QA-11-7

SOUTHWEST RESEARCH INSTITUTE
NONDESTRUCTIVE EXAMINATION
STATEMENT OF CERTIFICATION

The Director of the Department of Engineering Services, Nondestructive Evaluation Science and Technology Division, certifies that Lyle D. Spiess is qualified as Level II in Ultrasonic Testing in accordance with the requirements of SwRI Nuclear Quality Assurance Procedure 11-1, which incorporates the guidelines of SNT-TC-1A, 1975 and 1980 Editions.

Certification Limitations: Certification valid only while employed by SwRI

Special Qualifications (if any): None

Expiration Date: 1/19/91

Signed: Wayne J. Flaeck Date: 1-19-88

Director, Department of Engineering Services

EDUCATION, TRAINING, AND EXPERIENCE HISTORY

EDUCATION:	NAME	YEARS	DEGREE
High School	John Jay HS (TX)	4	GRAD
Additional:	Hallmark Aero	1	A&P
Major Field of Study	Airframe & Power Plant		

TRAINING (This method and level):

Date Completed 2/25/85; 1/13/88

Hours: 60; 11 Location: SwRI

Date employed by SwRI: 5/16/83

The individual has been credited with 22 months of experience in this examination method on the date of certification. Some of the experience may have been accrued simultaneously with other NDE methods (at least 25% was in this method).

Previous NDE experience (if used for qualification):

COMPANY	FROM	TO
None		

VISUAL ACUITY AND COLOR PERCEPTION

The individual is capable of reading Jaeger Number 1 letters at 12 inches in at least one eye (using corrective lenses if specified below), and can distinguish and differentiate contrast between colors used in this method.

Date	Corr. Req.	Verified by	Date	Corr. Req.	Verified by
7/1/87	No	Bonnie Caudle			

MOST RECENT EXAMINATION GRADES

	SCORES	WEIGHT
General:	93.02	0.3
Specific:	98.00	0.3
Practical:	100.00	0.4
Composite	97.31	1.0

Date: 1/19/88

Responsible Level III: E. H. Boecher 1/19/88

E. H. Boecher

CERTIFICATION HISTORY: THIS LEVEL

	DATE
Initial Certification:	4/9/85
Recertification:	1/19/88
Recertification:	
Recertification:	
Recertification:	
Recertification:	
Recertification:	

REMARKS

NOTE: This individual has received IGSCC detection training by EPRI and the IGSCC Statement of Qualification is on file at SwRI.

SwRI Form QA-11-7

APPENDIX G

MATERIAL AND EQUIPMENT CERTIFICATIONS

APPENDIX G

MATERIAL AND EQUIPMENT CERTIFICATIONS

Table of Contents

MATERIAL

EQUIPMENT

APPENDIX G

MATERIAL AND EQUIPMENT CERTIFICATIONS

Table of Contents (Cont'd)

TRANSDUCERS

SOUTHWEST RESEARCH INSTITUTE

POST OFFICE DRAWER 28510 • 6220 CULEBRA ROAD • SAN ANTONIO, TEXAS, USA 78284 • (512) 684-5111 • TELEX 76-7357

March 3, 1988

Mr. J.H. Wilson
Quality Assurance Systems & Engineering
Southwest Research Institute
6220 Culebra Road
San Antonio, TX 78238

Dear Sir:

The analysis that you requested on two marking pencils has been completed. The results are as follows:

Code	Sulfur, % wt. (ASTM D-129)	Chlorine, % wt. (ASTM D-808)
Berol Prismacolor Black 935	0.00 & 0.00	0.02 & 0.02
Berol Prismacolor White 938	0.05 & 0.04	0.06 & 0.06

If you have any questions concerning these test results, please contact me.

Sincerely,

Ralph W. Bowen

Ralph W. Bowen, Principal Scientist
Petroleum Products Research Dept.
Automotive Products & Emissions Res.

ygc

SwRI
P. O. [illegible]
P. R. [illegible]
LOG [illegible]

SAN ANTONIO, TEXAS

SOUTHWEST RESEARCH INSTITUTE

POST OFFICE DRAWER 28510 • 6220 CULEBRA ROAD • SAN ANTONIO, TEXAS, USA 78284 • 512/ 684-5111 • TELEX 244846

August 13, 1987

Mr. J.H. Wilson
Quality Assurance Systems &
Engineering
Southwest Research Institute
6220 Culebra Road
San Antonio, TX 78238

Dear Sir:

The chemical analysis that you requested on one sample of Glycerine has been completed. The results are as follows:

Code	Log 2444 Lot # TA861201 Run #1	Run #2
Sulfur, % wt. (ASTM D-129)	0.03	0.00
Chlorine, % wt. (ASTM D-808)	0.00	0.00

If you have any questios concerning these test results, please contact me.

Sincerely,

Ralph W. Bowen, Principal Scientist
Petroleum Products Research Dept.
Automotive Products & Emissions Res.

ygc

CC: S. Heller

SwRI
P. O. 31598
P. R. 374421
LOG 2444

SAN ANTONIO, TEXAS
DALLAS, TEXAS • DETROIT, MICHIGAN • HOUSTON, TEXAS • WASHINGTON, DC

BRANCH OFFICES:
Chicago, Illinois
Philadelphia, Pennsylvania

International Testing Laboratories, Inc.
Material Testing and Consulting Engineers
Weighers, Samplers and Assayers
578-582 MARKET STREET
NEWARK, N. J. 07105
PHONES: (201) 589-4772-3-4

Cable Address: INTEL
Telex: 13-1437

REPORT OF TEST

No. 520146 DATE June 20, 1987

From Echo Ultrasound
R.D. 4, Box 76
Lewistown, Penn. 17044

Sample of : Sonotrace 40

Marked : Batch No. 8767
Spec. ASTM-D-120 and D-808
Purchase Order No. 22515-DAL

Results :

Halogens	:	31.6 ppm
Sulphur	:	3.2 ppm

I, David N. Hoffman, do hereby certify that the above is true and correct.

Sworn to and subscribed
before me this 29th day of June, 19
Jacqueline Beatty
My Notary Public Commission
expires August 13, 1988.

SwRI
P. O. 35618
P. R. 374435
LOG 4456

To Echo Ultrasound
Lewistown, Penn.

INTERNATIONAL TESTING LABORATORIES, INC.
David N. Hoffman
ITL 102 RM 1-87

MAGNAFLUX Corporation 7300 West Lawrence Avenue Chicago IL 60656 Telephone 312-667-6000

MAGNAFLUX

Date: November 13, 1984

TO:

Purchase Order No. _____

We hereby certify that the Magnetic Particle Inspection Material type No. 1 Gray Powder, Batch No. 84L022

meets the requirements of the following specifications:

A. ASME Boiler and Pressure Vessel Code, Section V, 1980 Edition, Nondestructive Examination, with Summer 1980 through Winter 1982 Addenda. Paragraph T-753 (a) and Article 25 as applicable.

B. ASME Boiler and Pressure Vessel Code, Section V, 1983 Edition, Nondestructive Examination, with Addenda through Winter, 1983, Paragraphs T-723, T-726(a) and Article 25.

C. ASTM E 709-80, Paragraphs 6.1, 6.2, and 6.3.

D. NAVSEA 250-1500-1, Rev. 10 June 1979 and Rev. 11, May 1983, Paragraph 12.4.1.8.

E. MIL-I-6868E, 27 February 1976, Paragraphs 5.1, 5.2 and 5.3.

F. MIL-STD-271E(SHIPS), ACN-1, 24 October 1980, Paragraphs 4.2.8, 4.3.2.3, and 4.3.3.1.

G. MIL-STD-271E(SHIPS), NTR-1E, 16 June 1978, Paragraph 4.3.2.3.

H. MIL-STD-2132(SH), 16 January, 1981, Paragraph 4.2.1.3 and Appendix A, Paragraph 50.4.

We further certify that this material does not contain mercury as a basic element and no mercury bearing equipment was used in its manufacture.

Batch numbers appear on labels of bulk containers.

SwRI
P. O. 44630
P. R. 273765
Lot 1918

MAGNAFLUX CORPORATION

A. S. Britton

A. S. Britton - Manager, Chemical Quality Control
W. G. Blankenship - Director of Quality Assurance

Form No. 1565A R-7/84

MAGNAFLUX Corporation · 7300 Amigo Avenue · Chicago, IL 60631 · Telephone 312-887-8300

MAGNAFLUX

Date: June 14, 1984

TO:

Purchase Order No. _____

We hereby certify that the Magnetic Particle Inspection Material type

No. 8A Red Powder, Batch No. 845012

meets the requirements of the following specifications:

A. ASME Boiler and Pressure Vessel Code, Section V, 1980 Edition, Nondestructive Examination, with Summer 1980 through Winter 1982 Addenda, Paragraph T-733 (a) and Article 25 as applicable.

B. ASME Boiler and Pressure Vessel Code, Section V, 1983 Edition, Nondestructive Examination, with Addenda through Winter, 1983, Paragraphs T-723, T-726(a) and Article 25.

C. ASTM E 709-80, Paragraphs 6.1, 6.2, and 6.3.

D. NAVSEA 250-1500-1, Rev. 10 June 1979, Paragraph 12.4.1.6.

E. MIL-I-6868E, 27 February 1976, Paragraphs 3.1, 3.2 and 3.3.

F. MIL-STD-271E(SHIPS), ACN-1, 24 October 1980, Paragraphs 4.2.6, 4.3.2.3, and 4.3.3.1.

G. MIL-STD-271E(SHIPS), NTR-1E, 16 June 1978, Paragraph 4.3.2.3.

H. MIL-STD-2130(SH), 16 January, 1981, Paragraph 4.2.1.3 and Appendix A, Paragraph 30.4.

We further certify that this material does not contain mercury as a basic element and no mercury bearing equipment was used in its manufacture.

Batch numbers appear on labels of bulk containers.

DoDI
P. O. 47664
P. R. 271725
LOG 19214

MAGNAFLUX CORPORATION

A. J. Britton

A. J. Britton - Manager, Chemical Quality Control
W. C. Blankenship - Director of Quality Assurance

Form No. 1767A R-2 84

MAGNAFLUX

Date: July 1, 198#

TO:

Purchase Order No. _____

We hereby certify that the Magnetic Particle Inspection Material type

No. 8A Red Powder, Batch No. 8F7006

meets the requirements of the following specifications:

A. ASME Boiler and Pressure Vessel Code, Section V, 1980 Edition, Nondestructive Examination, with Summer 1980 through Winter 1982 Addenda, Paragraph T-753 (a) and Article 25 as applicable.

B. ASME Boiler and Pressure Vessel Code, Section V, 1983 Edition, Nondestructive Examination, with Addenda through Winter, 1984, Paragraphs T-723, T-726(a) and Article 25.

C. ASTM E 709-80, Paragraphs 6.1, 6.2, and 6.3.

D. NAVSEA 250-1500-1, Rev. 10 June 1979 and Rev. 11, May 1983, Paragraph 12.4.1.6.

E. MIL-I-6868E, 27 February 1976, Paragraphs 5.1, 5.2 and 5.3.

F. MIL-STD-271E(SHIPS), ACN-1, 24 October 1980, Paragraphs 4.3.6, 4.3.2.3, and 4.3.3.1.

G. MIL-STD-271E(SHIPS), NTR-1E, 16 June 1978, Paragraph 4.3.2.3.

H. MIL-STD-2132(SH), 16 January, 1981, Paragraph 4.3.1.3 and Appendix A, Paragraph 50.4.

We further certify that this material does not contain mercury as a basic element and no mercury bearing equipment was used in its manufacture.

Batch numbers appear on labels of bulk containers.

MAGNAFLUX CORPORATION

A. S. Britton

A. S. Britton - Manager, Quality Control
W. G. Blankenship - Director of Quality Assurance

Form No. 1565A R-6/85

Avail
P. O. 55934
P. R. 373928
Item 2053A

Date: April 29, 1987

TO:

Purchase Order No. _____

We hereby certify that the Magnetic Particle Inspection Material type 14AM Prepared Bath, Batch No. 87D051 meets the requirements of the following specifications:

A. ASME Boiler and Pressure Vessel Code, Section V, 1986 Edition, Nondestructive Examination, Paragraphs T-723, T-726(b) and Article 25 as applicable.

B. ASTM E 709-80, Paragraphs 6.1, 6.2, 6.4, 6.4.2, 6.4.4.2 and 6.4.5.1.

C. MIL-STD-1949, 1 August, 1985. Paragraphs 4.10.1, 4.10.1.2 and 4.10.2

D. MIL-STD-271E(SHIPS), NTR-1E, 16 June 1978, Paragraph 4.3.2.3.

E. MIL-STD-2132A(SH), 10 September 1984, Paragraph 6.2.1.3, 6.2.2.3, 6.2.2.4, 6.2.2.5, 6.2.2.6, and 6.2.2.7.

F. The flash point of the material is over 200°F when tested by the Pensky-Marten's Closed Cup Method (ASTM D-93).

G. The vehicle meets the requirements of DOD-P-87935, 21 January 1986 and Ammendment 2, 21 January 1986.

We further certify that this material does not contain mercury as a basic element and no mercury bearing equipment was used in its manufacture.

Batch numbers appear on labels of bulk containers and on the bottom of aerosol cans.

MAGNAFLUX CORPORATION

Shell
P. O. 35689
P. N. 374429
Qty 8450 B

R. S. Britton - Manager, Quality Assurance
M. Plamcottil - Quality Control Chemist

Form No. 1568 C R-1/87

MAGNAFLUX Corporation 7300 West Lawrence Avenue Chicago IL 60706 Telephone 312-867-8000

MAGNAFLUX

Date: August 28, 1987

Purchase Order No. _____

SUBJECT Spotcheck Cleaner/Remover Type: SKC-S Batch No. 87H067

We hereby certify that when tested at the time of manufacture, the above material:

1. Meets the requirements of and has been tested for sulfur and halogens according to:
   (a) ASME Boiler and Pressure Vessel Code, 1983 Edition, Section V, Nondestructive Examination, including all Addenda through Winter 1983 Addendum, Paragraph T-625 and Article 24 as applicable.
   (b) ASME Boiler and Pressure Vessel Code, 1986 Edition, Section V, Nondestructive Examination, Paragraph T-625 and Article 24 as applicable.
   (c) ASTM E-165-80, Paragraph 7.1.
   (d) NAVSEA 250-1500-1 (Rev. 10 June 1979 and Rev. 11 May 1983) Paragraphs 12.5.1.1 and 12.5.1.1.1.
   (e) MIL-STD-271E, (31 October 1975) and ACN-1 (24 October 1980), Paragraph 5.3.1.
   (f) MIL-STD-271E, NTR-1E, June 16, 1978, Paragraph 5.3.
   (g) MIL-STD-2132 (SH), 16 January, 1981, Paragraphs 5.1.2, 5.1.3 and 5.1.4 or 5.1.5 and Appendix B, Paragraph 30.
   (h) AOT Standard F3-67, May 1974 and October 1975 including Amendments 1 (4-6-76) and 2 (2-9-76), Article 6, Paragraph T-30.
   (i) General Electric P.P. 9500, Rev. 2 (2-21-80) Paragraphs 2.3 and 2.4.

The following test results were obtained:

Sulfur: NA wt. % of residue. Halogen: NA wt. % of residue

Cleaner residue (see Note 3) 0.0014 g/100g. 0.0011 g/100 ml.

2. We further certify that this material does not contain mercury as a basic element, and no mercury bearing equipment was used in its manufacture.

SmRI
P. O. 41095
P. R. 575514
100 2471

MAGNAFLUX CORPORATION

C. J. Britton

C. J. Britton - Manager, Quality Assurance
M. Piamontil - Quality Control Chemist

NOTES:
1. Our batch number appears on the bottom of all spray containers and on the label of all other containers.
2. Most specifications require test results stated in percent but some require parts per million (PPM). To convert "percent" figures to "parts per million" move the decimal four places to the right.
3. NAVSEA 250-1500-1, MIL-STD-271, MIL-STD-2132, AOT F3-67 and ASME Section V all require that materials be subject to a procedure to evaporate off volatile solvents before analysis for sulfur and halogen. According to these specifications, only those residues higher than 0.005 g/100 g shall be analyzed for sulfur and halogen. Lower residues shall be reported.
4. The above certification gives the results obtained at the time of manufacture. Age and use may alter the properties of any material.

Form No. 1569 R-1/87

MAGNAFLUX

Date: June 17, 198?

