

## BOOK101R

*Notes:*

"U (4.9) rods #3 log" on spine

Blank pages: inside front cover sheets, 165, 306-308, inside back cover sheets

-page 13 has 1 drawing

-page 14 has 1 drawing and 2 stickers plus 4 post-it-notes around drawing

-the following pages has a drawing(s) and a sticker on each page: 22, 26, 30, 34, 40, 43, 49, 56, 61, 62, 69, 72, 77, 79, 83, 87, 90, 96, 100, 106, 111, 120, 124, 129, 133, 154, 155(2), 156, 162, 164, 171, 173, 177, 180, 183, 189, 192, 197, 198, 201, 202, 204, 205, 209, 211, 214, 216, 217, 220, 226, 228, 232, 235(2), 237, 238, 242, 253, 255, 259, 262, 265, 268, 272, 274, 276, 277(2), 278, 280(2), 282, 284, 288, 291, 293, 299, 301(2), 302, 305

-page 24 has drawing and sticker plus 2 post-it-notes around drawing

-page 136 has small sheet of paper stapled to it

-page 139 has plastic clip at bottom

-page 141 has plastic clip at side

-pages 142/143 has 2 (8.5x11) sheets between pages

*Scanned by:*

*Sheila Finch*

*RSICC /Oak Ridge National Lab.*

*September 13, 1999*

14-2-1



PIONEERS SINCE 1831

# 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.

<u>Index</u>	<u>Page</u>
Continuation of Lattices of 0.052-in.-diam rods	2
Barren to undewater water; <sup>0.14 g/l</sup> 0.5-in.-diam rods	140
Analyses	143
0.3-in.-diam rods	178
0.5-in.-diam rods	211
<del>to</del> 1-in.-diam rods	216
0.8-in.-diam rods	237
Barren $\approx$ 0.2 g/l; 0.8-in.-diam rods	270
1-in.-diam rods	289
0.5-in.-diam rods	295
Water: 0.5-in.-diam, 3.4 cm Sepa, 3.0 cm length <sup>1/30/70</sup>	304

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE	SET	START-UP RANGE
K-1	3X10 <sup>-12</sup>	Meter ✓	2"	C.	3X10 <sup>-12</sup>
"	"	Filt ✓	"	"	"
K-2	—	M			
R-1					
R-2					
PM-1	700V	✓	Cont	—	500V
PM-2	1200V	✓	12"	—	900V
"		Alarm ✓	3"	—	"
LOG N CALIBRATE		—	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROSE LIGHT					

START-UP CHECK LIST

Equipment checked by AKK Personnel check by F.D.C.  
 Instruments and safeties checked by AKK  
 Source in checked by AKK M-13  
 Emergency equipment in control room checked by F.D.C.  
 Instruments in trip circuit: K-1 PM-1-2  
 Red light on by AKK Time 0805  
 Start-up OK'd by F.D.C. AKK Date 10-23-68

Repeat of last experiment (see log book #2 U(4.89)  
 rods  $\phi = 2.99$ ). Have an  $39 \times 39 - 16$  array.  
 Total of 1505 rods.

Water ht = 34.10 cm Temp  $^{\circ}\text{C}$   
 + Per 24.0 $^{\circ}\text{C}$

$$E = 1195.15 \text{ sec} = 1.1 \phi$$

0850 Water ht = 30.05 cm

System just critical

Drain to  $\sim 17.0$  cm and removed 1 rod.

Now have an  $39 \times 39 - 17$  array. Total of 1504  
 rods.

Water ht = 34.20 cm Temp  $^{\circ}\text{C}$   
<sup>2</sup>-Per 24.0 $^{\circ}\text{C}$

$$E = -1129.96 \text{ sec} = -1.2 \phi$$

0917 Drain:

avr:

Drain dump tanks. Cleaned hold tanks and dump tanks (to get rid of ~~leak~~  $x=100$ ). Refilled dump tanks with clean demineralized water.

Now have and  $39 \times 39 - 16$  array. Total of 1505 rods. Repeat of experiment shown on top of p-3.

$$\Delta h = 4.75 \text{ cm}$$

357 //  $\rightarrow$  Water ht = 34.10 cm Temp  $^{\circ}\text{C}$   
 3 + Per 23.3  $^{\circ}\text{C}$   
 $\tau = 695.36 \text{ sec} = 1.84$  Days

1350 Water ht = 29.35 cm  
 system just critical  
 Drain to  $\sim 17$  cm. and removed 1 rod

Now have an  $39 \times 39 - 17$  array. Total of 1504 rods.

357 // Water ht = 34.10 cm Temp  $^{\circ}\text{C}$   
 4 - Per 23.3  $^{\circ}\text{C}$   
 $\tau = -2238.19 \text{ sec} = 1.60$  f  
 1421 Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-3	$3 \times 10^{-12}$	Meter <input checked="" type="checkbox"/>	2"	-	$3 \times 10^{-12}$
"	"	Fast <input checked="" type="checkbox"/>	"	-	"
K-1	-	Meter			
		Fast			
	700V	Alarm <input checked="" type="checkbox"/>	cont	<input checked="" type="checkbox"/>	500V
	1200V	Low <input checked="" type="checkbox"/>	12"	<input checked="" type="checkbox"/>	900V
	"	Alarm <input checked="" type="checkbox"/>	3"	<input checked="" type="checkbox"/>	"
LOG IN CALIBRATE <input checked="" type="checkbox"/>		OPERATE <input checked="" type="checkbox"/>		SOURCE No. <u>B-80</u>	
DUMP WELL PROBE LIGHT		<u>7</u>			

START-UP CHECK LIST

Equipment checked by I.D.C. Personnel check by I.D.C.  
 Instruments and safeties checked and reset by R.K.H.  
 Source in checked by R.K.H. Source No. M-23  
 Emergency equipment in control room checked by I.D.C.  
 Instruments in trip circuit: K-1 PM-1-2  
 Red light on by R.K.H. Time 0915  
 Start-up OK'd by I.D.C. R.K.H. Date 10-24-68



6

.092" U(9.89) rods.  
.753 cm separation c-c.  
30 cm lengths.  
Rounded array.

Top of fuel:  
H<sub>2</sub>O = 19.90 cm

Now have an 41 x 41 array with 45 rods removed from each corner. Total of 1501 rods.

Water ht = 24.40 cm  $\Delta h = .75$  Temp °C  
+ Per 23.4 °C

$C = 47.81 \text{ sec} = 16.94 = 22.54 \text{ H/cm}$

0955 Water ht = ± 23.65 cm

System just critical  
Drain.

Removed 8 rods. 2 from each corner. Now have an 41 x 41 array, with 47 rods removed from each corner. Total of 1493 rods.

Water ht = 25.20 cm  $\Delta h = 1.15 \text{ cm}$   
+ Per

$C = 36.94 \text{ sec} = 20.04 = 17.4 \text{ H/cm}$

1025 Water ht = 24.05 cm

System just critical  
Drain.

Removed 16 rods. 4 from each corner. Now have an  $4 \times 4$  array, with 51 rods removed from each corner. Total of 1477 rods.

Water ht = 26.30 cm  $\Delta h = 1.05$  cm Temp  $^{\circ}$ C  
 $^3$  + Per 23.6  $^{\circ}$ C

$$t = 89.09 \text{ sec} = 10.8 \text{ s} = 11.3 \text{ H/cm}$$

1055 Water ht = 25.25 cm

System just critical  
 Drain.

Removed 16 rods. 4 from each corner. Now have an  $4 \times 4$  array, with 55 rods removed from each corner. Total of 1461 rods.

Water ht = 35.10 cm  $\Delta h = 4.7$  cm Temp  $^{\circ}$ C  
 $^4$  + Per 23.6  $^{\circ}$ C

$$t = 782.28 \text{ sec} = 1.6 \text{ s} = .34 \text{ H/cm}$$

1128 Water ht = 30.40 cm

System just critical  
 Drain.

avg:

2

Run for O.R.A.W.

Water ht = 35.10 cm  
5 + per

Temp °C  
23.7°C

1550 Water ht = 30.40 cm  
System just 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 ✓	1"	✓	"
"	"	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 F.I.C. Personnel check by F.I.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.I.C.  
 Instruments in trip circuit: K-1 PM-1-2  
 Red lights on by AKH Time 1010  
 Start-up O.I'd by F.I.C. AKH Date 10-30-68

10

Top of fuel

H<sub>2</sub>O = 19.10 cm.

after cleaning rods of oxide, and coating them with mineral oil. Repeat of experiment described on bottom of p - 7.

Have an 41 x 41 array, with 55 rods removed from each corner. Total of 1461 rods.

Water ht = 35.20 cm  
+ Per

Temp °C  
23.8 °C

1100 Water ht = ~~32.50 cm~~<sup>35.20 cm</sup>  
System just critical  
Drain

"Instrument Check Run."

