

## BOOK44R

### Notes:

"EBOR ML-1" on spine

Blank pages: inside front cover sheets, 1, 22, 23, 29, 30, 118-308, inside back cover sheets

The following was found between the front cover sheets:

- 1 {
  - 1 yellow (8.5X11) sheet
  - 3 green half sheets with a smaller sheet stapled to each
  - 3 small sheets
  - ALL of above was paper clipped together
  
- 2 {
  - 1 (8.5x17) sheet
  - 1 (8.5x11) sheet with yellow (8.5x11) sheet stapled to it
  - ALL of above was folded up together
  
- 3 (2 (8.5x17) sheets folded separately
  
- 4 (4 (8.5x11) sheets stapled together

### OTHERS-

- pages 26, 28, 41, 46, 48, 50, 51, 53, 59, 64, 65, 68, 69, 70, 72, 75, 79, 83, 88, 94, 95, 98, 107, 117 had 1 drawing of red circles attached to each page
- pages 25, 56, 58, 62, 67 has 2 drawings of red circles attached to each page
- page 42 has 1 circle drawing and 1 graph sheet attached
- page 78 has 1 graph sheet attached

Scanned by:

Sheila Finch

RSICC /Oak Ridge National Lab.

August 11, 1999

## REQUEST FOR CONTROL ANALYSIS

THIS FORM IS TO BE USED ONLY FOR REQUESTING ANALYSIS FOR VERIFICATION OF INVENTORY, VERIFICATION OF MATERIAL CONTENT BEING SHIPPED FROM THE LABORATORY TO OTHER INSTALLATIONS AND VERIFICATION OF MATERIAL CONTENT RECEIVED FROM OTHER INSTALLATIONS.

NAME E B Tuberson  
 SERIES NUMBER \_\_\_\_\_  
 DATE SUBMITTED 8/27/77

PURPOSE OF ANALYSIS	CHECK ONE
S.F. Receipt Verification	<input type="checkbox"/>
Inventory Verification	<input type="checkbox"/>
S.F. Shipment Verification	<input type="checkbox"/>

SAMPLE CODE	DESIRED ANALYSIS	ESTIMATION OF CONCENTRATION	PREVIOUS HISTORY OF SAMPLE	NATURE AND ESTIMATION OF ACTIVITY	CONCENTRATION OF ALL CONSTITUENTS IN SAMPLE	VOLUME OR NET WEIGHT IN LITERS OR GRAMS
	5 1/2	4g 1/2				514.6g
	9 B 1/2	0.3g B 1/2				

DISTRIBUTION: 1 (White) Analytical  
 2 (Canary) Requestor  
 3 (Blue) S.F. Accountability

E B Tuberson  
 Requestor

REQUISITION

684513

7

REQUISITION

684514

7

REQUISITION

684515

P  
00

REPORT TO

*P.K. Reedy*

BUILDING NO.

*9213*

PHONE NO.

*3-5237*

REPORT TO

*P.K. Reedy*

BUILDING NO.

*9213*

PHONE NO.

*3-5237*

REPORT TO

*P.K. Reedy*

BUILDING NO.

*9213*

PHONE NO.

*3-5237*

REQUISITION

684516

P

10:18

*SSV*  
*SPL*

REPORT TO

*Johnson*

BUILDING NO.

*9213*

PHONE NO.

*3-5237*

						g U/g
						g Ay/g
						g D/g
						g H/g
						g Mo/g
						g F/g
						SPEC.
						ASSAY
0.040g B/L						
.9981 density temp						
J. L.						
8.22.67						
DEPT.						

						g U/g
						g Ay/g
						g D/g
						g H/g
						g Mo/g
						g F/g
						SPEC.
						ASSAY
0.039g B/L						
.9988 density temp						
J. L.						
8.22.67						
DEPT.						

						g U/g
						g Ay/g
						g D/g
						g H/g
						g Mo/g
						g F/g
						SPEC.
						ASSAY
003971						
Spec - Cancelled						
10030 Spg @ 22.5% 22.5%						
J. L.						
8.29.67						
DEPT.						
T						

						g U/g
						g Ay/g
						g D/g
						g H/g
						g Mo/g
						g F/g
						SPEC.
						ASSAY
003964						
0.32g B/L						
10027 density temp						
20/40						
J. L.						
9.12.67						
DEPT.						
T						

REQUISITION  
684512

ROSA

at Temp.

REPORT TO  
BUILDING NO.  
PHONE NO.

*A. H. Roberts*  
9213  
3-5237

SPECTROGRAPHIC REPORT

MATERIAL TYPE: *H20*      DATE: *8/22/67*      BATCH NUMBER:      PLATE SHEET NO.: *17011*      REQUISITION NO.: *684512*

TYPE SPEC.:  N.C.       ppm as received       ppm metal basis       µg/ml as received  
 PYRO       ppm U<sub>2</sub>O<sub>5</sub> basis       % metal basis       other: *129/9*

1	Ag	<1	Al	<1	B	6	Ba	<1		
	Be	<10	Ca	<1	Cd	<1	Co	<2		
	Cr	<1	Cu	<1	Fe	<1	K	<2		
2	Li	<10	Mg	<1	Mn	<1	Ni	10		
	Ni	<4	P	<10	Pb	<1	S	<1		
	Sn	<1	Ti	<6	V	<1				
3	As	<1	Au	2	Bi	<1	C	<6	Hg	
	Ga	<1	Ge	<1	Hf	<1	In	<1	Re	
			Nb	<1	Pd	<6	Pb	<2	Te	<10
4	Sb	<1	S		Th	<4	Tl		U	<4
	W	<1	Zn	<6	Zr	<2				
5	C		Mo	<1	F		O			
	C/O		Mo							

UCN-260  
(2-5-64)

ppm as received basis  
factor, not actual analysis



REQUISITION 684511 21

RUSH

REPORT TO *H. B. ...*  
 BUILDING NO. 9213  
 PHONE NO. 3-5237

SPECTROGRAPHIC REPORT

MATERIAL TYPE: *H<sub>2</sub>O*      DATE: *8/22/67*      BATCH NUMBER:      PLATE SHEET NO.: *17011*      REQUISITION NO.: *684511*

TYPE SPEC.		REPORTING BASIS							
<input type="checkbox"/> N. C.	<input type="checkbox"/> PYRO	<input type="checkbox"/> ppm as received	<input type="checkbox"/> ppm - U <sub>3</sub> O <sub>8</sub> basis	<input type="checkbox"/> ppm metal basis	<input type="checkbox"/> % metal basis	<input type="checkbox"/> ug/ml as received	<input checked="" type="checkbox"/> other <i>ug/g</i>		
1	Ag	<.1	Al	<.1	B	.6	Ba	<.1	
	Be	<.10	Ca	.1	Cd	<.1	Co	<.2	
	Cr	<.1	Cu	<.1	Fe	<.1	K	<.2	
2	Li	<.10	Mg	<.1	Mn	<.1	Na	.8	
	Ni	<.4	P	<.10	Pb	<.1	Si	<.1	
	Sn	<.1	Ti	<.6	V	<.1			
3	As	<.1	Au	.2	Bi	<.1	Cs	<.6	Hg
	Ga	<.1	Ge	<.1	Hf	<.1	In	<.1	Re
			Nb	<.1	Pd	<.6	Rb	<.2	Tl
4	Sb	<.1	Sr		Th	<.4	Tl		U
	W	<.1	Zn	<.6	Zr	<.2			
5	C <sup>1</sup>		Mo	<.1	F <sup>*</sup>		O <sup>*</sup>		
	C/Q		Mo <sup>1</sup>						

UCN-260 (2-5-64)

<sup>1</sup>ppm as received basis  
 \* factor, not actual analysis

	g U/g
	g Ag/g
	g Dg
	g Hg
	g Pb/g
	g Zn/g
	SPEC.
	ASSAY

REF. BY: *Good*  
 DATE: *8-22-67*  
 DPT:

### SPERMATOGONIAL REPORT

MATERIAL TYPE	DATE	BATCH NUMBER	PLATE NUMBER	FEDERATION NO.
<i>12345</i>	<i>8/22/67</i>	<i>12345</i>	<i>12345</i>	<i>12345</i>

ELEMENT	UNIT	FORM	CONC.	TEST RESULTS	
				g U/g	g Ag/g
As	μg/g	0		<i>N/A</i>	<i>N/A</i>
Cd	μg/g	0		<i>N/A</i>	<i>N/A</i>
Co	μg/g	0		<i>N/A</i>	<i>N/A</i>
Cu	μg/g	0		<i>N/A</i>	<i>N/A</i>
Fe	μg/g	0		<i>N/A</i>	<i>N/A</i>
Mn	μg/g	0		<i>N/A</i>	<i>N/A</i>
Pb	μg/g	0		<i>N/A</i>	<i>N/A</i>
P	μg/g	0		<i>N/A</i>	<i>N/A</i>
Ti	μg/g	0		<i>N/A</i>	<i>N/A</i>
V	μg/g	0		<i>N/A</i>	<i>N/A</i>
Zn	μg/g	0		<i>N/A</i>	<i>N/A</i>
B	μg/g	0		<i>N/A</i>	<i>N/A</i>
Au	μg/g	0		<i>N/A</i>	<i>N/A</i>
Ga	μg/g	0		<i>N/A</i>	<i>N/A</i>
Hf	μg/g	0		<i>N/A</i>	<i>N/A</i>
Nb	μg/g	0		<i>N/A</i>	<i>N/A</i>
Pd	μg/g	0		<i>N/A</i>	<i>N/A</i>
Sr	μg/g	0		<i>N/A</i>	<i>N/A</i>
Tl	μg/g	0		<i>N/A</i>	<i>N/A</i>
U	μg/g	0		<i>N/A</i>	<i>N/A</i>
V	μg/g	0		<i>N/A</i>	<i>N/A</i>
W	μg/g	0		<i>N/A</i>	<i>N/A</i>
Xe	μg/g	0		<i>N/A</i>	<i>N/A</i>
Y	μg/g	0		<i>N/A</i>	<i>N/A</i>
Zr	μg/g	0		<i>N/A</i>	<i>N/A</i>
Br	μg/g	0		<i>N/A</i>	<i>N/A</i>
Ca	μg/g	0		<i>N/A</i>	<i>N/A</i>
Ce	μg/g	0		<i>N/A</i>	<i>N/A</i>
Cl	μg/g	0		<i>N/A</i>	<i>N/A</i>
Cr	μg/g	0		<i>N/A</i>	<i>N/A</i>
K	μg/g	0		<i>N/A</i>	<i>N/A</i>
La	μg/g	0		<i>N/A</i>	<i>N/A</i>
Mg	μg/g	0		<i>N/A</i>	<i>N/A</i>
Mo	μg/g	0		<i>N/A</i>	<i>N/A</i>
Ni	μg/g	0		<i>N/A</i>	<i>N/A</i>
Os	μg/g	0		<i>N/A</i>	<i>N/A</i>
Rb	μg/g	0		<i>N/A</i>	<i>N/A</i>
S	μg/g	0		<i>N/A</i>	<i>N/A</i>
Sc	μg/g	0		<i>N/A</i>	<i>N/A</i>
Se	μg/g	0		<i>N/A</i>	<i>N/A</i>
Si	μg/g	0		<i>N/A</i>	<i>N/A</i>
Sr	μg/g	0		<i>N/A</i>	<i>N/A</i>
Ta	μg/g	0		<i>N/A</i>	<i>N/A</i>
Tb	μg/g	0		<i>N/A</i>	<i>N/A</i>
Tm	μg/g	0		<i>N/A</i>	<i>N/A</i>
U	μg/g	0		<i>N/A</i>	<i>N/A</i>
V	μg/g	0		<i>N/A</i>	<i>N/A</i>
Yb	μg/g	0		<i>N/A</i>	<i>N/A</i>
Yt	μg/g	0		<i>N/A</i>	<i>N/A</i>
Zn	μg/g	0		<i>N/A</i>	<i>N/A</i>
Zr	μg/g	0		<i>N/A</i>	<i>N/A</i>
Other					

SPERMATOGONIAL REPORT



684510

REQUISITION

'67 JUL 26 AM 8:30

REPORT TO  
BUILDING NO.  
PHONE NO.

*P. H. Kelly*  
9213  
3-5237

SPECTROGRAPHIC REPORT

MATERIAL TYPE <i>Reflector H<sub>2</sub>O</i>	DATE <i>8/1/67</i>	BATCH NUMBER <i>#1</i>	PLATE SHEET NO. <i>16991</i>	REQUISITION NO. <i>684510</i>
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TYPE SPEC.		REPORTING BASIS			
<input type="checkbox"/> N. C.	<input type="checkbox"/> ppm as received	<input type="checkbox"/> ppm metal basis	<input type="checkbox"/> µg/ml as received		
<input type="checkbox"/> PYRO	<input type="checkbox"/> ppm - U <sub>3</sub> O <sub>8</sub> basis	<input type="checkbox"/> % metal basis	<input checked="" type="checkbox"/> other <i>µg/g</i>		

1	Ag	<i>&lt;.1</i>	Al	<i>&lt;.1</i>	B	<i>&lt;.1</i>	Ba	<i>&lt;.1</i>		
	Be	<i>&lt;.10</i>	Ca	<i>.2</i>	Cd	<i>&lt;.1</i>	Co	<i>&lt;.2</i>		
	Cr	<i>&lt;.1</i>	Cu	<i>&lt;.1</i>	Fe	<i>&lt;.1</i>	K	<i>&lt;.2</i>		
2	Li	<i>&lt;.1.0</i>	Mg	<i>&lt;.1</i>	Mn	<i>&lt;.1</i>	Na	<i>.4</i>		
	Ni	<i>&lt;.4</i>	P	<i>&lt;.10</i>	Pb	<i>&lt;.1</i>	Si	<i>&lt;.1</i>		
	Sn	<i>&lt;.1</i>	Ti	<i>&lt;.6</i>	V	<i>&lt;.1</i>				
3	As	<i>&lt;.1</i>	Au	<i>&lt;.1</i>	Bi	<i>&lt;.1</i>	Cs	<i>&lt;.6</i>	Hg	
	Ga	<i>&lt;.1</i>	Ge	<i>&lt;.4</i>	Hf	<i>&lt;.1</i>	In	<i>&lt;.1</i>	Re	
			Nb	<i>&lt;.1</i>	Pd	<i>&lt;.6</i>	Rb	<i>&lt;.2</i>	Ta	<i>&lt;.10</i>
4	Sb	<i>&lt;.1</i>	Sr		Th	<i>&lt;.4</i>	Tl	<i>&lt;.1</i>	U	<i>&lt;.4</i>
	W	<i>&lt;.1</i>	Zn	<i>&lt;.6</i>	Zr	<i>&lt;.2</i>				
5	C <sup>1</sup>		Mo	<i>&lt;.1</i>	F <sup>*</sup>		O <sup>*</sup>			
	C/Q		Mo <sup>1</sup>							

UCN-260  
(2 5-64)

<sup>1</sup>ppm as received basis  
\* factor, not actual analysis

REPT BY: *Phill*  
 DATE: *8-2-67*  
 DEPT: *7*

g U/g	
g A/g	
g D/g	
g H/g	
g Mo/g	
g P/g	
SPEC.	
ASSAY	

SPECTROGRAPHIC REPORT

PLATE NO.	DATE	ANALYST	REPT. BY	DEPT.
<i>10000000</i>	<i>8-2-67</i>	<i>Phill</i>	<i>Phill</i>	<i>7</i>
WAVELENGTH (nm)	INTENSITY (%)	IDENTIFIED ELEMENTS	CONCENTRATION (ppm)	REMARKS
4000	100			
4050	100			
4100	100			
4150	100			
4200	100			
4250	100			
4300	100			
4350	100			
4400	100			
4450	100			
4500	100			
4550	100			
4600	100			
4650	100			
4700	100			
4750	100			
4800	100			
4850	100			
4900	100			
4950	100			
5000	100			
5050	100			
5100	100			
5150	100			
5200	100			
5250	100			
5300	100			
5350	100			
5400	100			
5450	100			
5500	100			
5550	100			
5600	100			
5650	100			
5700	100			
5750	100			
5800	100			
5850	100			
5900	100			
5950	100			
6000	100			

\*Factor, not actual analysis  
 ppm as received basis  
 CON 582 (8-67)

X-494

TO: E B Johnson

FROM: General Analysis Lab

SERIES NO.

ANALYTICAL DATA REPORT SHEET

CONTROL NO. S.F. **A** 487

DATE 8-25-67

THIS FORM IS TO BE USED ONLY FOR REPORTING ANALYSIS FOR VERIFICATION OF INVENTORY, VERIFICATION OF MATERIAL CONTENT BEING SHIPPED FROM THE LABORATORY TO OTHER INSTALLATIONS AND VERIFICATION OF MATERIAL CONTENT RECEIVED FROM OTHER INSTALLATIONS.

ANALYZED FOR: \_\_\_\_\_ METHOD OF ANALYSIS: \_\_\_\_\_

Lab No	Sample Code	mg/ml U	mg/ml B											PRECISION OF ANALYTICAL METHOD	REMARKS
12658		3.97	0.31												

Activity in \_\_\_\_\_ REMARKS \_\_\_\_\_  
 Concentration \_\_\_\_\_  
 Sample Counted at \_\_\_\_\_ % geometry

- DISTRIBUTION: 1 (White) Requestor  
 2 (Canary) S. F. Accountability  
 3 (Blue) Analytical

WR Leung  
 Laboratory Supervisor

X-494

CONTROL NO. S.F. A 486

TO: RK Reedy

ANALYTICAL DATA REPORT SHEET

DATE 8-22-67

FROM: General Analysis Lab

THIS FORM IS TO BE USED ONLY FOR REPORTING ANALYSIS FOR VERIFICATION OF INVENTORY, VERIFICATION OF MATERIAL CONTENT BEING SHIPPED FROM THE LABORATORY TO OTHER INSTALLATIONS AND VERIFICATION OF MATERIAL CONTENT RECEIVED FROM OTHER INSTALLATIONS.

SERIES NO.

ANALYZED FOR: \_\_\_\_\_

METHOD OF ANALYSIS: \_\_\_\_\_

Lab No	Sample Code	mg/ml	Sp.Gr.	@22°C	Den.									PRECISION OF ANALYTICAL METHOD	REMARKS
12657	1-A	3.97	1.0048	1.0016											

Activity in \_\_\_\_\_ REMARKS

Concentration \_\_\_\_\_

Sample Counted at \_\_\_\_\_ % geometry

- DISTRIBUTION:
- 1 (White) Requestor
  - 2 (Canary) S. F. Accountability
  - 3 (Blue) Analytical

WR Laing  
Laboratory Supervisor

## REQUEST FOR CONTROL ANALYSIS

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NAME A. K. Reddy

SERIES NUMBER \_\_\_\_\_

DATE SUBMITTED 8-18-67

PURPOSE OF ANALYSIS	CHECK ONE
S.F. Receipt Verification	<input type="checkbox"/>
Inventory Verification	<input type="checkbox"/>
S.F. Shipment Verification	<input type="checkbox"/>

SAMPLE CODE	DESIRED ANALYSIS	ESTIMATION OF CONCENTRATION	PREVIOUS HISTORY OF SAMPLE	NATURE AND ESTIMATION OF ACTIVITY	CONCENTRATION OF ALL CONSTITUENTS IN SAMPLE	VOLUME OR NET WEIGHT IN LITERS OR GRAMS
1-A	g/g sp. gr. density temp.	~ 4.02% /l			NO <sub>2</sub> (NO <sub>3</sub> ) <sub>2</sub> solution ~ 92.4% v/v	77.0g

DISTRIBUTION: 1 (White) Analytical  
2 (Canary) Requestor  
3 (Blue) S.F. Accountability

A. K. Reddy  
Requestor

TO: RK Reedy

FROM: General Analysis Lab.

SERIES NO.

ANALYTICAL DATA REPORT SHEET

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ANALYZED FOR: \_\_\_\_\_ METHOD OF ANALYSIS: \_\_\_\_\_

Prob No	Sample Code	B <sup>g</sup> %	@ 25°C Den.												PRECISION OF ANALYTICAL METHOD	REMARKS
208	8-11-67 #1	0.019	.99744													
209	8-14-67 #2	0.019	.99739													

Activity in \_\_\_\_\_ REMARKS  
 Concentration \_\_\_\_\_  
 Sample Counted at \_\_\_\_\_ % geometry

WR Paing  
 Laboratory Supervisor

DISTRIBUTION: 1 (White) Requestor  
 2 (Canary) S. F. Accountability  
 3 (Blue) Analytical

TO: RK Reedy

ANALYTICAL DATA REPORT SHEET

DATE 8-16-67

FROM: General Analysis Lab

THIS FORM IS TO BE USED ONLY FOR REPORTING ANALYSIS FOR VERIFICATION OF INVENTORY, VERIFICATION OF MATERIAL CONTENT BEING SHIPPED FROM THE LABORATORY TO OTHER INSTALLATIONS AND VERIFICATION OF MATERIAL CONTENT RECEIVED FROM OTHER INSTALLATIONS.

SERIES NO.