Purchase Order No. _____

SUBJECT: Spotcheck Developer Type: SKD-S Batch No. 8?F047

We hereby certify that when tested at the time of manufacture, the above material:

1. Meets the requirements of and has been tested for sulfur and halogens according to:
   (a) ASME Boiler and Pressure Vessel Code, 1983 Edition, Section V, Nondestructive Examination, including all Addenda through Winter 1983 Addendum, Paragraph T-623 and Article 24 as applicable.
   (b) ASME Boiler and Pressure Vessel Code, 1986 Edition, Section V, Nondestructive Examination, Paragraph T-623 and Article 24 as applicable.
   (c) ASTM E-165-80, Paragraph 7.1.
   (d) NAVSEA 250-1500-1 (Rev. 10 June 1979 and Rev. 11 May 1983) Paragraphs 12.5.1.1 and 12.5.1.1.1.
   (e) MIL-STD-271E, (31 October 1973) and ACN-1 (24 October 1980), Paragraph 5.3.1.
   (f) MIL-STD-271E, NTR-1E, June 16, 1978, Paragraph 5.3.
   (g) MIL-STD-2132 (SH), 16 January, 19x1, Paragraphs 5.1.2, 5.1.3 and 5.1.4 or 5.1.5 and Appendix B, Paragraph 10.
   (h) NDT Standard 93-6T, May 1974 and October 1975 including Amendments 1 (4-6-76) and 2 (2-9-78), Article 6, Paragraph T-30.
   (i) General Electric P.S. 9000, Rev. 2 (2-11-80) Paragraphs 2.3 and 2.4.

The following test results were obtained:

Sulfur: 0.0481 wt. % of residue. Halogen: 0.0127 wt. % of residue

Cleaner residue (see Note 3): NA g/100g. NA g/100 ml.

2. We further certify that this material does not contain mercury as a basic element, and no mercury bearing equipment was used in its manufacture.

GMI
P. O. 35699
P. R. 377429
103 2450A

MAGNAFLUX CORPORATION

A. J. Brittin - Manager, Quality Assurance
M. Piasecotti - Quality Control Chemist

NOTES:
1. Our batch number appears on the bottom of all spray containers and on the label of all other containers.
2. Most specifications require test results stated in percent but some require parts per million (PPM). To convert "percent" figures to "parts per million" move the decimal four places to the right.
3. NAVSEA 250-1500-1, MIL-STD-271, MIL-STD-2132, NDT 93-6T and ASME Section V all require that materials be subject to a procedure to evaporate off volatile solvents before analysis for sulfur and halogen. According to these specifications, only those residues higher than 0.005 g/100 g shall be analyzed for sulfur and halogen. Lower residues shall be reported.
4. The above certification gives the results obtained at the time of manufacture. Age and use may alter the properties of any material.

Form No. 1369 5-1-87

MAGNAFLUX Corporation 7300 West Lawrence Avenue Chicago IL 60656 Telephone 312 567-8000

MAGNAFLUX

Date: December 26, 1984

P.O.	53208
T.R.	273811
S/O	1055C

Purchase Order No. _____

SUBJECT: Spotcheck Penetrant, Type: SKL-HF/S, Batch No. 841058

We hereby certify that when tested at the time of manufacture, the above material:

1. Meets the requirements of and has been tested for sulfur and halogens according to:
   (a) ASME Boiler and Pressure Vessel Code, 1980 Edition, Section V, Nondestructive Examination, with Summer 1980 through Winter 1982 Addenda, Paragraph T-644, and Article 24 as applicable.
   (b) ASME Boiler and Pressure Vessel Code, 1983 Edition, Section V, Nondestructive Examination, including all Addenda through Winter 1983 Addendum, Paragraph T-623 and Article 24 as applicable.
   (c) ASTM E-165-80, Paragraph 7.1.
   (d) MIL-STD-271E, (31 October 1973) and AMN-1 (14 October 1980), Paragraph 3.3.1.
   (e) MIL-STD-271E, NTR-1E, June 16, 1978, Paragraph 3.3.
   (f) MIL-STD-2132 (SH), 16 January, 1981, Paragraphs 5.1.2, 5.1.3 and 5.1.4 or 5.1.5 and Appendix B, Paragraph 10.
   (g) NDT Standard P3-4T, May 1974 and October 1978 including Amendments 1 (4-6-78) and 2 (1-8-79), Article 6, Paragraph T-10.

The following test results were obtained:

Sulfur: 0.0110 wt. % of residue. Halogen: 0.0145 wt. % of residue

Cleaner residue (see Note 3) NA g/100g. NA g/100 ml.

2. Meets the requirements of MIL-I-25135C (Amendment 3 and Interim Amendment 4).

3. Does not contain mercury as a basic element, and no mercury bearing equipment was used in its manufacture.

MAGNAFLUX CORPORATION

C. S. Britton

A. S. Blankenship - Director of Quality Assurance
A. S. Britton - Manager, Chemical Quality Control

NOTES: 1. Our batch number appears on the bottom of all spray containers and on the label of all other containers.
2. Most specifications require test results stated in percent but some require parts per million (PPM). To convert "percent" figures to "parts per million" move the decimal four places to the right.
3. MIL-STD-271, MIL-STD-1131, NDT P3-4T and ASME Section V all require that materials be subject to a procedure to evaporate off volatile solvents before analysis for sulfur and halogen. According to these specifications, only those residues higher than 0.005 g/100 g shall be analyzed for sulfur and halogen. Lower residues shall be reported.
4. The above certification gives the results obtained at the time of manufacture. Age and use may alter the properties of any material.

Form No. 1266 - Rev. 8/14

SOUTHWEST RESEARCH INSTITUTE

POST OFFICE DRAWER 28510 6220 CULEBRA ROAD SAN ANTONIO, TEXAS 78284 (512) 684-5111

Calibration Record

ITEM Dayton, Quick Temp SOURCE Div 17

MODEL 5X866 S/N 230270 SWRI NO 0276

PLUG-INS, ETC. Probe # 036

TOLERANCE Within 3°F of standard indication

STANDARDS

Standard No.	MFGR Model	Description	S/N	Cal. Due	Cal. Rec. No.
	Taylor (18-69°F)	Thermometer	63/5276	2-11-89	02148
	Taylor (77-131°F)	Thermometer	6402821	4-3-89	02247

ENVIRONMENT: Temperature 74°F Humidity 55%

Location Building 68, SwRI

PROCEDURE

☐ Essentially as outlined in MFGRS Service Manual

☒ SwRI Nuclear Projects Operating Procedures XII-AO-105-2

CONCLUSION

☐ Item within tolerance. No adjustment was necessary.

☐ Item ADJ/repaired to tolerance

☒ Item within limits of above procedure, see data sheet

Calibration was in accord with requirements of MIL-STD-45662, MIL-Q-9858 and MIL-C-45208. Measurements are traceable to the National Bureau of Standards. Inspection and test data are on file and available for inspection.

SIGNED [signature]

DATE 15 JAN 88

RECORD NUMBER 02254 NEXT CALIBRATION DUE 15 JUL 88

SOUTHWEST RESEARCH INSTITUTE
DATA SHEET

SHEET NO 1 OF 1 SHEETS'

PROJECT CALIBRATION

SUBJECT Calibration of [illegible] SX666, Quick-Temp

DATE 15 JAN 88

086 S/N 220270

BY [illegible]

Checked only on high range at points indicated below:

SX666, Quick-temp Reading	Standard Indication
47°F	45.0°F
106°F	107.0°F
120°F	121.0°F

Indication at Room Temperature after 1 hour Stabilization period:

Dayton Quick Temp	Standard
74°F	72.2°F

PC-4

SOUTHWEST RESEARCH INSTITUTE

POST OFFICE DRAWER 28510 · 6220 CULEBRA ROAD · SAN ANTONIO, TEXAS 78284 · (512) 684-5111

Calibration Record

ITEM Amprobe, Fastemp SOURCE Div 17

MODEL T-150 S/N #20177 SWRI NO. 120

PLUG-INS, ETC. Probe # 120

~~MFGRS~~ TOLERANCE within 3°F of standard indication

STANDARDS

Standard No.	MFGR Model	Description	S/N	Cal. Due	Cal. Rec. No.
	Taylor (18-89°F)	Thermometer	63F5516	2-11-89	02198
	Taylor (77-131°F)	Thermometer	64F2821	4-3-89	02247

ENVIRONMENT: Temperature 72°F Humidity 65%

Location Room 211, Bldg. 68, SwRI

PROCEDURE

☐ Essentially as outlined in MFGRS Service Manual

☒ SwRI Nuclear Projects Operating Procedure XII-AG-105-2

CONCLUSION

☐ Item within tolerance. No adjustment was necessary.

☐ Item ADJ/repaired to tolerance

☒ Item within limits of above procedure, see data sheet.

Calibration was in accord with requirements of MIL-STD-45662, MIL-Q-9858 and MIL-C-45208. Measurements are traceable to the National Bureau of Standards. Inspection and test data are on file and available for inspection.

SIGNED [signature]

DATE [illegible] 88

RECORD NUMBER: 05875 NEXT CALIBRATION DUE [illegible]

SOUTHWEST RESEARCH INSTITUTE
DATA SHEET

SHEET NO. 1 OF 1 SHEETS

PROJECT Calibration

SUBJECT Calibration of Amprobe, T-150

DATE 7-1-75

Fastemp S/N 20177, SwRI # 1446

BY [illegible]

Checked high range at following points:

T-150 Reading	Standard Reading
44°F	43.0°F
93°F	93.0°F
142°F	142.0°F

Indication at room temperature after 1 hour stabilization period:

T-150 Reading	Standard Reading
72°F	72°F

PQ-4

SOUTHWEST RESEARCH INSTITUTE

POST OFFICE DRAWER 28510 · 6220 CULEBRA ROAD · SAN ANTONIO, TEXAS 78284 · (512) 684-5111

Calibration Record

ITEM Amprobe, Pastemp SOURCE Div 17

MODEL T-150 S/N 510675 SWRI NO. 173

PLUG-INS, ETC. Probe # 133

MFGRS TOLERANCE WITHIN 3°F OF STANDARD INDICATION

STANDARDS

Standard No.	MFGR Model	Description	S/N	Cal. Due	Cal. Rec. No.
	Taylor (0-220°F)	Thermometer	63F5516	2-11-89	02198
	Taylor (32-212°F)	Thermometer	64F2821	4-3-89	02247

ENVIRONMENT: Temperature 74°F Humidity 35%

Location Room A11, Bldg. 68, SwRI

PROCEDURE

☐ Essentially as outlined in MFGRS Service Manual

☑ SwRI Nuclear Projects Operating Procedure XII-AG-105-2

CONCLUSION

☐ Item within tolerance. No adjustment was necessary.

☐ Item ADJ/repaired to tolerance

☑ Item within limits of above procedure, see data sheet.

Calibration was in accord with requirements of MIL-STD-45662, MIL-Q-9858 and MIL-C-45208. Measurements are traceable to the National Bureau of Standards. Inspection and test data are on file and available for inspection.

SIGNED R. L. Tom, Plum

DATE 15 JAN 88

RECORD NUMBER: 03391

NEXT CALIBRATION DUE: 15 JUL 89

SOUTHWEST RESEARCH INSTITUTE
DATA SHEET

SHEET NO. 1 OF 1 SHEETS

SUBJECT Calibration of Amprobe, T-150

PROJECT Calibration

Fastemp S/N 3-2573, SwRI # 173

DATE 15 JUL 77

BY [illegible]

Checked high range at following points:

T-150 Reading	Standard Reading
44 °F	42.5 °F
94 °F	94.0 °F
126 °F	125.0 °F

Indication at room temperature after 1 hour stabilization period:

T-150 Reading	Standard Reading
72 °F	72.2 °F

PC-4

SOUTHWEST RESEARCH INSTITUTE

POST OFFICE DRAWER 28510 · 6220 CULEBRA ROAD · SAN ANTONIO, TEXAS 78284 · (512) 684-5111

Calibration Record

ITEM Amprobe, Fastemp SOURCE Div 17

MODEL T-150 S/N 690455 SWRI NO. 158

PLUG-INS, ETC. Probe # 158

~~MFGRS~~ TOLERANCE WITHIN 3°F of STANDARD INDICATION

STANDARDS

Standard No.	MFGR Model	Description	S/N	Cal. Due	Cal. Rec. No
	Taylor (0-220°F)	Thermometer	63F5516	2-11-89	02198
	Taylor (0-100°C)	Thermometer	64F2221	4-3-89	02247

ENVIRONMENT: Temperature 74°F Humidity 35%F

Location ~~SwRI Yd.~~ Room 211 Bldg. 58, SwRI

PROCEDURE

☐ Essentially as outlined in MFGRS Service Manual

☒ SwRI Nuclear Projects Operating Procedure XII-AC-103-1

CONCLUSION

☐ Item within tolerance. No adjustment was necessary.

☐ Item ADJ/repaired to tolerance

☒ Item within limits of above procedure, see data sheet.

Calibration was in accord with requirements of MIL-STD-45662, MIL-Q-9858 and MIL-C-45208. Measurements are traceable to the National Bureau of Standards. Inspection and test data are on file and available for inspection.

SIGNED [signature]

DATE 15th JAN 88

RECORD NUMBER: 03336 NEXT CALIBRATION DUE: 15th JUL 88

SOUTHWEST RESEARCH INSTITUTE
DATA SHEET

SHEET NO. 1 OF 1 SHEETS
PROJECT Calibration
DATE 15 JAN 88
BY [illegible]

SUBJECT Calibration of Amprobe T-130
Fastemp S/N 640455 Sub: # 158

Checked high range at following points:

T-130 Reading	Standard Reading
47 °F	45.0°F
106°F	102.0°F
120°F	121.0°F

Indication at room temperature after 1 hour stabilization period:

T-130 Reading	Standard Reading
72°F	72.2°F

PC-4

ULTRAVIOLET RADIOMETER

TEST REPORT NUMBER: 873621 DATE: OCTOBER 26, 1987

INSTRUMENT: UVP J-221, S/N 26059

INSTRUMENT OWNER: SWRI

SUMMARY OF INSTRUMENT MEASUREMENTS

TEMPERATURE: 74 F. HUMIDITY: 52%

STANDARD INSTRUMENT READING		METER UNDER TEST PRE-CALIBRATION READING	METER UNDER TEST CALIBRATION READING
300	A	600	
720	A	1,200	
1,100	A	1,200+	
1,100	B	1,600	
4,000	B	5,400	
5,200	B	6,000+	
300	A		350
1,100	A		1,100
1,100	B		1,100
5,200	B		4,650

NOTE: UNIT OF MEASUREMENT IN ALL CASES IS MICROWATTS / SQUARE CENTIMETER
LOWER BOUND ON CALIBRATION IS 600 MICROWATTS / SQUARE CENTIMETER
UPPER BOUND ON CALIBRATION IS 6000 MICROWATTS / SQUARE CENTIMETER
STANDARD USED: SPECTROLINE DSE-100X, S/N 34441/34427
(NBS TEST NUMBERS: 232274 & 231129)

A I P , I N C .

P.O. BOX 8386 HOUSTON, TX PHONE (713) 522-2762

EVALUATION OF PERFORMANCE CHARACTERISTICS OF AN ULTRAVIOLET RADIOMETER

STATEMENT OF CERTIFICATION

THE UNDERSIGNED PERSON DOES CERTIFY THAT THE INSTRUMENT DESCRIBED HAS HAD ITS PERFORMANCE EVALUATED ACCORDING TO THE PROCEDURES SET FORTH BY THE MANUFACTURER. THE PERFORMANCE CHARACTERISTICS OF THE INSTRUMENT DESCRIBED ARE SUMMARIZED AND DETAILED IN THE FOLLOWING REPORT. IN MOST CASES A MANUFACTURER'S RECOMMENDED ALIGNMENT PROCEDURE OR A SUITABLE SUBSTITUTE WILL HAVE BEEN PERFORMED PRIOR TO APPLICATION OF THE CERTIFICATION PROCEDURE. THE RADIOMETER DESCRIBED IS CALIBRATED BY ELECTRONICALLY ADJUSTING THE INSTRUMENT TO READ WITHIN 1% OF THAT OF THE TRANSFER STANDARD RADIOMETER/PHOTOMETER, UDT-100X S/N 24441 WITH SENSOR S/N 24427. THE EQUIPMENT USED IN THIS CERTIFICATION PROCEDURE IS TRACEABLE TO THE NATIONAL BUREAU OF STANDARDS.

