May 18, 1994

Docket No. 50-331

LICENSEES: IES Utilities Inc.

FACILITY: Duane Arnold Energy Center

SUBJECT: SUMMARY OF MEETING TO DISCUSS PROPOSED HYDROGEN WATER CHEMISTRY RELIEF REQUEST

On May 5, 1994, members of the NRC met with representatives of IES Utilities Inc. (IES) to discuss the proposed request of May 28, 1993, for the reduction in certain Generic Letter (GL) 88-01 inspection frequencies due to the use of hydrogen water chemistry (HWC) at the Duane Arnold Energy Center (DAEC) to help reduce exposure during piping inspections. Enclosure 1 provides a list of the attendees.

IES made a brief presentation on their HWC program starting in 1987 through the present time (Enclosure 2). DAEC aims to reduce the number of examinations required of certain categories of piping weldments based on the use of HWC. IES has submitted this request which is consistent with the conclusions of the Boiling Water Reactor Owners Group Licensing Topical Report NEDC-31951P.

The NRC staff asked IES to be prepared to respond to seventeen (17) questions regarding this relief request at this meeting. Enclosure 3 provides the questions asked by the NRC staff and answers provided by IES.

The licensee requested a response by August 1, 1994, so that appropriate plans could be incorporated into the schedule for their next DAEC refueling outage.

ORIGINAL SIGNED BY

Robert M. Pulsifer, Project Manager
Project Directorate III-3
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

Enclosures:
1. List of Attendees
2. Presentation Slides
3. Questions and Answers

DISTRIBUTION
See attached page
cc w/enclosures:
See next page

OFFICE	LA:PDIII-3	PM:PDIII-3	PD:PDIII-3
NAME	MRushbrook	RPulsifer:dy	JHannon
DATE	5/17/94	5/17/94	5/17/94

OFFICIAL RECORD COPY FILENAME: G:\DUANEARN\86653.MTG

DFO1

200025

cc:

Jack Newman, Esquire
Kathleen H. Shea, Esquire
Newman, Bouknight and Edgar, P.C.
1615 L Street, N. W.
Washington, D. C. 20036

Chairman, Linn County
Board of Supervisors
Cedar Rapids, Iowa 52406

IES Utilities Inc.
ATTN: David L. Wilson
Plant Superintendent, Nuclear
3277 DAEC Road
Palo, Iowa 52324

Mr. John F. Franz, Jr.
Vice President, Nuclear
Duane Arnold Energy Center
3277 DAEC Road
Palo, Iowa 52324

Mr. Keith Young
Manager, Nuclear Licensing
Duane Arnold Energy Center
3277 DAEC Road
Palo, Iowa 52324

U. S. Nuclear Regulatory Commission
Resident Inspector's Office
Rural Route #1
Palo, Iowa 52324

Regional Administrator, RIII
U. S. Nuclear Regulatory Commission
801 Warrenville Road
Lisle, Illinois 60532-4531

Mr. Stephen N. Brown
Utilities Division
Iowa Department of Commerce
Lucas Office Building, 5th floor
Des Moines, Iowa 50319

Mr. Lee Liu
Chairman of the Board and
Chief Executive Officer
IES Utilities Inc.
Post Office Box 351
Cedar Rapids, Iowa 52406

DISTRIBUTION *Receives Enclosures 1 and 2

Docket File*
NRC & Local PDRs
PDIII-3 r/f *
WRussell/FMiraglia (12-G-18)
LReyes, Acting ADP (12-G-18)
JRoe
JZwolinski
JHannon
RPulsifer*
WKoo
KParczewslo
MRushbrook
OGC
EJordan (MNBB-3701)
ACRS (10)
BMcCabe (17-G-21)
EGreenman, Region III

ENCLOSURE 1

LIST OF ATTENDEES

HWC MEETING WITH DAEC ON MAY 5, 1994

NAME	AFFILIATION	PHONE
Robert Pulsifer	NRC/NRR/DRPW	(301) 504-3016
Clara Rushworth	IES	(319) 851-7157
Curt Bock	IES	(319) 851-7645
Bob Hite	IES	(319) 851-7625
Louis Kriege	IES	(319) 851-7291
W.D. Miller	GE	(319) 851-7363
G.C. Park	IES	(319) 851-7620
Frank Dohmen	IES	(319) 851-7333
William Koo	NRC/NRR/EMCB	(301) 504-2706
Kris Parczewski	NRC/NRR/EMCB	(301) 504-2705

HYDROGEN

WATER

CHEMISTRY

ENCLOSURE 2

HYDROGEN WATER CHEMISTRY

RELIEF REQUEST WILL

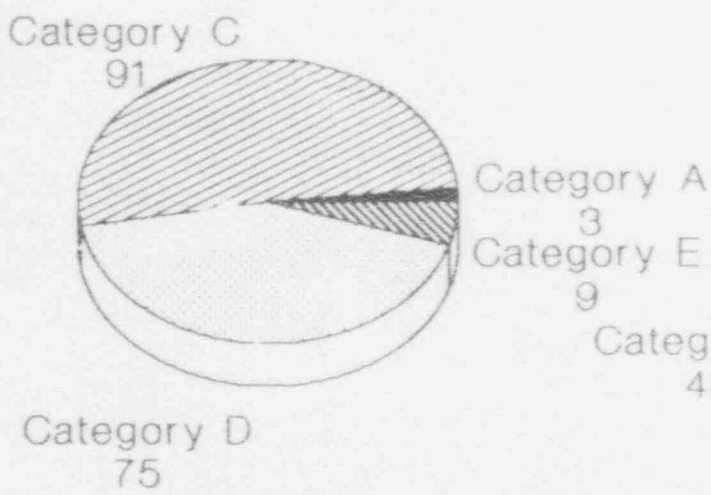
1 - REDUCE THE NUMBER OF

EXAMINATIONS REQUIRED

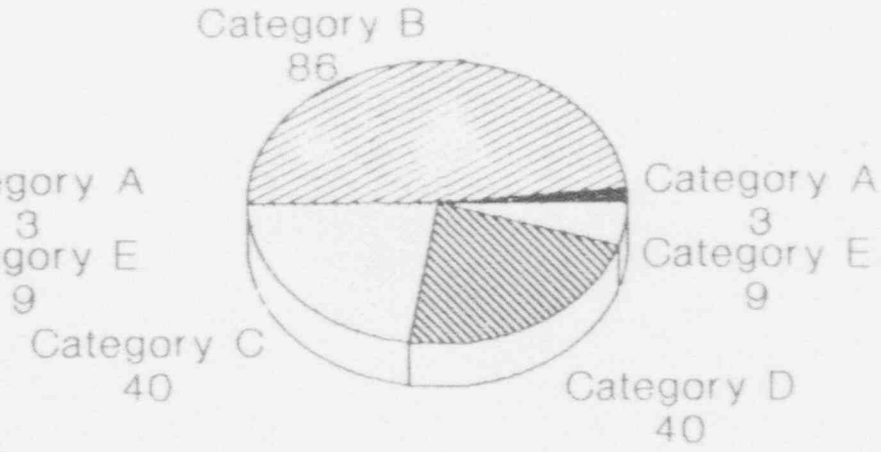
2 - MAN-REMS RECEIVED

DURING RFO13 AND RFO14

DAEC's Generic Letter 88-01
Examination Program



Existing Program



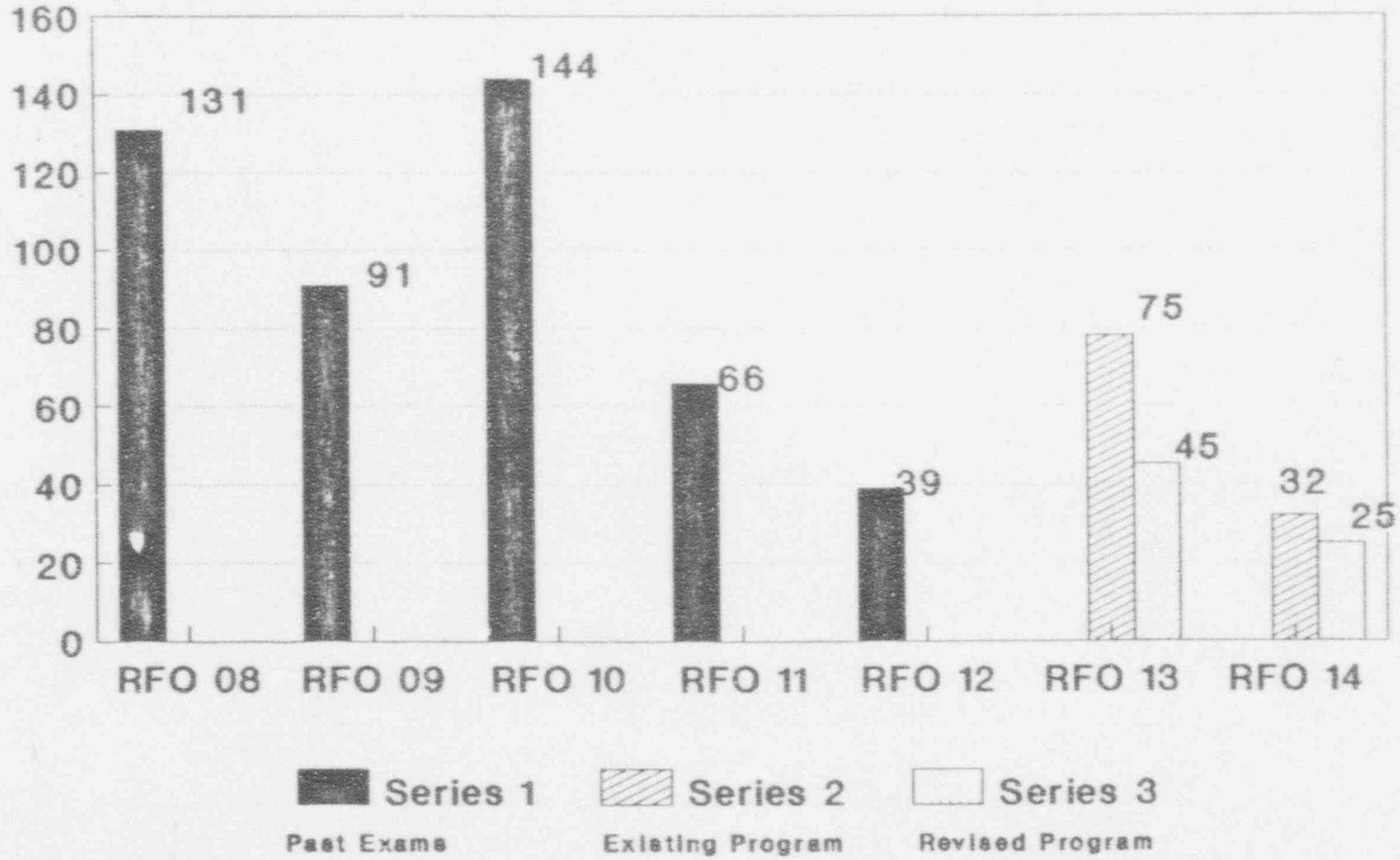
Revised Program

(Total # of Welds 178)

Safety Related Welds

DAEC's Generic Letter 88-01

Examination Program



Number of Examination each RFO

GENERIC LETTER 88-01
EXAMINATION HISTORY

248 WELDS IN THE PROGRAM

ALL WELDS EXAMINED ONCE

160 WELDS EXAMINED
TWO OR MORE TIMES

TOTAL OF 467 EXAMS OVER
A PERIOD OF 5 RFOs

WITHOUT ANY NEW IGSCC
INDICATIONS DETECTED

ISI DOSE REDUCTION

OUTAGE DOSE REDUCTION DUE TO PROPOSED REDUCED ISI SCOPE

RFO 13

PRESENT SCOPE: 75 WELDS

REDUCED SCOPE: 45 WELDS

DOSE REDUCTION:

30 WELDS X 1000 MR/WELD = 30 REM

RFO 14

PRESENT SCOPE: 33 WELDS

REDUCED SCOPE: 25 WELDS

DOSE REDUCTION:

8 WELDS X 1000 MR/WELD = 8 REM

THIS SHOWS AN APPROXIMATE SAVINGS OF 38 REM PER OUTAGE. THE REVISED 10CFR20 REQUIRES THAT LICENSEES PURSUE INITIATIVES THAT WILL MAINTAIN RADIATION EXPOSURES ALARA. THIS REQUEST REPRESENTS ONE OF THE HIGHEST EXPOSURE REDUCTION INITIATIVES REMAINING FOR THE DAEC. THIS WOULD ALLOW US TO REACH 300 REM OUTAGES WHICH PUTS US IN LINE TO ACHIEVE A 255 MAN REM THREE YEAR ROLLING AVERAGE AS PROPOSED BY THE BWR INDUSTRY THROUGH INPO.

