JUNO - NUCLEAR ENGINEERING
EQUIPMENT SUPPORT & INSPECTIONS GROUP
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Juno Beach, Florida

FINAL REPORT OF INSERVICE INSPECTION NONDESTRUCTIVE EXAMINATIONS OF UNISOLABLE PIPING SYSTEM AND COMPONENTS FOR POTENTIAL THERMAL STRESS EFFECTS REFERENCE NRC BULLETIN NO. 88-08

PREPARED BY:
FLORIDA POWER AND LIGHT COMPANY

FOR

TURKEY POINT NUCLEAR POWER PLANT
UNIT NO. 3
P.O. BOX 3088
FLORIDA CITY, FLORIDA 33034

COMMERCIAL SERVICE DATE: 14 DECEMBER 1972

NRC DOCKET NUMBER: 50-250

DOCUMENT NUMBER: ESIG-PTN-88-08 REV. 0

REVISION NO.: 0 DATE: 05/22/90

PREPARED BY: Edward L Anderson DATE: 18 May 1990
Sr. Specialist ISI

REVIEWED BY: J M Mallay DATE: 5/22/90
SUPERVISOR - CODES & PROGRAMS GROUP

APPROVED BY: R Modlin DATE: 5/22/90
MANAGER - EQUIPMENT SUPPORT & INSPECTIONS

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RECORD OF REVISION

REVISION NUMBER	DESCRIPTION OF REVISION REASON FOR THE CHANGE	DATE REVISED	APPROVALS

FINAL REPORT OF INSERVICE INSPECTION NONDESTRUCTIVE EXAMINATIONS OF UNISOLABLE PIPING SYSTEM AND COMPONENTS FOR POTENTIAL THERMAL STRESS EFFECTS REFERENCE NRC BULLETIN NO. 88-08

ABSTRACT

This document describes the Inservice Inspection results of Nondestructive Examinations performed during the 1990 refueling outage which began on February 6, 1990. This document addresses the nondestructive examinations performed, conditions noted and corrective measures recommended or taken as required by ASME Section XI 1980 Edition through the Winter 1981 Addenda, IWA-6220.

This document addresses NRC ACTION ITEM 2 and the reporting requirements as identified in item 4 of the Action Requested by the Nuclear Regulatory Commission.

This report documents the examination activity performed on Florida Power and Light Company Turkey Point Nuclear Power Plant Unit No. 3.

There were no indications that exceeded the acceptance criteria of the ASME Boiler and Pressure Vessel Code, Section XI.

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ABBREVIATIONS

LISTED BELOW ARE THE ABBREVIATIONS UTILIZED IN THIS DOCUMENT:

ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS
B&PV	BOILER AND PRESSURE VESSEL CODE
C&P	CODES AND PROGRAMS GROUP
CH	CHARGING
ESIG	EQUIPMENT SUPPORT & INSPECTIONS GROUP
FP&L	FLORIDA POWER AND LIGHT COMPANY
ISI	INSERVICE INSPECTION
JNS	JUNO NUCLEAR ENERGY - SERVICES
MCI	MATERIALS, CODES AND INSPECTIONS SECTION
NDE	NONDESTRUCTIVE EXAMINATION
NRC	NUCLEAR REGULATORY COMMISSION
PTN-3	TURKEY POINT PLANT UNIT NO. 3
RCS	MAIN REACTOR COOLANT SYSTEM
RC	REACTOR COOLANT

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1.0 INTRODUCTION

1.1 PROGRAM APPLICABILITY

This Report details the Florida Power & Light Company's results of Inservice Inspection, Nondestructive examinations performed at the Turkey Point Nuclear Power Plant, Unit No. 3.

1.1.1 The operating License for Turkey Point Unit no. 3 was issued on April 10 1973, and Florida Power and Light Company is the owner of record.

1.2 INSPECTION INTERVALS

The Second Inservice inspection Interval became effective on February 22, 1984 and ends on February 21, 1994.

1.3 INSPECTION PERIODS

The Inspection Interval is divided into three successive inspection periods as defined by Program "B". The NDE examinations were conducted in the Second Inspection Interval, Second Period and the Fourth outage.

Period	START	END
1	February 22, 1984	September 21, 1987
NOTE:	Extended the period in accordance with IWB-2412 (b) inorder to enable the inspections to coincide with a plant outage.	
2	September 21, 1987	February 22, 1991
3	February 22, 1991	February 21, 1994

1.4 APPLICABLE DOCUMENTS

The Nondestructive examination Program performed during this activity was developed after giving due consideration to the following documents:

- ASME BOILER AND PRESSURE VESSEL CODE, SECTION XI, 1980 EDITION THROUGH THE WINTER 1981 ADDENDA, "RULES FOR INSERVICE INSPECTION OF NUCLEAR POWER PLANT COMPONENTS"

- U. S. NUCLEAR REGULATORY BULLETIN - 88-08 TITLED "THERMAL STRESSES IN PIPING CONNECTED TO REACTOR COOLANT SYSTEMS" DATED; JUNE 22, 1988, SUPPLEMENT 1 DATED: JUNE 24, 1988 AND SUPPLEMENT 2 DATED: AUGUST 4, 1988

- TURKEY POINT UNITS 3 AND 4 (NRC BULLETIN 88-08 THERMAL STRESSES IN PIPING CONNECTED TO REACTOR COOLANT SYSTEM) ENGINEERING DOCUMENT FOR THE IDENTIFICATION OF UNISOLABLE PIPING AND DETERMINATION OF INSPECTION LOCATIONS, DOCUMENT NO: SE&PT-SSAD-7814, DATED: AUGUST 1988

- Letter L-88-558 dated December 30, 1988, Florida Power & Light (FPL) discussion of plans to have flow tests performed to demonstrate that these conditions are unlikely at Turkey Point Units 3 and 4.

- Letter L-88-436 dated October 14, 1988, Florida Power & Light Company (FPL) responded to action items 1 and 2 of the bulletin, and providing the results of FPL review for Turkey Point Units 3 and 4, and a plan and schedule for completing the non-destructive examination (NDE) required by the bulletin.

- Letter L-89-176 dated May 4, 1989, Florida Power & Light Company (FPL) report of non-destructive examinations performed on Turkey Point Plant Unit 4 and the results of the flow testing and the conclusions reached.

1.5 APPLICABLE CODE EDITIONS AND ADDENDA

As required by Title 10 of the Code of Federal Regulations paragraph 55a (g) (4) Inservice Inspections requirements applicable to nondestructive examination at Turkey Point Unit 3 are based on the rules set forth in the 1980 Edition of Section XI through the Winter 1981 Addenda, hereafter referred to as the Code.

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2.0 ENGINEERING RECOMMENDATIONS

Following is the engineering recommendations of areas were NONDESTRUCTIVE EXAMINATIONS were identified for potential thermal stress effects as described in NRC Bulletin 88-08.

The components subject to examination were determined to include portions of the following lines:

2.1 CHARGING PUMP TO PRESSURIZER AUXILIARY SPRAY LINE

The 2 inch weld on the 4" x 4" x 2" reducing tee at the Main Spray Line connection was recommended for examination as identified on isometric drawing 003-A31, and also, the weld at the outlet of valve 3-313.

2.2 CHARGING PUMP TO "C" HOT LEG

Two welds at elbow to valve 3-312B as identified on weld location map 003-A44.

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3.0 ABSTRACT OF EXAMINATIONS PERFORMED

3.1 APPLICABLE AREAS

Based on the recommendations identified in Section 2 following items were scheduled for nondestructive examination.

3.1.1 AUXILIARY SPRAY LINE DRAWING 003-A31

ZONE	IDENTIFICATION	DESCRIPTION	EXAM METHOD
035	2"-RC-1310-1	TEE - PIPE	UT & PT
035	2"-RC-1310-2	PIPE - VLV 3-313	UT & PT

3.1.2 CHARGING LINE LOOP C DRAWING 003-A44

ZONE	IDENTIFICATION	DESCRIPTION	EXAM METHOD
045	3"-CH-1301-43	PIPE - ELBOW	UT & PT
045	3"-CH-1301-42	ELBOW - PIPE	UT & PT

3.2 LIQUID PENETRANT EXAMINATIONS

The Liquid Penetrant examinations performed were conducted in accordance with FP&L NDE procedure 3.3. This procedure complies with the ASME Code. The examinations performed were required by Table IWB-2500-1 and FP&L intends to utilize the examination records for ASME Code credit and are part of the Inservice Inspection Program.

3.3 ULTRASONIC EXAMINATIONS

The ultrasonic examinations were not required by the ASME Code Tables IWB-2500-1 due to the size being 2" and 3". The supplemental examinations were conducted in accordance with standard piping techniques for the 3" charging system. For the 2" Auxiliary Spray system a new

NDE procedure (NDE 5.19) and calibration block (UT-54) had to be written and fabricated for the examination of the socket weld areas.

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4.0 ABSTRACT OF CONDITIONS NOTED

Described below by component is a summary of conditions noted during the Unit No. 3 examination activity:

4.1 AUXILIARY SPRAY LINE

4.1.1 ZONE 035, 2"-RC-1310-1, Reducing Tee - Pipe:

A liquid penetrant and ultrasonic examination using a 45 and 70 degree search unit was performed. ONE (1) geometric reflector was recorded and determined to be caused by the outside diameter. Confirmed by dampening the surface.

4.1.2 ZONE 035, 2"-RC-1310-2, PIPE - VALVE 3-313:

A liquid penetrant and ultrasonic examination using a 45 and 70 degree search unit was performed. One (1) geometric reflector was recorded and determined to be caused by root geometry.

4.2 CHARGING LINE LOOP C

4.2.1 ZONE 045, 3"-CH-1301-42, PIPE - ELBOW:

A liquid penetrant and ultrasonic examination using a 45 and 60 degree search unit was performed. Three (3) geometric reflectors were recorded and determined to be caused by root geometry.

4.2.2 ZONE 045, 3"-CH-1301-43, ELBOW - PIPE:

A liquid penetrant and ultrasonic examination using a 45 and 60 degree search unit was performed. Three (3) geometric reflectors were recorded and determined to be caused by root geometry.

5.0 CORRECTIVE ACTIONS TAKEN OR RECOMMENDED

All indications noted were evaluated in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section XI (were acceptance criteria exists). There were no indications that exceeded the acceptance criteria of the ASME Code, IWB-3000.

6.0 EVALUATION CRITERIA

During Inservice Inspection, flaw indications are evaluated against the acceptance standards of the ASME Code as follows:

6.1 CLASS 1

6.1.1 Acceptance standards for class 1 are as follows:

EXAMINATION CATEGORY	COMPONENTS OR PARTS EXAMINED	ACCEPTANCE STANDARD
B-J	DISSIMILAR AND SIMILAR METAL WELDS IN PIPING	IWB-3514

There were no Flaws identified during the examination activity.

7.0 INSPECTION SUMMARY TABLES

7.1 DESCRIPTION OF TABLES

The TURKEY POINT PLANT UNIT 3 Inservice Inspection tables are summarized by code categories and code item numbers and provides the results of the FP&L examination activity that were performed on the Auxiliary Spray Line and the Charging Line.

7.1.1 SUMMARY PLAN TABLES

The final report tables were developed based on systems and components which are subject to examination and include such information as follows:

(1) ZONE NUMBER - Components and or systems are divided into zones. Each zone is further subdivided by the following categories:

(a) ASME Code Category
(b) ASME Code Item Number
(c) ZONE Identification Number
(d) REFERENCE DRAWING IDENTIFICATION
(e) LINE ITEM NUMBER administrative number used for computer identification purposes
(f) Examination Area Identification identifies the item or area to be examined
(g) INSTRUCTIONS special comments that may be required for a specific item
(h) RESULTS divided into four areas:

1. NOREC no recordable indications
2. INSIG when indications were observed that were below the recording level
3. GEOM was applied when indications which have a amplitude equal to or greater than 100% of the DAC curve, and have been documented to be geometric in nature
4. OTHER are those indications evaluated to be other than insignificant or geometric

(i) Examination Method to be used for the examination
(j) NDE Examination Procedure to be used for the examination

2 INCH REACTOR COOLANT LINE

ZONE NUMBER: 035

SUMMARY NUMBER	EXAMINATION AREA IDENTIFICATION	ASME SEC. XI CATGY ITEM NO	EXAM METHOD	PROCEDURE	STATUS	NONE	INSERVICE	GEOMETRY	OTHER	REMARKS **CALIBRATION BLOCK**
	FROM PRZ. SPRAY LINE TO 3" CHARGING LINE REF. DWG. NO. 003-A31									
102000	2"-RC-1310-1 REDUCING TEE - TO - PIPE	B-J B9.40	PT	NDE 3.3-201	C	C				2-16-90 PT EXAM COMPLETE
			UT 70	NDE 5.19-1				C		2-16-90 UT 70 DEGREE AXIAL O.D. GEOMETRY
			UT-45	NDE 5.19-1		C				2-16-90 UT 45 DEGREE AXIAL SCAN COMPLETE **UT-54**
102100	2"-RC-1310-2 PIPE - TO - VALVE (3-313)	B-J B9.40	PT	NDE 3.3-202	C	C				2-16-90 PT EXAM COMPLETE
			UT 45	NDE 5.19-2					C	2-16-90 UT 45 DEGREE LIMITED TO .3" FROM
			UT 70	NDE 5.19-3		C				US SIDE TOE OF WELD & 0"-1" CW AND 0"-1" CCW. 2-16-90 UT 70 DEGREE COMPLETE **UT-54**

3 INCH CHEMICAL & VOLUME CONTROL LINE C

SUMMARY NUMBER	EXAMINATION AREA IDENTIFICATION	ASME SEC. XI CATGY ITEM NO	EXAM METHOD	PROCEDURE	S T A T	N O R C	I N S G	O T H E R	REMARKS **CALIBRATION BLOCK**
ZONE NUMBER: 045									
	FROM 29" RCS HOT LEG TO REGEN. HT. EX REF. DWG. NO. 003-A44								
155300	3"-CH-1301-42	B-J	PT	NDE 3.3-230	C	C			2-23-90 PT COMPLETE
	PIPE - TO - ELBOW	B9.21	UT 45	NDE 5.4-44				C	2-24-90 UT 45 COMPLETE
			UT 60	NDE 5.4-44				C	2-24-90 UT 60 COMPLETE
									UT-53
155400	3"-CH-1301-43	B-J	PT	NDE 3.3-233	C	C			2-22-90 PT COMPLETE
	ELBOW - TO - PIPE	B9.21	UT 45	NDE 5.4-43				C	2-24-90 UT 45 COMPLETE
			UT 60	NDE 5.4-43				C	2-24-90 UT 60 COMPLETE
									UT-53

8.0 RECORDS

8.1 GENERAL

Records of Inservice Inspections Plans, Outage schedules, Calibration standards, examination and test procedures, results of activities, final reports, certifications, corrective actions taken or recommended will be developed and maintained in accordance with IWA-6000 of the ASME Boiler and Pressure Vessel Code.

8.2 INSERVICE INSPECTION SUMMARY REPORTS

Ninety days (90) following the units return to service MCI shall forward a summary report (NIS-1) of the ISI activity to the Nuclear Regulatory Commission in accordance with IWA-6220.

8.3 SPECIAL REPORTS

This report is prepared to meet the reporting action required by the bulletin and satisfy the FP&L requirements.

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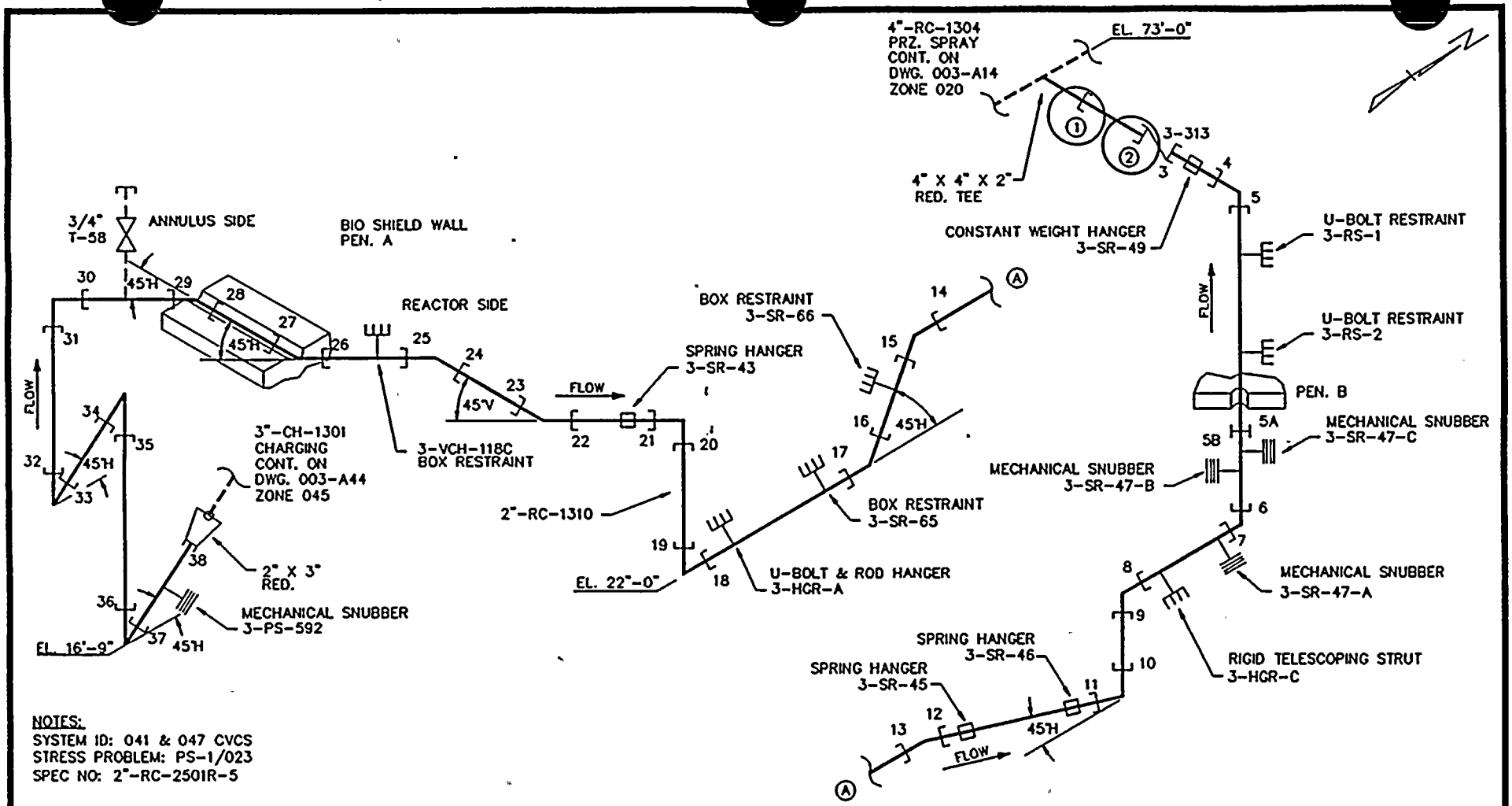
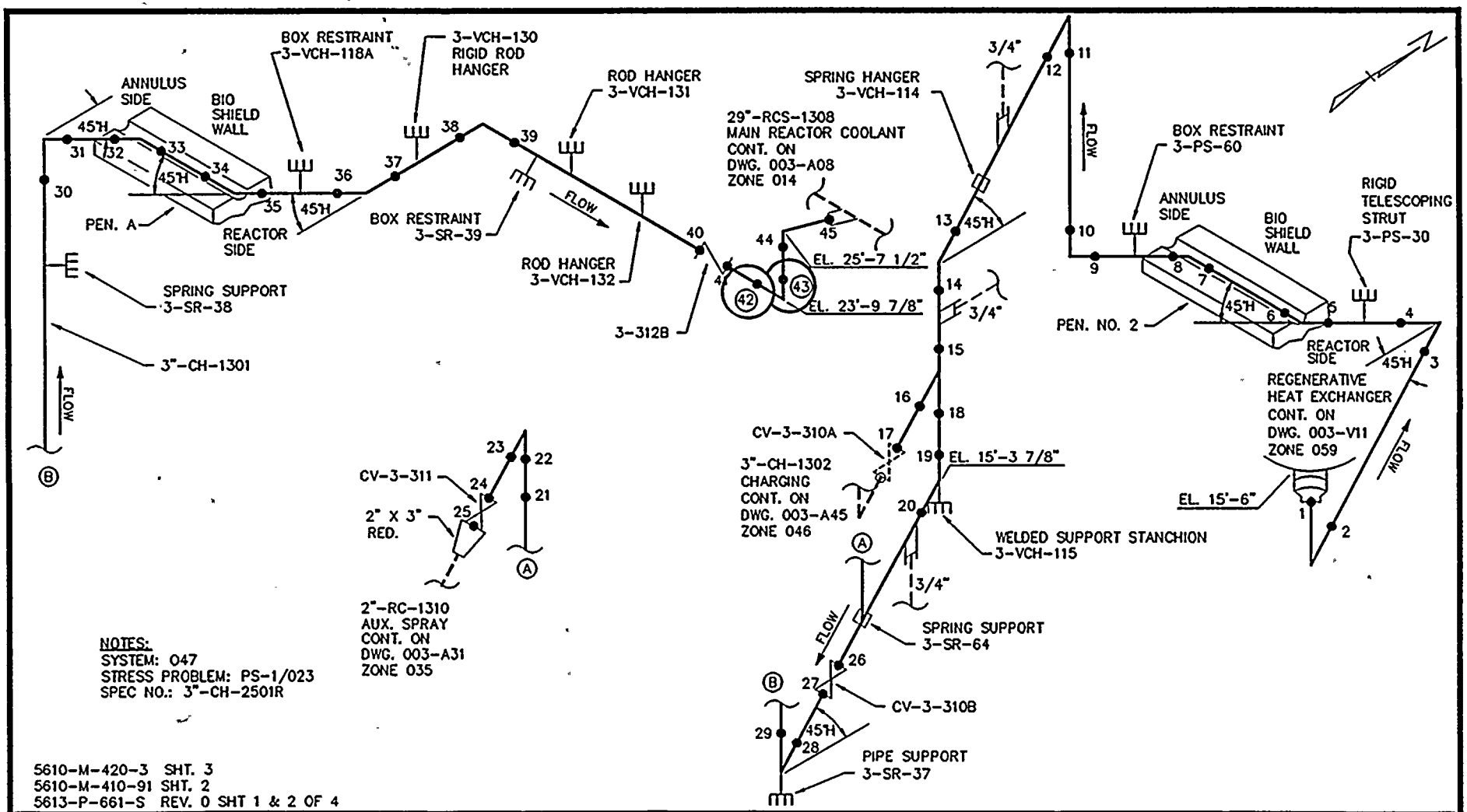
APPENDIX A
REFERENCE DRAWINGS

DRAWING NUMBER	REV. NO.	TITLE
003-A31	4	2" AUXILIARY SPRAY LINE
003-A44	4	3" CHARGING LINE



NOTES:
SYSTEM ID: 041 & 047 CVCS
STRESS PROBLEM: PS-1/023
SPEC NO: 2"-RC-2501R-5

REFERENCE DRAWINGS	PRESSURE & TEMPERATURE STATS	MATERIAL SPECS SIZE	SCH	TYPE	FPL	CODES & PROGRAMS GROUP TURKEY POINT UNIT 3
5177-102-SK-P-641 REV. D 5177-102-SK-P-639 REV. D 5610-FSK-M-433 5610-M-410-202 SHT. 2 OF 2 5610-M-420-214 SHT. 3 OF 3 5613-P-661-S REV. 1 SHT. 2/4	DESIGN PSIG: 2485 TEMP(F): 650 OPERATING PSIG: 2335 TEMP(F): 493 HYDROSTATIC PSIG: 2624 TEMP(F): 547	2" 160 A376 TP316 SMLS 3/4" 160 A376,TP316 SMLS UT CALIBRATION BLOCK: N/A			TITLE: 2 INCH AUXILIARY SPRAY LINE TO PRESSURIZER DATE: 10-20-89 ZONE: 035 REVISION 4 APPROVED BY: E. L. ANDERSON DRAWING NUMBER: 003-A31	



NOTES:
SYSTEM: 047
STRESS PROBLEM: PS-1/023
SPEC NO.: 3"-CH-2501R

5610-M-420-3 SHT. 3
5610-M-410-91 SHT. 2
5613-P-661-S REV. 0 SHT 1 & 2 OF 4

REFERENCE DRAWINGS	PRESSURE & TEMPERATURE STATS		MATERIAL SPECS SIZE	SCH	TYPE
5177-SK-P-639 REV. C 5177-SK-P-642 REV. D 5610-M-420-214 SHT. 3 OF 3 E2387-1C-297 5610-T-E-4505 SHT. 1 5610-T-E-4501 SHT. 1	DESIGN PSIG: 2485	TEMP(F): 680	3"	160	A376 TP316 SMLS
	OPERATING PSIG: 2235	TEMP(F): 653			
	HYDROSTATIC PSIG: 2335	TEMP(F): 547	UT CALIBRATION BLOCK: N/A		

FPL — CODES & PROGRAMS GROUP
TURKEY POINT UNIT 3

TITLE: 3 INCH CHARGING LINE FROM RHX TO LOOP "C" HOT LEG

DATE: 10-19-89 ZONE: 045

REVISION	APPROVED BY:	DRAWING NUMBER:
4	E. L. ANDERSON	003-A44

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APPENDIX B
PERSONNEL CERTIFICATIONS

NAME	VT-1	VT-2	VT-3	VT-4	UT	PT	MT	EYE EXAM
CARR, FRANCIS T.	N/A	N/A	N/A	N/A	III	III	III	04-14-89
BRANNIN, MICHAEL	N/A	N/A	N/A	N/A	IT	IT	N/A	09-08-89
KOVALOVICH, PAUL	II	N/A	N/A	N/A	II	II	II	01-05-90
REDDING, CRIS	N/A	N/A	N/A	N/A	II	II	II	02-02-90
ROBBINS, MICHAEL D.	II	II	II	II	II	II	II	08-09-89
VANO, RICHARD J.	N/A	N/A	N/A	N/A	IT	IT	IT	09-11-89

NONDESTRUCTIVE EXAMINATION PERSONNEL CERTIFICATION

NAME F. T. Carr CERTIFICATION LEVEL III

EXAMINATION METHOD Liquid Penetrant

LIMITATIONS None

EXAMINATION RESULTS:

	BASIC*	80%	ADMINISTERED BY ASNT (JA-718)	DATE	11/87
(METHOD*)	GENERAL	80%	ADMINISTERED BY ASNT (JA-718)	DATE	11/87
	SPECIFIC	95%	ADMINISTERED BY Hellier Associates	DATE	1/88
	PRACTICAL	100%	ADMINISTERED BY Hellier Associates	DATE	1/88
	COMPOSITE	88.75%	(AVERAGE OF ALL SCORES)	*LEVEL III ONLY	

EXPERIENCE: (INVERSE CHRONOLOGICAL ORDER)

DATES	NO. MOS. THIS METHOD	COMPANY (INCLUDE TYPE OF WORK AND NDE LEVEL)
12/80-Present	86	FPL; Level III, NDE Engr., responsible for ISI examination procedures and technical performance of nuclear & fossil NDE activities.
3/75-11/80	68	Nuclear Energy Svs; Director ISI Eng., Level III responsible for ISI examination procedures, techniqu development, technical direction of field NDE examination activities.
3/74-12/74	10	Offshore Power Systems; Section Mrg. NDE Production responsible for procedure and technique development.
10/70-2/74	40	Seatrain Shipbuilding Corp; Mgr. QC & NDT Dept. responsible for complete inspection of super tanker construction.