SERVICES PROVIDED HEREIN ARE IN ACCORDANCE WITH OUR QUALITY ASSURANCE PROGRAM QAM-1987-08-01.0 APPROVED ON NO CHANGES HAVE BEEN MADE TO THE PROGRAM SINCE THAT DATE. THIS CERTIFICATION REFERENCES PO# 41954

CERTIFICATION OFFICER: Paul R. Boucher

CERTIFICATION DATE: OCTOBER 26, 1987

EXPIRATION DATE: APRIL 26, 1988

REPORT NUMBER: 873621

SwRI MAGNETIC PARTICLE WEIGHT CALIBRATION BLOCK
DOCUMENTED CERTIFICATION/WEIGHT VERIFICATION

The following magnetic particle (MP) weight calibration blocks were fabricated by SwRI per drawing B-70198 B. The 1977 Edition of Section V Article 7 Paragraph T-732-3 of the ASME Boiler and Pressure Vessel Code require alternative current electromagnetic yokes demonstrate a minimum lifting power at the maximum pole spacing of 10-pounds (4.5 kg) minimum.

The following weight blocks were fabricated to weigh 1-pound in excess of the Code requirement. This is a verification that the weights were calculated by accurately measuring the blocks (see attached dimensional sheet) and calculating the cubic inches for each block and multiplying by (.28333) weight per cubic inch for steel. This is a verification that the MP weight calibration blocks also meet the intent of the Code requirement by exceeding the 10-pounds minimum weight.

Block ID No.	Calculated Weight	Weight Stamped on Block
B-70198-10	11.325	11.3
B-70198-11 ✓	11.326	11.3
B-70198-12	11.322	11.3
B-70198-13	11.317	11.3
B-70198-14	11.326	11.3
B-70198-15	11.318	11.3
B-70198-16	11.315	11.3
B-70198-17	11.322	11.3
B-70198-18	11.318	11.3
B-70198-19	11.312	11.3
B-70198-20	11.323	11.3
B-70198-21	11.322	11.3
B-70198-22	11.327	11.3
B-70198-23 ✓	11.322	11.3
B-70198-24	11.329	11.3
B-70198-25	11.327	11.3

Prepared by: [signature] 3/17/81
Robert L. Edwards
Research Engineer

Reviewed by: [signature]
Robert E. Engelhardt 3/17/81
Manager of Quality Assurance

ATTACHMENT

Dimensional Results - Drawing B-70198 B (JR #12266)

ID No.	Thickness	Width	Length
B-70198-10	1.2475	3.9960	8.019
B-70198-11	1.2473	3.9965	8.019
B-70198-12	1.2468	3.9968	8.019
B-70198-13	1.2465	3.9961	8.019
B-70198-14	1.2475	3.9961	8.019
B-70198-15	1.2465	3.9962	8.019
B-70198-16	1.2462	3.9962	8.019
B-70198-17	1.2471	3.9960	8.019
B-70198-18	1.2465	3.9962	8.019
B-70198-19	1.2475	3.9985	8.004
B-70198-20	1.2470	3.9966	8.019
B-70198-21	1.2468	3.9969	8.019
B-70198-22	1.2475	3.9963	8.019
B-70198-23	1.2470	3.9962	8.019
B-70198-24	1.2478	3.9960	8.019
B-70198-25	1.2476	3.9961	8.019

NOTE: Dimensions are in inches

SOUTHWEST RESEARCH INSTITUTE

INSPECTION AND TEST RESULTS

DRAWING NUMBER:	JOB REQUEST NO.	DATE:	PART NUMBER / PART NAME
B-70198B	12266	3-17-81	SEE ATTACHED LIST

TYPE OF INSPECTION OR TEST PERFORMED:

DIMENSIONAL

INSPECTION / TEST RESULTS: (ATTACH DATA SHEETS AS NECESSARY)

NUMBER OF ARTICLES INSPECTED OR TESTED	NUMBER OF CONFORMING ARTICLES	NUMBER OF ARTICLES REJECTED
16	16	0

NATURE OF DEFECTS OBSERVED:

NONE

BASIC CAUSES FOR ARTICLE REJECTION:

INSPECTION PERFORMED BY: B QA (SIGNATURE) 3-17-81 (DATE)

SOUTHWEST RESEARCH INSTITUTE

POST OFFICE DRAWER 28510 • 6220 CULEBRA ROAD • SAN ANTONIO, TEXAS, USA 78284 • 512 684-5[illegible] • TELEX 76 [illegible]

QUALITY ASSURANCE SYSTEMS
AND ENGINEERING DIVISION

[illegible]

August 31, 1984

MT WEIGHT CERTIFICATE

This is to verify that the weight stamped on the MT calibration block(s) is the weight of the block before the handle was added. Therfore, the total weight of the block is greater than the weight stamped on it which is greater than ten pounds.

Bruce Mabrito, Manager
Quality Assurance

SAN ANTONIO, TEXAS
[illegible]

SOUTHWEST RESEARCH INSTITUTE

CERTIFICATION OF CALIBRATION OF ELECTROMAGNETIC PARTICLE PROBES

THIS IS TO VERIFY THAT THE ELECTROMAGNETIC PARTICLE PROBES LISTED BELOW HAVE BEEN CALIBRATED IN ACCORDANCE WITH SOUTHWEST RESEARCH INSTITUTE NUCLEAR PROJECTS OPERATING PROCEDURE XII-PE-114-0.

MODEL AND SERIAL NUMBER	DATE	CALIBRATED BY
Whitehouse Mag Particle Yoke WL-1-10	17 Dec 87	[signature]

SWRI FORM PM-Z4-0

SOUTHWEST RESEARCH INSTITUTE

CERTIFICATION OF CALIBRATION OF ELECTROMAGNETIC PARTICLE PROBES

THIS IS TO VERIFY THAT THE ELECTROMAGNETIC PARTICLE PROBES LISTED BELOW HAVE BEEN CALIBRATED IN ACCORDANCE WITH SOUTHWEST RESEARCH INSTITUTE NUCLEAR PROJECTS OPERATING PROCEDURE XII-PE-114-0.

MODEL AND SERIAL NUMBER	DATE	CALIBRATED BY
Whitehall M46 Particle Yoke WK-1-11	17 Dec 87	[signature]

SWRI FORM PM-24-0

SOUTHWEST RESEARCH INSTITUTE

CERTIFICATION OF CALIBRATION OF ELECTROMAGNETIC PARTICLE PROBES

THIS IS TO VERIFY THAT THE ELECTROMAGNETIC PARTICLE PROBES LISTED BELOW HAVE BEEN CALIBRATED IN ACCORDANCE WITH SOUTHWEST RESEARCH INSTITUTE NUCLEAR PROJECTS OPERATING PROCEDURE VII-EG-114-0.

MODEL AND SERIAL NUMBER	DATE	CALIBRATED BY
Whitelite Mag Particle Yoke WL-1-12	20 Jul 87	[signature]

SWRI FORM PM-24-0

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SONIC FTS MARK I FLAW DETECTOR CALIBRATION

I OPERATIONAL CHECKLIST FOR SONIC FTS MK I No. 0111E

REFERENCE PROCEDURE XII-FF-104-01 CH 1, ALIGNMENT OF SONIC FTS MARK I FLAW DETECTOR

1. CURRENT DRAIN 427 MA.
2. AMPLITUDE LINEARITY 1 % FSH
3. CALIBRATION OF GAIN (COARSE) OK
4. CALIBRATION OF GAIN DB (FINE) OK
5. HORIZONTAL LINEARITY 1 % FSW
6. CHECKS OF POTS AND SWITCHES:

FREQUENCY MHZ	OK	REJECT	OK
RANGE	OK	DELAY POT.	OK
FILTER	OK	MATL. CAL.	OK
REP. RATE	OK	DELAY SW.	OK
VIDEO SW.	OK	THRU TRANS-NORM.	OK
DAMPING	OK	DEC.	N/A
6 DB SWITCH	OK	14 DB SWITCH	OK

7. LOW BATTERY LIGHT ADJUSTMENT:
(JUST ON AT 10.75 VOLTS) OK

II CERTIFICATION:

ALIGNMENT PERFORMED BY: [signature]
(SIGNATURE)

2 FEBRUARY 1978
(DATE)

SRI FORM FM-11-2

INSTRUMENT VERIFICATION RECORD

INSTRUMENT	SERIAL NO.	DATE
SONIC FIS MARK I	Ø1111E	2 FEB 88

AMPLITUDE LINEARITY

LARGER ECHO	SMALLER ECHO NOMINAL	ACTUAL
100 %	50 %	50 % FSH
90 %	45 %	45%
80 %	40 %	40%
70 %	35 %	35%
60 %	30 %	30%
50 %	25 %	25%
40 %	20 %	20%
30 %	15 %	15%
20 %	10 %	10%

6DB & 14DB SWITCH LINEARITY

100 %	- 6DB	40 %
100 %	- 14DB	20 %
40 %	+ 6DB	85 %
10 %	+ 14DB	85 %

TEST BY: Thomas J. Kay
(SIGNATURE)

CONTROL LINEARITY

80 %	- 6 DB	40 %
80 %	- 12 DB	20 %
40 %	+ 6 DB	85 %
20 %	+ 12 DB	85 %

DISTANCE LINEARITY

ACTUAL THICKNESS	ULTRASONIC MEASURED
10"	10"
9"	9"
8"	8"
7"	7"
6"	6"
5"	5"
4"	4"
3"	3"
2"	2"
1"	1"

SONIC FTS MARK I FLAW DETECTOR CALIBRATION

I OPERATIONAL CHECKLIST FOR SONIC FTS MK I No. C 1013 E

REFERENCE PROCEDURE XU-FE-101-Da:1 ALIGNMENT OF SONIC FTS MARK I FLAW DETECTOR

1. CURRENT DRAIN 235 MA.
2. AMPLITUDE LINEARITY 1 % FSH
3. CALIBRATION OF GAIN (COARSE) O.K.
4. CALIBRATION OF GAIN DB. (FINE) O.K.
5. HORIZONTAL LINEARITY 1 % FSW
6. CHECKS OF POTS AND SWITCHES:

FREQUENCY MHZ	O.K.	REJECT	O.K.
RANGE	O.K.	DELAY POT.	O.K.
FILTER	O.K.	MATL. CAL.	O.K.
REP. RATE	O.K.	DELAY SW.	O.K.
VIDEO SW.	O.K.	THRU TRANS-NORM.	O.K.
DAMPING	O.K.	DEC.	10/20
6 DB SWITCH	O.K.	14 DB SWITCH	O.K.

7. LOW BATTERY LIGHT ADJUSTMENT:

(JUST ON AT 10.75 VOLTS) O.K.

II CERTIFICATION:

ALIGNMENT PERFORMED BY: [signature]
(SIGNATURE)

4 SEPT 87
(DATE)

SRI FORM PM-11-2

INSTRUMENT VERIFICATION RECORD

INSTRUMENT	SERIAL NO.	DATE
SONIC ETS MK I	01110E	SEPT 87

AMPLITUDE LINEARITY

LARGER ECHO	SMALLER ECHO NOMINAL	ACTUAL
100 %	50 %	50 % FSH
90 %	45 %	45 %
80 %	40 %	40 %
70 %	35 %	35 %
60 %	30 %	30 %
50 %	25 %	25 %
40 %	20 %	20 %
30 %	15 %	15 %
20 %	10 %	10 %

6DB & 14DB SWITCH LINEARITY

100 %	- 6DB	51 %
100 %	- 14DB	13 %
40 %	+ 6DB	39 %
10 %	+ 14DB	51 %

TEST BY: _____
(SIGNATURE)

CONTROL LINEARITY

80 %	- 6 DB	42 %
80 %	- 12 DB	20 %
40 %	+ 6 DB	77 %
20 %	+ 12 DB	80 %

DISTANCE LINEARITY

ACTUAL THICKNESS	ULTRASONIC MEASURED
10"	10"
9"	9"
8"	8"
7"	7"
6"	6"
5"	5"
4"	4"
3"	3"
2"	2"
1"	1"

SWRI FORM PM-8-1

SONIC FTS MARK I FLAW DETECTOR CALIBRATION

I OPERATIONAL CHECKLIST FOR SONIC FTS MK I No. 01121E

REFERENCE PROCEDURE XII-EE-1[illegible] ALIGNMENT OF SONIC FTS MARK I FLAW DETECTOR

1. CURRENT DRAIN 733 MA.
2. AMPLITUDE LINEARITY 1 % FSH
3. CALIBRATION OF GAIN (COARSE) OK
4. CALIBRATION OF GAIN DB (FINE) OK
5. HORIZONTAL LINEARITY 1 % FSW
6. CHECKS OF POTS AND SWITCHES:

FREQUENCY MHZ	OK	REJECT	OK
RANGE	OK	DELAY POT.	OK
FILTER	OK	MATL. CAL.	OK
REP. RATE	OK	DELAY SW.	OK
VIDEO SW.	OK	THRU TRANS-NORM.	OK
DAMPING	OK	DEC.	N/A
6 DB SWITCH	OK	14 DB SWITCH	OK

7. LOW BATTERY LIGHT ADJUSTMENT:

(JUST ON AT 10.75 VOLTS) OK

II CERTIFICATION:

ALIGNMENT PERFORMED BY: Ralph C. Robb
(SIGNATURE)

21 DEC 67
(DATE)

SRI FORM PM-11-2

INSTRUMENT VERIFICATION RECORD

INSTRUMENT	SERIAL NO.	DATE
SONIC MK I	01121E	21 DEC 87

AMPLITUDE LINEARITY

LARGER ECHO	SMALLER ECHO NOMINAL	ACTUAL
100 %	50 %	50 % FSH
90 %	45 %	45
80 %	40 %	40
70 %	35 %	35
60 %	30 %	30
50 %	25 %	25
40 %	20 %	20
30 %	15 %	15
20 %	10 %	10

6DB & 14DB SWITCH LINEARITY

100 %	- 6DB	48 %
100 %	- 14DB	14 %
40 %	+ 6DB	82 %
10 %	+ 14DB	46 %

TEST BY: [signature]
(SIGNATURE)

CONTROL LINEARITY

80 %	- 6 DB	40 %
80 %	- 12 DB	20 %
40 %	+ 6 DB	60 %
20 %	+ 12 DB	80 %

DISTANCE LINEARITY

ACTUAL THICKNESS	ULTRASONIC MEASURED
10"	10
9"	9
8"	8
7"	7
6"	6
5"	5
4"	4
3"	3
2"	2
1"	1

SWRI FORM PM-8-1

SONIC FTS MARK I FLAW DETECTOR CALIBRATION

I OPERATIONAL CHECKLIST FOR SONIC FTS MK I No. 77422 C

REFERENCE PROCEDURE L-FE 101-10-1, ALIGNMENT OF SONIC FTS MARK I FLAW DETECTOR

1. CURRENT DRAIN 452 MA.
2. AMPLITUDE LINEARITY 1 % FSH
3. CALIBRATION OF GAIN (COARSE) O.K.
4. CALIBRATION OF GAIN DB (FINE) O.K.
5. HORIZONTAL LINEARITY 1 % FSW
6. CHECKS OF POTS AND SWITCHES:

FREQUENCY MHZ	O.K.	REJECT	O.K.
RANGE	O.K.	DELAY POT.	O.K.
FILTER	O.K.	MATL. CAL.	O.K.
REP. RATE	O.K.	DELAY SW.	O.K.
VIDEO SW.	O.K.	THRU TRANS-NORM.	O.K.
DAMPING	O.K.	DEC.	O.K.
6 DB SWITCH	O.K.	14 DB SWITCH	O.K.

7. LOW BATTERY LIGHT ADJUSTMENT:

(JUST ON AT 10.75 VOLTS) O.K.

