2/14/77

Docket No. 50-331

LICENSEE: Iowa Electric Light and Power Company (IELP)

FACILITY: Duane Arnold Energy Center (DAEC)

SUBJECT: SUMMARY OF FEBRUARY 10, 1977 MEETING CONCERNING IELP PLANS FOR FEEDWATER NOZZLE INSPECTION DURING THE SPRING 1977 REFUELING OUTAGE AT DUANE ARNOLD

Representatives of Iowa Electric Light and Power Company, General Electric Company and the Nuclear Regulatory Commission met in Bethesda, Maryland to discuss the design, installation, proposed inspection techniques, and acceptance criteria for feedwater nozzle inspection at Duane Arnold.

Representatives of IELP presented an overview of the DAEC Sparger/Nozzle configuration, details of the welded thermal sleeve arrangment, and DAEC history of thermal cycling (see Enclosure 1).

A representative of General Electric Company discussed the rationale for not including DAEC in their Revised Feedwater Nozzle Interim Examination Recommendation (FNIER). The rationale included: ferrite composition of DAEC cladding, "unique" welded thermal sleeve design, and GE experience of cracking and thermal cycling in the industry (see Enclosure 2). GE further discussed their program to provide a final fix and examination technique.

IELP discribed their proposed inspection technique. It includes a detailed visual inspection, installation of an instrumentation package for recording thermal cycling, and ultrasonic testing of feedwater nozzles.

During the meeting:

1. IELP agreed to provide a synopsis of the UT program including acceptance criterion and to keep the NRC project manager advised of the inspection results and any planned contingency actions.

OFFICE ➤						
SURNAME ➤						
DATE ➤						

2. IELP agreed to provide information on borescope examinations to be performed on the thermal-sleeve-to-nozzle welds during the forthcoming outage.

3. GE agreed to provide the NRC with the experience of KRB regarding welded thermal sleeves.

4. NRC agreed to advise IELP, by February 18, 1977, of any additional information that is required for the Spring 1977 inspection at Duane Arnold.

A list of meeting attendees is attached as Enclosure 3.

R. P. Snaider
Lead Engineer
ORB#2
Division of Operating Reactors

D. M. Verrelli
Acting ORPM
ORB#3
Division of Operating Reactors

Enlcosure:
1. IELP Briefing Charts
2. GE Briefing Charts
3. List of Attendees

OFFICE	ORB#3	ORB#1	ORB#3	SHEA-PM	
SURNAME	DVerrelli:acr	RSnaider	GLear		
DATE	2/11/77	2/11/77	2/11/77	2/11/77	

ENCLOSURE 1

DAEC FEEDWATER SPARGER/NOZZLE

I. DAEC SPARGER/NOZZLE CONFIGURATION

- A. WELDED IN THERMAL SLEEVE
- B. EXTENDED SAFE END AND THERMAL SLEEVE
- C. SPARGER/JUNCTION BOX CONFIGURATION
- D. THERMAL SLEEVE/JUNCTION BOX FIT-UP
- E. SPARGER INSTALLATION IN VESSEL

II. ADVANTAGES OF DAEC CONFIGURATION

- A. STRESS CORROSSION RESISTANCE
  - 1. CLAD FERRITE CONTENT
- B. THERMAL CYCLING MINIMIZED
  - 1. ZERO LEAKAGE BETWEEN NOZZLE AND THERMAL SLEEVE
  - 2. "STANDARD" PLANT LEAKAGE IS BASIS FOR THERMAL CYCLE CRACKING
  - 3. DAEC OPERATING HISTORY