(see attached resume for additional information)

CERTIFIED BY D.A. Sager TITLE for V.P. Nuc. Operations DATE 2-16-88

REVIEWED BY E. Mosba Manager, MCI THIS CERTIFICATION IS VALID UNTIL 2/16/91

"All historical information supplied by me to compile this certification is true and correct to the best of my knowledge"

F. T. Carr
EXAMINEE

JNS-QI-9.3
Revision 3

NONDESTRUCTIVE EXAMINATION PERSONNEL CERTIFICATION

NAME Frank T. Carr CERTIFICATION LEVEL III

EXAMINATION METHOD Magnetic Particle

LIMITATIONS None

EXAMINATION RESULTS:

(METHOD*)	BASIC*	80%	ADMINISTERED BY ASNT (JA-718)	DATE	11/87
	GENERAL	80%	ADMINISTERED BY ASNT (JA-718)	DATE	11/87
	SPECIFIC	96%	ADMINISTERED BY Hellier Associates	DATE	1/88
	PRACTICAL	100%	ADMINISTERED BY Hellier Associates	DATE	1/88
	COMPOSITE	89%	(AVERAGE OF ALL SCORES)	*LEVEL III ONLY	

EXPERIENCE: (INVERSE CHRONOLOGICAL ORDER)

DATES	NO. MOS. THIS METHOD	COMPANY (INCLUDE TYPE OF WORK AND NDE LEVEL)
12/80-Present	86	FPL; Level III, NDE Engr., responsible for ISI examination and technical performance of nuclear & fossil NDE activities.
3/75-11/80	68	Nuclear Energy Svs; Director ISI Eng., Level III responsible for ISI examination procedures, techniqu development, technical direction of field NDE examination activities.
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CERTIFIED BY D.A. Sager TITLE V.P. Nuc. Operations DATE 2-16-88

REVIEWED BY J.E. Moulva THIS CERTIFICATION IS VALID UNTIL 2/16/91
Manager, MCI

"All historical information supplied by me to compile this certification is true and correct to the best of my knowledge"

F. T. Carr
EXAMINEE

JNS-QI-9.3
Revision 3

NONDESTRUCTIVE EXAMINATION PERSONNEL CERTIFICATION

NAME F. T. Carr CERTIFICATION LEVEL III

EXAMINATION METHOD Ultrasonic

LIMITATIONS None

EXAMINATION RESULTS:

	BASIC*	80%	ADMINISTERED BY ASNT (JA-718)	DATE	11/87
(METHOD*)	GENERAL	80%	ADMINISTERED BY ASNT (JA-718)	DATE	11/87
	SPECIFIC	70%	ADMINISTERED BY Hellier Associates	DATE	1/88
	PRACTICAL	99%	ADMINISTERED BY Hellier Associates	DATE	1/88

COMPOSITE 82.25% (AVERAGE OF ALL SCORES) *LEVEL III ONLY

EXPERIENCE: (INVERSE CHRONOLOGICAL ORDER)

DATES	NO. MOS. THIS METHOD	COMPANY (INCLUDE TYPE OF WORK AND NDE LEVEL)
12/80-Present	86	FPL; Level III, NDE Engr. responsible for ISI examination procedures and technical performance of nuclear & fossil NDE activities.
3/75-11/80	68	Nuclear Energy Svs; Director ISI Eng., Level III responsible for ISI examination procedures, techniqu development, technical direction of field NDE examination activities.
3/74-12/74	10	Offshore Power Systems; Section Mgr. NDE Production responsible for procedure and technique development.
10/70-2/74	40	Seatrain Shipbuilding Corp; Mgr. QC & NDT Dept. responsible for complete inspection of super tanker construction.

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"All historical information supplied by me to compile this certification is true and correct to the best of my knowledge"

F. T. Carr
EXAMINEE

F. T. CARR REV. 4/84

NDE Specialist - Nuclear Energy Services

West Virginia Institute of Technology, Engineering and Business Administration

1965 - 1970 Douglas Ultrasonics, Inc., Ultrasonic Technician with varied independent assignments worldwide.

1970 A.J. Testing Laboratories, NDT Technician and Ultrasonic Specialist.

1970 - 1974 Seatrain Shipbuilding Corp., Supervisor and Manager of the QC inspection of Super Tankers. As the level III Supervisor my involvement started with the inception of this new Shipyard. During my tenure, I built a department of 40 Supervisors and Technicians.

1974 - 1975 Offshore Power Systems, Section Manager, NDE production responsible for UT, MT, PT, and VT procedures and programatic administration during the start-up of the construction of floating Nuclear power plants.

1975 - 1981 Director, ISI Engineering with overall management responsibility for 44 people in the production of Nuclear inservice inspection programs, NDE procedures, technique development, and the field deployment of examination personnel. My responsibility includes the training, certification, and administration of some 28 technicians. Level III (by examination) in UT, MT, PT, and VT aids my decision making ability as the principal authority for many company policies and project commitments.

1981 - present Florida Power and Light Company, NDE Specialist.

American Society for Nondestructive Testing - Sonics and Visual committee participation, past Chairman of the Metro-NY and Northeast Florida sections
American Welding Society

CERTIFICATION OF PERSONNEL QUALIFICATION

TRAINING SUPPLEMENT

NAME E. T. Carr

SCHOOL (PROGRAM)	LOCATION	DATE	LENGTH	SUBJECT
Dwight College Prep	New York, NY	1959	4 yrs	High School
W. Va. Inst. of Tech	Montgomery, WV	1961	2 yrs	Engineering/Business
Branson Instruments	Stamford, CT	1/67	40 hrs	Basic Ultrasonics
Krautkramer Ultrasonics	Richmond, VA	2/68	40 hrs	Basic Ultrasonics
ASNT	Norwich, CT	5/69	24 hrs	MT/PT/RT/UT/ET
Krautkramer Ultrasonics	Stratford, CT	10/69	40 hrs	Ultrasonic Weld Inspection
A. J. Testing	Brooklyn, nY	1970	40 hrs	MT/PT/RT (OJT)
ASNT	Teterboro, MY	1968	18 hrs	MT/PT
ASNT National Conference	Detroit, MI	1972	32 hrs	UT/RT/MT/PT
ASNT National Conference	Chicago, IL	1973	32 hrs	UT/RT/MT/PT
Kean College	Union, N.J.	1973	40 hrs	UT/RT/MT/PT/ET
Kean College	Union, N.J.	1973	40 hrs	Radiography (Level II)
ASNT National Conference	Cleveland, OH	1974	32 hrs	Ultrasonics
ASNT National Conference	Houston, TX	1976	32 hrs	Ultrasonics
Battelle-Columbus Labs	Columbus, OH	2/78	40 hrs	Ultrasonics-IGSCC Workshop
ASNT National Conference	Atlanta, GA	1981	32 hrs	UT/RT/MT
ASNT	Atlanta, GA	10/81	8 hrs	Leak Testing
ZETEC	Miami, FL	5/82	40 hrs.	Eddy Current
EPRI	Charlotte, NC	8/84	40 hrs	UT-Flaw Sizing

INSPECTION PERSONNEL EYE EXAMINATION

Name CARR, FRANK (LAST, FIRST, MIDDLE) Location: 11380 Hospital Farms Rd Palm Beach Gardens, FL.

Without Glasses ☐ With Glasses ☒	Chart No. J1	Without Glasses ☒ With Glasses ☐	Chart No. Snellen
Right Eye ☒ OK	☐ See Recommendation	Right Eye ☒ OK	☐ See Recommendation
Left Eye ☒ OK	☐ See Recommendation	Left Eye ☒ OK	☐ See Recommendation
Both Eyes ☒ OK	☐ See Recommendation	Both Eyes ☒ OK	☐ See Recommendation

Color Blindness (☐ Isihara ☐ Isochromatic) - Write in Number Read

1	9	17	25	33
2	10	18	26	34
3	11	19	27	35
4	12	20	28	36
5	13	21	29	37
6	14	22	30	38
7	15	23	31	
8	16	24	32	

Recommendation: X Pass ___ See Physician ___ Restricted ___ Fail

Remarks: VA at distance is 20/20 Right, left, & Both with out glasses

VA at 18" is J-1 Right, Left, & both with glasses

Test Administrator [signature] Date 4-14-89

Applicant's Signature [signature] Date 4/14/89

NOTE: THE ABOVE DATA WILL MEET THE SNT-TC-1A/ANSI N45.2.6 REQUIREMENTS LATEST REVISION.

Form 4302-1.2 (Non-Stocked) Rev 2/8

FPL

JNS-QI-9.:
Revision

NONDESTRUCTIVE EXAMINATION PERSONNEL CERTIFICATION

NAME CRIS M. REDDING CERTIFICATION LEVEL II

EXAMINATION METHOD ULTRASONIC

LIMITATIONS CONTACT TECHNIQUES ONLY

EXAMINATION RESULTS:

	BASIC*	N/A	ADMINISTERED BY	-	DATE -
(METHOD*)	GENERAL	86%	ADMINISTERED BY	F. T. CARR	DATE 11/22/89
	SPECIFIC	82%	ADMINISTERED BY	F. T. CARR	DATE 11/22/89
	PRACTICAL	100%	ADMINISTERED BY	F. T. CARR	DATE 01/30/90
	COMPOSITE	89.3%	(AVERAGE OF ALL SCORES)		*LEVEL III ONLY

EXPERIENCE: (INVERSE CHRONOLOGICAL ORDER)

DATES	NO. MOS. THIS METHOD	COMPANY (INCLUDE TYPE OF WORK AND NDE LEVEL)
10/89 - Present	-	FPL; Level II ISI Technician performing Nuclear Fossil Plant NDE.
2/87 - 10/89	32	EBASCO Services, Inc.; Level II ISI Technician performing PSI & ISI examinations at a variety of assignments.
6/85 - 7/86	13	World Technical Services; Level II NDE Technician.
11/83 - 1/85	13	Universal Testing Labs, Inc.; Level II NDE Technician.
1/77 - 11/83	60	U. S. Steel Corp.; Level II NDE Technician, Trainee, and Level I covered during this employment.

CERTIFIED BY F. T. Carr TITLE UT-III DATE 2/2/90

REVIEWED BY F. T. Carr THIS CERTIFICATION IS VALID UNTIL 2/2/93
NDE SUPERVISOR

"All historical information supplied by me to compile this certificat is true and correct to the best of my knowledge" Cris M. Redding
EXAMINEE

FPL

NONDESTRUCTIVE EXAMINATION PERSONNEL CERTIFICATION

NAME CRIS M. REDDING CERTIFICATION LEVEL II

EXAMINATION METHOD LIQUID PENETRANT

LIMITATIONS NONE

EXAMINATION RESULTS:

(METHOD*)	BASIC*	N/A	ADMINISTERED BY -	DATE	-
	GENERAL	78%	ADMINISTERED BY F. T. CARR	DATE	12/28/89
	SPECIFIC	90%	ADMINISTERED BY F. T. CARR	DATE	12/28/89
	PRACTICAL	94%	ADMINISTERED BY F. T. CARR	DATE	01/08/90
	COMPOSITE	87.3%	(AVERAGE OF ALL SCORES)	*LEVEL III ONLY	

EXPERIENCE: (INVERSE CHRONOLOGICAL ORDER)

DATES	NO. MOS. THIS METHOD	COMPANY (INCLUDE TYPE OF WORK AND NDE LEVEL)
10/89 - resent	-	FPL; Level II ISI Technician performing Nuclear, Fossil Plant NDE.
2/87 - 10/89	32	EBASCO Services, Inc.; Level II ISI Technician performing PSI & ISI examinations at a variety of assignments.
6/85 - 7/86	13	World Technical Services; Level II NDE Technician.
11/83 - 1/85	13	Universal Testing Labs, Inc.; Level II NDE Technician.
1/77 - 11/83	66	U. S. Steel Corp.; Level II NDE Technician, Trainee, and Level I covered during this employment.

CERTIFIED BY F. T. Carr TITLE PT-III DATE 1/30/90

REVIEWED BY F. T. Carr THIS CERTIFICATION IS VALID UNTIL 1/30/93
NDE SUPERVISOR

"All historical information supplied by me to compile this certification is true and correct to the best of my knowledge" Cris M. Redding
EXAMINEE

JNS-QI-9.3
Revision 4

FPL

NONDESTRUCTIVE EXAMINATION PERSONNEL CERTIFICATION

NAME CRIS M. REDDING CERTIFICATION LEVEL II

EXAMINATION METHOD MAGNETIC PARTICLE

LIMITATIONS YOKE & PROD TECHNIQUES ONLY

EXAMINATION RESULTS:

	BASIC*	N/A	ADMINISTERED BY -	DATE -
(METHOD*)	GENERAL	78%	ADMINISTERED BY F. T. CARR	DATE 12/22/89
	SPECIFIC	88%	ADMINISTERED BY F. T. CARR	DATE 12/22/89
	PRACTICAL	100%	ADMINISTERED BY F. T. CARR	DATE 01/26/90
	COMPOSITE	88.6%	(AVERAGE OF ALL SCORES)	*LEVEL III ONLY

EXPERIENCE: (INVERSE CHRONOLOGICAL ORDER)

DATES	NO. MOS. THIS METHOD	COMPANY (INCLUDE TYPE OF WORK AND NDE LEVEL)
10/89 - resent	-	FPL; Level II ISI Technician performing Nuclear, Fossil Plant NDE.
2/87 - 10/89	32	EBASCO Services, Inc.; Level II ISI Technician performing PSI & ISI examinations at a variety of assignments.
6/85 - 7/86	13	World Technical Services; Level II NDE Technician.
11/83 - 1/85	13	Universal Testing Labs, Inc.; Level II NDE Technician.
1/77 - 11/83	61	U. S. Steel Corp.; Level II NDE Technician, Trainee, and Level I covered during this employment.

CERTIFIED BY F. T. Carr TITLE MT III DATE 1/30/90

REVIEWED BY F. T. Carr THIS CERTIFICATION IS VALID UNTIL 1/30/93
NDE SUPERVISOR

"All historical information supplied by me to compile this certification is true and correct to the best of my knowledge" Cris M. Redding
EXAMINEE

FPL
FLORIDA POWER & LIGHT COMPANY

INSPECTION PERSONNEL EYE EXAMINATION

Name REDDING CRIS M (LAST / FIRST / MIDDLE) Location: JNS NDE SECTION

Without Glasses ☑ / With Glasses ☐ Chart No. J1	Without Glasses ☑ / With Glasses ☐ DISTANT Chart No. Snellen
Right Eye ☑ OK ☐ See Recommendation	Right Eye ☐ OK ☑ See Recommendation
Left Eye ☑ OK ☐ See Recommendation	Left Eye ☐ OK ☑ See Recommendation
Both Eyes ☑ OK ☐ See Recommendation	Both Eyes ☑ OK ☑ See Recommendation

Color Blindness (☑ Isihara ☐ Isochromatic) - Write in Number Read

1 OK	9 OK	17 OK	25 OK	33
2	10	18	26	34
3	11	19	27	35
4	12	20	28	36
5	13	21	29	37
6	14	22	30	38
7	15	23	31	
8	16	24	32	

Recommendation: ✓ Pass ✳ See Physician ✳ Restricted ___ Fail

Remarks: * UNABLE TO READ 20/20 WITH ONE EYE AT A TIME, OK WITH BOTH. THIS ATTRIBUTE IS FOR DISTANT VISION ONLY AND IS APPLICABLE TO VT-2 EXAMINATIONS

Test Administrator [signature] Date 2/2/90

Applicant's Signature Cris M. Redding Date 2/2/90

NOTE: THE ABOVE DATA WILL MEET THE SNT-TC-1A/ANSI N45.2.6 REQUIREMENTS LATEST REVISION.

FPL

CERTIFICATION OF PERSONNEL QUALIFICATION
TRAINING SUPPLEMENT

NAME Cris M. Redding

SCHOOL (PROGRAM)	LOCATION	DATE	LENGTH	SUBJECT
High School	Texas	9/75	-	G.E.D.
U. S. Steel	Baytown, TX	1979	24 hrs.	Magnetic Particle
U. S. Steel	Baytown, TX	1980	24 hrs.	Magnetic Particle
U. S. Steel	Baytown, TX	1979	40 hrs.	Ultrasonics Level I
U. S. Steel	Baytown, TX	1980	40 hrs.	Ultrasonics Level II
U. S. Steel	Baytown, TX	1978	24 hrs.	Liquid Penetrant
U. S. Steel	Baytown, TX	1979	24 hrs.	Liquid Penetrant
EPRI NDE Center	Charlotte, NC	2/84	40 hrs.	UT IGSCC Detection
EPRI NDE Center	Charlotte, NC	7/88	40 hrs.	UT IGSCC Sizing
EPRI NDE Center	Charlotte, NC	9/88	32 hrs.	UT IGSCC Overlay
EBASCO Services	Kearny, NJ	2/87	21 hrs.	Radiation Safety
EBASCO Services	Kearny, NJ	2/87	6 hrs.	Radiography
EBASCO Services	Kearny, NJ	4/87	22 hrs.	Magnetic Particle
EBASCO Services	Kearny, NJ	4/87	56 hrs.	Radiography
EBASCO Services	Kearny, NJ	4/87	16 hrs.	Liquid Penetrant
EBASCO Services	Kearny, NJ	4/87	38 hrs.	Ultrasonics AWS
EBASCO Services	Stuart, FL	6/89	80 hrs.	Visual VT-1 thru 4
FPL	Riviera Bch, FL	1/90	16 hrs.	FPL NDE Procedures

EBASCO SERVICES INCORPORATED

EBASCO

Materials Engineering Laboratory, Bldg. 100A Port Kearny, South Kearny, NJ 07032, (201) 344-8400

Name: Robbins, Michael D. SSN: 408-94-0001

CERTIFICATION HISTORY

Date	Method & Level	Basic General	Method Specific	Specific Practical	Composite
10/05/88	UT-II	87.50	90.00	97.00	92.05
10/05/88	MT-II	90.10	90.00	98.00	93.23
10/05/88	PT-II	76.90	100.0	97.00	91.87
10/05/88	VT-1 II	80.00	100.0	86.00	88.40
10/05/88	VT-3&4 II	76.70	95.00	100.0	91.50
09/12/89	VT-2 II	93.30	95.00	93.00	93.69

EBASCO SERVICES INCORPORATED

CURRENT NDE CERTIFICATIONS

NAME: Robbins, Michael D. SSN: 408-94-0001 EDUCATION LEVEL: High School

METHOD	LEVEL	HOURS OF TRAIN.	MONTHS OF EXPER.	DATE CERTIFIED	GENERAL/ BASIC GRADE	WT.	SPECIFIC/ METHOD GRADE	WT.	PRACTICAL/ SPEC-PRACT. GRADE	WT.	COMPOS. SCORE	RECERT. DUE	CERTIFIER
RT	N/A			/ /								/ /	
UT	II	104	164	10/05/88	87.50	0.3	90.00	0.3	97.00	0.4	92.05	08/04/91	R. PAILLAMAN
MT	II	24	164	10/05/88	90.10	0.3	90.00	0.3	98.00	0.4	93.23	08/01/91	H. BULLEN
PT	II	38	164	10/05/88	76.90	0.3	100.0	0.3	97.00	0.4	91.87	08/01/91	H. BULLEN
ET	N/A			/ /								/ /	
VT-1	II	63	132	10/05/88	80.00	0.3	100.0	0.3	86.00	0.4	88.40	08/03/91	R. PAILLAMAN
VT-2	II	63	164	09/12/89	93.30	0.3	95.00	0.3	93.00	0.4	93.69	08/22/92	R. Paillaman
VT-3,4	II	63	164	10/05/88	76.70	0.3	95.00	0.3	100.0	0.4	91.50	08/03/91	R. PAILLAMAN
N/A	N/A												

RESTRICTIONS: NONE ENDORSEMENTS: ISI

This is to certify that the above named person has been found qualified to perform the above listed NDE methods at the levels stated. The individual meets the requirements for education, training and experience as defined in Ebasco Procedure NDE-1, Revision 12, and has successfully completed the required examinations. Individual certification records are on file and available for review at the Ebasco Kearny, New Jersey Office.

LEVEL III NAME: H.C. Bullen SIGNATURE: Harold C. Bullen DATE ISSUED: 09/12/89

1333 9 5 81

REPORT OF EYE EXAMINATION

NAME Robbins, Michael SSN 408-94-0001

PART - A (To be completed by Eye Examiner)

A NEAR VISION ACUITY

- ☑ READ JAEGER J-1
- ☐ READ OTHER (Specify) _____
  - ☑ Left eye 20/20
  - ☑ Right eye 20/20

☑ UNCORRECTED
☐ EYEGLASSES
☐ CONTACTS

B. DISTANT VISION ACUITY

- ☑ SNELLEN
- ☐ OTHER (Specify) _____
  - ☑ Left eye 20/20
  - ☐ Right eye 20/20

☑ UNCORRECTED
☐ EYEGLASSES
☐ CONTACTS

C. COLOR VISION

☑ ISHIHARA ☐ OTHER (Specify) N/A

Number of Plates Tested 24
Number of Plates Correctly Read 24
List of Any Plates Read Incorrectly 0

NAME OF EXAMINER Charles Pattillo TITLE C-III
LOCATION Stuart, Florida
SIGNATURE Charles Pattillo DATE OF EXAM 8-9-89

PART - B (To be completed by The Appropriate Level III Individual)

MEETS QA - G.3.1 JAEGER J-1	☐ YES	☐ NO	
MEETS QA - G.3.1 SNELLEN MINIMUM — ONE EYE 20/40	N/A ☐ YES	☐ NO	☐ N/A
MEETS QA - G.3.1 COLOR VISION	☐ YES	☐ NO*	☐ N/A

DISCIPLINE LEVEL - III _____ (PRINT NAME) _____ (SIGNATURE) DATE _____

MEETS NDE - 1 JAEGER J-1	☑ YES	☐ NO	
MEETS NDE - 1 SNELLEN MINIMUM — ONE EYE 20/30	☑ YES	☐ NO	☐ N/A
MEETS NDE - 1 COLOR VISION	☑ YES	☐ NO*	☐ N/A

NDE - LEVEL - III Charles Pattillo (PRINT NAME) Charles Pattillo (SIGNATURE) DATE 8-9-89

If failed, provide justification for waiver of failed condition:

Approved Level III Signature and Date

EBASCO SERVICES INCORPORATED

EBASCO

Materials Engineering Laboratory, Bldg. 100A Port Kearny, South Kearny, NJ 07032, (201) 344-8400

Name: Kovalovich, Paul SSN: 050-60-7171

CERTIFICATION HISTORY

Date	Method & Level	Basic General	Method Specific	Specific Practical	Composite
10/88	UT-II	92.50	100.0	94.00	95.35
10/88	MT-II	83.40	80.00	93.00	86.20
10/88	PT-II	90.00	90.00	93.00	91.20
10/88	VT1-II	73.40	100.00	80.00	84.02

EBASCO SERVICES INCORPORATED

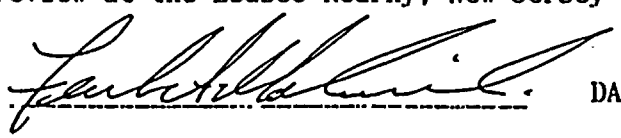
CURRENT NDE CERTIFICATIONS

NAME: Kovalovich, Paul SSN: 050-60-7171 EDUCATION LEVEL: 2 Years College

METHOD	LEVEL	HOURS OF TRAIN.	MONTHS OF EXPER.	DATE CERTIFIED	GENERAL/ BASIC GRADE	WT.	SPECIFIC/ METHOD GRADE	WT.	PRACTICAL/ SPEC-PRACT. GRADE	WT.	COMPOS. SCORE	RECERT. DUE	CERTIFIER
RT	N/A			/ /								/ /	
UT	II	190	37.5	10/03/88	92.50	0.3	100.0	0.3	94.00	0.4	95.35	09/28/91	R. PAILLAMAN
MT	II	37.5	29.7	10/03/88	83.40	0.3	80.00	0.3	93.00	0.4	86.20	09/28/91	H. BULLEN
PT	II	37.5	28.25	10/03/88	90.00	0.3	90.00	0.3	93.00	0.4	91.20	09/28/91	H. BULLEN
ET	N/A			/ /								/ /	
VT-1	II	39.5	6	10/03/88	73.40	0.3	100.0	0.3	80.00	0.4	84.02	09/29/91	R. PAILLAMAN
VT-2	N/A			/ /								/ /	
VT-3,4	N/A			/ /								/ /	
N/A	N/A												

RESTRICTIONS: NONE ENDORSEMENTS: ISI

This is to certify that the above named person has been found qualified to perform the above listed NDE methods at the levels stated. The individual meets the requirements for education, training and experience as defined in Ebasco Procedure NDE-1, Revision 12, and has successfully completed the required examinations. Individual certification records are on file and available for review at the Ebasco Kearny, New Jersey Office.

LEVEL III NAME: Frank A. Malinowski SIGNATURE:  DATE ISSUED: 10/03/88

*333-5.9-88

EBASCO SERVICES INCORPORATED

REPORT OF EYE EXAMINATION

NAME (PRINT) Paul Kovalovich SSN 050 60 7171

PART - A (To be completed by Eye Examiner)

A. NEAR VISION ACUITY

- [X] READ JAEGER J-1
- [ ] READ OTHER (Specify) ____
  - [X] Left eye J-1
  - [X] Right eye J-1

- [X] UNCORRECTED
- [ ] EYEGLASSES
- [ ] CONTACTS

B. DISTANT VISION ACUITY

- [X] SNELLEN
- [ ] OTHER (Specify) ____
  - [X] Left eye 20/20
  - [X] Right eye 20/20

- [ ] UNCORRECTED
- [X] EYEGLASSES
- [ ] CONTACTS

Right 20/20
Left 20/20

C. COLOR VISION

- [X] ISHIHARA
- [ ] OTHER (Specify) ____

Number of Plates Tested 9
Number of Plates Correctly Read 9
List of Any Plates Read Incorrectly ____

NAME OF EXAMINER Steve Houghton TITLE OPTOMETRIST

LOCATION 2505 So DIXIE HIGHWAY

SIGNATURE [signature] O.D. DATE OF EXAM 2-2-90

PART - B (To be completed by The Appropriate Level III Individual)

MEETS QA - G.3.1 JAEGER J-1	☐ YES	☐ NO	
MEETS QA - G.3.1 SNELLEN MINIMUM — ONE EYE 20/40	☐ YES	☐ NO	☐ N/A
MEETS QA - G.3.1 COLOR VISION	☐ YES	☐ NO*	☐ N/A

DISCIPLINE LEVEL - III ____ (PRINT NAME) ____ (SIGNATURE) DATE ____

MEETS NDE - 1 JAEGER J-1	☐ YES	☐ NO	
MEETS NDE - 1 SNELLEN MINIMUM — ONE EYE 20/30	☐ YES	☐ NO	☐ N/A
MEETS NDE - 1 COLOR VISION	☐ YES	☐ NO*	☐ N/A

NDE - LEVEL - III HECTOR SILVERMAN [signature] DATE Feb 5, 1990
(PRINT NAME) (SIGNATURE)

If failed, provide justification for waiver of failed condition:

Appropriate Level III Signature and Date ____

See reverse side for instructions.

EBASCO SERVICES INCORPORATED

Name: Vano, Richard J SSN: 167-58-4514

CERTIFICATION HISTORY

Date	Method	Level	Basic/ General	Method/ Specific	Specific/ Practical	Composite
09/08/89	UT	IT	90.00	85.00	81.00	85.80
09/11/89	PT	IT	93.30	90.00	93.00	92.22
01/18/90	MT	IT	75.00	95.00	92.00	86.10

EBASCO SERVICES INCORPORATED

CURRENT NDE CERTIFICATIONS

NAME: Vano, Richard J SSN: 167-58-4514 EDUCATION LEVEL.: HIGH SCHOOL

METHOD	LEVEL	HOURS OF TRAIN.	MONTHS OF EXPER.	DATE CERTIFIED	GENERAL/ BASIC GRADE	WT.	SPECIFIC/ METHOD GRADE	WT.	PRACTICAL/ SPEC-PRACT. GRADE	WT.	COMPOS. SCORE	RECERT. DUE	CERTIFIED BY
RT	N/A			/ /								/ /	
UT	IT	80.0	2.4	09/08/89	90.00	0.4	85.00	0.3	81.00	0.3	85.80	08/30/92	R. Paillaman
MT	IT	20.0	0.0	01/18/90	75.00	0.4	95.00	0.3	92.00	0.3	86.10	11/14/92	H.C. BULLEN
PT	IT	16.0	0.8	09/11/89	93.30	0.4	90.00	0.3	93.00	0.3	92.22	09/08/92	H.C. Bullen
ET	N/A			/ /								/ /	
VT-1	N/A			/ /								/ /	
VT-2	N/A			/ /								/ /	
VT-3,4	N/A			/ /								/ /	
N/A	N/A												

RESTRICTIONS: NONE ENDORSEMENTS: NONE

This is to certify that the above named person has been found qualified to perform the above listed NDE methods at the levels stated. The individual meets the requirements for education, training and experience as defined in Ebasco Procedure NDE-1, Revision 12, and has successfully completed the required examinations. Individual certification records are on file and available for review at the Ebasco Kearny, New Jersey Office.

LEVEL III NAME: H.C. Bullen SIGNATURE: Harold C. Bullen DATE ISSUED: 01/19/9[redacted]

1333-5 9-88

EBASCO SERVICES INCORPORATED

REPORT OF EYE EXAMINATION

NAME (PRINT) R.J. Vano SSN 167-58-4514

PART - A (To be completed by Eye Examiner)

A. NEAR VISION ACUITY

- ☑ READ JAEGER J-1
- ☐ READ OTHER (Specify) ____
  - ☑ Left eye J-1
  - ☑ Right eye J-1

☑ UNCORRECTED
☐ EYEGLASSES
☐ CONTACTS

B. DISTANT VISION ACUITY

- ☑ SNELLEN
- ☐ OTHER (Specify) ____
  - ☑ Left eye 20/20
  - ☑ Right eye 20/20

☑ UNCORRECTED
☐ EYEGLASSES
☐ CONTACTS

C. COLOR VISION

☐ ISHIHARA ☑ OTHER (Specify) Pseudo-Isochromatic

Number of Plates Tested 16
Number of Plates Correctly Read 16
List of Any Plates Read Incorrectly N/A

NAME OF EXAMINER Frank Malinowski TITLE NDE C III
LOCATION So. Kearny
SIGNATURE F. A. Malinowski DATE OF EXAM 9-11-89

PART - B (To be completed by The Appropriate Level III Individual)

MEETS QA - G.3.1 JAEGER J-1	☐ YES	☐ NO	
MEETS QA - G.3.1 SNELLEN MINIMUM — ONE EYE 20/40	☐ YES	☐ NO	☐ N/A
MEETS QA - G.3.1 COLOR VISION	☐ YES	☐ NO*	☐ N/A

N/A

DISCIPLINE LEVEL - III ____ (PRINT NAME) ____ (SIGNATURE) DATE ____

MEETS NDE - 1 JAEGER J-1	☑ YES	☐ NO	
MEETS NDE - 1 SNELLEN MINIMUM — ONE EYE 20/30	☑ YES	☐ NO	☐ N/A
MEETS NDE - 1 COLOR VISION	☑ YES	☐ NO*	☐ N/A

NDE - LEVEL - III F.A. Malinowski (PRINT NAME) F. A. Malinowski (SIGNATURE) DATE 9-11-89

If failed, provide justification for waiver of failed condition:

Appropriate Level III Signature and Date N/A

See reverse side for instructions.