II CERTIFICATION:

ALIGNMENT PERFORMED BY: [signature]
(SIGNATURE)

19 Dec 67
(DATE)

SRI FORM FM-11-2

INSTRUMENT VERIFICATION RECORD

INSTRUMENT	SERIAL NO.	DATE
Sonic FT-DIR I	77422	19 NOV 87

AMPLITUDE LINEARITY

LARGER ECHO	SMALLER ECHO NOMINAL	ACTUAL
100 %	50 %	50 % FSH
90 %	45 %	45 %
80 %	40 %	40 %
70 %	35 %	35 %
60 %	30 %	30 %
50 %	25 %	25 %
40 %	20 %	20 %
30 %	15 %	15 %
20 %	10 %	10 %

6DB & 14DB SWITCH LINEARITY

100 %	- 6DB	48 %
100 %	- 14DB	17 %
40 %	+ 6DB	80 %
10 %	+ 14DB	56 %

TEST BY: _____ (SIGNATURE)

CONTROL LINEARITY

80 %	- 6 DB	38 %
80 %	- 12 DB	20 %
40 %	+ 6 DB	83 %
20 %	+ 12 DB	80 %

DISTANCE LINEARITY

ACTUAL THICKNESS	ULTRASONIC MEASURED
10"	10"
9"	9"
8"	8"
7"	7"
6"	6"
5"	5"
4"	4
3"	3
2"	3
1"	1

SWRI FORM PM-8-1

NO D/A PLOT REQUIRED — TRANSDUCERS TO BE MOUNTED ON EDGE AND/OR USED AS ANGLE BEAM

FREQUENCY SPECTRUM AND R.F. WAVEFORM ANALYSIS

CERT. DATE 13 Jan 88 | OPERATOR S. Nicholson

NEXT CERT. DATE ~~13 Jan 88~~ SN

* SN 13 July 88

SEARCH UNIT

MANUFACTURER AeroTech | SERIAL NO. C01475

CASE STYLE Rd. | TEST ANGLE 0°

CRYSTAL SIZE 1/4" Dual | FREQUENCY 2.25 MHz

ULTRASONIC TRANSDUCER ANALYZER SETTINGS

ATTENUATION 0 | GATE WIDTH 480 | GAIN TRIM 026

DAMPING 555 | MODE Thru | EXT. PULSER DOWN

GATE DELAY 364 | REP. RATE 115 | EXT. TRIGGER DOWN

SPECTRUM ANALYZER — R.F. SECTION

INPUT ATTENUATION 20 | SCAN WIDTH 1 MHz

CENTER FREQUENCY 5.0 MHz | TUNING STABILIZER OFF

BAND WIDTH 30 KHz | RANGE 0–11

SPECTRUM ANALYZER — I.F. SECTION

LOG REF. LEVEL 1 MV/DIV | DISPLAY ADJUST 0

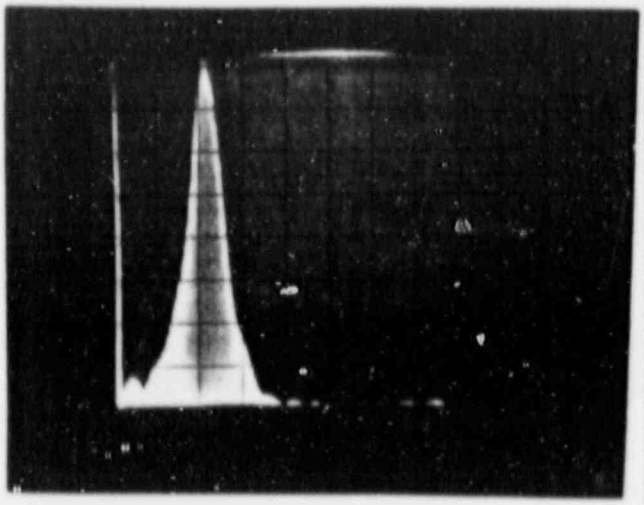
VIDEO FILTER OFF | TRIGGER AUTOMATIC

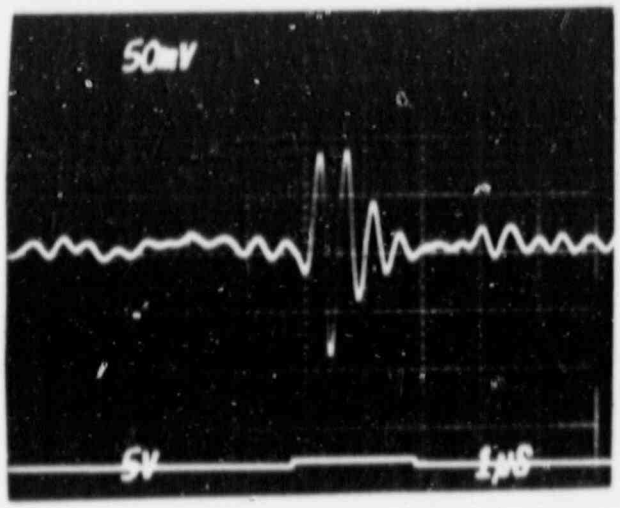
SCAN TIME/DIV. 2 MILLI SEC

TARGET REFLECTOR	SwRI SPEC	PHOTOGRAPH DATA
☐ 3/32 INCH, 1/3 T HOLE IN PT 300 BLOCK	MINIMUM 1.8 MHz	MHz/DIV 1
☐ 3/16 INCH, 3/4T HOLE IN E.E.I. BLOCK	MAXIMUM 2.7 MHz	USEC/CM 1
☐ PLASTIC BALL BLOCK S.D.H.	MEASURED FREQUENCY 2.1 MHz	VOLTS/CM 50 MV
☑ OTHER 1" section on PT 300 block		

REVIEWED AND ACCEPTED

SIGNATURE Hefen Kwan DATE Jan 13, 1988





SwRI FORM RD-2-5 CERTIFICATION PERFORMED IN ACCORDANCE WITH XII-RD-101

NO D/A PLOT REQUIRED ON TRANSDUCERS TO BE MOUNTED ON A WEDGE AND/OR USED AS ANGLE BEAM.

FREQUENCY SPECTRUM AND R.F. WAVEFORM ANALYSIS

CERT. DATE 15 Jan. 88
NEXT CERT. DATE ~~15 Jun 88~~ * SN 15 July 88
OPERATOR S. Nicholson

SEARCH UNIT

MANUFACTURER Aerotech
SERIAL NO. JD1760
CASE STYLE Rd.
TEST ANGLE 0°
CRYSTAL SIZE .250" Dual
FREQUENCY 2.25 MHz

ULTRASONIC TRANSDUCER ANALYZER SETTINGS

ATTENUATION 0
GATE WIDTH 453
GAIN TRIM 026
DAMPING 555
MODE thru
EXT. PULSER DOWN
GATE DELAY 357
REP. RATE 115
EXT. TRIGGER DOWN

SPECTRUM ANALYZER – R.F. SECTION

INPUT ATTENUATION 10
SCAN WIDTH 1 MHz
CENTER FREQUENCY 5.0 MHz
TUNING STABILIZER OFF
BAND WIDTH 30 KHz
RANGE 0–11

SPECTRUM ANALYZER – I.F. SECTION

LOG REF. LEVEL .2 MV/DIV
DISPLAY ADJUST 0
VIDEO FILTER OFF
TRIGGER AUTOMATIC
SCAN TIME/DIV. 2 MILLI SEC

TARGET REFLECTOR

- ☐ 3/32 INCH, 1/3 T HOLE IN PT 300 BLOCK
- ☐ 3/16 INCH, 3/4T HOLE IN E.E.I. BLOCK
- ☐ PLASTIC BALL BLOCK S.D.H.
- ☑ OTHER 1" section on P.T. 300 block

SwRI SPEC

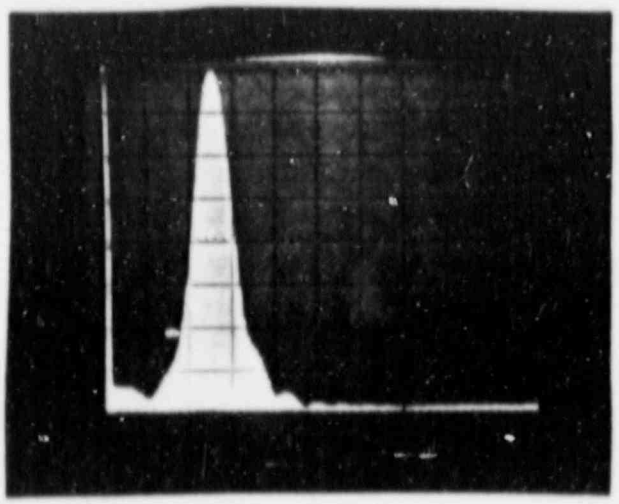
MINIMUM 1.8 MHz
MAXIMUM 2.7 MHz
MEASURED FREQUENCY 2.5 MHz

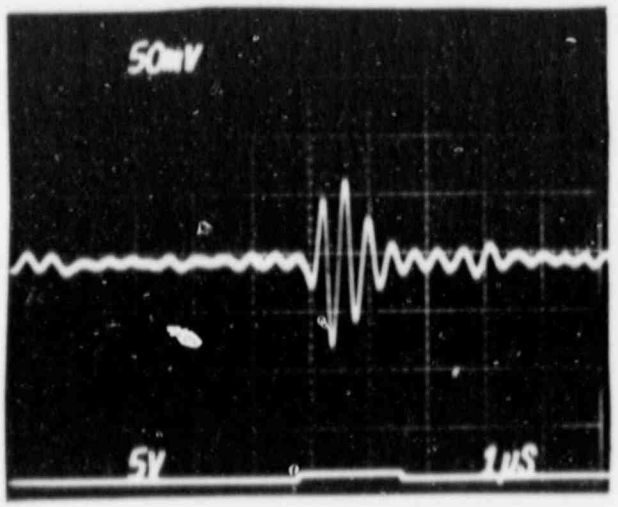
PHOTOGRAPH DATA

MHz/DIV 1
USEC/CM 1
VOLTS/CM 50 MV

REVIEWED AND ACCEPTED

SIGNATURE Hyeon Kwon DATE Jan 15, 1988





SwRI FORM RD-2-5 CERTIFICATION PERFORMED IN ACCORDANCE WITH XII-RD-101

S.W.R.I. ULTRASONIC TRANSDUCER ANALYSIS REPORT

CERT DATE: SEPT 14, 1987 NEXT CERT DATE: MAR 14, 1988
NAME OF OPERATOR : S. NICHOLSON

TRANSDUCER INFORMATION

MANUFACTURE: AEROTECH SERIAL NO: 013718
CASE STYLE: RECT TEST ANGLE = : 0
CRYSTAL SIZE: .50 X 1.0 FREQUENCY = : 2.25

WAVEFORM AND POWER SPECTRUM INST.

TYPE: AEROTECH MODEL: UTA-2 SERIAL #:1214
TYPE: HP WAVEFORM RECORDER MODEL: 5180A SERIAL #:2318A00667

UTA SETTING

ATTENUATION = :20 MODE = :NORM REP. RATE = :015
EXT. & INT. PULSER : = Switch to INT PULSER
EXT. & INT. PULSER : = Switch to INT TRIGGER

TARGET REFLECTOR INFORMATION

PLASTIC BALL BLOCK S. D. A.

FREQUENCY AND SPECTRUM ANALYSIS

ACCEPTABLE MINIMUM = : 1.8 Mhz
MEASURED FREQUENCY = : 2.19 Mhz
ACCEPTABLE MAXIMUM = : 2.7 Mhz

ULTRASONIC INST. -- DAC CURVE

TYPE :SONIC MODEL :MARK I SERIAL No. :01109E
Db SETTING :63

REVIEWED & ACCEPTED

Hagop Kuzu
SIGNATURE

Sept 14, 1987
DATE

CERTIFICATION PERFORMED IN ACCORDANCE WITH XII-RD-106-0

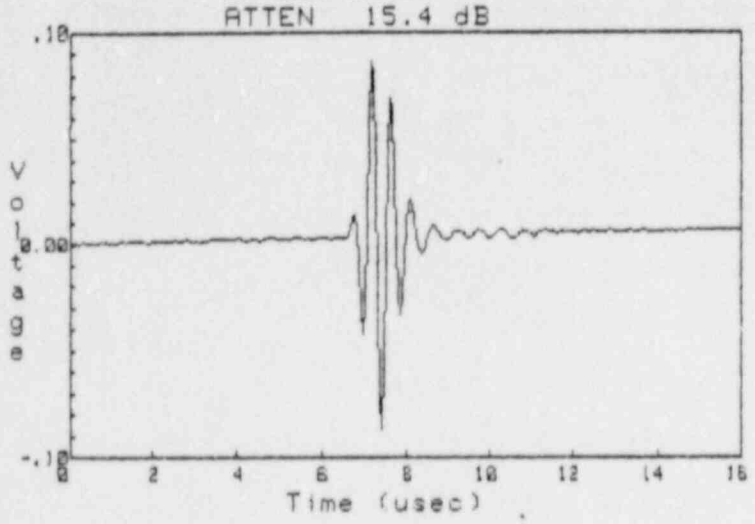
S.W.R.I. ULTRASONIC TRANSDUCER ANALYSIS REPORT

MANUFACTURE: AEROTECH SERIAL No: 013718

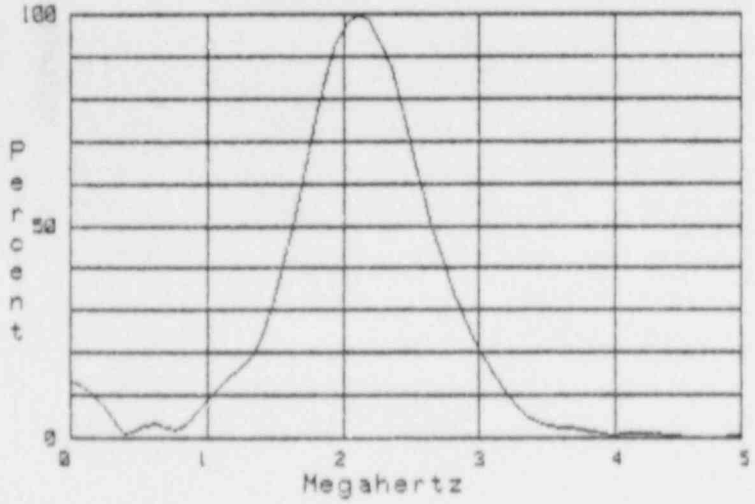
CERTIFICATION DATE: SEPT 14, 1987

ANALOG SCAN

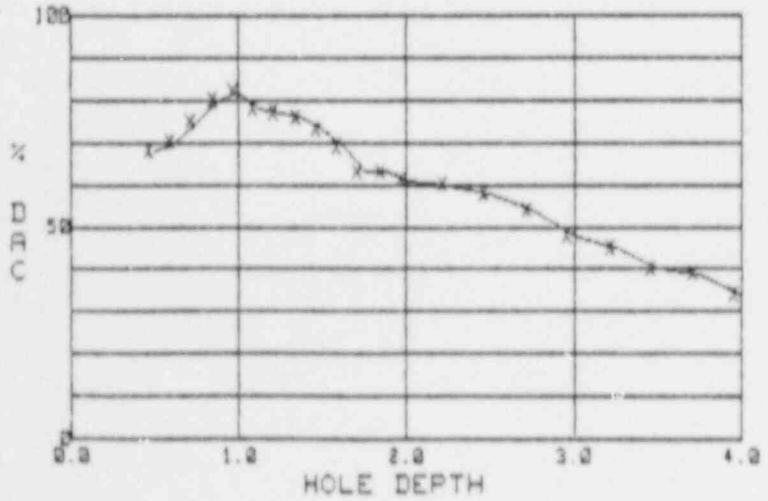
ATTEN 15.4 dB



POWER SPECTRUM



DAC CURVE



S.W.R.I. ULTRASONIC TRANSDUCER ANALYSIS REPORT

CERT DATE: OCT 27, 1987 NEXT CERT DATE: APR 27, 1988 Page 1 of 2
NAME OF OPERATOR : S. NICHOLSON

TRANSDUCER INFORMATION

MANUFACTURE: SWRI
CASE STYLE: RECT
CRYSTAL SIZE: .50
SERIAL NO: 685M
TEST ANGLE = : 0
FREQUENCY = : 2.25

WAVEFORM AND POWER SPECTRUM INST.

TYPE: AEROTECH MODEL: UTA-2 SERIAL #:1214
TYPE: HP WAVEFORM RECORDER MODEL: 5180A SERIAL #:2318A00667

UTA SETTING

ATTENUATION = :10 MODE = :NORM REP. RATE = :015
EXT. & INT. PULSER : = Switch to INT PULSER
EXT. & INT. PULSER : = Switch to INT TRIGGER

TARGET REFLECTOR INFORMATION

PLASTIC BALL BLOCK S. D. H.

FREQUENCY AND SPECTRUM ANALYSIS

ACCEPTABLE MINIMUM = : 1.8 Mhz
MEASURED FREQUENCY = : 2.03 Mhz
ACCEPTABLE MAXIMUM = : 2.7 Mhz

ULTRASONIC INST. -- DAC CURVE

TYPE :SONIC MODEL :MARK I SERIAL No. :01109E
Db SETTING :
NOT APPLICABLE SN

REVIEWED & ACCEPTED

Hejson Kwan
SIGNATURE

Oct 27, 1987
DATE

NO D/A PLOT REQUIRED ON TRANSDUCERS
TO BE MOUNTED ON A WEDGE AND/OR USED
AS ANGLE BEAM.

