



March 13, 1996

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

Subject: Meeting Held March 6, 1996, between Commonwealth Edison
Company (ComEd) and Office of Nuclear Reactor Regulation (NRR)
Byron Station Units 1 and 2, Braidwood Station Units 1 and 2
NRC Docket Nos. 50-454/455; 50-456/457

The enclosed document contains all non-proprietary information discussed
March 6, 1996, between ComEd and NRR regarding ABB/Combustion
Engineering Nuclear Operations Welded Sleeves for disclosure in the Public
Document Room.

If you have any questions regarding this correspondence, please contact this
office.

Sincerely,

A handwritten signature in cursive script, reading "Marcia T. Lesniak".

Marcia T. Lesniak
Nuclear Licensing Administrator

cc: H. Miller, Regional Administrator-RIII
G. Dick, Byron Project Manager-NRR
H. Peterson, Senior Resident Inspector-Byron
Illinois Department of Nuclear Safety-IDNS

180159

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PDR ADOCK 05000454
P PDR

ADD 1/1

ComEd/NRR

MARCH 6, 1996

**ABB
COMBUSTION ENGINEERING NUCLEAR OPERATIONS
WELDED SLEEVES**

AGENDA

- **INTRODUCTION/OBJECTIVES**
[J. BLOMGREN]
- **ABB CENO SLEEVE DESIGN AND EXPERIENCE**
[D. STEPNIK]
- **RECENT EVENTS**
 - **PRAIRIE ISLAND OBSERVATION/PROCESS**
[R. PEARSON]
 - **PRAIRIE ISLAND TUBE PULL RESULTS**
[W. GAHWILLER/J. LAREAU]
 - **INSTALLATION PROCESS/INSPECTION CHANGES**
[J. LAREAU]

AGENDA

- **OPERATING UNITS**
[D. AYRES]
- **BASIS FOR BYRON BRAIDWOOD SLEEVE APPROVAL**
[J. BLOMGREN]
- **CONCLUSIONS**
[J. BLOMGREN]

ComEd/NRR

INTRODUCTION/OBJECTIVES

ComEd/NRR

OBJECTIVES

- **GET NRC CONCURRENCE FOR USE OF ABB CENO SLEEVES AT BYRON/BRAIDWOOD**
- **PRESENT ABB CENO INFORMATION ON RESULTS OF PI TUBE PULLS**
- **ABB CENO PLAN AND SCHEDULE FOR RESOLUTION OF SLEEVE ISSUES**

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OUTAGE SCHEDULE BYRON STATION

- **TS CHANGE BYRON 1 SUBMITTED 5/19/95
—REQUIRED APPROVAL 2/96**
- **UNIT OFF-LINE APRIL 5**
- **ECT APRIL 11 TO APRIL 18**
- **SLEEVING APRIL 22 TO MAY 5**
- **MANWAY INSTALLATION MAY 2 TO MAY 7**
- **MODE 4 MAY 14**
- **UNIT ON-LINE MAY 20**

ComEd/NRR SLEEVE MEETING

REQUEST FOR ADDITIONAL INFORMATION

- **ABB CENO SLEEVING HISTORY**
- **PI RECENT EVENTS**
- **INSTALLATION PROCESS ISSUES**
- **NDE TECHNIQUES**
- **PROCESS CHANGES**
- **OPERATING SLEEVES**

PRAIRIE ISLAND UNIT 1 PRELIMINARY CONCLUSIONS

- **WELD INDICATIONS ARE PROCESS INDUCED**
- **PROCESS INDUCED FLAWS CAUSED BY INADEQUATE CLEANING**
 - **OXIDES PRESENT IN ALL CASES**
 - **NO INTERGRANULAR NATURE**
 - **NO GROWTH INDICATED BY I COIL**
- **OXIDE INDUCED WELD INDICATIONS DETECTED BY NDE**
- **STRUCTURAL INTEGRITY IS ADEQUATE**
- **LEAK RATE SMALL**

BYRON/BRAIDWOOD BASIS FOR ACCEPTANCE

- **HISTORICAL PERFORMANCE OF SLEEVES**
- **PROCESS CONTROLS**
- **IMPROVED INSPECTION**
 - **ENHANCED UT PROCESSING**
 - **ADDING VISUAL OF CLEANED TUBE (PROCESS INSPECTION)**
 - **+ POINT EXAM**

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ABB CENO SLEEVE DESIGN

&

EXPERIENCE

ABB WELDED SLEEVE DESIGN CRITERIA

- **LEAKTIGHT TO > 6500 psi**
- **LOW RESIDUAL STRESS**
- **CORROSION RESISTANT**
- **INSPECTABLE (100% U.T./V.T./ECT)**
- **REPAIRABLE (REWELD)**
- **STRUCTURAL REQUIREMENTS**
- **MAXIMUM TUBESHEET COVERAGE**
- **MINIMUM EFFECT ON HEAT TRANSFER**
- **PLUGGABLE**

CENO SLEEVING EXPERIENCE

DATE	PLANT	STANDARD	PERIPHERAL	ETZ/RTZ	TSP
1/96	PRAIRIE ISLAND 1	253	0	0	0
10/95	ANO2	0	0	627	0
10/95	ZION 1	911	0	0	0
1/95	ZION 2	162	0	0	0
5/94	PRAIRIE ISLAND 1	117	0	0	0
11/93	ZION 1	61	0	0	0
6/93	KRSKO	0	0	164	16
4/93	GINNA	51	0	0	0
11/92	PRAIRIE ISLAND 1	158	0	0	0
11/92	ZION 2	170	0	0	0
6/92	ASCO 1	0	0	49	5
4/92	GINNA	178	63	0	0
4/92	ZION 1	124	0	0	0
3/92	KEWAUNEE	0	16	0	0
7/91	RINGHALS 3	0	0	46	22
4/91	GINNA	183	29	0	NA
4/90	ZION 2	62	0	0	-
4/90	GINNA	198	48	0	-
31/90	PRAIRIE ISLAND 1	62	0	NA	-
4/89	GINNA	408	107	-	-
10/89	ZION 1	445	0	-	-
9/88	PRAIRIE ISLAND 1	73	0	-	-
5/87	RINGHALS 2	571	NA	-	-
4/87	PRAIRIE ISLAND 1	27	-	-	-
2/87	GINNA	104	-	-	-
10/86	ZION 1	128	-	-	-
5/86	RINGHALS 2	599	-	-	-
2/86	GINNA	36	-	-	-
5/85	RINGHALS 2	59	-	-	-
4/84	RINGHALS 2	18	-	-	-
		5178	263	886	43

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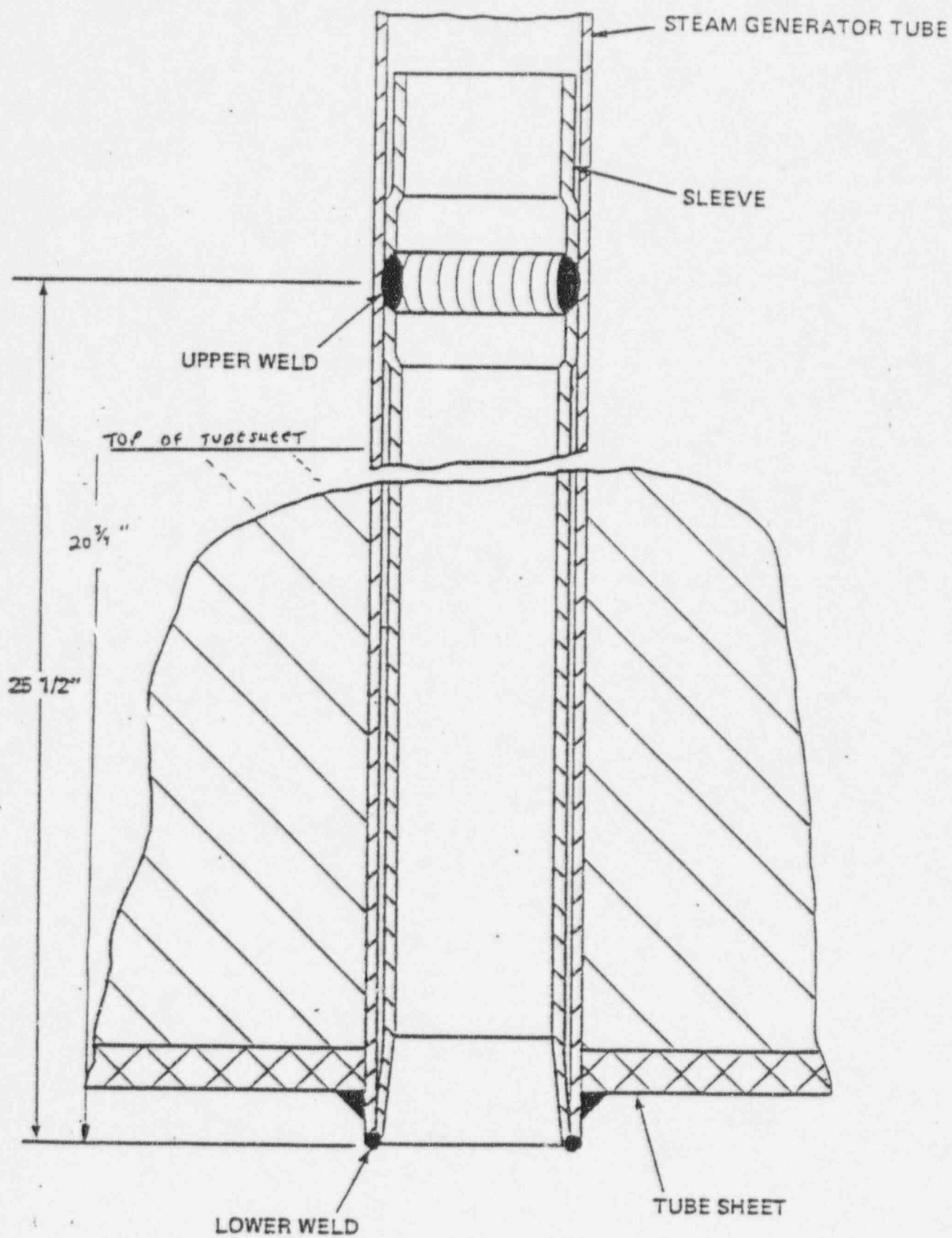
RECENT EVENTS

PRAIRIE ISLAND SLEEVING HISTORY

Date	Installed	Plugged	In Service
8704	27	0	27
8808	74	1	100
9001	63	0	163
9106	0	1	162
9210	158	1	319
9405	118	1	436
9601	285	41	680

SLEEVE INDICATIONS FROM EDDY CURRENT

- **Volumetric Indications at Upper Sleeve Weld**
 - 25 old sleeves (no change over one 20 month cycle based on I-coil and 3 coil RPC)
 - 26 new sleeves
- **Circumferential Indications at Upper Sleeve Weld**
 - 4 old sleeves (no change over 20 month cycle based on I-coil and 3 -coil RPC)
 - 6 new sleeves
- **No indications in parent tubing or sleeve away from the sleeve weld**