Top of fuel

H<sub>2</sub>O = 19.80 cm

Added 3 rods to center of 1 face, in order to increase power level.

Water ht = 35.40 cm  
+ Per

Temp °C  
24.0 °C

1320 Water ht = 27.05 cm  
System just critical  
Drain

Moved Log-11 to ~~within~~ within 4.5" of end face of array, and K-1 to within 6" of side face of array.

Water ht = 35.50 cm Temp °C  
2 + Per 24.0 °C

1500 Water ht = 27.05 cm Log 11 = 10  
System just critical K-1 = 55%  $10 \times 10^{-9}$   
Drain to ~ 17.00 cm and moved Log 11 out to ~ 10.5", K-1 still within 6.0" of side face of array.

Water ht = 35.50 cm Temp °C  
3 + Per 24.0 °C

1522 Water ht = Log 11 =  
System just critical K-1 = 50%  $10 \times 10^{-9}$   
Drain to ~ 17.0 cm : repeat + Per.

Water ht = 35.50 cm Log 11 = 16  
4 + Per K-1 = 60%  $3 \times 10^{-9}$

1540 Water ht = 27.05 cm Core = 300  $\frac{ng}{R}$   
System just critical : Drain shut down.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SET	START-UP RANGE
K-1	3 X 10 <sup>-12</sup>	✓	2"	3 X 10 <sup>-12</sup>
"	"	✓	"	"
K-2	"	✓	1"	"
"	"	✓	"	"
R-1				
R-2				
PM-1	700V	✓	cont	500V
PM-2	1200V	✓	12"	900V
"	"	✓	2"	"

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

Tap off  
H<sub>2</sub>O =

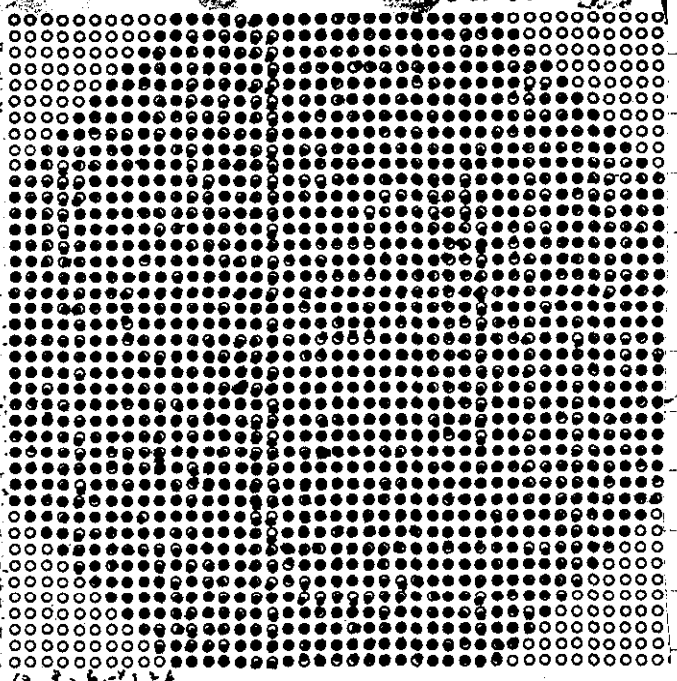
START-UP CHECK LIST

Equipment checked by F.I.O.C. AKK Personnel check by F.I.O.C.  
 Instruments and safeties checked and reset by AKK  
 Source in checked by AKK Source No. M-93  
 Emergency equipment in control room checked by F.I.O.C.  
 Instruments in trip circuit: K-1 PM-1-2  
 Red light on by AKK Time 0835  
 Start-up OK'd by F.I.O.C. AKK Date 10-31-68

1092" U(4x4) rods.  
 .753 cm separation e-c  
 30 cm length.

Have on 41x41 array, with 55 rods removed  
 from each corner. Total of 1461 rods.  
 41x41 - 55 from each corner  
 Total 1461 rods. .753 cm separation  
 30 cm length

0917 Water ht = 35.00 cm  
 System just initial  
 Drain. USE



Now have 43x43 array  
 from each corner.

Top of fuel Water ht = 36.20 cm  
 $H_2O = 20.55 \text{ cm} + R_{\text{rod}}$   
 $L = 273.80 \text{ cm} = 4.2 \phi = 5.55 \text{ cm}$

1318 Water ht = 28.60 cm - 20.55 = 8.05 cm  
 System just initial  
 Drain.



1.092" C  
1.753 cm  
30 cm

Have on 41x41 array  
from each corner

0917

Water ht = 35.00 cm  
system just initial  
Drain. USE

Temp °C  
23.8 °C

Now have 43x43 array, with 97 rods removed  
from each corner. Total of 1461 rods.

Top of fuel Water ht = 36.20 cm  $D_h = 7.6$  cm

$H_2O = 20.55$  cm + Per

$$T = 273.80 \text{ mm} = 4.24 \text{ } = 1.55 \text{ /cm}$$

1316 Water ht = 28.60 cm - 20.55 = 8.05 cm

system just initial  
Drain.

Removed 4 rods. 1 from each corner. Total number of rods now = 1457 rods.

Water ht = 36.20 cm

Temp °C  
24.1 °C

Per

$C = -1064.77 \mu = -1.3 f$

1400

Drain.

Added 1 rod. No... have in 43 x 43 array with 98 rods = -98

97 rods remain

1458

1423

Water ht = 36.0

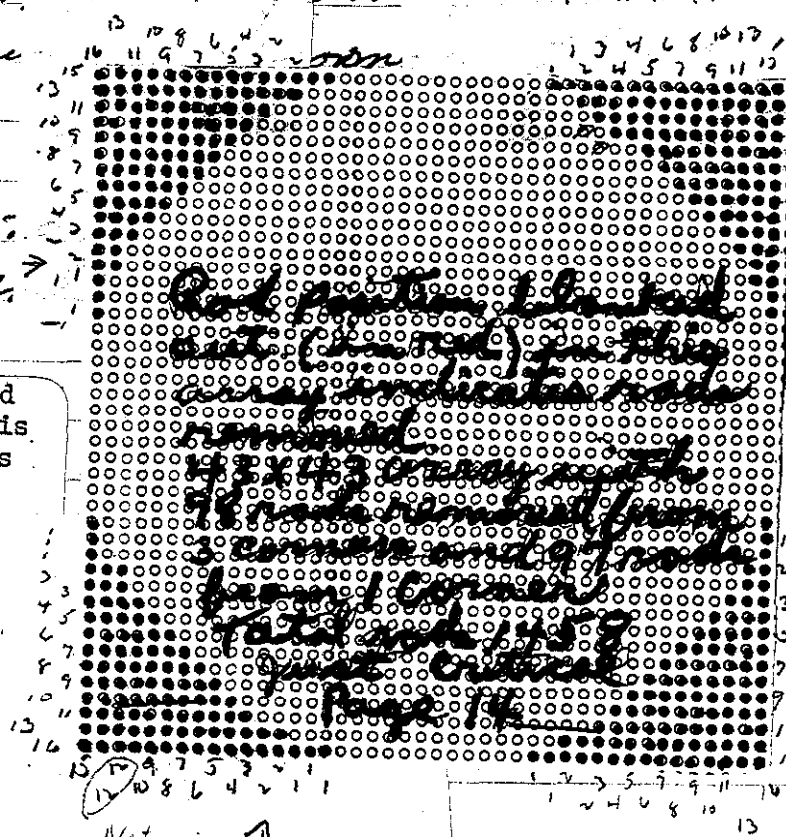
System just a

Drain.

Rod Position blanked out (in red) for this array indicates rods removed.

43 x 43 rods removed from 1 corner rods 1458 Just Cr

98



Not quite ↑

98

Removed 4 rods, 1 from each corner. Total number of rods now = 1457 rods.

Water ht = 36.20 cm

Temp °C

Per

24.1 °C

$C = -1064.77 \mu = -1.3 f$

1400

Drain.