CERTIFICATION PERFORMED IN ACCORDANCE WITH XII-RD-106-0

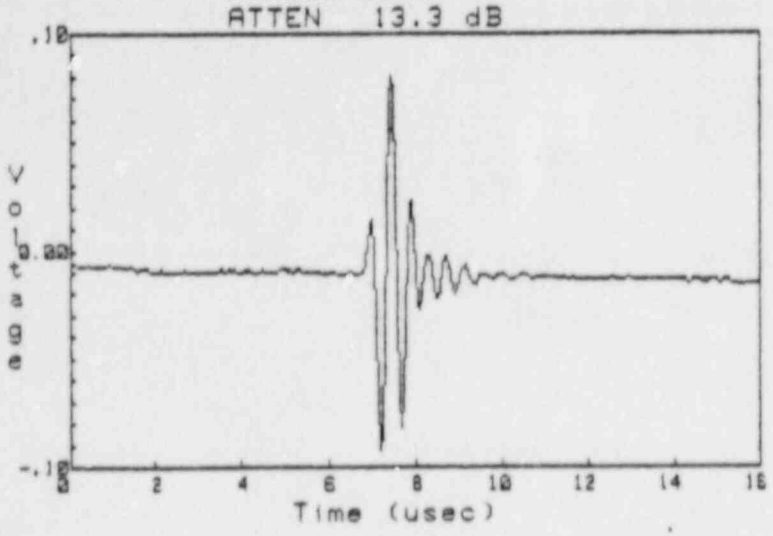
S.W.R.I. ULTRASONIC TRANSDUCER ANALYSIS REPORT

MANUFACTURE: SWRI SERIAL No: 685M

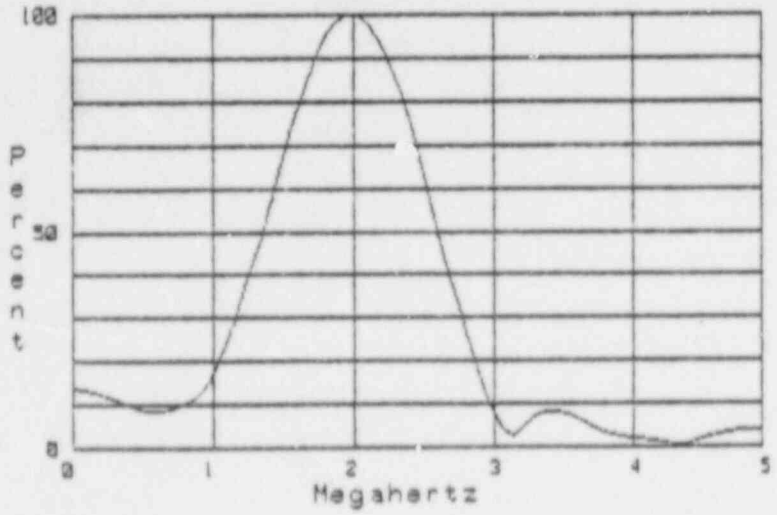
CERTIFICATION DATE: OCT 27, 1987

ANALOG SCAN

ATTEN 13.3 dB



POWER SPECTRUM



S.W.R.I. ULTRASONIC TRANSDUCER ANALYSIS REPORT

CERT DATE: JAN 22, 1988 NEXT CERT DATE: JUL 22, 1988
NAME OF OPERATOR : S. NICHOLSON

TRANSDUCER INFORMATION

MANUFACTURE: SWRI SERIAL NO: 1795
CASE STYLE: RECT TEST ANGLE = : 0
CRYSTAL SIZE: .375 FREQUENCY = : 2.25

WAVEFORM AND POWER SPECTRUM INST.

TYPE: AEROTECH MODEL: UTA-2 SERIAL #:1214
TYPE: HP WAVEFORM RECORDER MODEL: 5180A SERIAL #:2318A00667

UTA SETTING

ATTENUATION = :10 MODE = :NORM REP. RATE = :015
EXT. & INT. PULSER : = Switch to INT PULSER
EXT. & INT. PULSER : = Switch to INT TRIGGER

TARGET REFLECTOR INFORMATION

PLASTIC BALL BLOCK S. D. H.

FREQUENCY AND SPECTRUM ANALYSIS

ACCEPTABLE MINIMUM =	MEASURED FREQUENCY =	ACCEPTABLE MAXIMUM =
: 1.8 Mhz	: 2.34 Mhz	: 2.7 Mhz

ULTRASONIC INST. -- DAC CURVE

TYPE :SONIC MODEL :MARK I SERIAL No. :01109E
Db SETTING :
NOT APPLICABLE SN

REVIEWED & ACCEPTED

Hazen Kunn — SIGNATURE
Jan 22, 1988 — DATE

NO D/A PLOT REQUIRED ON TRANSDUCERS
TO BE MOUNTED ON A WEDGE AND/OR USED
AS ANGLE BEAM.
CERTIFICATION PERFORMED IN ACCORDANCE WITH XII-RD-106-0

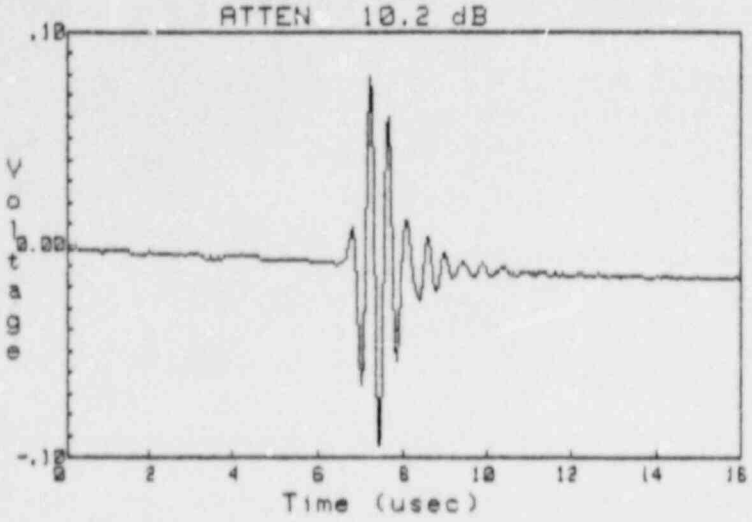
S.W.R.I. ULTRASONIC TRANSDUCER ANALYSIS REPORT

MANUFACTURE: SWRI SERIAL No: 1795

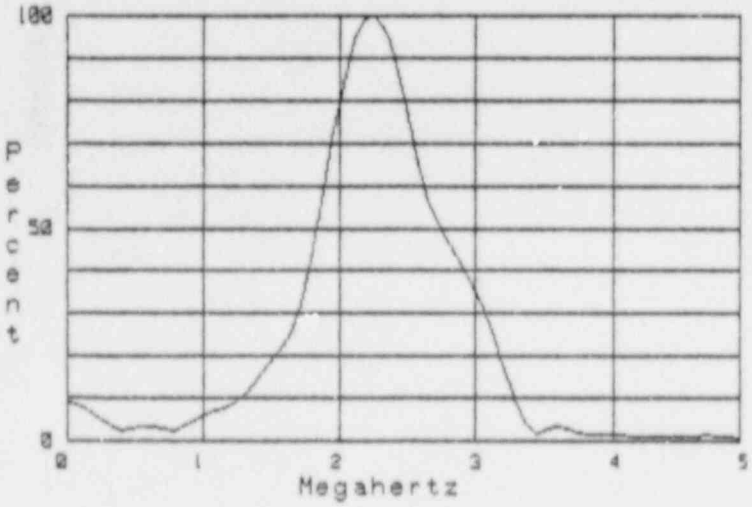
CERTIFICATION DATE: JAN 22, 1988

ANALOG SCAN

ATTEN 10.2 dB



POWER SPECTRUM



S.W.R.I. ULTRASONIC TRANSDUCER ANALYSIS REPORT

CERT DATE: JUN 15, 1987 NEXT CERT DATE: DEC 15, 1987 Page 1 of 2
NAME OF OPERATOR : S. NICHOLSON

TRANSDUCER INFORMATION

MANUFACTURE: SWRI
CASE STYLE: RECT
CRYSTAL SIZE: .375
SERIAL NO: 1800
TEST ANGLE = : 0
FREQUENCY = : 2.25

WAVEFORM AND POWER SPECTRUM INST.

TYPE: AEROTECH MODEL: UTA-2 SERIAL #:1214
TYPE: HP WAVEFORM RECORDER MODEL: 5180A SERIAL #:2318A00887

UTA SETTING

ATTENUATION = :6 MODE = :NORM REP. RATE = :015
EXT. & INT. PULSER : = Switch to INT PULSER
EXT. & INT. PULSER : = Switch to INT TRIGGER

TARGET REFLECTOR INFORMATION

PLASTIC BALL BLOCK S. D. H.

FREQUENCY AND SPECTRUM ANALYSIS

ACCEPTABLE MINIMUM = : 1.8 Mhz
MEASURED FREQUENCY = : 2.50 Mhz
ACCEPTABLE MAXIMUM = : 2.7 Mhz

ULTRASONIC INST. -- DAC CURVE

TYPE :SONIC MODEL :MARK I SERIAL No. :01109E
Db SETTING :81

REVIEWED & ACCEPTED

Harpon Kumar
SIGNATURE

June 15, 1987
DATE

CERTIFICATION PERFORMED IN ACCORDANCE WITH XII-RD-106-0

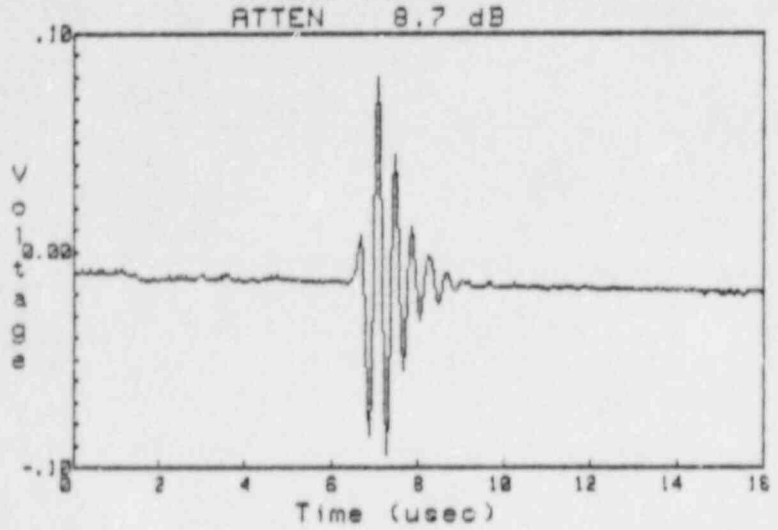
S.W.R.I. ULTRASONIC TRANSDUCER ANALYSIS REPORT

MANUFACTURE: SWRI SERIAL No: 1800

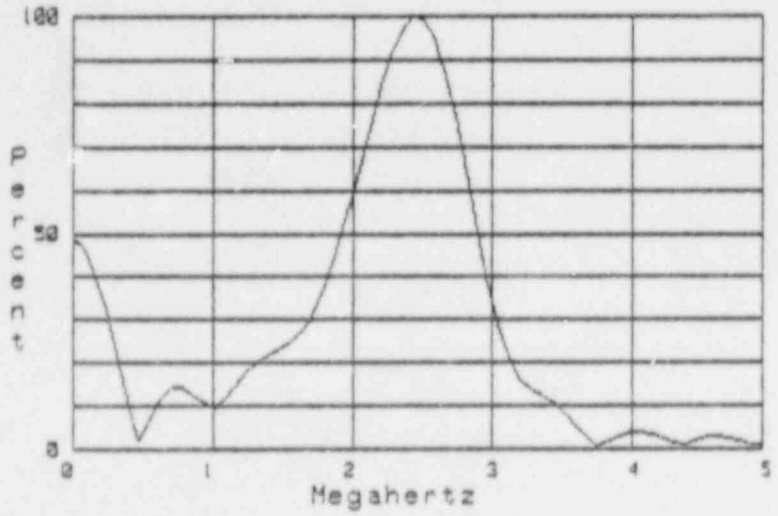
CERTIFICATION DATE: JUN 15, 1987

ANALOG SCAN

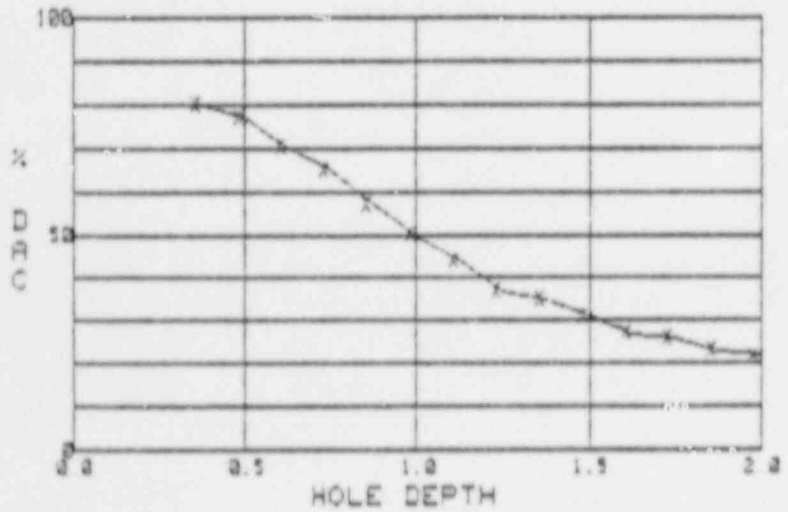
ATTEN 8.7 dB



POWER SPECTRUM



DAC CURVE



S.W.R.I. ULTRASONIC TRANSDUCER ANALYSIS REPORT

CERT DATE: SEPT 23, 1987 NEXT CERT DATE: MAR 23, 1988

NAME OF OPERATOR : S. NICHOLSON

TRANSDUCER INFORMATION

MANUFACTURE: SWRI
CASE STYLE: RD
CRYSTAL SIZE: .25 DL
SERIAL NO: 2158
TEST ANGLE = : 0
FREQUENCY = : 2.25

WAVEFORM AND POWER SPECTRUM INST.

TYPE: AEROTECH MODEL: UTA-2 SERIAL #:1214
TYPE: HP WAVEFORM RECORDER MODEL: 5180A SERIAL #:2318A00667

UTA SETTING

ATTENUATION = :3 MODE = :THRU REP. RATE = :015
EXT. & INT. PULSER : = Switch to INT PULSER
EXT. & INT. PULSER : = Switch to INT TRIGGER

TARGET REFLECTOR INFORMATION

OTHER = :1 INCH SECTION ON PT 300 BLOCK

FREQUENCY AND SPECTRUM ANALYSIS

ACCEPTABLE MINIMUM = : 1.8 Mhz
MEASURED FREQUENCY = : 2.66 Mhz
ACCEPTABLE MAXIMUM = : 2.7 Mhz

ULTRASONIC INST. -- DAC CURVE

TYPE :SONIC MODEL :MARK I SERIAL No. :01109E
Db SETTING :
Not Applicable BN

REVIEWED & ACCEPTED

No D/A plot Required on transducers to be mounted on a wedge and/or used as angle beam. BN

Mark A. Sheffield
SIGNATURE

Sept 23, 1987
DATE

CERTIFICATION PERFORMED IN ACCORDANCE WITH XII-RD-106-0

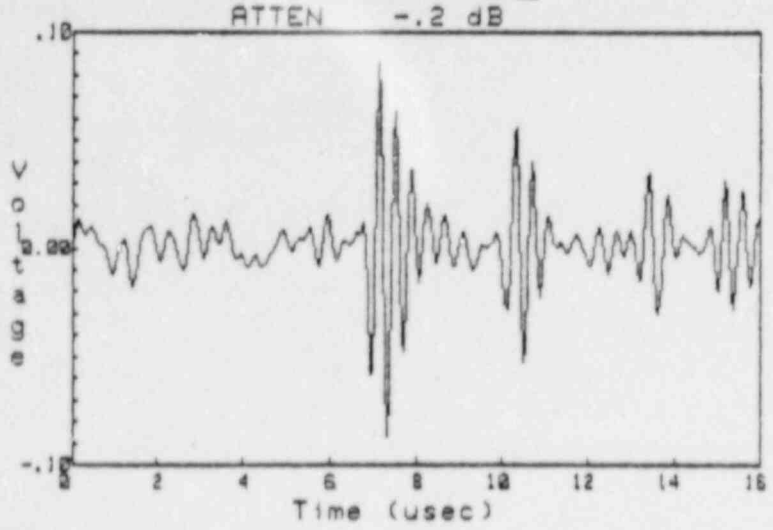
S.W.R.I. ULTRASONIC TRANSDUCER ANALYSIS REPORT

MANUFACTURE: SWRI SERIAL No: 2158

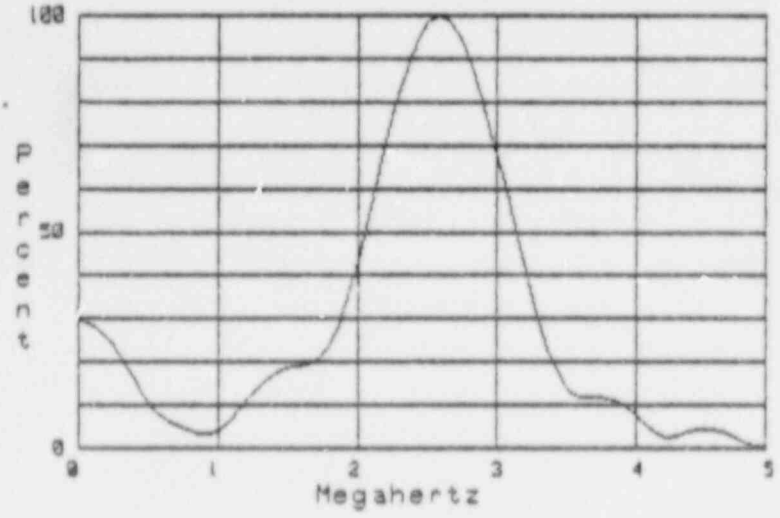
CERTIFICATION DATE: SEPT 23, 1987

ANALOG SCAN

ATTEN -.2 dB



POWER SPECTRUM



S.W.R.I. ULTRASONIC TRANSDUCER ANALYSIS REPORT

CERT DATE: NOV 24, 1987 NEXT CERT DATE: MAY 24, 1988
NAME OF OPERATOR : S. NICHOLSON

TRANSDUCER INFORMATION

MANUFACTURE: SWRI
CASE STYLE: RECT
CRYSTAL SIZE: .375
SERIAL NO: 2680
TEST ANGLE = : 0
FREQUENCY = : 1.5

WAVEFORM AND POWER SPECTRUM INST.