ANALYZED FOR: \_\_\_\_\_ METHOD OF ANALYSIS: \_\_\_\_\_

Lab No	Sample Code	B %	@ 25°C Den.												PRECISION OF ANALYTICAL METHOD	REMARKS
306	8-14-67(2)	0.0038	0.99716													
307	8-14-67(2A)	0.0038	0.99711													

Activity in \_\_\_\_\_ REMARKS

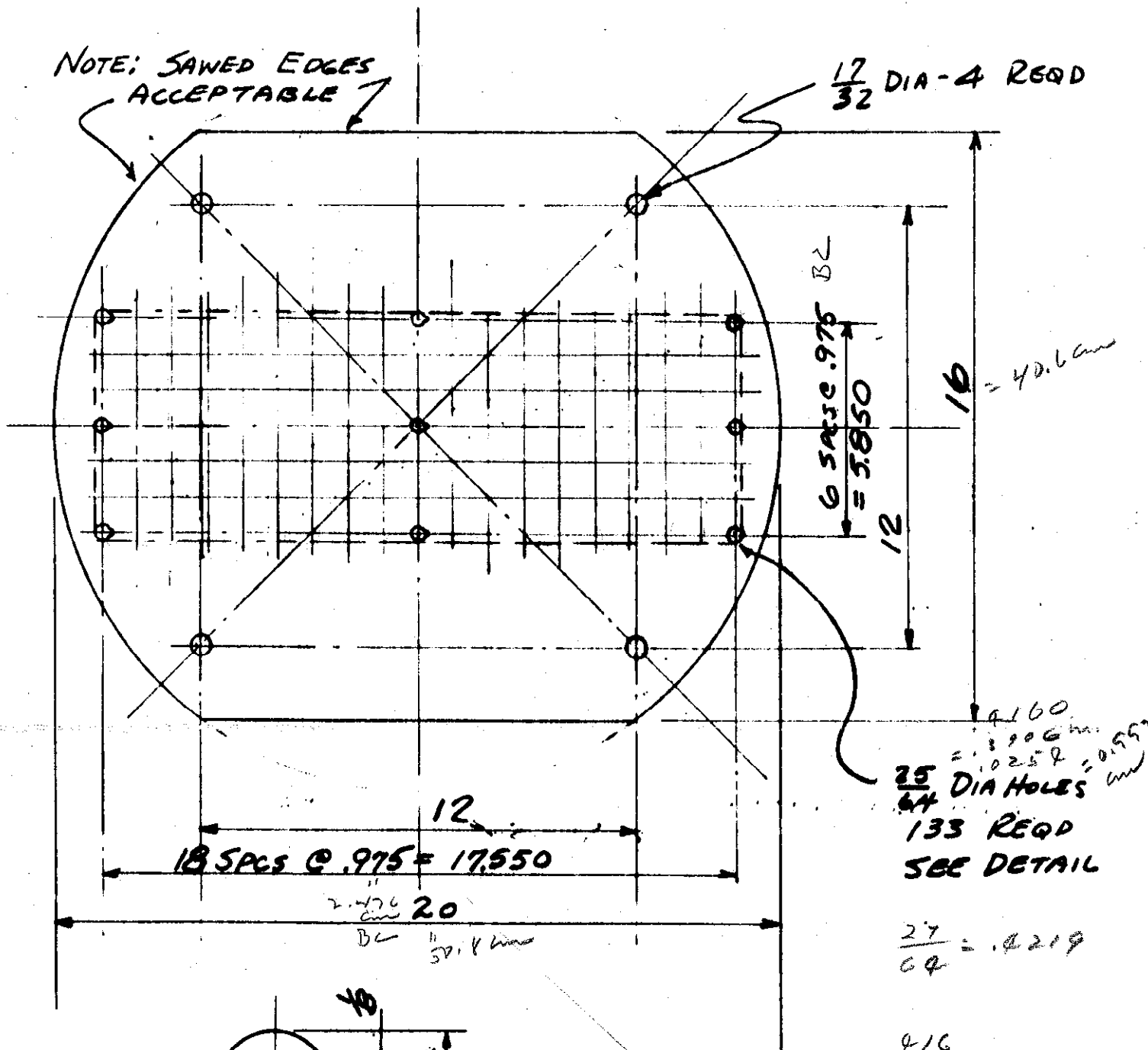
Concentration \_\_\_\_\_

Sample Counted at \_\_\_\_\_ % geometry

WR Laing  
Laboratory Supervisor

- DISTRIBUTION: 1 (White) Requestor  
 2 (Canary) S. F. Accountability  
 3 (Blue) Analytical

NOTE: SAWED EDGES ACCEPTABLE



12/32 DIA - 4 REQD

6 SPTS @ .975 B.C. = 5.850

25 DIA HOLES  
133 REQD  
SEE DETAIL

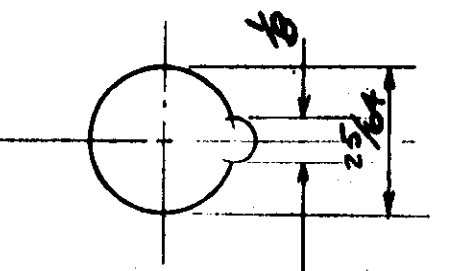
27/64 = .4219

.416

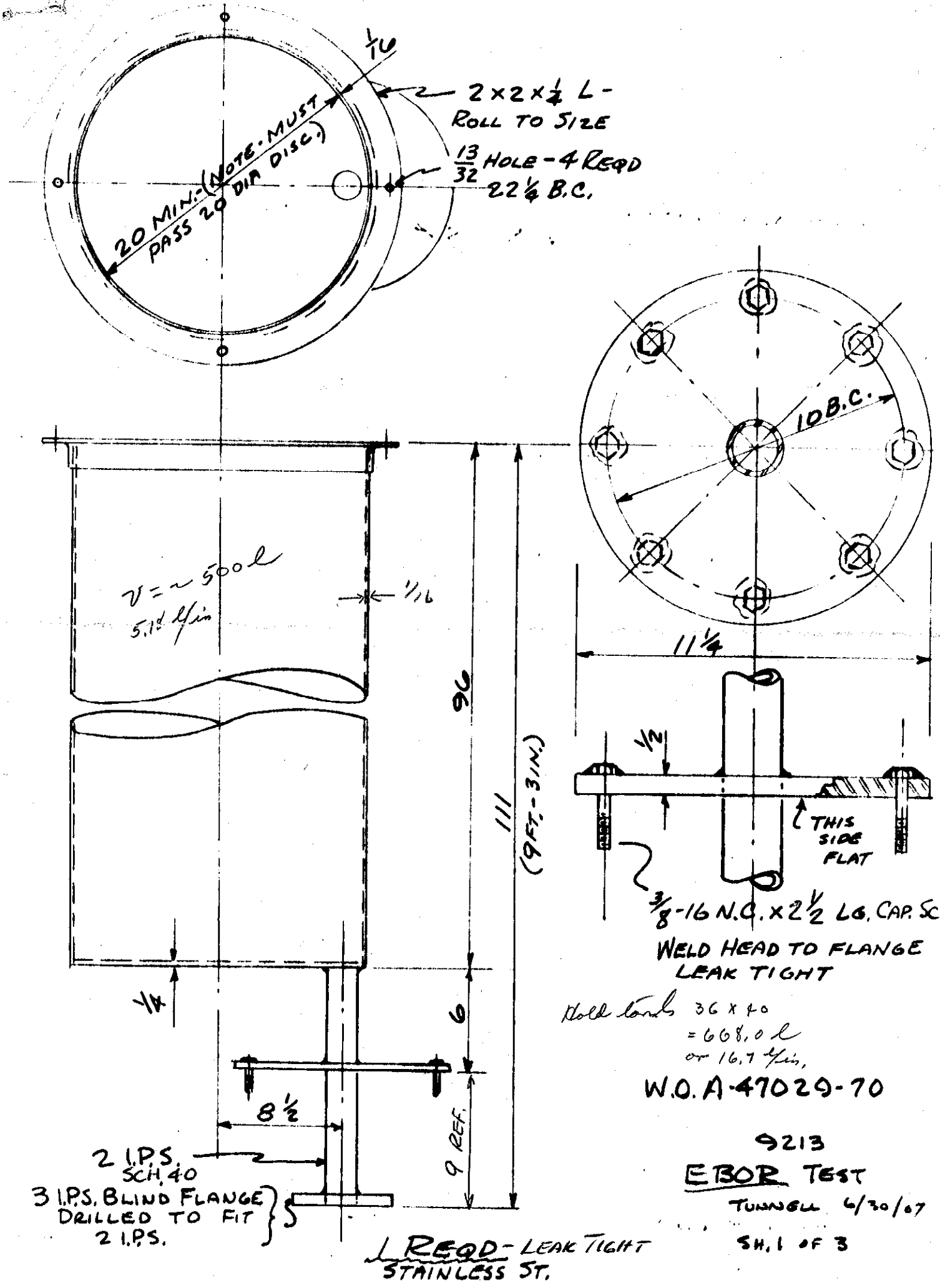
3 REQD PLEXIGLAS

W.O.A-47029-70

9213  
EBOR TEST  
TUNNEL 6/30/67  
SH. 2 OF 3



DETAIL OF 133 HOLES  
2X SIZE



2 I.P.S. SCH. 40  
3 I.P.S. BLIND FLANGE DRILLED TO FIT  
2 I.P.S.

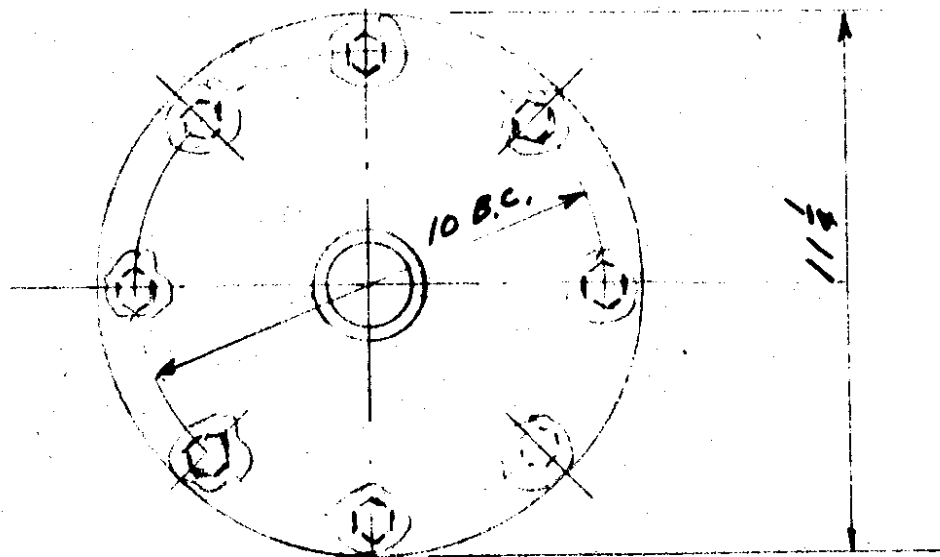
1 REQD - LEAK TIGHT  
STAINLESS ST.

3/8-16 N.C. x 2 1/2 LB. CAP. SC.  
WELD HEAD TO FLANGE  
LEAK TIGHT

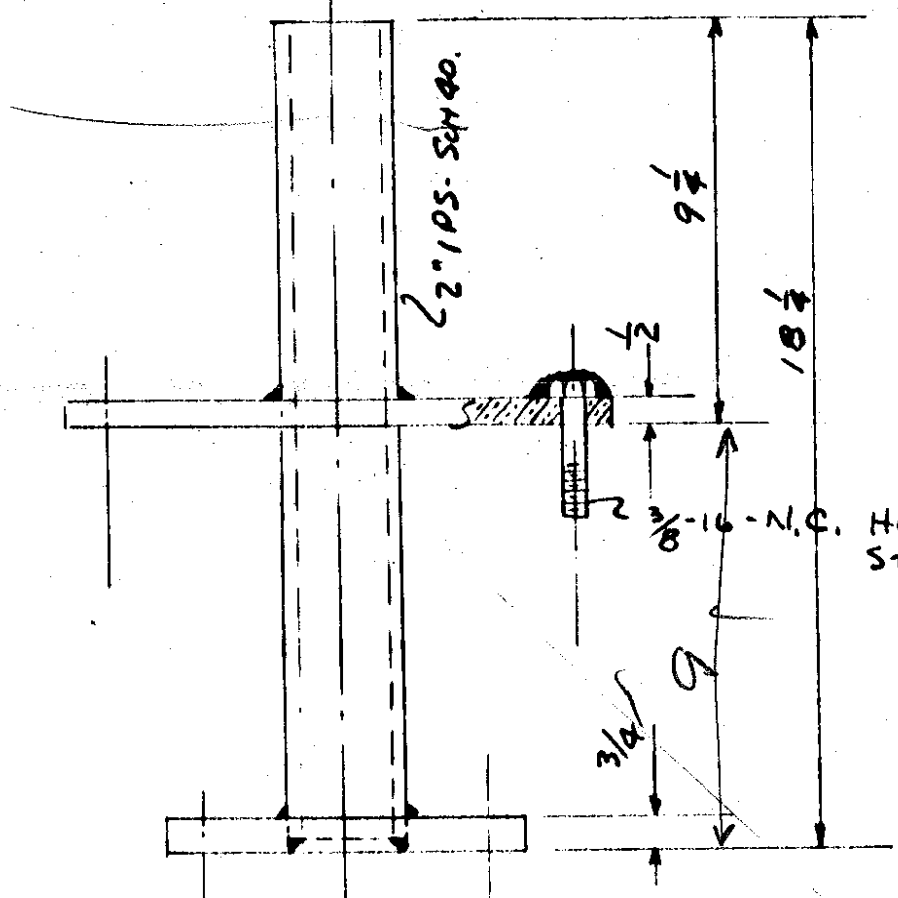
Hold tank 36 x 40  
= 668.0 lb  
or 16.7 lb/in.  
W.O.A-47029-70

9213  
EBOR TEST  
TUNNEL 6/30/67  
SH. 1 OF 3



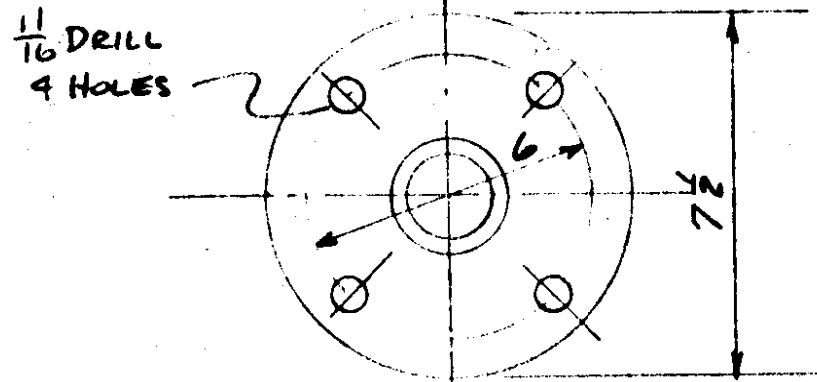


11 1/2

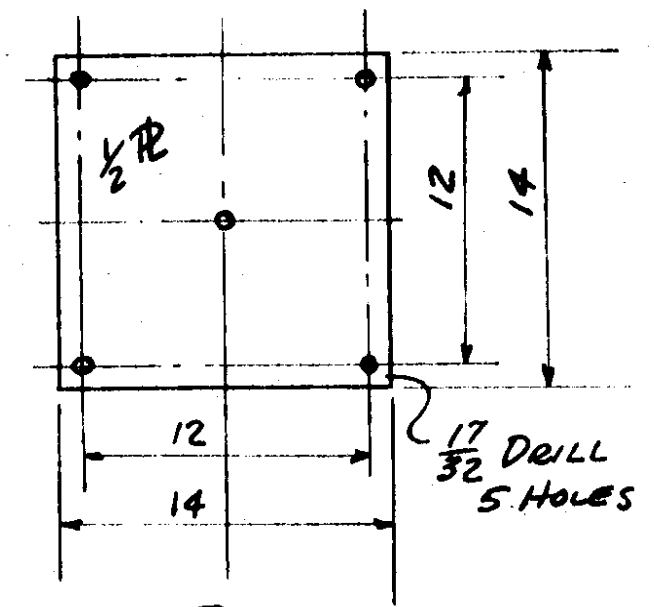
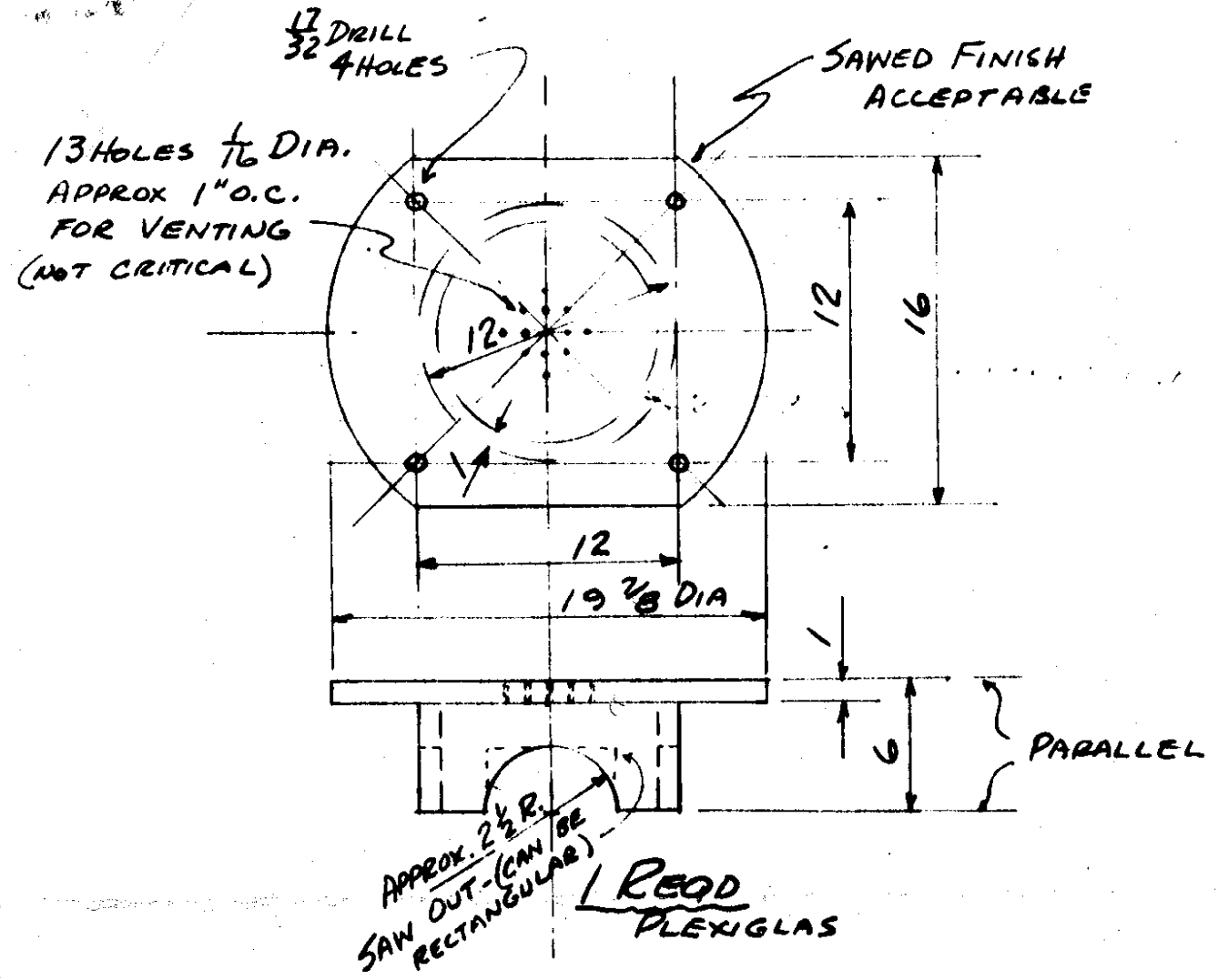


3/8-16-N.C. HEX HD CAP SC. - STAINLESS STEEL - WELD OVER HEAD LEAK TIGHT. - 8 BOLTS

3 READ - ALUMINUM WELD LEAK TIGHT



9213  
 REACTOR EXTENSION  
 REF DWG ESK 17257  
 SK 2 OF 3  
 TUNNELL - 7-8237  
 3/8/60



1/2-13 NC BAR, THREADED  
 CAT # 04-670-7650  
 4 LENGTHS REQ'D.

1 READ ALUM.

W.O.A-47029-70

9213  
 EBOR TEST  
 TUNNELL 6/30/67  
 SH 3 OF 3



# Account Book

No. S 149

NO UNITS

Journal . . . . .

Ledger, Single Entry . .

Ledger, Double Entry .

Record Ruled (27 Lines)

Made in 150, and 300 Pages

MADE IN U. S. A.

TO REORDER, SPECIFY NUMBER,  
RULING AND THICKNESS INDICATED  
ON BACKBONE OF THIS BOOK.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	X10 <sup>-12</sup>	Major ✓	1"		
"	"	Prog -	"		
K-2	"	Major -	"		
"	"	Prog ✓	"		
R-1					
R-2					
PM-1	700V	Alarm	cont		
PM-2	1200V	Low ✓	12"		
"	"	Alarm ✓	3"		

LOG N CALIBRATE \_\_\_\_\_ OPERATE \_\_\_\_\_ SOURCE No. \_\_\_\_\_  
 DUMP WELL PROCSE LIGHT \_\_\_\_\_

START-UP CHECK LIST

Equipment checked by \_\_\_\_\_ Personnel check by \_\_\_\_\_  
 Instruments and safeties checked and reset by \_\_\_\_\_  
 Source in checked by \_\_\_\_\_ Source No. \_\_\_\_\_  
 Emergency equipment in control room checked by \_\_\_\_\_  
 Instruments in trip circuit: \_\_\_\_\_  
 Red light on by AKR Time 1055  
 Start-up OK'd by \_\_\_\_\_ Date \_\_\_\_\_

1200

Scale  
 Distance by  
 5/4

142

Fuel rate = 1.7 cm/min.  
 Drain rate = ~~6.8~~ 6.5 cm/min.  
 Dump rate = 7.6 cm/min.