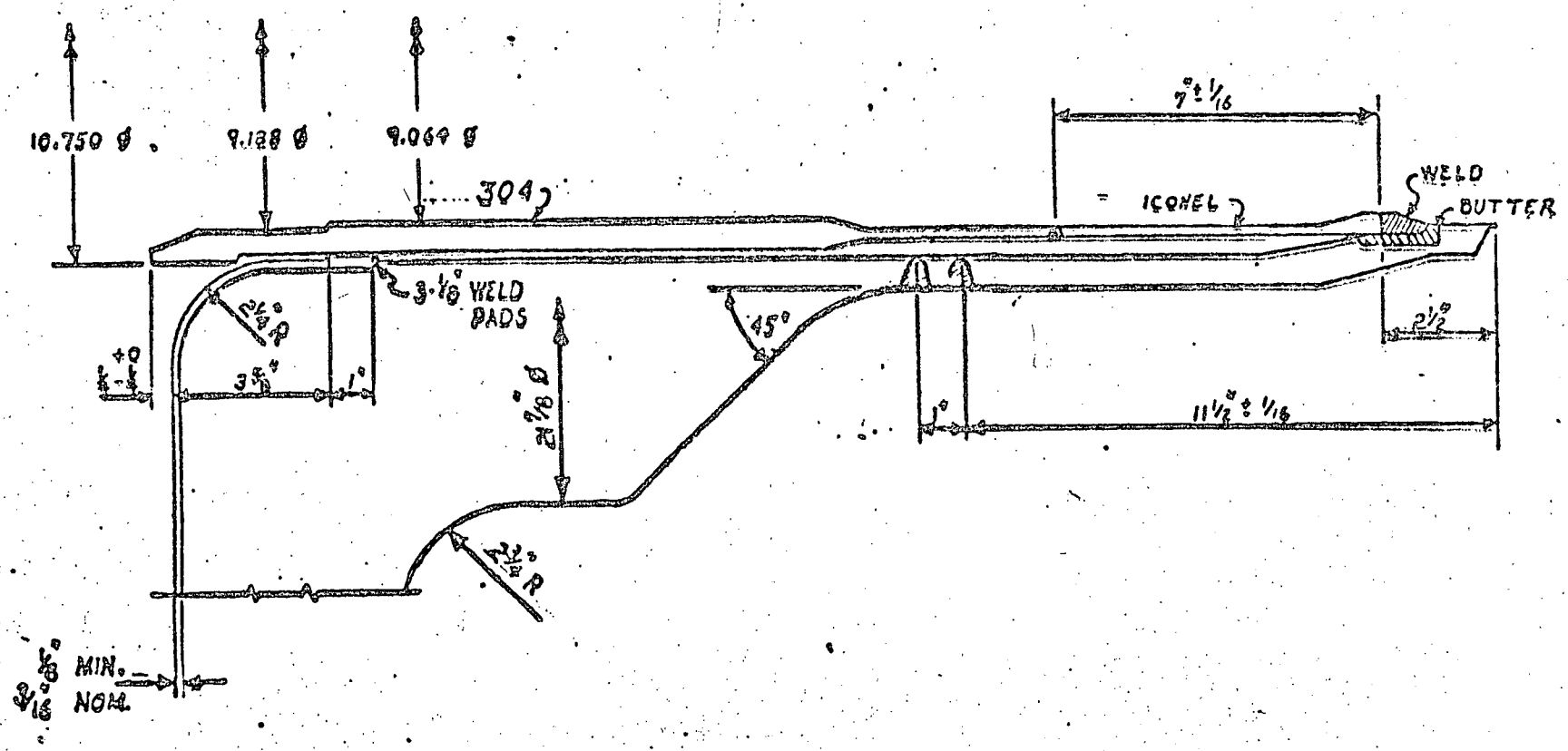
III. GENERAL ELECTRIC PRESENTATION ON NOZZLE CRACKING PHENOMENON

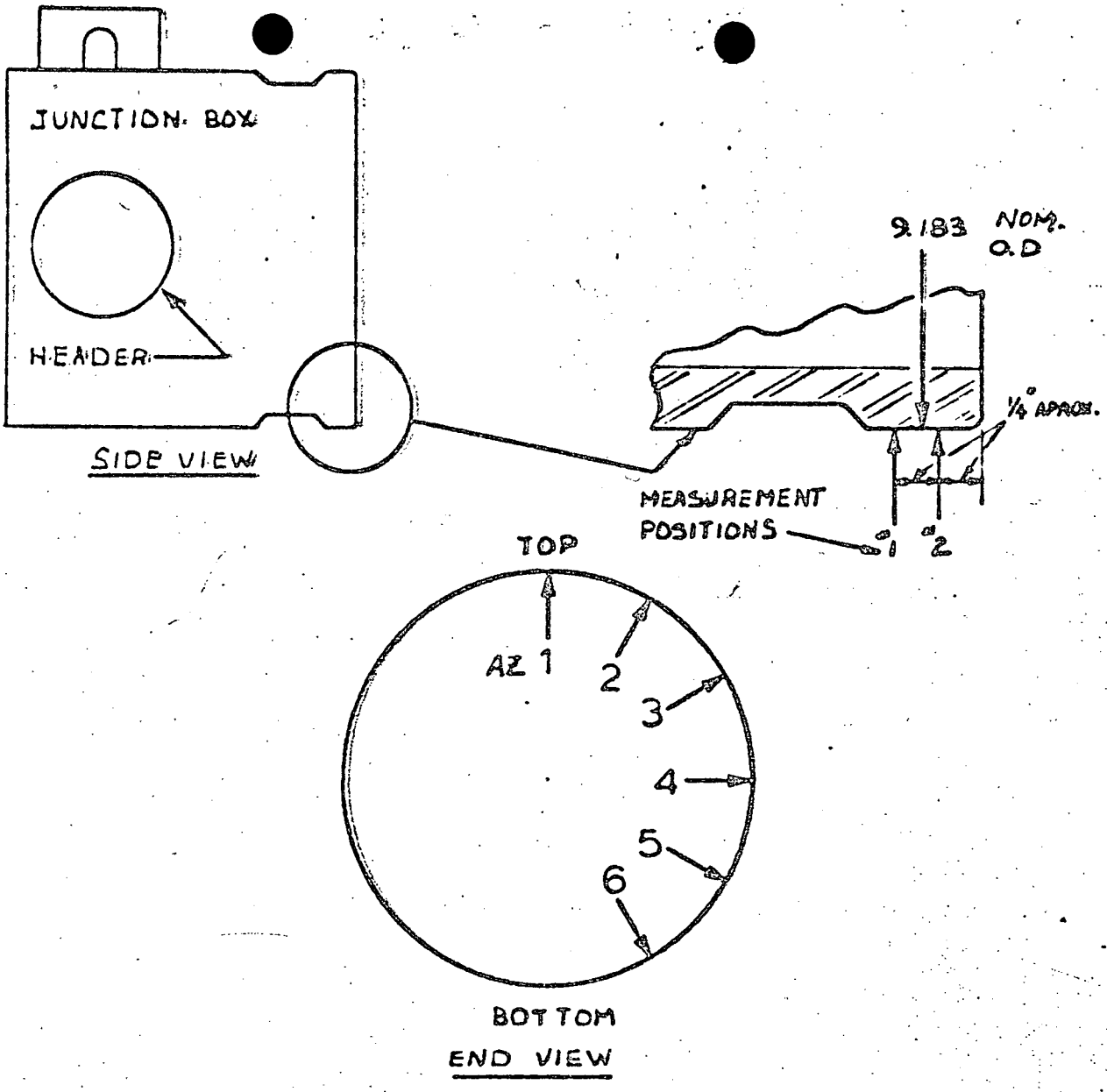
IV. RECOMMENDED ACTION FOR DAEC

- A. DETAILED VISUAL EXAMINATION
  - 1. BORESCOPE EXAMINATION OF THERMAL SLEEVE WELDS
- B. NOZZLE BLEND RADIUS CLAD FERRITE MEASUREMENT
- C. INSTALLATION OF THERMAL CYCLING INSTRUMENTATION
- D. UT EXAMINATION

V. EXPECTED PROGRESS IN EXAMINATION TECHNIQUE PRIOR TO 1978 OUTAGE