Added 1 rod. Now have an 43 x 43 array with 98 rods removed from 3 corners, and 97 rods removed from 1 corner. Total of 1458

58

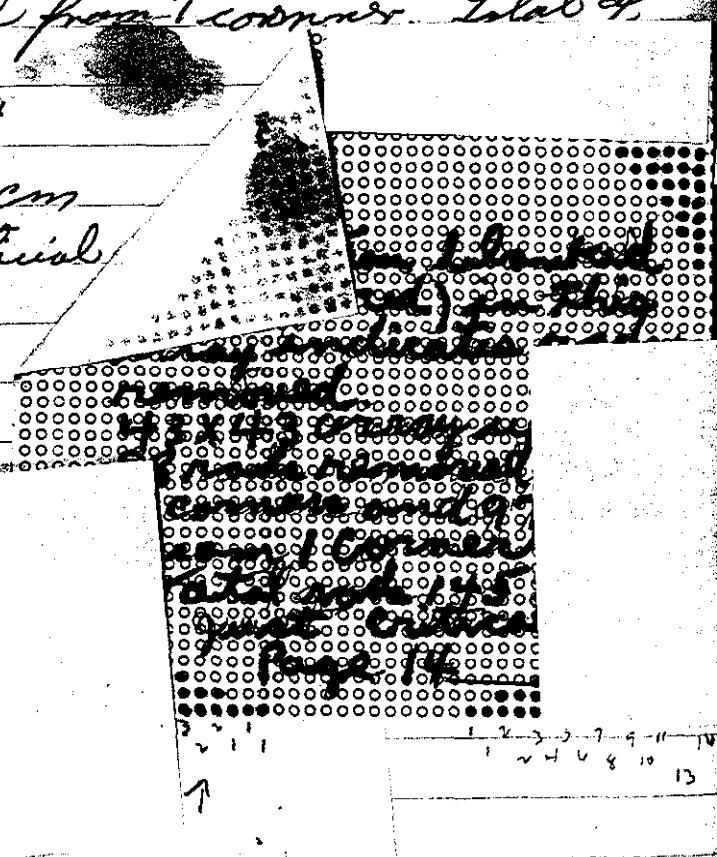
1423

Water ht = 36.20 cm  
System just critical  
Drain.

Rod Position blanked out (in red) for this array indicates rods removed.

43 x 43 array with 98 rods removed from 3 corners and 97 rods from 1 corner. Total rods 1458

Just Critical p. 14



1 2 3 4 5 6 7 8 9 10 11 12 13

INSTRUMENT CHECK

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

START-UP CHECK LIST

Equipment checked by I.D.C. Personnel check by I.D.C.  
 Instruments and safeties checked and reset by AKD  
 Source in checked by AKD Source No. M-93  
 Emergency equipment in control room checked by I.D.C.  
 Instruments in trip circuit: K-1 PM-1-2  
 Red light on by AKD Time 15-11  
 Start-up OK'd by I.D.C. AKD Date 11-8-68

10 17 /  
 7 11 12  
 15 17  
 11  
 5 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60  
 = 590  
 1  
 1  
 2  
 2  
 3  
 4  
 5  
 6  
 7  
 8  
 9  
 10  
 11  
 15 13  
 11  
 13

.092" U(4.89) rods.

.753 cm separation c-c.

~~60~~ cm length.

Square array is.

Now have an 33 x 33 array, 60 cm length.

Total of 1089 rods.

Top of fuel

 $H_2O = 16.85 \text{ cm}$ 

Water ht = 19.60 cm

s.d. = .30 cm

Temp °C

24.0 °C

+ Per

 $U = 32.59 \text{ m} = 21.64 = 71.93 \text{ f/cm}$ 

1.544 Water ht = 19.30 cm

System just critical

Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter <input checked="" type="checkbox"/>	2"	<input checked="" type="checkbox"/>	$3 \times 10^{-12}$
"	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2	"	Meter <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	"
"	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
P-1					
P-2					
PM-1	700 V	Alarm <input checked="" type="checkbox"/>	cont	<input checked="" type="checkbox"/>	500 V
PM-2	1200 V	Low <input checked="" type="checkbox"/>	12"	<input checked="" type="checkbox"/>	900 V
"	"	Alarm <input checked="" type="checkbox"/>	2"	<input checked="" type="checkbox"/>	"
LOG N CALIBRATE <input checked="" type="checkbox"/>		OPERATE <input checked="" type="checkbox"/>		SOURCE No. <u>B-80</u>	
DUMP WELL PROBE LIGHT <input checked="" type="checkbox"/> 7					

START-UP CHECK LIST

Equipment checked by F.D.C. Personnel check by F.D.C.  
 Instruments and safeties checked and reset by A.M.H.  
 Source in checked by A.M.H. Source No. M-43  
 Emergency equipment in control room checked by F.D.C.  
 Instruments in trip circuit: K-1 PM-1-2  
 Red light on by A.M.H. Time 0820  
 Start-up OK'd by F.D.C. A.M.H. Date 11-5-68

.753 cm separation c-c.  
60 cm length.

Removed 15 rods, now have an 33 X 33-15  
array. Total of 1074 rods.

Water ht = 20.00 cm  $\Delta h = .30$  Temp  $^{\circ}\text{C}$   
+ Per 23.5  $^{\circ}\text{C}$

$C = 39.11 \text{ sec} = 19.3 = 64.3 \text{ H/cm}$

0857 Water ht = 19.70 cm  
System just critical  
Drain.

Removed 26 rods. Now have an 32 X 32 + ~~25~~<sup>24</sup>  
array. Total of 1048 rods.

Water ht = 21.40 cm Temp  $^{\circ}\text{C}$   
+ Per 23.5  $^{\circ}\text{C}$

$C = 32.59 \text{ sec} = 21.64 \quad \Delta h = .50 \text{ cm}$

1028 Water ht = 20.90 cm  
System just critical  
Drain.

Removed 24 rods. Now have an 32 x 32 array. Total of 1024 rods.

Water ht = 25.00 cm  $z_h = 1.75$  cm Temp  $^{\circ}$ C  
 3 + Per 23.8  $^{\circ}$ C

$E = 30.96$  sec = 22.5 = 12.9 H/cm

1125 Water ht = 23.25 cm  
 System just critical  
 Drain.

~~24~~  
 Removed 10 rods. Now have an 32 x 32 - 10 array. Total of 1014 rods.

Water ht = 32.30 cm  $z_h = 7.10$  cm Temp  $^{\circ}$ C  
 4 + Per. 23.6  $^{\circ}$ C

$E = 86.96$  sec = 110.4 = 1.5

1430 Water ht = 25.20 cm  
 System just critical  
 Drain.

avg.



Remained 8 rods. Have an ~~32x32-17~~  
array. Total of 1006 rods.

1530 Water ht = 32.50 cm Temp °C  
5 - Per N.G. 23.8°C  
Drain to ~ 5 cm. and added 4 rods.

Now have an 32x32-14 array.  
Total of ~~1000~~<sup>1010</sup> rods.

Water ht = 32.50 cm Temp °C  
6 - Per 29.0°C

1603 Drain:  
C = -499.79 m = 2.84

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					
FA-1	700V	Alarm ✓	Out	✓	500V
FA-2	1200V	Low ✓	12	✓	900V
"	"	Alarm ✓	7"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROBE LIGHT		_____			

START-UP CHECK LIST

Equipment checked by E.D.C. AKV Personnel check by E.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 E.D.C.  
 Instruments in trip circuit: K-1 PM-1-2  
 Red light on by AKV Time 1315  
 Start-up OK'd by E.D.C. AKV Date 11-6-68

.092" rods @ c (7.89)  
1753 cm separation c-c  
60 cm length.  
Square array.

Now have an 32 x 32 - 12 array. Total of 1012 rods.

Water ht = 32.50 cm  $OR = 5.2$  Temp °C  
+ Res 23.8 °C  
 $t = 304.22 \text{ sec} = 3.84$

1358 Water ht = 27.35 cm - 16.2 (1.15)  
System just critical  
Drain.

~~Water ht = 23~~

Now have an 32 x 32 - 13 array. Total of 1011 rods.

Water ht = 32.50 cm - 16.25  
System just critical  
Drain. Temp °C 23.8 °C

11-6-68  
32 x 32 Array with 13  
rods removed from  
1 face  
Total: 1011 P-22

INSTRUMENT CHECK

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

LOG N CALIBRATE  OPERATE  SOURCE No. B-80

DUMP WELL PRQBE LIGHT

START-UP CHECK LIST

Equipment checked by AKM Personnel check by F.D.C.  
F.D.C.  
 Instruments and safeties checked and reset by AKM  
 Source in checked by AKM Source No. M-93  
 Emergency equipment in control room checked by F.D.C.  
 Instruments in trip circuit: K-1 PM-1-2  
 Red light on by AKM Time 19:55  
 Start-up OK'd by F.D.C. AKM Date 11-7-68

.092" O (4.88) rods.  
.753 cm separation c-c  
60 cm lengths.  
Rounded array!

Top of fuel

H<sub>2</sub>O = 17.5 cm (Average on its side)

Now have an 35 x 35 array, with 61 rods removed from each corner. Total of 981 rods.

Water ht = 36.70 cm

1 - Per

$T = -354.20 \text{ cm} = -4.1 \text{ f}$

1540 Drain to ~ 5.0 cm and added 2 rods.

Now have an 35 x 35 array with 61 rods removed from 2 corners, and 60 rods removed from 2 corners. Total of 983 rods.