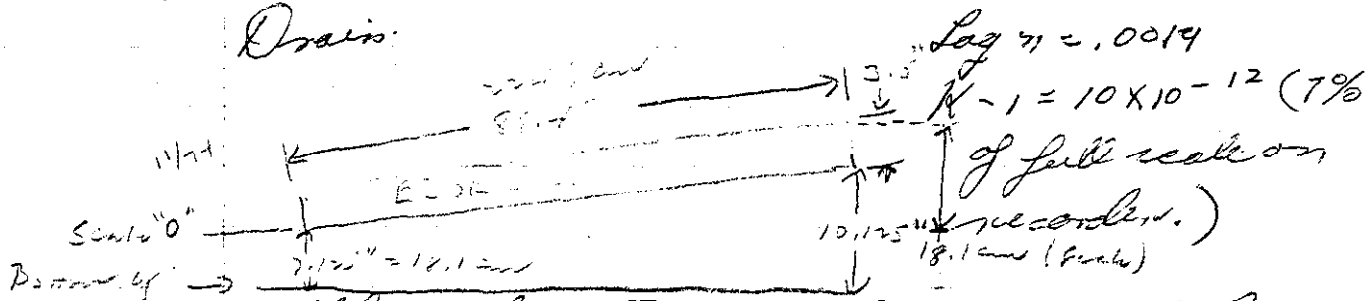
Have 1 element in Big kid: Element in the long pan, with 7.125" water reflector on one end and 10.125" water reflector at the other. (Note: This element is mounted on an plexiglass frame, and the ~~water~~ above measurement on bottom reflector water thickness when elements are flooded.)

Fuel: 0.0 cm on scale water is in contact with bottom of fuel. 18.1 cm water is at top of fuel.

1200 Water ht = 33.3 cm. - 6" reflected

1 Element sub critical

Drain:



Added 1 element: Now have ~~to~~ 2 fuel elements, element one separated 1.0"

1425 Water ht = 39.7

System sub critical  
 Drain:

$K-1 = 10 \times 10^{-12}$  (25% of full scale on recorder.)  
 Lag  $\eta = .0016$

ave:

Elements are now in contact.  
 Water ht = 34.0 cm  
 System sub critical  
 Chain.

## INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	1"	✓	$10 \times 10^{-12}$
	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	1"	✓	"
	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	cont	✓	500V
PM-2	1200V	Low ✓	12"	✓	900V
	"	Alarm ✓	3"	✓	"

LOG N CALIBRATE OPERATE 

SOURCE No.

B-80DUMP WELL PROBE LIGHT

## START-UP CHECK LIST

Equipment checked by R.M.H. Personnel check by F.D.C.  
 Instruments and safeties checked and reset by R.M.H.  
 Source in checked by R.M.H. Source No. M-93  
 Emergency equipment in control room checked by F.D.C.  
 Instruments in trip circuit: X-1-2 PM-1-2  
 Red light on by R.M.H. Time 1330  
 Start-up CK'd by F.D.C. R.M.H. Date 4-10-67

Now have 3 elements in contact.

1400 Water ht = 34,000 cm  
 System sub critical  
 Drain

1500 Now have 4 elements in contact.

1525 Water ht = 34,000 cm  
 System sub critical  
 Drain

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	1"	$10 \times 10^{-12}$
"	"	Fast ✓	"	"
K-2	"	Meter ✓	1"	"
"	"	Fast ✓	"	"
R-1				
R-2				
PM-1	700 v	Alarm ✓	cont ✓	500v
PM-2	1200 v	Low ✓	12" ✓	900v
"	"	Alarm ✓	3" ✓	"
LOG N CALIBRATE ✓		OPERATE ✓		SOURCE No. B-80
DUMP WELL PROBE LIGHT _____				

START-UP CHECK LIST

Equipment checked by AKV Personnel check by FID.C  
 Instruments and safeties checked by AKV  
 Source in checked by AKV M-93  
 Emergency equipment checked by FID.C  
 Instruments in trip K-1-2 PM-1-2  
 Red light on by AKV Time 0825  
 Start-up OK'd by FID.C AKV Date 4-11-67

Now have 5 elements in contact.

0904 Water ht = 34.0 cm  
System sub critical  
Drain.

1006 Now have 6 elements in contact.

1030 Water ht = 34.0 cm  
System sub critical  
Drain.  $K_2 = 227\%$  of full  
scale on  $10 \times 10^{-12}$

1230 Now have 7 element in contact

1302 Water ht = 34.0 cm  
System sub critical  
Drain.  $K_2 = 225\%$  of full  
scale on  $10 \times 10^{-12}$

Now have 8 elements in contact

1350 Water ht = 34.0 cm  
System sub critical  
Drain.  $K_2 = 220\%$  of full  
scale on  $10 \times 10^{-12}$



Now have 9 elements in contact.

1435 Water ht = 34.0 cm  
system sub critical  
Drain.

$K-2 = \sim 28\%$  of  
full scale on  $10 \times 10^{-12}$

Now have 10 elements in contact

1522 Water ht = 34.0 cm  
system sub critical  
Drain.

$K-2 = \sim 25\%$  of  
full scale on  
 $10 \times 10^{-11}$

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	<del>10 X 10</del> 3 X 10 <sup>-12</sup>	Meter ✓	1"	✓	10 X 10 <sup>-11</sup>
	"	Fast ✓	"	✓	"
K-2	3 X 10 <sup>-12</sup>	Meter ✓	"	✓	"
	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	Count	✓	5005
PM-2	1200V	Low ✓	12"	✓	9000
	"	Alarm ✓	3"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by AKM Personnel check by F.D.C.  
 Instruments and safeties checked and reset by AKM  
 Source in checked by AKM Source No. M-43  
 Emergency equipment in control room checked by F.D.C.  
 Instruments in trip circuit: X-1-2 PM-1-2  
 Red light on by AKM Time 1035  
 Start-up OK'd by F.D.C. P.T.F. Date 4-17-67  
a.c. WALL

*see:*

10 mil S.S. cylinder.

$U^{233}O_2(NO_3)_2$  solution

330 g/l.

7125

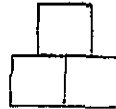
Have 1 - 4.9 l 10 mil S.S. cylinder. 7.2" O.D  
X 6.5" outside ht.

Cylinder completely filled.

System sub critical  $\frac{1}{m} = \approx 3.0$

F.B.O.R. Fuel elements.

Now have 3 fuel elements in array as  
shown. (end view) →

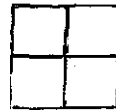


1400

Water ht = 44.5 cm

System sub critical  
Chain.

Now have 4 fuel elements in array as  
shown (end view) →

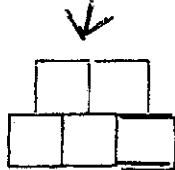


1520

Water ht = 44.5 cm

System sub critical  
Chain.

Now have 5 fuel elements in array as shown. (end view)



1612 Water hgt = 44.5 cm  
 System sub critical  $\frac{1}{\beta} = 2.0$   
 Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	1"	✓	$10 \times 10^{-12}$
		Fast ✓		✓	"
K-2	$3 \times 10^{-12}$	Meter ✓	1"	✓	"
		Fast ✓		✓	"
R-1	—				
R-2	—				
PM-1	700V	Alarm ✓	Control	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
		Alarm ✓	2"	✓	"
LOG N CALIBRATE ✓		OPERATE ✓		SOURCE No. B-80	
DUMP WELL PROSE LIGHT _____					

START-UP CHECK LIST

Equipment checked by AKM EBT Personnel check by FID-C

Instruments and safeties checked and reset by EBT

Source in checked by AKM SOURCE No. M-93

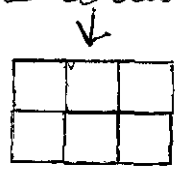
Emergency equipment in control room checked by EBT

Instruments in trip circuit: K-1-2 PM-1-2

Red light on by EBT Time 1045

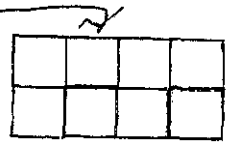
Start-up OK'd by EBT AKM Date 9-17-67

Now have 6 fuel elements in array as shown. (end view)



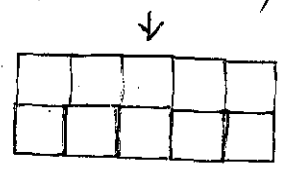
1120 Water ht = 48.5 cm  
System sub critical  
Drain.

Now have 8 fuel elements in array as shown. (end view)



1445 Water ht = 44.5 cm  
System sub critical  
Drain.

Now have 10 fuel element in array as shown. (end view)



1555 Water ht = ~~45~~ 45.0 cm  
System sub critical. Drain.

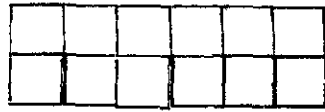
## INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	GUAGE RANGE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter -	1"	-	$10 \times 10^{-11}$
	"	Fast ✓	"	-	"
K-2	"	Meter -	1"	-	$3 \times 10^{-11}$
	"	Fast -	"	-	"
R-1					
R-2					
PM-1	700 v	Alarm ✓	Cent.	-	500v
PM-2	1200 v	Low ✓	12"	-	900v
	"	Alarm -	1"	-	"
LOG N CALIBRATE ✓		OPERATE -		SOURCE No. B-8a	
DUMP WELL PROBE LIGHT _____					

## START-UP CHECK LIST

Equipment checked by AKM Personnel check by FID.CInstruments and safeties checked and reset by AKMSource in checked by AKM Source No. M-43Emergency equipment in control room checked by FID.CInstruments in trip circuit: K-1-2 PM-1-2Red light on by AKM Time 0845Start-up OK'd by FID.C AKM Date 4-18-67

Now have 12 full elements in array as shown (end view)



0925 Water ht = 44.3 cm  
System sub critical  
Drain

Now have 14 full elements in array as shown. (end view)

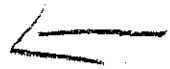


1045 Water ht = 44.3 cm  
System sub critical  
Drain

Now have 16 full elements in array as shown. (end view)



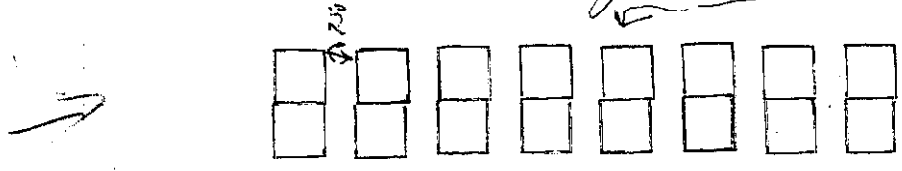
Water ht = 44.3 cm  
System sub critical. Drain



over!

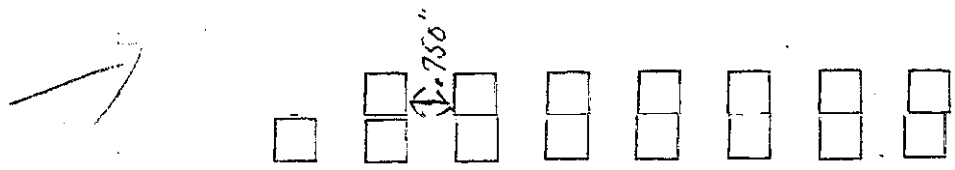


Now have 16 fuel elements in array as shown. element are separated = 750" in one dimension only. (end view)



1530 Water ht = 28.6 cm  
 System just critical  
 Drain.

Removed 1 element. Now have 15 fuel elements in array as shown. separation = 750" in one dimension only (end view)



1406 Water ht = 31.1 cm  
 System just critical  
 Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	1"	-	$10 \times 10^{-12}$
	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	1"	-	$3 \times 10^{-12}$
	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	cont	✓	500V
PM-2	1200V	Low ✓	12"	✓	900V
	"	Alarm ✓	3"	✓	"

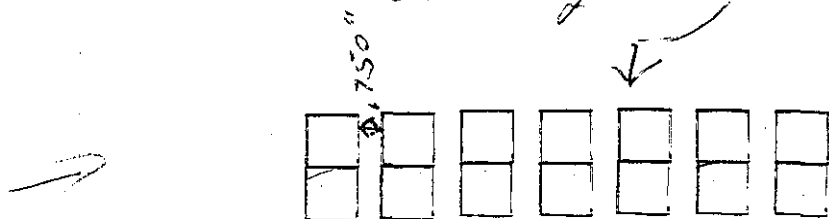
LOG N CALIBRATE  - OPERATE  SOURCE No. B-50  
 DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by AKK Personnel check by FIDC  
 Instruments and safeties checked and reset by AKK  
 Source in checked by AKK Source No. 19-43  
 Emergency equipment in control room checked by FIDC  
 Instruments in trip circuit: K-1-2 PM-1-2  
 Red light on by AKK Time 0815  
 Start-up OK'd by FIDC AKK Date 4-19-67

cont.

Remove 1 element. Now have 14 elements  
in array as shown. Separation = .750" in  
one dimension only (end view)

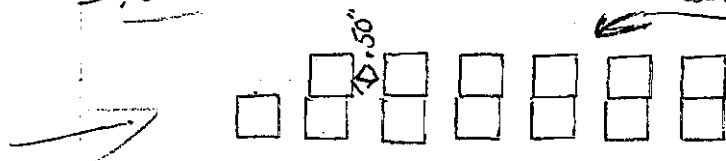


0855 Water ht = 44.9 cm  
System sub critical  
Drain.

Same array as shown above. Except separation  
in 1 ~~end~~ dimension now = .50"

1003 Water ht = 31.0 cm  
System just critical  
Drain.

Removed 1 element. Have 13 elements. Separation = .50" in 1 dimension as shown (end view)

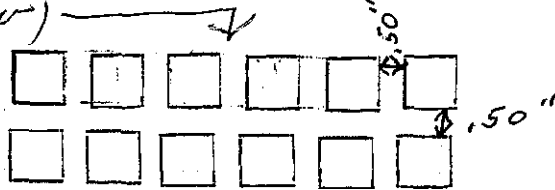


1055 Water ht = 44.7 cm  
System sub critical  
Chains

Same as above. Separation in 1 dimension now = .25"

1307 Water ht = 44.3 cm  
System sub critical  
Chains

Now have 12 full elements. Separation = .50" in 2 dimensions. as shown in array below. (end view)



1435 Experiment was not completed due to either a leak in the 3" drain or dump valve. System was near critical at a water ht of ~ 26.0 cm

err.

Removed 2 elements. Now have 10 fuel elements in on array or shown on bottom of page 19. Separation still .50" in 2 dimensions.

1536 Water ht = 31.0 cm  
 System just critical  
 Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SET	START/OP RANGE
K-1	3 X 10 <sup>-12</sup>	Motor ✓	✓	10 X 10 <sup>-12</sup>
"	"	Fast ✓	✓	"
K-2	"	Motor ✓	✓	"
"	"	Fast ✓	✓	"
P-1				
P-2				
PM-1	700 V	Alarm ✓	✓	500 V
PM-2	1200 V	Low ✓	✓	900 V
"	"	Alarm ✓	✓	"

LOG N CALIBRATE  OPERATE  SOURCE No. 13-80  
 DUMP WELL PROBE LIGHT

## START-UP CHECK LIST

Equipment checked by AKH Personnel check by F.D.C.

Instruments and safeties checked and reset by AKH

Source in checked by AKH Source No. 14-43

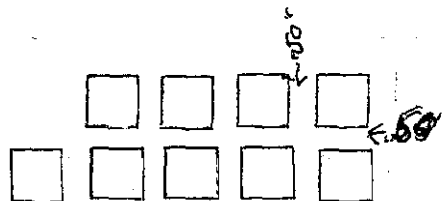
Emergency equipment in control room checked by F.D.C.

Instruments in trip circuit: K-1-2 PI-1-2

Red light on by AKH Time 0815

Start-up OK'd by F.D.C. AKH Date 4-20-67

Removed 1 element. Now have 9 fuel  
elements in an array as shown. Separation  
= .50" in 2 dimensions.



0855 Water ht = 47.3 cm  
System sub critical  
Chain. ✓

Lead  
3" R.  
4" de

DUMP WELL PROBE LIGHT

INSTRUMENT	RANGE	TRAP	SOURCE DISTANCE	SET	START-UP RANGE
K1 & X10-12	"	-	"	-	10 X10-12
K2	"	-	"	-	"
FMA	700V	-	12"	-	500V
PMG	1700V	-	12"	-	900V
	"	-	3"	-	"

LOG N CALIBRATE

OPERATE

SOURCE No. B-8a

INSTRUMENT CHECK

Equipment checked by AMV Personnel check by F.D.C.

Instruments and safeties checked and reset by AMV

Source in checked by AMV Source No. N-43

Emergency equipment in control room checked by F.D.C.

Instruments in trap checked: K-1-2 PM-1-2

Red light on by AMV Time 0805

Start-up OK'd by F.D.C. AMV Date 4-25-67

START-UP CHECK LIST

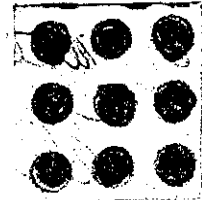
Feed rate = 4.0 cm/min  
3" Drain = 31.4 cm/min  
4" Drain = 41.4 cm/min

ML-1 Fuel Element.  
O<sub>2</sub> BeO S.S. clad.

25

Now an 3x3 array: Elements # 1, 2, 3, 4, 5, 6,  
7, 8, 9. Square array as shown.  
Separation = .50" edge-edge.

0848 Water ht = 89.5 cm  
System sub critical  
Drain:

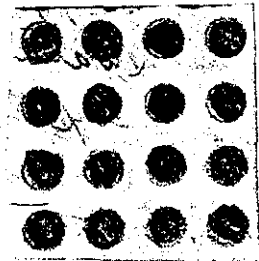


mass <sup>0235</sup> = 6.563 Kg

log  $\eta$  = .0035

Now have an 4x4 array. Elements # 1 to 16.  
Square array as shown.  
Separation = .50" edge-edge.

Water ht = 89.5 cm  
System sub critical  
Drain:



log  $\eta$  <sup>55</sup> =  $\frac{1}{M} = 22$

mass <sup>0235</sup> = 10.920 Kg

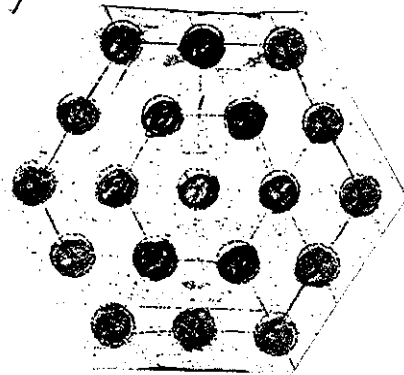
accy.



Now have 19 fuel element in an triangular  
array as shown. Edge-Edge separation  
= 1.55" (all elements except #18)

1112

Water ht = 90.5 cm  
System sub critical  
Drain.



Now  $0235 = 13.699 \text{ Kg}$

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3X10 <sup>-12</sup>	Alarm ✓	1"	✓	3X10 <sup>-12</sup>
"	"	Fast ✓	"	✓	"
K-2	"	Alarm ✓	"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	Cont	✓	500V
PM-2	1200V	Low ✓	12"	✓	900V
"	"	Alarm ✓	3"	✓	"

LOG N CALIBRATE  OPERATE  SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by AKL Personnel check by FIDC  
 Instruments and safeties checked and reset by AKL EBT  
 Source in checked by AKL Source No. M-43  
 Emergency equipment in control room checked by FIDC  
 Instruments in trip circuit: K-1-2 PM-1-2  
 Red light on by AKL Time 1445  
 Start-up OK'd by FIDC AKL Date 4-28-67

E. B. O. R. Fuel Pin's

Fuel pins are made up in a stack of  $76^{1/2} \times 3.27$ " x  $4.27$ " pellets encapsulated in  $0.020$ " Hastelloy X-280 tubes with an O.D. of  $.375$ " and an overall length of  $\sim 50.25$ ". There is an  $0.062$ " wide x  $0.020$ " high helical spacer projection - welded over  $.50$ " to the cladding of the tubes. The helix pitch being  $7.5$ ". See section 4-8, 4-9 of section 4 of Reactor Core. of E. B. O. R. Drawings numbers 40.50-136 and 40.54-131. Tube O.D. with  $.020$ " space =  $.415$ "

Water - Fuel rate =  $5.2$  cm/min "Big lid."

" - 3 Drain =  $11.8$  cm/min

" - 3 Dump =  $12.2$  cm/min

→ Top of fuel tubes =  $225.1$  cm on side scales.

Have a  $10 \times 10$  array: Total of 100 fuel pins.

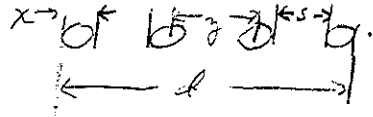
Close pack array. Separation =  $\sim .040$ "

Measured array =  $4.050$ "

1600

Water ht =  $240.3$  cm

System sub critical  
Drain.



$$d = x(n) + s(-1)$$

$$x = \frac{d - s(-1)}{n}$$

$$d = \frac{x(n) + s(-1)}{1}$$

$x$  = center spacing

$x$  = effective (or actual) pin

$s$  = spacing between pins

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
"	$3 \times 10^{-12}$	Master ✓	1"	-	$3 \times 10^{-12}$
"	"	Fast ✓	1"	-	"
K2	"	Master ✓	1"	-	"
"	"	Fast ✓	<del>1"</del>	✓	"
P-1					
P-2					
PM1	700 V	Alarm ✓	cont	-	500 V
PM2	1700 V	low ✓	12"	-	900 V
"	"	Alarm ✓	3"	-	"
LOG IN CALIBRATE ✓		OPERATE ✓	SOURCE No. <u>B-80</u>		
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by AMJ <sup>F.I.D.C.</sup> Personnel check by AMJ  
 Instruments and safeties checked and reset by AMJ  
 Source in checked by AMJ Source No. M-93  
 Emergency equipment in control room checked by F.I.D.C.  
 Instruments in trip circuit: K-1-2 PM-1-2  
 Red light on by AMJ Time 1335  
 Start-up OK'd by F.I.D.C. AMJ Date 5-1-67

any:

Have an 10 x 10 array. Total of 100 fuel pins. Pins separated with .10" plastic spacers. Measured array = 4.775" avg.