EBASCO SERVICES INCORPORATED

EBASCO

Materials Engineering Laboratory, Bldg. 100A Port Kearny, South Kearny, NJ 07032, (201) 344-8400

Name: Michael Brannin SSN: 141-60-0508

CERTIFICATION HISTORY

Date	Method & Level	Basic General	Method Specific	Specific Practical	Composite
09/08/89	UT I Trainee	90.00	85.00	83.00	86.40
09/08/89	PT I Trainee	86.70	85.00	97.00	89.28

EBASCO SERVICES INCORPORATED

CURRENT NDE CERTIFICATIONS

NAME: Brannin, Michael P SSN: 141-60-0508 EDUCATION LEVEL: High School

METHOD	LEVEL	HOURS OF TRAIN.	MONTHS OF EXPER.	DATE CERTIFIED	GENERAL/ BASIC GRADE	WT.	SPECIFIC/ METHOD GRADE	WT.	PRACTICAL/ SPEC-PRACT. GRADE	WT.	COMPOS. SCORE	RECERT. DUE	CERTIFIER
RT	N/A			/ /								/ /	
UT	IT	80	0	09/08/89	90.00	0.4	85.00	0.3	83.00	0.3	86.40	08/30/92	R. Paillaman
MT	N/A			/ /								/ /	
PT	IT	16	0	09/08/89	86.70	0.4	85.00	0.3	97.00	0.3	89.28	09/08/92	H.C. Bullen
ET	N/A			/ /								/ /	
VT-1	N/A			/ /								/ /	
VT-2	N/A			/ /								/ /	
VT-3,4	N/A			/ /								/ /	
N/A	N/A												

RESTRICTIONS: NONE ENDORSEMENTS: NONE

This is to certify that the above named person has been found qualified to perform the above listed NDE methods at the levels stated. The individual meets the requirements for education, training and experience as defined in Ebasco Procedure NDE-1, Revision 12, and has successfully completed the required examinations. Individual certification records are on file and available for review at the Ebasco Kearny, New Jersey Office.

LEVEL III NAME: H.C. Bullen SIGNATURE: Harold C Bullen DATE ISSUED: 09/11/89

:331-5.9-88

EBASCO SERVICES INCORPORATED

REPORT OF EYE EXAMINATION

NAME (PRINT) Michael Brannin SSN 141-60-0508

PART - A (To be completed by Eye Examiner)

A. NEAR VISION ACUITY

- ☑ READ JAEGER J-1
- ☐ READ OTHER (Specify) _____
  - ☑ Left eye J-1
  - ☑ Right eye J-1

- ☑ UNCORRECTED
- ☐ EYEGLASSES
- ☐ CONTACTS

B. DISTANT VISION ACUITY

- ☑ SNELLEN
- ☐ OTHER (Specify) _____
  - ☑ Left eye 20/25
  - ☑ Right eye 20/20

- ☑ UNCORRECTED
- ☐ EYEGLASSES
- ☐ CONTACTS

C. COLOR VISION

☑ ISHIHARA ☐ OTHER (Specify) _____

Number of Plates Tested 25

Number of Plates Correctly Read 25

List of Any Plates Read Incorrectly N/A

NAME OF EXAMINER Frank A. Malinowski TITLE NDE CIII

LOCATION So. Kearny

SIGNATURE [signature] DATE OF EXAM 9/8/89

PART - B (To be completed by The Appropriate Level III Individual)

MEETS QA - G.3.1 JAEGER J-1	☐ YES	☐ NO	
MEETS QA - G.3.1 SNELLEN MINIMUM — ONE EYE 20/40 N/A	☐ YES	☐ NO	☐ N/A
MEETS QA - G.3.1 COLOR VISION	☐ YES	☐ NO*	☐ N/A

DISCIPLINE LEVEL - III _____ (PRINT NAME) _____ (SIGNATURE) DATE _____

MEETS NDE - 1 JAEGER J-1	☑ YES	☐ NO	
MEETS NDE - 1 SNELLEN MINIMUM — ONE EYE 20/30	☑ YES	☐ NO	☐ N/A
MEETS NDE - 1 COLOR VISION	☑ YES	☐ NO*	☐ N/A

NDE - LEVEL - III Frank Malinowski (PRINT NAME) [signature] (SIGNATURE) DATE 9/8/89

If failed, provide justification for waiver of failed condition:

Appropriate Level III Signature and Date N/A

See reverse side for instructions.

FINAL REPORT OF INSERVICE INSPECTION
NONDESTRUCTIVE EXAMINATIONS
OF
UNISOLABLE PIPING SYSTEM AND COMPONENTS
FOR POTENTIAL THERMAL STRESS EFFECTS
REFERENCE NRC BULLETIN NO. 88-08

APPENDIX C
EQUIPMENT CERTIFICATIONS
ULTRASONIC EQUIPMENT

MODEL NUMBER	SERIAL NO	PRE OUTAGE LINEARITY	POST OUTAGE LINEARITY
USL-48	213222	02/05/90	03/23/90
USK-7	27276-1078	02/05/90	04/04/90
USK-7	27276-1091	02/05/90	03/23/90

PRE - OUTAGE LINEARITY

PROCEDURE CAL-1

ULTRASONIC INSTRUMENT LINEARITY RECORD

INSTRUMENT | **CALIBRATION BLOCK**

Model No. USL-48 Serial No. 213222 Type RompAS Serial No. 792653

TRANSDUCER

Brand KB-AEROTECH Frequency 2.25 MHZ Size .50" Straight Beam (✓)
Brand KB-AEROTECH Frequency 2.25 MHZ Size .50" Angle Beam (✓)

HORIZONTAL LINEARITY

BACK REFLECTOR	GRID LOC.	ACCEPT LIMITS
1	1	1
2	2	1.90 - 2.10
3	3	2.85 - 3.15
4	4	3.80 - 4.20
5	5	4.75 - 5.25
6	6	5.70 - 6.30
7	7	6.65 - 7.35
8	8	7.60 - 8.40
9	9	8.55 - 9.45
10	10	10

VERTICAL LINEARITY

(SIGNAL AMPLITUDES IN % FSH)

LOW GAIN

NO.	ACTUAL HIGHER SIGNAL	(CALCULATE) 1/2 OF HIGHER	(CALCULATE) ACCEPT. LIMITS*	ACTUAL LOWER SIGNAL
1	100	(50)	(55)-(45)	52
2	90	(45)	(50)-(40)	46
3	80	(40)	(45)-(35)	40
4	70	(35)	(40)-(30)	36
5	60	(30)	(35)-(25)	30
6	50	(25)	(30)-(20)	25
7	40	(20)	(25)-(15)	20
8	30	(15)	(20)-(10)	15
9	20	(10)	(15)-(5)	10
10	10	(5)	(10)-(0)	5

*Acceptance Limits are 1/2 of the Higher Signal ± 5% FSH

AMPLITUDE CONTROL LINEARITY

LOW GAIN

INITIAL AMPLITUDE	db CHANGE	RESULT	LIMIT
80% FSH	DOWN 6	40	32% - 48%
80% FSH	DOWN 12	20	16% - 24%
40% FSH	UP 6	80	64% - 96%
20% FSH	UP 12	80	64% - 96%

HIGH GAIN

INITIAL AMPLITUDE	db CHANGE	RESULT	LIMIT
80% FSH	DOWN 6	40	32% - 48%
80% FSH	DOWN 12	20	16% - 24%
40% FSH	UP 6	80	64% - 96%
20% FSH	UP 12	80	64% - 96%

HIGH GAIN

NO.	ACTUAL HIGHER AIGNAL	(CALCULATE) 1/2 OF HIGHER	(CALCULATE) ACCEPT. LIMITS*	ACTUAL LOWER SIGNAL
1	100	(50)	(55)-(45)	52
2	90	(45)	(50)-(40)	46
3	80	(40)	(45)-(35)	40
4	70	(35)	(40)-(30)	36
5	60	(30)	(35)-(25)	30
6	50	(25)	(30)-(20)	26
7	40	(20)	(25)-(15)	20
8	30	(15)	(20)-(10)	15
9	20	(10)	(15)-(5)	10
10	10	(5)	(10)-(0)	5

*Acceptance Limits are 1/2 of the Higher Signal ± 5% FSH

Performed By: Andrew S. Bullock

UT Level: II Date: 2-5-90

Form 3327 (Non-Stocked) Rev. 11/86

PROCEDURE CAL-1

ULTRASONIC INSTRUMENT LINEARITY RECORD

INSTRUMENT | **CALIBRATION BLOCK**

Model No. USL-48 Serial No. 213222 Type IIW c/s Serial No. 798472

TRANSDUCER

Brand KB-Aerotech Frequency 2.25 mHz Size .50 Straight Beam (✓)
Brand N/A Frequency N/A Size N/A Angle Beam ( )

HORIZONTAL LINEARITY

BACK REFLECTOR	GRID LOC.	ACCEPT LIMITS
1	1	1
2	2	1.90 - 2.10
3	3	2.85 - 3.15
4	4	3.80 - 4.20
5	5	4.75 - 5.25
6	6	5.70 - 6.30
7	7	6.65 - 7.35
8	8	7.60 - 8.40
9	9	8.55 - 9.45
10	10	10

VERTICAL LINEARITY

(SIGNAL AMPLITUDES IN % FSH)

LOW GAIN

NO.	ACTUAL HIGHER SIGNAL	(CALCULATE) 1/2 OF HIGHER	(CALCULATE) ACCEPT. LIMITS*	ACTUAL LOWER SIGNAL
1	100	(50)	(55)-(45)	50
2	90	(45)	(50)-(40)	45
3	80	(40)	(45)-(35)	40
4	70	(35)	(40)-(30)	35
5	60	(30)	(35)-(25)	30
6	50	(25)	(30)-(20)	25
7	40	(20)	(25)-(15)	20
8	30	(15)	(20)-(10)	15
9	20	(10)	(15)-(5)	10
10	10	(5)	(10)-(0)	5

*Acceptance Limits are 1/2 of the Higher Signal ± 5% FSH

AMPLITUDE CONTROL LINEARITY

LOW GAIN

INITIAL AMPLITUDE	db CHANGE	RESULT	LIMIT
80% FSH	DOWN 6	40	32% - 48%
80% FSH	DOWN 12	20	16% - 24%
40% FSH	UP 6	80	64% - 96%
20% FSH	UP 12	80	64% - 96%

HIGH GAIN

INITIAL AMPLITUDE	db CHANGE	RESULT	LIMIT
80% FSH	DOWN 6	40	32% - 48%
80% FSH	DOWN 12	20	16% - 24%
40% FSH	UP 6	80	64% - 96%
20% FSH	UP 12	80	64% - 96%

HIGH GAIN

NO.	ACTUAL HIGHER AIGNAL	(CALCULATE) 1/2 OF HIGHER	(CALCULATE) ACCEPT. LIMITS*	ACTUAL LOWER SIGNAL
1	100	(50)	(55)-(45)	50
2	90	(45)	(50)-(40)	45
3	80	(40)	(45)-(35)	40
4	70	(35)	(40)-(30)	35
5	60	(30)	(35)-(25)	30
6	50	(25)	(30)-(20)	25
7	40	(20)	(25)-(15)	20
8	30	(15)	(20)-(10)	15
9	20	(10)	(15)-(5)	10
10	10	(5)	(10)-(0)	5

*Acceptance Limits are 1/2 of the Higher Signal ± 5% FSH

Performed By: Michael D. Robbins

UT Level: II Date: 3-23-90

Wigm 3/23/90

Pre-outage Linearity

PROCEDURE CAL-1

ULTRASONIC INSTRUMENT LINEARITY RECORD

INSTRUMENT

Model No. USK-7 Serial No. 27276-1078

CALIBRATION BLOCK

Type Kompas Serial No. 792653

TRANSDUCER

Brand KB-Aerotech Frequency 2.25 mHz Size .50" Straight Beam (✓)

Brand KB-AeroTech Frequency 2.25 mHz Size .50" Angle Beam (✓)

HORIZONTAL LINEARITY

BACK REFLECTOR	GRID LOC.	ACCEPT LIMITS
1	1	1
2	2	1.90 - 2.10
3	3	2.85 - 3.15
4	4	3.80 - 4.20
5	5	4.75 - 5.25
6	6	5.70 - 6.30
7	7	6.65 - 7.35
8	8	7.60 - 8.40
9	9	8.55 - 9.45
10	10	10

VERTICAL LINEARITY

(SIGNAL AMPLITUDES IN % FSH)

LOW GAIN

NO.	ACTUAL HIGHER SIGNAL	(CALCULATE) 1/2 OF HIGHER	(CALCULATE) ACCEPT. LIMITS*	ACTUAL LOWER SIGNAL
1	100	(50)	(55)-(45)	50
2	90	(45)	(50)-(40)	45
3	80	(40)	(45)-(35)	40
4	70	(35)	(40)-(30)	35
5	60	(30)	(35)-(25)	30
6	50	(25)	(30)-(20)	25
7	40	(20)	(25)-(15)	20
8	30	(15)	(20)-(10)	15
9	20	(10)	(15)-(5)	10
10	10	(5)	(10)-(0)	5

*Acceptance Limits are 1/2 of the Higher Signal ± 5% FSH

AMPLITUDE CONTROL LINEARITY

LOW GAIN

INITIAL AMPLITUDE	db CHANGE	RESULT	LIMIT
80% FSH	DOWN 6	40	32% - 48%
80% FSH	DOWN 12	22	16% - 24%
40% FSH	UP 6	80	64% - 96%
20% FSH	UP 12	72	64% - 96%

HIGH GAIN

INITIAL AMPLITUDE	db CHANGE	RESULT	LIMIT
80% FSH	DOWN 6	42	32% - 48%
80% FSH	DOWN 12	21	16% - 24%
40% FSH	UP 6	72	64% - 96%
20% FSH	UP 12	80	64% - 96%

HIGH GAIN

NO.	ACTUAL HIGHER AIGNAL	(CALCULATE) 1/2 OF HIGHER	(CALCULATE) ACCEPT. LIMITS*	ACTUAL LOWER SIGNAL
1	100	(50)	(55)-(45)	50
2	90	(45)	(50)-(40)	45
3	80	(40)	(45)-(35)	40
4	70	(35)	(40)-(30)	35
5	60	(30)	(35)-(25)	30
6	50	(25)	(30)-(20)	25
7	40	(20)	(25)-(15)	20
8	30	(15)	(20)-(10)	15
9	20	(10)	(15)-(5)	10
10	10	(5)	(10)-(0)	5

*Acceptance Limits are 1/2 of the Higher Signal ± 5% FSH

FPL

Performed By: Andrew S. Bullock

UT Level: II Date: 2-5-90

Post Outage Linearity

PROCEDURE CAL-1

ULTRASONIC INSTRUMENT LINEARITY RECORD

INSTRUMENT | **CALIBRATION BLOCK**

Model No. USK-7 Serial No. 27276-1078 Type Rompas Serial No. 792653

TRANSDUCER

Brand KBA Frequency 2.25 MHZ Size 1.0" Straight Beam (✓)

Brand N/A Frequency N/A Size N/A Angle Beam ( )

HORIZONTAL LINEARITY

BACK REFLECTOR	GRID LOC.	ACCEPT LIMITS
1	1	1
2	2	1.90 - 2.10
3	3	2.85 - 3.15
4	4	3.80 - 4.20
5	5	4.75 - 5.25
6	6	5.70 - 6.30
7	7	6.65 - 7.35
8	8	7.60 - 8.40
9	9	8.55 - 9.45
10	10	10

VERTICAL LINEARITY

(SIGNAL AMPLITUDES IN % FSH)

LOW GAIN

NO.	ACTUAL HIGHER SIGNAL	(CALCULATE) 1/2 OF HIGHER	(CALCULATE) ACCEPT. LIMITS*	ACTUAL LOWER SIGNAL
1	100	(50)	(45)-(55)	50
2	90	(45)	(40)-(50)	45
3	80	(40)	(35)-(45)	40
4	70	(35)	(30)-(40)	35
5	60	(30)	(25)-(35)	30
6	50	(25)	(20)-(30)	25
7	40	(20)	(15)-(25)	20
8	30	(15)	(10)-(20)	15
9	20	(10)	(5)-(15)	10
10	10	(5)	(0)-(10)	5

*Acceptance Limits are 1/2 of the Higher Signal ± 5% FSH

AMPLITUDE CONTROL LINEARITY

LOW GAIN

INITIAL AMPLITUDE	db CHANGE	RESULT	LIMIT
80% FSH	DOWN 6	40	32% - 48%
80% FSH	DOWN 12	20	16% - 24%
40% FSH	UP 6	80	64% - 96%
20% FSH	UP 12	80	64% - 96%

HIGH GAIN

INITIAL AMPLITUDE	db CHANGE	RESULT	LIMIT
80% FSH	DOWN 6	40	32% - 48%
80% FSH	DOWN 12	20	16% - 24%
40% FSH	UP 6	80	64% - 96%
20% FSH	UP 12	80	64% - 96%

HIGH GAIN

NO.	ACTUAL HIGHER AIGNAL	(CALCULATE) 1/2 OF HIGHER	(CALCULATE) ACCEPT. LIMITS*	ACTUAL LOWER SIGNAL
1	100	(50)	(45)-(55)	50
2	90	(45)	(40)-(50)	45
3	80	(40)	(35)-(45)	40
4	70	(35)	(30)-(40)	35
5	60	(30)	(25)-(35)	30
6	50	(25)	(20)-(30)	25
7	40	(20)	(15)-(25)	20
8	30	(15)	(10)-(20)	15
9	20	(10)	(5)-(15)	10
10	10	(5)	(0)-(10)	5

*Acceptance Limits are 1/2 of the Higher Signal ± 5% FSH

Performed By: [signature]

UT Level: II Date: 4-4-90

PRE-OUTAGE LINEARITY

PROCEDURE CAL-1

ULTRASONIC INSTRUMENT LINEARITY RECORD

INSTRUMENT | **CALIBRATION BLOCK**

Model No. USK-7 Serial No. 27276-1091 Type Rompas Serial No. 788445

TRANSDUCER

Brand KB-AEROTECH Frequency 2.25 MHZ Size .375" Straight Beam (✓)

Brand KB-AEROTECH Frequency 2.25 MHZ Size .375" Angle Beam (✓)

HORIZONTAL LINEARITY

BACK REFLECTOR	GRID LOC.	ACCEPT LIMITS
1	1	1
2	2	1.90 - 2.10
3	3	2.85 - 3.15
4	4	3.80 - 4.20
5	5	4.75 - 5.25
6	6	5.70 - 6.30
7	7	6.65 - 7.35
8	8	7.60 - 8.40
9	9	8.55 - 9.45
10	10	10

VERTICAL LINEARITY

(SIGNAL AMPLITUDES IN % FSH)

LOW GAIN

NO.	ACTUAL HIGHER SIGNAL	(CALCULATE) 1/2 OF HIGHER	(CALCULATE) ACCEPT. LIMITS*	ACTUAL LOWER SIGNAL
1	100	(50)	(55)-(45)	50
2	90	(45)	(50)-(40)	45
3	80	(40)	(45)-(35)	40
4	70	(35)	(40)-(30)	35
5	60	(30)	(35)-(25)	30
6	50	(25)	(30)-(20)	25
7	40	(20)	(25)-(15)	20
8	30	(15)	(20)-(10)	15
9	20	(10)	(15)-(5)	10
10	10	(5)	(10)-(0)	5

*Acceptance Limits are 1/2 of the Higher Signal ± 5% FSH

AMPLITUDE CONTROL LINEARITY

LOW GAIN

INITIAL AMPLITUDE	db CHANGE	RESULT	LIMIT
80% FSH	DOWN 6	40	32% - 48%
80% FSH	DOWN 12	20	16% - 24%
40% FSH	UP 6	80	64% - 96%
20% FSH	UP 12	80	64% - 96%

HIGH GAIN

INITIAL AMPLITUDE	db CHANGE	RESULT	LIMIT
80% FSH	DOWN 6	40	32% - 48%
80% FSH	DOWN 12	20	16% - 24%
40% FSH	UP 6	80	64% - 96%
20% FSH	UP 12	80	64% - 96%

HIGH GAIN

NO.	ACTUAL HIGHER AIGNAL	(CALCULATE) 1/2 OF HIGHER	(CALCULATE) ACCEPT. LIMITS*	ACTUAL LOWER SIGNAL
1	100	(50)	(55)-(45)	50
2	90	(45)	(50)-(40)	45
3	80	(40)	(45)-(35)	40
4	70	(35)	(40)-(30)	35
5	60	(30)	(35)-(25)	30
6	50	(25)	(30)-(20)	25
7	40	(20)	(25)-(15)	20
8	30	(15)	(20)-(10)	15
9	20	(10)	(15)-(5)	10
10	10	(5)	(10)-(0)	5

*Acceptance Limits are 1/2 of the Higher Signal ± 5% FSH

FPL

Performed By: Andrew S. Bullock

UT Level: II Date: 2-5-90

PROCEDURE CAL-1

ULTRASONIC INSTRUMENT LINEARITY RECORD

INSTRUMENT | **CALIBRATION BLOCK**

Model No. USK-7 KRAUTKRAMER Serial No. 27276-1091 Type IIW c/s Serial No. 798472

TRANSDUCER

Brand KB-Aerotech Frequency 2.25 mHz Size .50 Straight Beam (X)
Brand N/A Frequency N/A Size N/A Angle Beam ( )

HORIZONTAL LINEARITY

BACK REFLECTOR	GRID LOC.	ACCEPT LIMITS
1	1	1
2	2	1.90 - 2.10
3	3	2.85 - 3.15
4	4	3.80 - 4.20
5	5	4.75 - 5.25
6	6	5.70 - 6.30
7	7	6.65 - 7.35
8	8	7.60 - 8.40
9	9	8.55 - 9.45
10	10	10

VERTICAL LINEARITY

(SIGNAL AMPLITUDES IN % FSH)

LOW GAIN

NO.	ACTUAL HIGHER SIGNAL	(CALCULATE) 1/2 OF HIGHER	(CALCULATE) ACCEPT. LIMITS*	ACTUAL LOWER SIGNAL
1	100	(50)	(55)-(45)	50
2	90	(45)	(50)-(40)	45
3	80	(40)	(45)-(35)	40
4	70	(35)	(40)-(30)	35
5	60	(30)	(35)-(25)	30
6	50	(25)	(30)-(20)	25
7	40	(20)	(25)-(15)	20
8	30	(15)	(20)-(10)	15
9	20	(10)	(15)-(5)	10
10	10	(5)	(10)-(0)	5

*Acceptance Limits are 1/2 of the Higher Signal ± 5% FSH

AMPLITUDE CONTROL LINEARITY

LOW GAIN

INITIAL AMPLITUDE	db CHANGE	RESULT	LIMIT
80% FSH	DOWN 6	40	32% - 48%
80% FSH	DOWN 12	20	16% - 24%
40% FSH	UP 6	80	64% - 96%
20% FSH	UP 12	80	64% - 96%

HIGH GAIN

INITIAL AMPLITUDE	db CHANGE	RESULT	LIMIT
80% FSH	DOWN 6	40	32% - 48%
80% FSH	DOWN 12	20	16% - 24%
40% FSH	UP 6	80	64% - 96%
20% FSH	UP 12	80	64% - 96%

HIGH GAIN

NO.	ACTUAL HIGHER AIGNAL	(CALCULATE) 1/2 OF HIGHER	(CALCULATE) ACCEPT. LIMITS*	ACTUAL LOWER SIGNAL
1	100	(50)	(55)-(45)	50
2	90	(45)	(50)-(40)	45
3	80	(40)	(45)-(35)	40
4	70	(35)	(40)-(30)	35
5	60	(30)	(35)-(25)	30
6	50	(25)	(30)-(20)	25
7	40	(20)	(25)-(15)	20
8	30	(15)	(20)-(10)	15
9	20	(10)	(15)-(5)	10
10	10	(5)	(10)-(0)	5

*Acceptance Limits are 1/2 of the Higher Signal ± 5% FSH

Performed By: Michael D. Robbins

UT Level: II Date: 3-23-90

wjm 3/23/90

FINAL REPORT OF INSERVICE INSPECTION
NONDESTRUCTIVE EXAMINATIONS
OF
UNISOLABLE PIPING SYSTEM AND COMPONENTS
FOR POTENTIAL THERMAL STRESS EFFECTS
REFERENCE NRC BULLETIN NO. 88-08

APPENDIX D
EQUIPMENT CERTIFICATIONS
ULTRASONIC SEARCH UNITS

SERIAL NO	MAKE	TYPE	SIZE	FREQUENCY
D24473	GAMMA	MSWS	.25"	2.25
H12310	GAMMA	MSWS	.25"	2.25
L23777	GAMMA	MSWS	.25"	2.25

TRANSDUCER CERTIFICATION

Transducer Description

as GAMMA S/N 024473

Frequency 2.25 MHz Size .25

Style MSWS Connector MD

☑ Contact ☐ Immersion ☐ Nonfocused

Water Path _____ ☐ Spherical

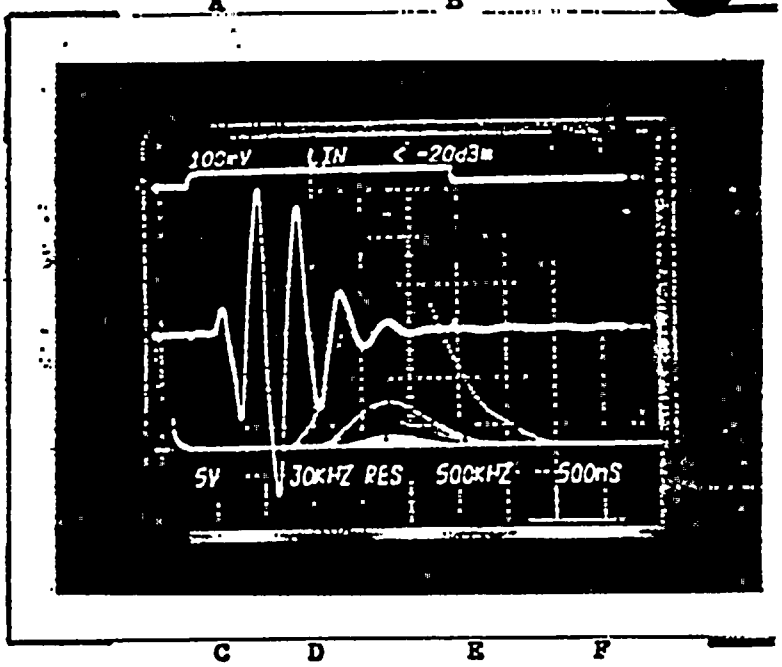
Target 1" Plex ☐ Cylindrical

Relative Sensitivity 17 dB

Energy Setting 2 Impedance 50

☑ Peak or ☐ Center Frequency 2.25 MHz

Inspector SCD Date 9-28-84



Testing Procedure

The real time waveform shown in the photo above is the first return echo from a reflector selected with respect to transducer type. All contact (wearplate) transducers are tested on a steel (4340) plate while epoxy-faced shear wave transducers are tested on a flat polymer block. Dual contact transducers are tested on a flat polymer block unless otherwise specified. Delay fingertip removable (Style DFR) transducers are tested off of the tip of the delay line. Nonfocused immersion transducers are tested in water over a flat steel plate using a water path as specified above. Focused immersion transducers are tested the same as nonfocused transducers except that the water path used is equal to the actual focal length.

Using an AEROTECH Ultrasonic Transducer Analyzer, Model UTA-4, and a Tektronix 7L12 frequency spectrum analyzer in a 7704A Mainframe, the real time waveform, UTA-4 gate signal, and the frequency spectrum of the gated signal are simultaneously displayed and photographed. Using the linear attenuator in the UTA-4 receiver, the amplitude of the real time waveform is adjusted to a six centimeter amplitude (± 1 dB) on the CRT. With the vertical calibration of Trace II fixed at 100 millivolts per division, the amount of attenuation used provides a relative sensitivity rating for all transducers certified by Krautkramer Branson.

Real Time Waveform - Trace II

Screen writing figures A and F provide the vertical and horizontal screen calibration respectively for Trace II.