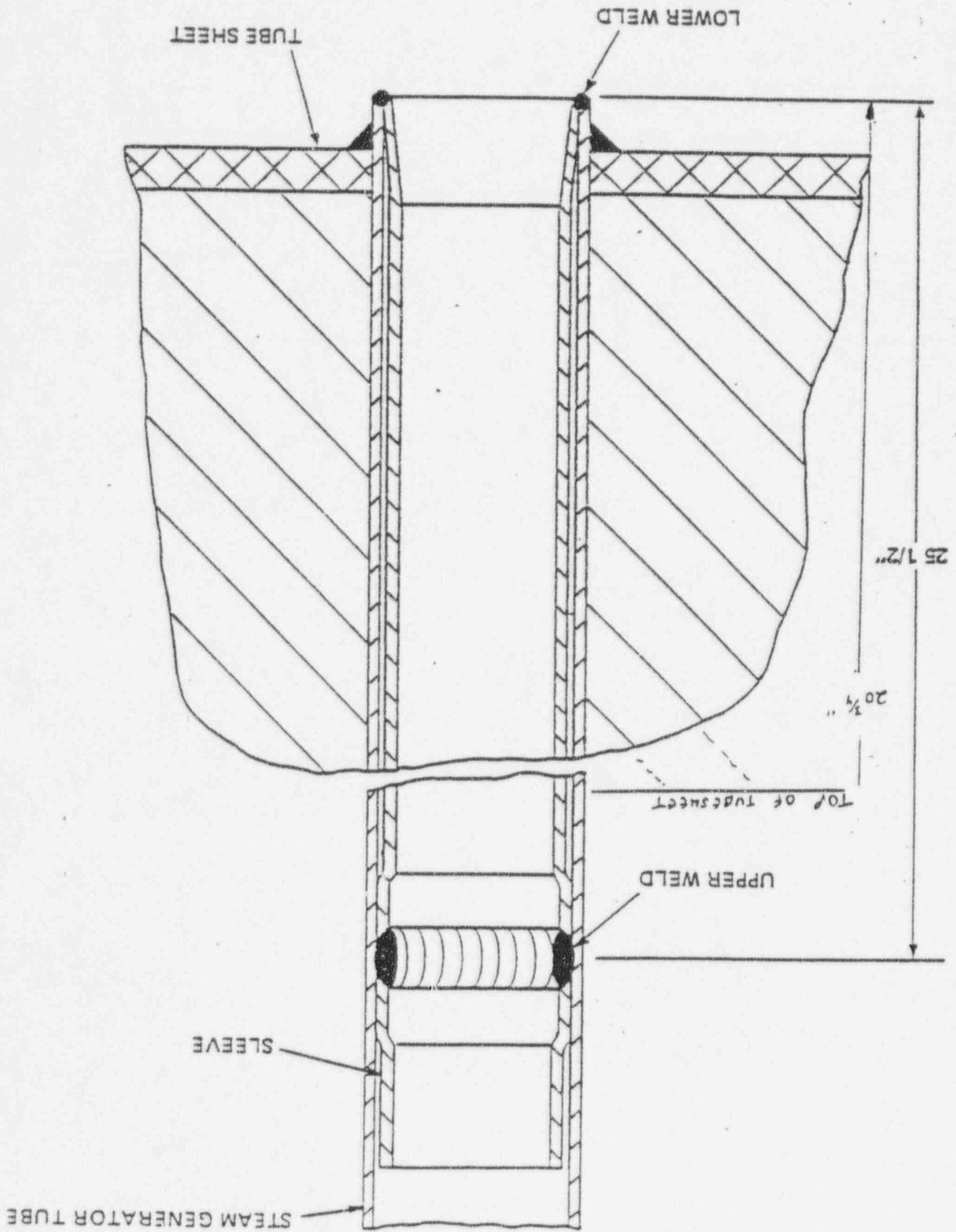


SLEEVE PULL - PURPOSE

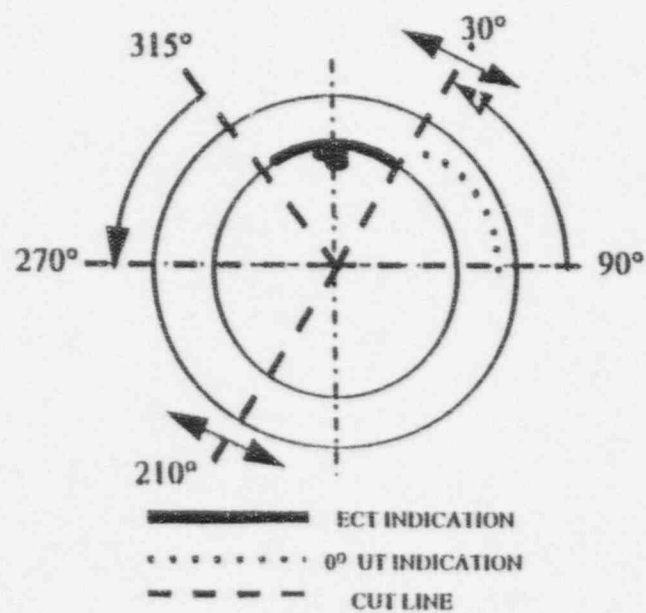
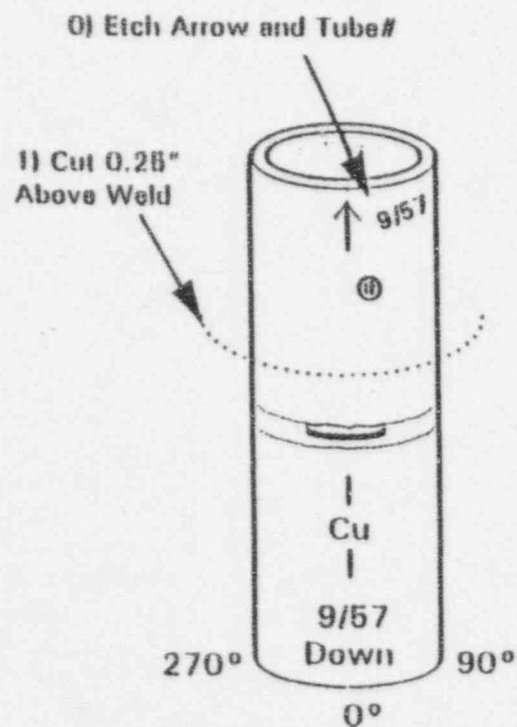
- **Identify physical condition which is source of ET Indications**
- **Evaluate Effect on Structural Integrity**
- **Identify Root Cause (Service or Process)**
- **Evaluate Leak Tightness**
 - **Plant developed a 23 GPD(max) leak on 11/17/96**
 - **One Sleeve, R7C63, leaked 1 drop per 6 minutes under 750# Secondary Pressure**
- **Received Encouragement from NRC**

SLEEVE PULL - TUBE SELECTION

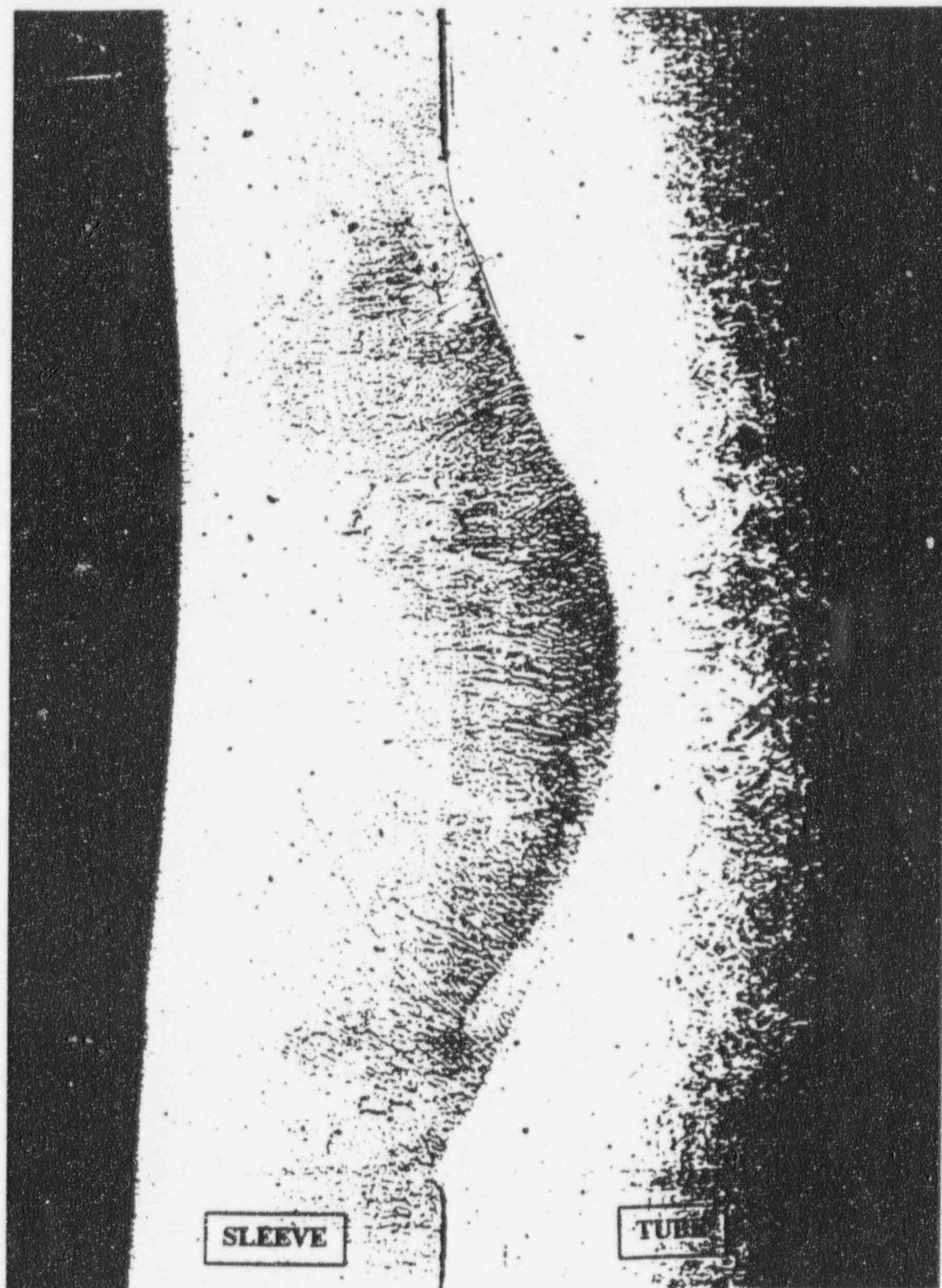
- **R5C48** **Single Circumferential Indication**
Installed 9210 **1 Weld**
- **R7C52** **Multiple Circumferential Indication**
Installed 9405 **4 Welds**
- **R9C57** **Single Circumferential Indication**
Installed 9210 **1 Weld**
- **R7C63** **Volumetric Indication**
Installed 9210 **2 Welds**
- **R5C74** **Multiple Circumferential Indication**
Installed 9601 **2 Welds**