1435 Water ht = 244.3 cm  
System sub critical  
Drain.

## INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	2"	✓	$3 \times 10^{-12}$
"	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	Cont	✓	500V
PM-2	1200V	Low ✓	12"	✓	900V
"	"	Alarm ✓	3"	✓	"
LOG N CALIBRATE		✓	OPERATE		✓
DUMP WELL PROBE LIGHT		_____			
SOURCE No.				B-80	

## START-UP CHECK LIST

Equipment checked by R.K.H. F. DC Personnel check by F.D.C.  
 Instruments and safeties checked and reset by R.K.H.  
 Source in checked by R.K.H. Source No. M-93  
 Emergency equipment in control room checked by F.D.C.  
 Instruments in trip circuit: K-1-2 P19-1-2  
 Red light on by R.K.H. Time 0850  
 Start-up OK'd by F.D.C. R.K.H. Date 5-2-67

Have an 13 x 13 array. Total of 169 fuel pins. Pins separated with .10" plastic spacers. Measured array = 6.20" avg.

0952 Water ht = 243.0 cm  
 System sub critical  
 Drain

Have an 13 x 13 array. Total of 169 fuel pins. Pins separated with .20" plastic spacers. Measured array = 7.45" avg.

Water ht = 72.5 cm  
 System just critical  
 Drain

~~4.5~~  
~~2.575~~ - 0.215

Have an  $12 \times 12$  array, total of  $144$  pins. Pins separated with  $.20$ " plastic spacers. Measured array =  $6.82$ " avg

1348 Water ht =  $124.10$  cm  
System just critical  
Drain.

Have an  $11 \times 11$  array, total of  $121$  pins. Pins separated with  $.20$ " plastic spacers. Measured array =  $6.3$ " avg

1511 Water ht =  $244.5$  cm  
System sub critical  
Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	2"	✓	$3 \times 10^{-12}$
"	"	Test —	"	—	"
K-2	"	Meter ✓	1"	✓	"
"	"	Test ✓	"	—	"
R-1					
R-2					
PM-1	700V	Alarm ✓	Cont		500V
PM-2	1200V	low ✓	12"	✓	900V
"	"	Alarm ✓	3"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. <u>B-43</u>
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by AKM FID.C Personnel check by F.D.C  
 Instruments and safeties checked and reset by AKM  
 Source in checked by AKM Source No. M-43  
 Emergency equipment in control room checked by FID.C  
 Instruments in trip circuit: N-1-2 AM-1-2  
 Red light on by AKM Time 0810  
 Start-up OK'd by FID.C AKM Date 5-3-67

over



Have an 11x17 array. Total of 132 pins. Pins  
 spaced with .20" plastic spacers. Measured  
 array = 6.3" x 6.80" avg.

0905 Water ht = 246.0 cm  
 System sub critical  
 Orbits.

Have an 12x17 array, with 3 ~~pins~~ <sup>pins</sup> removed  
 from each corner. Total of 132 pins. Pins  
 spaced with .20" plastic spacers. Measured  
 array =

1315 Water ht = 244.50 cm  
 System sub critical  
 Orbits.

added 4 pins. Now have an 17x12, with 2 pins removed from each corner. Total of 136 pins. Pins separated with .20" plastic spacers. Measured array = 6.82" avg (from 10 measurement).

1445 Water ht = 245.5 cm.  
System sub critical  
Drain.

add  
pins  
add

added 4 pins. Now have an 12x12, with 1 pin removed from each corner. Total of 140 pins. Pins separated with .20" plastic spacers. Measured array = 6.82".

1552 Water ht = 173.6 cm  
System just critical  
Drain.

$$\frac{6.82 - 0.375}{1}$$

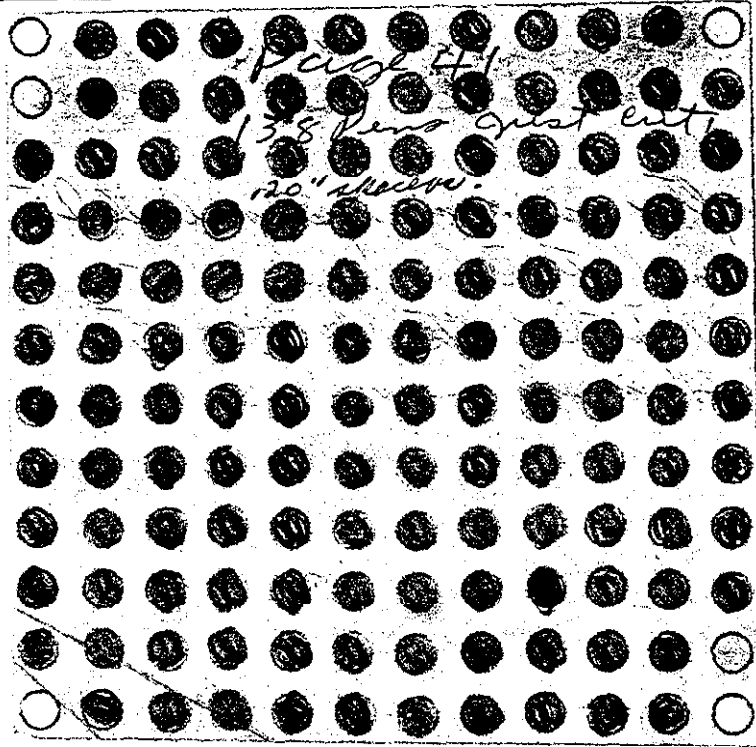
Center spot 5th

## INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-3	$3 \times 10^{-12}$	Meter ✓	1"	✓	$3 \times 10^{-12}$
"	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	2"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PAW 1700V		Alarm ✓	cont	✓	500V
PAW 1200V		Low ✓	12"	✓	900V
"		Alarm ✓	3"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROBE LIGHT _____					

## START-UP CHECK LIST

Equipment checked by AMM F.D.C. Personnel check by F.D.C.  
 Instruments and safeties checked and reset by AKK  
 Source in checked by AMM Source No. M-43  
 Emergency equipment in control room checked by F.D.C.  
 Instruments in trip circuit: K-1-2 P19-1-2  
 Red light on by AKK Time 0800  
 Start-up OK'd by F.D.C. AKK Date 5-4-67



Remained 2 pins. Now have an 12x12 array with 1 pin removed from 2 corners and 2 pins removed from 2 corners. Total of 135 pins. Pins separated with .20" plastic spacers. Measured array = 6.82". (This gives an edge-edge separation of .107")

0855 Water ht = 245.0 cm  
 Per: system sub critical  
 Drain.

.10" spacers. (see p 34-35)

Now have an 14x14 array. Total of 196 pins. Pins separated with .10" plastic spacers. Measured array = ~~6.71~~ <sup>6.71</sup>" avg of ten measurements (This gives an edge-edge separation of .069")

1330 Water ht = 245.0 cm  
 System sub critical  
 Drain.

7.22  
 5.17  
 ---  
 1.59

Now have an 15x15 array. Total of 225 pins. Pins separated with .10" plastic spacers. Measured array = 7.23" avg. (This gives an edge-edge separation of .071")

1535 Water ht = 247.0 cm  
 (1) - Per

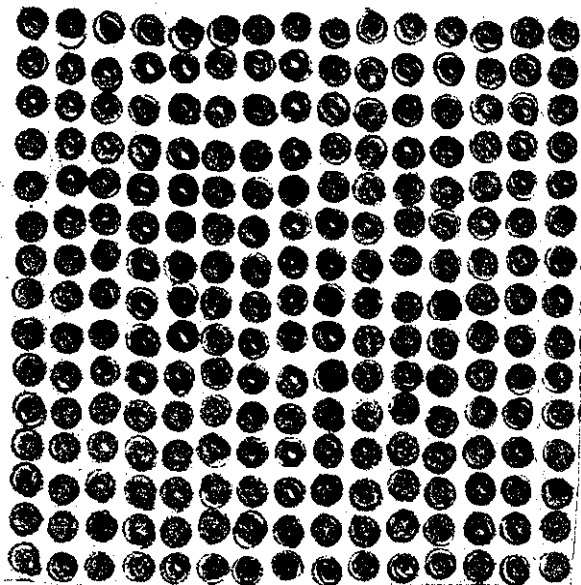
avg:

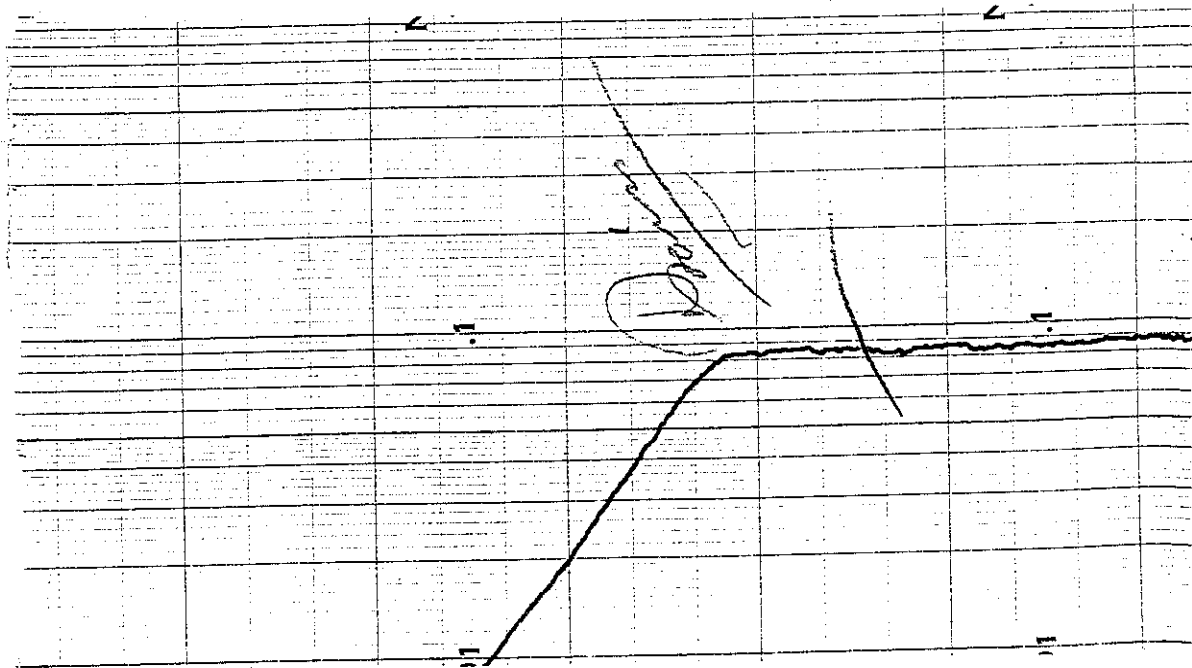
1543 after ~ 8.0 min system leveled to just critical  
(see chart attached.)

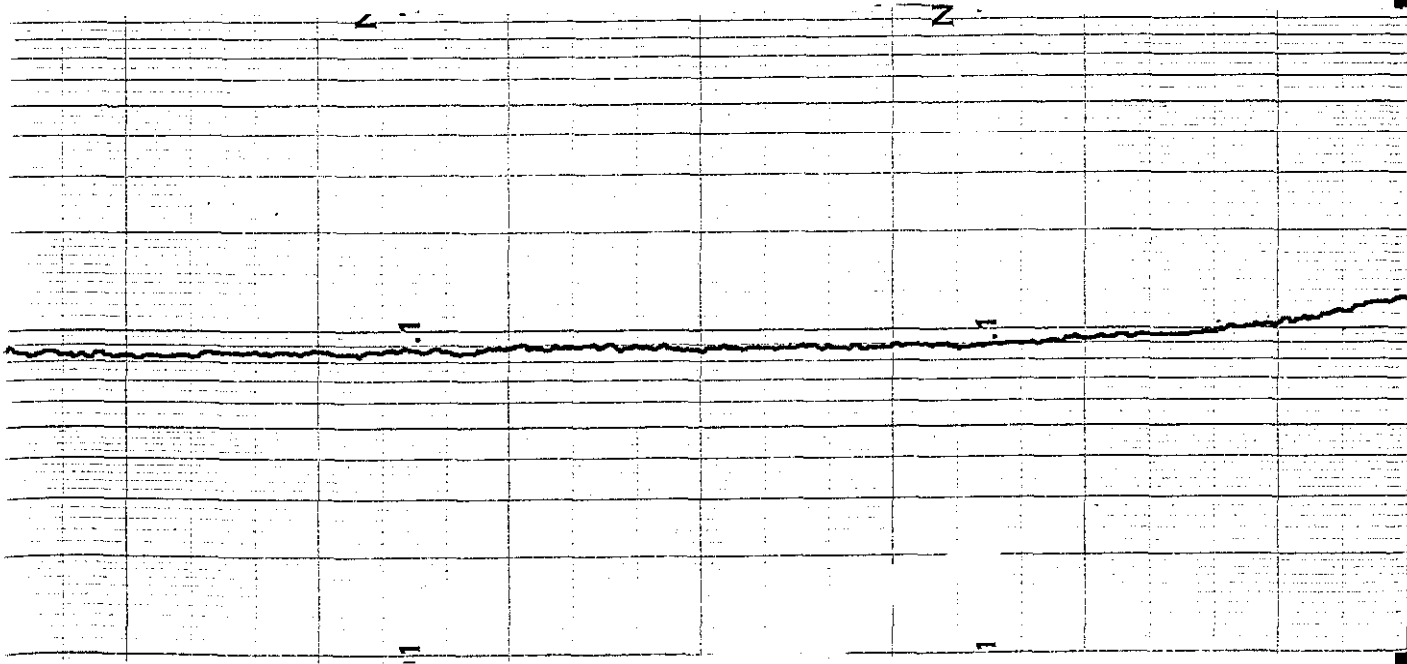
5-8-67 - see page 44. (this is not just critical)  
AKA!

1604 Drawn.

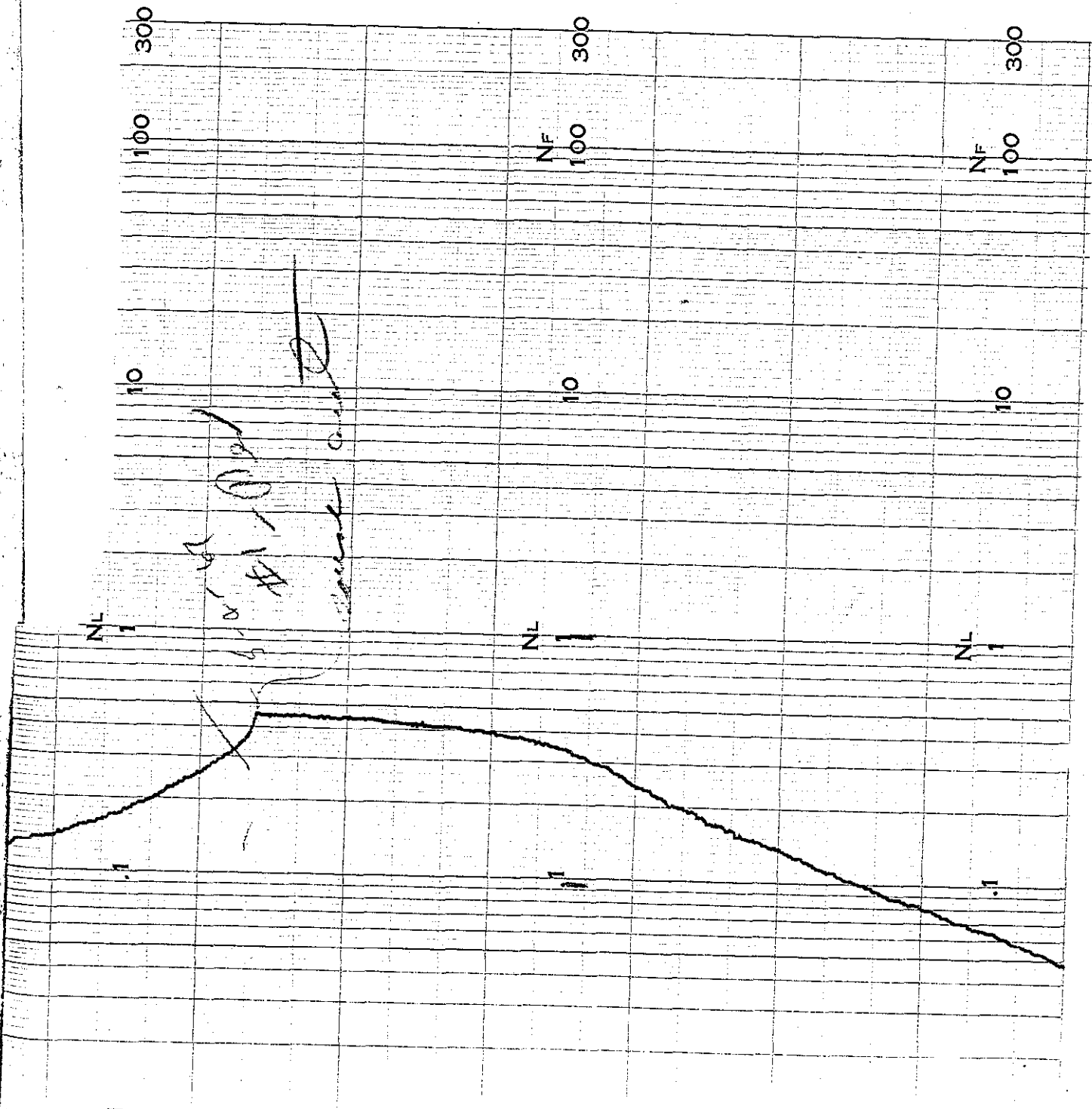
Page 41-42











*Handwritten notes and signature:*  
 10-1-50  
 H. J. ...  
 [Signature]

## INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-3	$3 \times 10^{-12}$	Meter ✓	1"	✓	$3 \times 10^{-12}$
"	"	F.H. -	"	-	"
K-2	"	Meter ✓	2"	✓	"
"	"	F.H. ✓	1"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	Cont	-	500V
PM-2	1200V	Low ✓	12"	✓	900V
"	"	Alarm ✓	3"	✓	"

LOG N. CALIBRATE  OPERATE  SOURCE No. B-50

DUMP WELL PROBE LIGHT

## START-UP CHECK LIST

Equipment checked by AKH F.O.E. Personnel check by AKH

Instruments and safeties checked and reset by AKH

Source in checked by AKH Source No. M-93

Emergency equipment in control room checked by F.O.C.

Instruments in trip circuit: K-1-2 AM-1-2

Red light on by AKH Time 1230

Start-up OK'd by F.O.C. AKH Date 5-5-67

over

Have an 11x11 array, with 3 pins removed from each corner. Total of 109 pins. Pins separated with .30" plastic spacers.

Measured array = (7.24" (avg of 8 measurements.)  
(This gives an avg of .267" edge-edge separation)

1310 Water ht = 106.0 cm  
System just critical  
Drain:

Removed 2 pins from each corner. Now have a total 101 pins. Separation same as above.

1430 Water ht = 245.0 cm  
System slightly - Neg.

1450 System just critical. (Log  $\eta$  leveled after a slow decay of one decade.) K-1 & 2 also leveled.

1453 Drain:

5-5-67 After discussion with J.T.T. the above system was not critical and the system described on page 42-43 (5-4-67). R.K.H. E.B.J.

DUMP WELL PROBE LIGHT

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	2 X 10 <sup>-12</sup>	Meter	"	-	3 X 10 <sup>-12</sup>
"	"	Fast	"	-	"
K-2	"	Meter	"	-	"
"	"	Fast	"	-	"
PM-1	700 V	Alarm	"	-	500 V
PM-2	1300 V	Low	"	-	900 V
LOG N CALIBRATE	OPERATE	SOURCE NO.	28-8		

INSTRUMENT CHECK

START-UP CHECK LIST

Equipment checked by AKV Personnel check by F.D.C.  
 Instruments and safeties checked and reset by AKV  
 Source in checked by AKV Source No. M-93  
 Emergency equipment in control room checked by F.D.C.  
 Instruments in trip circuits: K-2 PM-1-2  
 Red light on by AKV Time 0815  
 Start-up OK'd by F.D.C. AKV Date 5-8-67

added two pins to opposite corners of array,  
discussed on page 44. Now have a total of  
103 pins.

1007 water ht = 164.6 cm  
system just critical

1008 water ht = 168.1 cm.  
(1) + per

1016 water ht = 164.6 cm      water temp  $t_c = 22.0$   
system just critical  
Drain to  $\sim 120.0$  cm and removed 1 pin.

Removed 1 pin. Have an 11x11 array with  
5 pins removed from 3 corners and 4 pins  
removed from 1 corner. Total of 102 pins.  
.30" plastic ~~spacers~~ spacers. Measured array  
= 7.24" (avg of 4 measurements.)

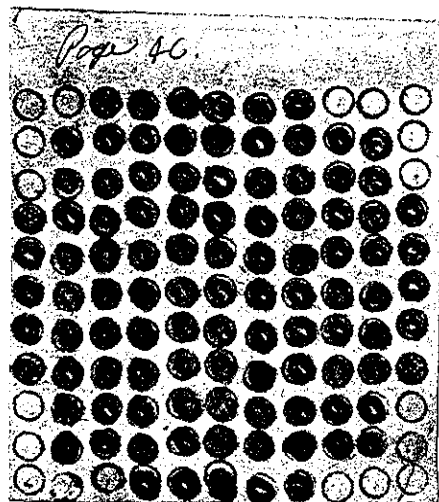
~~0.511" avg spacer separation~~

1050 water ht = 192.9 cm.  
system just critical.