Gate Marker - Trace I

Screen writing figure C provides the vertical amplitude of the gate marker and is an inconsequential figure. The horizontal calibration for Trace I is the same as that for Trace II. The portion of Trace II that falls within the gate time period is the signal fed to the frequency spectrum analyzer.

Frequency Spectrum - Trace III

Screen writing figure E provides the horizontal calibration for Trace III. Figures [redacted] and [redacted] the spectrum analyzer's attenuator and resolution settings respectively.

KRAUTKRAMER BRANSON
P. O. Box 350
Lewistown, PA 17044

Transducer Description

Series GAMMA

ency 2.25 MHz Size .25"

.. No. [redacted]

☒ Contact ☐ Immersion ☒ Nonfocused
Water Path ☐ Spherical
1" Plex. ☐ Cylindrical

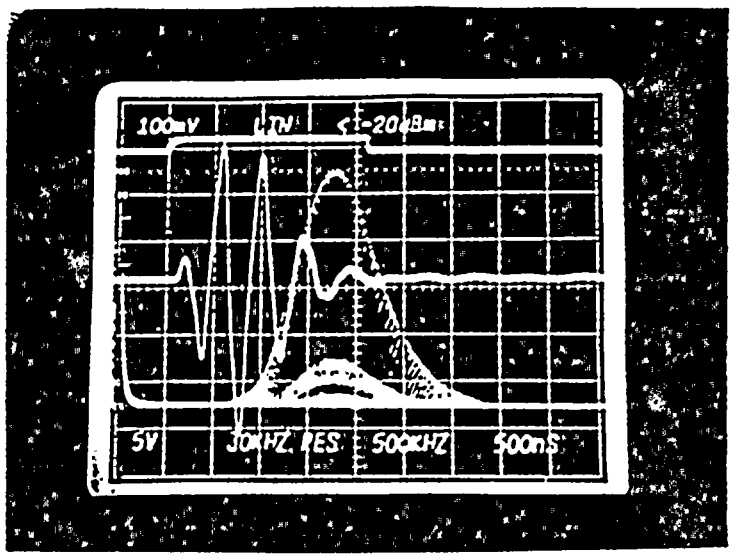
Style MSWS Connector MD

Relative Sensitivity 22 DB

.gy Setting 2 Impedance 50Ω

Inspector MK Date 10-5-83

A B



TRACE I

TRACE II

TRACE III

C D E F

Testing Procedure

The real time waveform shown in the photo above is the first return echo from a reflector selected with respect to transducer type. All contact (wearplate) transducers are tested on a 1.0" flat steel (4340) plate while epoxy-faced shear wave transducers are tested on a flat polymer block. Delay fingertip removable (Style DFR) transducers are tested off of the tip of the delay line. Nonfocused immersion transducers are tested in water over a flat ·l plate using a water path as specified above. Focused immersion ducers are tested the same as nonfocused transducers except that the path used is equal to the actual focal length.

Using an AEROTECH Ultrasonic Transducer Analyzer, Model UTA-4, and a Tektronix 7L12 frequency spectrum analyzer in a 7704A Mainframe, the real time waveform, UTA-4 gate signal, and the frequency spectrum of the gated signal are simultaneously displayed and photographed. Using the linear attenuator in the UTA-4 receiver, the amplitude of the real time waveform is adjusted to a six centimeter amplitude (± 1 db) on the CRT. With the vertical calibration of trace II fixed at 100 millivolts per division, the amount of attenutation used provides a relative sensitivity rating for all transducers certified by ·autkramer Branson.

Real Time Waveform - Trace II

Screen writing figures A and F provide the vertical and horizontal screen calibration respectively for trace II.

Gate Marker - Trace I

Screen writing figure C provides the vertical amplitude of the gate marker and is an inconsequential figure. The horizontal calibration for trace I is the same as that for trace II. The portion of trace II that falls within the ·te time period is the signal fed to the frequency spectrum analyzer.

··ency Spectrum - Trace III

reen writing figure E provides the horizontal calibration for trace III. Figures B and D show the spectrum analyzer's attenuator and resolution settings respectively.

KRAUTKRAMER BRANSON
P. O. Box 350

TRANSDUCER CERTIFICATION

Transducer Description

es GAMMA S/N [redacted]

Frequency .225 MHz Size .25

Style MSW2S Connector MC

☑ Contact ☐ Immersion ☐ Nonfocused

Water Path 1.0A ☐ Spherical

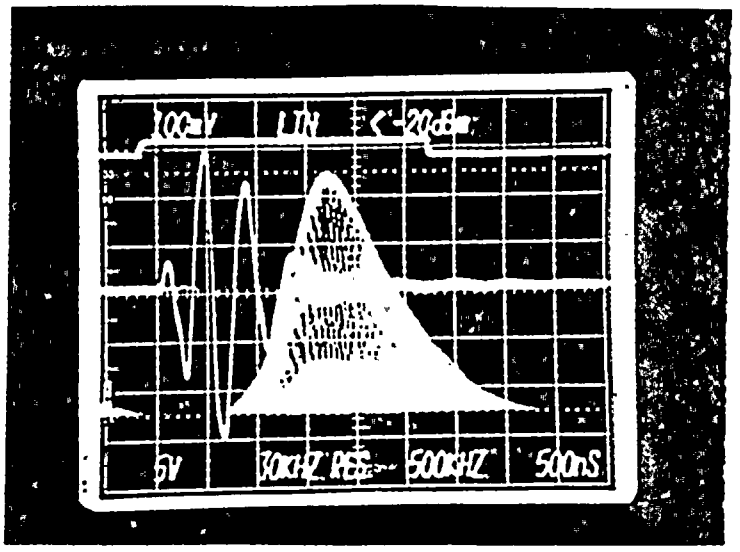
Target 1.0" P/E x ☐ Cylindrical

ative Sensitivity 21 dB

Energy Setting 2 Impedance 50

☑ Peak or ☐ Center Frequency 2.2 MHz

Inspector JCD Date 11-25-87



Testing Procedure

The real time waveform shown in the photo above is the first return echo from a reflector ected with respect to transducer type. All contact (wearplate) transducers are tested on a steel (4340) plate while epoxy-faced shear wave transducers are tested on a flat po r ock. Dual contact transducers are tested on a flat polymer block unless otherwise specified. Delay fingertip removable (Style DFR) transducers are tested off of the tip of the delay line. Nonfocused immersion transducers are tested in water over a flat steel plate using a water path as specified above. Focused immersion transducers are tested the same as nonfocused transducers except that the water path used is equal to the actual focal length.

Using an AEROTECH Ultrasonic Transducer Analyzer, Model UTA-4, and a Tektronix 7L12 frequency spectrum analyzer in a 7704A Mainframe, the real time waveform, UTA-4 gate signal, and the frequency spectrum of the gated signal are simultaneously displayed and photographed. Using the linear attenuator in the UTA-4 receiver, the amplitude of the real time waveform is adjusted to a six centimeter amplitude (± 1 dB) on the CRT. With the vertical calibration of Trace II fixed at 100 millivolts per division, the amount of attenuation used provides a ative sensitivity rating for all transducers certified by Krautkramer Branson.

Real Time Waveform - Trace II

Screen writing figures A and F provide the vertical and horizontal screen calibration respectively for Trace II.

Gate Marker - Trace I

Screen writing figure C provides the vertical amplitude of the gate marker and is an inconsequential figure. The horizontal calibration for Trace I is the same as that for Trace II. The portion of Trace II that falls within the gate time period is the signal fed to the frequency spectrum analyzer.

quency Spectrum - Trace III

Screen writing figure E provides the horizontal calibration for Trace III. Figures nd ow the spectrum analyzer's attenuator and resolution settings respectively.

KRAUTKRAMER BRANSON
P. O. Box 350
Lewistown, PA 17044

FINAL REPORT OF INSERVICE INSPECTION
NONDESTRUCTIVE EXAMINATIONS
OF
UNISOLABLE PIPING SYSTEM AND COMPONENTS
FOR POTENTIAL THERMAL STRESS EFFECTS
REFERENCE NRC BULLETIN NO. 88-08

APPENDIX E
EQUIPMENT CERTIFICATIONS
ULTRASONIC COUPLANT

BATCH NUMBER	MANUFACTURER	DESCRIPTION
8330	ECHO LABS	ULTRAGEL II

BRANCH OFFICES
Chicago, Illinois
Philadelphia, Pennsylvania

Cable Address: INTEL
Telex: 139187

International Testing Laboratories, Inc.

Materials Testing and Consulting Engineers
Weighers, Samplers and Assayers
578-582 MARKET STREET
NEWARK, N. J., 07105

PHONES (201) 589-4772-3-4

REPORT OF ASSAY

No. 486170 DATE February 4, 1983

Our assay of the sample of Ultragel II

From Technicare-Echo, Incoprorated

Marked: Batch #8330
Spec. ASTM-D-129 and ASTM-D-808, 1982
Purchase Order No. 008647 SDW and submitted to sh

Halogens (Chlorides)	:	21.4 ppm
Sulphur	:	4.9 ppm

I, David N. Hoffman, Director of Laboratories, do hereby certify that the above is true and correct.

Sworn to and Subscribed before me
this 4th day of February, 1983.
[illegible]
My Notary Public Commission expires
August 13, 1984.

To

Technicare-Echo, Incorporated
Lewistown, Penna.

INTERNATIONAL TESTING LABORATORIES, IN

David N. Hoffman

FINAL REPORT OF INSERVICE INSPECTION
NONDESTRUCTIVE EXAMINATIONS
OF
UNISOLABLE PIPING SYSTEM AND COMPONENTS
FOR POTENTIAL THERMAL STRESS EFFECTS
REFERENCE NRC BULLETIN NO. 88-08

APPENDIX F
EQUIPMENT CERTIFICATIONS
SURFACE THERMOMETERS

SERIAL NUMBER	MANUFACTURER	CAL DATE	EXPIRATION DATE
90-006	PTC INSTRUMENTS MODEL 312F	01/19/90	04/19/90
90-010	PTC INSTRUMENTS MODEL 312F	01/19/90	04/19/90

TEMPERATURE INDICATOR

CHECK RECORD

(S/N) Identification 90 - 006

CHECK DATE	VOID DATE	CHECK READINGS 50° F LOW STD.	LOW METER	HIGH STD.	HIGH METER	SIGNATURE
1-19-90	4-19-90	43°	42°	96°	96°	

INSTRUCTIONS:

(1) Place your indicator and the control indicator side by side in a cold location (or in contact with a cold item). Wait 60 seconds or until the readings stabilize, whichever is longer.

(2) Read and record the readings from both.

(3) Place the two (2) indicators in a fairly warm area (50° F hotter) or in contact with a hot item. Wait 60 seconds or until the readings stabilize, whichever is longer.

(4) Read and record the readings from both.

(5) The respective readings shall agree within ± 10%

(6) Retain a copy for your records, forward original to the Juno file.

Reference (Control Unit) Standard Identification (S/N) 018393

Reference (Control Unit) Standard Calibration Date 4-29-88

TEMPERATURE INDICATOR

CHECK RECORD

(S/N) Identification 90-010

CHECK DATE	VOID DATE	CHECK READINGS 50° F LOW STD.	LOW METER	HIGH STD.	HIGH METER	SIGNATURE
01-19-90	04-19-90	43°	46°	96°	96°	[signature]

INSTRUCTIONS:

(1) Place your indicator and the control indicator side by side in a cold location (or in contact with a cold item). Wait 60 seconds or until the readings stabilize, whichever is longer.

(2) Read and record the readings from both.

(3) Place the two (2) indicators in a fairly warm area (50° F hotter) or in contact with a hot item. Wait 60 seconds or until the readings stabilize, whichever is longer.

(4) Read and record the readings from both.

(5) The respective readings shall agree within ± 10%

(6) Retain a copy for your records, forward original to the Juno file.

Reference (Control Unit) Standard Identification (S/N) 018393

Reference (Control Unit) Standard Calibration Date 4-29-88

FINAL REPORT OF INSERVICE INSPECTION
NONDESTRUCTIVE EXAMINATIONS
OF
UNISOLABLE PIPING SYSTEM AND COMPONENTS
FOR POTENTIAL THERMAL STRESS EFFECTS
REFERENCE NRC BULLETIN NO. 88-08

APPENDIX G
EQUIPMENT CERTIFICATIONS
PENETRANT MATERIAL

BATCH NO.	MANUFACTURER	TYPE	DESCRIPTION
89K039	MAGNAFLUX	SKL-HF/S	SPOTCHECK PENETRANT
87M025	MAGNAFLUX	SKC-NF/2C-7B	SPOTCHECK CLEANER
88B019	MAGNAFLUX	SKD-NF/ZB-9B	SPOTCHECK/ZYGLO DEVELOPER

MAGNAFLUX®

Date: October 25, 1989

Purchase Order No. C90663 90169

SUBJECT: Spotcheck Penetrant Type: SKL-HF/S Batch No. 89K039

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) ASME Boiler and Pressure Vessel Code, 1989 Edition, Section V, Nondestructive Examination, Paragraph T-625 and Article 24 as applicable.
   (d) ASTM E-165-80, Paragraph 7.1.
   (e) NAVSEA 250-1500-1 (Rev. 10 June 1979 and Rev. 11 May 1983) Paragraphs 12.5.1.1 and 12.5.1.1.1.
   (f) MIL-STD-271F(SH), 27 June 1986, Paragraphs 5.3 and 5.3.1.
   (g) MIL-STD-2132A(SH), 15 March 1985, Paragraphs 7.1.1, 7.1.2, and 7.1.3 and Appendix C, Paragraph 30.

The following test results were obtained:

Sulfur: 0.0139 wt. % of residue. Halogen: 0.0156 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.

MAGNAFLUX

M. Plamoottil

M. Plamoottil - Manager, Quality Assurance

NOTES:
1. Our batch number appears on the bottom of all aerosol cans and on the label of all bulk 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, 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 ml 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.

MAGNAFLUX, A Division of Illinois Tool Works Inc
306 Industrial Street | P O Box 366 | DeWitt Iowa 52742 | Telephone 319.659.8143 | Fax 319.659.9712

MAGNAFLUX Corporation • 7300 West Lawrence Avenue • Chicago, IL 60656 • Telephone 312-867-8000

MAGNAFLUX

Date: February 16, 1988

Purchase Order No: _____

SUBJECT: Spotcheck Cleaner/Remover Type: SKC-NF/2C-7B Batch No. 87X025

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 1985 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-271F(SH), 27 June 1986, Paragraphs 5.3 and 5.3.1.
   (f) MIL-STD-2132A(SH), 15 March 1985, Paragraphs 7.1.1, 7.1.2, and 7.1.3 and Appendix C, Paragraph 30.
   (g) RDT Standard F3-6T, May 1974 and October 1975 including Amendments 1 (4-6-76) and 2 (2-9-78), Article 6, Paragraph T-30.
   (h) General Electric P.S. 9000, 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): 0.0001 g/100g. 0.0002 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.

MAGNAFLUX CORPORATION

C. J. Britton

C. J. Britton - Manager, Quality Assurance
M. Piacentil - 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, RDT F3-6T 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 halogens. 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-10/87

MAGNAFLUX®

Date: October 25, 1989

Purchase Order/Contract No. C90663 90169

We hereby certify that the Spotcheck Penetrant, Type SKL-HF/S, Batch No. 89K039, supplied meets the requirements of MIL-I-25135E, and is approved by the U.S. Air Force.

When tested according to paragraph 4.4.1.2., Sampling Plan A, the following results were obtained:

(a) Flash Point (PMCT), 4.5.3	209 °F
(b) Viscosity, (3.04 cs Nominal), 4.5.4	3.00 cs @ 100°F
(c) Developer Fluorescence, 4.5.14	NA
(d) Water Content, 4.5.2[illegible]	NA %
(e) Penetrant Removability, 4.5.17 (VP-1 Standard)	Passes
(f) Water Tolerance, 4.5.12	NA %
(g) Fluorescent Brightness of Penetrants, 4.5.7 (Standard)	NA %
(h) Surface Wetting, 4.5.6	Passes
(i) Thermal Stability, 4.5.9	NA %
(j) Redispersibility, 4.5.13	NA
(k) Valve Leakage, 4.5.20	NA
(l) Net Content, 4.5.19	NA

We further certify that this material meets the requirements of MIL-STD-6866 (29 November 1985), Paragraph 4.4.1 and where applicable, 5.8.4.

MAGNAFLUX®

M. Plamoottil

M.J. Plamoottil - Manager, Quality Assurance

Form No. 1579B
Rev 10/89

R-90-0916 PAGE 7 OF 7

MAGNAFLUX, A Division of Illinois Tool Works Inc
306 Industrial Street | P.O. Box 366 | DeWitt, Iowa 52742 | Telephone: 319-659-8143 | Fax: 319-659-9713

MAGNAFLUX Corporation 7300 West Lawrence Avenue • Chicago, IL 60656 • Telephone 312-867-8000

MAGNAFLUX

Date: February 16, 1989

Purchase Order No. _____

SUBJECT: Spotcheck/Zyglo Developer Type: SKD-NF/ZP-9B Batch No. 88B019

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-271F(SH), 27 June 1986, Paragraphs 5.3 and 5.3.1.
   (f) MIL-STD-2132A(SH), 15 March 1985, Paragraphs 7.1.1, 7.1.2, and 7.1.3 and Appendix C, Paragraph 30.
   (g) DOT Standard P3-6T, May 1974 and October 1975 including Amendments 1 (4-6-76) and 2 (2-9-78), Article 6, Paragraph T-30.
   (h) General Electric P.S. 9000, Rev. 2 (2-21-80) Paragraphs 2.3 and 2.4.

The following test results were obtained:
Sulfur: 0.0561 wt. % of residue. Halogen: 0.0417 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.

MAGNAFLUX CORPORATION

A. J. Britton

A. S. Britton - Manager, Quality Assurance
M. Piansettil - 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, DOT P3-6T 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 analysed 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. 1560 R-10/87

0037115

0037116

FINAL REPORT OF INSERVICE INSPECTION
NONDESTRUCTIVE EXAMINATIONS
OF
UNISOLABLE PIPING SYSTEM AND COMPONENTS
FOR POTENTIAL THERMAL STRESS EFFECTS
REFERENCE NRC BULLETIN NO. 88-08

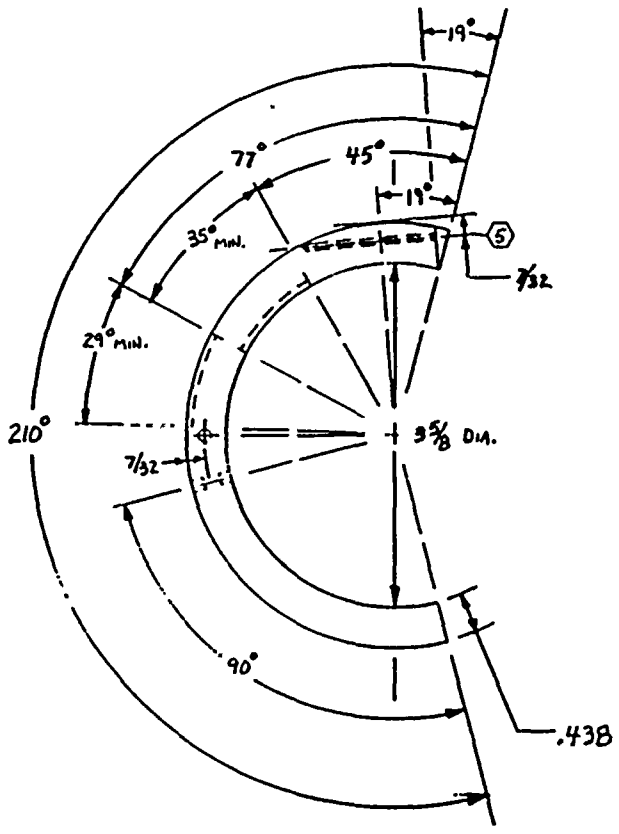
APPENDIX H
EXAMINATION PROCEDURES

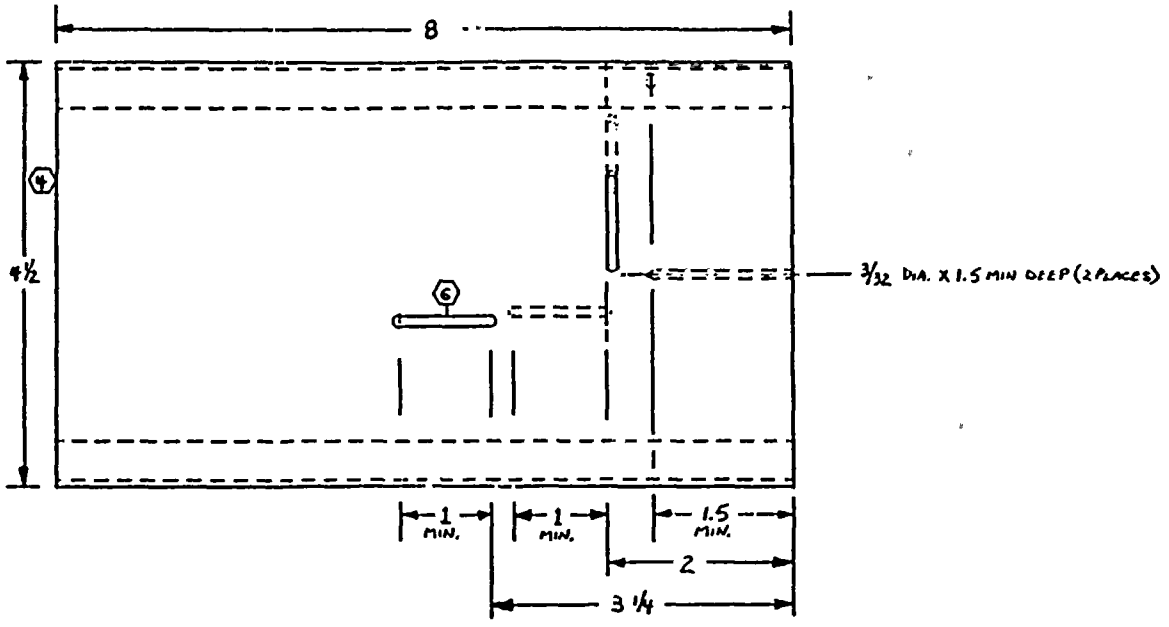
PROCEDURE NUMBER	REVISION NUMBER	FIELD CHANGE	TITLE
NDE 3.3	2	N/A	LIQUID PENETRANT EXAMINATION SOLVENT REMOVABLE VISIBLE DYE TECHNIQUE
NDE 5.4	7	N/A	ULTRASONIC EXAMINATION OF AUSTENITIC PIPING WELDS
NDE 5.19	0 FCA	N/A	ULTRASONIC EXAMINATION OF SOCKET WELDS IN PRESSURIZER AUXILIARY SPRAY LINE (PTN3&4)

FINAL REPORT OF INSERVICE INSPECTION
NONDESTRUCTIVE EXAMINATIONS
OF
UNISOLABLE PIPING SYSTEM AND COMPONENTS
FOR POTENTIAL THERMAL STRESS EFFECTS
REFERENCE NRC BULLETIN NO. 88-08

APPENDIX I
CALIBRATION BLOCK

CALIBRATION BLOCK NUMBER	DESCRIPTION	DRAWING NO.
UT-53	.438 INCH THICK, 4.0 INCH DIA	D-ISI-024
UT-54	.343 INCH X .893 INCH SOCKET WELDED FITTING TO PIPE MOCK UP	FSK-M-3077





TOLERANCES (UNLESS OTHERWISE NOTED)
DECIMALS ± .005
FRACTIONS ± 1/32
WHOLE NUMBERS ± 1/8
ANGLES ± 1°

7 - FINISH INTERIOR OF HOLES & GROOVES 63 RMS, OTHER SURFACES 250 RMS

(6) END MILL GROOVE 1/8 WIDE X .093 DEEP, 4 PLACES

(5) BREAK-THRU ALLOWED

(4) STEEL STAMP BLOCK ID No. UT-53-4-.438-TKY THIS END IN CHARACTERS 3/16 MIN. HEIGHT, STAMP HEAT No. EITHER END

3- DEBURR & BREAK SHARP EDGES 1/32.

2- ALL DIMENSIONS ARE IN INCHES.

1- FABRIC[illegible]OM STAINLESS BAR STOCK SA-182, TP 316 HT# 164865.

NOTES

DESIGN COMPLIES WITH ASME V ART 5 & CC N-335 1983

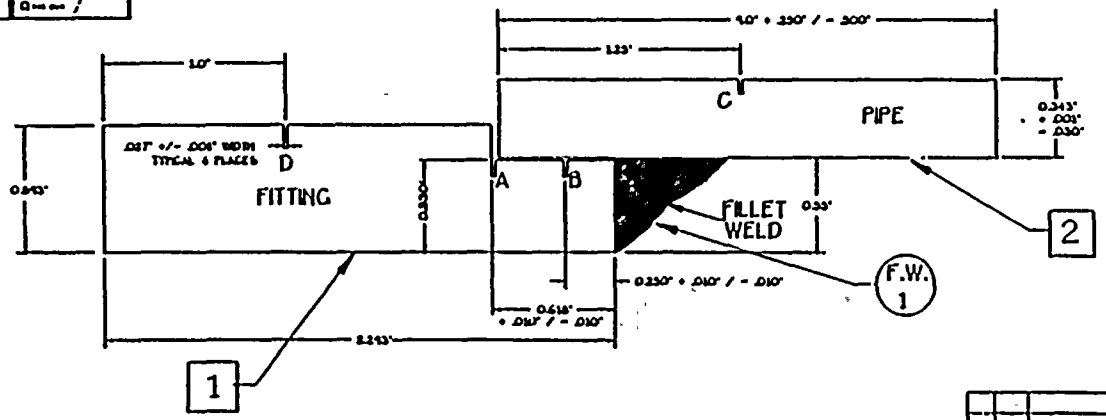
REVISIONS	
0	ULTRASONIC CALIBRATION BLOCK
	FLORIDA POWER & LIGHT COMPANY
	UT-53-4-.438-TKY
DRAWN BY	DATE
CHECKED BY	DATE:
APPROVED BY	DATE 12-2-85
	SHEET 1 OF 1
	D-ISI-024

	1/2" A.E.
	A5.350 GR
	YES
	GR 316
	N/A
	50° MIN.
	250° MAX.
	N/A

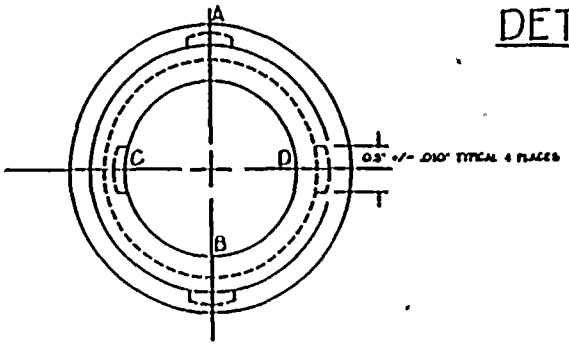
received
1-29-90

BILL OF MATERIALS

ITEM	QTY	DESCRIPTION	MTL	CA	REF
01	1	PIPE SMLS 316	SA-376	316	304-0171
02	1	2" SCH 160 FITT	SA-182	F316	304-5815



DETIAL "A"



DETAIL "B"

NOTES

1) WELD #1 SHALL MEET THE QUALITY GROUP "A" REQUIREMENTS OF THE F.P.L. WELD CONTROL MANUAL
2) LINE CLASS IS 2501
3) THIS DWG. IS FOR CAL. BLOCK FABRICATION ONLY. NOT FOR PERM. PLANT INSTALLATION
4) INSTALL PIPE INTO CPLG. PER DETAIL "B"

FOR INFORMATION ONLY. VERIFY AGAINST STICK FILE DWG. PRIOR TO USE

NO.	DATE	REVISIONS	BY	CHK.	ENGR.	WELD	APP.	APP.
0		ISSUE FOR CONST.	ML					

BECHTEL CONSTRUCTION CO.
GAITHERSBURG, MARYLAND
JOB 10003

FLORIDA POWER & LIGHT COMPANY
TURKEY POINT NUCLEAR UNITS
UNIT NO. 3 1070-760 MW INSTALLATION
UNIT NO. 4 1071-760 MW INSTALLATION

I.S.I. CALIBRATION BLOCK

DRAWN BY MDL
DATE 1/22/90
SCALE NONE
DRAWING NO. FSK-M-3077
REV 0
CWO: 500246
PC/M: N/A

FINAL REPORT OF INSERVICE INSPECTION
NONDESTRUCTIVE EXAMINATIONS
OF
UNISOLABLE PIPING SYSTEM AND COMPONENTS
FOR POTENTIAL THERMAL STRESS EFFECTS
REFERENCE NRC BULLETIN NO. 88-08

APPENDIX J
LIQUID PENETRANT DOCUMENTATION LOG

DATA SHEET NUMBER	IDENTIFICATION NUMBER	DESCRIPTION
3.3-201	2"-CH-1310-1	REDUCING TEE - PIPE
3.3-202	2"-CH-1310-2	PIPE - VALVE 3-313
3.3-230	3"-CH-1301-42	PIPE - ELBOW
3.3-233	3"-CH-1301-43	ELBOW - PIPE