HWC HISTORY

EXCELLENT SYSTEM AVAILABILITY

VIRTUALLY 100% OF THE TIME

ECP IS MEASURED 100%

OF THE TIME HYDROGEN

IS FED USING EXTERNAL

AUTOCLAVES

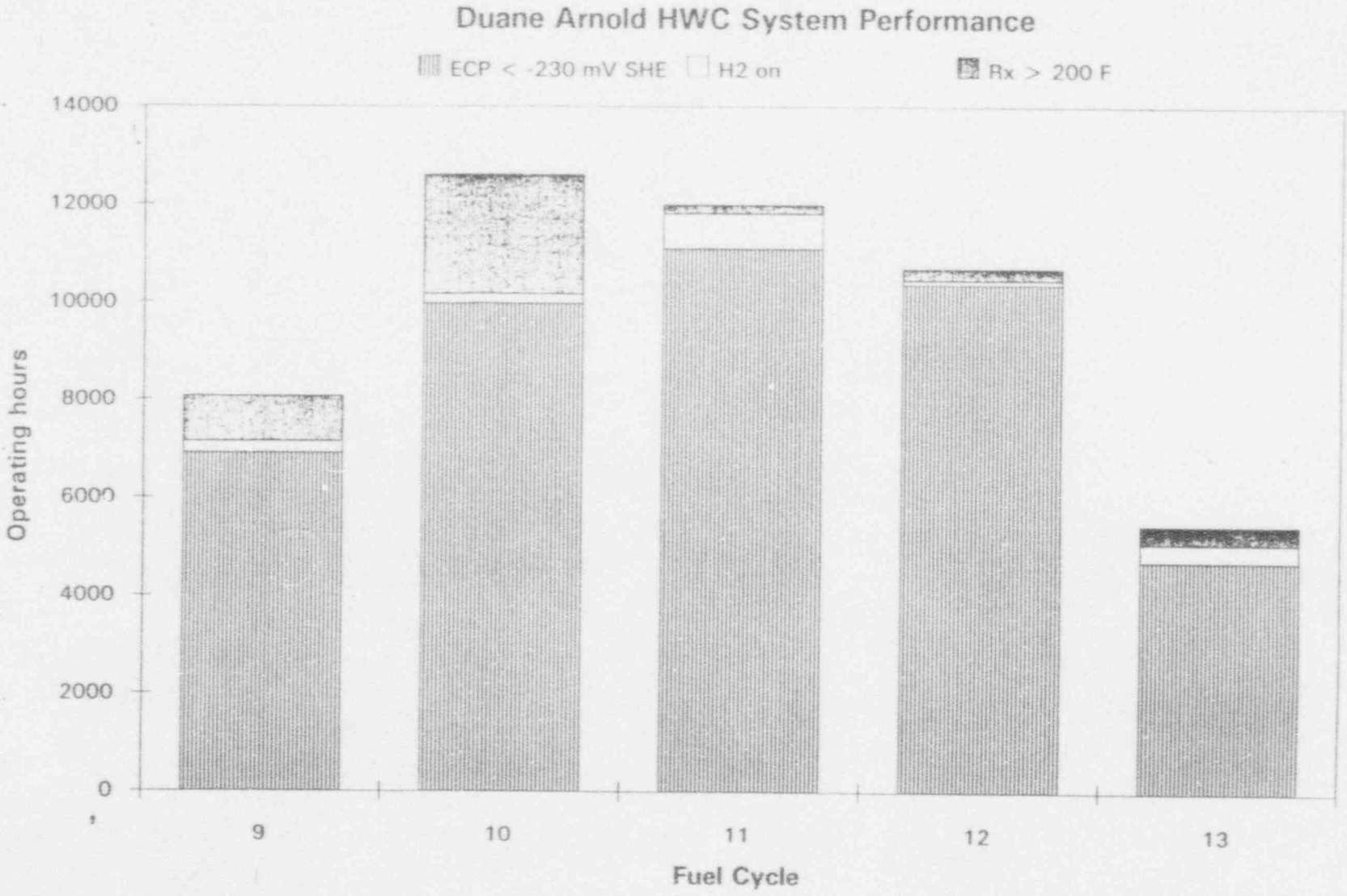
RELIEF REQUEST

REDUCES # OF EXAMS BASED ON HWC PRIOR TO EACH RFO

CONTINGENCY ISSUED IF HWC

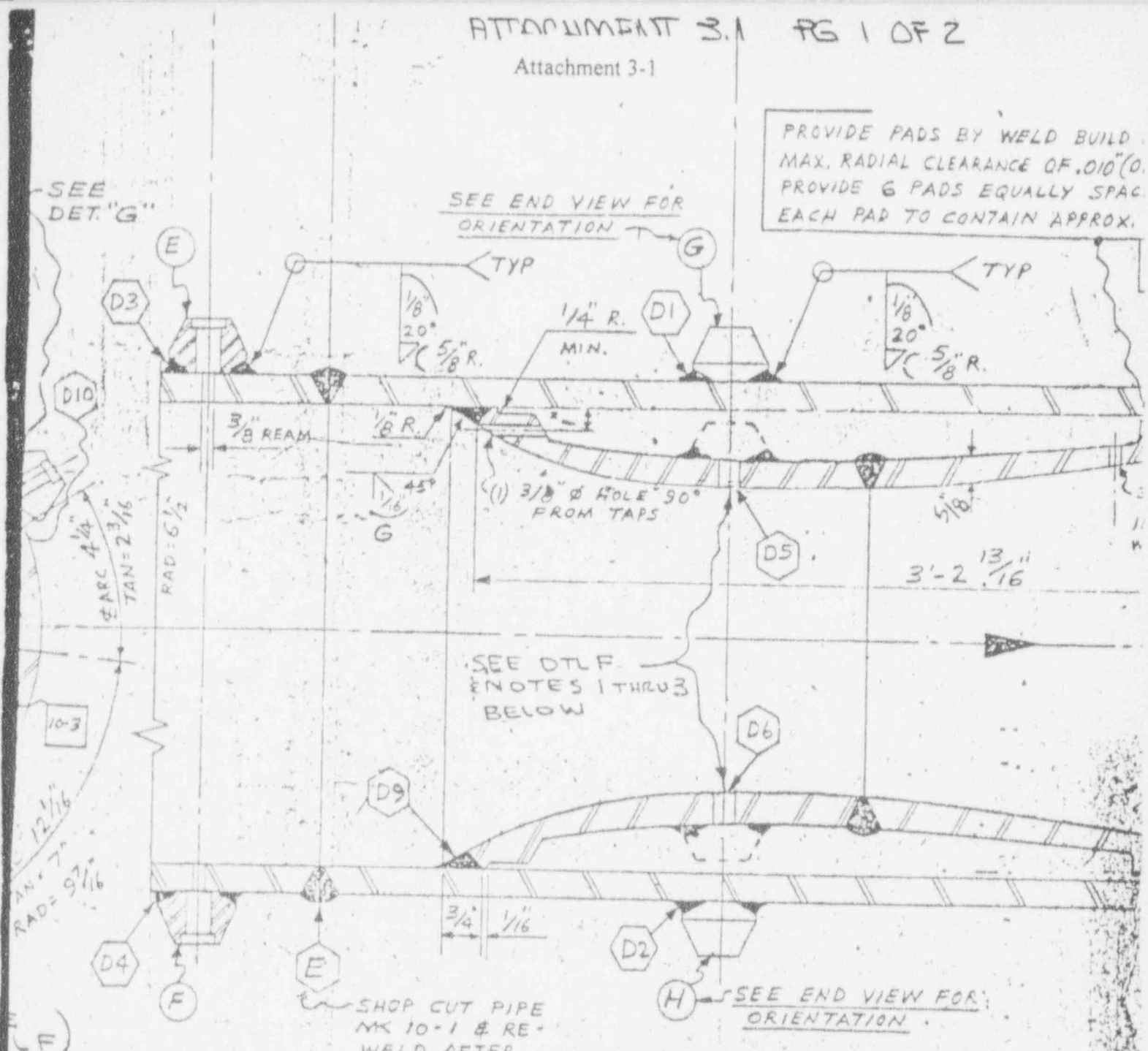
- NOT AVAILABLE 80% OF THE TIME DURING THE PREVIOUS CYCLE WITH AN APPROPRIATE ENG. EVALUATION

Attachment 1-1



ATTACHMENT 3.1 PG 1 OF 2

Attachment 3-1



DETAIL "A" (FE-NOISE)

FOR INSTALLATION PROCEDURE SEE BIF DWG.# A-133206 & G.E. DWG. SK-2-5671

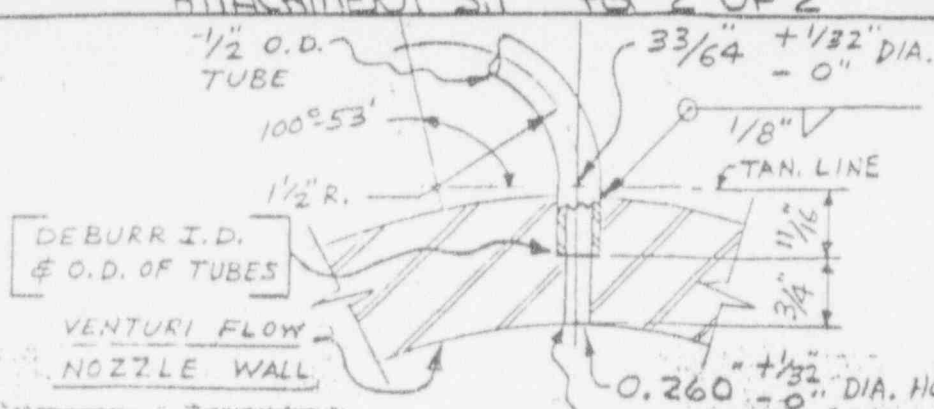
INSTALLATION TO BE SUPERVISED BY BIF

INSTALLATION OF B.I.F. VENTURI FLOW NOZZLE

1. REMOVE TWO EXISTING BOSSES FROM VENTURI FL DYE CHECK I.D. AND O.D. SURFACES. DRILL THRU W/ 1/2" Ø DRILL. PLUG WELD 3/4" DEEP FRO DYE-CHECK I.D. & O.D. SURFACES OF PLUG WELD GRIND I.D. TO SMOOTH FINISH OF 125 RMS. & WITH SAME CONTOUR AS NOZZ. THROAT.
2. DRILL THRU FOR TUBING PER DETAIL F
3. WELD TUBES TO VENTURI FLOW NOZZ. (SEE DET. "F
4. DRILL HOLES IN PIPE. UPSTREAM PER DET. "A". DOV
5. INSTALL VENTURI FLOW NOZZ. INSIDE PIPE & WEL

TION

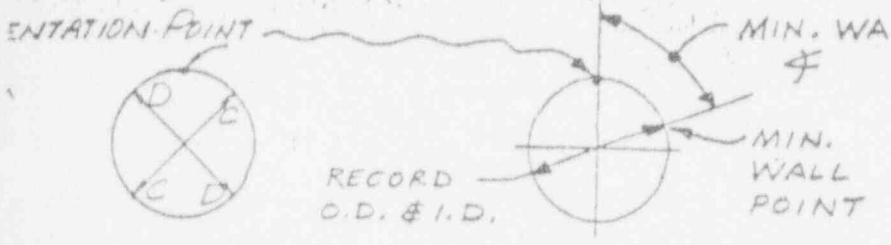
ANIQUE



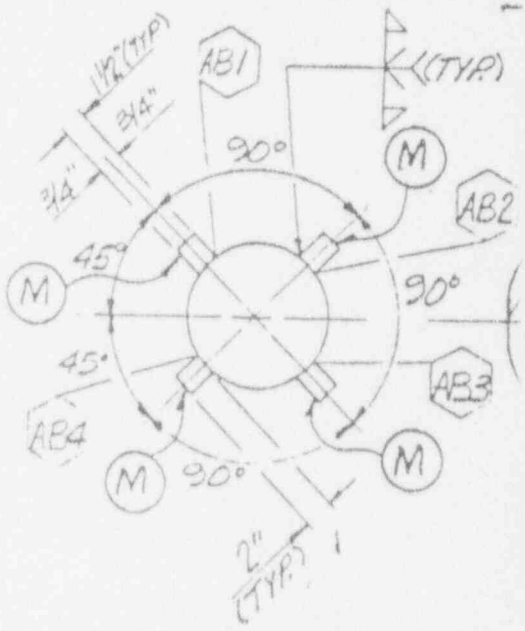
DEBU OF T PIPE - WALL

DETAIL "F"

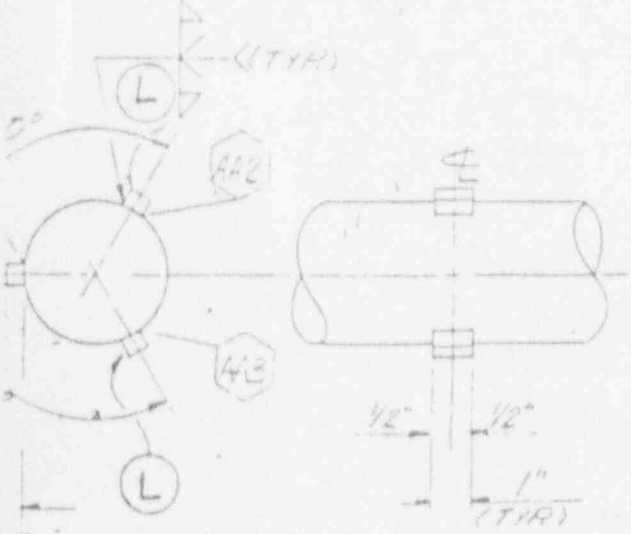
EDGE TO BE SHARP & FREE OF BURRS INTERIOR OF HOLE TO HAVE A 32 RMS FINISH & MUST BE FREE OF RADIAL TOOL MARKS



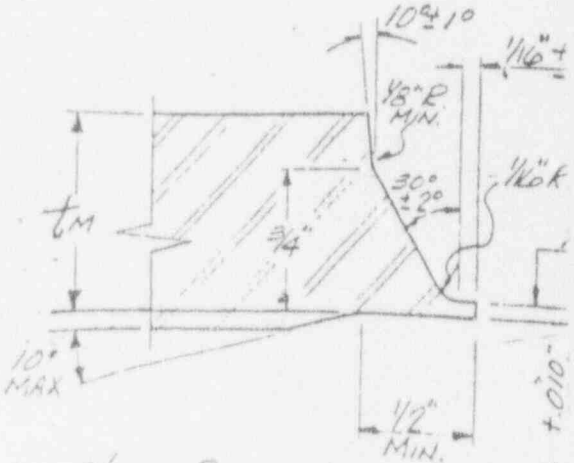
HED DIM @ OPEN END ±.010"				MIN WALL ℄	O.D. AT M.W. POINT	I.D. AT M.W. POINT
	BB	CC	DD			
2	21.975	19.974	19.970	100°	22.000	19.970
3	23.414	19.978	19.974	45°	23.363	19.978
7	20.138	18.147	18.138	180°	20.145	18.155
7	4.687	3.865	3.867	45°	4.687	3.865