TYPE: AEROTECH MODEL: UTA-2 SERIAL #:1214
TYPE: HP WAVEFORM RECORDER MODEL: 5180A SERIAL #:2318A00667

UTA SETTING

ATTENUATION = :3 [illegible] = :NORM REP. RATE = :015
EXT. & INT. TRIGGER : = Switch to INT PULSER
EXT. & INT. PULSER : = Switch to INT TRIGGER

TARGET REFLECTOR INFORMATION

PLASTIC BALL BLOCK S. D. H.

FREQUENCY AND SPECTRUM ANALYSIS

ACCEPTABLE MINIMUM =	MEASURED FREQUENCY =	ACCEPTABLE MAXIMUM =
: 1.2 Mhz	: 1.41 Mhz	: 1.8 Mhz

ULTRASONIC INST. -- DAC CURVE

TYPE :SONIC MODEL :MARK I SERIAL No. :01105E
Db SETTING :
NOT APPLICABLE SN

REVIEWED & ACCEPTED

Hegion Kinnan — SIGNATURE
Nov. 24, 1987 — DATE

NO D/A PLOT REQUIRED ON TRANSDUCERS TO BE MOUNTED ON A WEDGE AND/OR USED AS ANGLE BEAM.

CERTIFICATION PERFORMED IN ACCORDANCE WITH XII-XD-10E-0

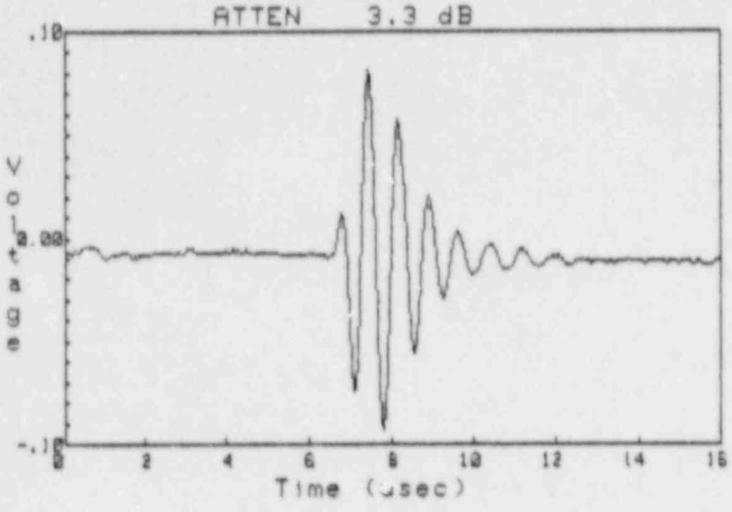
S.W.R.I. ULTRASONIC TRANSDUCER ANALYSIS REPORT

MANUFACTURE: SWRI SERIAL No: 2680

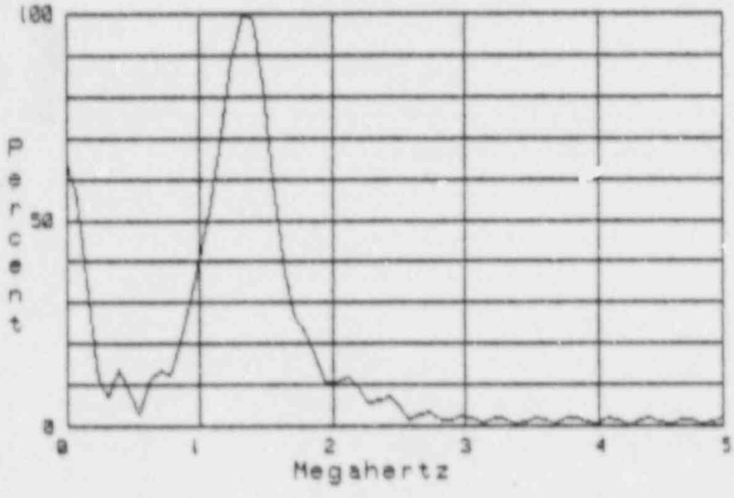
CERTIFICATION DATE: NOV 24, 1987

ANALOG SCAN

ATTEN 3.3 dB



POWER SPECTRUM



NO D/A PLOT REQUIRED ON TRANSDUCERS
TO BE MOUNTED ON A WEDGE AND/OR USED
AS ANGLE BEAM

FREQUENCY SPECTRUM AND R.F. WAVEFORM ANALYSIS

CERT. DATE 7 JAN 88
NEXT CERT. DATE ~~7 JAN 88~~ *SW

OPERATOR S. Nicholson

*SW 7 July 88

SEARCH UNIT

MANUFACTURER SwRI
SERIAL NO. 2831
CASE STYLE RECT.
TEST ANGLE 45°
CRYSTAL SIZE .3 x .5 DUAL
FREQUENCY 2.25 mHz

ULTRASONIC TRANSDUCER ANALYZER SETTINGS

ATTENUATION 28
GATE WIDTH 459
GAIN TRIM 026
DAMPING 555
MODE THRU
EXT. PULSER DOWN
GATE DELAY 456
REP. RATE 115
EXT. TRIGGER DOWN

SPECTRUM ANALYZER — R.F. SECTION

INPUT ATTENUATION 20
SCAN WIDTH 1 MHz
CENTER FREQUENCY 2.0 mHz
TUNING STABILIZER OFF
BAND WIDTH 30 KHz
RANGE 0–11

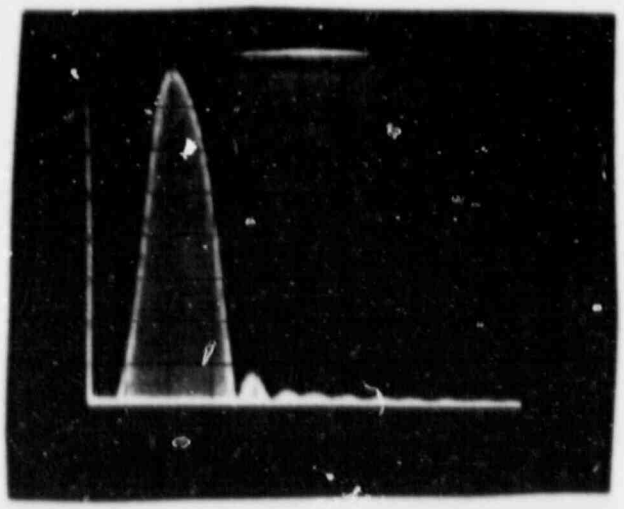
SPECTRUM ANALYZER — I.F. SECTION

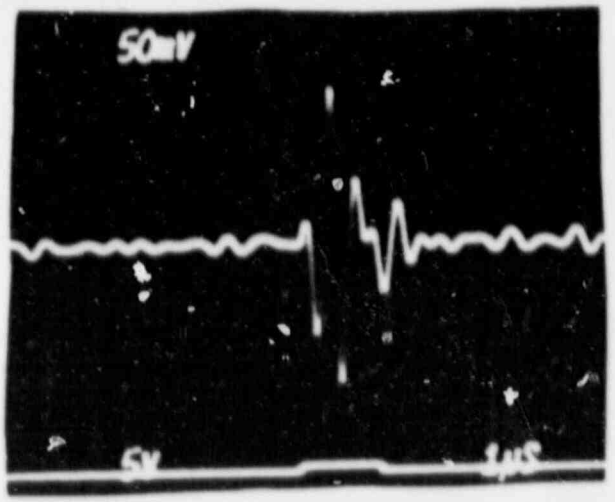
LOG REF. LEVEL 1 MV/DIV
DISPLAY ADJUST 0
VIDEO FILTER OFF
TRIGGER AUTOMATIC
SCAN TIME/DIV. 2 MILLI SEC

*TARGET REFLECTOR	SwRI SPEC	PHOTOGRAPH DATA
☑ 3/32 INCH, 1/3 T HOLE IN P1 300 BLOCK	MINIMUM 1.8 mHz	MHz/DIV 1
☐ 3/16 INCH, 3/4T HOLE IN E.E.I. BLOCK	MAXIMUM 2.7 mHz	USEC/CM 1
☐ PLASTIC BALL BLOCK S.D.H.	MEASURED FREQUENCY 2.0 mHz	VOLTS/CM 50 MV
☐ OTHER		

REVIEWED AND ACCEPTED

SIGNATURE Hazen Kwan DATE Jan 8 1988





SwRI FORM RD-2-5 CERTIFICATION PERFORMED IN ACCORDANCE WITH XII-RD-101

TO BE MOUNTED ON EDGE AND/OR USED AS ANGLE BEAM.

FREQUENCY SPECTRUM AND R.F. WAVEFORM ANALYSIS

CERT. DATE 6 Jan 88
NEXT CERT. DATE ~~6 Jun 88~~ *SW

OPERATOR S Nicholson

*SW 6 July 88

SEARCH UNIT

MANUFACTURER Ken Briers
SERIAL NO. KB 4
CASE STYLE Rd
TEST ANGLE 0°
CRYSTAL SIZE .25"
FREQUENCY 2.25 MHz

ULTRASONIC TRANSDUCER ANALYZER SETTINGS

ATTENUATION 13
GATE WIDTH 492
GAIN TRIM 026
DAMPING 555
MODE Thru
EXT. PULSER DOWN
GATE DELAY 444
REP. RATE 115
EXT. TRIGGER DOWN

SPECTRUM ANALYZER — R.F. SECTION

INPUT ATTENUATION 30
SCAN WIDTH 1 MHz
CENTER FREQUENCY 5.0 MHz
TUNING STABILIZER OFF
BAND WIDTH 30 KHz
RANGE 0–11

SPECTRUM ANALYZER — I.F. SECTION

LOG REF. LEVEL 2 MV/DIV
DISPLAY MODE 0
VIDEO FILTER OFF
TRIGGER AUTOMATIC
SCAN TIME/DIV. 2 MILLI SEC

TARGET REFLECTOR

- ☐ 3/32 INCH, 1/3 T HOLE IN PT 300 BLOCK
- ☐ 3/16 INCH, 3/4T HOLE IN E.E.I. BLOCK
- ☐ PLASTIC BALL BLOCK S.D.H.
- ☑ OTHER 1" SECTION ON PT 300 BLOCK

SwRI SPEC

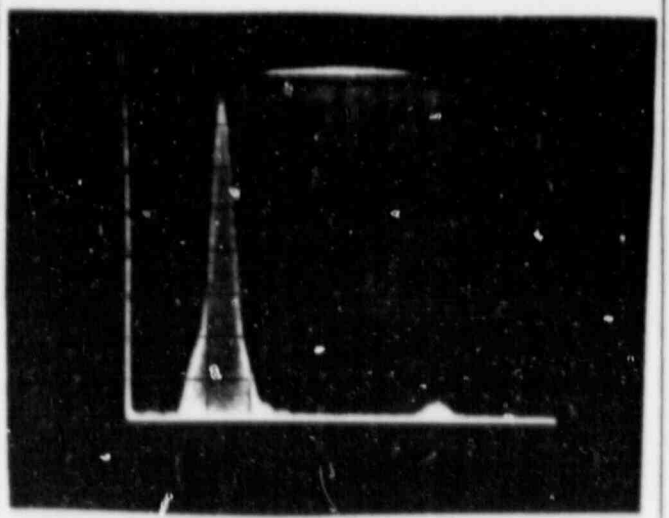
MINIMUM 1.8 MHz
MAXIMUM 2.7 MHz
MEASURED FREQUENCY ~~2.35 MHz~~ 3.35 MHz

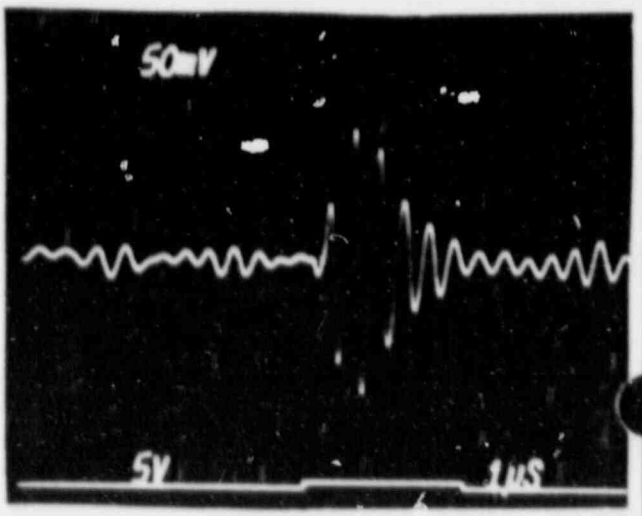
PHOTOGRAPH DATA

MHz/DIV 1
USEC/CM 1
VOLTS/CM 50 MV

REVIEWED AND ACCEPTED

SIGNATURE Hazem Kurm
DATE Jan 7, 1988





SwRI FORM RD-2-5 CERTIFICATION PERFORMED IN ACCORDANCE WITH XII-RD-101

APPENDIX H

CUSTOMER NOTIFICATION FORMS

APPENDIX H

CUSTOMER NOTIFICATION FORMS

Table of Contents

*CNFs 6 through 10, 12, 13, and 16 were issued under the NRC Bulletin 87-01 Examination Program.

Southwest Research Institute
CUSTOMER NOTIFICATION FORM

Serial Nº. 0001
Utility PSE+G
Site HOPE CREEK

Part I - SwRI Findings

Project Nº: 17-1259	Type of Examination: ☐ PSI ☒ ISI	NDT Method: ☐ UT ☐ PT ☒ MT ☐ RT ☐ ET ☐ VT	SwRI Procedure/Rev.: 3ei-2/42
Examination Date: 4MAR88			

Comments: PEI 1+2

Nine ~~Eight~~ linear indications were recorded on the inside surface of the feed water check valve 1HVF074S. The linear indications ranged from 1/4 to 2 1/2 inches in length

Examination Reference: 120000, 120001

Signature of SwRI Representative: Edward J Sery — Date: 4MAR88

Part II - Customer Notification

Notification Acknowledged by: [illegible] — Date: March 4, 1988

Part III - Indication Disposition by Customer

Comments: The indications were documented on Public Service Discovery Report HOT-88-004. Indications were removed with light grinding.

Signature of Customer Representative: Donald C Kaysen — Date: 3-23-88

Part IV Reexamination

Comments: Reexamined with Fluorescent mag particle, acceptable.