PRAIRIE ISLAND TUBE/SLEEVE TYPICAL CUT PLAN

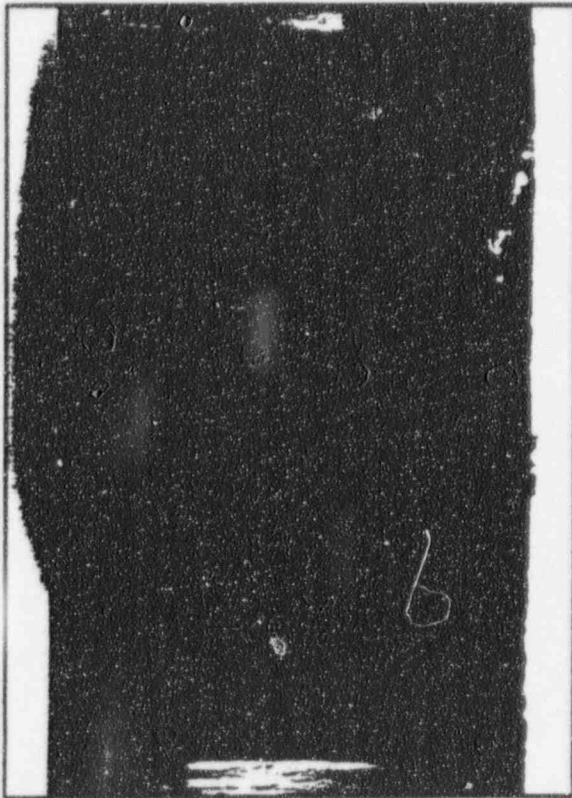


TUBE R 9 C 57
ACCEPTABLE WELD

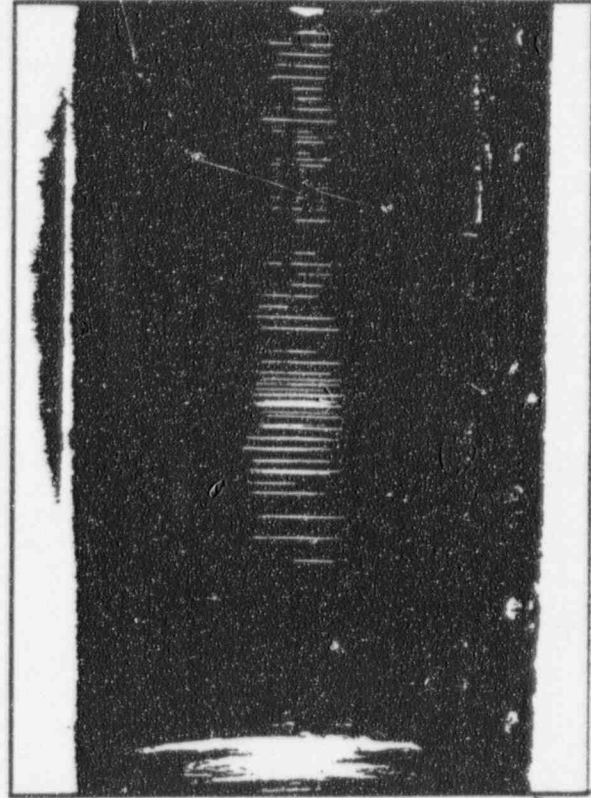


**PRAIRIE ISLAND UNIT 1
STEAM GENERATOR 1 2
TUBE R 5 C 74**

Tube I.D. Surface
(5/8" Below Sleeve Weld)