Drain to  $\sim 120.0$  cm.

$$\frac{7.24 \times 0.375}{17} = 0.156$$

cm<sup>2</sup>  
5/17



Removed 1 pin. Total of 101 pins. Repeat  
of experiment described on ~~bottom~~ bottom  
of page 44. (5-5-67). 11x11 with 5 pins  
removed from each corner.

1130

Water ht = 245.0 cm  
System sub critical  
Drain.

22.0

Now have an 10x10 array, with 3 pins  
removed from each corner. Total of 88 pins.  
Pins separated with .90" plastic spacers.  
Measured array = 7.46" (avg of 5 measurements.)  
(This gives an avg of .368" edge-edge separation.)

1404

Water ht = 125.60 cm  
System just critical  
Drain ~ 80 cm and removed 2 pins.

$$\frac{7.46 - 0.375}{5} = 0.787$$

Center

Gap

over.

Removed 2 pins. Now have an 10 x 10 array with  
~~3 pins~~ removed from 2 corners and 4 pins  
 removed from 2 corners. Total of 86 pins.

Water ht = 153.40

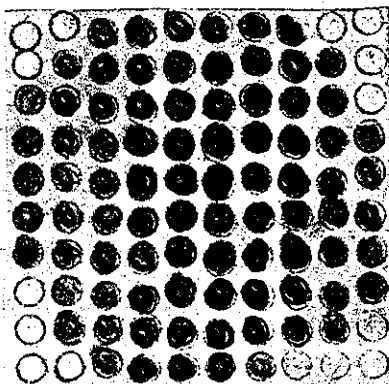
System just critical

Drain to ~ 100 cm and removed 2 pins

Now have an 10 x 10 array with 4 pins removed  
 from each corner. Total of 84 pins.

1512 Water ht = 245.0 cm.  
 System sub critical  
 Drain.

86 pins upper: } 85 pins.  
 84 pins sub: }



Page 84



## INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	-	Meter			
		Fast			
K-2	$3 \times 10^{-12}$	Meter ✓	3"		$3 \times 10^{-12}$
	"	Fast ✓	"		"
R-1					
R-2					
PM-1	700 V	Alarm ✓	cont		500 V
PM-2	1200 V	Low ✓	12"		900 V
	"	Alarm ✓	3"		"

LOG N CALIBRATE  OPERATE  SOURCE No. B-80

DUMP WELL PROBE LIGHT

## START-UP CHECK LIST

Equipment checked by AKH/FIR Personnel check by RKAD  
 Instruments and safeties checked and reset by AKH  
 Source in checked by AKH Source No. M-93  
 Emergency equipment in control room checked by FID.C  
 Instruments in trip circuit: K-2 PM-1-2  
 Red light on by AKH Time 0940  
 Start-up OK'd by FID.C AKH Date 5-9-67

Have an 9x9 array. Total of 81 pins. Pins separated with .50" plastic spacers. Measured array = 7.54" (avg of 9 measurements) (this gives an avg of .476" edge-edge separation.)

Water ht = 140.90 cm  
System just critical  
Drain

$$\begin{array}{r} 7.54 \\ - 3.37 \\ \hline 4.17 \end{array}$$

.571

$$\begin{array}{r} 7.54 - 3.37 = 0.896 \\ \hline 4 \end{array}$$

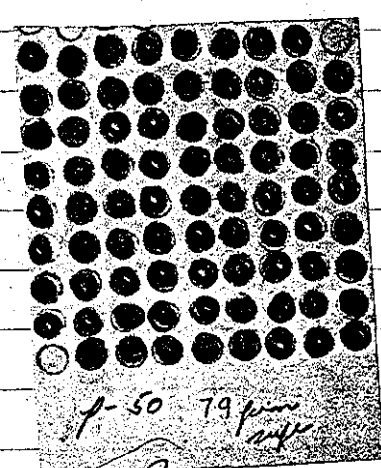
.224

Removed 2 pins. Have an 9x9 array with 1 pin removed from 2 opposite corners. Total of 79 pins.

1316 Water ht = 175.2 cm  
~~175.2 cm~~  
System just critical

1317 Water ht = 176.3 cm  
+ Per

1345 Water ht = 175.2 cm  
System just critical  
Drain to ~ 80 cm and removed 2 pins.



Have on 9x9 array with 1 pin removed  
from each corner. Total of 77 pins. (See  
top of p. 50 for explanation)

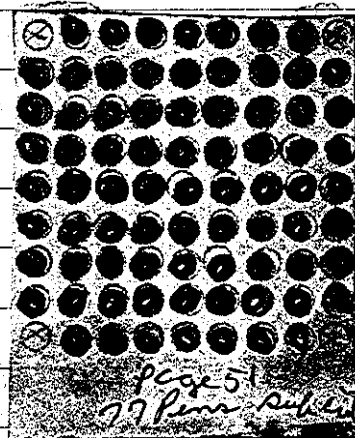
1445 Water ht = 245.0 cm

System sub critical

Oris:

79 pins super. .. 78 pins.

77 pins sub



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	—	Meter			
	—	Fact			
K-2	3K10 <sup>-12</sup>	Meter ✓	2"	—	3K10 <sup>-12</sup>
	"	Fact ✓	"	—	"
R-1					
R-2					
PM-1	700V	Alarm ✓	Cont	—	500V
PM-2	1200V	Low ✓	10"	—	900V
	"	Alarm ✓	3"	—	"
LOG N CALIBRATE ✓		OPERATE ✓		SOURCE No. B-80	
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by AKH <sup>F.O.C</sup> Personnel check by F.O.C  
 Instruments and safeties checked and reset by AKH  
 Source in checked by AKH Source No. M-93  
 Emergency equipment in control room checked by F.O.C  
 Instruments in trip circuit: K-2 PM-1-2  
 Red light on by AKH Time 1225  
 Start-up OK'd by F.O.C AKH Date 5-10-67

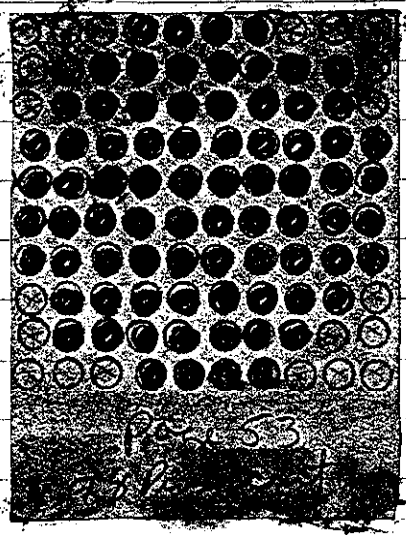
See p. 58-59 for correct date at dis 53  
separation. RKM 5-12-67

Now have on 10x10 array, with 5 pins  
removed from each corner. <sup>total pins = 80</sup> Pins separated  
with .50" plastic spacers. Measured array  
= 8.44" (avg of 8 measurements) (This gives an avg  
of .477" edge-edge separation).

1345 Water ht = 139.2 cm.  
System just critical  
Drain.

Removed 2 pins. Now have on 10x10 array with  
6 pins removed from 2 corners, and 5 pins  
removed from 2 corners. Total of 78 pins.  
See array as shown. (Separation same as above)

1511 Water ht = 206.8 cm.  
System just critical  
Drain.



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1		Meter			
		Fast			
K-2	$3 \times 10^{-12}$	Meter ✓	3"	✓	$3 \times 10^{-12}$
	"	Fast ✓	"	-	"
R-1					
R-2					
PM-1	700v	Alarm -	cont	✓	500v
PM-2	1200v	Low ✓	12"	✓	900v
	"	Alarm ✓	3"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROSE LIGHT _____					

START-UP CHECK LIST

Equipment checked by AMV Personnel check by Filc  
 Instruments and safeties checked and reset by AMV  
 Source in checked by AMV Source No. M-93  
 Emergency equipment in control room checked by Filc  
 Instruments in trip circuit: K-1 PM-1-2  
 Red light on by AMV Time 0945  
 Start-up OK'd by Filc AMV Date 5-11-67



Removed 4 pins, 10x10 array with 6 pins  
 removed from each corner. Total of 76 pins.  
 (Separation same as given on p-55)

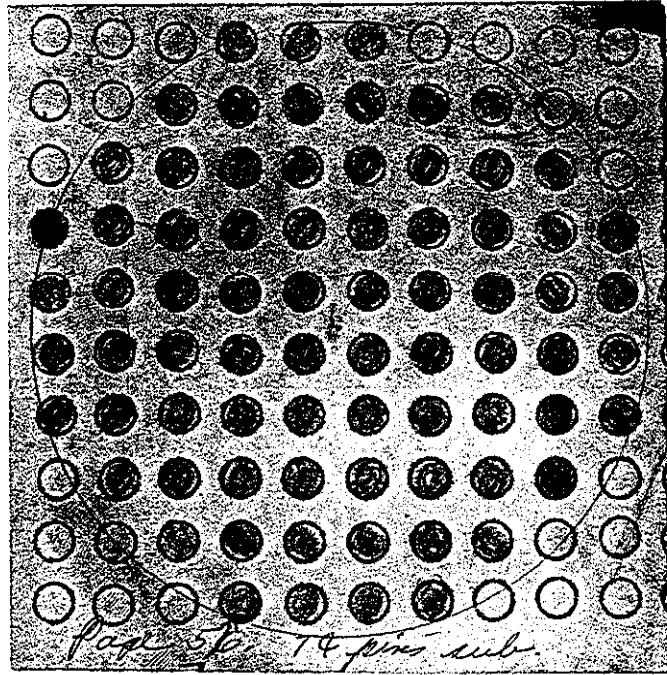
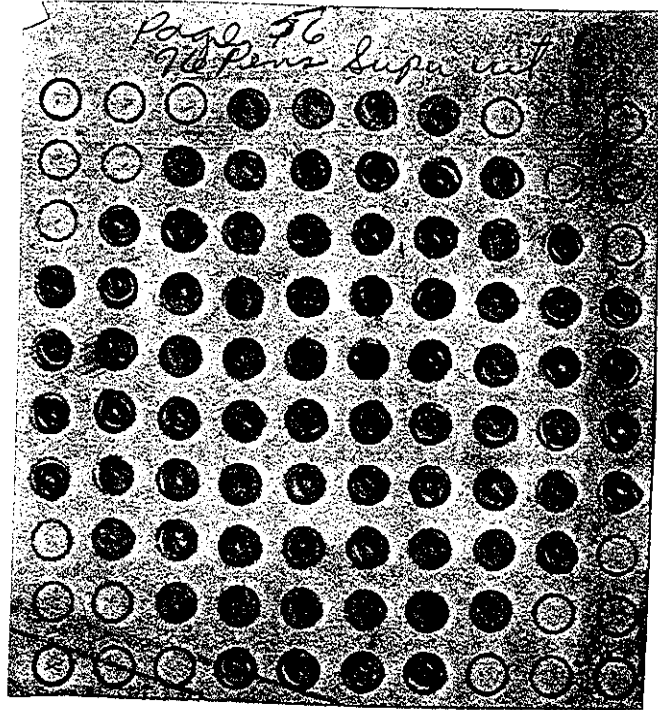
1325 Water ht = 152.9 cm.  
 System just critical  
 Drain.

Removed 3 pins: 10x10 array with 7 pins  
 removed from 2 corners and 6 pins removed  
 from 2 corners - Total of 74 pins. (Separation  
 same as above)

1453 Water ht = 245.0 cm  
 System sub-critical  
 Drain.

76 pins super : 75 pin .60" edge-edge. ○  
 74 pins sub





INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1		Meter			
		Fast			
K-2	$10 \times 10^{-12}$	Meter ✓	1"	✓	$3 \times 10^{-12}$
		Fast			
R-1					
R-2					
PM-1	700V	Alarm ✓	cont	✓	500V
PM-2	1900V	Low ✓	2"	✓	900V
		Alarm ✓	10"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROBE LIGHT					

START-UP CHECK LIST

Equipment checked by D.C. F.D. Personnel check by AKH  
 Instruments and safeties checked and reset by F.D.C.  
 Source in checked by AKH Source No. M-43  
 Emergency equipment in control room checked by F.D.C.  
 Instruments in trip circuit: K-2 PM-1-2  
 Red light on by D.C. Time 10.00  
 Start-up OK'd by D.C. F.D.C. AKH Date 5-12-67

Have an 10 X 10 array. with 5 pins removed from 2 corners, and 6 pins removed from 2 corners. Total of 78 pins. Purpose is to include experiments described on p-<sup>53</sup>55. (We believe that the array has only 77 pins instead of ~~78~~ 78. <sup>77</sup> photo shows. Also this gives a check on the how close arrays and be reproduced.) Array separated with .50" plastic spacers. Measured array = 8.36" (avg of 4 measurements). This gives an avg of .468" edge-edge separation.

1108 Water ht = 162.90 cm  
System just critical  
Orain =  $\frac{8.36 - 0.375}{5}$

Center sep = 0.887

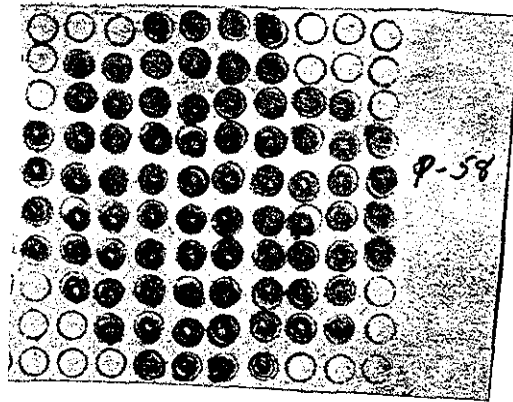
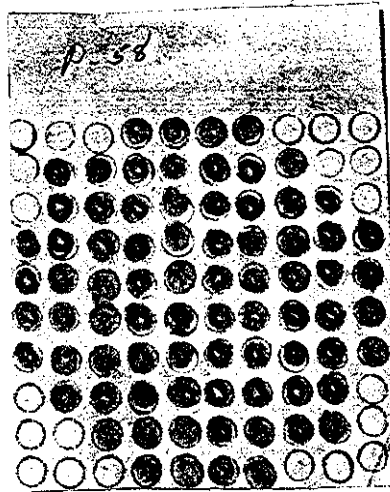
Removed 1 pin. Now have 5 pins removed from 2 corners, 6 pins removed from 1 corner, and 7 pins removed from 1 corner. Total of 77 pins. See array as shown. Photo taken for array shown on page 53 shows this. Separation same as above.

1325 Water ht = 245.0 cm  $\Delta h = 30.9$  cm

+ Per

O.R.N.L. Log  $C = 436.8$  cm = 2.8f = .094/cm

Kaithley Log  $C = 499.8$  cm = 2.4f = .081/cm p-59





1345 Water ht = 214.2 cm

Water temp ° = 22.5

System just critical  
Drain.

Have 10 x 10 array, with 6 pins removed from  
3 corners and 5 pins removed from 1  
corner. Total of 71 pins. Separation some  
as shown on page 58. (~~1.50"~~)

1458 Water ht = 245.0 cm.  $h_1 = 34.7$  cm

2 + Res  
O.R.N.L. tag.  $E = 219.5$  cm = 5.1  $\phi$  = .15  $\frac{h}{cm}$   
Keithley tag.  $E = 221.6$  cm = 5.1  $\phi$  .15  $\frac{h}{cm}$

1508 Water ht = 210.3 cm

System just critical  
Drain.

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1		Meter			
K-2		Meter	4"		
R-1					
R-2					
PM-1	7000	Alarm	cont		
PM-2	12000	Low	10"		
	"	Alarm	3"		

INSTRUMENT-CHECK:

LOG N CALIBRATE  OPERATE  SOURCE No. B-58

DUMP WELL PROBE LIGHT

INSTRUMENT CHECK

TRIP by

START-UP CHECK

Equipment checked by \_\_\_\_\_

Insights and safeties checked and reset by \_\_\_\_\_

Sensed in checked by \_\_\_\_\_

Emergency equipment in covered room checked by \_\_\_\_\_

Instruments in trip circuit \_\_\_\_\_

Red light on by \_\_\_\_\_

Source No. \_\_\_\_\_

Time \_\_\_\_\_

Date \_\_\_\_\_

## START-UP CHECK LIST

Equipment checked by AKM F.I.C. Personnel check by AKMInstruments and safeties checked and reset by AKMSource in checked by AKM Source No. M-43Emergency equipment in control room checked by F.I.C.Instruments in trip circuit: K-2 PM-1-2Red light on by AKM Time 1320Start-up OK'd by F.I.C. AKM Date 5-15-67

Have on 10 X 10 array with 5 pins removed from each corner. Total of 80 pins.  
 Pins separated with .70" plastic spacers.  
 Measured array = 10.22" (avg of 8 measurements)  
 (This gives an avg of 674" edge-edge separation)

140.4 Water ht =  $12.4.8 \text{ cm}$   <sup>$12.22 - 0.375 = 11.845$</sup>  <sub>5.75</sub> 6.475" (avg)  
 System just critical  
 Drains to ~ 0.0 cm and remained 3 pins.

Remained 3 pins. Have on 10 X 10 array with 6 pins removed from 3 corners, and 5 pin removed from 1 corner. Total of 77 pins.

AKM



66

1445 Water hts = 171.0 cm  
System just critical  
Drain to ~ 60.0 cm and removed  
1 pin.

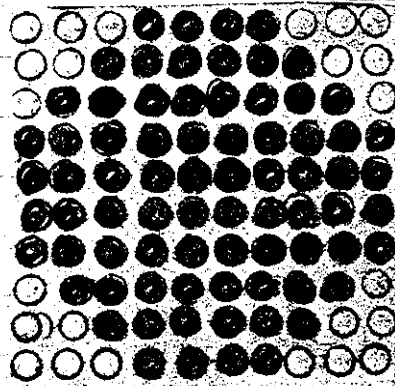
Remained 1 pin. Now have an 10x10 array,  
with 6 pins removed from each corner.  
Total of 76 pins.

1533 Water hts = 245.0 cm  
System sub critical  
Drain.

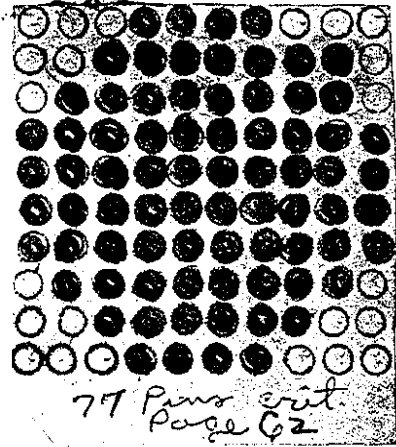
Water Temp °C  
23.0°C

.70"  
.689"

77 upper  
76 sub



76 Pin sub crit  
Page 62



77 Pairs crit.  
Page 62

## INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1		Master			
		Foot			
K-2	$3 \times 10^{-12}$	Meter	4"	✓	$3 \times 10^{-12}$
	"	Foot	"	✓	"
R-1	-				
R-2	-				
PM-1	700V	Alarm	Cont	-	500V
PM-2	1200V	Low	10"	✓	900V
	"	Alarm	3"	✓	"

LOG N CALIBRATE OPERATE 

SOURCE No.

B-80DUMP WELL PROBE LIGHT 

## START-UP CHECK LIST

Equipment checked by AKM F.R.C. Personnel check by AKLVInstruments and safeties checked and reset by AKMSource in checked by AKM Source No. M-23Emergency equipment in control room checked by F.I.O.C.Instruments in trip circuit: K-2 PM-1-2Red light on by AKM Time 10:15Start-up OK'd by F.I.O.C. AKM Date 5-16-67

Now have an  $10 \times 10$  array with 5 pins removed from each corner. Total of 80 pins. Pins separated with .80" plastic spacers. Measured array = 10.99" (avg of 8 measurements.) (This gives an avg of .760" edge-edge separation)

$$\frac{7.24}{9} = 0.804$$

1137 Water ht = 245.0 cm  
System sub critical  
Drain.

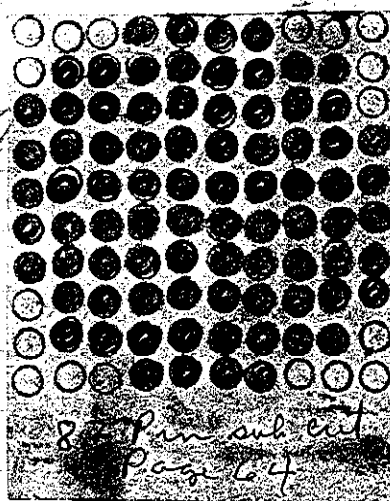
$$17.99 - 0.375$$

9

Center Sp. 1.179

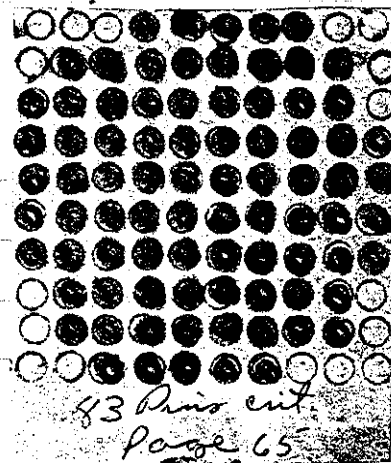
added 2 pins. Have an  $10 \times 10$  array with 5 pins removed from 2 corners and 9 pins removed from 2 corners. Total of 82 pins. Separation same as above.

1343 Water ht = 245.0 cm  
System slightly sub critical  
Drain.



added 1 pin. Here on 10x10 array with  
 5 pins removed from 1 corner, and 4 pins  
 removed from 3 corners. Total of 83 pins.  
 Repetition same or shown on p-64.

1455 Water ht = 180.1 cm  
 System just critical  
 Drain.



## INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1		Meter			
		Fast			
K-2	$3 \times 10^{-12}$	Meter ✓	4"	✓	$3 \times 10^{-12}$
	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	Cont	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
	"	Alarm ✓	3"	✓	"
LOG N CALIBRATE ✓		CALIBRATE ✓		SOURCE No. B-80	
DORP WELL FROST LIGHT ✓					

## START-UP CHECK LIST

Equipment checked by I.D.C. RKM Personnel check by RKL

Instruments and safeties checked and reset by RKL

Source in checked by RKL Source No. M-93

Emergency equipment in control room checked by F.I.D.C.