SECTION "BB"



SECTION "AA"



NOTE: BEVEL DESIGN TYP FOR BELOW 3/4" WALL EXCEPT 10° ANGLE NOT REQ'D

530" AT

LD RTN

NO.	DATE	REVISION	DRFTR	CHK'D	ENGR.	VER.
1		DRAFTED FOR VESSEL INSPECTION PROGRAM	MS			

IES:
Inservice Inspection Program
Reactor Pressure Vessel Sketch

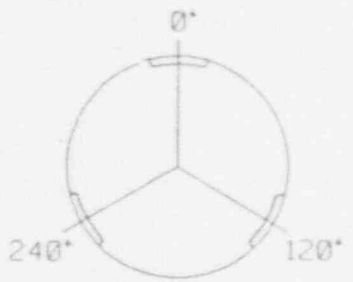
RECIRCULATION INLET
NOZZLE MK N2A/H

DWG. NO.
VS-01-11

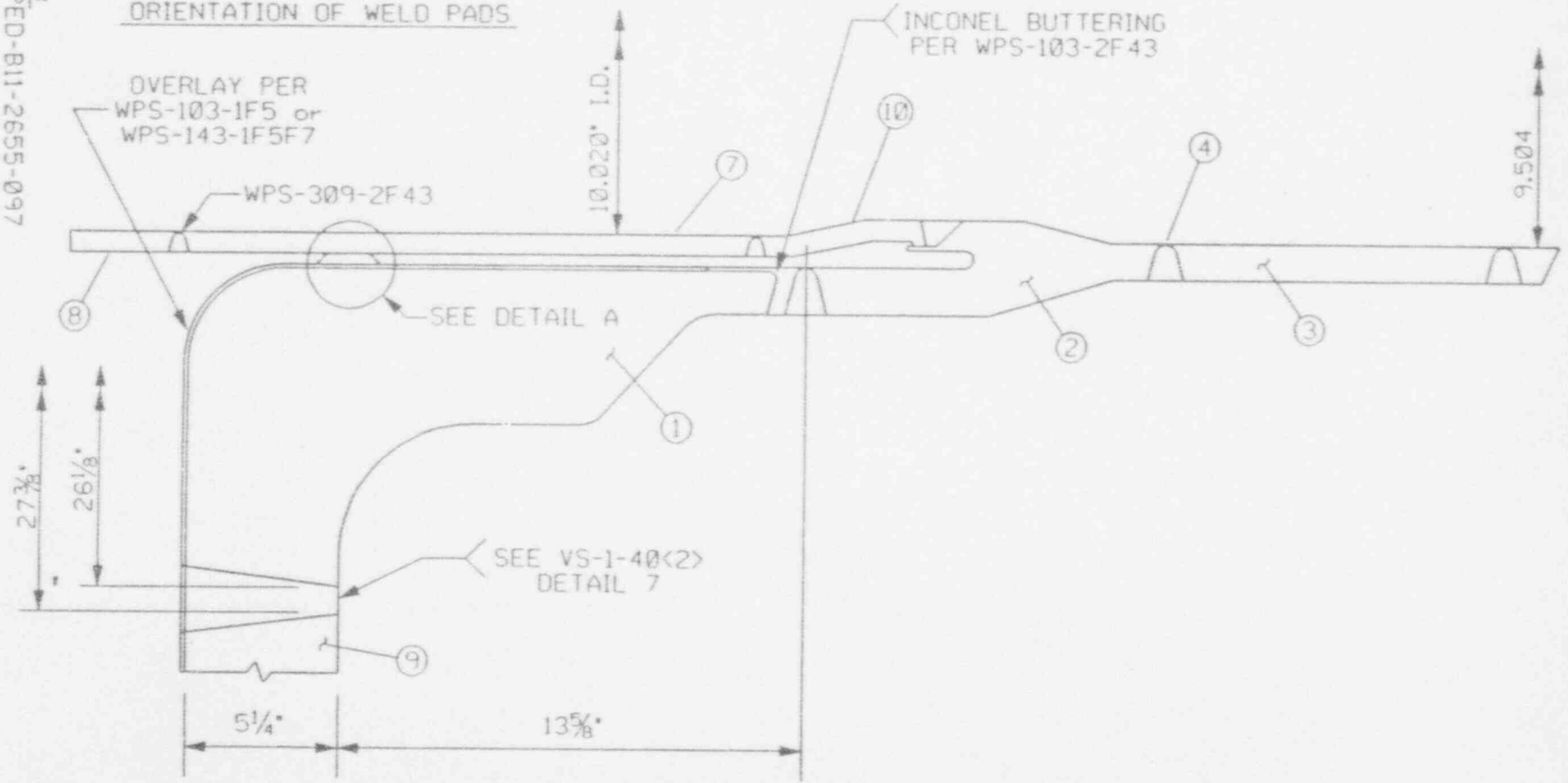
REV.
1

REFERENCE DRAWINGS:
APED-B11-2655-096, APED-B11-2655-097

NO.	DISCRIPTION	BILL OF MATL.	PROCED.
1	FORGING	SA508 CLASS 2	
2	SAFE END FORGING	SB-166	
3	SAFE END EXT. FORGING	SA336 CLASS F8	
4	CONSUMABLE INSERT	INCONEL 82	
5	1ST CLAD LAYER	309L	
6	2ND & 3RD CLAD LAYER	308L	
7	THERMAL SLEEVE	SB-168	
8	THERM. SLEEVE INNER EXT.	304L SA240	
9	SHELL PLATE #1	SA533 CLASS 1 GR.B	
10	THERMAL SLEEVE ADAPTER	SB-166	

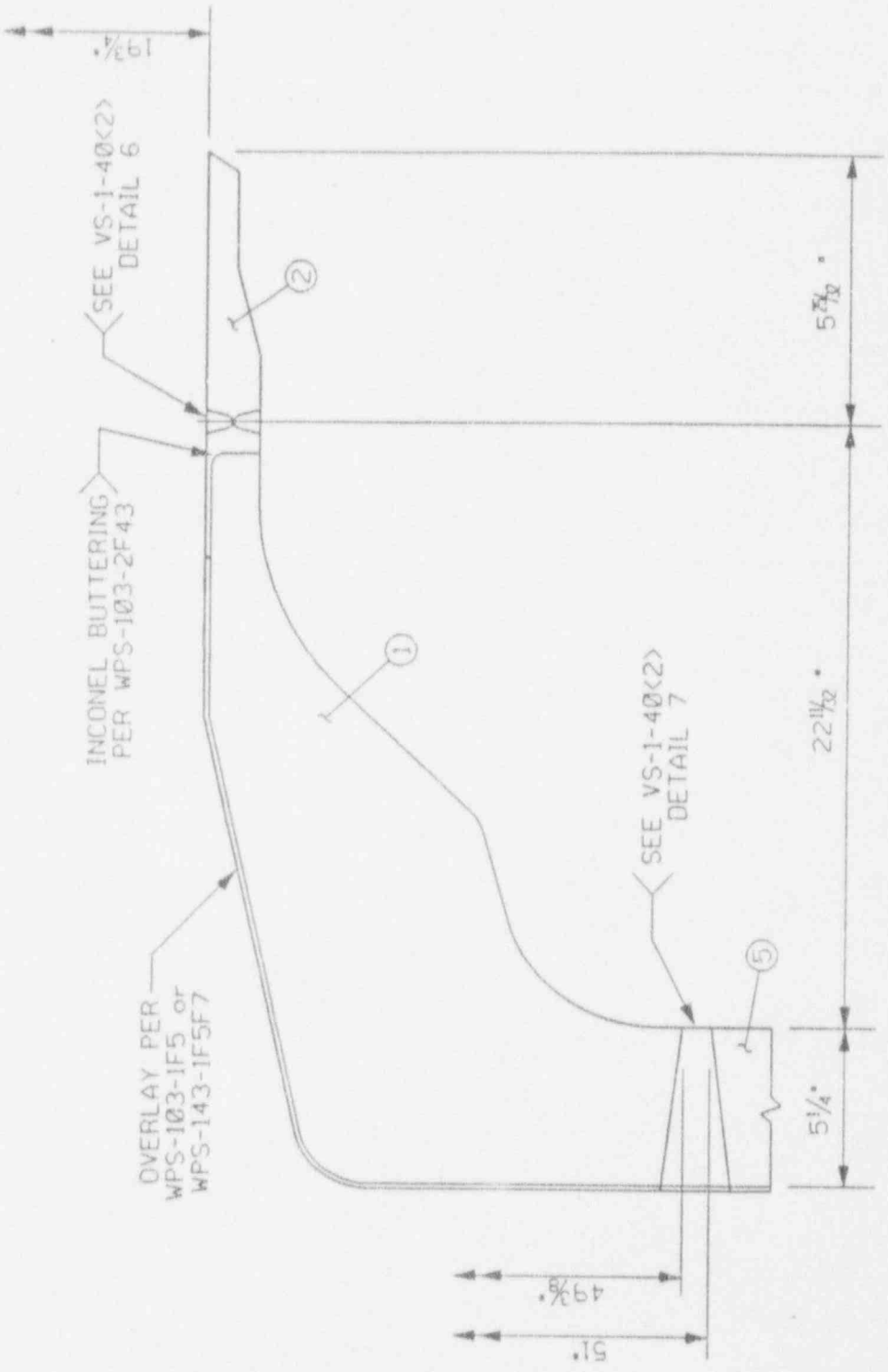


DETAIL A
ORIENTATION OF WELD PADS



Attachment 3-2

NO.	DISCRIPTION	BILL OF MATL.	PROCED.
1	FORGING	SA508 CLASS 2	
2	SAFE END FORGING	SA336 CLASS F8	
3	IST CLAD LAYER	309L	
4	2ND & 3RD CLAD LAYER	308L	
5	SHELL PLATE #1	SA533 CLASS 1 GR.B	



REFERENCE DRAWING:
APED-B11-2655-095

NO.	DATE	REVISION	DRAWN	CHKD	ENGR	APP
1		DRAFTED FOR VESSEL INSPECTION PROGRAM	MS			

IES:
Inservice Inspection Program
Reactor Pressure Vessel Sketch

RECIRCULATION OUTLET NOZZLE MK N1A/B

DWG. NO. VS-01-10

REV. 1

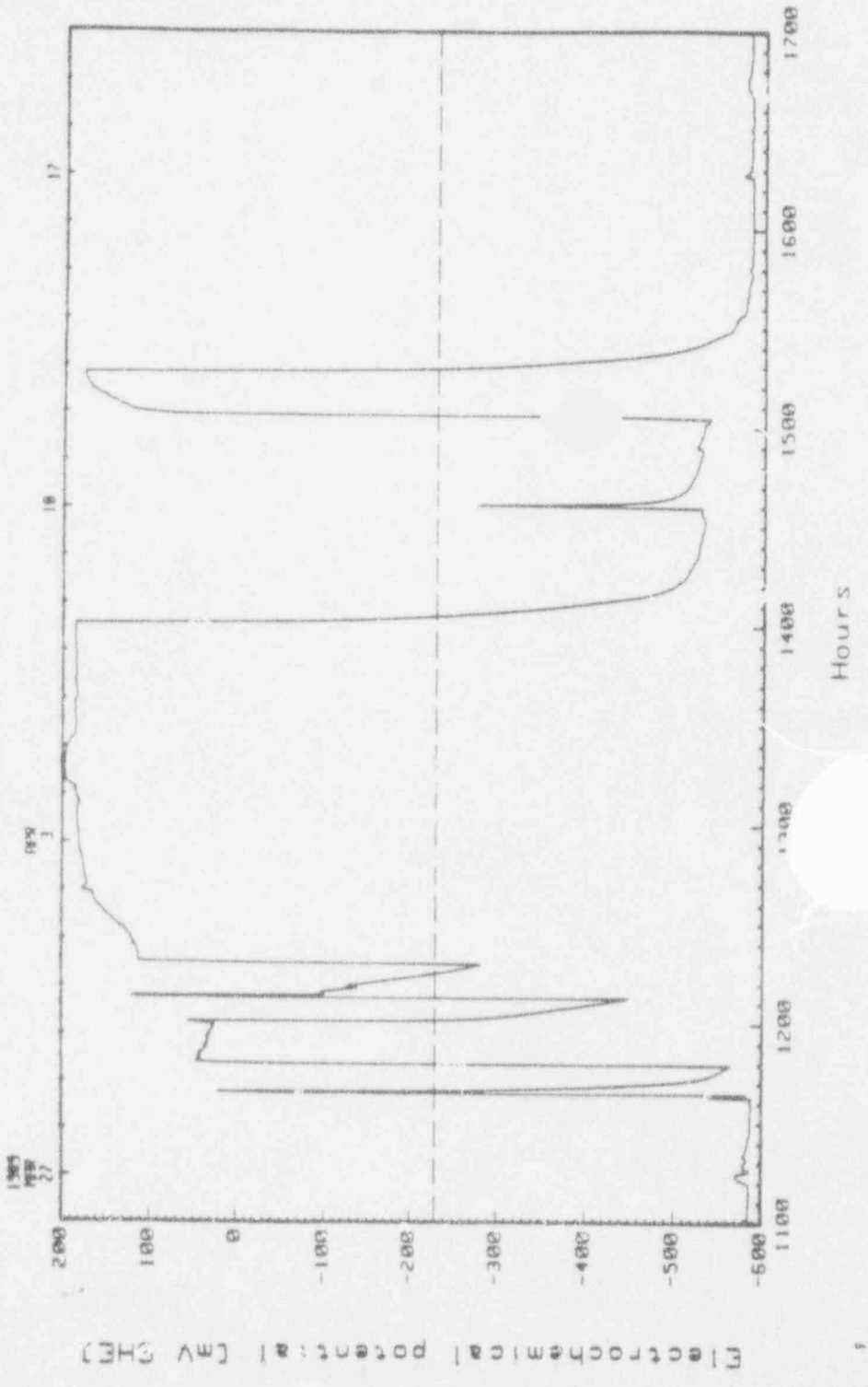


Figure 3-3. In-pipe recirculation ECP of stainless steel, high sample flow measurement—during hydrogen interruption