DALC Feedwater Nozzle/Safe End/Thermal Sleeve Configuration





	POSITION 1				POSITION 2			
Azimuth	1st RDG.	2nd RDG.	3rd RDG.	AVG.	1st RDG.	2nd RDG.	3rd RDG.	AVG.
1								
2								
3								
4								
5								
6								

REV. | DESCRIPTION | DR | CHK | SUPV | MATL | APPROVALS | DATE

0

BECHTEL

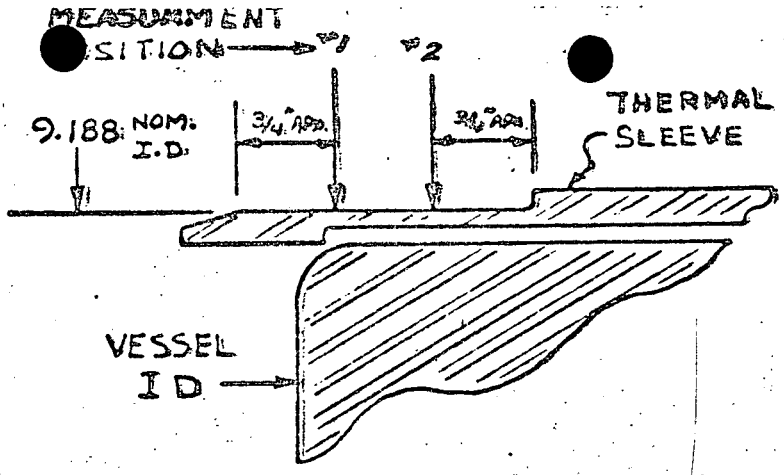
POWER AND INDUSTRIAL DIVISION

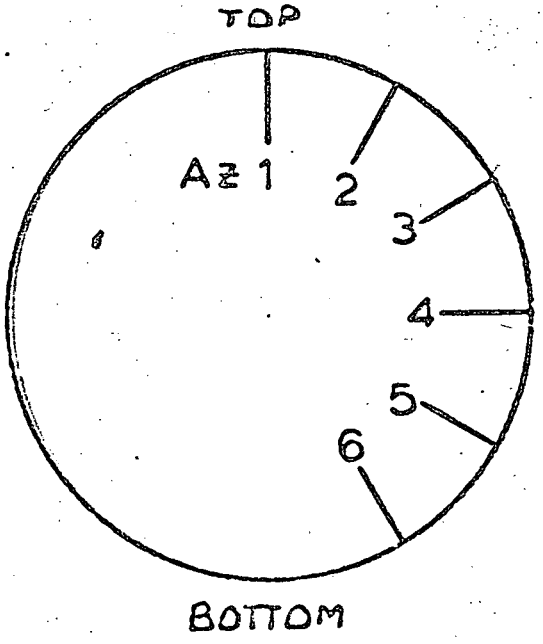
FEED WATER SPARGER MODIFICATION ENGINEERING WORK SHEET

JOB No.