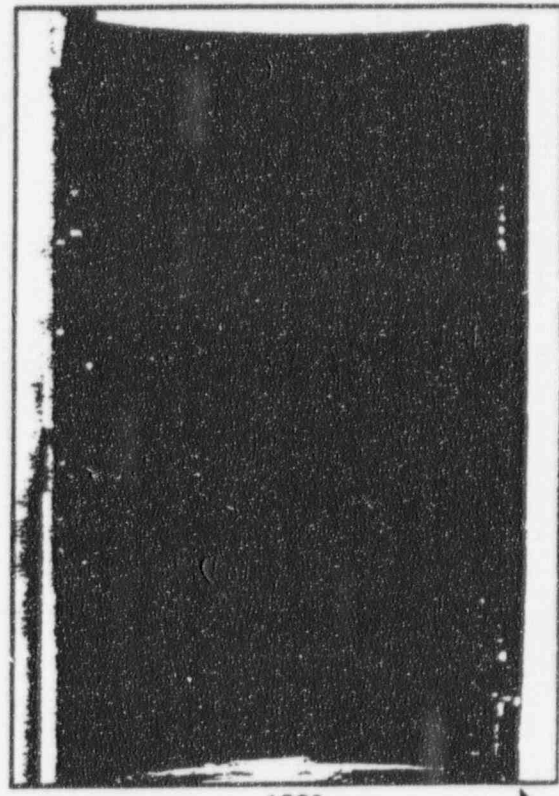
90° 0°
HALF



0° 270°
HALF

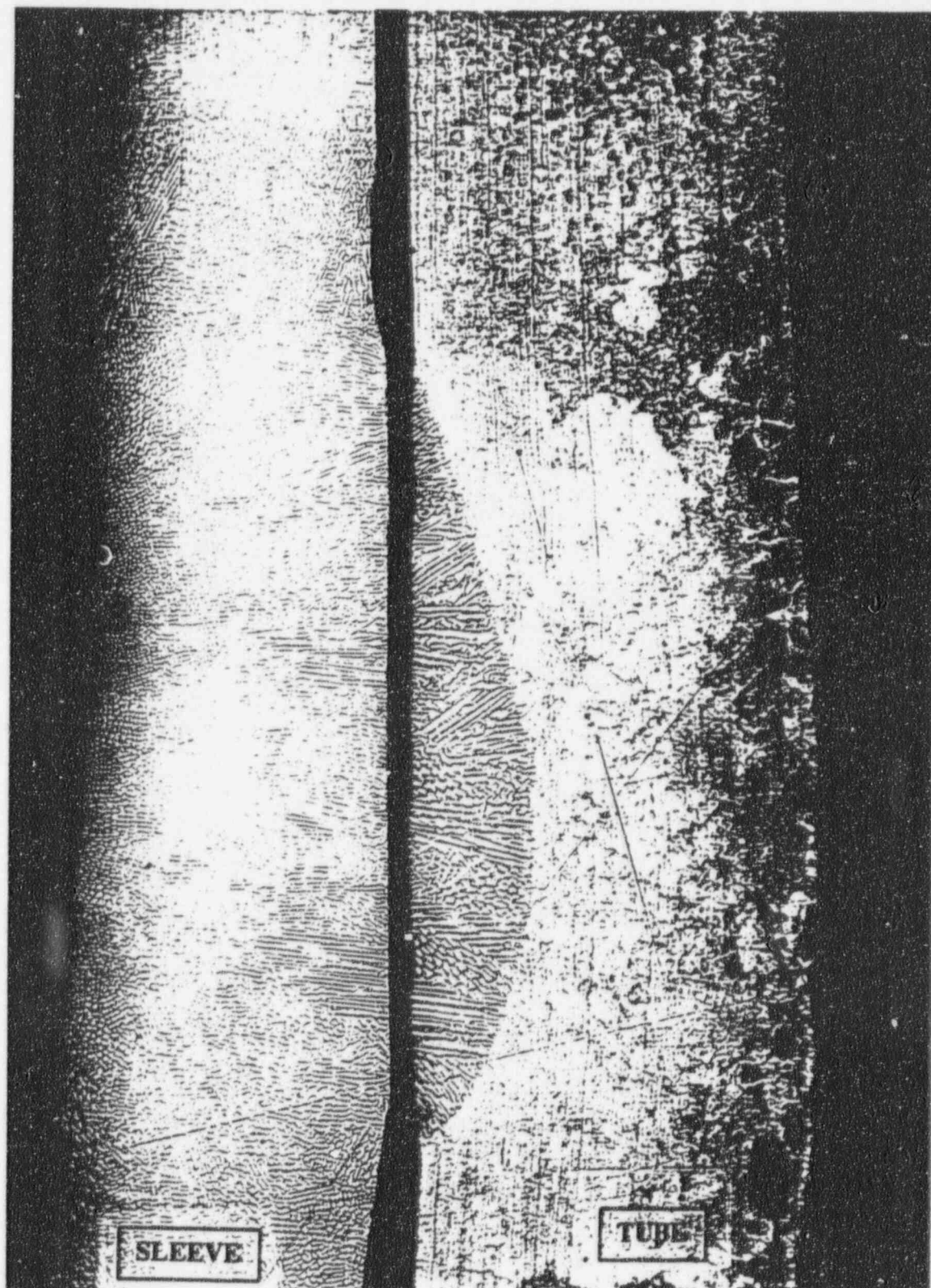


270° 180°
HALF

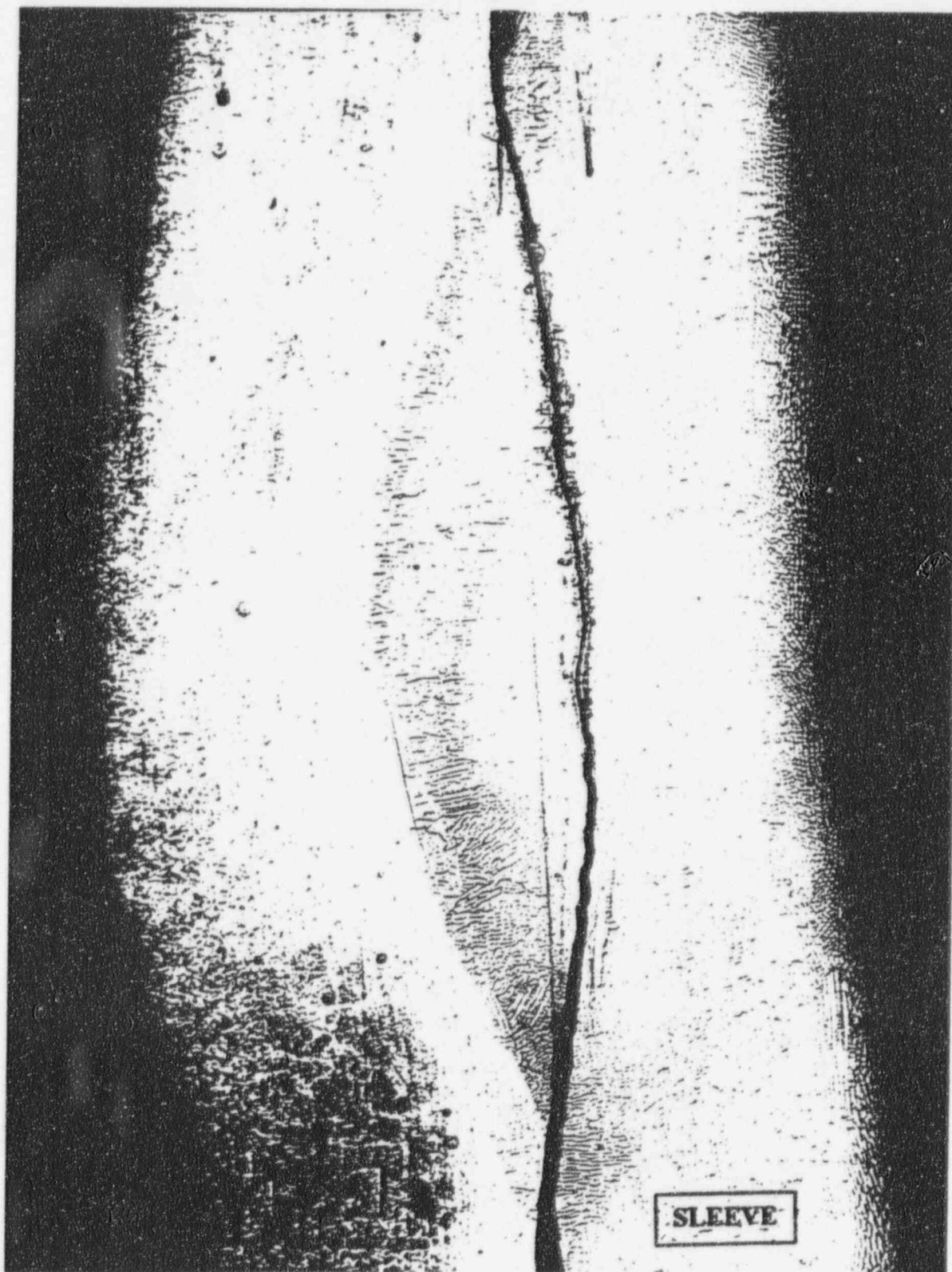


180° 90°
HALF

TUBE R 7 C 63
LACK OF FUSION

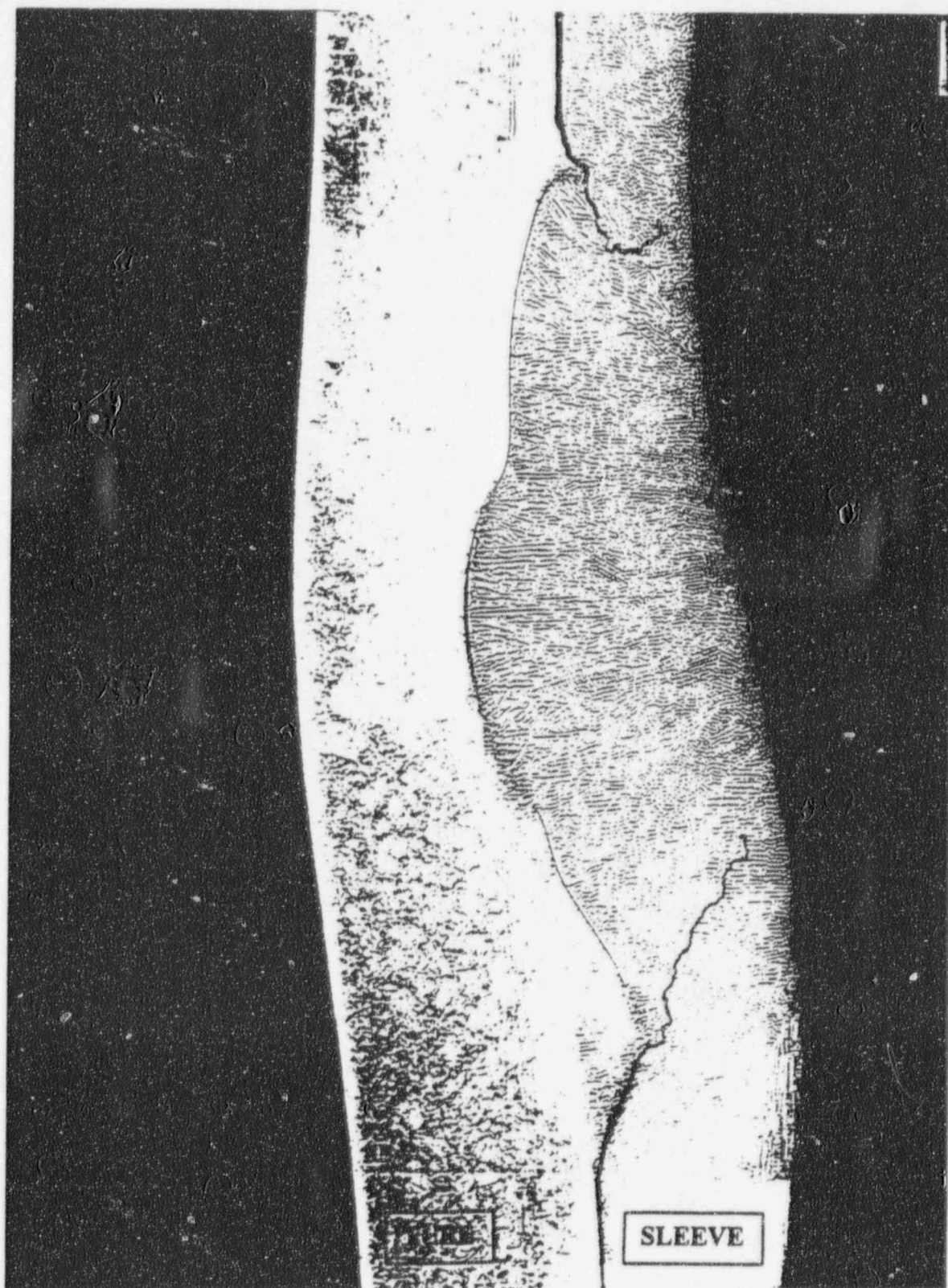


TUBE R 7 C 52
OXIDE INCLUSION / FILM

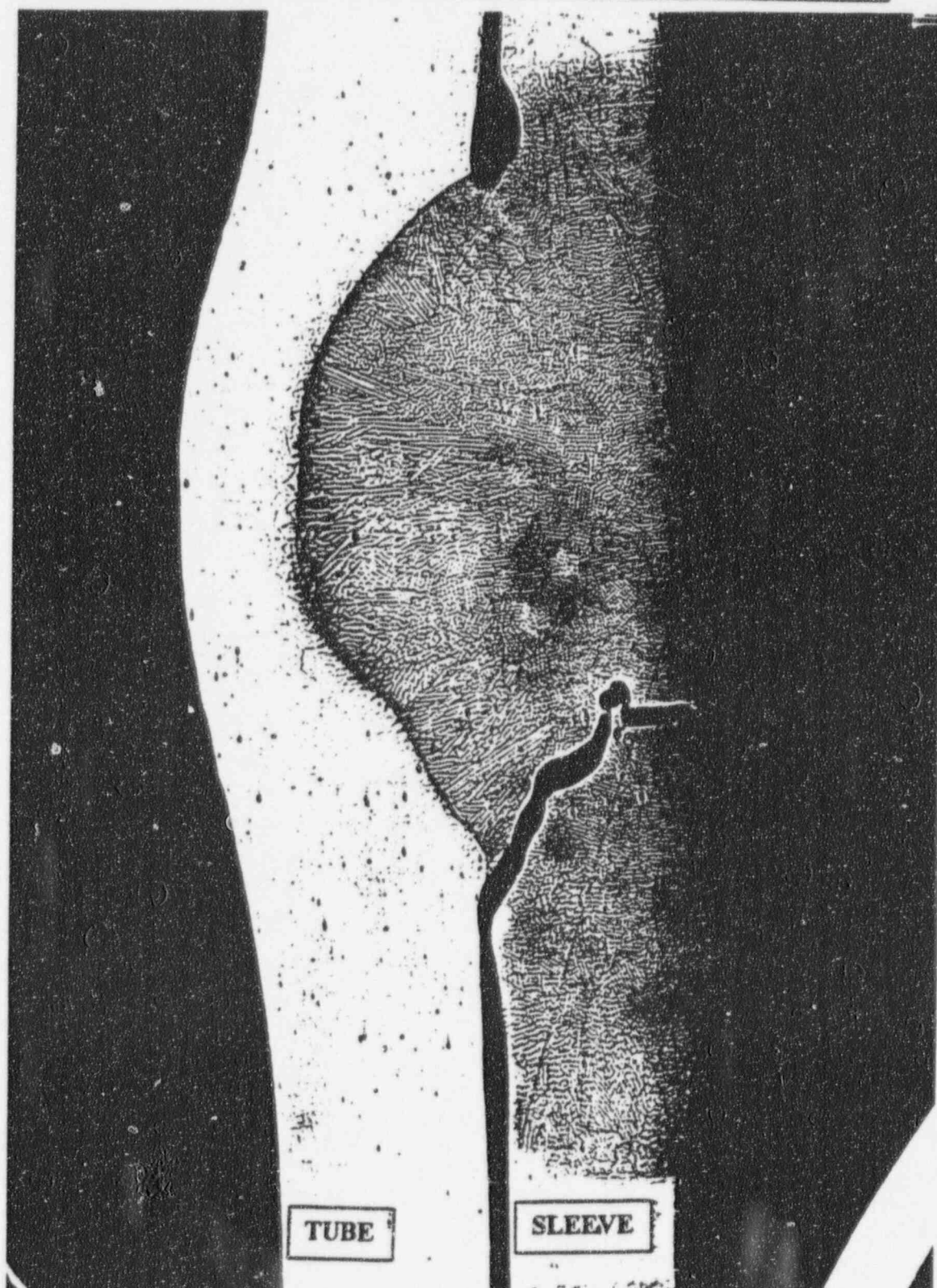


SLEEVE

TUBE R 5 C 74
OXIDE INCLUSION / FILM



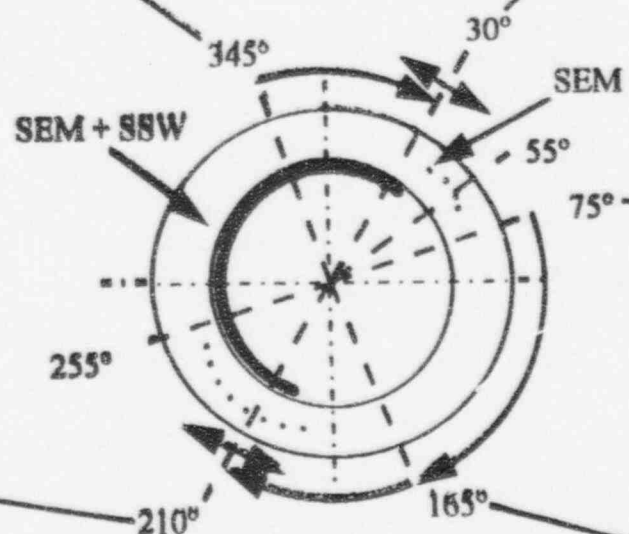
TUBE R 7 C 52
SEPARATED OXIDE INCLUSION / FILM