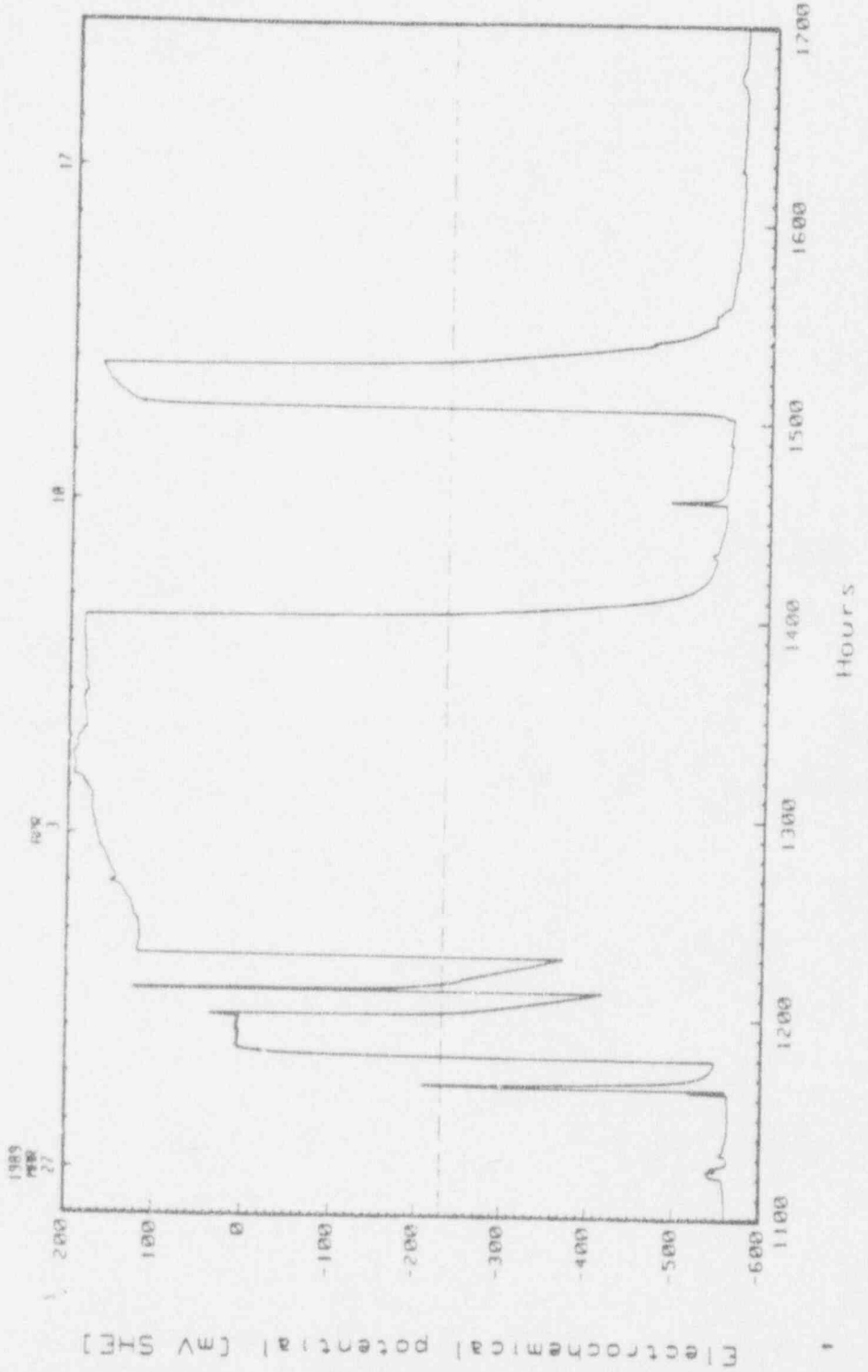


Figure 3-4. In-pipe recirculation ECP of ground (stainless steel), low sample flow measurement—during hydrogen interruption

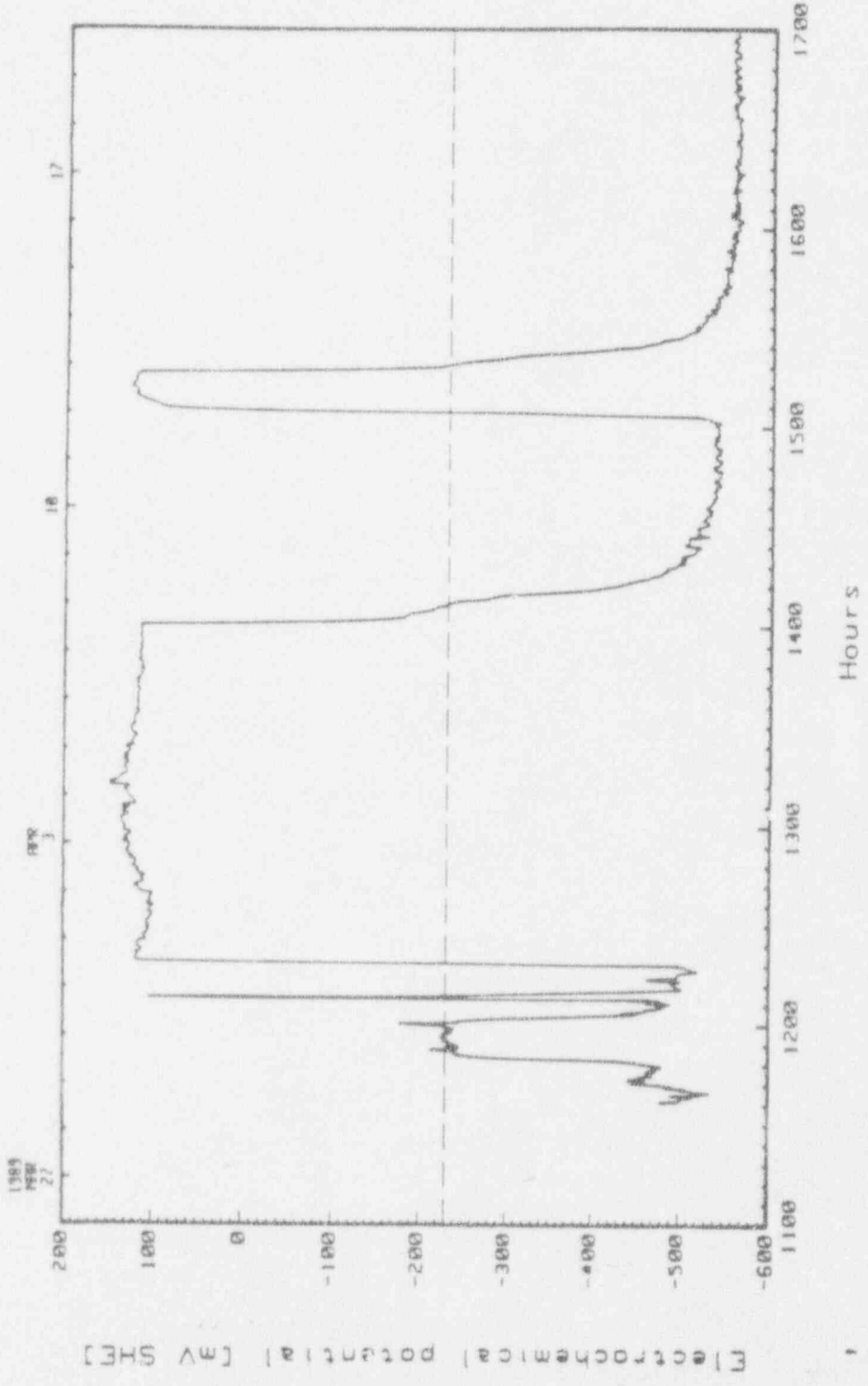


Figure 3-5. Recirculation sample autoclave ECP measurement of stainless steel—during hydrogen interruption

Attachment 4-3 (from Reference 1)

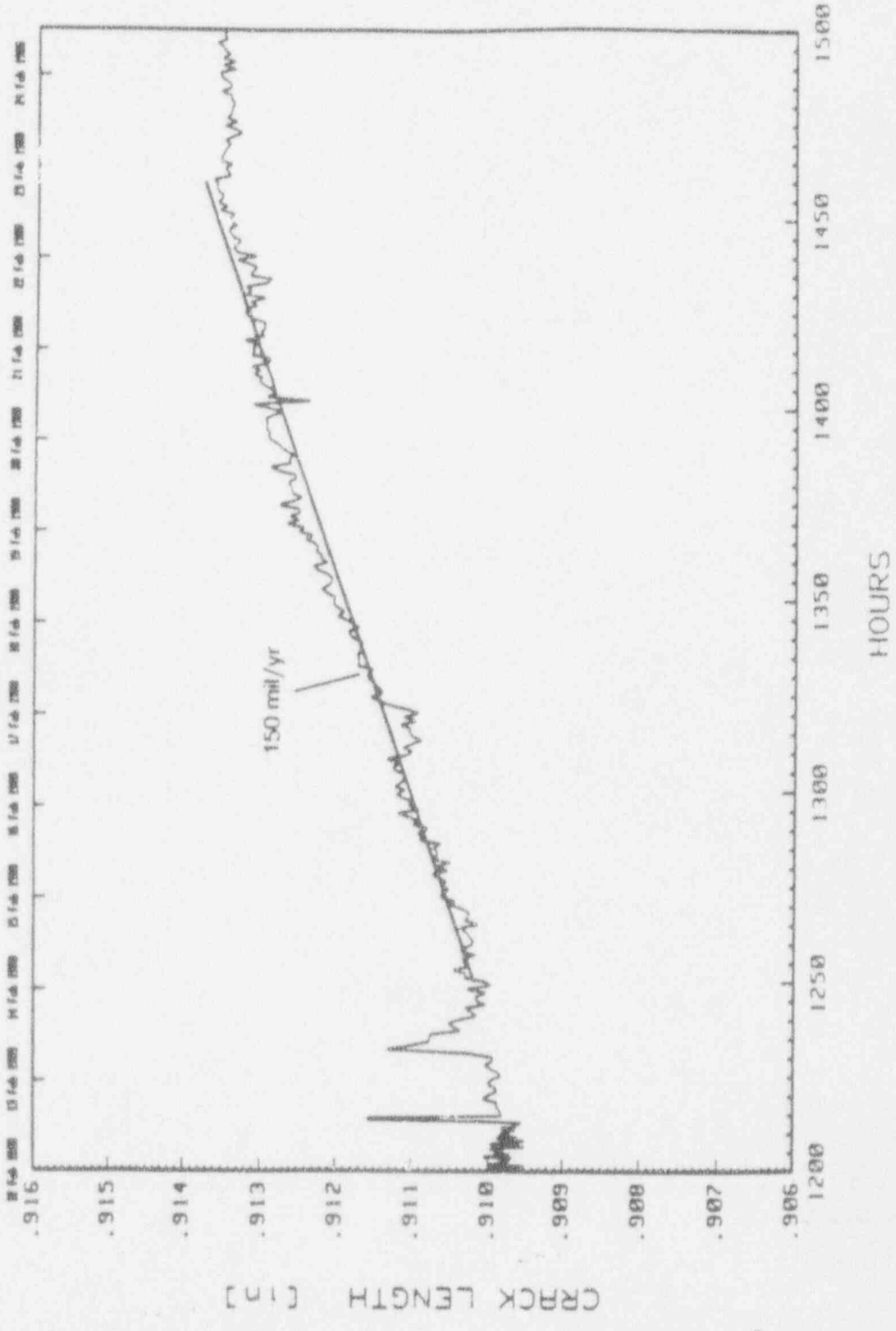


Figure 3-17. CAV recirculation sample crack growth. Sensitized Alloy 182 (INC_182). 28 ksi·in$^{0.5}$—measured during one week of hydrogen interruption