DSK

G-231-A
8-8-62





Azimuth	POSITION # 1				POSITION # 2			
	1ST RDG.	2ND RDG.	3RD RDG.	AVG.	1ST RDG.	2ND RDG.	3RD RDG.	AVG.
1								
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3								
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5								
6								

REV.	DESCRIPTION	ENG	DR	CHK	SUPV	MATL	APPROVALS	DATE
0								

BECHTEL

POWER AND INDUSTRIAL DIVISION

FEED WATER SPARGER MODIFICATION ENGINEERING WORK SHEET

JOB No

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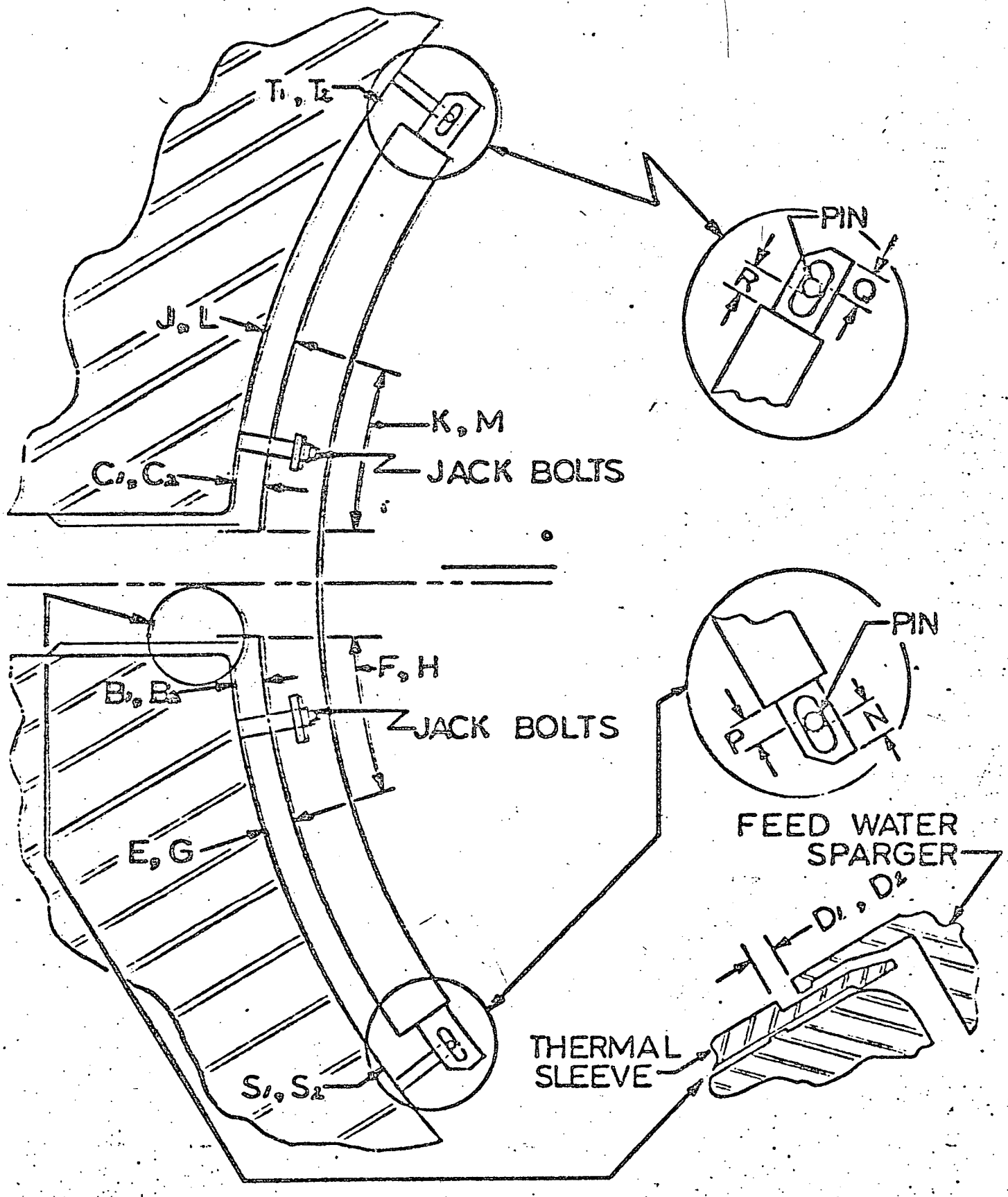
G-231-A
8-8-62



REV.	DESCRIPTION	ENG	DR	CHK	SURV	MATL	APPROVALS	DATE
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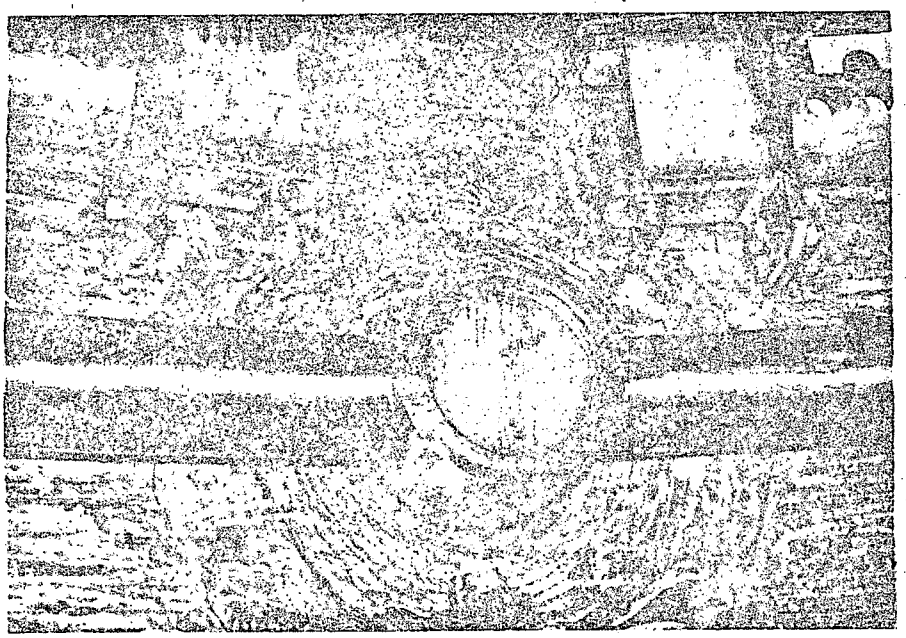
POWER AND INDUSTRIAL