LIQUID PENETRANT EXAMINATION DATA SHEET

CIS-5

Procedure No. NDE 3.3 Data Sheet No. 3.3-201

Revision 2 Page 1 of 1

Plant Name/Unit: PTN-3 Date: 02-16-90

Identification of Item Examined: 2"-RC-1310-1 Iso: 003-A31

Examiner's Name: Michael D. Robbins SNT Level II

CLEANER	PENETRANT	REMOVER	DEVELOPER
Brand: MAGNAFLUX	Brand: MAGNAFLUX	Brand: MAGNAFLUX	Brand: MAGNAFLUX
Type: SKC-NF/ZC-7B	Type: SKL-HF/S	Type: SKC-NF/ZC-7B	Type: SKD-NF/ZP-9B
Batch No. 87M025	Batch No. 89K039	Batch No. 87M025	Batch No. 88B019

Time

Cleaning Completed 0900 Dwell Time 0907 | 0927 Removal Completed 0935 Time Applied 0942 Time Read 0952

Additional Information

Sketch Attached NO Temperature AMBIENT Thermometer S/N N/A

Camera Photo Attached NO Other N/A

Ind. No.	L Location	W Location	Up or Downstream	Round or Linear	Dia. or Lenght	Accept/ Reject
NO RECORDABLE INDICATIONS						

D. Rogers 2/20/90
ANII DATE

Sketch:

NOTE: DUE TO THE CLOSE PROXIMITY OF THE FOLLOWING WELDS, ALL EXAMINATIONS WERE PERFORMED SIMULTANEOUSLY:

2"-RC-1310-1
2"-RC-1310-2
2"-RC-1310-3
2"-RC-1310-4
4"-1302-4
4"-1306-1A
4"-1306-3
4"-1304-7

3 mok 2-16-90

Reviewed by Chris M. Redding 2/17/90

Form 3326 (Non-Stocked) Rev. 10/86

LIQUID PENETRANT EXAMINATION DATA SHEET

CIS-5

Procedure No. NDE 3.3 Data Sheet No. 3.3.202

Revision 2 Page 1 of 1

Plant Name/Unit: PTN-3 Date: 02-16-90

Identification of Item Examined: 2"-RC-1310-2 Iso: 003-A31

Examiner's Name: Michael D. Robbins SNT Level II

CLEANER	PENETRANT	REMOVER	DEVELOPER
Brand: MAGNAFLUX	Brand: MAGNAFLUX	Brand: MAGNAFLUX	Brand: MAGNAFLUX
Type: SKC-NF/ZC-7B	Type: SKL-HF/S	Type: SKC-NF/ZC-7B	Type: SKD-NF/ZP-9B
Batch No. 87M025	Batch No. 89K039	Batch No. 87M025	Batch No. 88B019

Time

Cleaning Completed 0900 Dwell Time 0907/0927 Removal Completed 0935 Time Applied 0942 Time Read 0952

Additional Information

Sketch Attached NO Temperature AMBIENT Thermometer S/N N/A

Camera Photo Attached NO Other N/A

Ind. No.	L Location	W Location	Up or Downstream	Round or Linear	Dia. or Lenght	Accept/ Reject
NO RECORDABLE INDICATIONS						

D C Beyer 2/20/90
ANII DATE

Sketch:

NOTE: DUE TO THE CLOSE PROXIMITY OF THE FOLLOWING WELDS, ALL EXAMINATIONS WERE PERFORMED SIMULTANEOUSLY:

2"- RC-1310-1
2"- RC-1310-2
2"- RC-1310-3
2"- RC-1310-4
4"- RC-1302-4
4"- RC-1306-1A
4"- RC-1306-3
4"- RC-1308-7

3 mor 2-16-90

Reviewed by Chris M. Redding 2/17/90

Form 3326 (Non-Stocked) Rev. 10/86

LIQUID PENETRANT EXAMINATION DATA SHEET

CIS-5

Procedure No. NDE 3.3 Data Sheet No. 3.3.230

Revision 2 Page 1 of 1

Plant Name/Unit: PTN-3 Date: 2-23-90

Identification of Item Examined: 3"-CH-1301-42 Iso: 003-A44

Examiner's Name: Michael D. Robbins SNT Level II

CLEANER	PENETRANT	REMOVER	DEVELOPER
Brand: Magnaflux	Brand: Magnaflux	Brand: Magnaflux	Brand: Magnaflux
Type: SKC-NF/ZC-7B	Type: SKL-HF/S	Type: SKC-NF/ZC-7B	Type: SKD-NF/ZP-4B
Batch No. 87M025	Batch No. 89L039	Batch No. 87M025	Batch No. 88R019

Time

Cleaning Completed 1335 Dwell Time 1340 | 1400 Removal Completed 1405 Time Applied 1410 Time Read 1420

Additional Information

Sketch Attached NO Temperature Ambient Thermometer S/N N/A

Camera Photo Attached NO Other N/A

Ind. No.	L Location	W Location	Up or Downstream	Round or Linear	Dia. or Lenght	Accept/ Reject
No Recordable Indications						

Sketch:

NOTE: Faint indication at Toe of weld, 360° intermittent geometry - non relevant.

Due To The close Proximity of The Following welds, All Examinations were performed Simultaneously.*
weld # 3"-CH-1301-42
weld # 3"-CH-1301-43

Reviewed by [signature] ANII

D E Rogers 2/26/90 DATE

Form 3326 (Non-Stocked) Rev. 10/86

LIQUID PENETRANT EXAMINATION DATA SHEET

CIS-5

Procedure No. NDE 3.3 Data Sheet No. 3.3.233

Revision 2 Page 1 of 1

Plant Name/Unit: PTN-3 Date: 2-23-90

Identification of Item Examined: 3"-CH-1301-43 Iso: 003-A44

Examiner's Name: Michael D. Robbins SNT Level II

CLEANER	PENETRANT	REMOVER	DEVELOPER
Brand: Magnaflux	Brand: Magnaflux	Brand: Magnaflux	Brand: Magnaflux
Type: SKC-NF/ZC-7B	Type: SKL-HF/S	Type: SKC-NF/ZC-7B	Type: SKD-NF/ZP-4B
Batch No. 87M025	Batch No. 89K039	Batch No. 87M025	Batch No. 88B019

Time

Cleaning Completed 1335 Dwell Time 1340 | 1400 Removal Completed 1405 Time Applied 1410 Time Read 1420

Additional Information

Sketch Attached NO Temperature Ambient Thermometer S/N N/A

Camera Photo Attached NO Other N/A

Ind. No.	L Location	W Location	Up or Downstream	Round or Linear	Dia. or Lenght	Accept/ Reject
No Recordable Indications						

Sketch:

NoTe: Faint indication at Toe of weld, 360° intermittent geometry - non relevant.

Due To the close proximity of the following welds, All Examinations were performed Simultaneously.
weld# 3"-CH-1301-42
weld# 3"-CH-1301-43

Reviewed by [signature] D.E. Roger 2/26/90 ANI DATE

Form 3326 (Non-Stocked) Rev. 10/86

FINAL REPORT OF INSERVICE INSPECTION
NONDESTRUCTIVE EXAMINATIONS
OF
UNISOLABLE PIPING SYSTEM AND COMPONENTS
FOR POTENTIAL THERMAL STRESS EFFECTS
REFERENCE NRC BULLETIN NO. 88-08

APPENDIX K
ULTRASONIC EXAMINATION DOCUMENTATION LOG

DATA SHEET NUMBER	IDENTIFICATION NUMBER	DESCRIPTION
5.4-43	3"-CH-1301-43	ELBOW - PIPE
5.4-44	3"-CH-1301-42	PIPE - ELBOW

FINAL REPORT OF INSERVICE INSPECTION
NONDESTRUCTIVE EXAMINATIONS
OF
UNISOLABLE PIPING SYSTEM AND COMPONENTS
FOR POTENTIAL THERMAL STRESS EFFECTS
REFERENCE NRC BULLETIN NO. 88-08

APPENDIX K
ULTRASONIC EXAMINATION DOCUMENTATION LOG

DATA SHEET NUMBER	IDENTIFICATION NUMBER	DESCRIPTION
5.19-1	2"-RC-1310-1	REDUCING TEE - PIPE
5.19-2	2"-RC-1310-2	PIPE - VALVE 3-313
5.19-3	2"-RC-1310-2	PIPE - VALVE 3-313

Zone/Iso 045 003-A44
Plant/Unit PTN-3
Comp/System 3" CHARGING LINE

CALIBRATION DATA SHEET

CIS-1

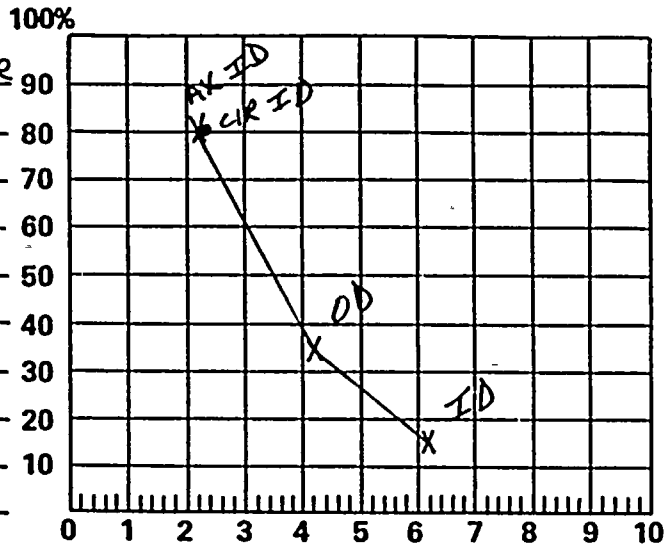
Data Sheet 5.4-43
Page 1 of 4
Procedure No. NDE 5.4
Rev/Chng. No. 7
Cal. Block No. UT-53
Cal. Block Temp. 85°F
Thermometer S/N 90-006
Each Major CRT Div. = .3"
CRT Calibrated in: (Sound Path)/Depth
Cal. Direction: Axial, Circ. (Both)
Scan Area: 0° WRV, 0° Mt'l
(⊥ to Weld), (∥ to Weld)

INSTRUMENT SETTINGS

Mfg./Model: KRAUTKRAMER USL-48
Serial No: 213222
Delay: 5.12 Range: .5
M'tl Cal: 12.46
Damping: FIXED Reject: OFF
Freq.: 2.25 Mode: SINGLE
Filter: NA Rep. Rate: FIXED
DEC/Gate: NA
Video: NA 600V Switch: NA
Gain: AX 20/22 CIR 20/26
Scan Sens: AX 48 CIR 52
6dB switch: NA 14dB switch: NA

SEARCH UNIT

Exam angle: 45° Mode: SHEAR
Fixturing (if any): LUCITE
Brand & S/N: KBA (ex) D24473 D2415
Size & Shape: .25" DIA
Style/Type: GAMMA
Frequency: 2.25
Measured angle: 45°
Cable: 6' BNC-MTD
Couplant brand: ULTRAGEL-II
Couplant batch: 8330



INST. VERT. LINEARITY

	AMPLITUDE High	AMPLITUDE Low		AMPLITUDE High	AMPLITUDE Low
1	100	50	6	50	25
2	90	44	7	40	20
3	80	40	8	30	14
4	70	35	9	20	10
5	60	29	10	10	5

AMPL. CONTROL LINEARITY

Initial	Δ dB	Result
80	-6	39
80	-12	20
40	+6	79
20	+12	80

EXAMINATION AREA/WELD	RECORDABLE INDICATIONS YES	NO	GEOM.	COMMENTS/REASON FOR INCOMPLETED SCAN(S)	ITEM TEMP.
3"-CH-1301-43			✓	45° BETWEEN 4.25" TO 7.50" SCAN	88°F
				LIMITED TO 1 FULL V PATH DUE TO	
				INNER RADIUS OF THE ELBOW, ALSO,	
				TO ½ V PATH WITH THE 60°.	
				NOTE: UT-44 DOES NOT CONTAIN ID	
				NOTCHES. UT-53 WAS USED IN LIEU	
				OF UT-44. UT-53 IS THE SAME NOMINAL	
				THICKNESS AND HAS THE SAME ACOUSTICAL	
				PROPERTIES. (JRC)	

EXAMINERS Michael D. Robbins : LEVEL II DATE 2-24-90
Richard J. Vano LEVEL IT DATE 2-24-90
REVIEWERS [signature] D E Boyer ANII 2/26/90

CAL. CHECKS TIME

Initial Cal. 0847
Intermed.
Intermed.
Intermed.
Final Cal 1050

FPL

Zone/Iso 045 003-A44
Plant/Unit PTN-3
Comp/System 3" CHARGING LINE

CALIBRATION DATA SHEET

CIS-1

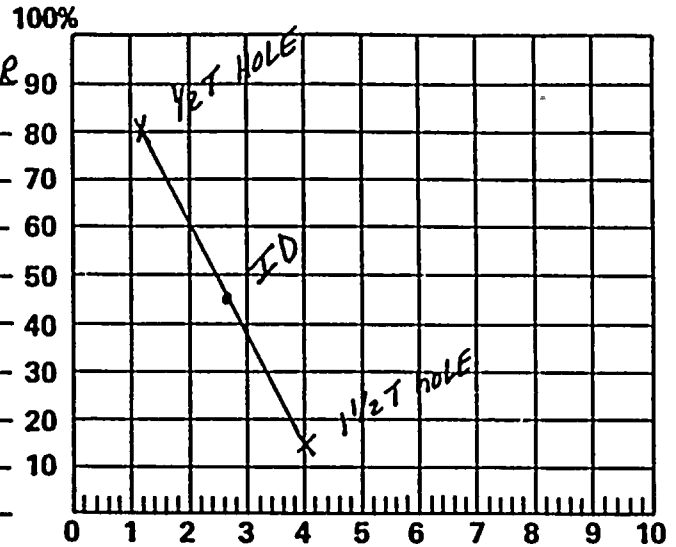
Data Sheet 5.4.43
Page 2 of 4
Procedure No. NDE 5.4
Rev/Chng. No. 7
Cal. Block No. UT-53
Cal. Block Temp. 85° F
Thermometer S/N 90-006
Each Major CRT Div. = .3"
CRT Calibrated in: (Sound Path) Depth
Cal. Direction: (Axial) Circ., Both
Scan Area: 0° WRV, 0° Mt'l
(⊥ to Weld) ∥ to Weld

INSTRUMENT SETTINGS

Mfg./Model: KRAUTKRAMER USL-48
Serial No: 213222
Delay: 5.12 Range: .5
M'tl Cal: 12.46
Damping: FIXED Reject: OFF
Freq.: 2.25 Mode: SINGLE
Filter: NA Rep. Rate: FIXED
DEC/Gate: NA
Video: NA 600V Switch: NA
Gain: AX 20/18
Scan Sens: AX 44
6dB switch: NA 14dB switch: NA

SEARCH UNIT

Exam angle: 60° Mode: SHEAR
Fixturing (if any): LUCITE
Brand & S/N: KBA H12310
Size & Shape: .25" dia
Style/Type: GAMMA
Frequency: 2.25
Measured angle: 59°
Cable: 6' BNC - MTI
Couplant brand: ULTRAGEL II
Couplant batch: 8330



INST. VERT. LINEARITY

	AMPLITUDE High	AMPLITUDE Low		AMPLITUDE High	AMPLITUDE Low
1	100	50	6	50	25
2	90	44	7	40	20
3	80	40	8	30	14
4	70	35	9	20	10
5	60	29	10	10	5

AMPL. CONTROL LINEARITY

Initial	Δ dB	Result
80	-6	39
80	-12	20
40	+6	79
20	+12	80

EXAMINATION AREA/WELD	RECORDABLE INDICATIONS YES	NO	GEOM.	COMMENTS/REASON FOR INCOMPLETED SCAN(S)	ITEM TEMP.
3"-CH-1301-43			✓	60° BETWEEN 4.25" TO 7.50" SCAN	88°F
				LIMITED TO 1/2 V PATH DUE TO	
				INNER RADIUS OF THE ELBOW, ALSO,	
				1 FULL PATH WITH THE 45°.	
				NOTE: UT-44 DOES NOT CONTAIN ID	
				NOTCHES. UT-53 WAS USED IN LIEU	
				OF UT-44. UT-53 IS THE SAME	
				NOMINAL THICKNESS AND HAS THE SAME	
				ACOUSTICAL PROPERTIES.	

EXAMINERS Michael D. Robbins LEVEL II DATE 2-24-90
[redacted] LEVEL IT DATE 2-2[redacted]
REVIEWERS [redacted] D E Boger ANII 2/26/90

CAL. CHECKS TIME

Initial Cal. 0857
Intermed.
Intermed.
Intermed.
Final Cal 1058

FPL

INDICATION REPORT SHEET

CIS-2

Calibration Data Sheet Number: 5.4-43	Lo Location: OUTSIDE RADIUS	Examiner: TC-1A-Level Michael D. Robbins II
Item Identification: 3"-CH-1301-43	Wo Location: CENTERLINE OF WELD.	Examiner: TC-1A-Level [illegible] IT
Component Thickness: .50" Component Diameter(nom): 3"	Scan Area: ⊥ to weld ∥ to weld	Date: 2-24-90

Ind #	Angle used	% of DAC	INDICATION LENGTH 20	50	MAX	50	20	FWD AMP W / DAC MP		MAX W	MAX MP	BACK AMP W / DAC MP		S.U. LOC.	REMARKS
1	45°	35	360°	INT.	6.25"	360°	INT.	.35"	.54"	.45"	.57"	.55"	.66"	D.S.	ROOT GEOMETRY 360° VARYING AMP.
2	45°	60	360°	INT.	6.25"	360°	INT.	1.2"	1.74"	1.3"	1.8"	1.4"	1.89"	D.S.	ROOT GEOMETRY 360° VARYING AMP.
3	60°	40	360°	INT.	8.00"	360°	INT.	TOE	up	.8	.84	.85	.96	D.S.	ROOT GEOMETRY 360° VARYING AMP.

Additional Remarks:

REVIEWER(s) [illegible] (IT)

Further Evaluation Required Yes ____ No ✓

5.4-43

BY Michael D. Robbins DATE 2-24-90

CHKD. BY CWM DATE 2/24/90

FPL

SHEET NO 4 of 4

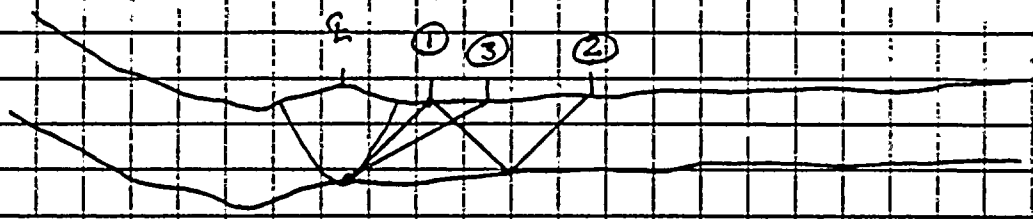
PROJECT NO PTN-3

WELD NO. 3"-CH-1301-43

FLOW

ELBOW

PIPE



Zone/Iso 045 003-A44
Plant/Unit PTN-3
Comp/System 3" Charging Line

CALIBRATION DATA SHEET

CIS-1

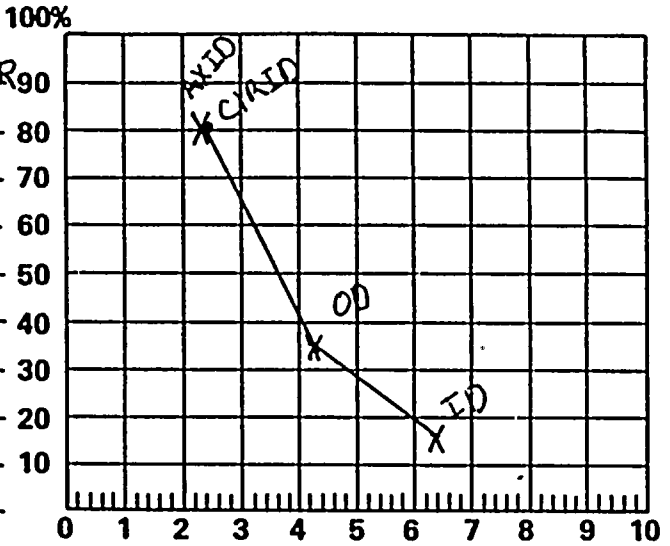
Data Sheet 5.4-44
Page 1 of 4
Procedure No. NDE 5.4
Rev/Chng. No. 7
Cal. Block No. UT-53
Cal. Block Temp. 85°F
Thermometer S/N 90-006
Each Major CRT Div. = .3"
CRT Calibrated in: (Sound Path)/Depth
Cal. Direction: Axial, Circ. (Both)
Scan Area: 0° WRV, 0° Mt'l
(⊥ to Weld), (∥ to Weld)

INSTRUMENT SETTINGS

Mfg./Model: KrautKramer USL-48
Serial No: 213222
Delay: 5.12 Range: .5
M'tl Cal: 12.46
Damping: FIXED Reject: OFF
Freq.: 2.25 Mode: SINGLE
Filter: N/A Rep. Rate: FIXED
DEC/Gate: N/A
Video: N/A 600V Switch: N/A
Gain: AX 20/22 CIR 20/26
Scan Sens: AX 48 CIR 52
6dB switch: N/A 14dB switch: N/A

SEARCH UNIT

Exam angle: 45° Mode: SHEAR
Fixturing (if req'd): LUCITE
Brand & S/N: KBA D24473 D2445
Size & Shape: .25" DIA
Style/Type: GAMMA
Frequency: 2.25
Measured angle: 45°
Cable: 6' BNC-MTD
Couplant brand: Ultragel-II
Couplant batch: 8330



INST. VERT. LINEARITY

	AMPLITUDE High	AMPLITUDE Low		AMPLITUDE High	AMPLITUDE Low
1	100	50	6	50	25
2	90	44	7	40	20
3	80	40	8	30	14
4	70	35	9	20	10
5	60	29	10	10	5

AMPL. CONTROL LINEARITY

Initial	Δ dB	Result
80	-6	39
80	-12	20
40	+6	79
20	+12	80

EXAMINATION AREA/WELD	RECORDABLE INDICATIONS YES	NO	GEOM.	COMMENTS/REASON FOR INCOMPLETED SCAN(S)	ITEM TEMP.
3"-CH-1301-42			✓	45° BETWEEN 9.75" TO 1.75"	88°F
				SCAN LIMITED TO 1V FULL	
				PATH DUE TO INNER RADIUS	
				OF THE ELBOW, ALSO, ½V	
				PATH WITH THE 60°	
				NOTE: UT-44 DOES NOT CONTAIN ID	
				NOTCHES. UT-53 WAS USED IN LIEU	
				OF UT-44. UT-53 IS THE SAME NOMINAL	
				THICKNESS AND HAS THE SAME	
				ACOUSTICAL PROPERTIES (RC)	

EXAMINERS Michael D. Robbins (RC) LEVEL II DATE 2-24-90
Richard J. Vana LEVEL II DATE 2-24-90
REVIEWERS [signature] D E Boger ANII 2/26/90

CAL. CHECKS TIME

Initial Cal. 0847
Intermed.
Intermed.
Intermed.
Final Cal. 1050

FPL

Zone/Iso 045 003-A44
Plant/Unit PTN-3
Comp/System 3" CHARGING LINE

CALIBRATION DATA SHEET

CIS-1

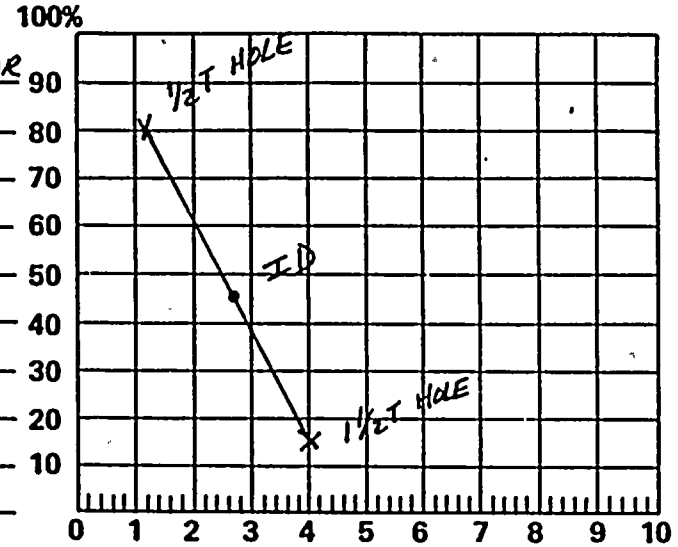
Data Sheet 5.4.44
Page 2 of 4
Procedure No. NDE 5.4
Rev/Chng. No. 7
Cal. Block No. UT-53
Cal. Block Temp. 85° F
Thermometer S/N 90-006
Each Major CRT Div. = .3"
CRT Calibrated in: (Sound Path) Depth
Cal. Direction: (Axial) Circ., Both
Scan Area: 0° WRV, 0° Mt'l
(⊥ to Weld) ∥ to Weld

INSTRUMENT SETTINGS

Mfg./Model: KRAUTKRAMER USL-48
Serial No: 213222
Delay: 5.12 Range: .5
M'tl Cal: 12.46
Damping: FIXED Reject: OFF
Freq.: 2.25 Mode: SINGLE
Filter: NA Rep. Rate: FIXED
DEC/Gate: NA
Video: NA 600V Switch: NA
Gain: AX 20/18
Scan Sens: AX 44
6dB switch: NA 14dB switch: NA

SEARCH UNIT

Exam angle: 60° Mode: SHEAR
Fixturing (if any): LUCITE
Brand & S/N: KBA H12310
Size & Shape: .25" dia
Style/Type: GAMMA
Frequency: 2.25
Measured angle: 59°
Cable: 6' BNC - MTD
Couplant brand: ULTRAGEL II
Couplant batch: 8330



INST. VERT. LINEARITY

	AMPLITUDE High	AMPLITUDE Low		AMPLITUDE High	AMPLITUDE Low
1	100	50	6	50	25
2	90	44	7	40	20
3	80	40	8	30	14
4	70	35	9	20	10
5	60	29	10	10	5

AMPL. CONTROL LINEARITY

Initial	Δ dB	Result
80	-6	39
80	-12	20
40	+6	79
20	+12	80

EXAMINATION AREA/WELD	RECORDABLE INDICATIONS YES	NO	GEOM.	COMMENTS/REASON FOR INCOMPLETED SCAN(S)	ITEM TEMP.
3"-CH-1301-42			✓	60° BETWEEN 9.75" TO 1.75" SCAN	88°F
				LIMITED TO 1/2V PATH DUE TO	
				INNER RADIUS OF THE ELBOW, ALSO,	
				1 FULLVPATH WITH THE 45°.	
				NOTE: UT-44 DOES NOT CONTAIN ID	
				NOTCHES, UT-53 WAS USED IN LIEU	
				OF UT-44, UT-53 IS THE SAME	
				NOMINAL THICKNESS AND HAS THE	
				SAME ACOUSTICAL PROPERTIES.	

EXAMINERS Michael D. Robbins LEVEL II DATE 2-24-90
[signature] LEVEL II DATE 2-2
REVIEWERS [signature]

CAL. CHECKS TIME

Initial Cal. 0857
Intermed.
Intermed.
Intermed.
Final Cal. 1058

FPL

INDICATION REPORT SHEET

CIS-2

Calibration Data Sheet Number: 5.4-44	Lo Location: TDC	Examiner: TC-1A-Level Michael D. Robbins II
Item Identification: 3"-CH-1301-42	Wo Location: CENTERLINE OF WELD	Examiner: TC-1A-Level [signature] IT
Component Thickness: .50" Component Diameter(nom): 3.0"	Scan Area: ⊥ to weld ∥ to weld	Date: 2-24-90

Ind #	Angle used	% of DAC	INDICATION LENGTH 20	50	MAX	50	20	FWD AMP W	FWD DAC MP	MAX W	MAX MP	BACK AMP W	BACK DAC MP	S.U. LOC.	REMARKS
1	45°	35	360°	INT.	0° TDC	360°	INT.	.40"	5.4"	.50"	.60"	.60"	.66"	U.S.	ROOT GEOMETRY 360° VARYING AMP.
2	45°	60	360°	INT.	0" TDC	360°	INT.	1.2"	1.74"	1.3"	1.8"	1.4"	1.89"	U.S.	ROOT GEOMETRY 360° VARYING AMP.
3	60°	80	360°	INT	1.4"	360°	INT.	.60"	.84"	.75"	.81"	.80"	1.02"	U.S.	ROOT GEOMETRY 360° VARYING AMP.