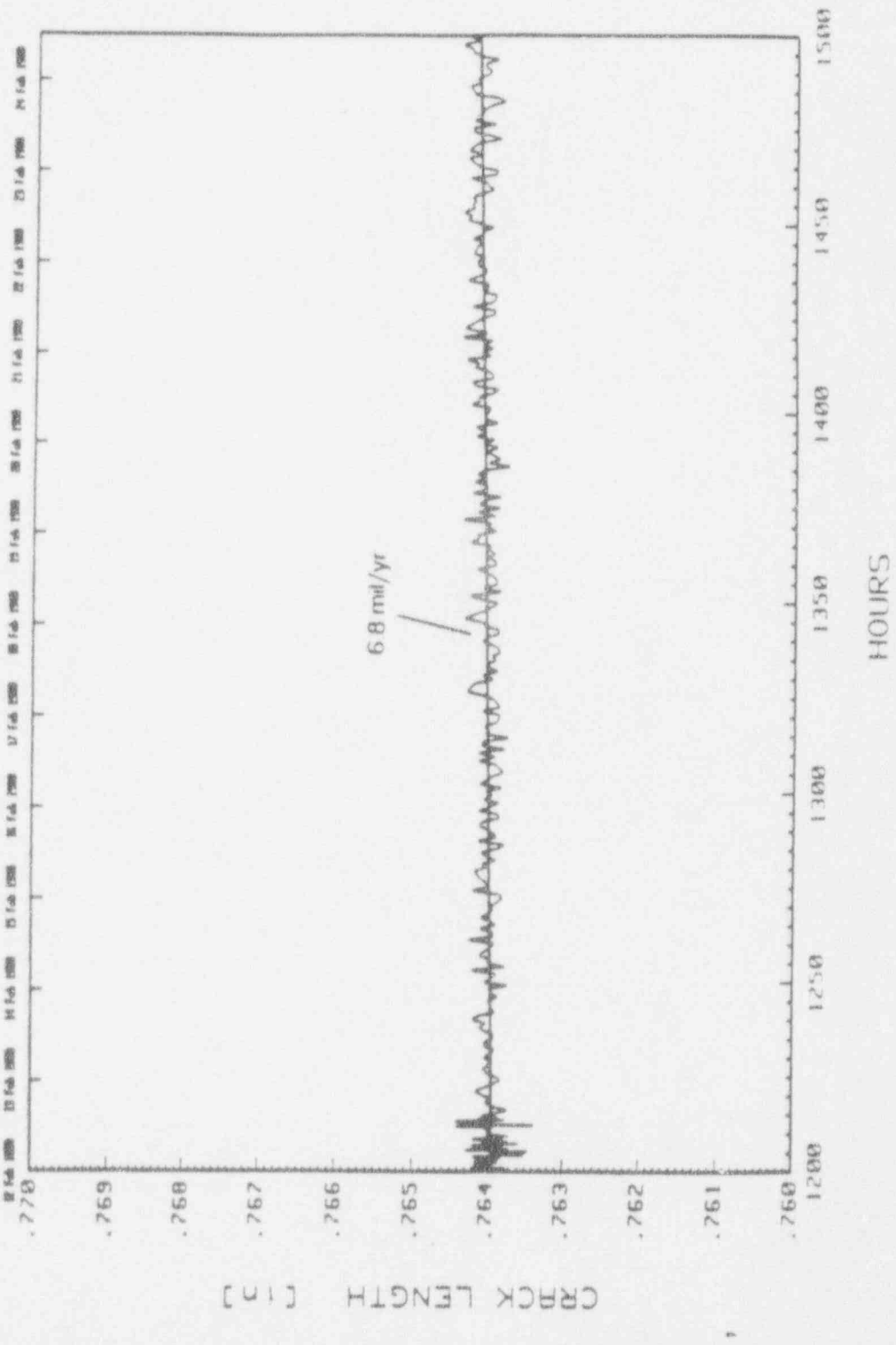


Figure 3-18. CAV recirculation sample crack growth. Sensitized Type 304 stainless steel (304_SS1), 23 ksi·in$^{0.5}$—measured during one week of hydrogen interruption

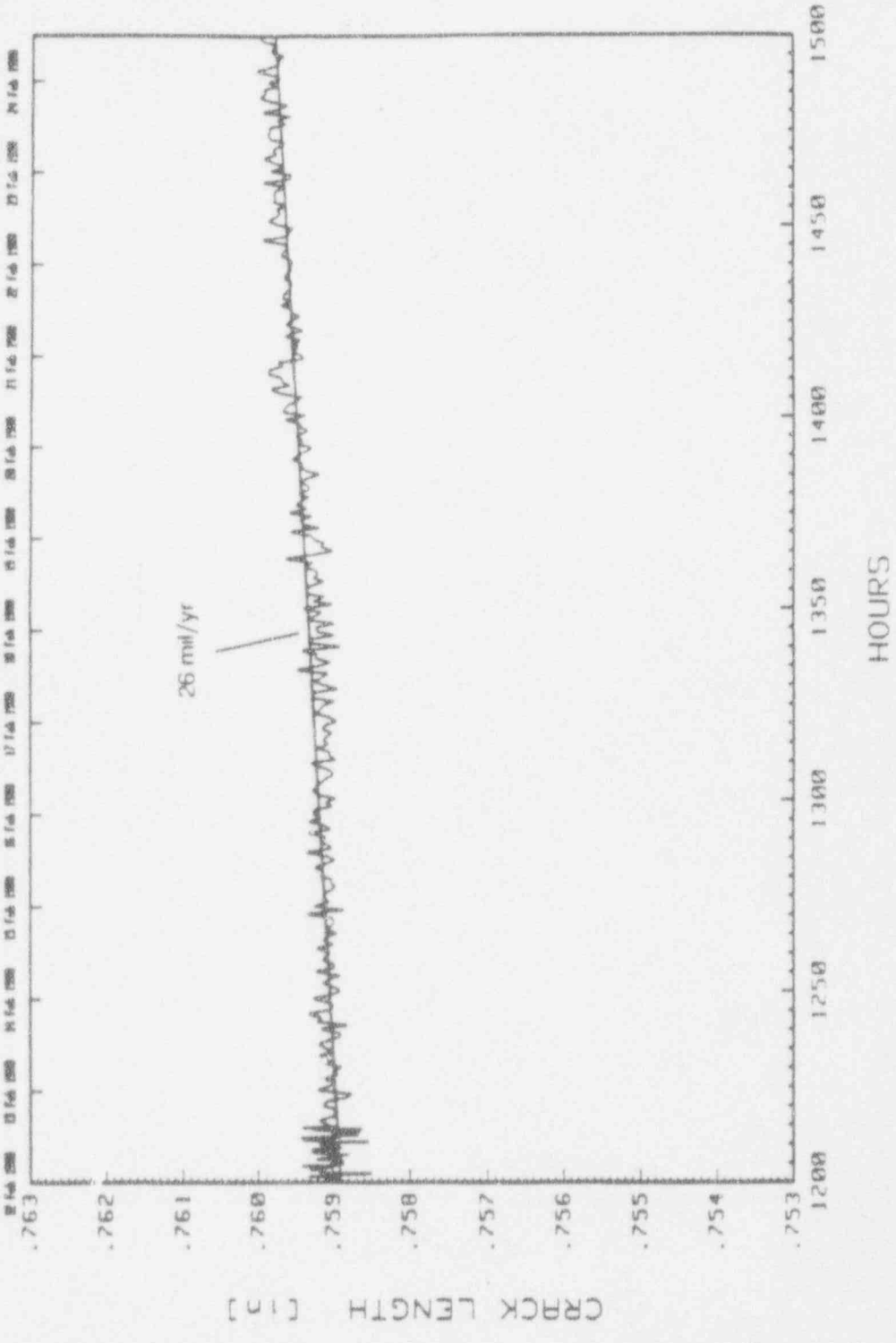


Figure 3-19. CAV recirculation sample crack growth Sensitized Type 304 stainless steel (304_SS2), 31 ksi·in$^{0.5}$—measured during one week of hydrogen interruption

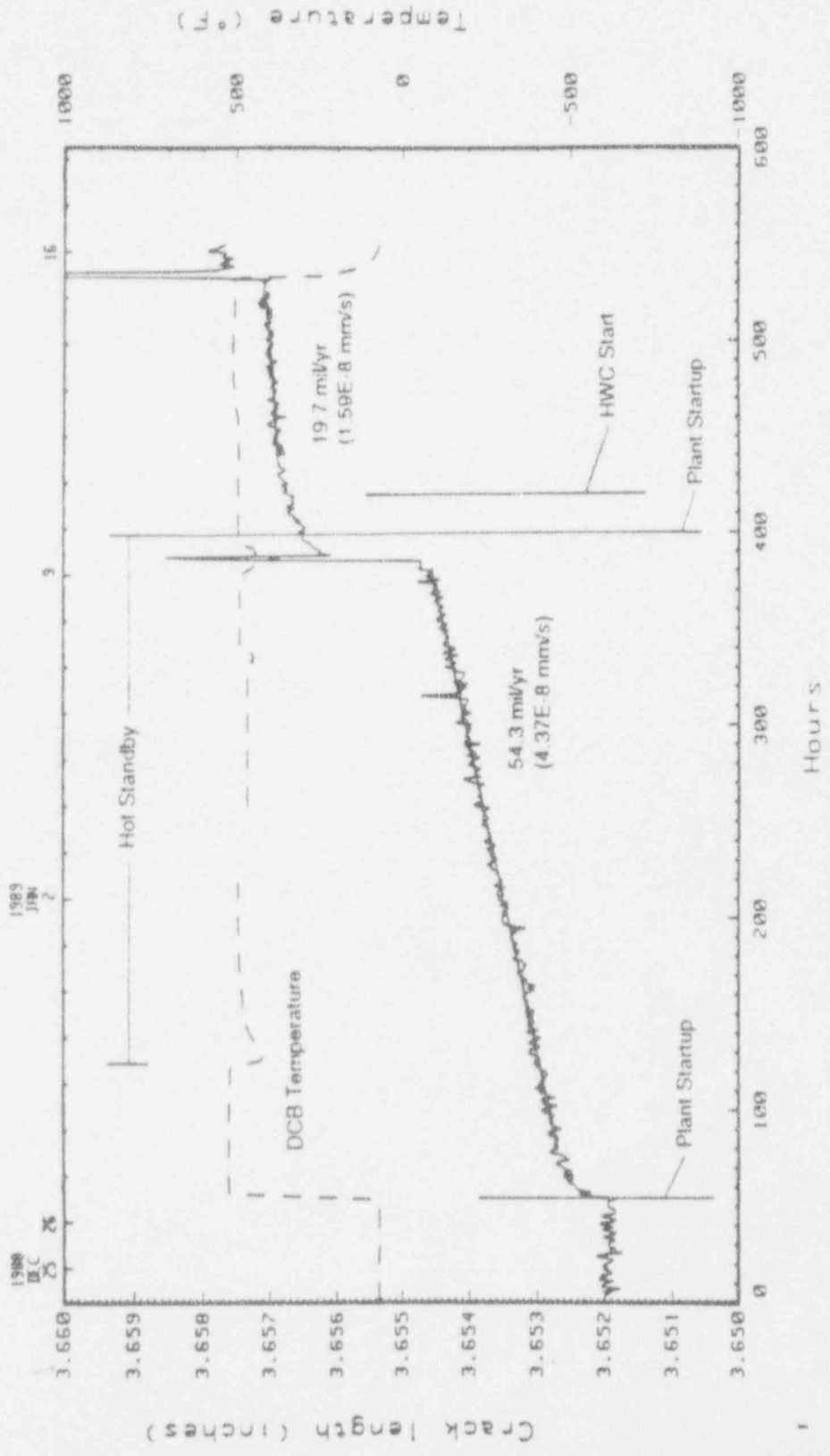


Figure 3-10. Recirculation sample autoclave DCB crack growth. Sensitized Type 304 stainless steel (RA1_304), 27 ksi·in$^{0.5}$ During start-up of fuel cycle 10

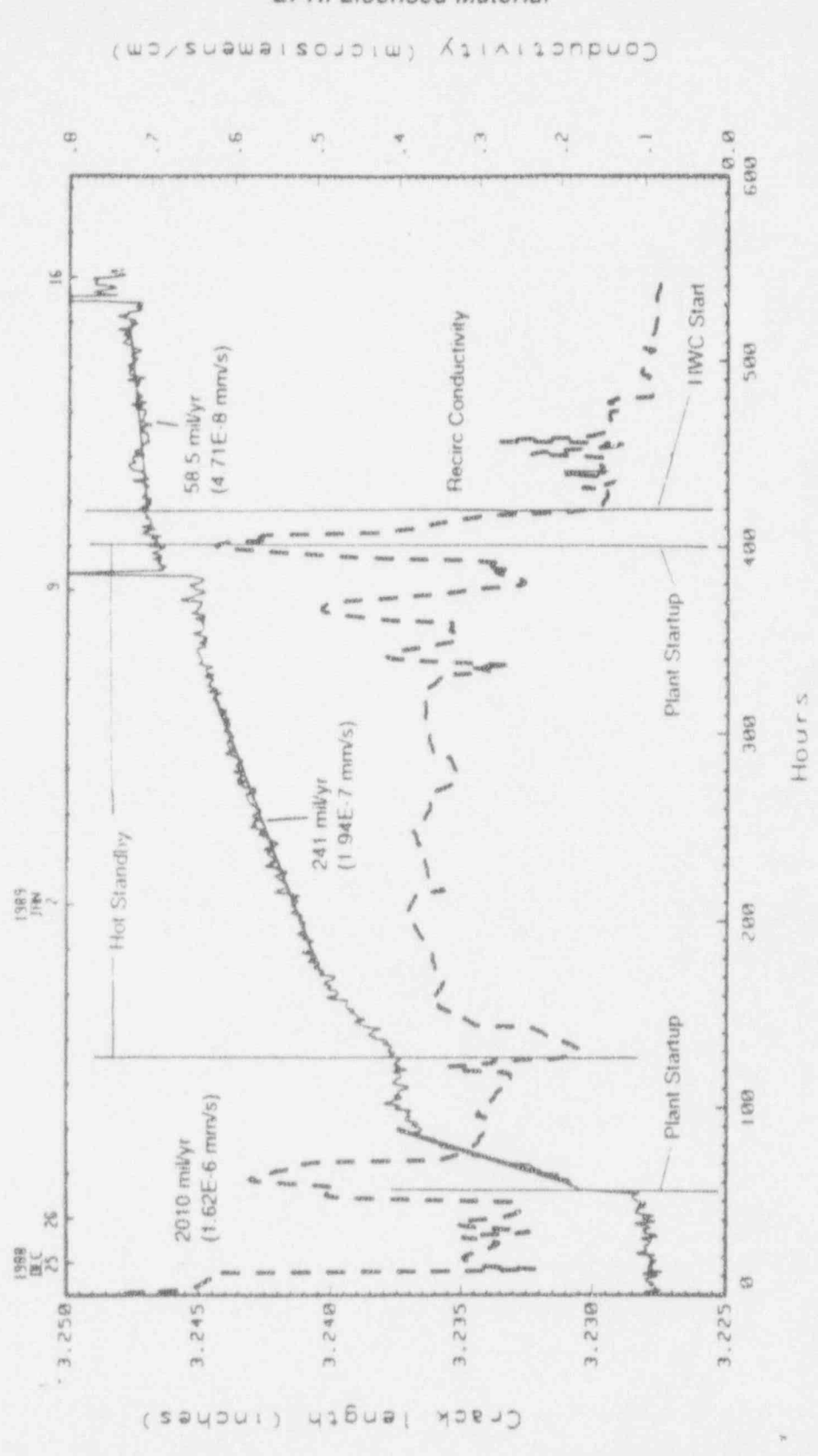


Figure 3-11. Recirculation sample autoclave DCB crack growth. Sensitized Type 304 stainless steel (RA2_304), 27 ksi·in$^{0.5}$. During start-up of fuel cycle 10.