FEED WATER SPARGER MODIFICATION ENGINEERING WORK SHEET

JOB No

REV.

231-A 8-62



#3

Spargers in position and welded. Note: Two brackets at top of picture are F.W. brackets, bottom is Core Spray.

#4

Sparger in position and are spring loaded. Note: tack welds on jacking bolts. Typical

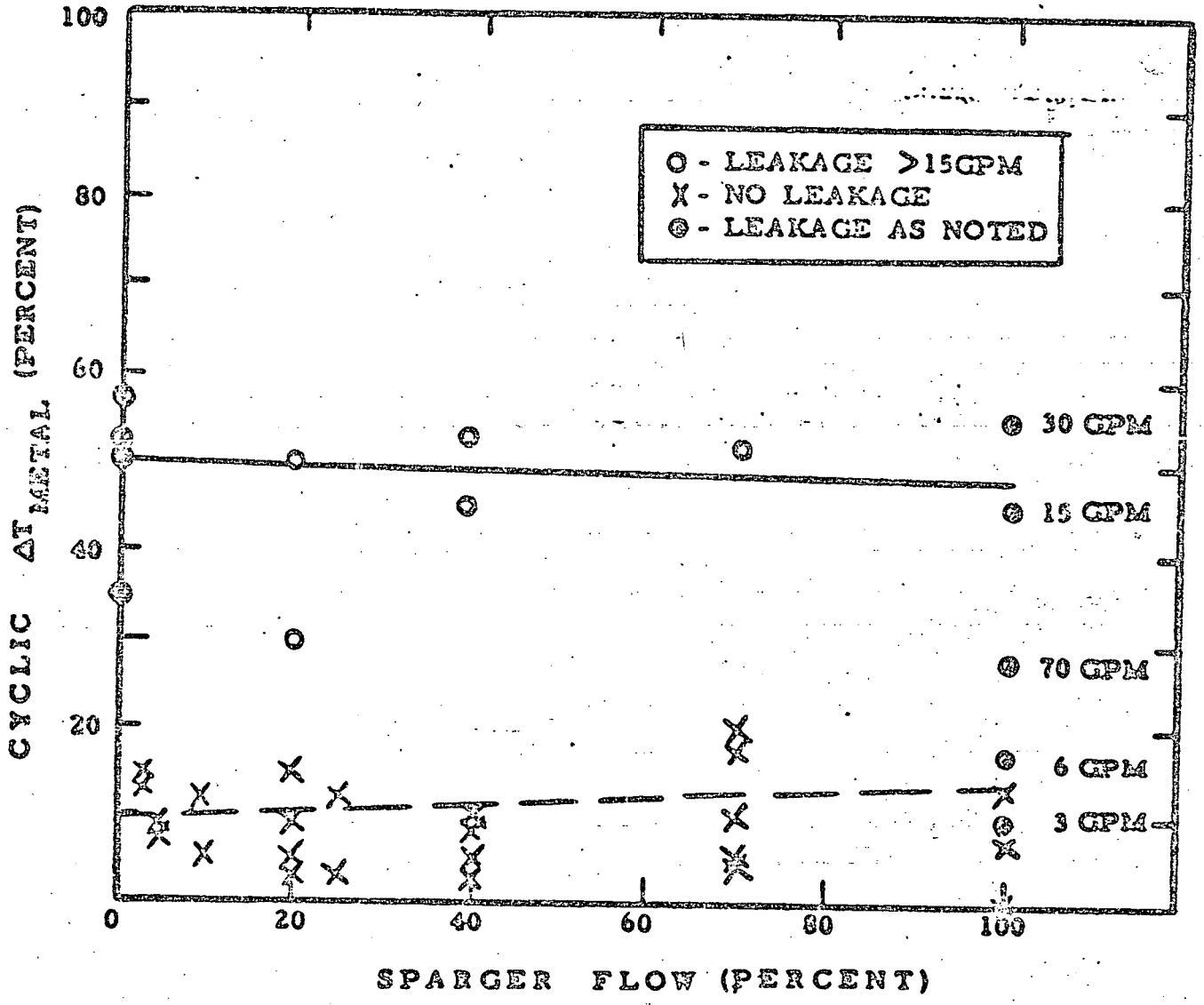
ENCLOSURE 2

FACTORS IN GE RECOMMENDATION

- CLADDING HAS FERRITE > 3%
  - PB 3 - 4.2% NO SIGNIFICANT CRACKING
  - MILLSTONE HEAD - 2.4% NO CRACKS
- WELDED TEE BOX DESIGN
  - CYCLING TOO LOW TO INITIATE CRACKS
  - INSTRUMENTATION WILL CONFIRM
- REMOVING SLEEVE AT THIS TIME MAY START PROBLEM -
- EXPERIENCE AT KRB INDICATES WELDS ARE SOUND
- FINAL FIX AVAILABLE AT NEXT OUTAGE