Water ht ~~33~~ 33.80 cm

D<sub>h</sub> = 4.8

Le = 0

2 + Per

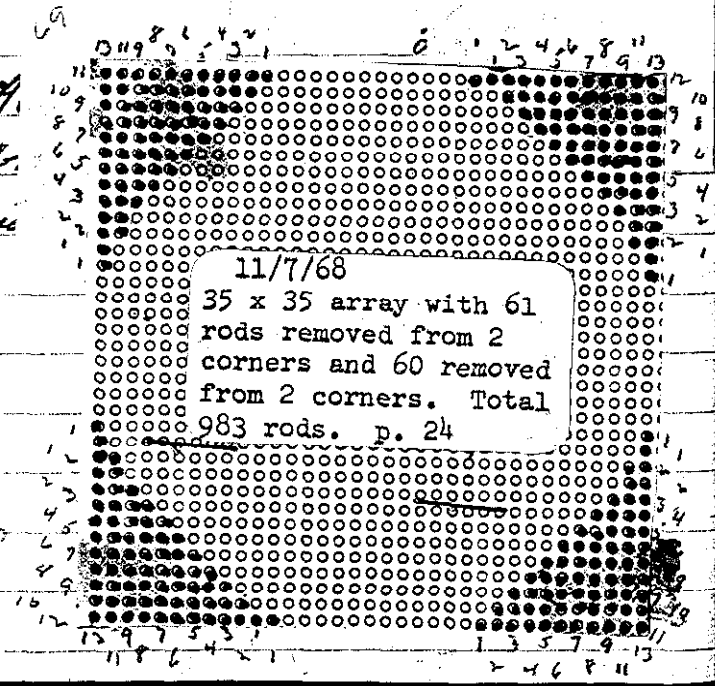
$1053.90 \text{ cm} = 1.1 \text{ f} = .239 \text{ f}$

1614 Water ht = 28.95 cm

system just critical  
Drain

17.5  
11.4

This does not match the description. The log with 21 9/87



.092" O (4.88) rods.  
.753 cm separation c-c  
60 cm length.  
Rounded array.

Top of fuel

H<sub>2</sub>O = 17.5 cm (Artery on its side)

Now have an 35 x 35 array, with 61 rods removed from each corner. Total of 981 rods.

Water ht = 36.70 cm

1-Per

$T = -354.20 \mu = -4.1 f$

1540 Drain to ~ 5.0 cm and added 2 rods.

Now have an 35 x 35 array, with 61 rods removed from 2 corners, and 60 rods removed from 2 corners. Total of 983 rods.

Water ht = 33.80 cm

$D_{1/2} = 4.8$

Temp °

2+Per

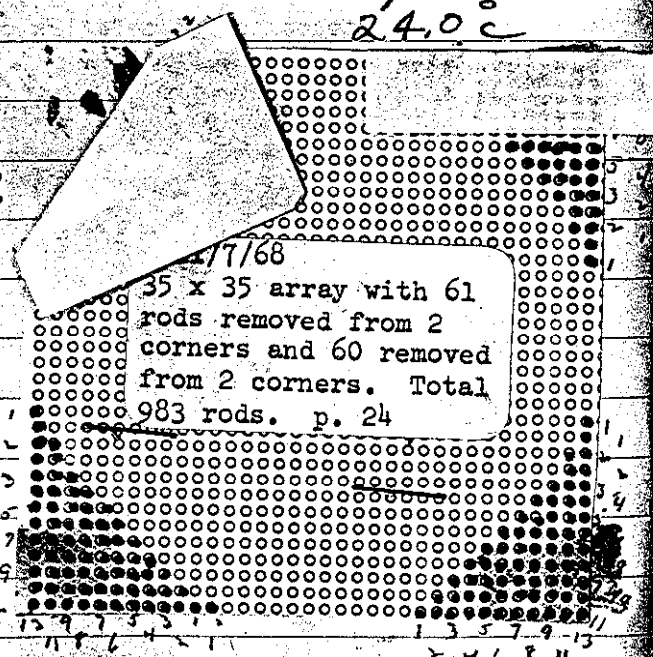
24.0 °

$1053.90 \mu = 1.1 f = .239 \mu m$

1614 Water ht = 28.95 cm

System just critical  
Drain

17.5  
11.43



The dwg does not match the description. The dwg does not match the description. w.r. 24 does not match the description. 10/87



11/8/68

35x35 array with 61 rods removed from 3 corners and 60 rods removed from 1 corner. Total 982 rods.

0913

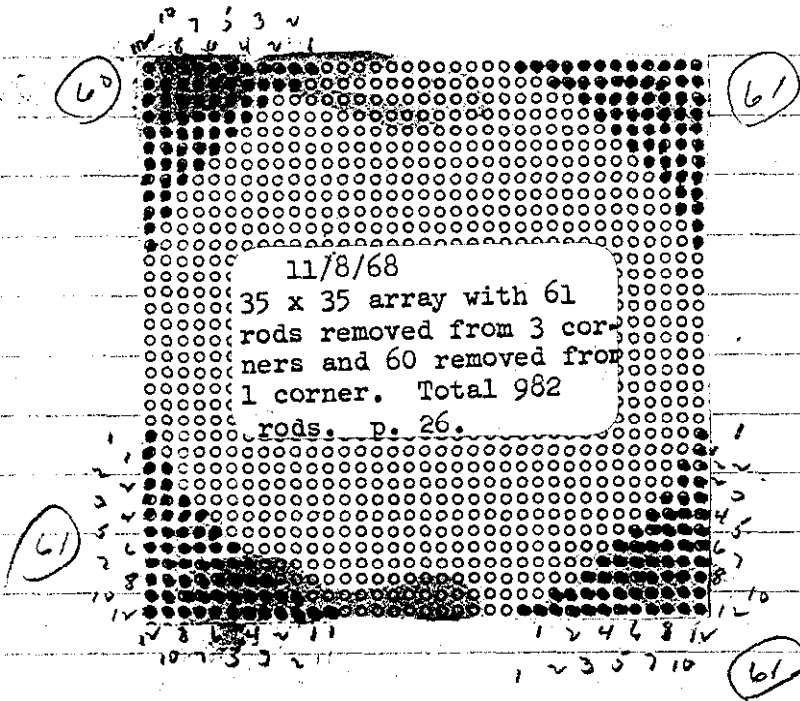
Wrtw @ 32.5 cm. Subcritical. Source dead in  
-17.5  
15.0 min T = 23.5°C

0920

Source arr. for long period.  
T = -1282.07 sec = -1.04

0927

Drawn.





## 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 ✓	2.5"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700 V	Alarm -	cont	-	500 V
PM-2	1200 V	Low -	13.5"	✓	900 V
"	"	Alarm -	3.5"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROBE LIGHT _____					

## START-UP CHECK LIST

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

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

Red light on by AKH Time 1445

Start-up OK'd by F.I.D.C. AKH Date 11-17-68

28

.092"  $\phi$  (489) rods.  
 .845 cm separation c-c.  
 30 cm lengths.  
 Square array's

Top of Fuel  
 $H_{2O} = 21.0$  cm.

Now have an  $39 \times 39 - 16$  array. Total of 1505 rods.

Water ht = 36.40 cm  $\Delta h = 6.9$  cm  
 Temp  $^{\circ}C$   
 23.6  $^{\circ}C$   
 1 + Per  
 $E = 228.16$  sec = 5.0 f = .72 f/cm

1533 Water ht = 29.50 cm  
 System just critical  
 Drain to ~ 15.0 cm and removed 1 rod.

Now have an  $39 \times 39 - 17$  array. Total of 1504 rods.

Water ht = 36.50 cm  $\Delta h = 6.1$   
 Temp  $^{\circ}C$   
 23.6  $^{\circ}C$   
 2 + Per  
 $E = 406.35$  sec = 2.9 f = .47 f/cm

1600 Water ht = 30.40 cm  
 System just critical  
 Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	✓	2"	✓	$3 \times 10^{-12}$
"	"	✓	"	✓	"
K-2	$3 \times 10^{-12}$	✓	"	✓	"
"	"	✓	"	✓	"

R-1

R-2

PM-1	700V	Alarm	✓	1/2"	✓	500V
PM-2	1200V	Low	✓	12"	✓	900V
		Alarm	✓	2"	✓	"

LOG IN CALIBRATE  OPERATE  SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by F.I.C. Personnel check by AKU

Instruments and safeties checked and reset by AKU

Source in checked by AKU Source No. M-43

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

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

Red light on by AKU Time 0810

Start-up OK'd by F.I.C. AKU Date 11-13-68

5

504

Top  
H<sub>2</sub>O

Repeat of experiment described on bottom of p-28  
39 x 39 - 17 array. Total of 1504 rods.

Water ht = 36.50 cm  $z_h = 6.1$  cm Temp °C  
+ P<sub>ex</sub> 23.4 °C

$$E = 391.11 \text{ sec} = 3.14 = .514/\text{cm}$$

0924 Water ht = 30.40 cm

System just critical.

Drain. to ~ 15.0 cm and removed 1 rod.

Now have an 39 x 39 - 18 array. Total of 1503 rods.