Reexamination Reference: 120027, 120017

Signature: Edward J Sery — Date: 22MAR88

CNF Closed (Customer Representative Signature): Donald C Kaysen — Date: 3-22-88

Southwest Research Institute
CUSTOMER NOTIFICATION FORM

Serial Nº 0002
Utility PSE&G
Site HOPE CREEK

Part I - SwRI Findings

Project Nº 17-1259	Type of Examination	NDT Method	SwRI Procedure/Rev.
Examination Date 5MAR88	☐ PSI ☒ ISI	☒ MT ☐ RT ☐ ET ☐ VT ☐ UT ☐ PT	300-2 /42

Comments

DEV 1-2

NINE LINEAR INDICATIONS WERE RECORDED ON THE INSIDE SURFACE OF FEEDWATER CHECK VALVE HV-F074A. THESE LINEAR INDICATIONS RANGED IN LENGTH FROM 3/8 to 1¼ INCHES.

Examination Reference: 120011, 120012

Signature of SwRI Representative: Edward J Day — Date: 6 MAR 88

Part II - Customer Notification

Notification Acknowledged by: E.M. Mey — Date: 3/6/88.

Part III - Indication Disposition by Customer

Comments: Indications were documented on PS. Deficiency Report HMT-88-1018. Indications were removed with light grinding.

Signature of Customer Representative: Donald D Rogers — Date: 3-23-88

Part IV Reexamination

Comments: Acceptable re-exam with fluorescent M.T.

Reexamination Reference: 120053, 120019 RT

Signature: Edward J Day — Date: 23 MAR 88

CNF Closed (Customer Representative Signature): Donald D Rogers — Date: 3-23-88

SwRI FORM NDTR-CNF-1, Rev-1

Southwest Research Institute
CUSTOMER NOTIFICATION FORM

Serial Nº. 0003
Utility PSE&G
Site HOPE CREEK

Part I - SwRI Findings

Project Nº: 17-1259	Type of Examination: ☐ PSI ☒ ISI	NDT Method: ☐ UT ☐ PT ☒ MT ☐ RT ☐ ET ☐ VT	SwRI Procedure/Rev. 300-2 /42
Examination Date: 6MAR88			

Comments: DEV 1+2

SPARE VALVE HV-F074 HAS ONE RECORDED LINEAR INDICATION. FOLLOW-UP EXAMINATION WITH PROCEDURE 200-1 170 DEV 3 REVEALED THE SAME.

Examination Reference: 120014, 110006

Signature of SwRI Representative: Edward J Dwyer | Date: 7MAR88

Part II - Customer Notification

Notification Acknowledged by: [illegible] | Date: 7 Mar. 88.

Part III - Indication Disposition by Customer

Comments: This spare valve was examined to establish a baseline once the indications noted in SwRI CNF 1+2 were not acceptable. This indication was documented on PT Difference Report HRT-384074. The indications were removed with light grinding and buffing.

Signature of Customer Representative: Donald R Keyser Jr. | Date: 3-23-88

Part IV Reexamination

Comments: Acceptable re-exam performed with fluorescent PT

Reexamination Reference: 120040

Signature: Edward J Dwyer | Date: 23MAR88

CNF Closed (Customer Representative Signature): Donald R Keyser Jr. | Date: 3-23-88

Southwest Research Institute
CUSTOMER NOTIFICATION FORM

Serial No. 0004
Utility PSE&G
Site HOPE CREEK

Part I - SwRI Findings

Project No. 17 1259	Type of Examination ☐ PSI ☒ ISI	NDT Method ☐ UT ☐ PT ☒ MT ☐ RT ☐ ET ☐ VT	SwRI Procedure/Rev. 300 2/35
Examination Date: 9MAR88			

Comments DEV2

EXAMINATION AREA VALVE HV-F074B
HAS THREE RECORDABLE LINEAR INDICATIONS
ON THE OUTSIDE OF THE VALVE BODY

Examination Reference: 120015

Signature of SwRI Representative: Edward J Jerz Date: 9MAR88

Part II - Customer Notification

Notification Acknowledged by: Louis H. Lake Date: 3/9/88

Part III - Indication Disposition by Customer

Comments: The indications were documented on P.S. Defining Report HNT 88-1019. Indications to be removed with light grinding

Signature of Customer Representative: Donald D Rogers Date: 3-23-88

Part IV Reexamination

Comments: Re-examined acceptable with magnetic rub.

Reexamination Reference: 120017

Signature: Edward J Jerz Date: 23MAR88

CNF Closed (Customer Representative Signature): Donald D Rogers Date: 3-25-88

SwRI FORM NDTR-CNF-1, Rev-1

Southwest Research Institute
CUSTOMER NOTIFICATION FORM

Serial Nº 0005
Utility PSE&G
Site HOPE CREEK

Part I - SwRI Findings

Project Nº	Type of Examination	NDT Method	SwRI Procedure / Rev.
17-1259	☐ PSI ☒ ISI	☒ MT ☐ RT ☐ ET ☐ VT ☐ UT ☐ PT	300-1/35
Examination Date 9 MAR 88			

Comments

EXAMINATION AREA VALVE HV-F074A HAS TWO RECORDABLE LINEAR INDICATIONS ON THE OUTSIDE OF THE VALVE BODY.

Examination Reference: 120016

Signature of SwRI Representative: Edward J. Dwyer — Date: 9 MAR 88

Part II - Customer Notification

Notification Acknowledged by: Jessie H. Lake — Date: 3/9/88

Part III - Indication Disposition by Customer

Comments: The indications were documented on P.S. Deficiency Report HMT-88-108. Indications were removed with light grinding & blending

Signature of Customer Representative: Donald W. Fogert — Date: 3-23-88

Part IV Reexamination

Comments: Acceptable results performed with M.T.

Reexamination Reference: 120008, 120009

Signature: Edward J. Dwyer — Date: 23 MAR 88

CNF Closed (Customer Representative Signature): Donald W. Fogert — Date: 3-23-88

Southwest Research Institute
CUSTOMER NOTIFICATION FORM

Serial Nº 0011
Utility PSE+G
Site HOPE CREEK

Part I - SwRI Findings

Project Nº	Type of Examination	NDT Method	SwRI Procedure/Rev.
17-1259	☐ PSI ☒ ISI	☒ UT ☐ PT ☐ MT ☐ RT ☐ ET ☐ VT	600-31/23 DEV1
Examination Date: 15MAR88			

Comments

FOR EXAMINATION AREA 1-BB-2BUCA-014-SLD, NO UT EXAMINATION WAS PERFORMED FROM 7 TO 12 INCHES L DUE TO PIPE SUPPORT INTERFERENCE.

Examination Reference: 890012

Signature of SwRI Representative: Edward J Lloyd — Date: 16MAR88

Part II - Customer Notification

Notification Acknowledged by: Donald W Rogozinski — Date: 16 MAR 88

Part III - Indication Disposition by Customer

Comments: Due to time constraints in the outage and the work involved the area will be completed at a later date prior to the end of the first interval.

Signature of Customer Representative: Donald W Rogozinski — Date: 3-22-88

Part IV Reexamination

Comments: NO re-examination required this time

Reexamination Reference

Signature: Edward J Lloyd — Date: 22MAR88

CNF Closed (Customer Representative Signature): Donald W Rogozinski — Date: 3-22-88

SwRI FORM NDTR-CNF-1, Rev-1

Southwest Research Institute
CUSTOMER NOTIFICATION FORM

Serial Nº 0014
Utility PSE+G
Site HOPE CREEK

Part I - SwRI Findings

Project Nº	Type of Examination	NDT Method	SwRI Procedure/Rev
17-1259	☐ PSI ☒ ISI	☒ UT ☐ PT ☐ MT ☐ RT ☐ ET ☐ VT	QCC-741/2 Rev 1
Examination Date: 19MAR88			

Comments

THIS IS NOTIFICATION OF AN EXAMINATION LIMITATION ON THE N4B NOZZLE WHEN PERFORMING THE 22° EXAM FROM THE NOZZLE BOSS, DUE TO WELDED THERMO PADS AND INSTRUMENTATION WIRES, NO EXAM WAS PERFORMED FROM 7 TO 9 O'CLOCK.

Examination Reference: 890059

Signature of SwRI Representative: Edward J Dey — Date: 21MAR88

Part II - Customer Notification

Notification Acknowledged by: Donald W Reynolds — Date: 3-21-88

Part III - Indication Disposition by Customer

Comments: The limitations are due to permanently mounted thermo pads. They will be documented in the MRR ISI report to the commission.

Signature of Customer Representative: Donald W Reynolds — Date: 5-23-88

Part IV Reexamination

Comments: No re-exam is required Dwk

Reexamination Reference

Signature: Edward J Dey — Date: 23MAR88

CNF Closed (Customer Representative Signature): Donald W Reynolds — Date: 5-23-88

Southwest Research Institute
CUSTOMER NOTIFICATION FORM

Serial NR 0015
Utility PSE&G
Site HOPE CREEK

Part I - SwRI Findings

Project NR: 17-1259	Type of Examination: ☐ PSI ☒ ISI	NDT Method: ☒ UT ☐ PT ☐ MT ☐ RT ☐ ET ☐ VT	SwRI Procedure/Rev.: 900941/2
Examination Date: 19MAR88			

Comments

OEVI.

THIS IS NOTIFICATION OF AN EXAMINATION LIMITATION ON N4D NOZZLE WHEN PERFORMING THE 22° EXAM FROM THE NOZZLE BOSS, DUE TO WELDED THERMO PADS FROM 8:30 TO 9 O'CLOCK, NO EXAMINATION OF THIS AREA WAS PERFORMED

Examination Reference: 890038

Signature of SwRI Representative: Edward J Jones — Date: 21MAR88

Part II - Customer Notification

Notification Acknowledged by: Donald W Koppel — Date: 3-21-88

Part III - Indication Disposition by Customer

Comments: The limitations are due to permanently mounted thermocouple pads. They will be documented in the NRR's 10R report to the commission

Signature of Customer Representative: Donald W Koppel — Date: 5-23-88

Part IV Reexamination

Comments: NO re-exam required DWK

Reexamination Reference

Signature: Edward J Jones — Date: 23 MAR 88

CNF Closed (Customer Representative Signature): Donald W Koppel — Date: 5-23-88

SwRI FORM NDTR-CNF-1, Rev-1

APPENDIX I

EXAMINATIONS PERFORMED FOR INFORMATION ONLY

TO: PSE+G

DATE: 12MAR 98

SUBJECT: THICKNESSES TAKEN ADJACENT TO VALVE BODY EXCAVATIONS.

PER PSE+G REQUEST, THICKNESSES WERE TAKEN ADJACENT TO INDICATION EXCAVATIONS IN THE FOLLOWING AREAS (*)!

CHECK VALVE F074 A - OUTSIDE BODY EXCAVATIONS 1+2 ← IND #1 = 3.0" (2.4" GROOVE) FLANGE
IND #2 = 2.7"
INSIDE BODY EXCAVATION #9 = T=3.5"

CHECK VALVE F074B OUTSIDE BODY EXCAVATIONS
IND. #1 = 2.5 GROOVE 3.2 FLANGE
IND. #2 = "
IND. #3 = 3.3"

INSIDE BODY EXCAVATIONS
IND #1 = 3.2"
#6 = 2.6"
#7 = 3.3" → 3.6"
#9 = 3.3" → 4.0"

NOTE: ALL MEASUREMENTS TAKEN FROM O.D.

* SEE ORIGINAL SKETCHES FOR AREA OF INDICATIONS.

CALIBRATION #250003

Sw. R. I. EXAMINATION SUMMARY RECORD

PROJECT No.:	SITE:	SHEET No.:
17-1259	HOPE CREEK GENERATING STATION	INFO
EXAMINATION AREA (SYSTEM / COMPONENT)	**(LINE / SUBASSEMBLY)**	**(IDENTIFICATION)**
FEEDWATER	VALVE HV-F074 ~~A~~	SPARE

	EXAMINATION TYPE	EXAMINATION RECORD SHEET No.	EXAMINER INITIALS	EXAM DATE	INDICATIONS N	I	G	O	RESOLUTION RECORD SHEET No.	CNF No.	REMARKS
VT	INITIAL EXAMINATION										
	FOLLOW-UP EXAMINATION										
PT ☐	INITIAL EXAMINATION	120014	LS	6MAR 88				X		0003	Inside Valve
MT ☒	FOLLOW-UP EXAMINATION										
UT	0° LAM SCAN										
	0° WELD SCAN										
	45° SCAN										
	45° T SCAN										
	60° SCAN										
	60° T SCAN										
	PT	110006	RF	7MAR 88				X			FOLLOW UP TO MT INSIDE VALVE
	MT	120020	LS	9MAR 88				X			INSIDE VALVE
	MT	120021	RF	9MAR 88	X						OUTSIDE SURFACE OF VALVE BODY.
	MT	120040	BR	22MAR 88	X						RECOOK I.D. OF INDICATION 1

SUMMARIZED BY:	DATE	CONTINUED ON SHEET No.:	
Edward J Dwyer	22MAR88	NA	PAGE 1 OF 1

FORM NO. SWRI 17-50 (REV 1-29-79)

Sw. R. I MAGNETIC PARTICLE EXAMINATION RECORD

PROJECT No.: 17-1259	SITE: HOPE CREEK GENERATING STATION	DATE: (DAY-MO-YR) 6 MAR 88	TIME: (24 HR. CLOCK) EXAM STARTED: 1950 EXAM ENDED: 2220	SHEET No.: 120014
EXAMINATION AREA: (SYSTEM/COMPONENT) N/A	LINE / SUBASSEMBLY: HV-F074	IDENTIFICATION: SPARE	Lo LOCATION: SEE DRAWING	Wo LOCATION: TOP EDGE OF VALVE SEE DRAWING
EXAMINER: L SPISSS	SNT LEVEL II	PROCEDURE No. 300-2	SURFACE FINISH: CAST	WELD TYPE (—FLOW→) INSIDE SURFACE OF VALVE	MAGNETIZATION AC
EXAMINER: R FUSE	SNT LEVEL II	REV. 42 DEV. 1+2			YOKE SPACING: 5 3/8 IN YOKE BRAND: WHITE'S SERIAL No.: WL-1-10

MATERIAL

BRAND: MAGNAGLO WET ☑ DRY ☐
BATCH No.: 870051 FLUORESCENT ☑
TYPE: 14Am MIXED NO ☑ YES ☐
COLOR: GREEN MIXED WITH N/A

CALIBRATION BLOCK SERIAL No.: B70198 11 WEIGHT: 11.3 LBS	CALIBRATION VERIFICATION TIME:	1930	2228	N/A
	CALIBRATION VERIFICATION INITIALS:	ID	LO	N/A

DISTANCE FROM BLACK LIGHT TO SENSOR CELL 17 IN.