Additional Remarks:

REVIEWER(s) [signature] [signature]

Further Evaluation Required Yes ____ No ✓

5.4-44

BY Michael D. Robbins DATE 2-24-90

CHKD. BY CWK DATE 2/24/90

FPL

SHEET NO 4 of 4

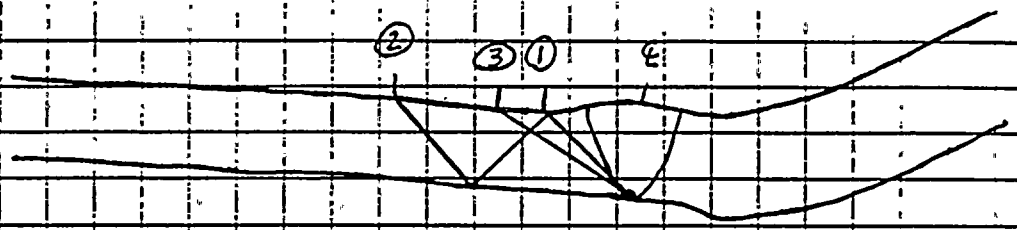
PROJECT NO PTN-3

WELD NO. 3"-CH-1301-42

FLOW

PIPE

ELBOW



Zone/Iso 035/003-A31
Plant/Unit PTN-3
Comp/System 2" Auxil. spray line Pressurizer

CALIBRATION DATA SHEET

CIS-1

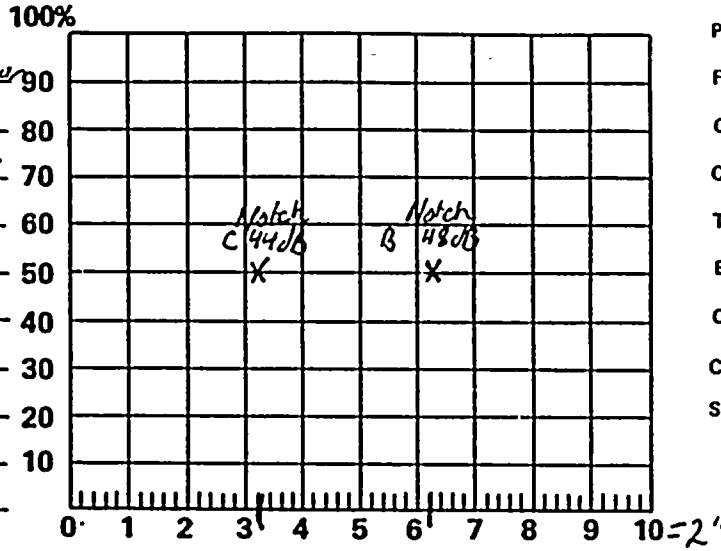
Data Sheet 5.19-1
Page 1 of 3
Procedure No. NDE 5.19
Rev/Chng. No. 0/A
Cal. Block No. VT-54
Cal. Block Temp. 68°F
Thermometer S/N 90-010
Each Major CRT Div. = .2"
CRT Calibrated in: (Sound Path) Depth
Cal. Direction: (Axial) Circ., Both
Scan Area: 0° WRV, 0° Mt'l
(⊥ to Weld,) ∥ to Weld

INSTRUMENT SETTINGS

Mfg./Model: Krautkramer/USK-7
Serial No: 27276-1091
Delay: 7.55 Range: 2.5
M'tl Cal: 362
Damping: N/A Reject: off
Freq.: Broad Band Mode: Single
Filter: N/A Rep. Rate: Fixed
DEC/Gate: N/A
Video: N/A 600V Switch: N/A
Gain: B 20+20dB, C 20+24 dB
Scan Sens: B 40+2dB, C 20+38dB
6dB switch: N/A 14dB switch: N/A

SEARCH UNIT

Exam angle: 70° Mode: Shear
Fixturing (if any): Lucite wedge
Brand & S/N: Aerotech L23777
Size & Shape: .25" round
Style/Type: Gamma
Frequency: 2.25 MHz
Measured angle: 68°
Cable: 6' BNC-MTO
Couplant brand: Ultragel II
Couplant batch: 8330



INST. VERT. LINEARITY

	AMPLITUDE High	AMPLITUDE Low		AMPLITUDE High	AMPLITUDE Low
1	100	50	6	50	25
2	90	45	7	40	20
3	80	40	8	30	15
4	70	35	9	20	10
5	60	30	10	10	5

AMPL. CONTROL LINEARITY

Initial	Δ dB	Result
80	-6	40
80	-12	20
40	+6	80
20	+12	80

EXAMINATION AREA/WELD	RECORDABLE INDICATIONS YES	NO	GEOM.	COMMENTS/REASON FOR INCOMPLETED SCAN(S)	ITEM TEMP.
2"-RC-1310-1			X	Complete Scan Performed	88°F

EXAMINERS [signature] LEVEL II DATE 2-16-90
Michael P. Brannigan LEVEL II DATE 2-16-90
REVIEWERS [signature] 2/17/90 [signature] ANII 2/21/90

CAL. CHECKS TIME

Initial Cal. 0945
Intermed. 1100
Intermed. N/A
Intermed. N/A
Final Cal. 1142

FPL

CALIBRATION DATA SHEET

CIS-1

Zone/Iso 035/003-A31
Plant/Unit PTN-3
Comp/System 2" Auxil. spray line - pressurizer

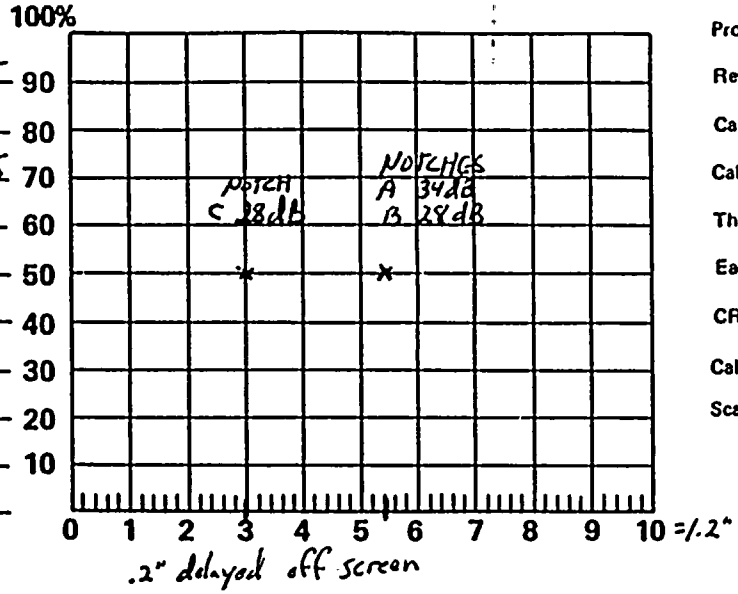
Data Sheet 5.19-1
Page 2 of 3
Procedure No. NDE 5.19
Rev/Chng. No. 0/A
Cal. Block No. UT-54
Cal. Block Temp. 68°F
Thermometer S/N 90-010
Each Major CRT Div. = .10"
CRT Calibrated in: (Sound Path) / Depth
Cal. Direction: (Axial) Circ., Both
Scan Area: 0° WRV, 0° Mt'l
(1) to Weld || to Weld

INSTRUMENT SETTINGS

Mfg./Model: Krautkramer/USK-7
Serial No: 27276-1078
Delay: 7.26 Range: .5"
M'tl Cal: 7.96
Damping: N/A Reject: N/A
Freq.: Broadband Mode: single
Filter: N/A Rep. rate: Fixed
DEC/Gate: N/A
Video: N/A 600V Switch: N/A
Gain: A 20+14, B 20+8, C 20+8
Scan Sens: A 20+28, B 20+22, C 20+22
6dB switch: N/A 14dB switch: N/A

SEARCH UNIT

Exam angle: 45° Mode: Shear
Fixturing (if any): Lucite wedge
Brand & S/N: (EP) 024473 / Aerotech 024475
Size & Shape: .25" round
Style/Type: Gamma
Frequency: 2.25 MHz
Measured angle: 45°
Cable: 6' BNC-MTD
Couplant brand: Ultragel II
Couplant batch: 8330



INST. VERT. LINEARITY

	AMPLITUDE High	AMPLITUDE Low		AMPLITUDE High	AMPLITUDE Low
1	100	50	6	50	25
2	90	45	7	40	20
3	80	40	8	30	15
4	70	35	9	20	10
5	60	30	10	10	5

AMPL. CONTROL LINEARITY

Initial	Δ dB	Result
80	-6	40
80	-12	20
40	+6	80
20	+12	80

EXAMINATION AREA/WELD	RECORDABLE INDICATIONS YES	NO	GEOM.	COMMENTS/REASON FOR INCOMPLETED SCAN(S)	ITEM TEMP.
2" RC-1310-1		X		Complete scan performed	88°F

EXAMINERS Carl Fowler LEVEL II DATE 2-16-90
Michael P. Brannin LEVEL II DATE 2-16-90
REVIEWERS Chris M. Redding 2/17/90 D.E. Boger ANII 2/21/90

CAL. CHECKS TIME

Initial Cal. 0940
Intermed. 1050
Intermed. N/A
Intermed. N/A
Final Cal. 1145

FF

FPL

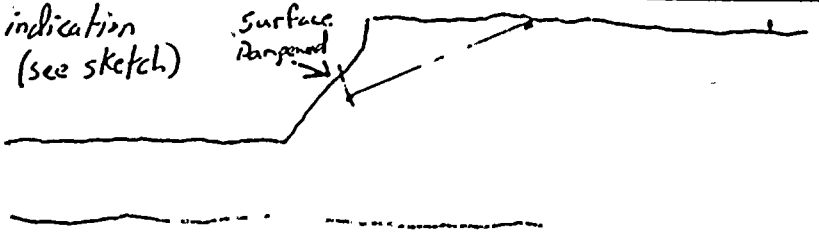
INDICATION REPORT SHEET

CIS-2

Calibration Data Sheet Number: 5.19-1	Lo Location: TDC	Examiner: TC-1A-Level Paul Hoerbst L II
Item Identification: 2"-RE1310-1	Wo Location: DS Toe of weld	Examiner: TC-1A-Level Michael P. Bowman ET
Component Thickness: Pipe = .4" / Tee .67" Component Diameter (nom): 2"	Scan Area: ⊥ to weld ∥ to weld	Date: 2-16-90

Ind #	Angle used	% of DAC	INDICATION LENGTH 20	50	MAX	50	20	FWD AMP W	FWD DAC MP	MAX W	MAX MP	BACK AMP W	BACK DAC MP	S.U. LOC.	REMARKS
	70	200		2"ccw	0"	2"cw		0.6	0.8	0.9	1.04	0.95	1.1	O.S.	Geometry (OD)
	70	200		4"cw	6"	8"cw		0.6	0.8	0.9	1.04	0.95	1.1	O.S.	Geometry (OD)

Additional Remarks: Recorded OD geometry Because the indication appeared in the area of interest on the CRT (see sketch)



REVIEWER(s) Chris M. Riddle 2/17/90

Further Evaluation Required Yes ____ No ✓

Zone/Iso 035/003-A31
Plant/Unit PTN-3
Comp/System 2"Auxil spray line - Pressurizer

CALIBRATION DATA SHEET

CIS-1

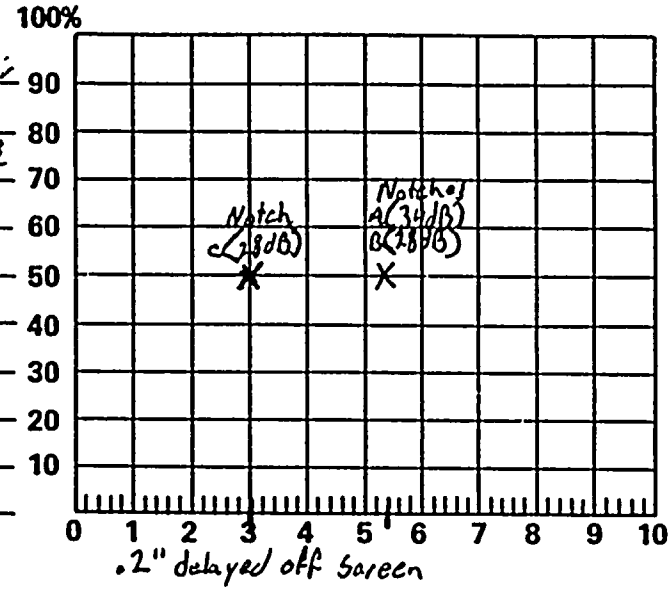
Data Sheet 5.19-2
Page 1 of 4
Procedure No. NDE 5.14
Rev/Chng. No. 01A
Cal. Block No. UT-54
Cal. Block Temp. 68°F
Thermometer S/N 90-010
Each Major CRT Div. = .10"
CRT Calibrated in: (Sound Path) / Depth
Cal. Direction: (Axial) / Circ., Both
Scan Area: 0° WRV, 0° Mt'l
(⊥ to Weld), ∥ to Weld

INSTRUMENT SETTINGS

Mfg./Model: Krautkramer/USK-7
Serial No: 27276-1079
Delay: 7.26 Range: .5"
M'tl Cal: 7.96
Damping: N/A Reject: N/A
Freq.: Broad Band Mode: Single
Filter: N/A Rep. Rate: Fixed
DEC/Gate: N/A
Video: N/A 600V Switch: N/A
Gain: A 20+14dB, B 20+8dB, C 20+8dB
Scan Sens: A 20+28dB, B 20+22dB, C 20+22dB
6dB switch: N/A 14dB switch: N/A

SEARCH UNIT

Exam angle: 45° Mode: Shear
Fixturing (if any): Lucite Wedge
Brand & S/N: (Aerotech) / D24473 / 0K4475
Size & Shape: .25"
Style/Type: Gamma
Frequency: 2.25 MHz
Measured angle: 45°
Cable: 6' BNC-MTD
Couplant brand: Ultragel II
Couplant batch: 8330



INST. VERT. LINEARITY

	AMPLITUDE High	AMPLITUDE Low		AMPLITUDE High	AMPLITUDE Low
1	100	50	6	50	25
2	90	45	7	40	20
3	80	40	8	30	15
4	70	35	9	20	10
5	60	30	10	10	5

AMPL. CONTROL LINEARITY

Initial	Δ dB	Result
80	-6	40
80	-12	20
40	+6	80
20	+12	80

EXAMINATION AREA/WELD	RECORDABLE INDICATIONS YES	NO	GEOM.	COMMENTS/REASON FOR INCOMPLETED SCAN(S)	ITEM TEMP.
2"-RC-1310-2	X			Scan limited to 3" from US side toe of weld and from 0"-1" cw and 0"-1" ccw	86°F

EXAMINERS Ralph Strickland LEVEL II DATE 2-16-90
Michael L. Brannin LEVEL II DATE 2-16-90
REVIEWERS [illegible] D E Boyer ANII 2/21/90

CAL. CHECKS TIME

Initial Cal. 0940
Intermed. 1050
Intermed. N/A
Intermed. N/A
Final Cal. 1145

FPL

INDICATION REPORT SHEET

5.19-2

CIS-2

Calibration Data Sheet Number:	Lo Location: TDC	Examiner: TC-1A-Level Paul Farabee L II
Item Identification: 2"-RC-1310-2	Wo Location: US Toe of Weld	Examiner: TC-1A-Level Michael R. Brown II
Component Thickness: Pipe = .4" / Valve .62" Component Diameter (nom): 2"	Scan Area: ± to weld ∥ to weld	Date: 2-16-90

Ind #	Angle used	% of DAC	INDICATION LENGTH 20	50	MAX	50	20	FWD AMP W	FWD DAC MP	MAX W	MAX MP	BACK AMP W	BACK DAC MP	S.U. LOC.	REMARKS
1	45°	22		1.0" CW	1.8" CW	1.9" CW		.35"	.70"	.50"	.76"	.60"	.88"	US	* } ROOT GEOMETRY,
2	45°	20		1.0" CW	1.6" CW	1.8" CW		.35"	.70"	.50"	.76"	.60"	.88"	US	* } T. Cox UT=III
															RECODED INDS 1 & 2 WITH 45°, 60°, & WSY AND DETERMINED IND.S TO BE LESS THAN 0.050" IN DEPHT. CWA 2/19/90

Additional Remarks: * Signal not able to be Followed from 0"-1" (CW and CCW) due to valve configuration.

REVIEWER(s) TC

Further Evaluation Required Yes ____ No ✓

BY Paul Knudsen DATE 2-16-90

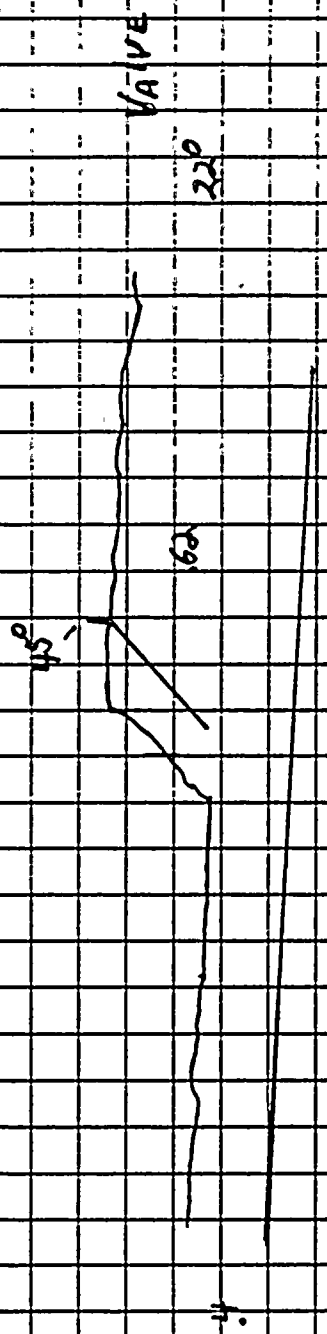
CHKD. BY [illegible] DATE 2/19/90

FPL

PROJECT NO PTN-3

ZONE/ISO 035/0037A31

2"-RC-1310-2



CALIBRATION DATA SHEET

CIS-1

Zone/Iso 035/003-A31
Plant/Unit PTN-3
Comp/System 2" Auxil. Spray line - pressurizer

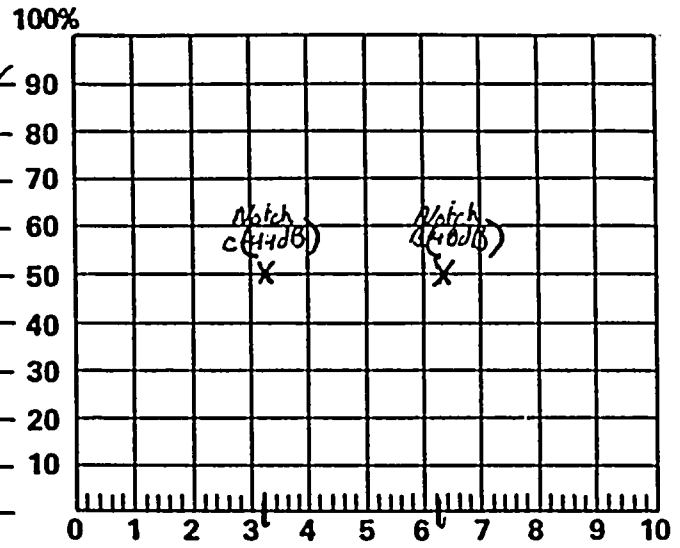
Data Sheet 5.19-3
Page 2 of 4
Procedure No. NDE 5.19
Rev/Chng. No. 0/A
Cal. Block No. UT-54
Cal. Block Temp. 68°F
Thermometer S/N 90-010
Each Major CRT Div. = .2"
CRT Calibrated in: Sound Path/Depth
Cal. Direction: (Axial) Circ., Both
Scan Area: 0° WRV, 0° Mt'l
(⊥ to Weld) ∥ to Weld

INSTRUMENT SETTINGS

Mfg./Model: Krautkramer/USK7
Serial No: 27276-1091
Delay: 7.55 Range: 2.5
M'tl Cal: 362
Damping: N/A Reject: off
Freq.: Broad Band Mode: Single
Filter: N/A Rep. Rate: Fixed
DEC/Gate: N/A
Video: N/A 600V Switch: N/A
Gain: B 20+28 dB, C 20+24 dB
Scan Sens: B 40+2 dB, C 20+38 dB
6dB switch: N/A 14dB switch: N/A

SEARCH UNIT

Exam angle: 70° Mode: Shear
Fixturing (if any): Lucite Wedge
Brand & S/N: Aerotech / 23777
Size & Shape: .25 round
Style/Type: Gamma
Frequency: 2.25 MHz
Measured angle: 68°
Cable: 6' BNC-MTO
Couplant brand: Ultragel II
Couplant batch: 8330



INST. VERT. LINEARITY

	AMPLITUDE High	AMPLITUDE Low		AMPLITUDE High	AMPLITUDE Low
1	100	50	6	50	25
2	90	45	7	40	20
3	80	40	8	30	15
4	70	35	9	20	10
5	60	30	10	10	5

AMPL. CONTROL LINEARITY

Initial	Δ dB	Result
80	-6	40
80	-12	20
40	+6	80
20	+12	80

EXAMINATION AREA/WELD	RECORDABLE INDICATIONS YES	NO	GEOM.	COMMENTS/REASON FOR INCOMPLETED SCAN(S)	ITEM TEMP.
2"-RC-1310-2		X		Scan limited to 3" from US side	88°F
				Toe of weld and from 0" to 1" cw and	
				0" to 1" ccw.	

EXAMINERS Paul Korzlow II LEVEL II DATE 2-16-90
Michael P. Brannin LEVEL IT DATE 2-16-90
REVIEWERS RC D E Boger ANI 2/21/90

CAL. CHECKS TIME

Initial Cal. 0945
Intermed. 1100
Intermed. N/A
Intermed. N/A
Final Cal. 1142

FINAL REPORT OF INSERVICE INSPECTION
NONDESTRUCTIVE EXAMINATIONS
OF
UNISOLABLE PIPING SYSTEM AND COMPONENTS
FOR POTENTIAL THERMAL STRESS EFFECTS
REFERENCE NRC BULLETIN NO. 88-08

APPENDIX L
ENGINEERING RECOMMENDATIONS

DOCUMENT NO. SE&PT-SSAD-7814

TURKEY POINT UNITS 3 AND 4

(NRC BULLETIN 88-08 THERMAL STRESSES IN PIPING CONNECTED TO REACTOR COOLANT SYSTEM)

IDENTIFICATION OF UNISOLABLE PIPING AND DETERMINATION OF INSPECTION LOCATIONS

August 1988

P. L. Strauch
M. Ucak

Verified by: for
W. H. Bamford

Approved by:
G. A. Antaki

NRC BULLETIN 88-08

1. PURPOSE

This report provides the basis and conclusions of the evaluation of Turkey Point Units 3 and 4 unisolable piping systems and components for potential thermal stress effects as described in NRC Bulletin 88-08 (June 22, 1988), Supplement 1 (June 24, 1988) and Supplement 2 (August 4, 1988).

2. SCOPE

This report addresses items 1 and 2 of Bulletin 88-08, "Actions Requested" for Turkey Point Units 3 and 4.

(a) Determination of "unisolable sections of piping connected to the RCS which can be subjected to stresses from temperature stratification or temperature oscillations that could be induced by leaking valves and that were not evaluated in the design analysis of the piping".

(b) Determination of locations for nondestructive examination to "provide assurance that there are no existing flaws". In addition, inspection guidelines are provided to enhance the likelihood of detection of indications.

3. PROCEDURE

- A plant specific systems review of piping attached to the reactor coolant system is performed to identify any unisolable piping which may be susceptable to the thermal phenomenon outlined in NRC Bulletin 88-08.

- For any unisolable piping identified, piping isometric drawings are reviewed to determine critical locations where in-service inspection should be performed.

4. CONCLUSIONS

The systems review to determine unisolable sections of piping (item (a) of Scope) is documented in Attachment 1. In this evaluation the unisolable piping has been defined as the piping from the reactor coolant system to the first check valve in the auxiliary piping under consideration.

It is concluded that portions of the following auxiliary lines in the Turkey Point Units 3 and 4 plants must be considered under Bulletin 88-08:

- Charging pump to pressurizer auxiliary spray line
- Charging pump to C hot leg

The determination of locations for nondestructive examination (item (b) of Scope) is documented in Attachment 2. It is concluded that the locations identified in figures A to D need to be nondestructively examined under Bulletin 88-08. If any pipe welds exist between the welds identified, they should also be included in the inspection. Guidelines to enhance detection of possible indications are provided in attachment 3.

5. REFERENCES

a) United States Nuclear Regulatory Commission Bulletin No. 88-08, June 22, 1988, "Thermal Stresses in Piping Connected to Reactor Coolant Systems."

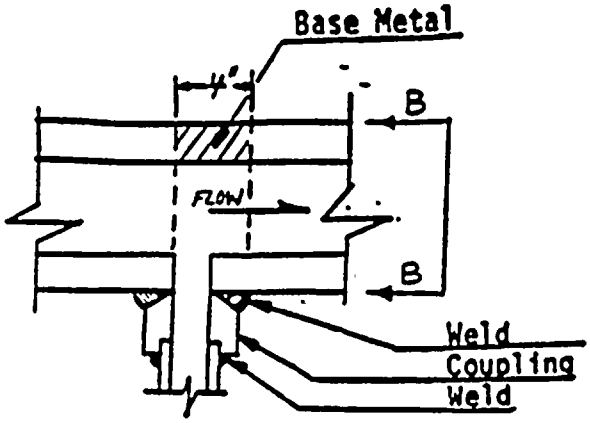
b) Isometric Drawing 5613-P-661-S, Sheets 1 and 2, Rev. 0.

c) Isometric Drawing 5614-P-782-S, Sheets 1 and 2, Rev. 0.

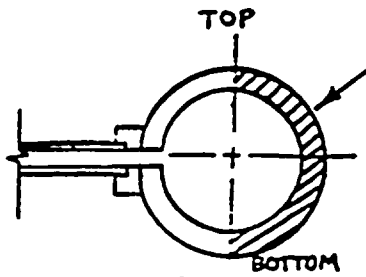
d) P & ID Drawing 5610-M-410-91, Sheet 2.

e) P & ID Drawing 5610-M-420-3, Sheet 3.

f) Heat and Mass Transfer, Eckert, McGraw-Hill, 1959.



SECTION A-A



SECTION B-B

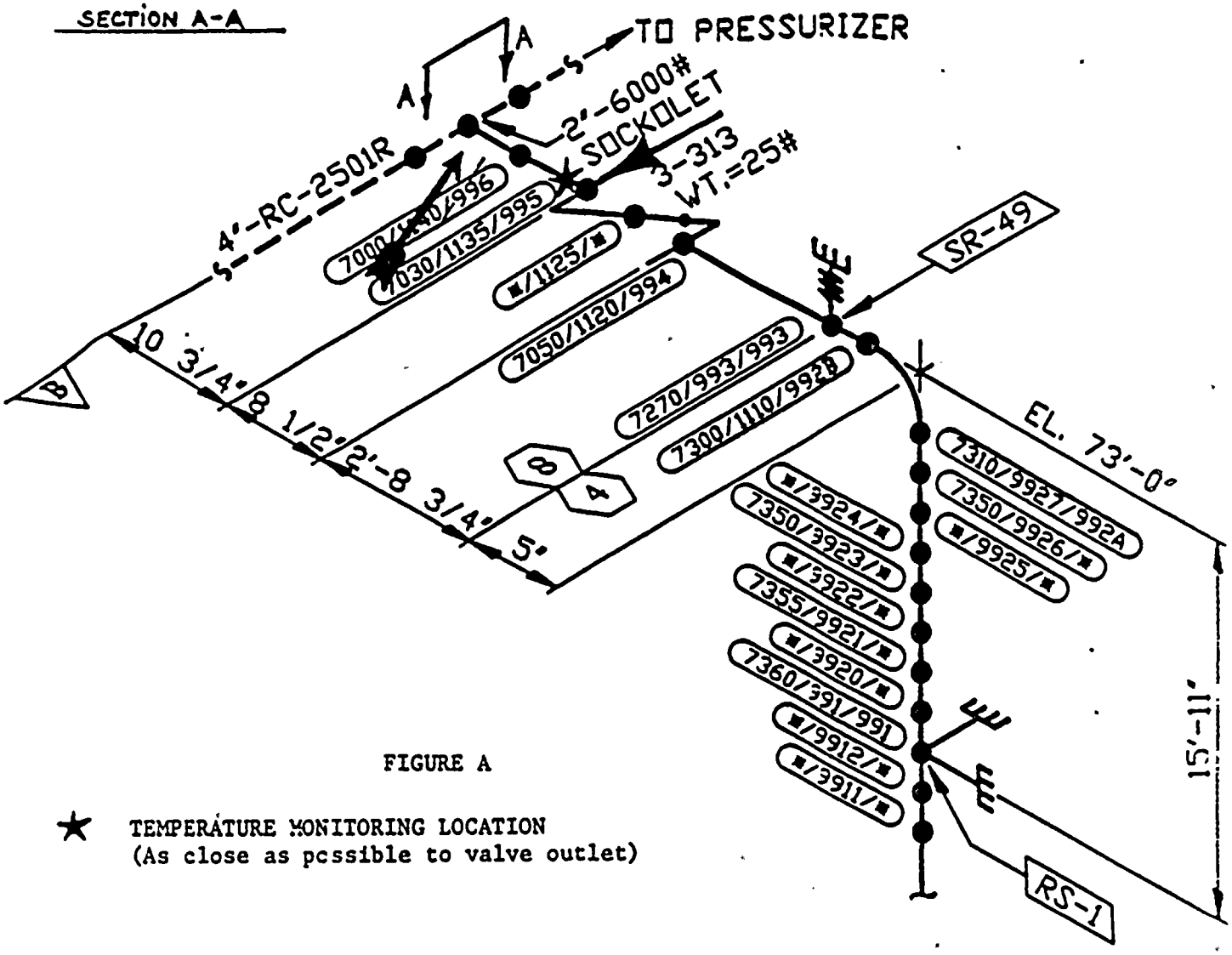
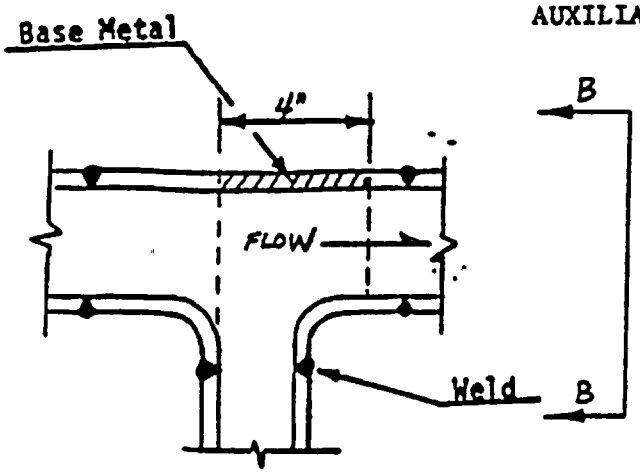


FIGURE A

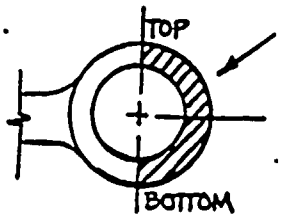
★ TEMPERATURE MONITORING LOCATION
(As close as possible to valve outlet)

Ref: Isometric Drawing 5613-P-661-S

Sheet 2 of 4



SECTION A-A



Inspect only shaded portion of tee.