0948 Water ht = 36.50 cm  $z_h = 15.5$  cm Temp °C  
System just critical 23.4 °C  
Drain.

11-13-68  
39 x 39 array with 18  
rods removed from 1  
face. Total rods 1503

p. 30

Top of fuel

$$H_2O = 22.80 \text{ cm}$$

.092" rods  
 .845 cm separation c-c  
 30 cm length.  
 Rounded array's.

Now have an  $43 \times 43$  array, with 99 rods removed from each corner. Total of 1453 rods.

Water ht = 38.20 cm  $dh = 9.2 \text{ cm}$  Temp  $^{\circ}\text{C}$   
 $2 + \text{Per}$  23.8  $^{\circ}\text{C}$   
 $\tau = 119.57 \text{ sec} = 8.6 \text{ f} = .93 \text{ f/cm}$

1.515 Water ht = 29.00 cm  
 System just critical  
 Drawn.

Removed 4 rods. Now have an  $43 \times 43$  array, with 100 rods removed from each corner. Total of 1449 rods.

Water ht = 38.20 cm  $dh = 6.9 \text{ cm}$  Temp  $^{\circ}\text{C}$   
 $3 + \text{Per}$  24.0  $^{\circ}\text{C}$   
 $\tau = 486.75 \text{ sec} = 2.5 \text{ f} = .36 \text{ f/cm}$

Water ht = 31.30 cm  
 System just critical  
 Drawn.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3X10 <sup>-12</sup>	Meter ✓	2"	✓	3X10 <sup>-12</sup>
"	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	1/2"	✓	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 F.I.C. A.M.C. Personnel check by F.I.C.  
 Instruments and safeties checked and reset by A.M.C.  
 Source in checked by A.M.C. Source No. M-43  
 Emergency equipment in control room checked by F.I.C.  
 Instruments in trip circuit: K-1-2 PM-1-2  
 Red light on by A.M.C. Time 0810  
 Start-up OK'd by F.I.C. A.M.C. Date 11-18-68

Repeat of experiment described on bottom  
of p-31.  $43 \times 43$  array, with 100 rods  
removed from each corner. Total of  
1449 rods.

Water ht = 38.40 cm  $dh = 7.1 \text{ cm}$  Temp  $^{\circ}\text{C}$   
+ Per 24.0  $^{\circ}\text{C}$   
 $t = 430.25 \text{ sec} = 2.84 = .39$

0914 Water ht = 31.30 cm  
System just critical  
Draw

Removed 1 rod. Have an  $43 \times 43$  array, with  
101 rods removed from 1 corner, and 100 rods  
removed from 3 corners. Total of 1448 rods.

Water ht = 38.40 cm  $dh = 5.85 \text{ cm}$   
+ Per

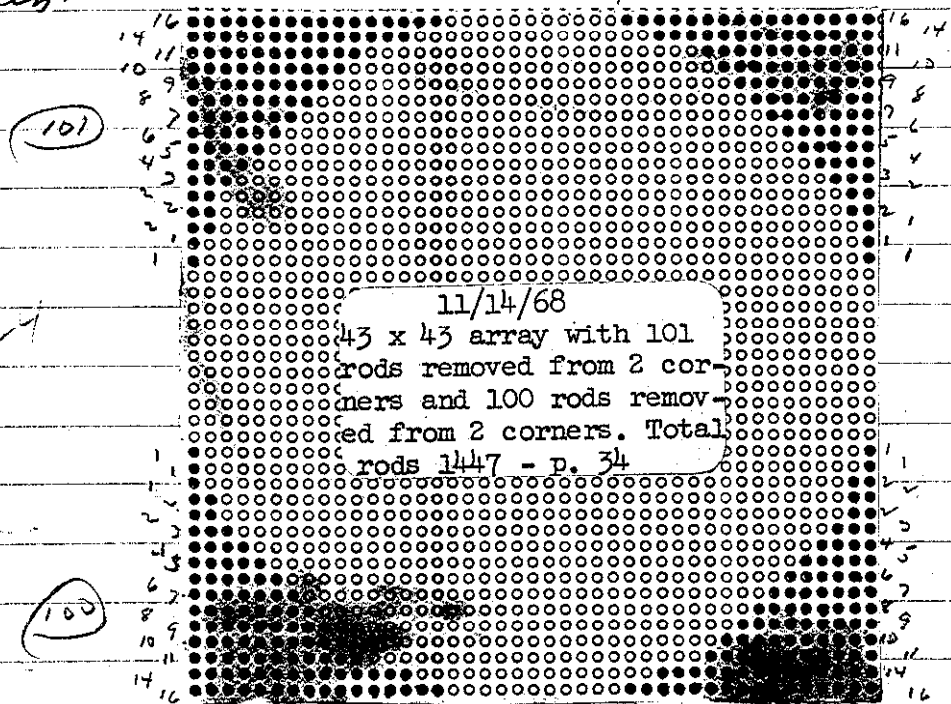
$t = 390.93 \text{ sec} = 1.49 = .54 \text{ H/cm}$

1000 Water ht = 32.55 cm  
System just critical

Removed 1 rod. Now have an 43 x 43 array with 101 rods removed from 2 corners, and 100 rods removed from 2 corners. Total of 1447 rods.

1025. Water ht = 38.40 cm  
 System just critical  
 Drain.

Temp °C  
 24.2°C





INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	2.5"	✓	$3 \times 10^{-12}$
"	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	2"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	1/2"	✓	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 F.I.D.C. Personnel check by F.I.D.C.

Instruments and safeties checked and reset by AMC

Source in checked by AMC Source No. M-43

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 AMC Time 1330

Start-up OK'd by F.I.D.C. AMC Date 11-15-68

.092" rods. V(4.89)  
 .845 cm separation c-c.  
 60 cm lengths  
 Square array

Top of fuel  
 $H_2O = 17.70 \text{ cm.}$

Top  
 $H_2O$

Now have an  $32 \times 32 - 16$  array. Total of 1008 rods.

Water ht = 21.20 cm  $DL = .40 \text{ cm}$  Temp  $^{\circ}\text{C}$   
 1 + per 23.7  $^{\circ}\text{C}$

$$t = 54.32 \text{ sec} = 15.5 \text{ ft} = 38.75 \text{ ft/cm}$$

1410 Water ht = 20.80 cm  
 System just critical  
 Drain.

Removed 12 rods. Now have an  $32 \times 32 - 28$  array. Total of 996 rods.

Water ht = 22.10 cm  $DL = .80 \text{ cm}$  Temp  $^{\circ}\text{C}$   
 2 + per 24.0  $^{\circ}\text{C}$

$$t = 36.94 \text{ sec} = 20.0 \text{ ft} = 25.0 \text{ ft/cm}$$

1515 Water ht = 21.30 cm  
 System just critical  
 Drain.

Top of fluid

$$H_{20} = 16.80 \text{ cm}$$

Removed 19 rods. Now have an  $31 \times 31 + 16$  array. Total of 977 rods.

Water ht 26.20 cm.

$$\Delta h = 2.80 \text{ cm}$$

Temp  $^{\circ}\text{C}$

$^3 + \text{Pr}$

24.0  $^{\circ}\text{C}$

$$t = 43.46 \text{ sec} = 18.0 \text{ f} = 6.4 \text{ Hcm}$$

Water ht = 23.40 cm

System just critical  
Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	2.5"	✓	$3 \times 10^{-12}$
"	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	5"	✓	500V
PM-2	1200V	Low ✓	12"	✓	900V
"	"	Alarm ✓	3"	✓	"

LOG N CALIBRATE  OPERATE  SOURCE No. D-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

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

Instruments and safeties checked and reset by AKM

Source in checked by AKM Source No. 19-43

Emergency equipment in OK all reset checked by F.D.C.

Instruments in OK K-1-2 PM 1-2

Red light on by AKM Time 0810

Start-up OK'd by F.D.C. AKM Date 11-19-68

*Top 9  
72*

.092" rods O(4.89)  
1845 cm operation e-c,  
60 cm length.  
Square array's.

39

Top of fuel

H<sub>2</sub>O = 16.80 cm.

Removed 16 rods. (see p-37) Now have  
an 31 X 31 array. Total of 961 rods.

Water ht = 32.40 cm

Temp °C

<sup>1</sup>-Per

23.6 °C

N.G

0855 Drain:

added 4 rods. Now have an 31 X 31 + 4  
array. Total of 965 rods.

Water ht = 32.50 cm

Temp °C

<sup>2</sup>-Per

23.7 °C

$\tau = -158.6 \text{ sec} = -11.2 \text{ f}$

0935 Drain:

added 4 rods. Now have an 31 X 31 + 8  
array. Total of 969 rods.

Water ht = 32.50 cm.

Temp °C

<sup>3</sup>-Per

23.8 °C

$\tau = -608.4 \text{ sec} = -2.3 \text{ f}$

1027 Drain:

Added 1 rod. Now have an 31 x 31 + 9  
array. Total of 970 rods.

1050

Water ht = 32.50 cm  
System just critical  
Drain.