Attachment 4-8 (from Reference 1)

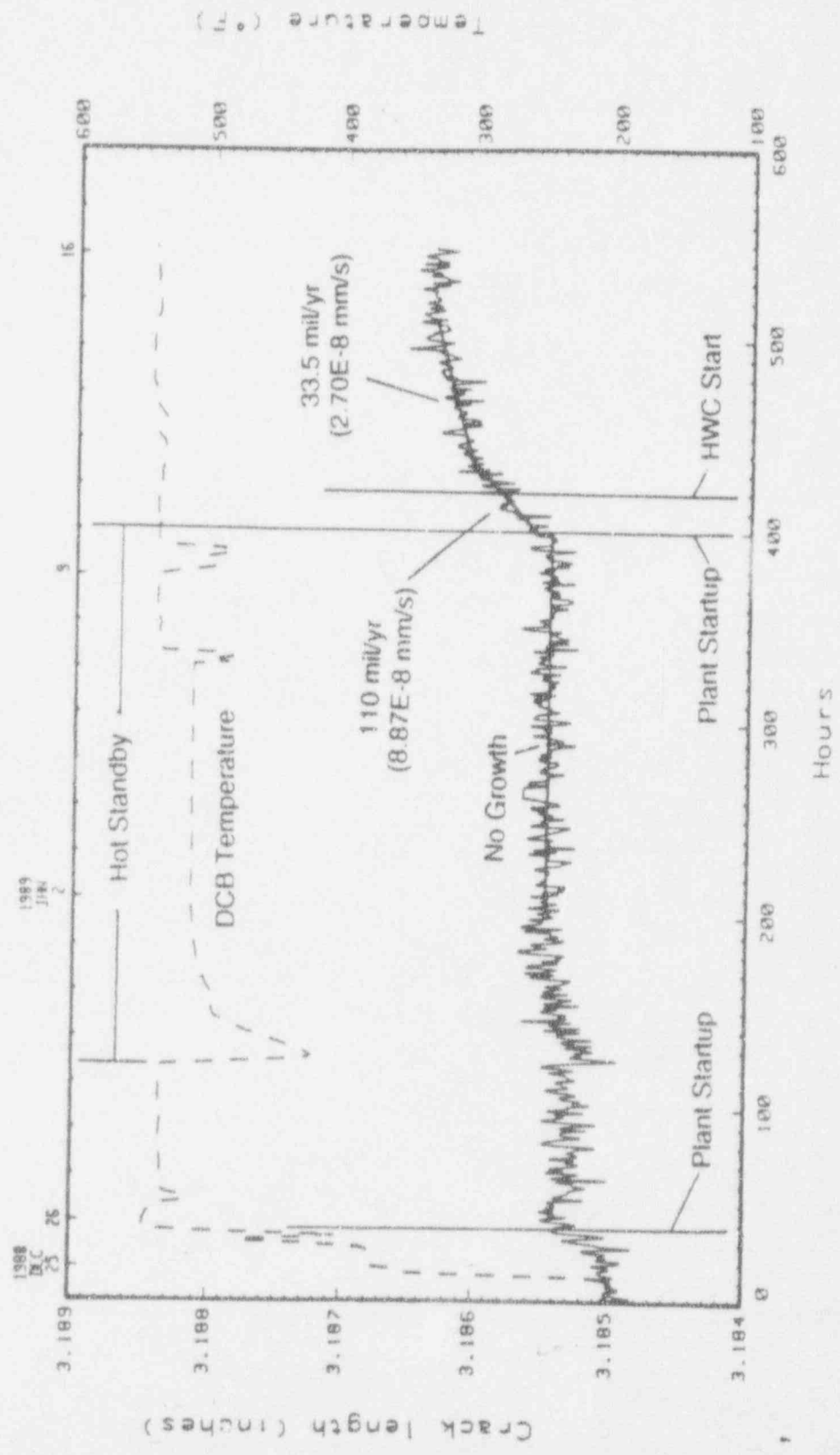


Figure 3-12. DCB crack growth measured in core bypass region. Sensitized Type 304 stainless steel (IC1_304S), 24 ksi·in$^{0.5}$. During start-up of fuel cycle 10

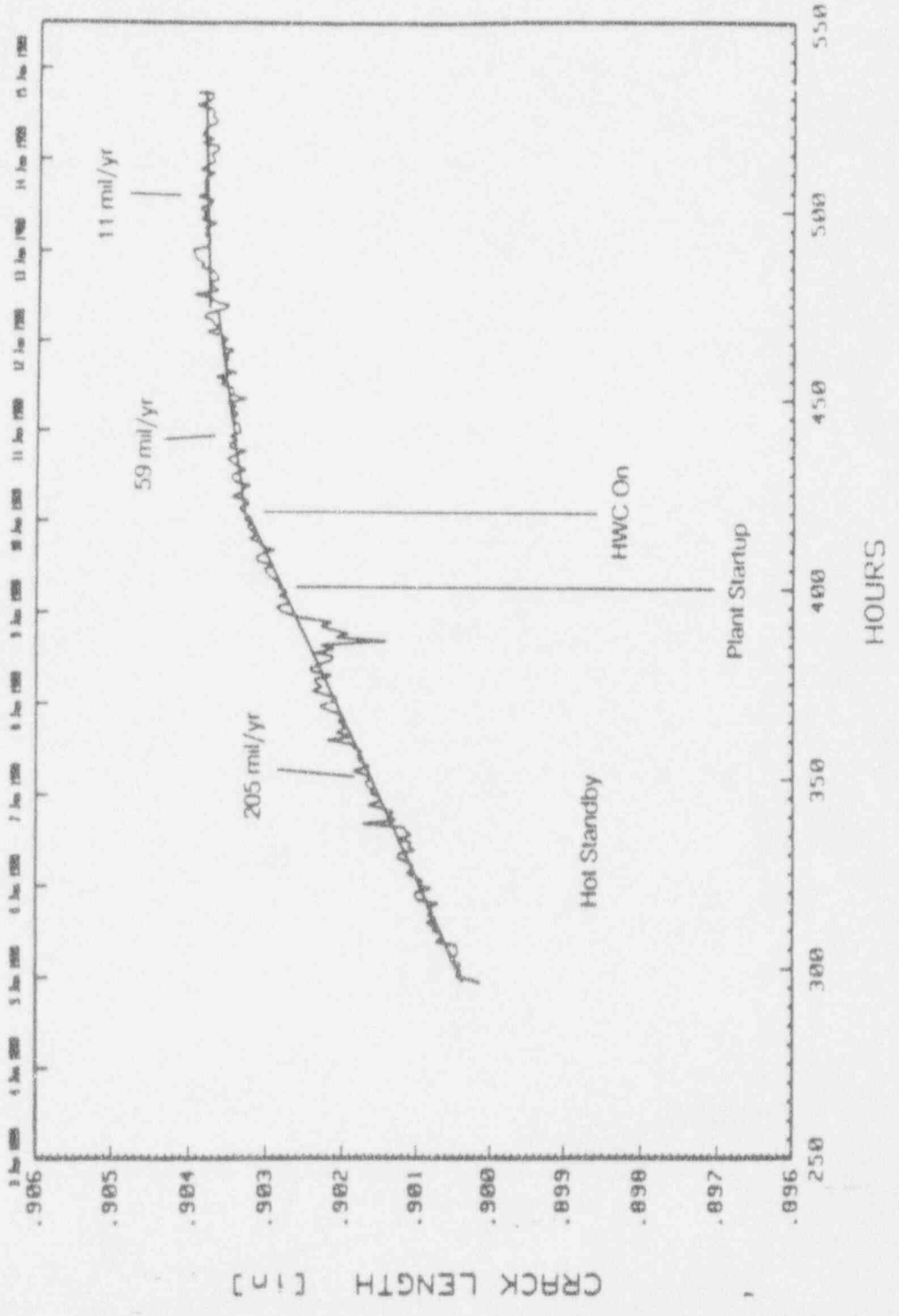


Figure 3-13. CAV recirculation sample crack growth. Sensitized Alloy 182 (INC_182), 28 ksi·in.$^{0.5}$. During start-up of fuel cycle 10.

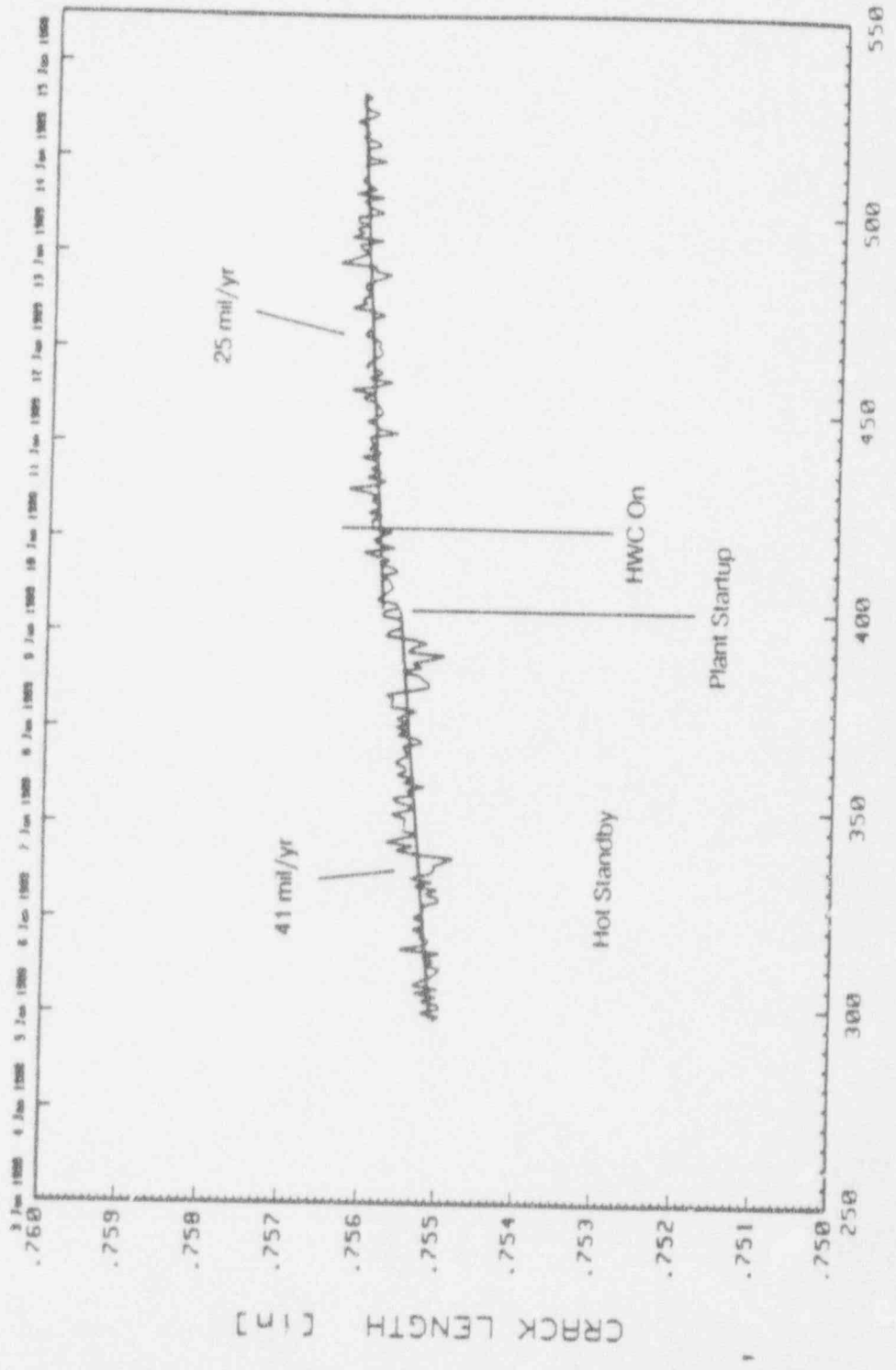


Figure 3-14. CAV recirculation sample crack growth. Sensitized Type 304 stainless steel (304_SS2), 31 ksi·in$^{0.5}$. During start-up of fuel cycle 10.