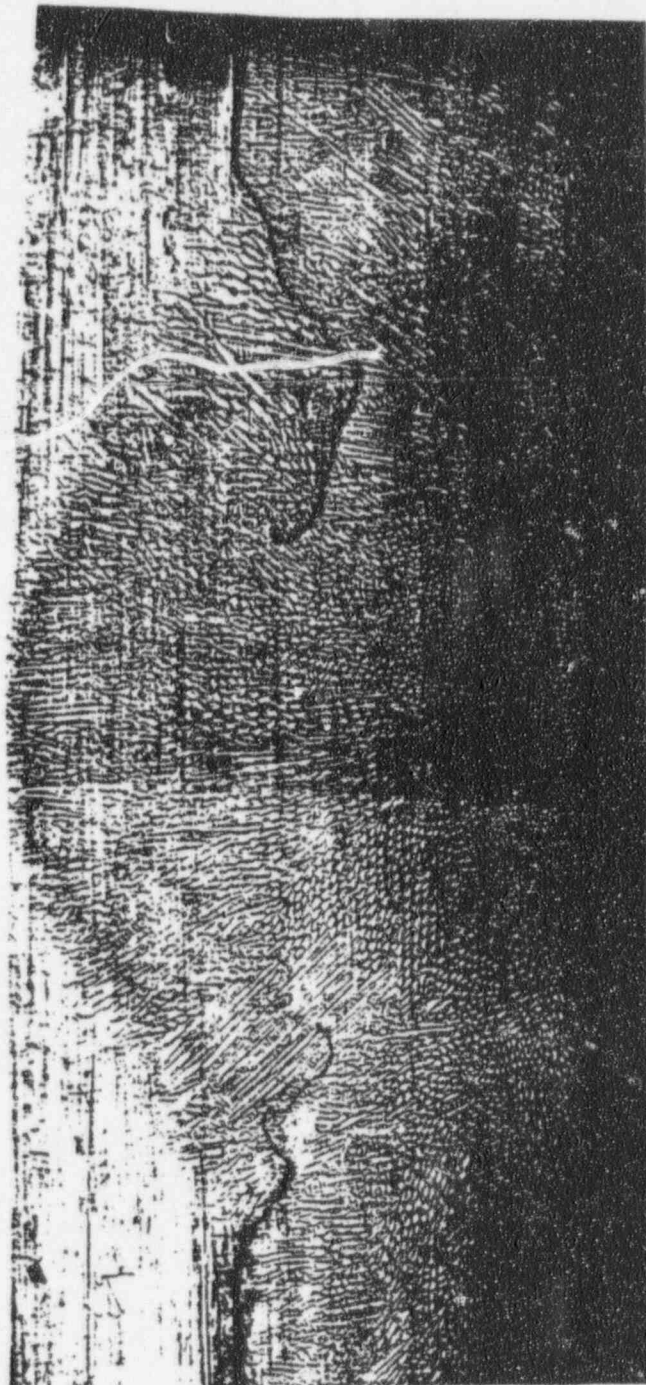
PRAIRIE ISLAND UNIT 1 S/G 1 2

TUBE R 7 C 52

(View from tubesheet up)



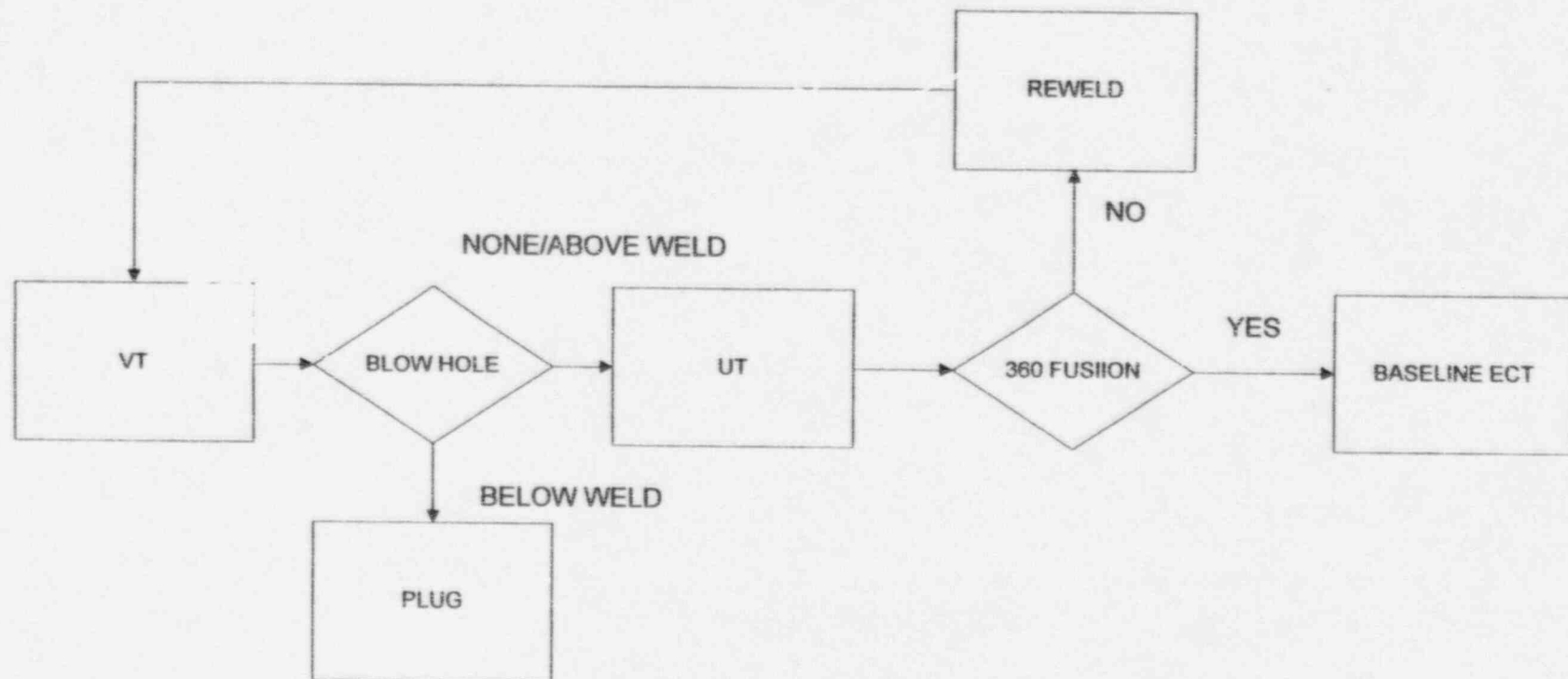
— ECT INDICATION
..... 6° UT INDICATION
- - - CUT LINE



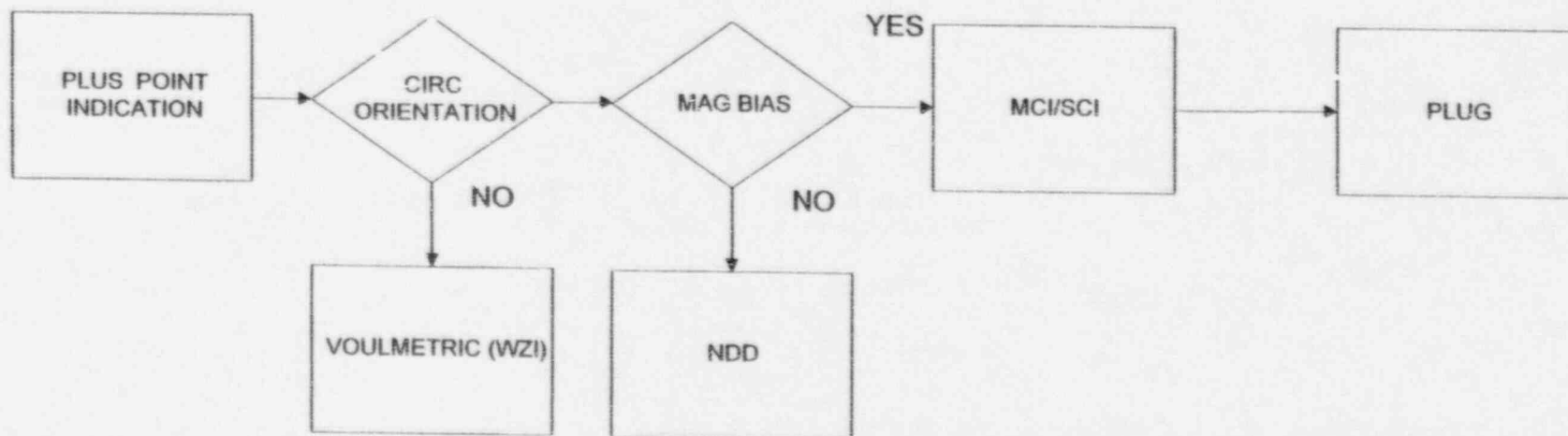
45X
LONGITUDINAL VIEW OF TUBE
R26C39 AT 90° POSITION.