TEE-BOX TEST GEOMETRY

METAL TEMPERATURE CYCLING IN NOZZLE BLEND RADIUS

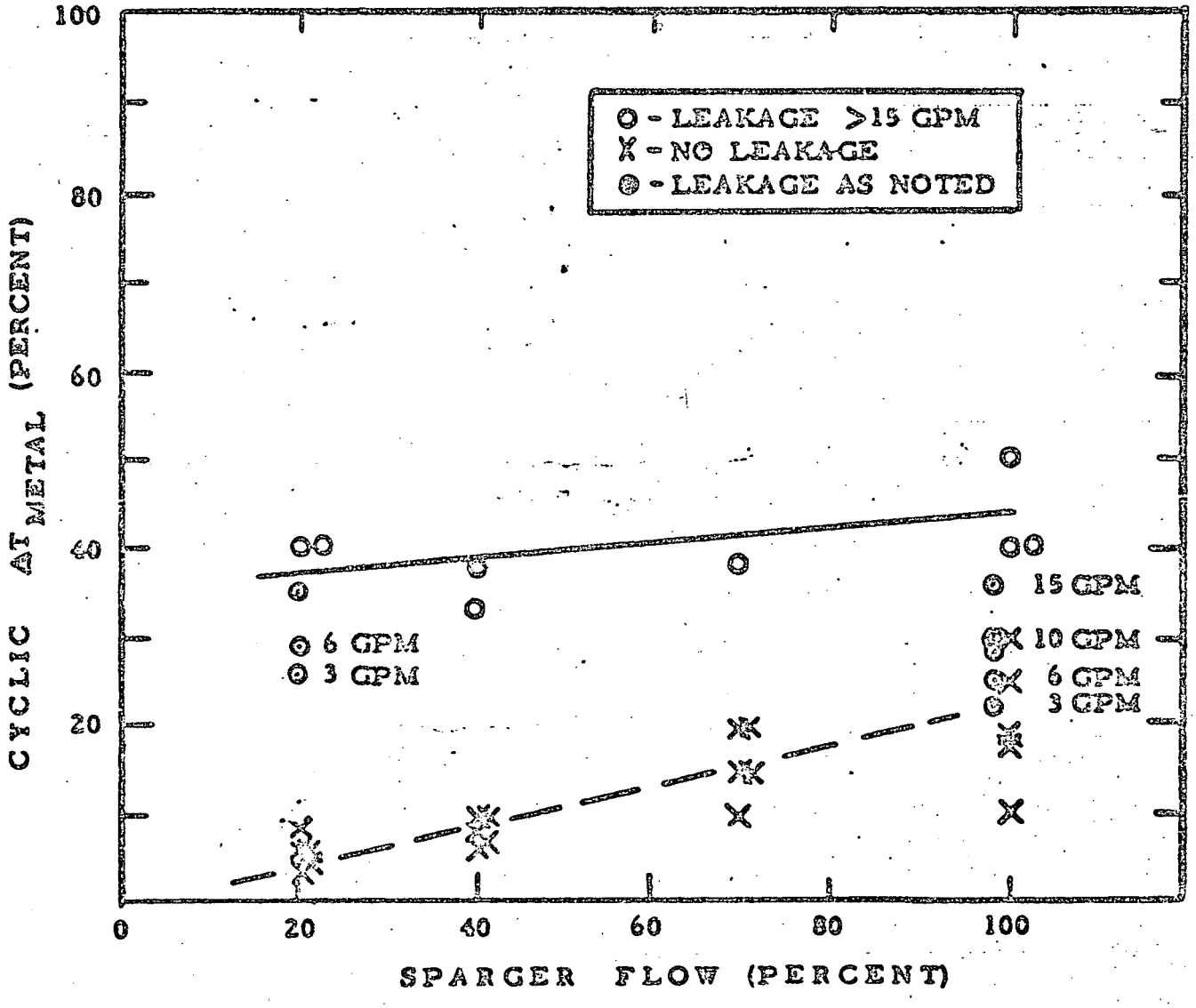


CONCLUSIONS:

- METAL TEMPERATURE CYCLING APPROXIMATELY HALF THAT IN FLUID.
- EFFECT OF LEAKAGE CONSISTENT WITH THAT IDENTIFIED FROM FLUID TEMPERATURE CYCLING.