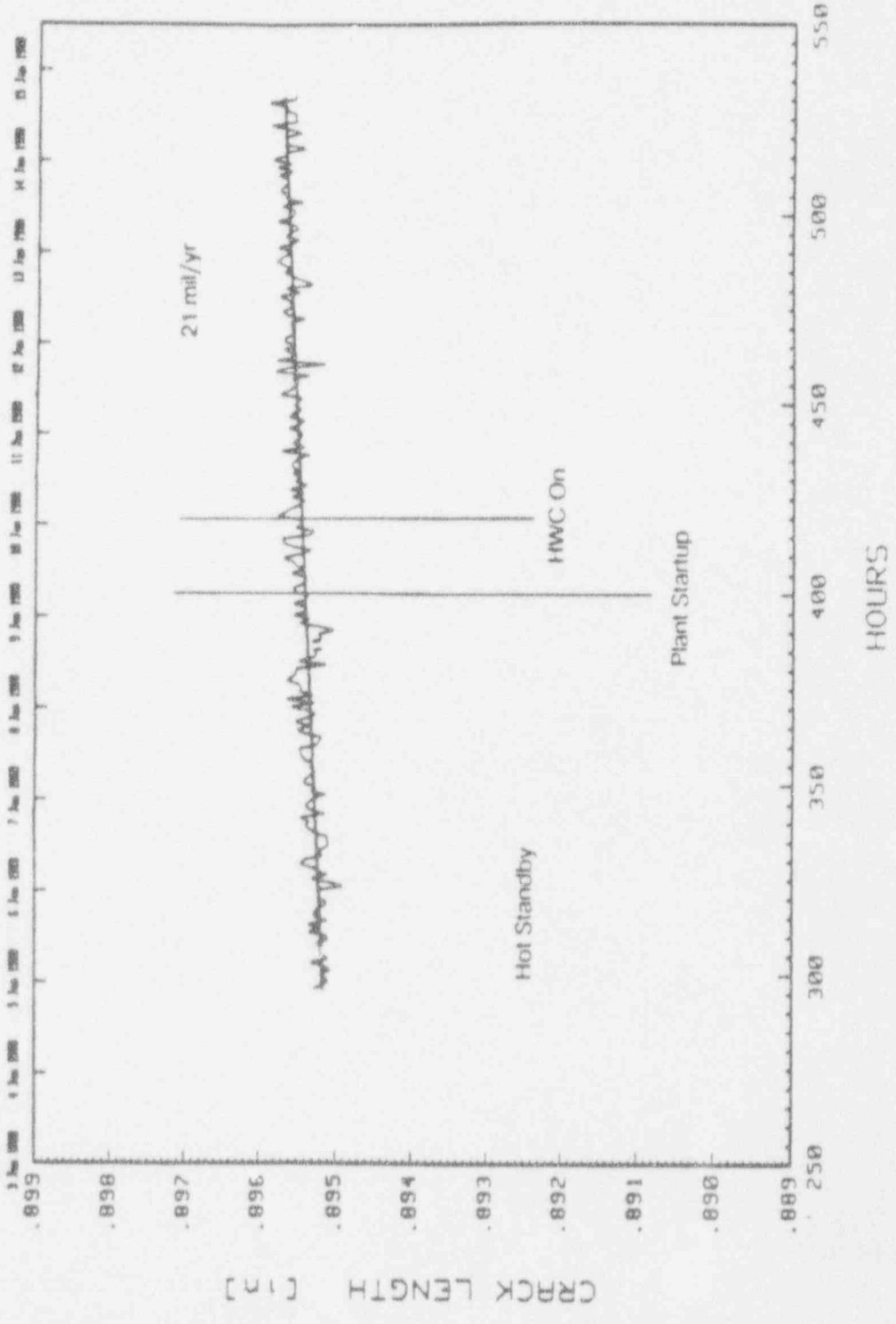
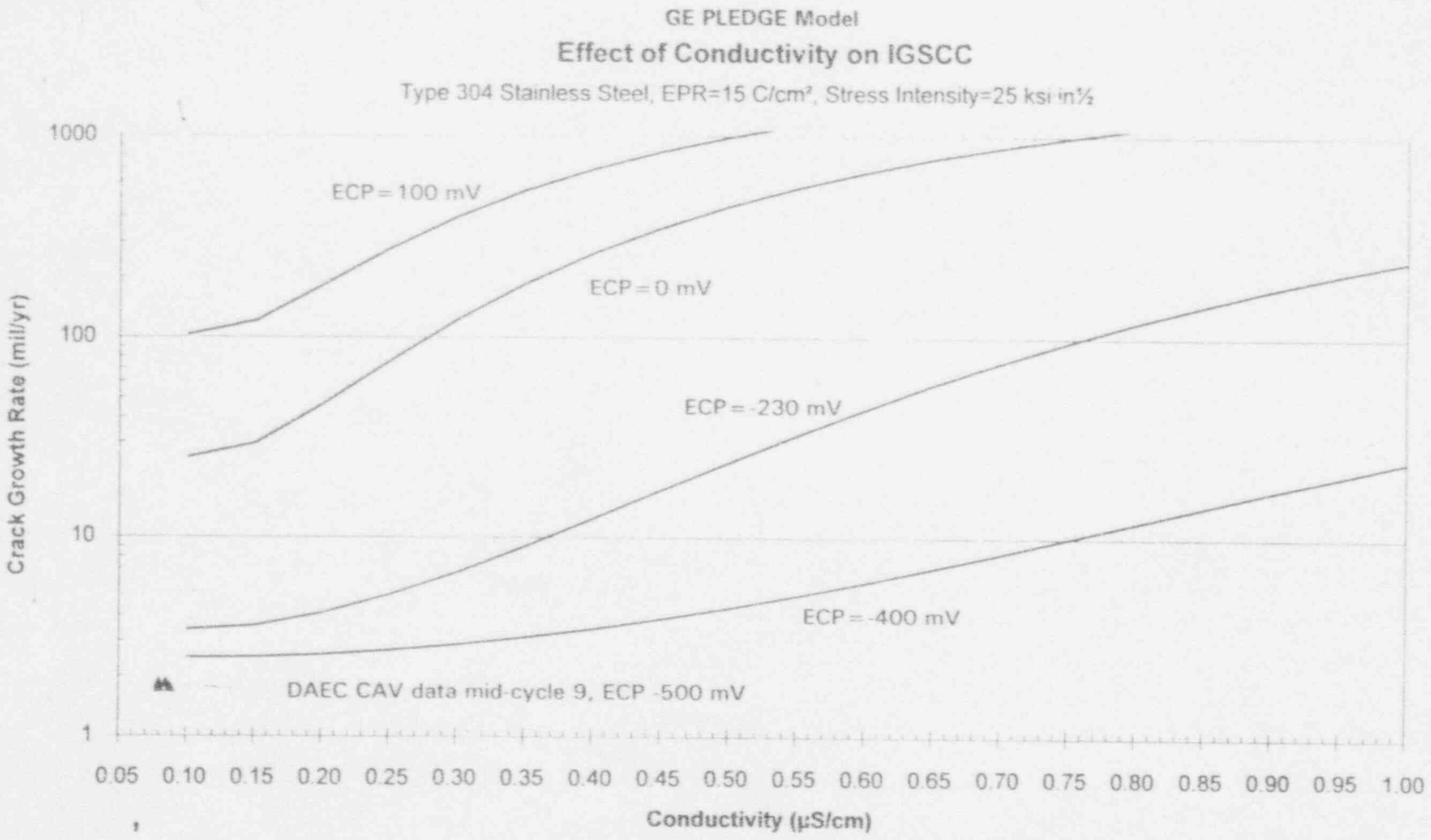
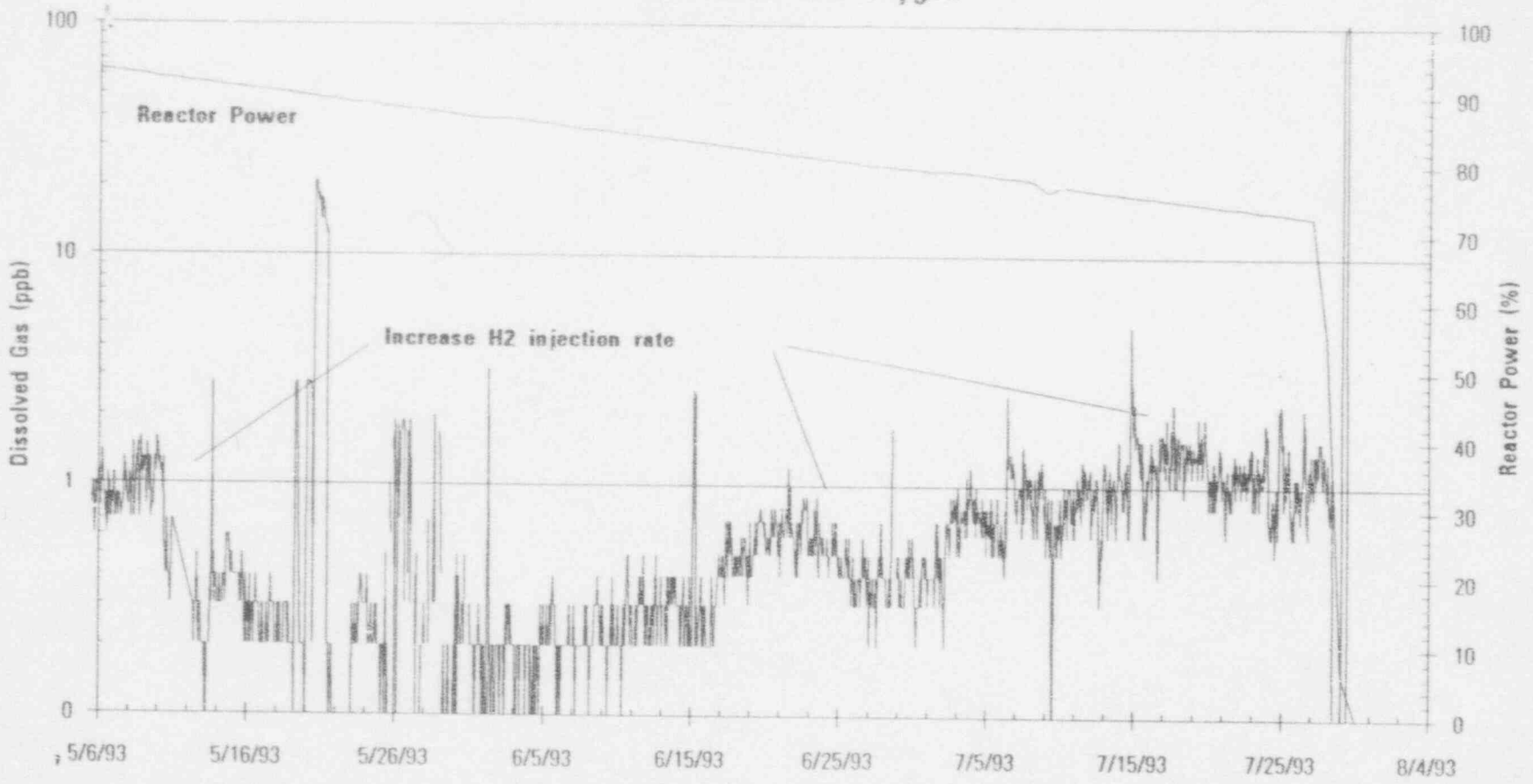


Figure 3-15. CAV recirculation sample crack growth. As-received Alloy 600 (INC_600), 27 ksi·in$^{0.5}$ During start-up of fuel cycle 10


GE PLEDGE Model
Effect of Conductivity on IGSCC
Type 304 Stainless Steel, EPR=15 C/cm², Stress Intensity=25 ksi in½
Crack Growth Rate (mil/yr)
1000
100
10
1
ECP = 100 mV
ECP = 0 mV
ECP = -230 mV
ECP = -400 mV
DAEC CAV data mid-cycle 9, ECP -500 mV
0.05 0.10 0.15 0.20 0.25 0.30 0.35 0.40 0.45 0.50 0.55 0.60 0.65 0.70 0.75 0.80 0.85 0.90 0.95 1.00
Conductivity (µS/cm)