FIGURE 5

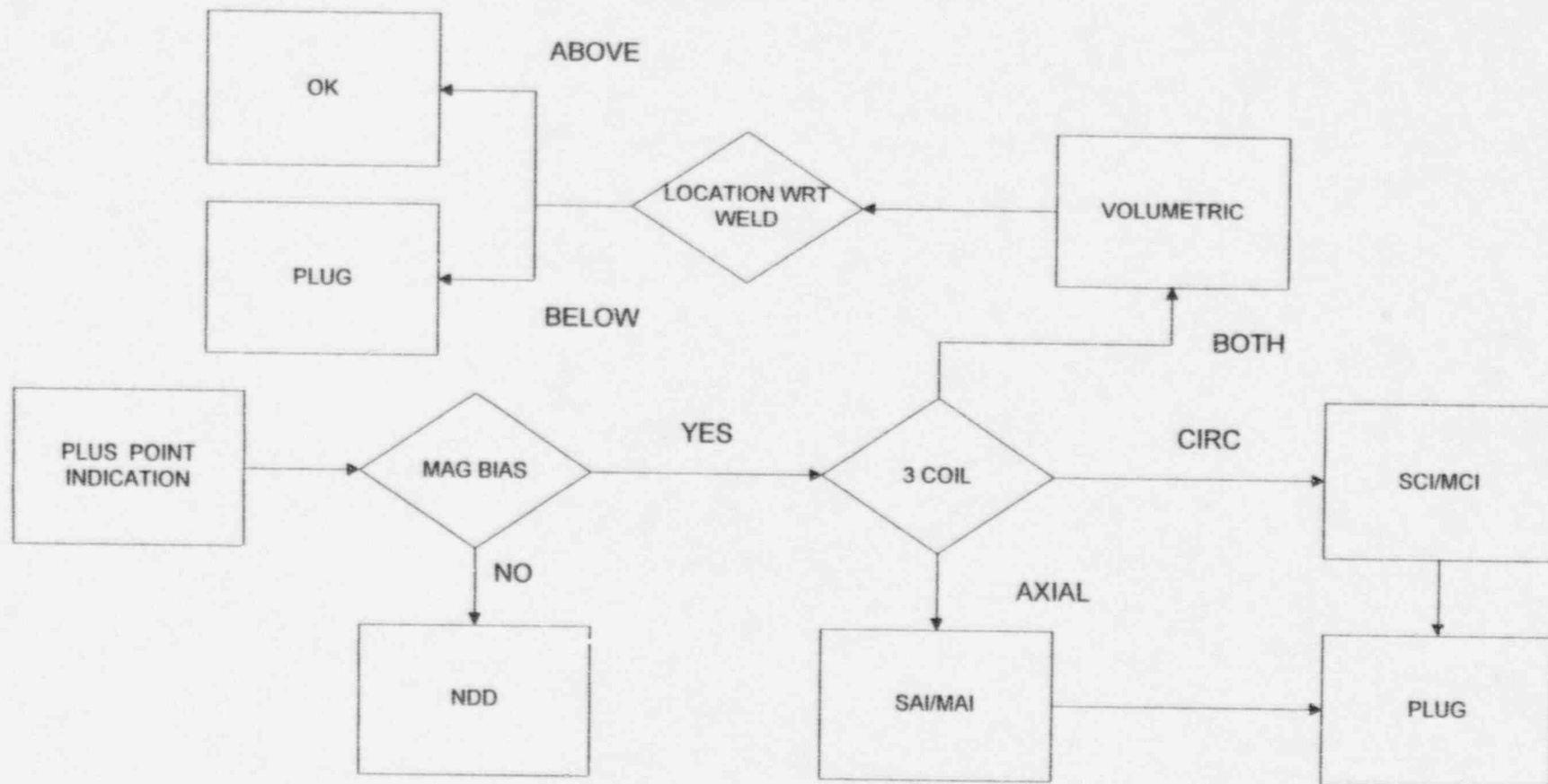
INSPECTION PROGRAM POST WELDING



ECT BASELINE PREVIOUS PRACTICE

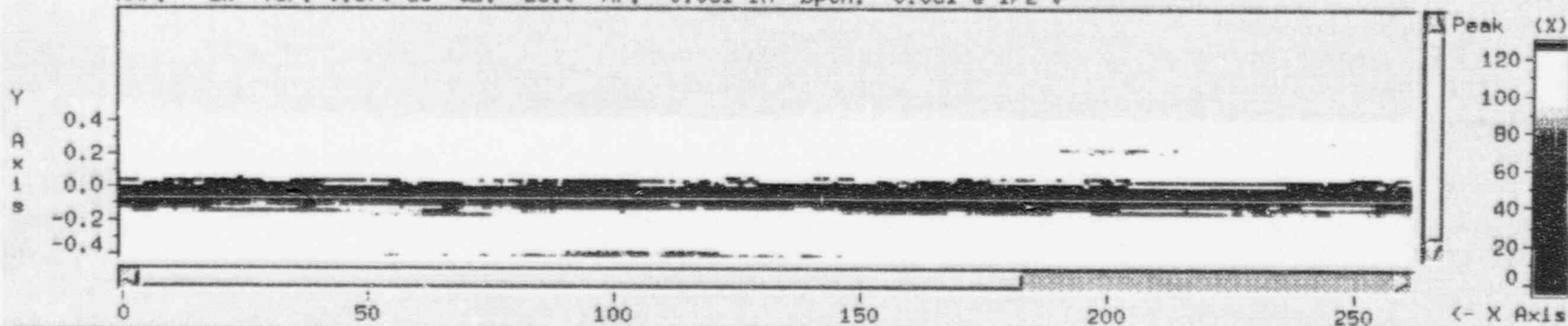


ECT BASELINE NEW PRACTICE

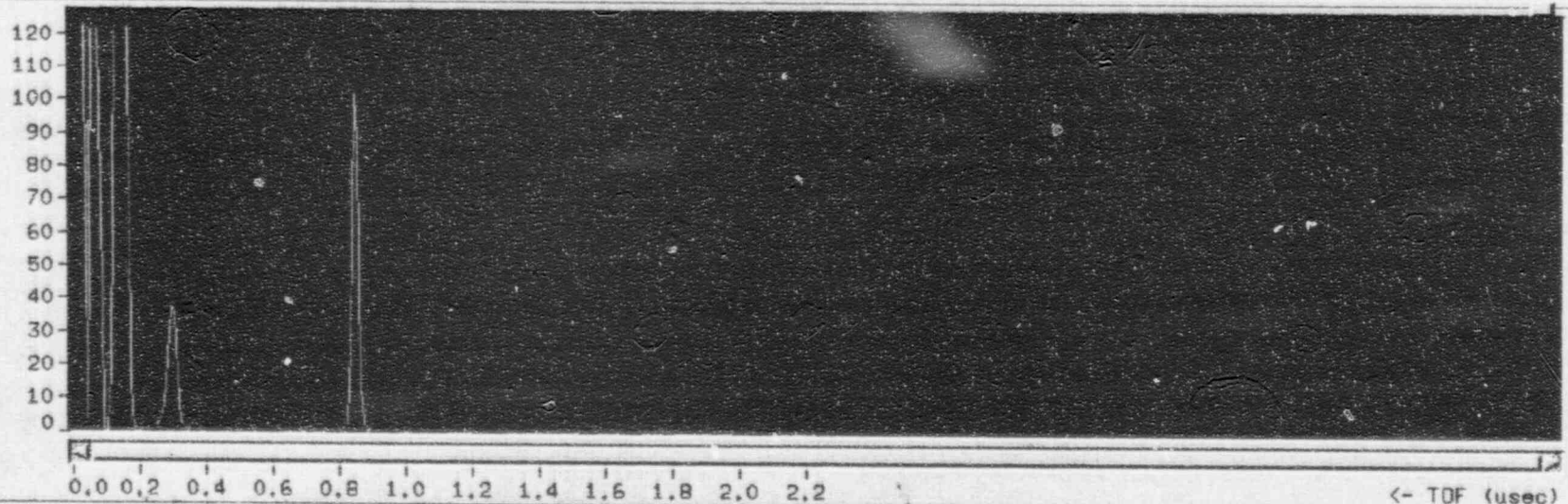
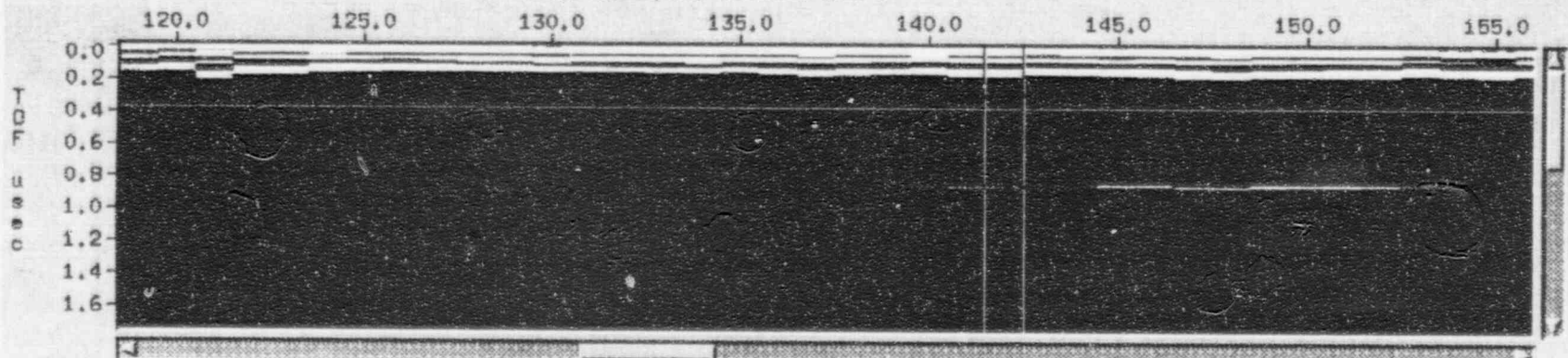


File: PIR5C48a Exam Date: 02/21/96 Time: 17:06 - 17:10
 Channel: 1 Gate: SW 1 Mode: Max Video Mode: OFF Video Filter: 8
 Gain: 74.0 dB Dac: OFF Offset: 0.0 db Pulser Voltage: 400

X Axis: 142.000 Y Axis: -0.060
 AMP: 2% TOF: 0.370 us dB: -26.0 MP: 0.031 in Dpth: 0.031 @ 1/2 V



X Axis: 142.000 Y Axis: -0.060 DTOF: 0.370 us Meas: NA
 SX Axis: 142.000 SY Axis: -0.060
 AMP: 2% TOF: 0.370 us MP: 0.031 in Dpth: 0.031 @ 1/2 V



What
 is the
 optimum

File: PIR5C48a Exam Date: 02/21/96 Time: 17:06 - 17:10
Channel: 1 Gate: IFACE Mode: Thresh Video Mode: Off Video Filter: 8
Gain: 74.0 dB Dec: OFF Offset: 0.0 db Pulse Voltage: 400

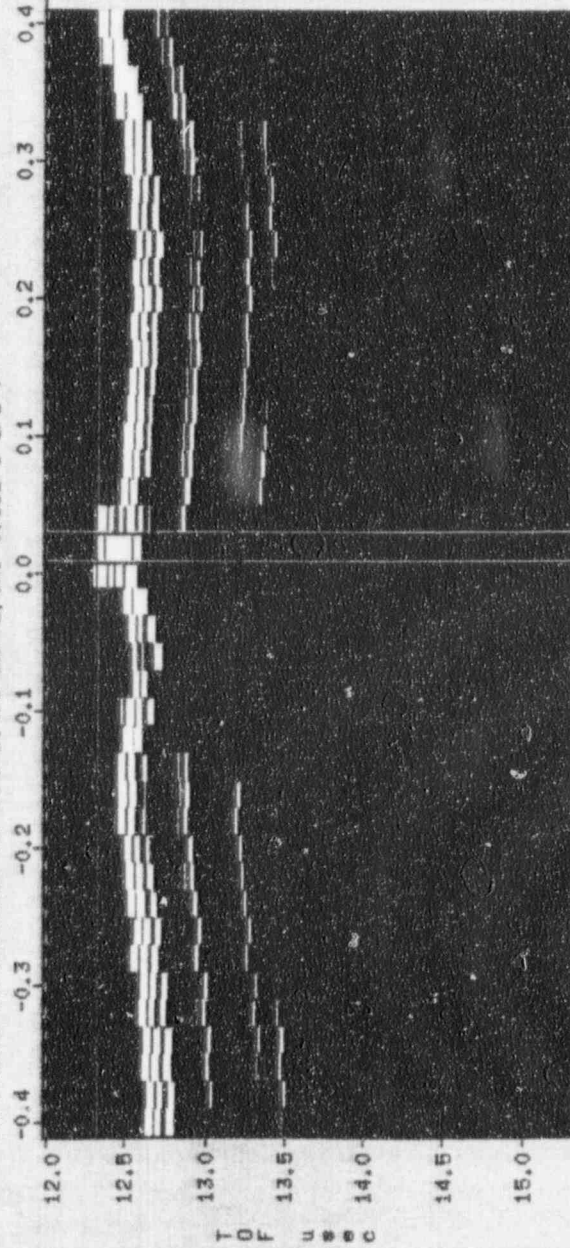
X Axis: 321.000, Y Axis: 0.020
PMP: 78X TDF: 12.320 us dB: 5.8 MP: 1.418 in Depth: 1.418 @ 1/2 V