Instruments in trip circuit: K-2 PM-1-2

Red light on by RKL Time 1030

Start-up OK'd by I.D.C. RKM Date 5-17-67

Slab Arrays Using .60" plastic spacers.  
(Full length pins)

Base on 6 x 16 array. Total of 96 pins.  
Pins separated with .60 plastic spacers.  
(Measured array = 5.37" x 15.12")

1128 Water ht = 201.5 cm  
System just critical  
Crain:

$$\frac{2.77}{9.12/1.5} = 2.628$$

$$\frac{15.12 - 0.375}{15} = 0.983$$

$$= 2.999$$

Removed 3 pins. 6 x 16 - 3 on 1 face. See  
array shown. Total of 93 pins.

1333 Water ht = 245.0 cm  
System sub critical  
Crain:

Added 1 pin. 6 x 16 - 2 on 1 face. See  
array shown. Total of 94 pins.

1450 Water ht = 245.0 cm  
System sub critical  
Crain:

Slab Arrays Using .60" plastic spacers.  
(Full length pins)

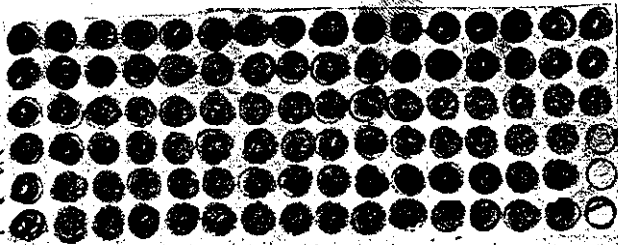
Went on 6 X 16 array. Total of 96 pins.  
Pins separated with .60 plastic spacers.  
(Measured array = 5.37" X 15.12")

1128

Water ht = 20.5 cm  
System just critical  
Drain:

$$\frac{15.12 - 0.375}{15} = 0.983$$

$$= 0.559$$

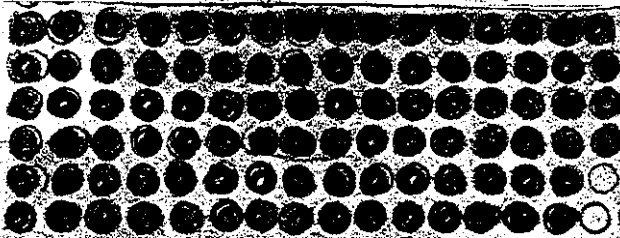


Removed 3 pins.  
array shown. Total

1333

Water ht = 245.1  
System sub critical  
Drain:

P-67 6 X 16 - 3  
.60" spacer



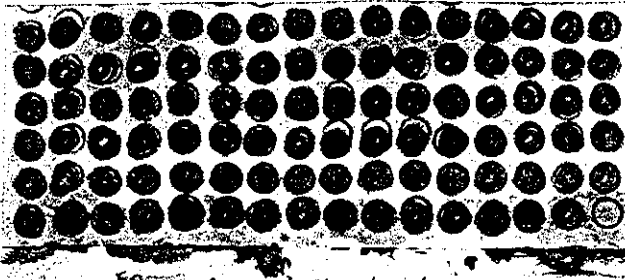
Added 1 pin.  
array shown

P-67 6 X 16 - 2  
.60" spacer

1450

Water ht = 245.0 cm  
System sub critical  
Drain:





Added  
shown <sup>7-68</sup> 6x16-1  
.60" spacing. see array

1608 Water hts = 245.0 cm  
System sub critical  
Overs.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1		Meter			
		Fast			
K-2	3x10 <sup>-12</sup>	Meter ✓	3"	✓	3x10 <sup>-12</sup>
	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	cont	✓	500V
PM-2	1200V	Low ✓	10	✓	900V
	"	Alarm ✓	3	✓	"
LOG N CALIBRATE	✓	OPERATE	✓	SOURCE No.	B-80
DUMP WELL PROBE LIGHT					

Added 1 pin. 6 X 16 - 1 on 1 face. See array shown. Total of 95 pins.

1606 Water ht = 245.0 cm  
System sub critical  
Open.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1		Meter			
		Fast			
K-2	$3 \times 10^{-12}$	Meter ✓	3"	✓	$3 \times 10^{-12}$
	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	7000	Alarm ✓	cont	✓	5000
PM-2	12000	Low ✓	10	✓	9000
	"	Alarm ✓	3	✓	"
LOG N CALIBRATE	✓	OPERATE	✓	SOURCE No.	B-60
DUMP WELL PROBE LIGHT					

DE  
0  
10

START-UP CHECK LIST

Equipment checked by AKM Personnel check by E.P.C

Instruments and safeties checked and reset by AKM

Source in checked by AKM Source No. 14-23

Emergency equipment in control room checked by E.P.C

Instruments in trip circuit: K-2 PM-1-2

Red light on by AKM Time 0815

Start-up OK'd by E.P.C AKM Date 5-18-67

Notes

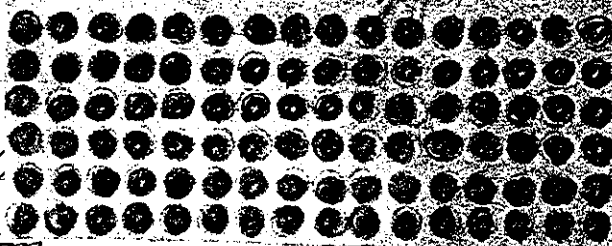
Top of fuel pins = 225.1 cm. Top of fuel in pins = 214.2 cm.  
<sup>60" top reflector</sup> = 229.4 cm.

Same array as described on top of page 07. 6x16 array. Total of 96 pins. .60" plastic spacers.

Water ht = 235.0 cm <sup>dh = 25.6 cm</sup> P-69 6x16  
 .60" spacers

+ Per  
 H-Log = 5 = 91.27 cm = 10.64 = .41 Horn  
 O.R.N.L. Log = 5 = 93.44 cm = 10.44

0945 Water ht = 203.6 cm  
 System just critical  
 Drain to ~ 143.0 cm



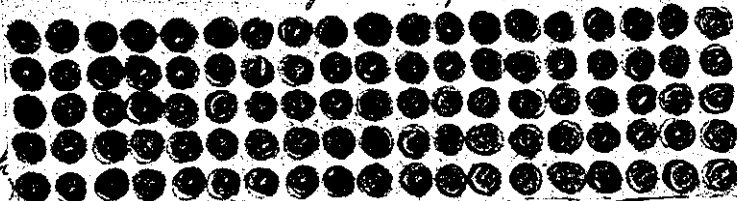
Water ht = 235.5 cm <sup>dh = 25.6</sup> Water Temp = 22.2 °C

+ Per  
 H-Log = 5 = 91.27 cm = 10.64 = .41 Horn  
 O.R.N.L. Log = 5 = 91.27 cm = 10.64

1013 Water ht = 203.8 cm  
 System just critical. Drain:

over

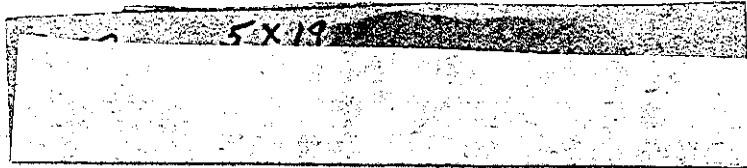
P 70 5 x 19  
 .60" plastic spacers.



Now h  
 Pins separated with .60" plastic spacers.  
 (Measured array = 4.33 x 18.03").

$$\frac{1.575}{.60} = 2.625$$

1548 Water ht = 245.0 cm  
 Depth sub critical  
 Drain.



Now have an 5 X 19 array. Total of 95 pins.  
 Pins separated with .60" plastic spacers.  
 (Measured array = 4.33 X 18.03").

$$\frac{1.87}{1.87} = \frac{7.123}{12.905/18} = 6.606$$

1548 Water ht = 245.0 cm  $\lambda = 0.114$

System sub critical in downwell in the center  
 Drain.

INSTRUMENT CHECK

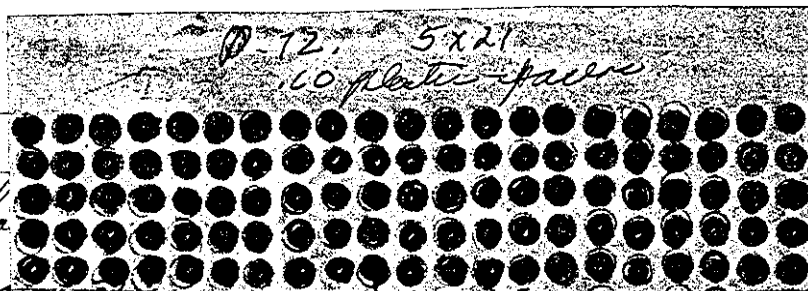
INSTRUMENT	RANGE	TEMP	SOURCE DISTANCE	SET	START-UP RANGE
K-1		Meter			
		Fast			
K-2	3K10-12	Meter	4"		3K10-12
		Fast	"		"
R-1					
R-2					
PM-1	700V	Alarm	cont		500V
PM-2	1200V	Low	10"		900V
	"	Alarm	3"		"

LOG N CALIBRATE  OPERATE  SOURCE No. B-80  
 DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by AKK/F.D.C Personnel check by F.D.C  
 Instruments and safeties checked and reset by AKK  
 Source in checked by AKK Source No. M-43  
 Emergency equipment in control room checked by F.D.C  
 Instruments in trip circuit: K-2 PM-1-2  
 Red light on by AKK Time 0900  
 Start-up OK'd by F.D.C AKK Date 5-27-67

avr.



New hole  
Pins

(Measured array = 4.33" x 20.05")

$$\frac{0.617}{\frac{12.175}{20}} = 0.609$$

1015 Water ht = 240.0 cm  
System sub critical  
Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	FBIP	SOURCE	SET	START-UP RANGE
K-1		Alarm			
K-2	3 x 10 <sup>-12</sup>	Alarm ✓	4"		3 x 10 <sup>-12</sup>
	"	" -	"		"
R-1					
R-2					
PM-1	700V	Alarm -	cont		500V+
PM-2	1200V	Low ✓	10"		900V
	"	Alarm -	3"		"
LOG N CALIBRATE		OPERATE	SOURCE No. B80		
DUMP WELL PROBE LIGHT					

Now have an 5 x 21 array. Total of 105 pins.  
 Pins separated with .60" plastic spacers.  
 (Measured array = 4.33" x 20.05")

$$\begin{array}{r} 0.617 \\ \times 7.875 \\ \hline 12.175125 \end{array} = 0.605$$

1015 Water ht = 240.0 cm  
 System sub critical  
 Crisis.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE	SET	START-UP
			DISTANCE		RANGE
K-1	—	Alarm			
K-2	3 x 10 <sup>-12</sup>	Alarm ✓	9"		3 x 10 <sup>-12</sup>
	"	Alarm —	"		"
R-1					
R-2					
PM-1	100V	Alarm —	cont		500V+
PM-2	1200V	Low —	10"		900V
	"	Alarm —	3"		"

LOG & CALIBRATE  OPERATE  SOURCE No. B80  
 DUMP WELL FROGE LIGHT



## START-UP CHECK LIST

Equipment checked by AKM <sup>F.D.C.</sup> Personnel check by AKM <sup>F.D.C.</sup>

Instruments and safeties checked and reset by AKM

Source in checked by AKM Source No. 14-43

Emergency equipment in control room checked by F.D.C.

Instruments in trip circuit: K-2 PM-1-2

Red light on by AKM Time 1400

Start-up OK'd by F.D.C. AKM Date 5-23-67

Now have an triangular array. Have 4 full rings, plus 2 pins on each face in 5th ring. Total of 73 pins. Pin separated with .50" plastic spacers.

1520 Water ht = 245.0 cm  
System sub critical  
Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	-	Meter			
		Fast			
K-2	$3 \times 10^{-12}$	Meter ✓	3"	✓	$3 \times 10^{-12}$
	"	Fast ✓	"	✓	
R-1					
R-2					
PM-1	700V	Alarm		✓	500V
PM-2	1200V	Low -	8"	✓	900V
	"	Alarm -	3"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-10
DUMP WELL PROBE LIGHT					

START-UP CHECK-LIST

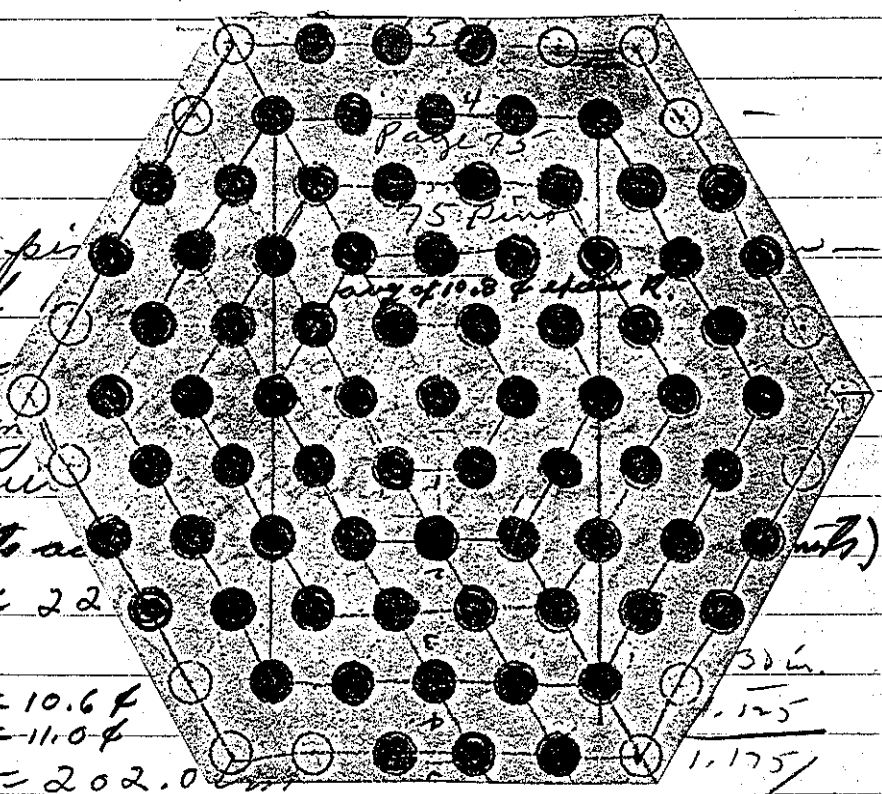
Equipment checked by AKK/FIDC Personnel check by FIDC  
 Instruments and safeties checked and reset by AKK/F  
 Source in checked by AKK Source No. M-43  
 Emergency equipment in control room checked by FIDC  
 Instruments in trip circuit; K-2 PM-1-2  
 Red light on by AKK/F Time 1225  
 Start-up OK'd by FIDC AKK/F Date 5-30-67

0.0.0

added 3 pins. Now have an triangular array with 4 full rings, plus 3 pins on 3 faces, and 2 pins on 3 faces in the fifth ring. Total of 76 pins. Pin separated with 1.50" plastic spacers.

Water ht = 161.0 cm  
 System just critical  
 Drain

Removed 1 pin  
 array with  
 4 faces, and  
 in 5th ring  
 separated in  
 array measurements as



Water ht = 22.0  
 7-Pin

$K\text{-Log} = T = 91.3 \text{ cm} = 10.6 \text{ f}$   
 $O.R.N.L. \text{ Log} = C = 86.9 \text{ ''} = 11.0 \text{ f}$

Water ht = 202.0 cm  
 System just critical  
 Drain to ~ 150 cm.

also

Added 3 pins. Now have an triangular array with 4 full rings, and 2 pins on fifth ring. Total of 75 pins. Pins separated with .50" plastic spacers.

Water ht =  
System just  
Drain.

Removed 1 pin. Now have an triangular array with 4 full rings, plus 2 pins on 4 faces, and 3 pins on 2 opposite faces in 5th ring. Total of 75 pins. Pins separated with .50" plastic spacers.  
avg measurements across flats = 9.19" (avg of 6 measurements)  
Water ht = 221.4 cm

$\tau = 91.3 \text{ cm} = 10.6 \text{ ft}$   
 $\sigma = 86.9 \text{ " } = 11.0 \text{ ft}$   
 Water ht = 202.0 cm  
 System just critical  
 Drain to ~ 150 cm.

Across points = 5.30 in.

4.125

1.175

10

0.1475"

across

1535 Water ht = 232.2 cm

+ Per

K-leg =  $\sigma = 91.3 \text{ m} = 10.6 \phi$

O.R.N.L. Leg =  $\sigma = 86.9 \text{ m} = 19.0 \phi$

1544 Water ht = 202.0 cm

System just critical  
W. drain

### INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3X10 <sup>-12</sup>	Meter -	4"	✓	3X10 <sup>-12</sup>
"	"	Fast	"	✓	"
K-2	"	Meter -	3"	✓	"
"	"	Fast	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	cont	✓	500V
PM-2	1200V	Low ✓	12"	✓	900V
"	"	Alarm ✓	2"	✓	"
LOG N CALIBRATE ✓		OPERATE ✓		SOURCE No. B-80	
DUMP WELL PROBE LIGHT _____					

### START-UP CHECK LIST

Equipment checked by AKH Personnel check by BER F.C.

Instruments and safeties checked and reset by AKH

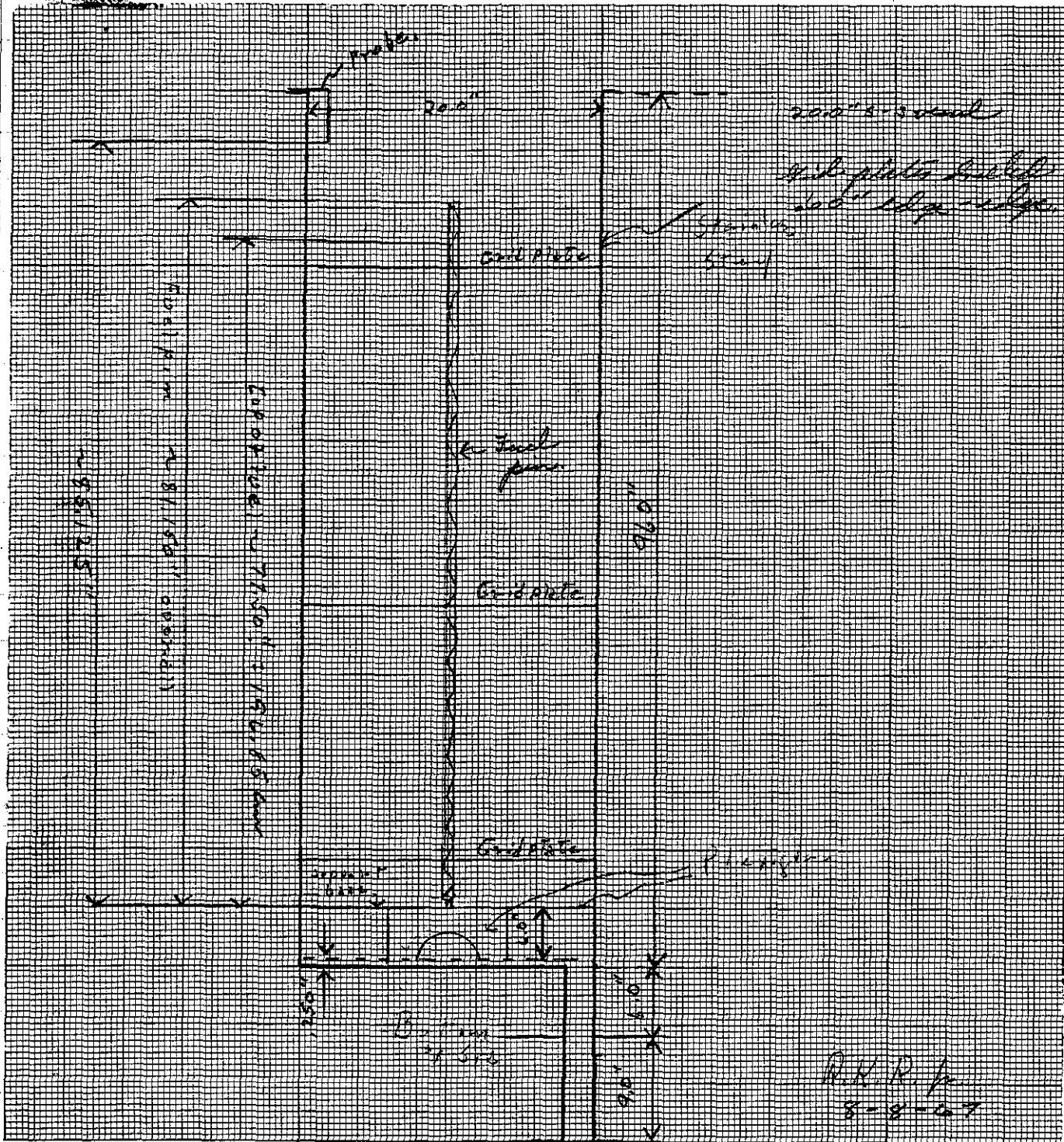
Source in checked by AKH Source No. 14-43

Emergency equipment in control room checked by T.D.C.

Instruments in trip circuit: K-1-2 PM-1-2

Red light on by AKH Time 1300

Start-up OK'd by FID.C. AKH Date 6-7-67



R.H.R. Jr.  
8-8-07

E.B.O.R. fuel pins in an 20.0" I.D. x  
96.0" long vessel. (grid plates made from pleriglas)

Now have 20.0" stainless steel vessel mounted  
in Big-bid. Have 3 grid plates mounted in  
20" vessel to take on map of 7x19 array.  
Separation = 1.60". The ~~following~~ ~~following~~ array  
will be flooded with  $\text{U}^{235}\text{H}_2\text{O}$  in the  
20.0" vessel, and reflector will  $\text{H}_2\text{O}$  in Big  
bid.