FORGED TEE TEST GEOMETRY

METAL TEMPERATURE CYCLING IN NOZZLE BLEND RADIUS

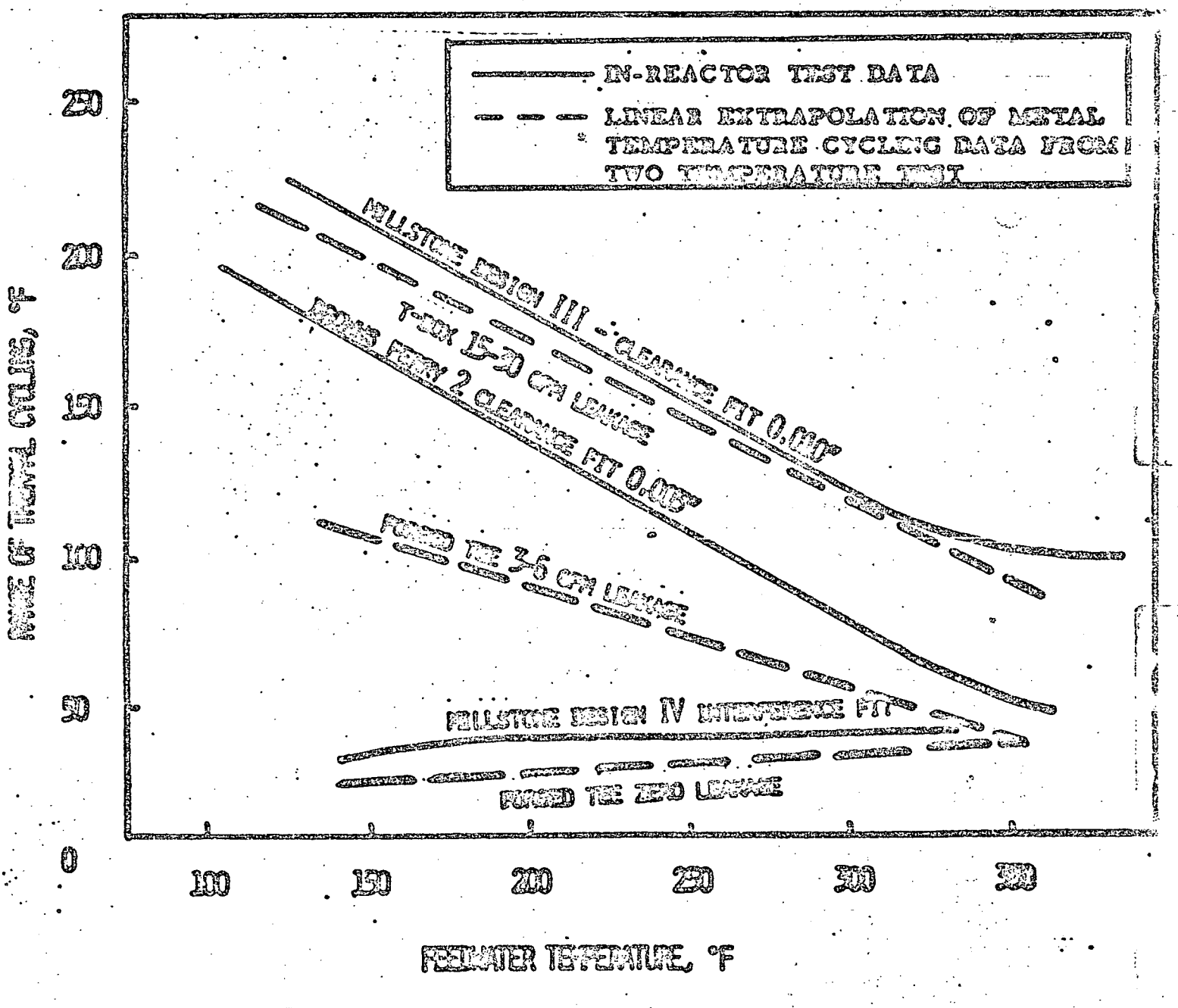


CONCLUSIONS:

- METAL TEMPERATURE CYCLING APPROXIMATELY HALF THAT IN FLUID.
- EFFECT OF LEAKAGE CONSISTENT WITH THAT IDENTIFIED FROM FLUID TEMPERATURE CYCLING.