Y
A
X
I
S

0.2
-0.1
-0.2
-0.3
-0.4

TDF (us)
12.0
12.6
13.2
13.8
← X Axis

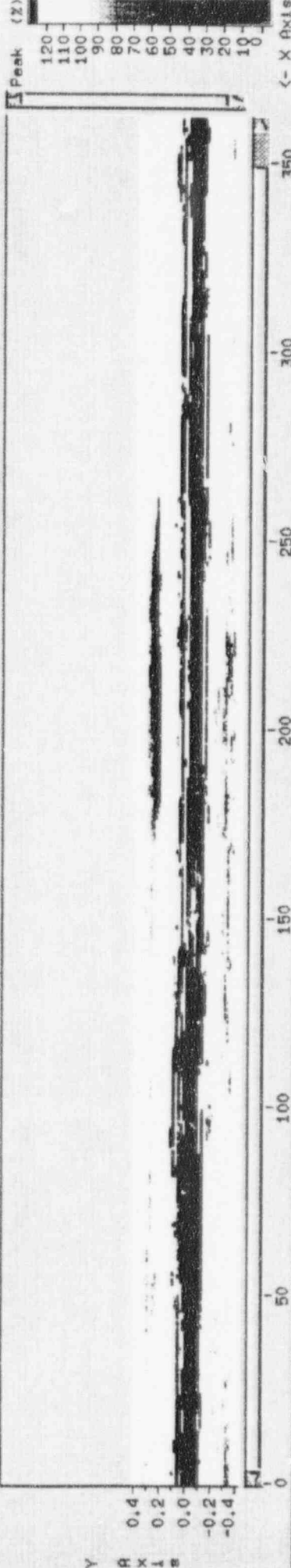
X Axis: 321.000 Y Axis: 0.020 DTDF: 0.320 us Meas: NR
SX Axis: 321.000 SY Axis: 0.020
PMP: 122X TDF: 12.320 us MP: 1.418 in Depth: 0.582 @ 2/2 V



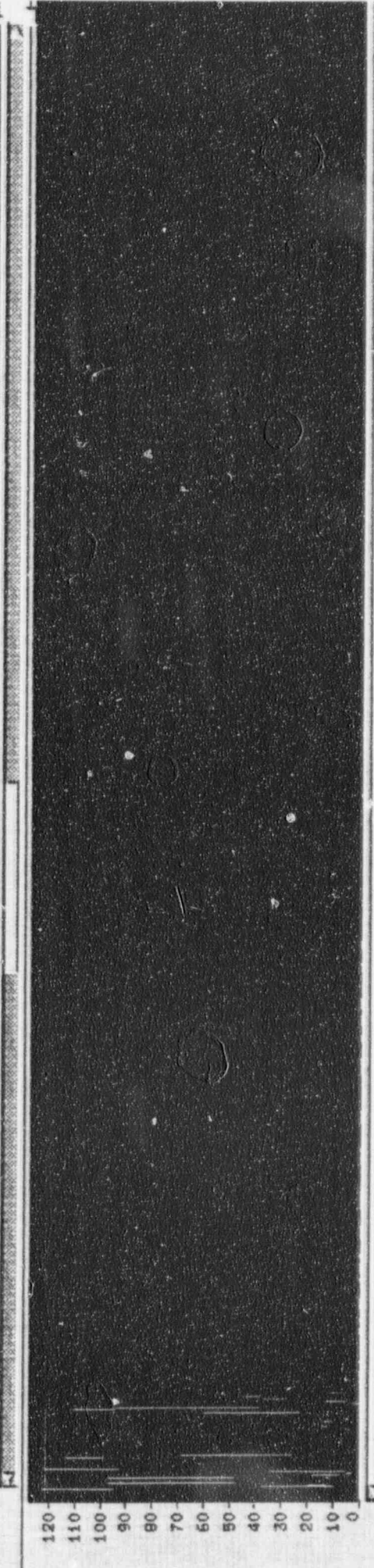
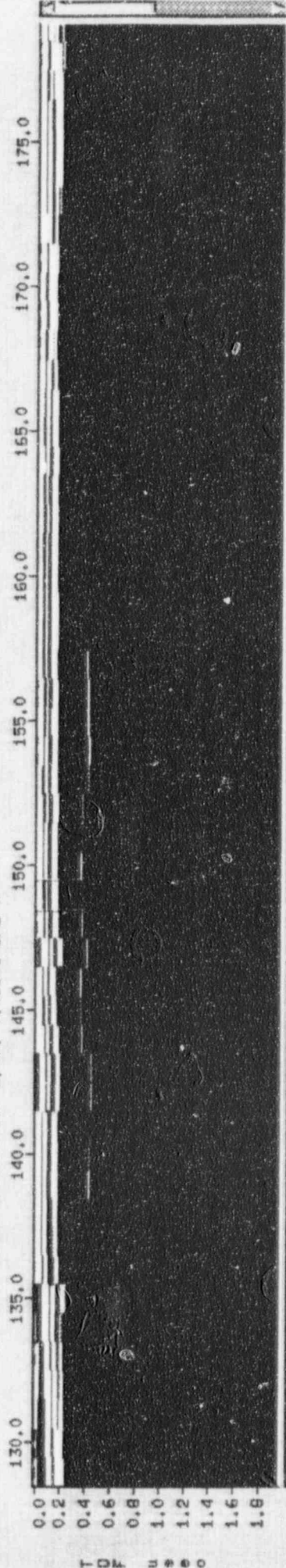
120
110
100
90
80
70
60
50
40
30
20
10
0

File: PIR752a Exam Date: 02/21/96 Time: 17:39 - 17:43
 Channel: 1 Gate: SU 1 Mode: Max Video Mode: Off Video Filter: 8
 Gain: 74.0 dB Dec: OFF Offest: 0.0 db Pulse Voltage: 400

X Axis: 149.000, Y Axis: -0.060
 AMP: 122X TDF: 0.360 us dB: 9.7 MP: 0.030 in Dpth: 0.030 @ 1/2 V



X Axis: 149.000 Y Axis: -0.060 DTDF: 0.360 us Meas: NA
 SX Axis: 149.000 SY Axis: -0.060
 AMP: 122X TDF: 0.360 us MP: 0.030 in Dpth: 0.030 @ 1/2 V



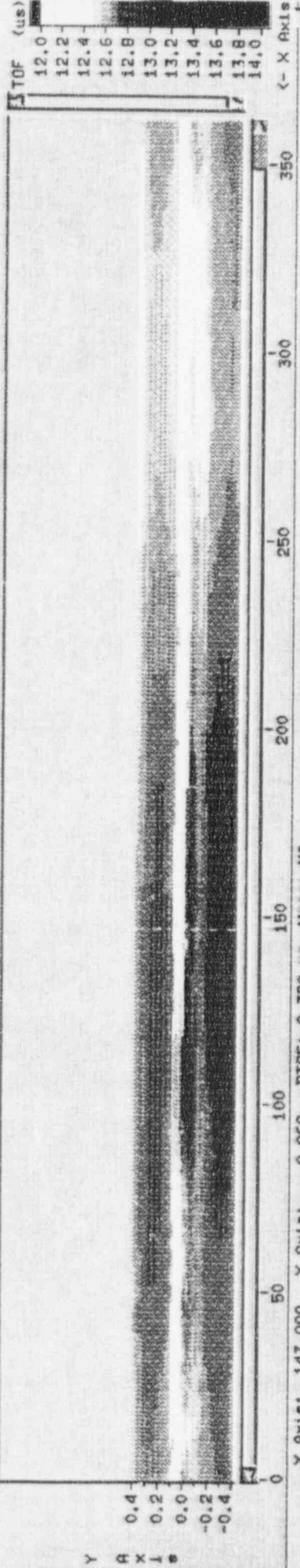
0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0 2.2

File Channel Gate C-Scan B-Scan A-Scan Tools Settings

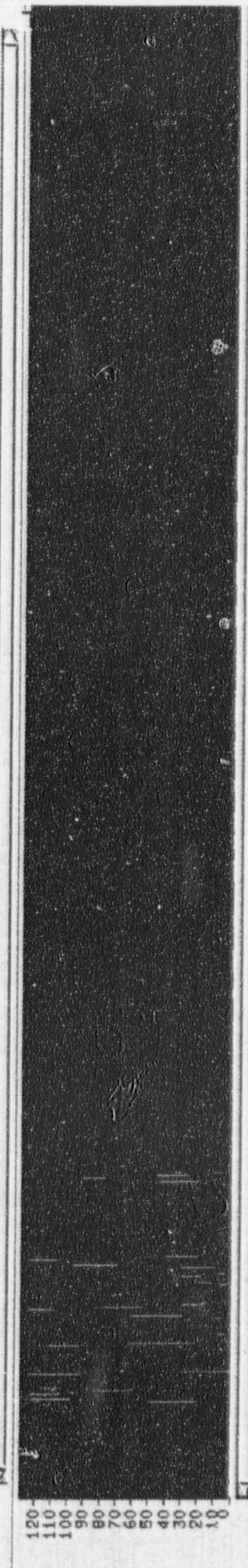
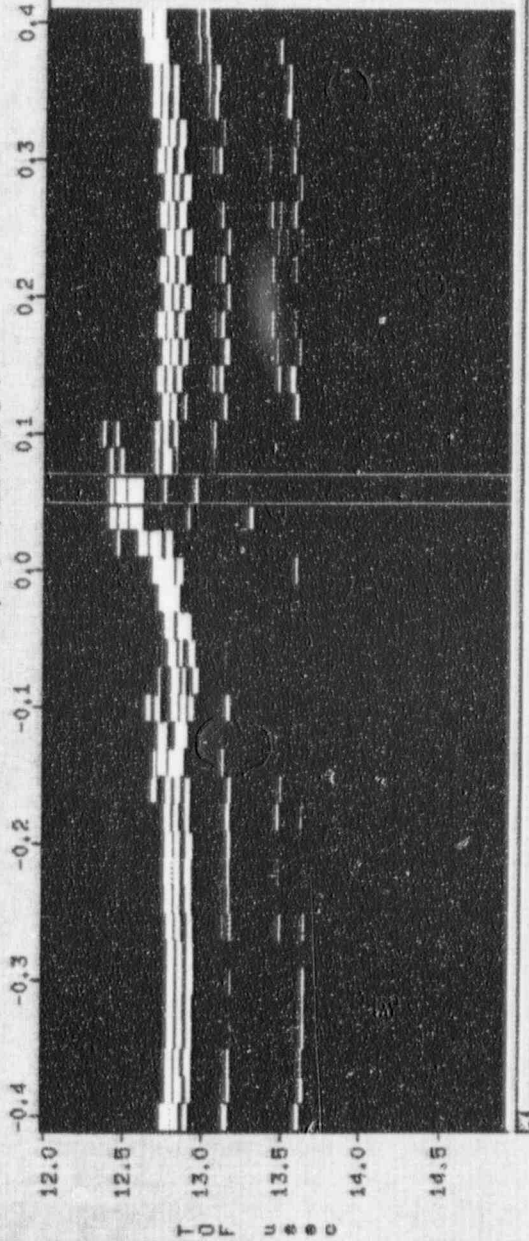
Help