When M-4 (Liquid level monitor) reads 91.00"  
~~the~~ pins have 6.0" top reflector in 20.0"  
vessel. And when  $\text{H}_2\text{O}$  reads 249.8 cm on side  
scale the 20.0" vessel has a full bottom & side  
~~reflector~~ reflector. (20.0" vessel also has an probe to  
indicate when vessel has 6.0" top reflector)

20.0" vessel

Big bid.

Fuel rate = 4.50  $\frac{\text{in}}{\text{min}}$

Fuel rate = 2.17  $\frac{\text{in}}{\text{min}}$

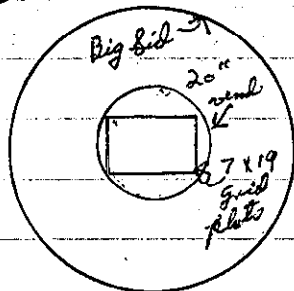
$\frac{3}{4}$ " Drain rate = 14.33  $\frac{\text{in}}{\text{min}}$

3" Drain = 5.12  $\frac{\text{in}}{\text{min}}$

3.0" Dump rate = 27.81  $\frac{\text{in}}{\text{min}}$

3" Dump = 5.12  $\frac{\text{in}}{\text{min}}$

Top of pins =



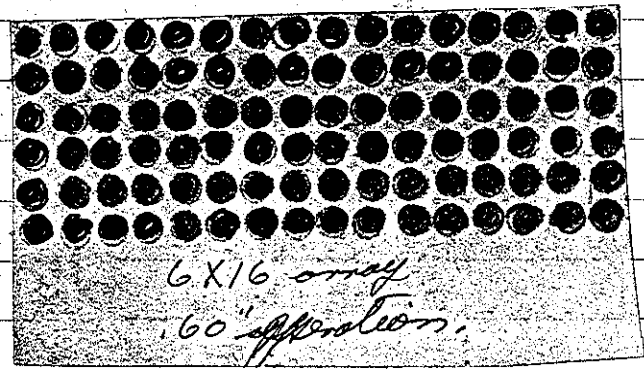


Have an 6 X 16 array. (see page 69) Total of 96 pins.  
Separation = .60" edge - edge.

1526 Water hts (20.0" seal) = 90.14" Water ht (lid) = 2498 cm

\* System sub critical  
Drain.

Temp °C H<sub>2</sub>O  
20.0" seal = 23.7 °C  
lid = 23.2 °C



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3 X 10 <sup>-12</sup>	Meter ✓	4"	✓	3 X 10 <sup>-12</sup>
"	"	Fast ✓	"	—	"
K-2	"	Meter ✓	3"	—	"
"	"	Fast —	"	—	"
R-1					
R-2					
PM-1	700 V	Alarm ✓	cont	✓	500 V
PM-2	1200 V	Low ✓	12"	✓	900 V
"	"	Alarm —	4"	✓	"

LOG N CALIBRATE  OPERATE  SOURCE No. B-80  
DUMP WELL PROBE LIGHT

## START-UP CHECK LIST

Equipment checked by F.P.C. RKL Personnel check by F.P.C.  
 Instruments and safeties checked and reset by RKL  
 Source in checked by RKL Source No. M-43  
 Emergency equipment in control room checked by F.P.C.  
 Instruments in trip circuit: K-1-2 PM-1-V  
 Red light on by RKL Time 0835  
 Start-up OK'd by F.P.C. RKL Date 8-8-67

.60" operation edge-edge.  
 Now have on 6x17-4. Total of 98 pins. See  
 array shown.

10.00 Water ht. (20.0" vent) = 90.21" Water ht. (Reg. lid) = 299.8  
 System sub critical  
 Drain

10.40 added 2 more pins. Now have on 6x17-2.  
 Total of 100 pins.

11.30 Water ht. (20.0" vent) = 79.40"  $D_2 = 5.5$  in Water ht. (Reg. lid) = 299.8  
 + Per Temp °C H<sub>2</sub>O  
 $t = 89.09 \text{ cm} = 10.84$  in 20.0" vent = 24.2 °C  
 Reg. lid = 24.2 °C

1140 water ht (20.0" vent) = 73.94" water ht (Pig lib) = 249.8 cm  
 System just critical  
 Drain.

Removed 1 pin. Now have on 6X17-3. Total of  
 99 pins.

1518 water ht (20.0" vent) = 91.22" water ht (Pig lib) = 249.8 cm  
 System very slightly super critical  
 Drain.

Temp ° C H<sub>2</sub>O

20.0" vent = 24.2 ° C

Pig lib = 24.2 ° C

2998  
 9

2.

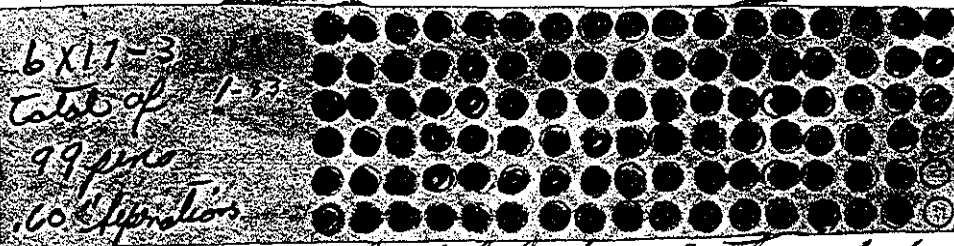
2998  
 9

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	4"	✓	$3 \times 10^{-12}$
"	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	3"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700v	Alarm ✓	cont	✓	500v
PM-2	1200v	Low ✓	1-2"	✓	900v
"	"	Alarm ✓	3"	✓	"
LOG N CALIBRATE ✓		OPERATE ✓		SOURCE No. B-80	
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by AKH FIDC Personnel check by FIDC AKH  
 Instruments and safeties checked and reset by AKH  
 Source in checked by AKH Source No. M-43  
 Emergency equipment in control room checked by FIDC  
 Instruments in trip circuit: K-1-2 PM-1-2  
 Red light on by AKH Time 10.00  
 Start-up OK'd by FIDC AKH Date 8-9-67



ht of array described at bottom of page 81.  
 6 x 17 = 3. Total of 99 pins.

$$\Delta h = 6.6 \text{ in.}$$

1145 Water ht (20.0" seal) = 90.50"

(1) + Rev.

$$C = 1738.40 \text{ cm} = .70 \text{ f} = .11 \text{ f/in}$$

Water ht (big lid) = 249.8 cm

Temp °C

20.0" seal = 24.2 °C

Big lid = 24.2 °C

1208 Water ht (20.0" seal) = 83.96"

System just critical  
 Drain:

Water ht (big lid) = 249.8 cm

Relocated instrument. Purpose to reach critical  
ht. of array described at bottom of page 81.  
6 X 17-3. Total of 99 pins.

$$\Delta h = 6.6'' \text{ in.}$$

1145 Water ht (20.0" seal) = 90.50"

(1) + Rev.

$$C = 1738.40 \text{ cm} = .70 \text{ f} = .11 \text{ f/in}$$

Water ht (big lid) = 249.8 cm

Temp °C

$$20.0'' \text{ seal} = 29.2^\circ \text{C}$$

$$\text{Big lid} = 29.2^\circ \text{C}$$

1208 Water ht (20.0" seal) = 83.96"

Septum just critical  
Drain.

Water ht (big lid) = 249.8 cm

## INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	4"	-	$3 \times 10^{-12}$
"	"	Fast ✓	"	-	"
K-2	"	Meter ✓	3"	-	"
"	"	Fast ✓	"	-	"
R-1					
R-2					
PM-1	700 V	Alarm ✓	Alarm	-	500 V
PM-2	1200 V	Low ✓	12"	-	900 V
"	"	Alarm ✓	3"	-	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROBE LIGHT _____					

## START-UP CHECK LIST

Equipment checked by F.D.C. PKV Personnel check by F.D.C.

Instruments and safeties checked and reset by PKV

Source in checked by PKV Source No. M-43

Emergency equipment in control room checked by F.D.C.

Instruments in trip circuit: K-1-2 PM-1-2

Red light on by PKV Time 1030

Start-up OK'd by F.D.C. PKV Date 8-10-67

array with  $H_3BO_3$  (Boric acid).

85

, 60" separation edge-edge.

Now have on 6x19 array, total of 119 pins.  
also have added <sup>351.37 grams</sup> ~~399.77 grams~~ of  $H_3BO_3$  to  
reflector-moderator ~~to~~ water in (20.0" vessel only).  
This should give  $\approx 0.10$  g/l. (Volume of 20.0" vessel  
dump tank = 614 l.)

1330 Water ht (20.0" vessel) = 91.47"

(Big lid)

Water ht = 249.8 cm

System sub critical.

1500 Now have on 7x19 array, total of 133 pins.

Water ht (20.0" vessel) = 29.00" water ht (Big lid) = 249.8 cm

System just critical  
DRAIN

Temp °C

20.0" vessel = 24.2 °C

Big lid = 24.3 °C



## INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3 X 10 <sup>-12</sup>	Meter ✓	4"	✓	3 X 10 <sup>-12</sup>
"	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	3"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm	cut	✓	500V
PM-2	1200V	Low ✓	12"	✓	900V
"	"	Alarm ✓	3"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80

DUMP WELL PROBE LIGHT \_\_\_\_\_

## START-UP CHECK LIST

Equipment checked by AKM Personnel check by FID.CInstruments and safeties checked and reset by AKMSource in checked by AKM Source No. M-43Emergency equipment in control room checked by FID.CInstruments in trip circuit: K-1-2 PM-1-2Red light on by AKM Time 0830Start-up OK'd by FID.C AKM Date 8-11-67

array's with  $H_3BO_3$  (Boric acid) 87  
.60 "operation" edge-edge.

added 100 grams of  $H_3BO_3$  to deep tanks.

Have on 7 x 19 array. Total of 133 pins.

10.00 Water ht (20.0" vessel) = 39.37"      Big lid  
Water ht = 249.8 cm  
System just critical.  
Drain.

10.20 added 100 grams of  $H_3BO_3$  to deep tanks.

11.00 Water ht (20.0" vessel) = 49.54"      Big lid  
Water ht = 249.8 cm  
System just critical      Temp °C  
Drain.      20.0" vessel = 24.2 °C  
Big lid =

11.15 added 100 grams of  $H_3BO_3$  to deep tanks.

12.50 Water ht (20.0" vessel) = 68.53"      Big lid  
Water ht = 249.8 cm  
System just critical.  
Drain.      Temp °C  
20.0" = 24.2 °C  
Big lid = 24.2

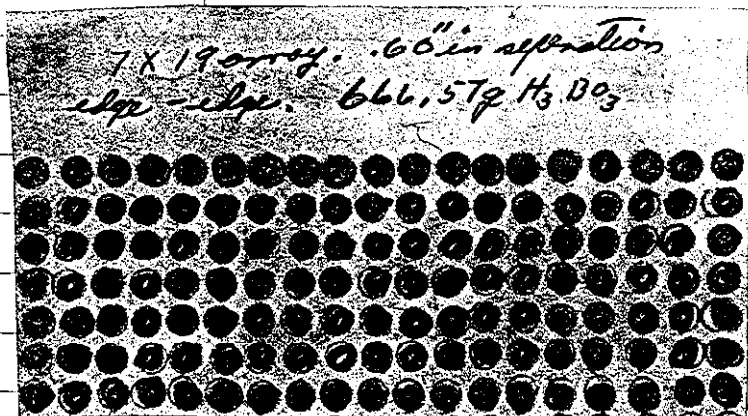
array.

7 X 19 array.

Added 10 grams of  $H_3BO_3$  to dump tanks. Now have a total of 661.57 gram of  $H_3BO_3$  in dump tank.

1415 Water ht (20.0" vent) = 76.55"

System just critical  
Drains -



1520

Water ht (20.0" vent) = 91.18"

+Pex

$T = 604.09 \text{ mV} = 2.0 \text{ f} = 1.25 \text{ f/in}$

Big lid  
Water ht = 249.8 cm

Temp °C

20.0" vent = 24.2

Big lid = 24.5

to dump tanks. Now  
57 gram of  $H_3BO_3$  in

28.1 in

Big lid  
Water ht = 249.8 cm

Temp °C

20.0" vent = 24.0 °C

Big lid = 24.5 °C

1545

Water ht = (20.0" vent) = 83.04"

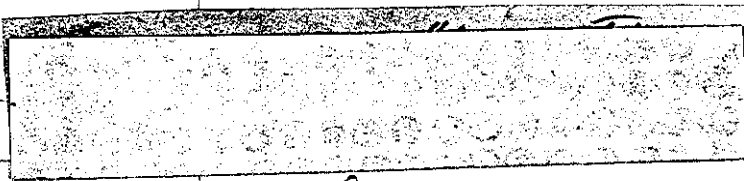
System just critical  
Drains

Big lid  
Water ht = 249.8 cm

added 10 grams of  $H_3BO_3$  to dump tanks. Now have a total of 661.57 gram of  $H_3BO_3$  in dump tanks.

1415 Water ht (20.0" vent) = 76.55"

System just critical  
Praxis



Big lid  
Water ht = 249.8 cm

Temp °C

20.0" vent = 24.2

Big lid = 24.5

added 5 grams of  $H_3BO_3$  to dump tanks. Now have a total of 666.57 gram of  $H_3BO_3$  in dump tanks.

1520 Water ht (20.0" vent) = 91.18"

+Praxis

$t = 604.09 \text{ cm} = 2.0 f = 1.25 \text{ g/in}$

$\Delta h = 8.1 \text{ in}$

Big lid

Water ht = 249.8 cm

Temp °C

20.0" vent = 24.0 °C

Big lid = 24.5 °C

1545 Water ht = (20.0" vent) = 83.04"

System just critical  
Praxis

Big lid

Water ht = 249.8 cm

1600 Sample taken from 20.0" dump tank.

cm

cm

0  
10  
20

cm

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	4"	✓	$3 \times 10^{-12}$
"	"	Fast ✓	"	-	"
K-2	"	Meter ✓	3"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	cont	-	500V
PM-2	1200V	Low ✓	12"	✓	900V
"	"	Alarm ✓	3"	✓	"
LOC N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROB LIGHT _____					

START-UP CHECK LIST

Equipment checked by FIDC RKL Personnel check by FIDC

Instruments and safeties checked and reset by RKL

Source-in-checked by RKL Source No. M-43

Emergency equipment in control room checked by FIDC

Instruments in trip circuit: K-1-2 PM-1-2

Red light on by RKL Time 0815

Start-up OK'd by FIDC RKL Date 8-14-67

7x19 array  
.60" separation edge - edge 91

Repeat of experiment described on page 88. Have  
an 7x19 array, with 666.57 grams  $H_3BO_3$ .

10.00 water ht (20.0" vessel) = 91.14" big lid  
water ht = 249.8 cm

system slightly sub-critical.

Drain.

Temp °C

(Biline system slightly sub due to  
evaporation ~~over~~ over week-end.)

20.0" vessel = 24.0 °C

big lid = 23.5 °C

→ Sample taken from 20.0" dump tanks. (8 samp.)  
(92)

6x19 array

.60" separation edge - edge.

13.20. Now have an 6x19 array. Total of 114 pins.  
Have ~ 222.0 grams of  $H_3BO_3$  in 20.0" dump  
tanks.

14.10 big lid  
water ht (20.0" vessel) = 90.81" water ht (249.8 cm.

system sub-critical

Drain:

Drained ~ 15.250" ( $H_3BO_3$ ) water from 20.0" dump  
tanks. ~~Now have~~ and added more dissolved  
 $H_2O$  to tank. Now have ~ 137.0 gram of  
 $H_3BO_3$ .

over.

0.2 = 14.50" Dig lid

1523 Water ht (20.0" seal) = 90.54" Water ht = 299.8 cm  
 + Per

$T = 67.36 \text{ sec} = 13.3 \text{ f} = .92 \text{ f/inch}$

Big lid

1532 Water ht (20.0" seal) = 76.34" Water ht = 299.8 cm

System just critical  
 Dross

Temp °C

20.0" seal = 24.0°

Big lid = 29.0°

Sample + Kern (p. 91):

X-10: A-483 WT 70 B @ 25°C

0.019

0.99744

0.019

0.99739

Y-12: 684511 0.190 g B/l 0.99872 g/ml

@ 7.15°F

684514 0.190 g B/l 0.99925 g/ml

@ 7.15°F



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3X10 <sup>-12</sup>	Meter ✓	4"	✓	3.X10 <sup>-12</sup>
"	"	Fst ✓	"	✓	"
K-2	"	Meter ✓	3"	✓	"
"	"	Fst ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	low	✓	500V
PM-2	1200V	Low ✓	12"	✓	900V+
"	"	Alarm ✓	3"	✓	"

LOG N CALIBRATE  OPERATE  SOURCE No. B-80

DUMP WELL PRGBE LIGHT

START-UP CHECK LIST

Equipment checked by AKM <sup>I.D.C</sup> Personnel check by I.D.C  
 Instruments and safeties checked and reset by AKM  
 Source in checked by AKM Source No. M-43  
 Emergency equipment in control room checked by I.D.C  
 Instruments in trip circuit: K-1-2 PM-1-2  
 Red light on by AKM Time 0810  
 Start-up OK'd by I.D.C. AKM Date 8-15-67

.60" separation edge-edge.

Repeat of experiment described on p's 91-92.  
6 X 19 array. ~ 137 grams  $H_3BO_3$ .

0950 Water ht (20.0" vessel) = 91.00"    Big hill  
+ Per

$$E = 76.06 \text{ cm} = 12.24 = .90 \text{ g/in}$$

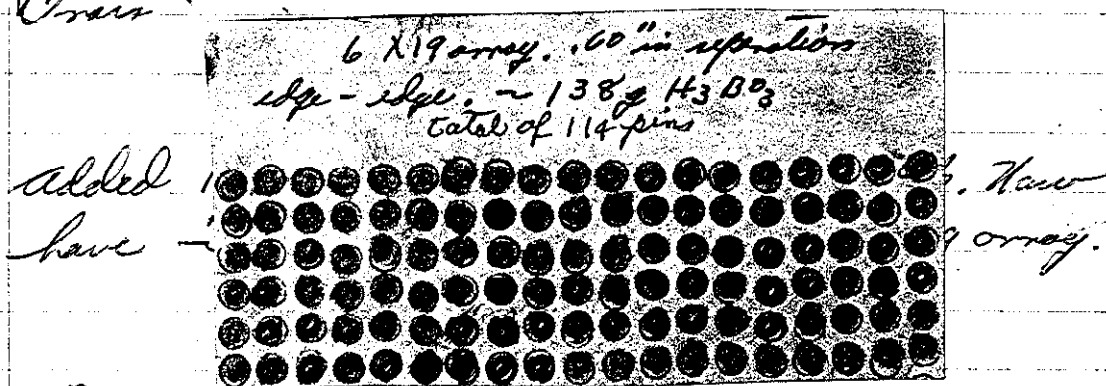
Temp °C

20.0" vessel = 24.0°C

Big hill = 23.5°C

1003 Water ht (20.0" vessel) = 77.07"    Big hill  
Water ht = 249.5 cm

System just critical  
Crises



1050 System screamed by K-1. K-1 was ~ 70%  
full scale on  $3 \times 10^{-4}$ . (Instrument scream).

1100 Water ht (20.0" vessel) = 91.02"    Big hill  
+ Per

$$E = 73.88 \text{ cm} = 12.49 = .90 \text{ g/in}$$

.60" separation edge-edge.

Repeat of experiment described on p's 91-92.  
6 X 19 array. ~ 137 grams  $H_3BO_3$ .

0950 Water ht (20.0" vessel) = 91.00"  $\Delta L = 13.9$ " Big hill  
+ Per Water ht = 249.8 cm

$$E = 76.06 \text{ cm} = 12.24 = .90 \text{ f/in}$$

Temp °C

20.0" vessel = 24.0 °C

Big hill = 23.5 °C

1003 Water ht (20.0" vessel) = 77.07"  $\Delta L = 14.2$ " Big hill  
Septen just critical  
Criss Water ht = 249.8 cm

Added 1 gram  $H_3BO_3$  to 20.0 deep tank. Now  
have ~ 138 grams of  $H_3BO_3$ . 6 X 19 array.

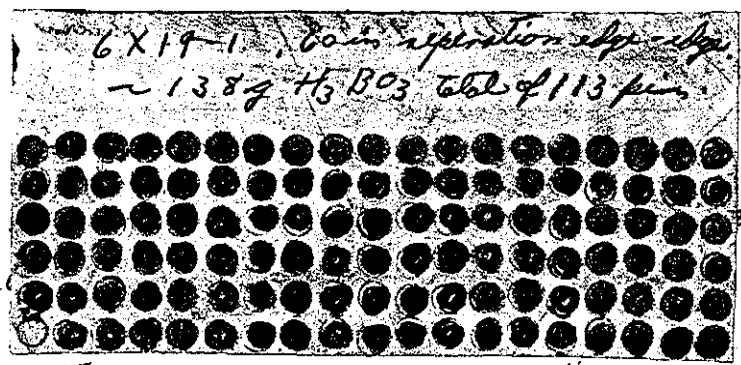
1050 Septen scummed by K-1. K-1 was ~ 70%  
full, scale on 3 X 10" H. (Instrument scum).