SECTION B-B

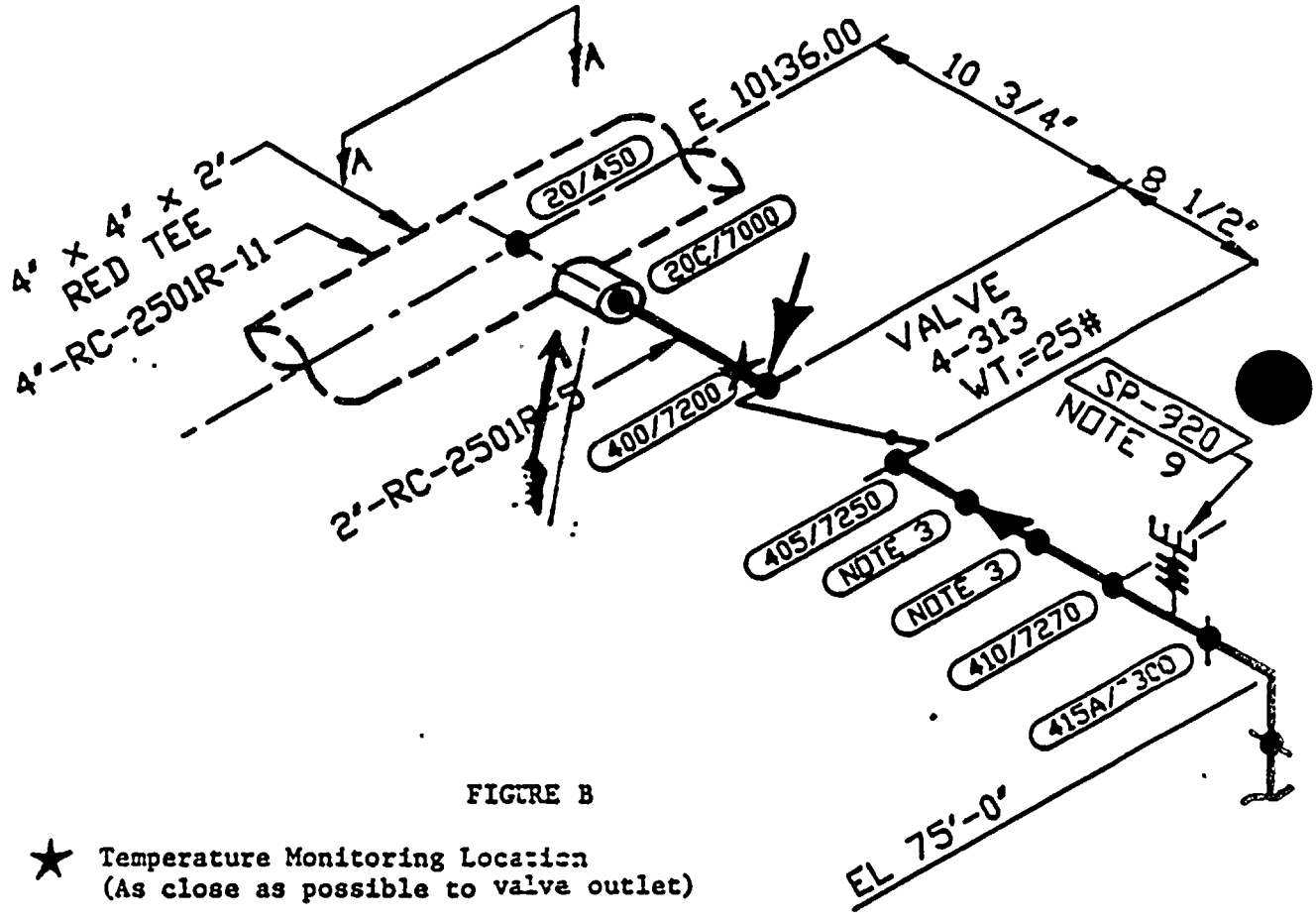


FIGURE B

★ Temperature Monitoring Location
(As close as possible to valve outlet)

Ref: Isometric Drawing 5614-P-782-S

Rev. 0, Sheet 1 of 3

TURKEY POINT UNIT 3

CHARGING PUMP TO C HOT LEG

★ Temperature Monitoring Location
(As close as possible to elbow weld)

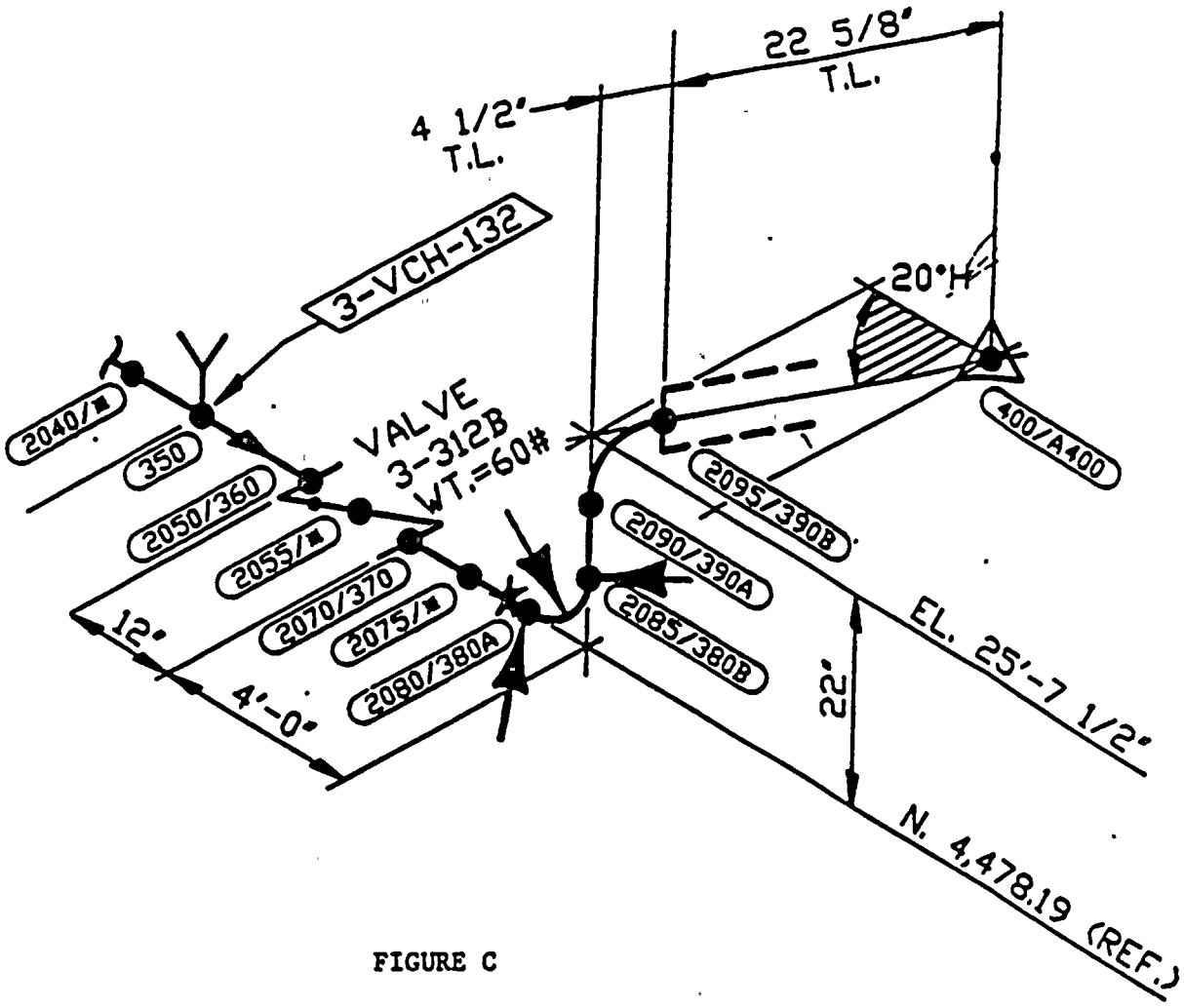


FIGURE C

Ref: Isometric Drawing 5613-P-661-S
Rev. 0, Sheet 2 of 4

TURKEY POINT UNIT 4

CHARGING PUMP TO C HOT LEG

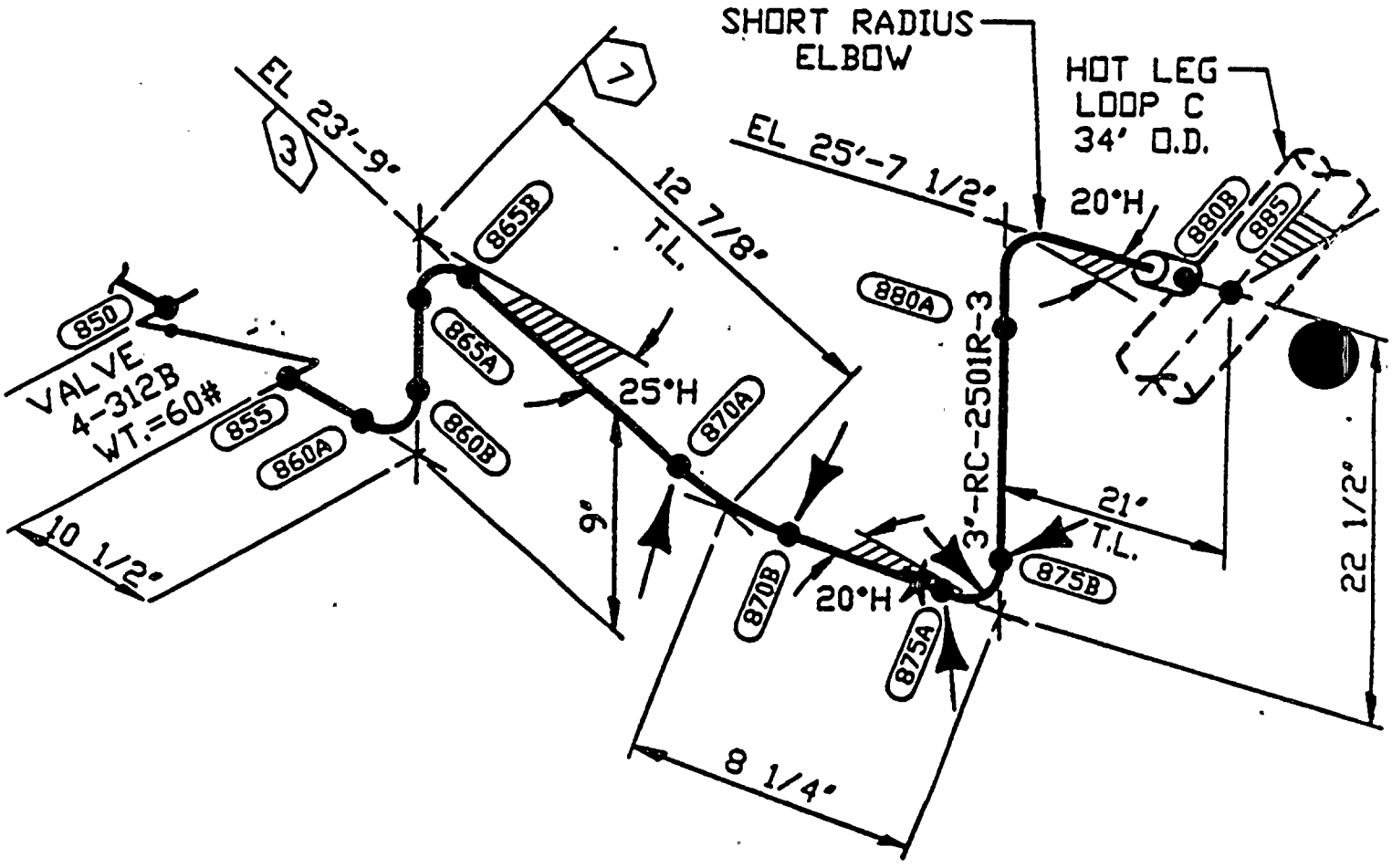


FIGURE D

★ Temperature Monitoring Location
(As close as possible to elbow weld

Ref: Isometric Drawing 5614-P-782-S
Rev. 0, Sheet 2 of 3

ATTACHMENT 1

NRC BULLETIN 88-08 EVALUATION FOR TURKEY POINT PLANT
UNITS 3 & 4

SYSTEMS REVIEW

In general, this phenomenon of thermal fatigue of unisolable piping connected to the RCS, as described in the NRC Bulletin 88-08, can occur whenever the connected piping is isolated by a leaking isolation valve and the pressure upstream of the leaking valve is greater than the RCS pressure (2250 psig nominal), and the temperature of the fluid is significantly cooler than the RCS temperatures. The only pressure source available in the Turkey Point plant which fits this criteria is the normal charging system. During normal conditions, the pressure at the discharge of the charging pumps is approximately 2350 psig.

Our review identified all flow paths between the discharge of the charging pumps to the RCS. Lines identified included the auxiliary spray line and the charging line to C loop hot leg. The following is a review of each line.

1. Auxiliary Spray Line

Figures 1 and 2 depict the CVCS auxiliary spray line connection to the main spray lines, for Turkey Point Plant Units 3 and 4, respectively. During normal operations, the auxiliary spray line is isolated by closure of valve 311. Valve 311 is a three inch air operated globe isolation valve (3-IA58RGP). The differential pressure across the valve is estimated to be approximately 50.0 psid, under normal conditions. The check valve 313 (2-C58) is a two inch lift check valve.

In-leakage from the high pressure charging line across valve 311 would result in eventual leakage of the fluid volume between valves 311 and the check valve 313 into the RCS.

The temperature upstream of closed valve 311 is around 493°F based on the regenerative heat exchanger tube side outlet temperature. Point E on Figures 1 and 2 represents the junction of the CVCS auxiliary spray line with the main spray lines. The temperature at point E is maintained at approximately cold leg temperature of 546.2°F by the 1 gpm spray flow. Note that some cooldown due to heat loss typically occurs in the main spray line from the spray scoop to point E.

From Figures 1 and 2, it is seen that there is a long cold trap between points B and C downstream of valve 311. Although the line is insulated, any leakage through 311 will very likely be cool before it climbs up 50 feet of pipe and reaches point D. Point D is expected to be hot since it is located close to the main spray line. Therefore, if the valve 311 leaks, cool leakage entering the warm section from point D to E could present a thermal stratification and cyclic fatigue problem downstream of the check valve 313.

2. Charging Line to C Loop Hot Leg

Figures 3 and 4 depict the CVCS charging line to C loop hot leg, for Turkey Point Plant Units 3 and 4, respectively. During normal operations, this line is isolated by closure of valve 310B. Valve 310B is a three inch air operated globe isolation valve (3-IA58DEP). The differential pressure across the valve is estimated to be approximately 45.0 psid, under normal conditions, and the amount of any leakage is expected to be minute.

The check valve 312B (3-C58) is a three inch swing type check valve. With a small amount of in-leakage from the high pressure charging line through valve 310B would result in eventual leakage of the fluid volume between valves 310B and the check valve 312B into the RCS, and the cracking pressure of the check valve would create a cyclic phenomena by periodically burping fluid as pressure builds up between the isolation valve and the check valve, due to the leakage.

Under the normal charging conditions the temperature of the charging flow around the valve 310B is expected to be 493°F (point A in Figures 3 and 4), the regenerative heat exchanger tube side outlet temperature. The temperature of the fluid downstream of the check valve 312B is expected to be close to 600°F by virtue of its location above the RCS hot leg (point D in Figures 3 and 4). In Unit 3 layout (Figure 3), there is a cold trap between the downstream of valve 310B - point A, and point B. Similarly, in Unit 4 layout (Figure 4), there is a cold trap between points A and B and the check valve 312B. In either case, any leakage through the valve 310B will very likely be cool before it reaches the check valve 312B although the line is insulated. Point C is expected to be much hotter since it is located close to the hot leg.

Therefore, if the valve 310B leaks, cool leakage entering the hot section from point B to C could present a thermal stratification and cyclic fatigue problem in this section of piping downstream of the check valve 312B.

Notes: "Cold Trap" refers to the cooler water at the bottom of a vertical pipe section.

"Cool" refers to a temperature which is approximately ambient (100°F).

FIGURE 1

AUXILIARY SPRAY LINE (UNIT 3)

Ref.: 5613-P-661-S, Sh. 1, 2

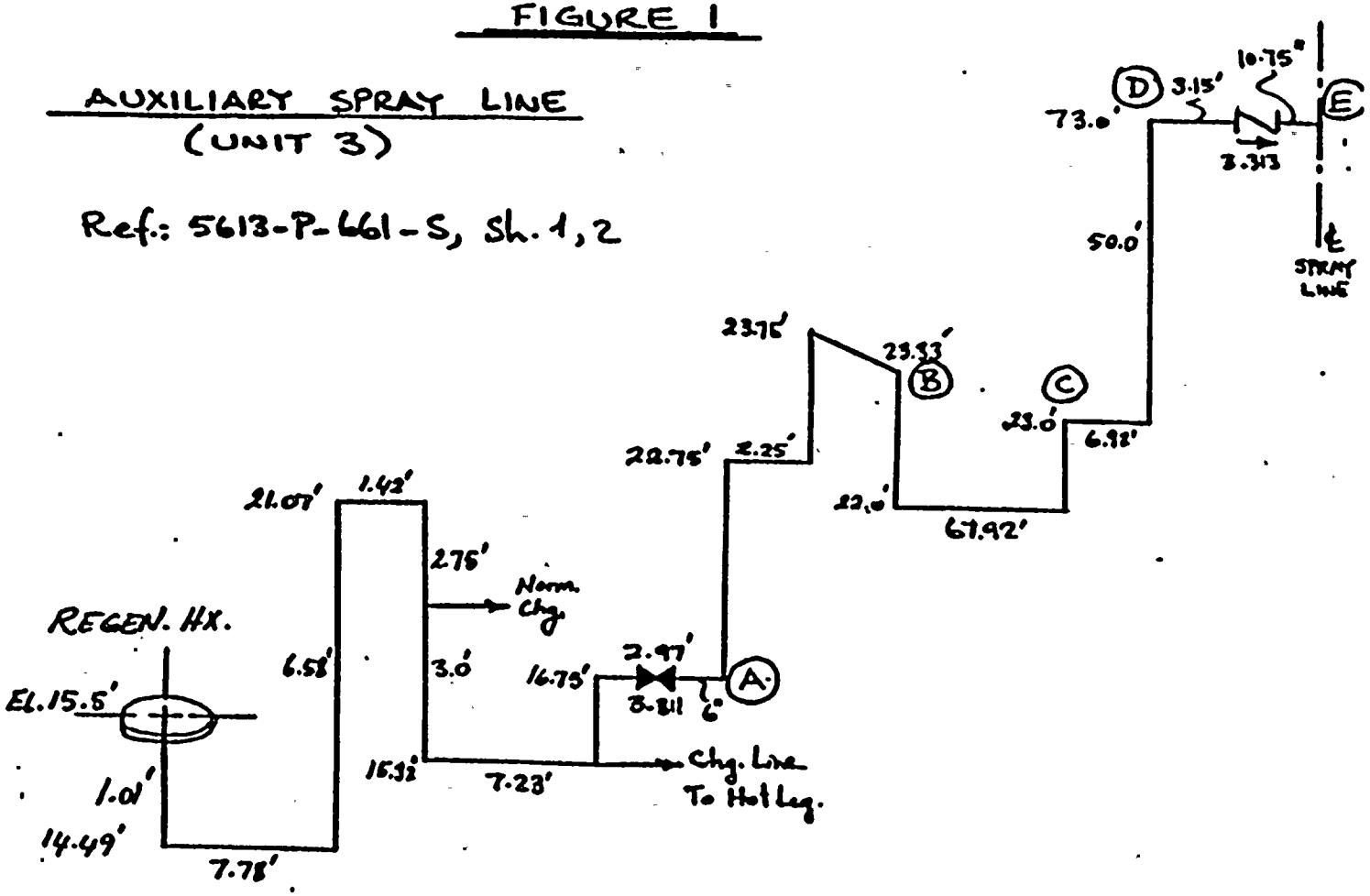


FIGURE 2

AUXILIARY SPRAY LINE (UNIT 4)

Ref.: 5614-P-782-S, Sh. 2,1

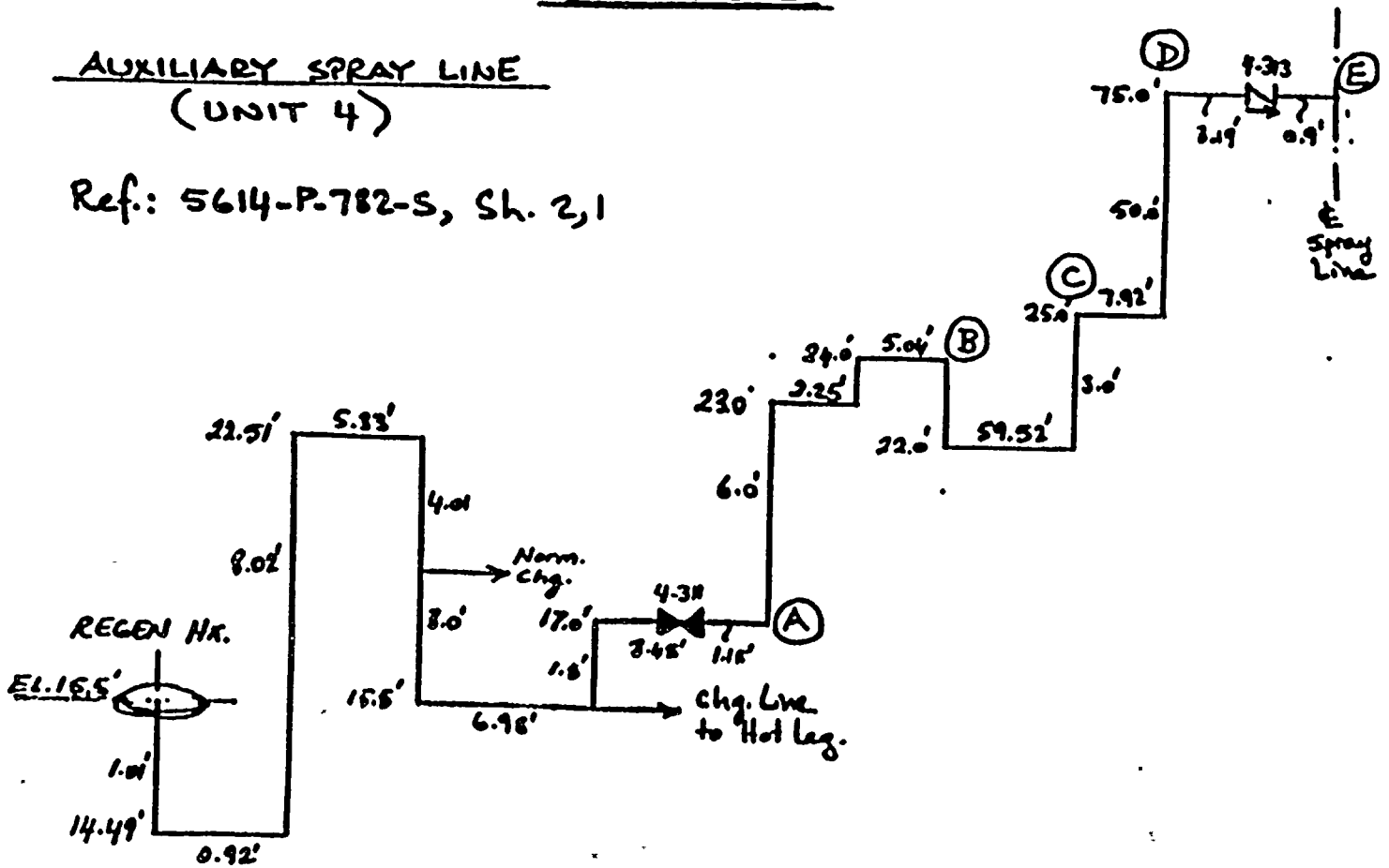


FIGURE 3

CHARGING LINE TO LOOP-C HOT LEG (UNIT 3)