Shutdown End of Fuel Cycle 12

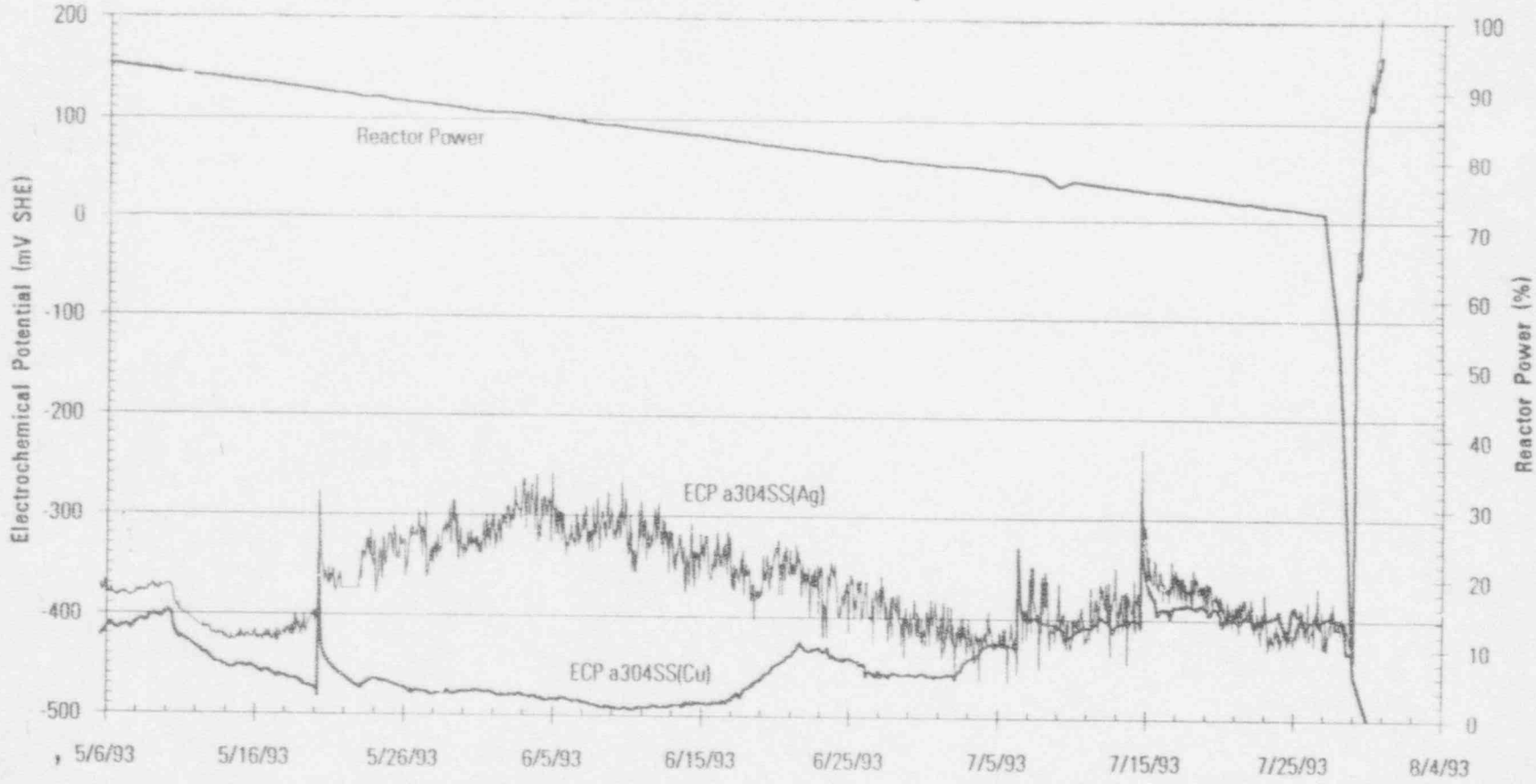
Recirculation Dissolved Oxygen



Attachment 4-14

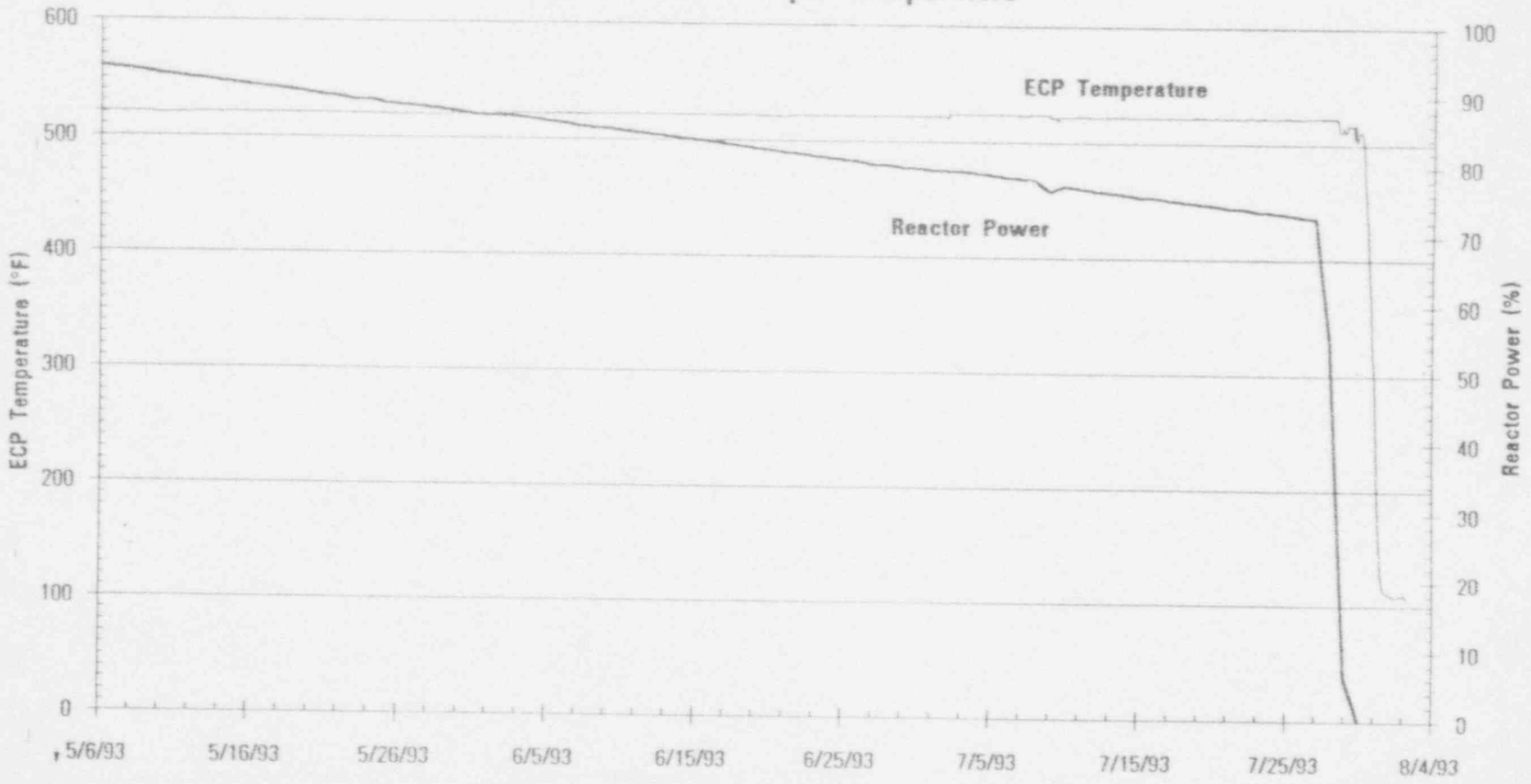
Shutdown End of Fuel Cycle 12

Recirculation ECP, CAV Loop A



Shutdown End of Fuel Cycle 12

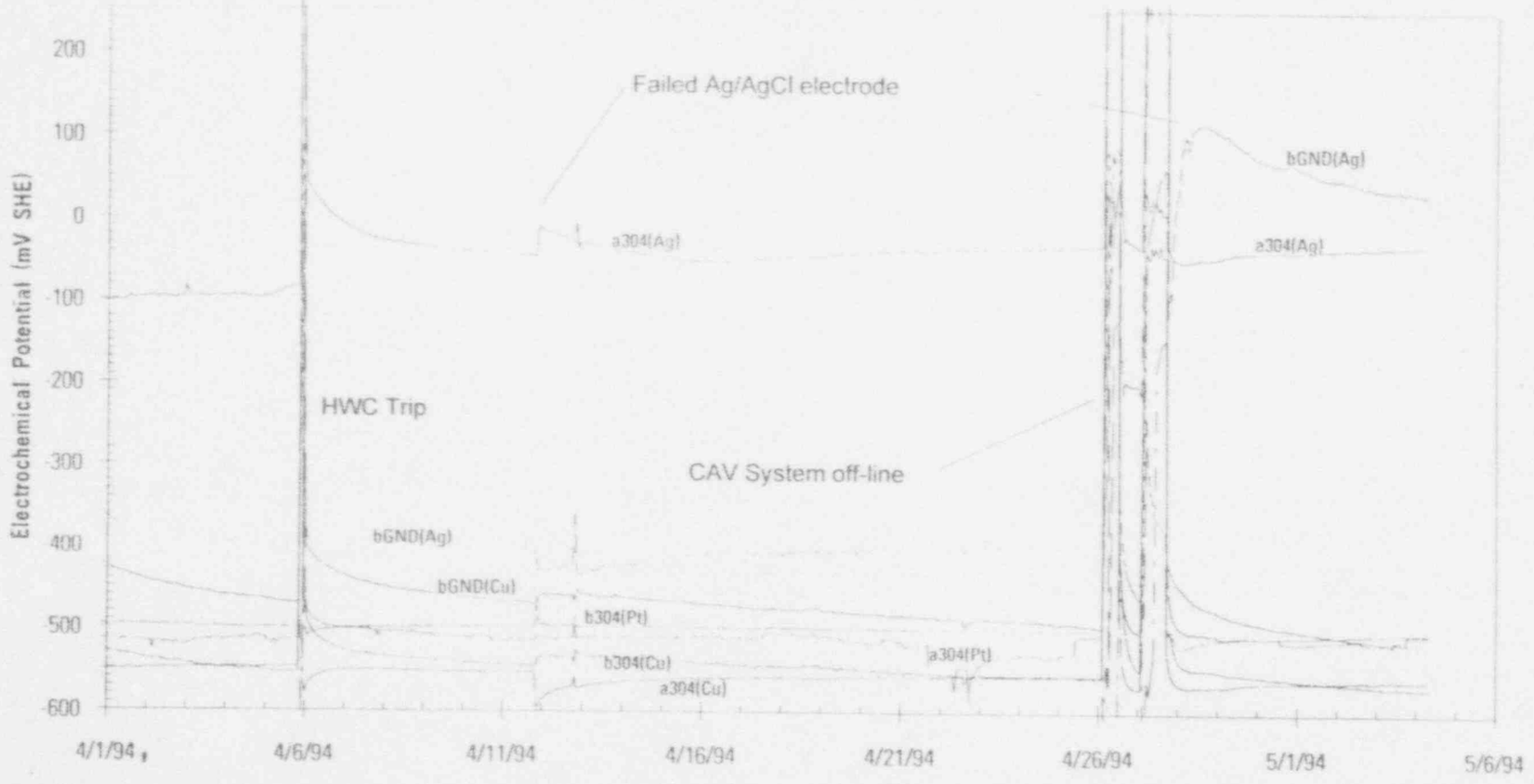
ECP Recirculation Sample Temperature

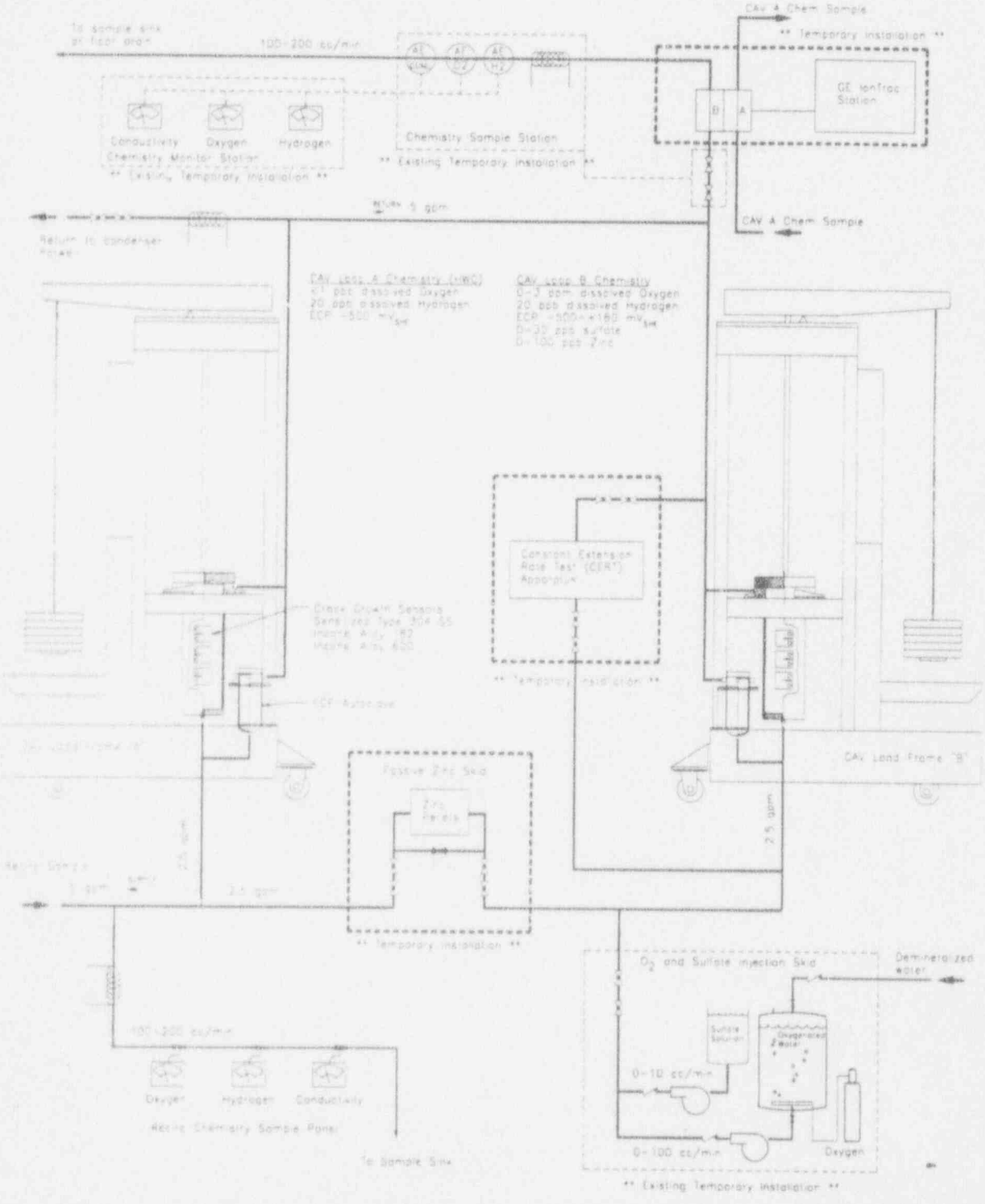


Attachment 5-1

DAEC HWC Performance

Recirculation Sample ECP





Attachment 13-1