1100 Water ht (20.0" vessel) = 91.02"  $\Delta L = 14.2$ " Big hill  
+ Per Water ht = 249.8 cm

$$E = 73.88 \text{ cm} = 12.44 = .90 \text{ f/in}$$

1123 Water ht (20.0" seal) = 76.84" water ht = 249.8cm  
 system just critical  
 Big lid.

Temp °C  
 20.0" seal = 24.0°C  
 Big lid = 24.0°C



11,30 we have on

1210 Water ht (20.0" seal) = 91.02" water ht = 249.8cm  
~~3 pins~~  
 system just critical.  
 Drain.  
 Big lid.

Temp °C  
 20.0" seal = 24.0°C  
 Big lid = 24.0°C

Sample	X-10	A-484	WT 90 B	$\rho @ 25^\circ\text{C}$
			0.0038	0.55714
			0.0038	0.55711

Y-1V:	684513	0.040 g B/l	0.5581 g/cm <sup>3</sup>
	684514	0.039 g B/l	0.5588 g/cm <sup>3</sup>
		<hr/> 0.03975 g B/l	

big lid.

1123 Water ht (20.0" seal) = 76.84" water ht = 299.8cm  
 system just critical

Temp °C  
 20.0" seal = 24.0°C  
 big lid = 24.0°C

1130 Removed 1 pin from corner. Now have on  
 6 x 19-1. total of 113 pins.

big lid.

1210 Water ht (20.0" seal) = 91.02" water ht = 299.8cm  
~~3 x for~~  
 system just critical.  
 One pin.

Temp °C  
 20.0" seal = 24.0°C  
 big lid = 24.0°C

Sample	X-10	A-484	WT 47 B	$\rho @ 25^\circ C$
			0.0038	0.55714
			0.0038	0.55711

Y-14	684513	0.040 g B/L	0.5581 g/cm <sup>3</sup>
	684514	0.039 g B/L	0.5588 g/cm <sup>3</sup>
		<u>0.03875 g B/L</u>	

**INSTRUMENT CHECK**

LOG N CALIBRATE \_\_\_\_\_ OPERATE \_\_\_\_\_ SOURCE No. \_\_\_\_\_

DUMP WELL PROBE LIGHT \_\_\_\_\_

K-1	Meter	Fast
K-2	Meter	Fast
R-1	Meter	Fast
R-2	Meter	Fast
PM-1	Alarm	Low
PM-2	Alarm	Low

INSTRUMENT RANGE TRIP SOURCE DISTANCE SET START-UP RANGE

**INSTRUMENT CHECK**

LOG N CALIBRATE \_\_\_\_\_ OPERATE \_\_\_\_\_ SOURCE No. \_\_\_\_\_

DUMP WELL PROBE LIGHT \_\_\_\_\_

K-1	Meter	Fast
K-2	Meter	Fast
R-1	Meter	Fast
R-2	Meter	Fast
PM-1	Alarm	Low
PM-2	Alarm	Low

INSTRUMENT RANGE TRIP SOURCE DISTANCE SET START-UP RANGE

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter	4"	<input checked="" type="checkbox"/>	$3 \times 10^{-12}$
"	"	Fast	"	<input checked="" type="checkbox"/>	"
K-2	"	Meter	3"	<input checked="" type="checkbox"/>	"
"	"	Fast	"	<input checked="" type="checkbox"/>	"
R-1					
R-2					
PM-1	700V	Alarm	cont	<input checked="" type="checkbox"/>	500V
PM-2	1200V	Low	12"	<input checked="" type="checkbox"/>	900V
"	"	Alarm	3"	<input checked="" type="checkbox"/>	"

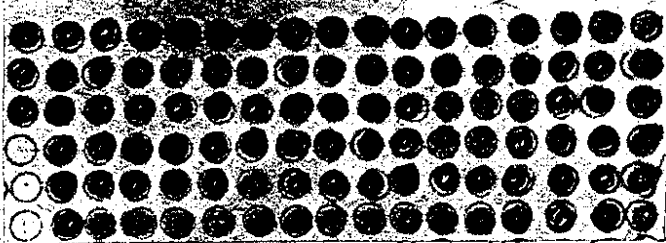
LOG & CALIBRATE  OPERATE  SOURCE No. D-80  
 DUMP WELL PROBE LIGHT \_\_\_\_\_

START-UP CHECK LIST

Equipment checked by AKM <sup>F.D.C.</sup> Personnel check by F.D.C.  
 Instruments and safeties checked and reset by AKM  
 Source in checked by AKM Source No. 19-93  
 Emergency equipment in control room checked by F.D.C.  
 Instruments in trip circuit: K-1-2 PM-1-2  
 Red light on by AKM Time 0920  
 Start-up OK'd by F.D.C. AKM Date 8-17-67

6 X 17 = 3 H<sub>2</sub>O only  
.60" operation edge-edge.

7-3 array.  
only. .60" operation edge-edge



X17-3 array. Total of 99 pins.  
(p-83) after clearing 20.0"

vented dump tanks of H<sub>3</sub>BO<sub>3</sub>.

10 22 Water ht (20.0" vent) = 90.44"  
+ Pr

Dig. lid.  
Water ht = 249.5 cm

Water Temp °C  
20.0" vent = 24.5 °C  
Dig. lid = 23.5 °C

10 45 Water ht (20.0" vent) = 93.35"  
System just artificial  
Drain.

Dig. lid  
Water ht = 249.6 cm



6X17-3

.60" operation edge

6X17-3 array.

H<sub>2</sub>O only. .60" operation edge

Now have on 6X17-3 array. Total of 99 pins.  
Repeat of experiment (p-83) after clearing 20.0"  
vessel dump tanks of H<sub>3</sub>BO<sub>3</sub>.

1022 Water ht (20.0" vessel) = 90.44"  
+ Per

Dig lid.  
Water ht = 249.5 cm

Water temp °C

20.0" vessel = 24.5 °C

Dig lid = 23.5 °C

1045 Water ht (20.0" vessel) = 93.35"

Dig lid  
Water ht = 249.6 cm

System just critical  
DRAIN.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	3"	-	$3 \times 10^{-12}$
"	"	Fast ✓	"	-	"
K-2	"	Meter ✓	3"	-	"
"	"	Fast ✓	"	-	"
R-1					
R-2					
PM-1	700V	Alarm ✓	cm	✓	500V
PM-2	1200V	Low ✓	12"	✓	900V
"	"	Alarm ✓	3"	✓	

LOG N CALIBRATE  OPERATE  SOURCE No. B-8-0

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by AKK/ERR Personnel check by AKK  
 Instruments and safeties checked and reset by AKK  
 Source in checked by AKK Source No. M-43  
 Emergency equipment in control room checked by AKK  
 Instruments in trip circuit: K-1-2 PM-1-2  
 Red light on by AKK Time 0812  
 Start-up OK'd by ERR, AKK Date 8-18-67

5 x 16 array: Total of 80 pins.  
 $\approx 4.0 \text{ g/l}$ .

added 6,000 cc of  $\text{VO}_2\text{NO}_3$  solution  $\approx 410 \text{ g/l}$  to  
 20.0" dump tank. (Volume of dump tank  $\approx 618 \text{ l}$ .)

10.00 Solution ht (20.0" vessel) = 90.14"      Big lid  
 Water ht = 299.8  
 System sub critical  
 Drain.  
 Temp  $^{\circ}\text{C}$   
 20.0" vessel = 29.8  $^{\circ}\text{C}$   
 Big lid = 29.0  $^{\circ}\text{C}$

added 3 fuel pins: Now have an 5 x 17-8  
 array. Total of 83 pins.

1048 Solution ht (20.0" vessel) = 90.44"      Big lid  
 Water ht (299.8 cc)  
 + Pen  
 Prob  $\approx 61 \text{ g} \approx 1 \text{ g}$

1107 Solution ht (20.0" vessel) = 84.73"      Big lid  
 Water ht (299.8 cc)  
 System just critical  
 Drain.

1230 Solution samples taken:

	Y-12		X-10
	#1		#1-A
	Reg # 684515		A-623
	G 96.7g	ash for	G 96.0 g
	T 19.0g	2 1/2 0.003571 T	19.0 g
	N 77.7g	sp. gr. 1.0030	N 77.0 g
		22.502	
		Dens 40	Density 1.0016
		36.88 g <sup>2050</sup> / l	36.8 g <sup>205</sup> / l

1555 added 700 grams of  $H_3BO_3$  to 20.0" vessel  
lump tanks.

102

8/22/67

## INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	2"	✓	$3 \times 10^{-12}$
		Fst ✓		/	
K-2	$3 \times 10^{-12}$	Meter ✓	2"	/	$3 \times 10^{-12}$
		Fst ✓		/	
R-1	—				
R-2	—				
PM-1	7000	Alarm ✓	Contact	✓	5000
PM-2	12000	Low ✓	12"	/	9000
		Alarm ✓	3"	/	
LOG N CALIBRATE	✓	OPERATE	✓	SOURCE No.	B-50
DUMP WELL PROBE LIGHT	—				

## START-UP CHECK LIST

Equipment checked by EJ IDC Personnel check by IDC  
 Instruments and safeties checked and reset by IDC EJ  
 Source in checked by EJ Source No. M-43  
 Emergency equipment in control room checked by IDC  
 Instruments in trip circuit: K-1, K-2, PM-1, PM-2  
 Red light on by IDC Time 10:00  
 Start-up OK'd by EJ IDC Date 8/22/67

Solution in 20" cylinder round pins contains  
 = 4 g/liter of  $V(92.4)O_2(NO_3)_2$  and 700g of  
 $H_2BO_3$ . Mixed. Lattice is 7x19 pins.

1126 Critical with solution below indicated  
 level.

Drain.

Added 100g of  $H_2BO_3$  to solution. Now have  
 800g  $H_2BO_3$ .

1438 Again critical before M-4 was on scale.  
 Drain.

Added 100g to make a total of 900g of  
 $H_2BO_3$ .

1520 Critical with solution height at 41.45 in.  
 Drain

#1 24.2°C

#2 24.0°C

Added 100g to make 1000g of  $H_2BO_3$  total.

1600 Critical with solution height at 50.25 in.  
 Drain

#1 24.2°C

#2 24.0°C

104

8/23/67

## INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-14}$	Meter ✓ Fast ✓	2"	✓	$3 \times 10^{-14}$
K-2	$3 \times 10^{-14}$	Meter ✓ Fast ✓	2"	✓	$3 \times 10^{-14}$
R-1	—				
R-2	—				
PM-1	700V	Alarm	Contact	✓	500V
PM-2	1200V	Low ✓ Alarm ✓	12" 1"	✓	900V
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-8D
DUMP WELL PROBE LIGHT ———					

## START-UP CHECK LIST

Equipment checked by EQ/IDC Personnel check by IDC  
 Instruments and safeties checked and reset by EQ  
 Source in checked by EQ Source No. M-43  
 Emergency equipment in control room checked by IDC  
 Instruments in trip circuit: K-1, K-2, PM-1, PM-2  
 Red light on by KE Time 0915  
 Start-up OK'd by EQ, IDC Date 8/23/67

Added 100g of  $H_3BO_3$  for a total of 1100g.

10:30 Water up. Critical with solution at 72.71 in.  
 Drain  $T_1$  24.5°C  
 $T_2$  24.0°C

Repeat of above:

13:50 + Period. solution at 76.44 in.

13:55 Critical. Solution at 74.25 in. Lower reading  
 74.37 in.

Added 5g  $H_3BO_3$ . Total now 1105g

16:20 + Period. Solution level at 85.67 in.  
 Drain  $T = 56.6$  sec;  $\rho = 15.05 g$



INSTRUMENT CHECK

8/24/67

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3x10 <sup>-12</sup>	Meter ✓ Felt ✓	2"		3x10 <sup>-12</sup>
K-2	3x10 <sup>-12</sup>	Meter ✓ Felt ✓	2"		3x10 <sup>-12</sup>
R-1	—				
R-2	—				
PM-1	7000	Alarm ✓	Contact		5000
PM-2	12000	Low ✓ Alarm ✓	12" 3"		9000

LOG N CALIBRATE \_\_\_\_\_ OPERATE \_\_\_\_\_ SOURCE No. B-80

DUMP WIRE PROBE LIGHT       

START-UP CHECK LIST

Equipment checked by EJ IDC Personnel check by IDC

Instruments and facilities checked and reset by EJ

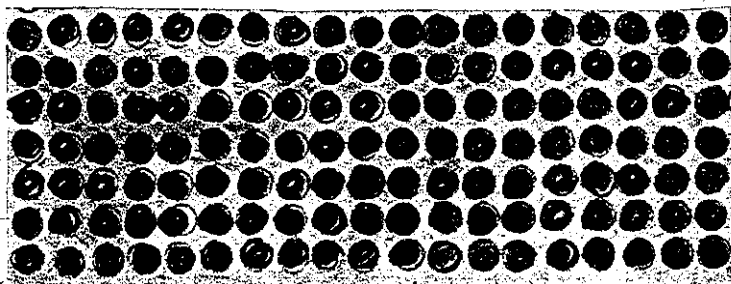
Source in checked by EJ Source No. M-43

Emergency equipment in control room checked by IDC

Instruments in trip circuit: K-1, K-2, PM-1, PM-2

Red light on by IDC Time 0915

Start-up OK'd by EJ, IDC Date 8/24/67



1050

N  
H<sub>2</sub>

T = 7 x 19 lattice w. v (92.6)  $\rho_{H_2}$  @ 48%  $\rho_{H_2}$   
and  $\approx 0.38$  B/l as  $H_2B^3$

+ period #1

24.3°C

24.0°C

1056

Solution at 76.78 in. Critical.

Drain

Repeat:

1125

Solution at 80.04 in. + Period #2

T = 146.3 sec;  $\rho = 7.3 \text{ g}$ 

1130

Critical. Solution at 76.84 in.

#1 24.2°C

#2 24.0°C

Drain

Added 5 g  $H_2B^3$ . Total now 111.0 g.

1350

+ Period #3. Solution at 91.00 in.

T = 109.1 sec;  $\rho = 9.2 \text{ g}$ 

#1 24.2°C

#2 24.2°C

1400

Critical. Solution height 79.38 in.

(Probe "light" comes on at 91.77 in.) Drain.

Repeat:

1455

Critical. Solution height 79.07 in.

Drain.

No change since p. 105, end.

1050 H<sub>2</sub>O up. Solution at 85.47 in. + period #1  
 T = 66.75 sec;  $\rho = 13.4 \text{ g}$  #1 24.3°C  
 #2 24.0°C

1056 Solution at 76.78 in. Critical.  
 Drain  
 Repeat:

1125 Solution at 80.06 in. + Period #2  
 T = 146.3 sec;  $\rho = 7.3 \text{ g}$

1130 Critical. Solution at 76.84 in. #1 24.2°C  
 Drain #2 24.0°C

Added 5 g H<sub>3</sub>BO<sub>3</sub>. Total now 1110 g.

1350 + Period #3. Solution at 91.00 in.  
 T = 109.1 sec;  $\rho = 9.2 \text{ g}$  #1 24.2°C  
 #2 24.2°C

1400 Critical. Solution height 79.38 in.  
 (Probe "light" comes on at 91.77 in.) Drain.  
 Repeat:

1455 Critical. Solution height 79.07 in.  
 Drain.

8/24/67  
1500

Sample of solution taken.

To X-15: AL24

Net 514.6 g

g U/l: 3.97

g B/l: 0.31

To Y-12: Reg. 684516

Net 513.0

g U/g = 0.003964

g B/g 0.32 g B/l

Density 1.0027

Temp. 26.4°C

8/30/67 Dimer #4. (Washings from dump tanks of 20.0" mesh.

Y-12 Reg # 684517

Net = 87.4 g.

684517 - 2861

g U/l 0.00121 g U/g

Density 0.55881 @ 25°C

It is, therefore, concluded that this lattice, submerged in a solution containing 3.68 g of U/l and 0.315 g of B/l has no excess reactivity corresponding to  $k_{eff} \approx 1.001$ .

$$\left( \frac{100\%}{0.008} - \frac{9.29}{X} \right)$$

$$X = 0.0027 \approx 0.1601$$

9-5-67 Sample ~~note~~ for Y-12. Replacement of  
Reg # 684516.

Reg II 684518

$\bar{c} = 147.2$  orb for.

$T = 17.5$  g/g 0.003986

$N = 129.7$

g/g 9/7/67; Kachin just 4 analyses  
on 516, will list as 518. 29

density 1.0027

temp. 26.4°C

4 lines  
5  
1

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE	SET	START-UP RANGE
K-1	3 110-12	Meter -	3"	✓	
"	"	Fast ✓	"	-	
K-2	"	Meter -	"	-	
"	"	Fast ✓	"	-	
R-1					
R-2					
PM-1	700V	Alarm ✓	cont	-	
PM-2	1200V	Low ✓	18"	-	
"	"	Alarm ✓	3"	-	

LOG N CALIBRATE  OPERATE  SOURCE No. B-80  
 DUMP WELL PROBE LIGHT \_\_\_\_\_

START-UP CHECK LIST

Equipment checked by F.D.C. (AKH) Personnel check by F.D.C.  
 Instruments and safeties checked and reset by AKH  
 Source in checked by AKH Source No. M-43  
 Emergency equipment in control room checked by F.D.C.  
 Instruments in trip circuit: K-1-2 PM-1-2  
 Red light on by AKH Time 0900  
 Start-up OK'd by F.D.C. AKH Date 9-12-67

Have an 17 X 17 array: Total of 289 pins. Pins  
are in contact. (Measured array = 6.72" (avg of 8 measurements).  
Top of table = 17.6 cm on side scale.

1009 Water ht = 249.8 cm  
System sub critical  
Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	X10 - 2	Meter ✓	3"	✓	3.810 <sup>-18</sup>
"	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	2"	-	"
"	"	Fast -	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm -	Cont	✓	500V
PM-2	1200V	Low -	18"	✓	900V
"	"	Alarm -	4"	✓	"

LOG IN CALIBRATE  OPERATE  SOURCE No. B-80

DUMP WELL PROCSE LIGHT

START-UP CHECK LIST

Equipment checked by AKM Personnel check by FIDC

Instruments and safeties checked and reset by AKM

Source in checked by AKM Source No. M-93

Emergency equipment in control room checked by FIDC

Instruments in trip circuit: K-1-2 PM-1-2

Red light on by AKM Time 0810  
1455

Start-up OK'd by FIDC AKM Date 9-15-67  
9-14-67



Specimens (b.c.l.)

Have on <sup>19</sup> 20 x 20 array: Total of ~~380~~ <sup>380</sup> pins. Pins  
one in contact. Measured array = 8.43" (avg of 8 measured?  
four on each level.) <sub>7.69"</sub>

0930 Water ht = 249.8 cm

Water temp °C

system sub critical  
Chain.

22.7 °C

$$\begin{array}{r} 8.43 \\ 7.69 \\ \hline 0.743 / 19 \\ \hline 0.049 \end{array}$$

$$\begin{array}{r} 7.65 \\ 7.125 \\ \hline 0.525 / 18 = 0.0291 \end{array}$$

Repeat 0.070

Currents:

$$\frac{8.43 - 0.375}{19} = 0.423$$

$$\frac{7.65 - 0.375}{18} = 0.406$$

Avg = 0.415

RT-UP  
UNGE

0

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3 X 10 <sup>-12</sup>	Meter ✓	1"	✓	3 X 10 <sup>-12</sup>
"	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	2"	✓	"
"	"	Fast ✓	"	✓	"
P-1					
P-2					
PM-1	700 V	Alarm ✓	Coat	✓	500 V
PM-2	1200 V	Low ✓	12"	✓	900 V
"	"	Alarm ✓	2"	✓	"

LOG N CALIBRATE  OPERATE  SOURCE No. B-80  
 DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by F.D.C. AKH Personnel check by Z.D.C.  
 Instruments and safeties checked and reset by AKH  
 Source in checked by AKH Source No. M-43  
 Emergency equipment in control room checked by F.D.C.  
 Instruments in trip circuit: K-1-2 RM-12  
 Red light on by AKH Time 1225  
 Start-up OK'd by F.D.C. AKH Date 10-11-67

15 x 15 array  
10" separation edge-edge.

115

Have an 15 x 15 array: Total of 225 pins. Pins  
separated with 10" plastic spacers. (Measured array  
= 7.22" (avg of 10 measurements). Top of table = 17.6 cm  
on side scale.

Water ht = 149.00 cm      Water Temp °C  
System just critical      22.8°C  
Drain.

$$\frac{7.22 - 5.0}{10} = 0.222$$

Removed 6 pins: 2 from 2 corners and 1 from  
2 corners. Now have a total of 219 pins.

150s Water ht = 249.8 cm

System sub critical  
Drain.

$$\frac{7.22 - 0.375}{14} = 0.489$$

$$\text{Center spacing} = \frac{d - x}{h - 1}$$

## INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3 x 10 <sup>-12</sup>	Meter	1"	✓	3 x 10 <sup>-12</sup>
	"	Fast	"	✓	"
K-2	"	Meter	2"	✓	"
	"	Fast	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm	Cent	✓	500V
PM-2	1200V	Low	14"	✓	900V
	"	Alarm	3"	✓	"
LOG N' CALIBRATE		✓	OPERATE		✓
DUMP WELL PROBE LIGHT		✓	SOURCE No.		B-80

## START-UP CHECK LIST

Equipment checked by FIDC Personnel check by FIDC

Instruments and safeties checked and reset by AKLL

Source in checked by AKLL Source No. M-43

Emergency equipment in control room checked by FIDC

Instruments in trip circuit: K-1-2 PM-1-2

Red light on by AKLL Time 0815

Start-up OK'd by FIDC AKLL Date 10/12/67

15 X 15 array:

10" separation edge-edge.

117

Have on 15 X 15 array with 1 pin removed from each corner: Total of 221 pins.

Water ht = 249.80 cm

Temp °C

System subcritical

23.0 °C

Drain.

Added 2 pins: Now have on 15 X 15 array with 2 pins removed from opposite corners. Total of 223 pins.

1028

Water ht = 163.90 cm

System just critical

Drain.

Report: 222