TEMPERATURE CYCLING IN NOZZLE BLEND RADIUS

COMPARISON OF TWO-TEMPERATURE TEST AND IN-REACTOR DATA

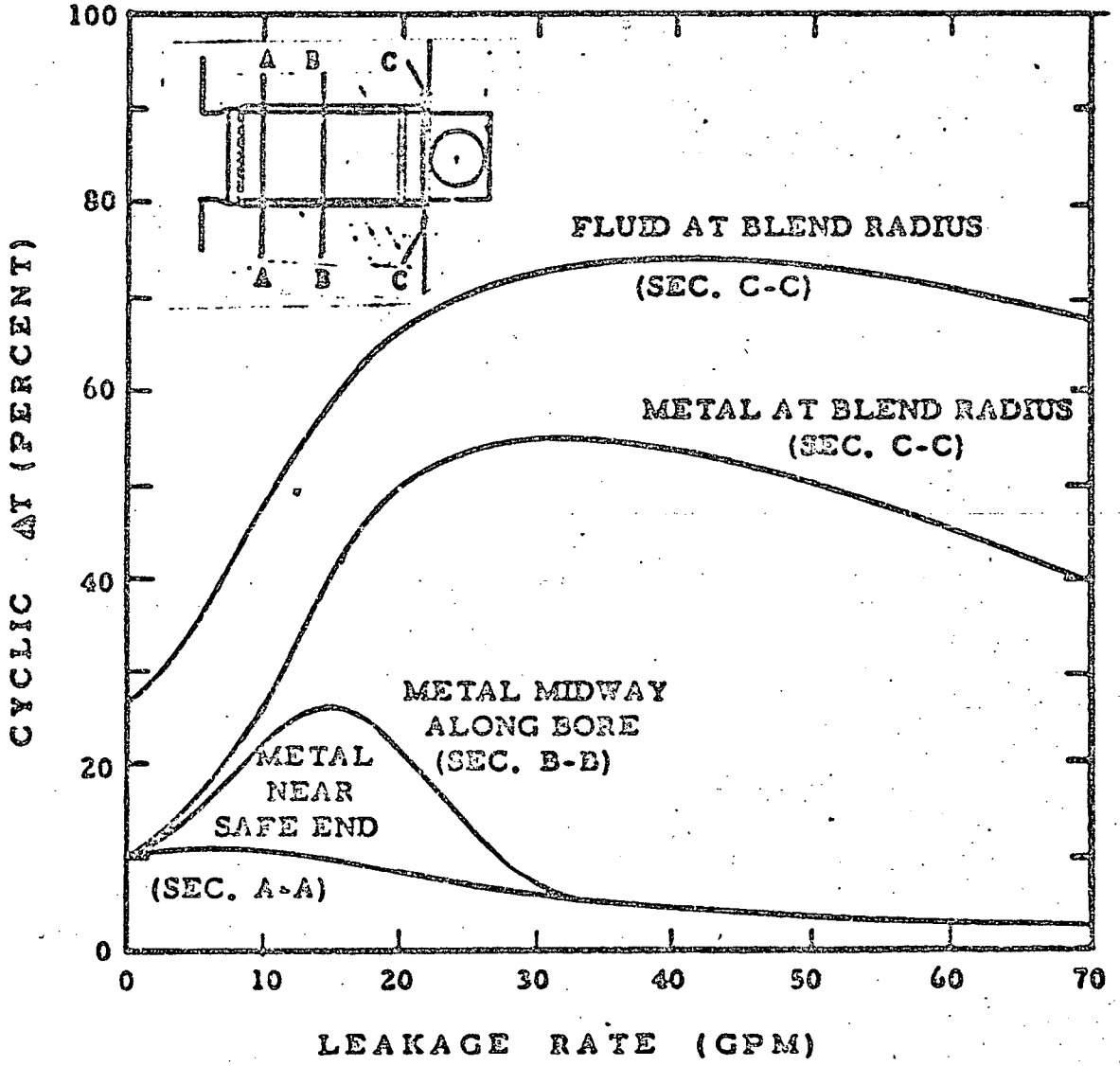


CONCLUSIONS:

- TWO TEMPERATURE TEST PROVIDES GOOD REPRESENTATION OF IN-REACTOR BEHAVIOR.

TEE-BOX TEST GEOMETRY

NOZZLE THERMAL CYCLING TRENDS
VARIOUS SECTIONS - 100% SPARGER FLOW



CONCLUSIONS:

- BLEND RADIUS CYCLING SATURATES AT 15 TO 20 GPM LEAKAGE.
- BEHAVIOR OF OTHER NOZZLE SECTIONS DIFFERENT, BUT CYCLING SIGNIFICANTLY LESS THAN IN BLEND RADIUS.

ENCLOSURE 3

MEETING ATTENDEES

IOWA ELECTRIC LIGHT & POWER COMPANY

DUANE ARNOLD ENERGY CENTER

FEBRUARY 10, 1977

Name	Organization
Chuck Dillmann	GE
H. T. Watanabe	GE
Michael A. Bouser	Lowenstein, Newman, Reis & Axelrad
Lee Liu	IELP
Larry Root	IELP
Karl Meyer	IELP
Harry Schearer	IELP
John Gebert	IELP
Ken Harrington	IELP
Harold Rehrauer	IELP
Ellery Hammond	IELP
Daniel Minick	IELP
Ted Lambert - UT Consultant	IELP
D. M. Verrelli	NRC
R. P. Snaider	NRC
W. S. Hazelton	NRC
R. M. Gamble	NRC
P. N. Randall	NRC
C. Y. Cheng	NRC
R. E. Johnson	NRC
V. S. Noonan	NRC
R. W. Klecker	NRC
C. M. Erb - Region III	NRC

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

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Harold F. Reis, Esquire
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426 Third Avenue, S. E.
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NRC PDR
Local PDR
Docket Files
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ORB#3 Rdg
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V. Stello
K. R. Goller
D. Eisenhut
T. J. Carter
J. Reece
D. L. Ziemann
G. E. Lear
R. W. Reid
L. C. Shao
R. L. Baer
A. Schwencer
B. K. Grimes
Project Manager
OELD
OI&E (3)
C. Parrish
NRC Participants
ACRS (16)
T. B. Abernathy
J. R. Buchanan
D. Thompson
Licensee