SURFACE TEMP. 70 °F

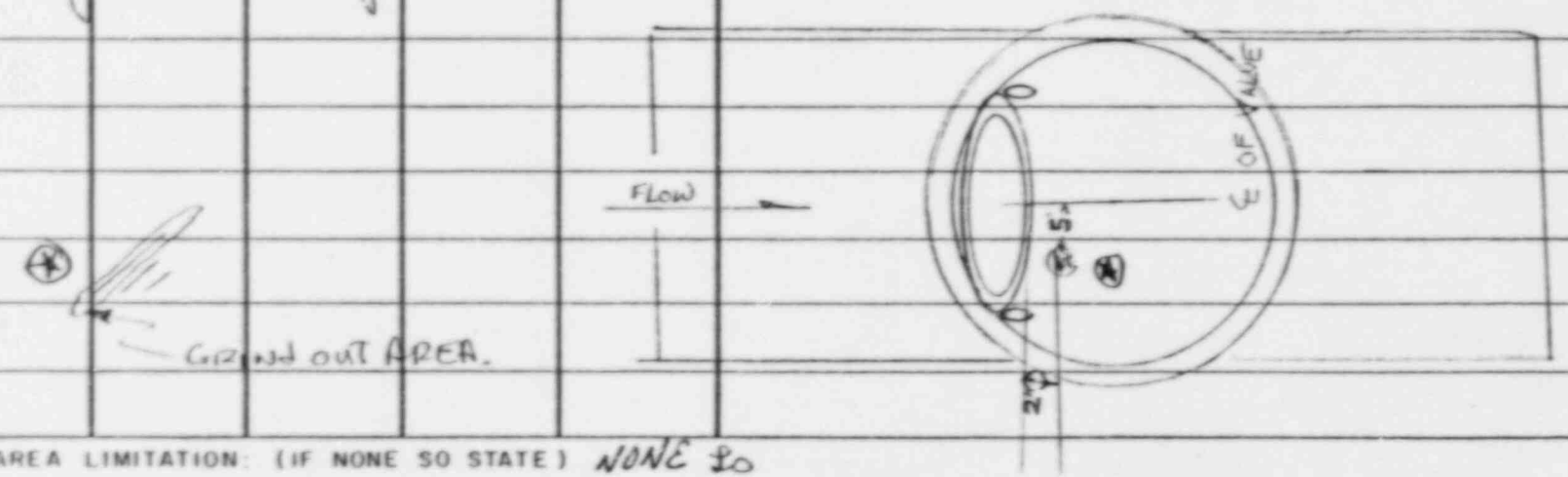
THERMOMETER SERIAL No.: SwRI 158

BLACK LIGHT BRAND: BLAK-RAY SERIAL No.: ~~WL-1-10~~ BL-13	INTENSITY METER BRAND: BLAK-RAY SERIAL No.: 26059	BLACK LIGHT OUTPUT 1100 µw/cm²	BLACK LIGHT OUTPUT VERIF. TIME: 1945 N/A N/A
			BLACK LIGHT OUTPUT VERIF. INITIALS: ID N/A N/A

MATERIAL APPLICATION: N/A

DUSTING ☐ FLOODING ☑ SPRAYING ☐

IND No.	L	W	LOCATION	ROUND OR LINEAR	SIZE DIA. OR LENGTH	REMARKS:	INI.
1	SEE DRAWING	SEE DRAWING	VALVE Body	LINEAR	1/2	3 GROUPED TOGETHER	LO



EXAMINATION AREA LIMITATION: (IF NONE SO STATE) NONE LO

REVIEWED BY:	SNT LEVEL	DATE:	PAGE 1 OF 1
Edward J Doyle	II	7 MAR 88	

FORM No. SWRI NDTR 17-12 (REV. 11-26-79)

Sw.R.I. LIQUID PENETRANT EXAMINATION RECORD

PROJECT NO. 17-1259	SITE: HOPE CREEK GENERATING STATION	DATE: (DAY-MON.-YR.) 7 MAR 88	W. LOCATION: *	SHEET NO.: 10006
EXAMINATION AREA: (SYSTEM/COMPONENT) N/A	LINE/SUBASSEMBLY HV-F074	(IDENTIFICATION) SPARE	L. LOCATION: *	WELD TYPE: (-FLOW→) N/A

EXAMINER: R FINE	SNT LEVEL II	PROCEDURE NO. 200-1 REV. 10 DEV. 3	SURFACE TEMPERATURE: 70 °F	THERMOMETER SERIAL NUMBER SWRI 158
EXAMINER: L SPIESS	SNT LEVEL II		SURFACE FINISH: CAST	WELD LENGTH N/A

PRE CLEANER		PENETRANT		REMOVER		DEVELOPER	
BRAND:	SPOTCHECK	BRAND:	SPOTCHECK	BRAND:	SPOTCHECK	BRAND:	SPOTCHECK
TYPE:	SKC-S	TYPE:	SKL-HF/S	TYPE:	SKC-S	TYPE:	SKD-S
BATCH NO.:	87H067	BATCH NO.:	84L058	BATCH NO.:	87H067	BATCH NO.:	87F047
CLEANING COMPLETED	0910	TIME APPLIED:	0919	REMOVAL COMPLETED	0936	TIME APPLIED:	0941
		TIME REMOVED	0935			TIME READ:	0950

IND. NO.	L	W	LOCATION UP OR DOWN STREAM	TYPE ROUND OR LINEAR	SIZE DIA. OR LENGTH	REMARKS	INI.
1R	*	*	VALVE Body	LINEAR	1/2	Relook of IND #1 only MT Exam R1 Ref Exam Record # 120014	R7
						* Ref Exam Record 120014 R7	

EXAMINATION AREA LIMITATION (IF NONE, SO STATE): NONE RF

REVIEWED BY:	SNT LEVEL:	DATE:	PAGE
Edward J. Dwyer	II	7 MAR 88	1 OF 1

FORM NO. Sw.R.I NDTR 17-11 (REV. 1-5-79)

Sw. R. I MAGNETIC PARTICLE EXAMINATION RECORD

P.O. 3259	SITE: HOPE CREEK GENERATING STATION	DATE: (DAY-MO-YR) 9 MAR 88	TIME: (24 HR. CLOCK) EXAM STARTED: 0531 EXAM ENDED: 0539	SHEET No.: 120920	
AREA (COMPONENT) N/A	LINE / SUBASSEMBLY: HV F074	IDENTIFICATION: SPARE	L0 LOCATION: Ref Exam Record* 120014	W0 LOCATION: Top EDGE VALVE	
L SPOOL	SNT LEVEL II	PROCEDURE No. 300-2 REV. 42 DEV. 1+2	SURFACE FINISH: Cast	WELD TYPE (—FLOW→) INSIDE SURFACE OF VALVE	MAGNETIZATION AC
R FINE	SNT LEVEL II				YOKE SPACING: 5 3/8 IN YOKE BRAND: Whitehall SERIAL No.: WL-1-10

MATERIAL
BRAND: MAGNAGLO WET ☑ DRY ☐
BATCH No.: 87D051 FLUORESCENT ☑
TYPE: 14AM MIXED NO ☑ YES ☐
COLOR: GREEN MIXED WITH N/A

CALIBRATION BLOCK	CALIBRATION VERIFICATION				DISTANCE FROM BLACK LIGHT TO SENSOR
SERIAL No.: C10198 23	TIME:	0530	0540	N/A	CELL 17 IN.
WEIGHT: 11.328 S	INITIALS:	LO	LO	N/A	

SURFACE TEMP. °F: 76
THERMOMETER SERIAL No.: SWRI 158

BLACK LIGHT	INTENSITY METER	BLACK LIGHT OUTPUT	BLACK LIGHT OUTPUT VERIF.			MATERIAL APPLICATION:	
BRAND: BLAK RAY	BRAND: BLAK RAY	1100 µw/cm²	TIME:	0528		N/A	DUSTING ☐
SERIAL No.: BL-13	SERIAL No.: 22059		INITIALS:	LO	Final		FLOODING ☑ SPRAYING ☐

IND No.	L	W	LOCATION	ROUND OR LINEAR	SIZE DIA. OR LENGTH	REMARKS:	INI.
1	*	*	VALVE Body	LINEAR	3/8	2 of the 3 Ground together Removed after	LO
						Grinding * Ref Exam Record 120014	LO
						Relook Indication #1 only	LO

EXAMINATION AREA LIMITATION: (IF NONE SO STATE) NONE LO

REVIEWED BY:	SNT LEVEL	DATE:	PAGE 1 OF 1
Edward Young	II	9 MAR 88	

FORM No. SWRI NDT-9 17-12 (REV. 11-26-79)

Sw. R. I MAGNETIC PARTICLE EXAMINATION RECORD

PROJECT No.: 17-1259	SITE: HOPE CREEK GENERATING STATION	DATE: (DAY-MO-YR) 22MAR88	TIME: (24 HR. CLOCK) EXAM STARTED: 1438 EXAM ENDED: 1455	SHEET No.: 120010
EXAMINATION AREA: (SYSTEM/COMPONENT) N/A	LINE / SUBASSEMBLY: HV-E074	IDENTIFICATION: SPARE	Lo LOCATION: *	Wo LOCATION: *
EXAMINER: B ROBERDS	SNT LEVEL II	PROCEDURE No. 300-2 REV. 42 DEV. 1, 2	SURFACE FINISH: CAST	WELD TYPE (—FLOW→) INSIDE SURFACE OF VALVE
EXAMINER: C. LITTLEFIELD	SNT LEVEL II			MAGNETIZATION AC
				YOKE SPACING: 6-5/8 IN
				YOKE BRAND: MAGNAFLUX
				SERIAL No.: YYL-1-10

MATERIAL

BRAND: MAGNAGLO WET ☒ DRY ☐
BATCH No.: 870051 FLUORESCENT ☒
TYPE: 14AM MIXED NO ☒ YES ☐
COLOR: GREEN MIXED WITH N/A

SURFACE TEMP. 75 °F

THERMOMETER SERIAL No.: SWRI 086

CALIBRATION BLOCK	CALIBRATION VERIFICATION			DISTANCE FROM BLACK LIGHT TO SENSOR
SERIAL No.: B70198 23	TIME:	1437	1457	CELL 16 IN.
WEIGHT: 11.3 LBS	INITIALS:	[illegible]	[illegible]	FINAL

BLACK LIGHT	INTENSITY METER	BLACK LIGHT OUTPUT
BRAND: BLAK-RAY	BRAND: BLAK-RAY	1200 μw/cm²
SERIAL No.: BL-13	SERIAL No.: 26059	

BLACK LIGHT OUTPUT VERIF.			
TIME:	1433		
INITIALS:	[illegible]		

MATERIAL APPLICATION: DUSTING ☐ FLOODING ☐ SPRAYING ☒

IND No.	L	W	LOCATION	ROUND OR LINEAR	SIZE DIA. OR LENGTH	REMARKS:	INI.
						* REF. EXAM RECORD NO. 120014 & 120020	[illegible]
						AFTER GRINDING RELOOK INDICATION NO. 1 RECORDED ON DATA	[illegible]
						SHEET NO. 120020 NO RECORDABLE	[illegible]
						INDICATIONS	[illegible]

EXAMINATION AREA LIMITATION: (IF NONE SO STATE)
NONE [illegible]

REVIEWED BY:	SNT LEVEL	DATE:	PAGE 1 OF 1
[signature]	II	22 MAR 88	

FORM No. SWRI NDTR 17-12 (REV. 11-26-79)

Sw. R. I MAGNETIC PARTICLE EXAMINATION RECORD

PROJECT No.: 17-1259	SITE: HOPE CREEK GENERATING STATION	DATE: (DAY-MO-YR) 9 MAR 88	TIME: (24 HR. CLOCK) EXAM STARTED: 0556 EXAM ENDED: 0637	SHEET No.: 120021
EXAMINATION AREA: (SYSTEM/COMPONENT) N/A	LINE / SUBASSEMBLY: HV F074	IDENTIFICATION: SPARE	Lo LOCATION: N/A	Wo LOCATION: TOP EDGE
EXAMINER: R FINZ	SNT LEVEL II	PROCEDURE No. 300-1 REV. 35 DEV. 2	SURFACE FINISH: CAST	WELD TYPE (—FLOW→) OUTSIDE SURFACE of VALVE
EXAMINER: L SPIESS	SNT LEVEL II			

MAGNETIZATION: AC
YOKE SPACING: 5 5/8 IN
YOKE BRAND: WHITEHALL
SERIAL No.: WL-1-10

MATERIAL
BRAND: MAGNAFLUX WET ☐ DRY ☑
BATCH No.: 84F012 FLUORESCENT ☐
TYPE: 8A MIXED NO ☑ YES ☐
COLOR: RED MIXED WITH N/A

SURFACE TEMP. °F: N/A
THERMOMETER SERIAL No.:

CALIBRATION BLOCK
SERIAL No.: B70198 Z3
WEIGHT: 11.5 LBS

CALIBRATION VERIFICATION

TIME:	0555	0638	N/A
INITIALS:	LS	LS	N/A

DISTANCE FROM BLACK LIGHT TO SENSOR CELL N/A IN

BLACK LIGHT
BRAND: N/A
SERIAL No.:

INTENSITY METER
BRAND: N/A
SERIAL No.:

BLACK LIGHT OUTPUT
N/A μw/cm²

BLACK LIGHT OUTPUT VERIF.

TIME:	N		
INITIALS:			A

MATERIAL APPLICATION: N/A
DUSTING ☑
FLOODING ☐
SPRAYING ☐

IND No.	L	W	LOCATION	ROUND OR LINEAR	SIZE DIA. OR LENGTH	REMARKS:	INI.
	NO	RECORDABLE		INDICATIONS			LS

EXAMINATION AREA LIMITATION: (IF NONE SO STATE) NO Exam under Riveted Identification Plate #0

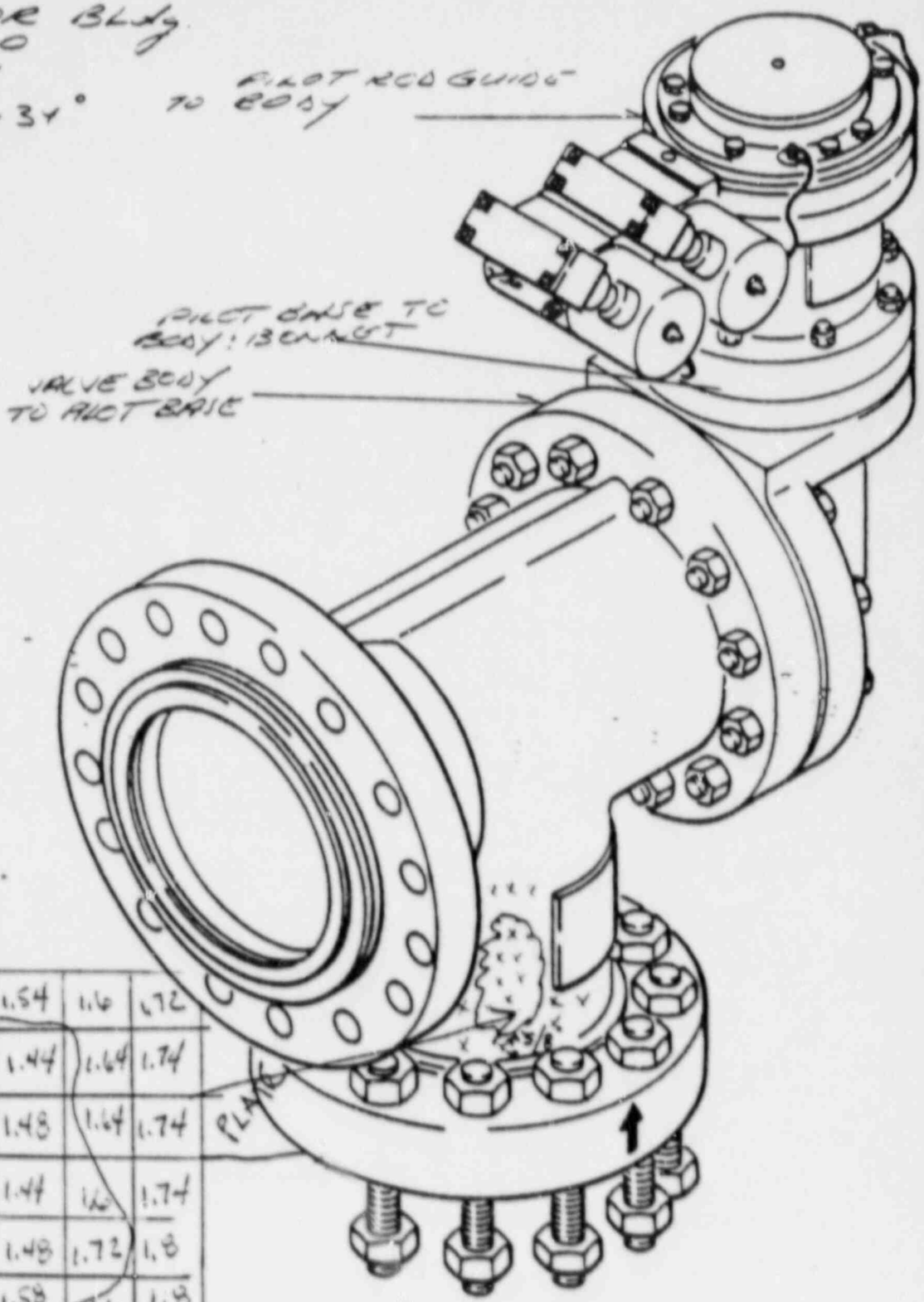
REVIEWED BY: E. Smith	SNT LEVEL II	DATE: 9 MAR 88	PAGE 1 OF

FORM No. SWRI NDTR 17-12 (REV. 11-26-79)

HB-PSV-F013A

MSRV RELIEF VALVE

REACTOR BLDG
RM 4220
EL 127'
AZ 53°-34°



	1.4	1.44	1.54	1.6	1.72
	1.4	1.4	1.44	1.64	1.74
	1.44	1.38	1.48	1.64	1.74
	1.44	1.5	1.44	1.6	1.74
	1.48	1.5	1.48	1.72	1.8
	1.6	1.6	1.58	1.6	1.8

NO MEASUREMENTS DUE TO STEP/TRANS.

Frontispiece

21 MAR 88
CAL. SHT. # 250011