Temp °C  
23.8°C

11-19-68

11-19-68  
31 x 31 array + 9 rods  
on 1 face  
Total rods 970  
P-40

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3 x 10 <sup>-12</sup>	Meter ✓	2.5"	✓	3 x 10 <sup>-12</sup>
"	"	Flow ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
"	"	Flow ✓	"	✓	"
R-1					
R-2					
PM	700V	Alarm -	1.5"	✓	500V
PM	1200V	Low ✓	12"	✓	900V
"	"	Alarm ✓	2"	✓	"

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

START-UP CHECK LIST

Equipment checked by F.D.C. AKL Personnel check by F.D.C.  
 Instruments and safeties checked and reset by AKL  
 Source in checked by AKL Source No. M-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 AKL Time 0910  
 Start-up OK'd by F.D.C. AKL Date 11-20-68

42

.092" rods U(9.89)  
 .845 cm separation c-c.  
 60 cm lengths.  
 Rounded array.

Top of fuel

 $H_2O = 18.40 \text{ cm.}$ 

Now have an  $35 \times 35$  array, with 67 rods removed from each corner. Total of 957 rods.

Water ht = 22.80 cm  
 + Per.

Temp  $^{\circ}C$   
 23.5  $^{\circ}C$

 $C = 82.57 \text{ sec} = 11.4 \%$ 

0953 Water ht = 22.20 cm

System just critical  
 Drain.

Removed 16 rods. 4 from each corner. Now have an  $35 \times 35$  array, with 71 rods removed from each corner. Total of 941 rods.

Water ht = 33.80 cm  
<sup>2</sup> + Per

Temp  $^{\circ}C$   
 23.7  $^{\circ}C$

 $C = 169.49 \text{ sec} = 6.4 \%$ 

1055 Water ht = 26.20 cm

System just critical  
 Drain.



Removed 4 rods. 1 from each corner. Now have an 35x35 array, with 72 rods removed from each corner. Total of 937 rods.

Water ht = 33.80 cm

Temp °C

3 - Per

23.7 °C

$\bar{v} = -325.95 \text{ cm} = -4.5 \text{ f}$

1300

Drain

Added 2 rods. 1 each to opposite corners. Now have an 35x35 array, with 72 rods <sup>out of</sup> ~~out of~~ 2 corners, and 71 rods <sup>out of</sup> ~~out of~~ 2 corners. Total of 939 rods.

Water ht = 33.90 cm

7 - Per

$\bar{v} = 1629.75 \text{ cm} = .80 \text{ f}$

1335

Water ht = 29.75 cm

System just critical

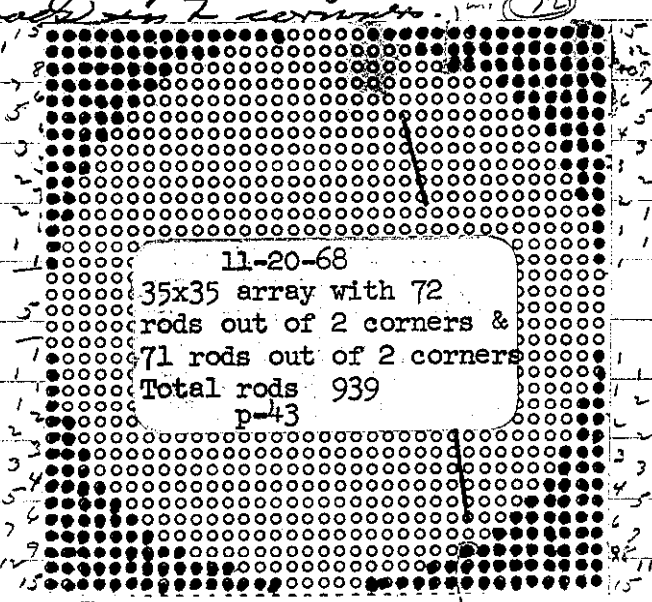
Drain

29.75

FVS

18.4

11.35



over.

Removed 1 rod. Now have ~~72 rods~~ an  
 35 x 35 array, with 72 rods removed from  
 3 corners and 71 rods removed from 1  
 corner. Total of 938 rods.

Water ht = 33.80 cm

5-Per

Temp °

23.8 °

$T = -717.09 \text{ sec} = -1.9 \text{ F}$

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	700 V	Alarm —	.5"	—	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 I.D.C. AKK Personnel check by R.K.R.  
 Instruments and safeties checked and reset by AKK  
 Source in checked by AKK Source No. M-43  
 Emergency equipment in control room checked by I.D.C.  
 Instruments in trip circuit: K-1 PM-1-2  
 Red light on by AKK Time 1435  
 Start-up OK'd by I.D.C. AKK Date 11-21-68

46

.092" rods  $\phi$  (4.89)  
1890 cm separation c-c.  
30 cm lengths.  
Square array's

Top of fuel

$H_2O = 21.0 \text{ cm}$

Have an  $39 \times 39$  array. Total of 1521 rods.

Water ht = 36.50 cm

System sub critical  
Drain.

Temp  $^{\circ}C$

23.6  $^{\circ}C$

## INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Master ✓	2"	✓	$3 \times 10^{-12}$
"	"	Fast ✓	"	✓	"
K-2	"	Master	"	✓	"
"	"	Fast	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	15"	✓	500
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 <sup>F.D.C.</sup> AKH Personnel check by AKHInstruments and safeties checked and reset by AKHSource in checked by AKH Source No. M-43Emergency equipment in control room checked by F.D.C.Instruments in trip circuit: K-1 - K-2 PM-1-2Rod light on by AKH Time 0800Start-up OK'd by F.D.C. AKH Date 11-27-68

Top of fuel  
 $H_{20} = 26.90 \text{ cm}$

.092" rods  $V(4.89)$   
 .890 cm separation c-c,  
 30 cm length.  
 Square array 'v'.

Added 19 rods to 1 fuel. Now have an  $39 \times 39 + 19$   
 array. Total of 1540 rods.

0850 Water ht = 42.40 cm Temp  $^{\circ}\text{C}$   
 System sub critical 23.3  $^{\circ}\text{C}$   
 Drain.

Added 20 rods. Now have an  $39 \times 40$  array.  
 Total of 1560 rods.

Water ht = 42.25 cm  $\Delta h = 7.15 \text{ cm}$  Temp  $^{\circ}\text{C}$   
 + Per Temp  $^{\circ}\text{C}$   
 $E = 217.30 \text{ sec} = 5.2 \phi$  23.4  $^{\circ}\text{C}$

0923 Water ht = 35.10 cm  
 System just critical  
 Drain.

Removed ~~4~~ 4 rods. Now have an  $39 \times 39 + 35$   
 array. Total of 1556 rods.

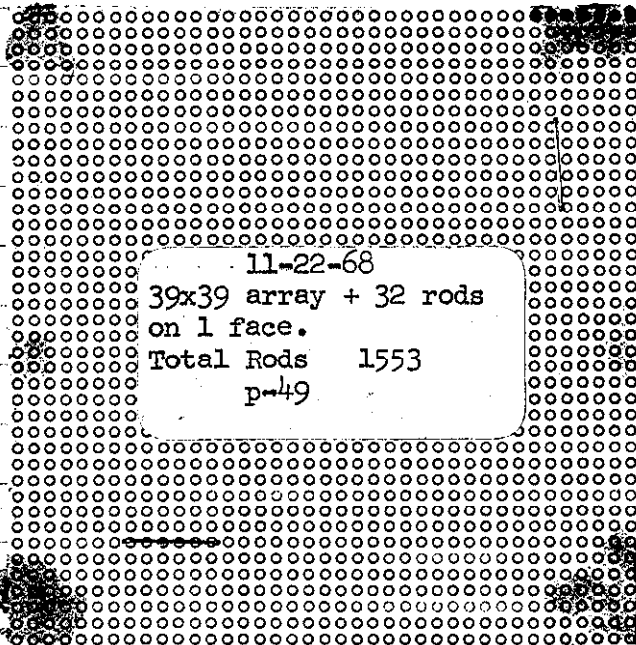
Water ht = 42.40 cm  $\Delta h = 6.30 \text{ cm}$   
 + Per  
 $E = 412.87 \text{ sec} = 2.9 \phi$

Water ht = 36.10 cm  
System just critical  
Drain.

Removed 3 rods. Now have on 39 x 39 + 32  
array. Total of 1553 rods.