Ref.: 5613-P-661-S, Sh. 1, 2

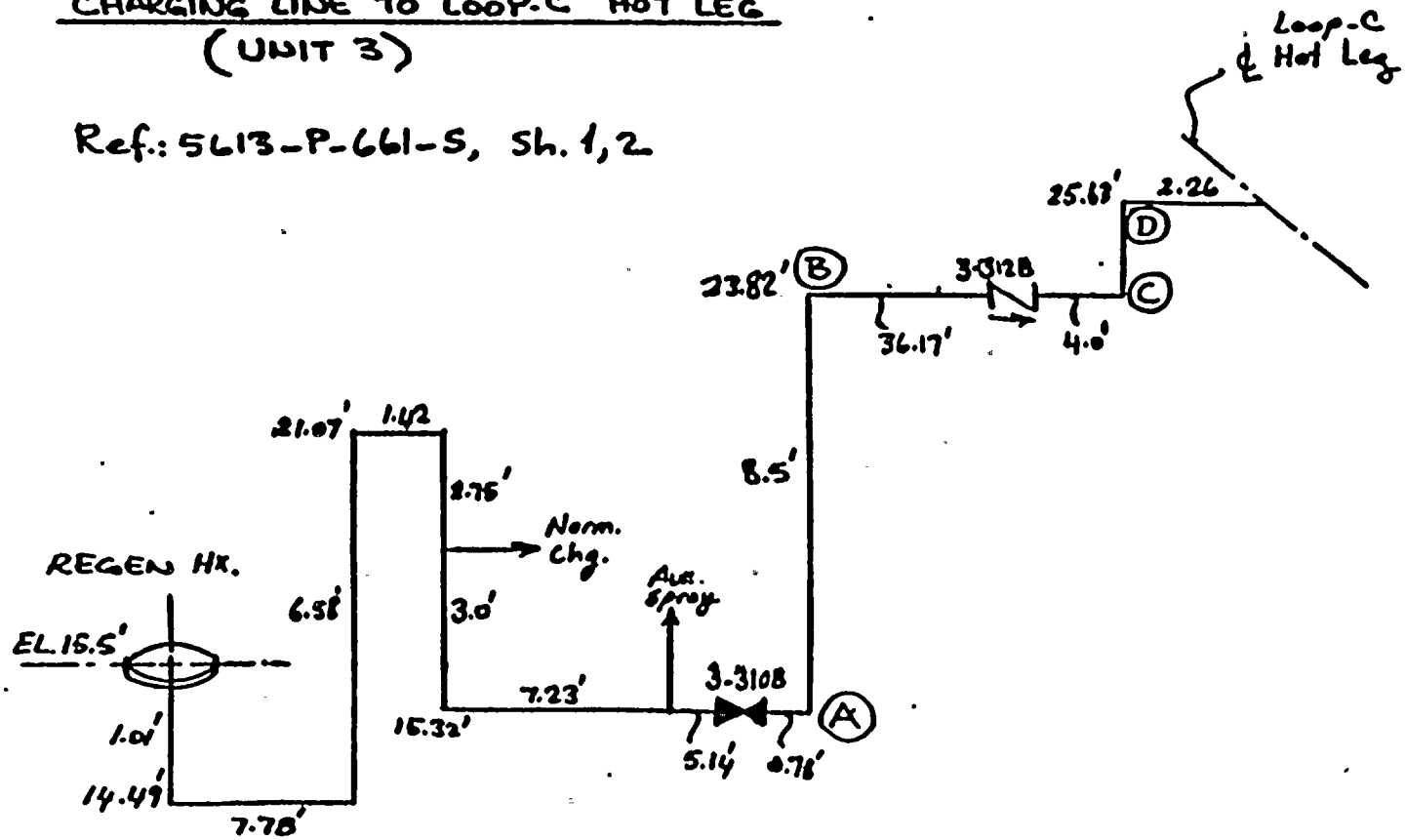
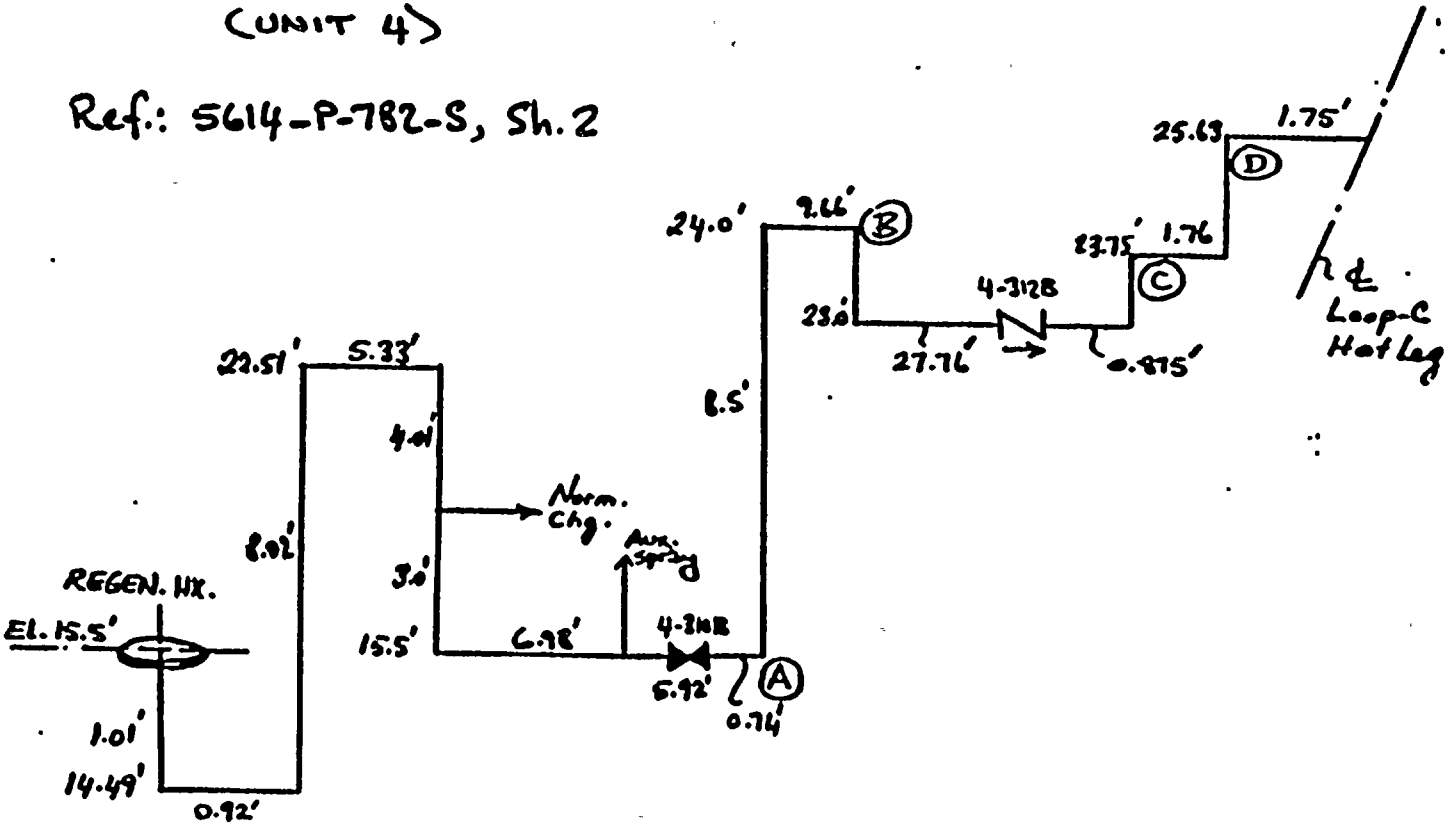


FIGURE 4

CHARGING LINE TO LOOP C HOT LEG
(UNIT 4)

Ref.: 5614-P-782-S, Sh. 2



ATTACHMENT 2
BULLETIN 88-08 EVALUATION
INSPECTION LOCATIONS

1.0 METHODOLOGY

Attachment 1 identifies unisolable sections of piping connected to the RCS which can be subjected to large thermal stresses induced by leaking valves and that were not evaluated in the design analysis of the piping.

Within these systems, a thermal and stress review is performed, and documented in this attachment, to identify the locations of maximum potential stress for nondestructive examination.

a. The base line temperature (no leakage flow) of the unisolable piping is defined based on piping layout.

The base line temperature in the dead leg (no leakage flow) for a well insulated pipe can be represented by the conduction and/or free convection relationship:

$$\frac{T(x) - T_o}{T(o) - T_o} = \exp\left[- (UP/keffA)^{1/2}\, x\right]$$

where x = axial position from hot fluid source

$T(x)$ = temperature at axial position x

T_o = ambient temperature

k_{eff} = effective thermal conductivity (e.g. E.R.G. Eckert, Heat and Mass Transfer, McGraw-Hill, 1959, for free convection)

U = net thermal resistance between fluid and ambient

P = pipe wetted perimeter

A = cross-sectional flow

Base line temperatures are calculated for several nominal pipe sizes, schedule 160 wall and 2-inch calcium silicate insulation, with a 100 degree F ambient temperature.

Free convection and conduction are shown separately in figure 2-1 for 3" NPS and smaller piping.

The free convection curves would apply to vertical legs with the hot fluid source at the bottom. The molecular conduction curves would apply to vertical legs with the hot fluid source at the top ("cold trap") or horizontal legs.

b. The leakage flow is conservatively assumed to be at ambient temperature.

For a small leakage flow into a pipe with stagnant water, the axial temperature can be estimated by the relationship:

$$\frac{T(x) - T_o}{T(c) - T_o} = \exp\left[- (UP/\dot{m}Cp)\, x \right]$$

where $\dot{m}$ = leakage mass flow rate

C_p = fluid specific heat

This estimate shows that for small leakage (.01 gpm) the leakage flow temperature will tend to decrease to close tc ambient temperature over a length of approximately 10 feet. It is therefore conservative to assume that the leakage flow is at ambient.

c. The leakage flow is conservatively assumed to stratify and not mix with the hot dead leg fluid, except in vertical segments of pipe.

The stratification was confirmed from plant measurements of leakage flow and can be expected based on low flow rates (large Richardson number).

d. Pipe sections of maximum temperature gradient (top to bottom) and temperature fluctuations (cycling of leakage flow) are determined.

e. Within pipe sections locations of largest stress concentration are identified for non-destructive examination.

2.0 RESULTS OF ASSESSMENT FOR INSPECTION LOCATIONS

Based on the methodology described above, the locations of maximum potential ΔT and most susceptible to fatigue are identified in figures A through D. These locations are recommended for NDE per Bulletin 88-08. Relevant details on selection of location pertaining to the identified system are provided below. Per supplement 1 of Bulletin 88-08 the component of maximum anticipated fatigue loadings is selected for base metal evaluation. Otherwise, only weld locations are specified as the stress concentration at these points will generally maximize the fatigue affects.

The welds of the reactor coolant loop nozzle do not require inspection due to sufficient mixing resulting from flow in the main coolant piping.

a. Auxiliary Spray Line, Unit 3

The welds and components in the vicinity of the 2 inch branch connection to the main sprayline are recommended for inspection as shown in figure A. The base metal in the main spray piping near the branch outlet is also recommended for inspection due to the potential for leakage impingement on this component during low spray flow conditions. Also, the weld at the outlet of valve 3-313 requires inspection due to the high ΔT determined for this point.

b. Auxiliary Spray Line, Unit 4

The 2" weld on the 4" x 4" x 2" reducing tee at the main sprayline connection is recommended for inspection as shown in figure B. The tee base metal is also recommended for inspection due to the potential for leakage impingement on this component during low spray flow conditions. Also, the weld at the outlet of valve 4-313 requires inspection due to the high ΔT determined for this point.

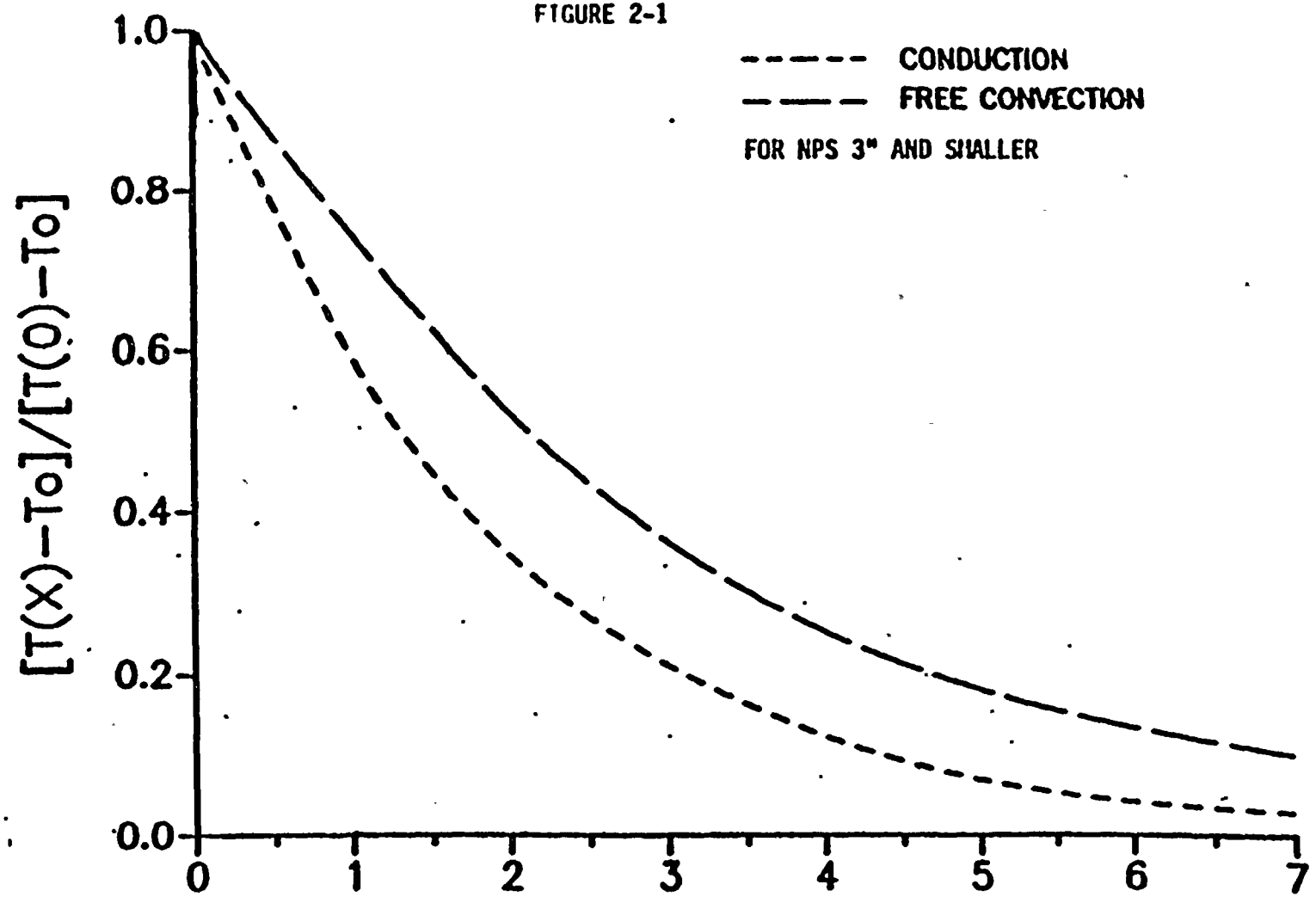
c. Charging Pump to C Hot Leg, Unit 3

The base metal and welds of the first elbow downstream of check valve 3-312B are recommended for inspection as shown in figure C.

d. Charging Pump to C Hot Leg, Unit 4

All welds from the third to fourth elbow down stream of check valve 4-312B (4 weld locations) and the base metal of the fourth elbow downstream of check valve 4-312B are recommended for inspection as shown in figure D.

FIGURE 2-1



EFFECT OF MOLECULAR CONDUCTION AND FREE CONVECTION ON AXIAL TEMPERATURE DISTRIBUTION

ATTACHMENT 3

INSPECTION GUIDELINES

Based on the examinations performed at Farley Unit 2 on the six(6) inch schedule 160 safety injection lines, the following supplemental examinations were able to detect the through-wall indication in the Farley Unit 2 line.

Perform penetrant examinations of 100% of the outside diameter weld surface plus 1/2 inch on each side of the above welds where practical.

If UT is performed, the following guidelines shall apply to account for Bulletin 88-08 Supplement 2:

Performing a 45 degree refracted shear wave examination using a 2.25 Mhz 0.5 to 0.25 inch diameter transducer, calibrating out to a one and one-half vee exam for all of the above welds.

Performing an additional 60 degree refracted shear wave examination using a 0.50 to 0.25 inch diameter, 1.5 MHz transducer, calibrating out to a one and one-half vee exam for all of the above welds.

Scanning sensitivities should be at 14 dB above reference sensitivity with a noise level of less than 10% full screen height for the 45 and 60 degree exams. If the noise level exceeds the above limit, reduce the scanning sensitivity in one dB increments until the noise level drops to below the above level, and record this reduction on the applicable data sheet.

Record and evaluate all indications that traveled in time, are not attributed to component geometry and have an amplitude of greater than or equal to 20% of the distance amplitude correction curved.

FINAL REPORT OF INSERVICE INSPECTION NONDESTRUCTIVE EXAMINATIONS OF UNISOLABLE PIPING SYSTEM AND COMPONENTS FOR POTENTIAL THERMAL STRESS EFFECTS REFERENCE NRC BULLETIN NO. 88-08

APPENDIX M
NRC BULLETIN NO. 88-08

NRC BULLETIN NO. 88-08
THERMAL STRESSES IN PIPING CONNECTED
TO REACTOR COOLANT SYSTEMS

OMB No.: 3150-0011
NRCB 88-08

UNITED STATES
NUCLEAR RFGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555

June 22, 1988

NRC BULLETIN NO. 88-08: THERMAL STRESSES IN PIPING CONNECTED TO REACTOR COOLANT SYSTEMS

Addressees:

All holders of operating licenses or construction permits for light-water-cooled nuclear power reactors.

Purpose:

The purpose of this bulletin is to request that licensees (1) review their reactor coolant systems (RCSs) to identify any connected, unisolable piping that could be subjected to temperature distributions which would result in unacceptable thermal stresses and (2) take action, where such piping is identified, to ensure that the piping will not be subjected to unacceptable thermal stresses.

Description of Circumstances:

On December 9, 1987, while Farley 2 was operating at 33 percent power, the licensee noted increased moisture and radioactivity within containment. The unidentified leak rate was determined to be 0.7 gpm. The source of leakage was a circumferential crack extending through the wall of a short, unisolable section of emergency core cooling system (ECCS) piping that is connected to the cold leg of loop B in the RCS. This section of piping, consisting of a nozzle, two pipe spools, an elbow, and a check valve, is shown in Figure 1. The crack resulted from high-cycle thermal fatigue that was caused by relatively cold water leaking through a closed globe valve at a pressure sufficient to open the check valve. The leaking globe valve is in the bypass pipe around the boron injection tank (BIT) as shown in Figure 2. During normal operation this valve and others isolate the ECCS piping from the discharge pressure of the charging pumps. With a charging pump running and the valve leaking, temperature stratification occurred in the ECCS pipe as indicated in Figure 1. In addition, temperature fluctuations were found at the location of the failed weld with peak-to-peak amplitudes as large as 70 degrees F and with periods between 2 and 20 minutes.[1]

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[1] The staff has learned recently of a problem discovered at Trojan in the pressurizer surge line which involved excessive stresses due to thermal stratification. The staff believes that common elements may exist between the Farley 2 event which necessitated this bulletin and the observations at Trojan. The need for an additional generic communication is being considered as part of our ongoing evaluation of the Trojan event.

Discussion:

At Farley 2, dual-purpose pumps are used for charging the RCS with coolant from the chemical and volume control system during normal operation and injecting emergency core coolant at high pressure during a loss-of-coolant accident (LOCA). Separate runs of piping from these pumps are connected to separate nozzles on the RCS piping for normal charging flow, backup charging flow, and hot- and cold-leg ECCS injection and to a nozzle on the pressurizer for auxiliary pressurizer spray. All of these runs of piping, downstream from the last check valve in each pipe, are susceptible to the kind of failure that occurred in the ECCS piping connected to the cold leg of loop B.

In any light-water-cooled power reactor, thermal fatigue of unisolable piping connected to the RCS can occur when the connected piping is isolated by a leaking block valve, the pressure upstream from the block valve is higher than RCS pressure, and the temperature upstream is significantly cooler than RCS temperature. Because valves often leak, an unrecognized phenomenon and possibly unanalyzed condition may exist for those reactors that can be subjected to these conditions. Under these conditions, thermal fatigue of the unisolable piping can result in crack initiation as experienced at Farley 2. Cracking has occurred at other plants in Class 2 systems (see IE Bulletin 79-13, "Cracking in Feedwater System Piping," dated June 25, 1979 and Revisions 1 and 2 dated August 30 and October 16, 1979, respectively). Subjecting flawed piping to excessive stresses induced by a seismic event, waterhammer, or some other cause conceivably could result in failure of the pipe.

General Design Criterion 14 of Appendix A to Part 50 of Title 10 of the Code of Federal Regulations requires that the reactor coolant pressure boundary be designed so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture. At Farley 2, the pressure boundary failed well within its design life.

Actions Requested:

1. Review systems connected to the RCS to determine whether unisolable sections of piping connected to the RCS can be subjected to stresses from temperature stratification or temperature oscillations that could be induced by leaking valves and that were not evaluated in the design analysis of the piping. For those addressees who determine that there are no unisolable sections of piping that can be subjected to such stresses, no additional actions are requested except for the report required below.

2. For any unisolable sections of piping connected to the RCS that may have been subjected to excessive thermal stresses, examine nondestructively the welds, heat-affected zones and high stress locations, including geometric discontinuities, in that piping to provide assurance that there are no existing flaws.

3. Plan and implement a program to provide continuing assurance that unisolable sections of all piping connected to the RCS will not be subjected to combined cyclic and static thermal and other stresses that could cause fatigue failure during the remaining life of the unit. This assurance may be provided by (1) redesigning and modifying these sections of piping to withstand combined stresses caused by various loads including temporal and spatial distributions of temperature resulting from leakage across valve seats, (2) instrumenting this piping to detect adverse temperature distributions and establishing appropriate limits on temperature distributions, or (3) providing means for ensuring that pressure upstream from block valves which might leak is monitored and does not exceed RCS pressure.

4. For operating plants not in extended outages, Action 1 should be completed within 60 days of receipt of this bulletin, and Actions 2 and 3, if required, should be completed before the end of the next refueling outage. If the next refueling outage ends within 90 days after receipt of this bulletin, then Actions 2 and 3 may be completed before the end of the following refueling outage.

   For operating plants in extended outages and for plants under construction, Action 1 should be completed within 60 days of receipt of this bulletin or before achieving criticality, whichever is later, and Actions 2 and 3 should be completed before achieving criticality, unless criticality is scheduled to occur within 90 days of receipt of this bulletin. In that case, Actions 2 and 3 should be completed before the end of the next refueling outage.

Reporting Requirements:

1. Within 30 days of completion of Action 1, each addressee shall submit a letter confirming that the action has been completed and describing the results of the review. If the review performed under Action 1 indicates that a potential problem exists, the confirmatory letter shall include a schedule for completing Actions 2 and 3.

2. Those addressees who determine that there are unisolable sections of pipe that can be subjected to stresses from temperature stratification or temperature oscillations that could be induced by leaking valves and that were not evaluated in the design analysis of the piping shall submit a letter within 30 days of completion of Actions 2 and 3. This letter should confirm that Actions 2 and 3 have been completed and describe the actions taken.

The written reports, required above, shall be addressed to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555, under oath or affirmation under the provisions of Section 182a, Atomic Energy Act of 1954, as amended. In addition, a copy shall be submitted to the appropriate Regional Administrator.

This requirement for information was approved by the Office of Management and Budget under clearance number 3150-0011.

If you have any questions regarding this matter, please contact one of the technical contacts listed below or the Regional Administrator of the appropriate NRC regional office.

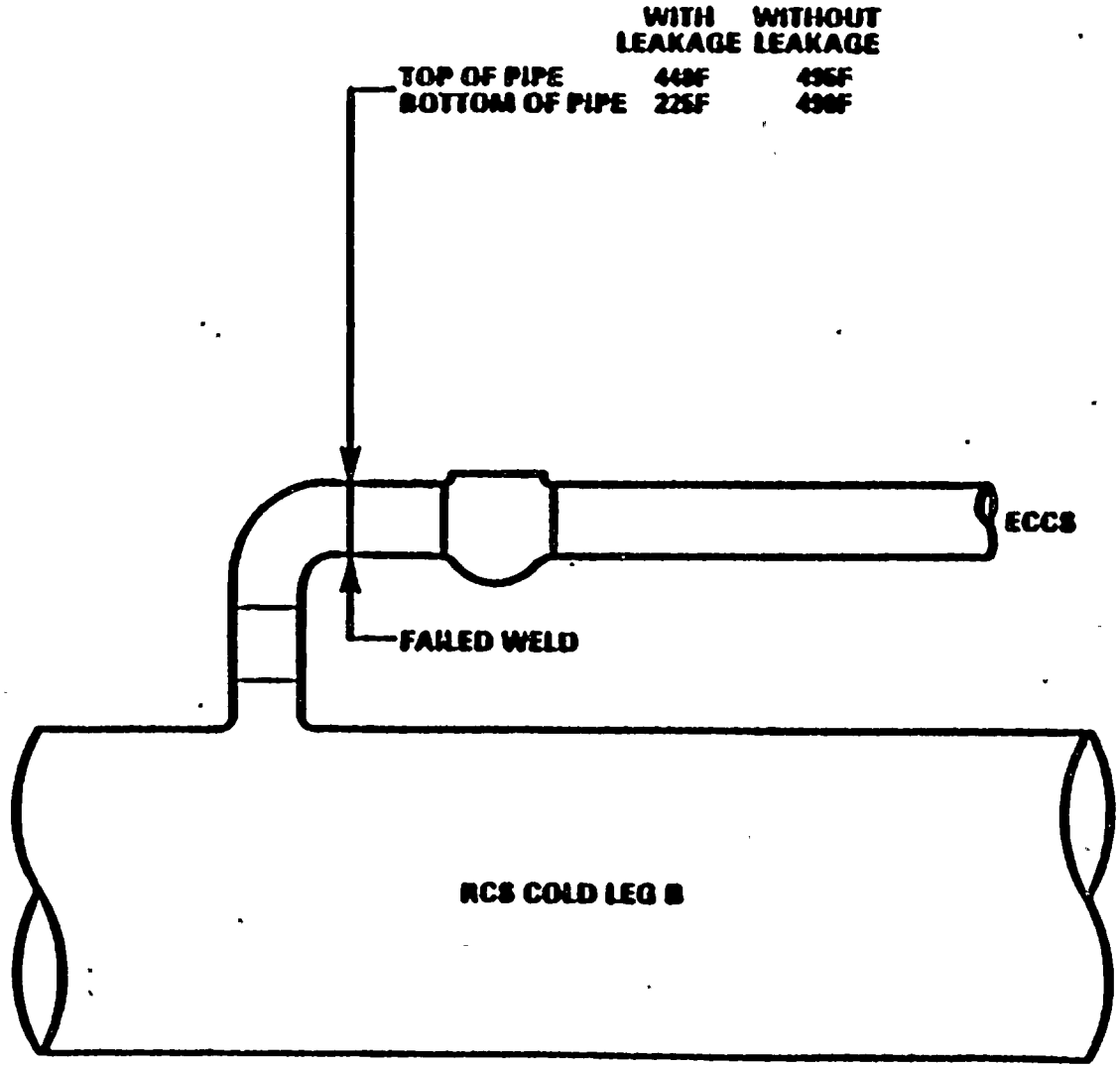
Charles E. Rossi

Charles E. Rossi, Director
Division of Operational Events Assessment
Office of Nuclear Reactor Regulation

Technical Contacts: Roger W. Woodruff, NRR
(301) 492-1180

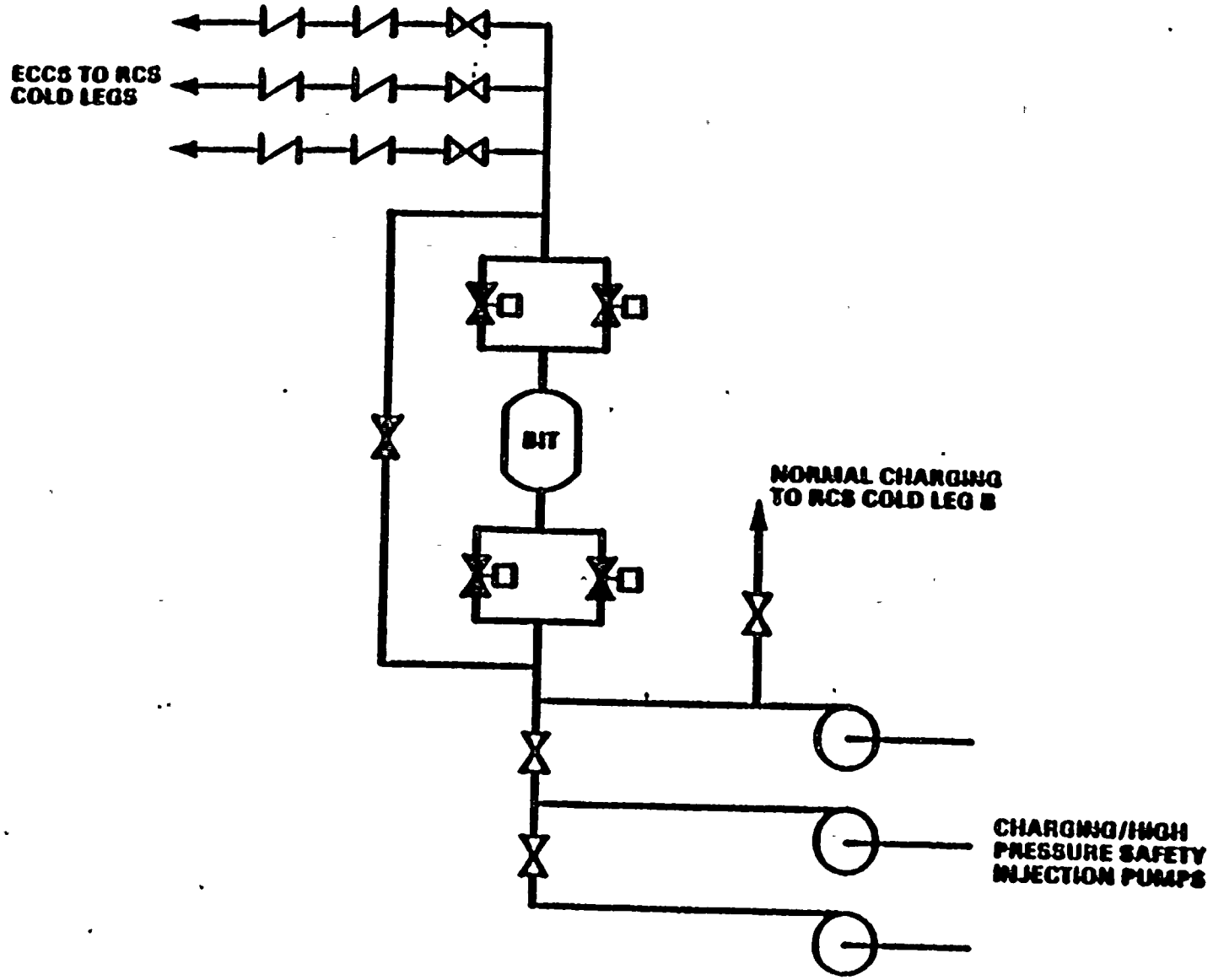
Pao Kuo, NRR
(301) 492-0907

Attachments:
1. Figure 1 - Farley 2 Temperature Data
2. Figure 2 - Farley 2 ECCS
3. List of Recently Issued NRC Bulletins



FARLEY 2 TEMPERATURE DATA

FIGURE 1



FARLEY 2 ECCS

FIGURE 2