File: PIR7C52a Exam Date: 02/21/96 Time: 17:39 - 17:43
 Channel: 1 Gate: IFACE Mode: Thresh Video Mode: OFF Video Filter: 8
 Gain: 74.0 dB Dao: OFF Offset: 0.0 db Pulser Voltage: 400

X Axis: 147.000, Y Axis: 0.060
 AMP: 78X TDF: 12.390 us dB: 5.8 MP: 1.426 in Dpth: 1.426 @ 1/2 V



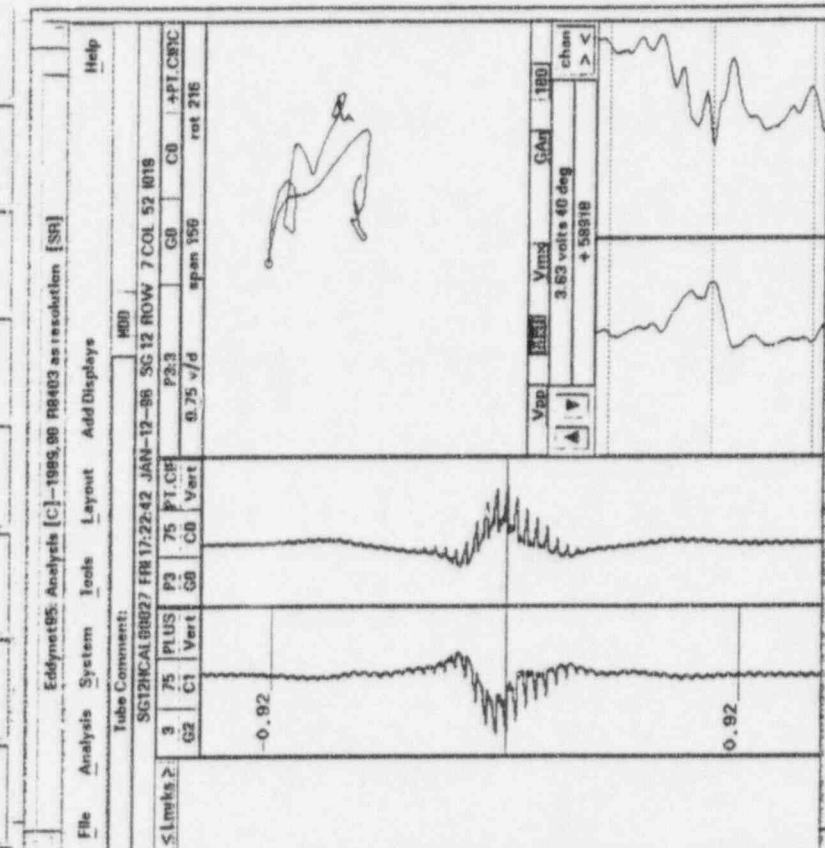
X Axis: 147.000 Y Axis: 0.060 DTDF: 0.390 us Meas: NA
 SX Axis: 147.000 SY Axis: 0.060
 AMP: 122X TDF: 12.390 us MP: 1.426 in Dpth: 1.426 @ 1/2 V

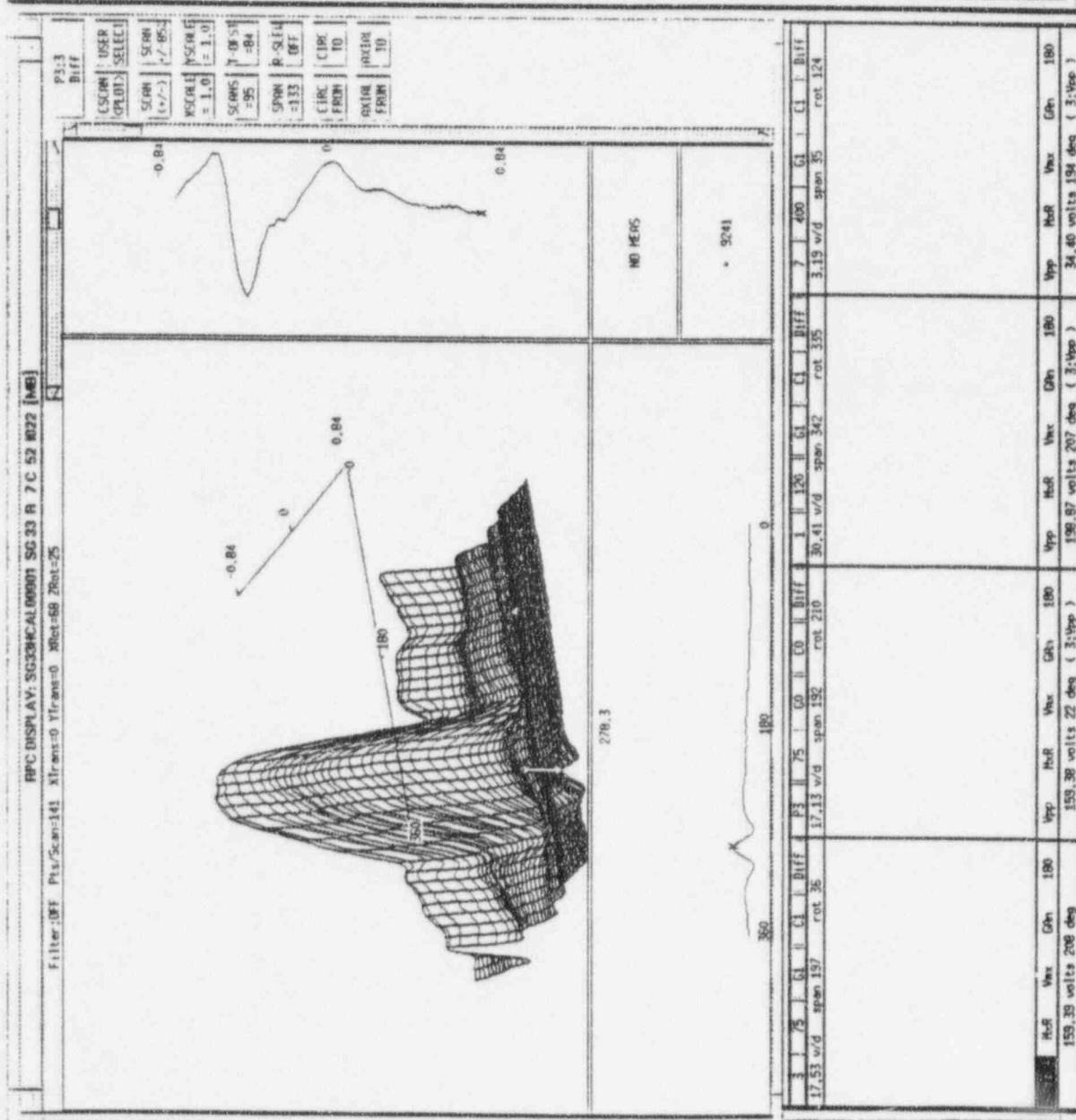


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Eddynet Global Menu																											
File			Environment			Analysis			Acquisition			Management			Utilities			Local			Help						
CONFIRMATION																											
Data = H1230.6PREC.26TEC 1230 SPS/SEC																											
min Pts/Scan=75 max Pts/Scan=84																											
SPS/LINQ circ=34 arisl=23																											
FREQ																											
1250		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1000																											
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Eddynet95: Analytic Control Panel																							
Data Directory			Print Screen			ZOOMED 10> <30			Tube > <			Landmark > <			<Get> Setup			Refresh (10)			Window Menu...		



[illegible]

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CONCLUSIONS

- **ROOT CAUSE**
 - INADEQUATE CLEANING**
- **CORRECTIVE ACTION**
 - CLEANING PROCESS CHANGED**
 - IMPROVED INSPECTION**

BYRON/BRAIDWOOD BASIS FOR ACCEPTANCE

- **HISTORICAL PERFORMANCE OF SLEEVES**
- **PROCESS CONTROLS**
- **IMPROVED INSPECTION**
 - **ENHANCED UT PROCESSING**
 - **ADDING VISUAL OF CLEANED TUBE (PROCESS INSPECTION)**
 - **+ POINT EXAM**

ACRONYMS

• SCI/MCI	Single/Multiple circumferential indications
• SAI/MAI	Single/Multiple axial indications
• PV	Permeability variation
• VOL	Volumetric indication
• WZI	Weld zone indication
• +PT	Plus point probe design
• C SCAN	Plan view of data
• B SCAN	0 - 360 degree cross section view
• B' SCAN	Axial cross section
• SEM	Scanning electron microscope
• UET	Upper expansion transition

Plant	Inlet Log Temp (F)	Sleeve Type (1)	ABB-CEND S/O Sleeve Operating History (to January 1996)															TOTAL
			Estimated EFPY of Sleeve Operation (2)															
			<1	1	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	
Ringhals 2	610	STAW			16													
	600	STAW				571	599		59	16								1245
Bunn	601	STAW				51	178		183	198		408			104		36	1158
		PTAW					63		29	48		107						247
Prairie Island 1 (4)	590	STAW																
		RTHT	253		117		158					62			73		27	100
																		590
Kewaunee (4)	590	PTAW					16											16
Zion 1 (4)	594	STAW	911		61	124			445				128					1669
Zion 2 (4)	594	STAW		162	170				82									414
AND 2 (4)	611	RTHT	627															627
Ringhals 3 (4)	610	RTHT							46									46
		SPHT							22									22
KRSND (4)	619	RTHT			164													164
		SPHT			16													16
Total			1791	162	528	746	1014	0	866	262	0	577	128	0	177	0	63	6314
Cumulative Total			6314	4523	4361	3833	3087	2073	2073	1207	945	945	368	240	240	63	63	
					(3)													

(3)

Notes:

(1) Sleeve Type designations and their totals are as follows:

STAW	Standard Tubesheet sleeves where the welds are in the As Welded condition	Totals
PTAW	Peripheral (Initially Curved) Tubesheet sleeves where the welds are in the As Welded condition	4586
STHT	Standard Tubesheet sleeves where the upper weld has been Post Weld Heat Treated	263
RTHT	Roll Transition sleeves where the weld has been Post Weld Heat Treated	590
SPHT	Support Plate sleeves where the welds have been Post Weld Heat Treated	837
		38

(2) EFPY of operation is based either on data received from the plant or calculated from the load factor published in Nuclear Engineering International for the period during which the sleeves have been in place. Operating time is rounded to the nearest 0.1 EFPY as of 1 July 1995

(3) 16 Sleeves which ran for a year at Ringhals 3 before T hot was reduced are included in totals for 600 F

(4) Plants inspected with I-coil or Plus Point ECT probe