1040 Water ht = 42.40 cm  
System just critical  
Drain.

Temp °  
23.6 °



#3

+35

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3 X 10 <sup>-12</sup>	Alarm ✓	2"	✓	3 X 10 <sup>-12</sup>
"	"	Alarm ✓	"	✓	"
K-2	"	Alarm ✓	1.5"	✓	"
"	"	Alarm ✓	"	✓	"
R-1					
R-2					
PM-1	700v ✓	Alarm ✓	.5"	✓	
PM-2	1200v ✓	Alarm ✓	12"	✓	
		Alarm ✓	2"	✓	

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

START-UP CHECK LIST

Equipment checked by F.I.D.C. AKL Personnel check by F.I.D.C.  
 Instruments and safeties checked and reset by AKL  
 Source in checked by AKL Source No. M-43  
 Emergency equipment for use of road checked by F.I.D.C.  
 Instruments for use checked K-1 PM 1-2  
 Red Light on by R.K.M. Time 0905  
 Start-up OK'd by F.I.D.C. AKL Date 11-25-68

Top  
H<sub>2</sub>C

0



.092" rods. U.C. 891  
 .890 cm separation c-c  
 30 cm length.

top of fuel  
 $H_{2O} = 28.50 \text{ cm}$

~~bounded array~~  
 bounded array's

Now have an  $44 \times 44$  array, with 97 rods removed from each corner. Total of 1548 rods.

Water ht = 30.75 cm  $D_h = .55$  Temp  $^{\circ}C$   
 $1 + P_{ex}$  23.3  $^{\circ}C$   
 $\bar{v} = 56.50 \text{ cm} = 15.14$

0947 Water ht = 30.20 cm  
 System just critical  
 Drain.

Removed 8 rods. 2 from each corner. Now have an  $44 \times 44$  with 99 rods removed from each corner. Total of 1540 rods.

Water ht = 31.30 cm  $D_h = .90 \text{ cm}$  Temp  $^{\circ}C$   
 $2 + P_{ex}$  23.3  $^{\circ}C$   
 $\bar{v} = 45.63 \text{ cm} = 17.44$

Water ht = 30.50 cm  
 System just critical  
 Drain.

Removed 8 rods, 2 from each corner. Now  
have an 44 x 44 with 101 rods removed  
from each corner. Total of 1532 rods.

Water ht = 31.90 cm  $\Delta h = 1.0$  cm. Temp  $^{\circ}$ C  
<sup>3</sup>+ P<sub>so</sub> 23.4  $^{\circ}$ C  
 $t = 45.63$  sec = 17.4 f

1100 Water ht = 30.90 cm  
 System just 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 ✓	1.5"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	7000	Alarm ✓	5"	✓	5000
PM-2	12000	Low ✓	12"	✓	9000
"	"	Alarm ✓	2"	✓	"
LOG N CALIBRATE		✓	OPERATE	—	SOURCE No. B-80
DUMP WELL PROBE LIGHT —————					

## START-UP CHECK LIST

Equipment checked by F.D.C. A.K.M. Personnel check by F.D.C.

Instruments and safeties checked and reset by A.K.M.

Source in checked by A.K.M. Source No. M-03

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

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

Red-light on by A.K.M. Time 0815

Start-up OK'd by F.D.C. A.K.M. Date 11-26-68

.092" rods  $\cup$  (4.89)  
 .890 cm separation c-c  
 30 cm lengths.  
 Rounded array's.

Removed 16 rods. 4 from each corner. Now have an  $44 \times 44$  with 105 rods removed from each corner. Total of 1516 rods.

Water ht = 33.50 cm

Temp  $^{\circ}\text{C}$

+ Per

23.3  $^{\circ}\text{C}$

$\tau = 49.99 \text{ sec} = 16.44$

0.909

Water ht = 31.95 cm

System just critical  
 Drain.

Removed 16 rods, 4 from each corner. Now have an  $44 \times 44$  array with 109 rods removed from each corner. Total of 1500 rods.

Water ht = 44.00 cm

Temp  $^{\circ}\text{C}$

+ Per

23.6  $^{\circ}\text{C}$

$\tau = 123.86 \text{ sec} = 8.34$

0.950

Water ht = 34.30 cm

System just critical  
 Drain.

Removed 8 rods. 2 from each corner. Now have an  $44 \times 44$  array with 111 rods removed from each corner. Total of 1492 rods.

Water ht = 44.10 cm

Temp  $^{\circ}\text{C}$

<sup>3</sup>- Per

23.6  $^{\circ}\text{C}$

$$I = -695.36 \text{ sec} = -2.0 \text{ f}$$

11.16 Drain

Added 4 rods. 1 to each corner. Now have an  $44 \times 44$  array, with 110 rods removed from each corner. Total of 1496 rods.

Water ht = 44.00 cm

Temp  $^{\circ}\text{C}$

<sup>4</sup>+ Per

24.0  $^{\circ}\text{C}$

$$I = 436.77 \text{ sec} = 2.8 \text{ f}$$

1.355 Water ht = 36.50 cm

System just critical

Drain.

Removed 1 rod. Now have an 44x44 array  
 with ~~111~~<sup>111</sup> rods removed from 1 corner  
 and 110 rods removed from 3 corners.  
 Total of ~~1497~~<sup>1497</sup> rods.  
 1495 RRR.

Water ht = 44.10 cm  
 5 + Per

Temp °C  
 24.0 °C

$\tau = 847.47 \text{ sec} = 1.5 \text{ f}$

1427 Water ht = 37.30 cm

System just critical  
 Drain.

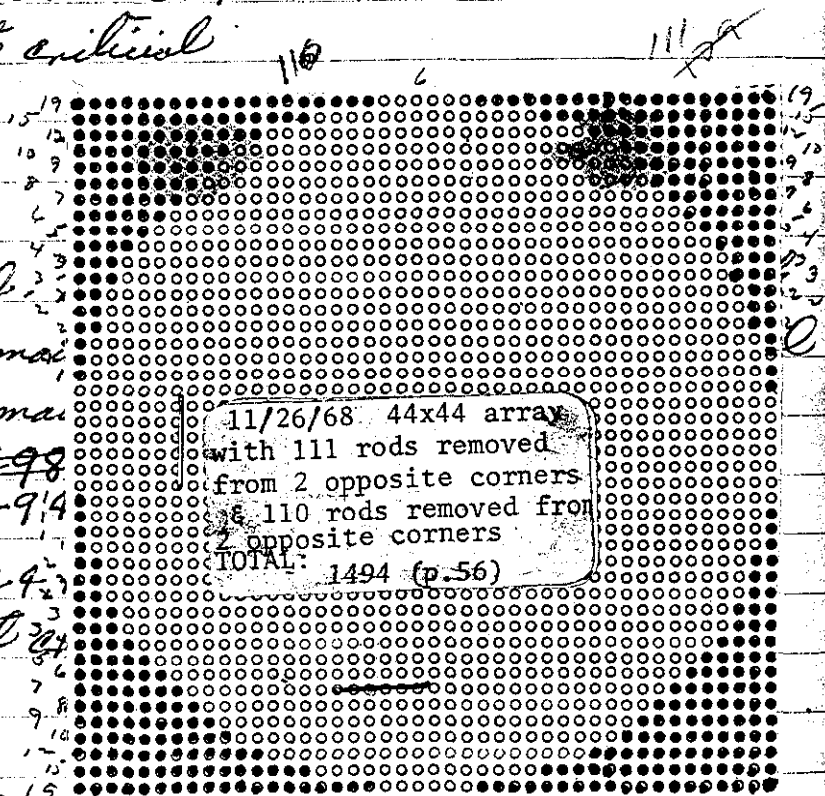
Removed 1 rod  
~~111~~<sup>111</sup> rods remain  
 110 rods remain

Total of ~~1498~~<sup>1498</sup>  
 1494

1515 Water ht = 44.27

System just critical  
 Drain.

Corrected by RRR.  
 6-3-69



32

Removed 1 rod. Now have an 44x44 array  
 with ~~107~~<sup>111</sup> rods removed from 1 corner  
 and 110 rods removed from 3 corners.  
 Total of ~~1495~~<sup>1497</sup> rods.  
 1495 RKR.

Water ht = 44.10 cm  
 5 + Res

Temp °C  
 24.0 °C

$\Gamma = 847.47 \text{ sec} = 1.5 \text{ f}$

1427 Water ht = 37.30 cm

System just critical  
 Drain.

15  
12  
10  
9  
8  
7  
6  
5  
4  
3

Removed 1 rod. Now have an 44x44 array, with  
~~107~~<sup>111</sup> rods removed from 2 opposite corners, and  
 110 rods removed from 2 opposite corners.  
 Total of ~~1498~~<sup>1499</sup> rods.  
 1494 RKR

1515 Water ht = 44.40 cm  
 System just critical  
 Drain.

Temp °C  
 24.3 °C

7  
8  
9  
12  
15

Corrected by RKR  
 6-3-69

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	—	—	—
P-1	—	—	—	—	—
P-2	—	—	—	—	—
PM-1	700V ✓	Alarm ✓	.5"	—	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 F.I.D.C. Personnel check by F.I.D.C.

Instruments and safeties checked and reset by AKKJ

Source in checked by AKKJ Source No. 14-93

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

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

Red light on by AKKJ Time 1035

Start-up OK'd by F.I.D.C. AKKJ Date 12-2-68

19  
18  
17  
16  
15  
14  
13  
12  
11  
10  
9  
8  
7  
6  
5  
4  
3  
2  
1



58

.092" rods  $V(4.89)$   
 .890 cm separation c.c.  
 60 cm length.  
 Square array's.

Top of Fuel

$H_2O = 24.20$  cm New have an  $32 \times 32 + 26$  array. Total of  
 1050 rods.

Water ht = 25.80 cm  $\Delta h = .20$  cm Temp  $^{\circ}C$   
 + Per 23.6  $^{\circ}C$

$\tau = 63.02$  sec = 13.94

Water ht = 25.60 cm

System just critical  
 Drain.

Removed 13 rods. New have an  $32 \times 32 + 13$  array.  
 Total of 1037 rods.

Water ht = 26.15 cm  $\Delta h = .35$  cm Temp  $^{\circ}C$   
 + Per 23.6  $^{\circ}C$

$\tau = 32.59$  sec = 21.64

1325 Water ht = 25.80 cm

System just critical  
 Drain.

Top of  
 $H_2O =$

10

1

Top of fuel

140 = 23.30 cm, Removed 29 rods. Now have an  $32 \times 32 - 16$  array. Total of 1008 rods.

Water ht = 27.00 cm  $D_h = .50$  cm. Temp  $^{\circ}C$   
 $3 + Per$  24.0 $^{\circ}C$

$$L = 39.11 \text{ cm} = 19.3 f$$

1505 Water ht = 26.50 cm.  
 System just critical  
 Drain.

Removed 24 rods. Now have an  $31 \times 31 + 23$  array. Total of 984 rods.

Water ht = 28.70 cm Temp  $^{\circ}C$   
 $4 + Per$  24.0 $^{\circ}C$

$$L = 80.40 \text{ cm} = 11.7 f$$

1544 Water ht = 28.00 cm  
 System just critical  
 Drain.

Top  
H<sub>2</sub>O

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE	SET	STAR RAN
K-1	3X10 <sup>-12</sup>	✓	2"	✓	3X10 <sup>-12</sup>
"	"	✓	"	✓	"
K-2	~	✓			
R-1					
PM 1	700 V	✓	.5"	✓	500V
PM 2	1200 V	✓	1.2"	✓	900V
"	"	✓	2"	✓	"
LCS IN OPERATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL FROZE LIGHT _____					

START-UP CHECK LIST

Equipment checked by I.V.C. / A.H.B. Personnel check by \_\_\_\_\_

Instruments and safeties checked and reset by A.H.B.

Source in checked by \_\_\_\_\_ Source No. \_\_\_\_\_

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

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

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

Start-up OK'd by \_\_\_\_\_ Date 12-3-68

.092" rods UCF.89)  
1890 cm separation c-c  
60 cm length.  
Square arrays.

Top of Fuel

H<sub>2</sub>O = 23.30 cm Remained 11 rods.

Now have on 31 x 31 + 12 rods

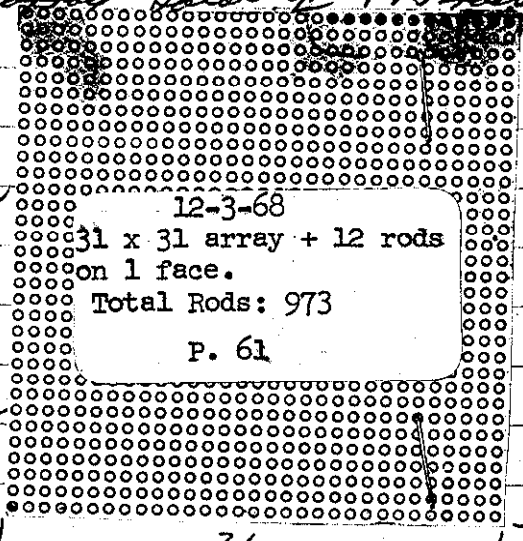
This diagram is numbered in rows. Total of 973 rods.

Water ht = 38.80 cm

1 - Per  $\frac{-23.3}{15.5}$  top reflected

T = 2455.5 sec = - .53 f

1052 Drain.



Added 1 rod. Now have Total of 974 rods.

Water ht = 38.75 cm

2 + Per

T = 399.83 sec = 3.0 f

Temp °C

29.4 °C

1027 Water ht = 32.70 cm - 23.3 = 9.4 cm top reflected  
System just critical  
Drain

START RAN

X10<sup>-2</sup>

"

500 V

000 V

80

.092" rods UCF.89)  
1890 cm separation c-c  
60 cm length.  
Square array's.

Top of Fuel

H<sub>2</sub>O = 23.30 cm Remaind 11 rods.

This diagram is  
a water level in rods  
Total of 973 rods

Now have an 31 X 31 + 12 array.

Water ht = 38.80 cm

Temp °C  
24.3 °C

1 - Per  $\frac{-23.3}{15.5}$  top reflected

$T = L - 2455.5 \text{ sec} = -.53 \phi$

1052 Drain.

Added 1 rod. Now have an 31 X 31 + 13 array.  
Total of 974 rods.

Water ht = 38.75 cm

Temp °C  
24.4 °C

2 + Per

$T = 399.83 \text{ sec} = 3.0 \phi$

1027 Water ht = 32.70 cm - 23.3 = 9.4 cm top reflected

System just critical

Drain.

62

.092" rods  $\phi$ (4.89)  
.890cm separation c-c.  
60 cm length.  
Rounded arrays.

Top of Fuel

H<sub>2</sub>O = 25.00 cm

Now have an 35 x 35 array, with 71 rods removed from each corner. Total of 941 rods.

Water ht = 40.40 cm

<sup>3</sup>+Per

Temp °C  
24.5 °C

$\tau = 330.30 \text{ sec} = 3.6 \text{ hr}$

1554 Water ht = 33.70 cm

System just critical  
Drain

Removed 1 rod. Now have an 35 x 35 array, with 72 rods removed from 1 corner, and 71 rods removed from 3 corners. Total of 940 rods.

Water ht = 40.50 cm

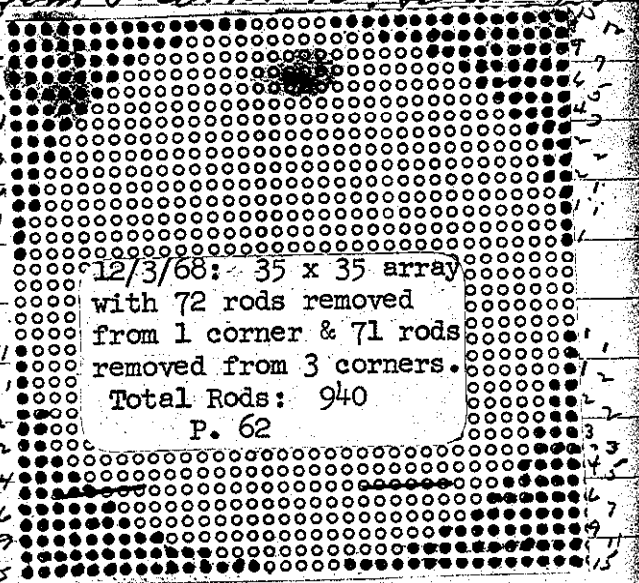
<sup>4</sup>+Per

$\tau = 1564.6 \text{ sec} = 1.81 \text{ hr}$

1552 Water ht = 36.10 cm

System just critical  
Drain

11.1 cm



62

.092" rods  $\phi(4.89)$   
.890cm separation c-c.  
60 cm lengths.  
Rounded array's.

Top of Fuel

H<sub>2</sub>O = 25.00 cm

Now have an 35 x 35 array, with 71 rods removed from each corner. Total of 941 rods

Water ht = 40.40 cm

3 + Per

Temp °C

24.5 °C

$I = 330.30 \text{ cm} = 3.6 \%$

1554 Water ht = 33.70 cm

System just critical  
Drain

Removed 1 rod. Now have an 35 x 35 array, with 72 rods removed from 1 corner, and 71 rods removed from 3 corners. Total of 940 rods.

Water ht = 40.50 cm

4 + Per

Temp °C

24.6 °C

$I = 1564.6 \text{ cm} = .81 \%$

1552 Water ht = 36.10 cm

System just critical  
Drain

11.1 cm

(71)

INSTRUMENT-CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter	2"	-	$3 \times 10^{-12}$
"	"	Fist	"	-	"
K-2	-	Meter	-	-	-
		Fist			
R-1					
R-2					
PM 1	700V	Alarm	5"	-	500V
PM 2	1200V	Low	12"	-	900V
"	"	Alarm	2"	-	"
LOG N. CALIBRATE		<input checked="" type="checkbox"/>	OPERATE	<input checked="" type="checkbox"/>	SOURCE No. B-80
DUMP WELL FROZE LIGHT <input type="checkbox"/>					

START-UP CHECK LIST

Equipment checked by F.P.C. AKK 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 F.P.C.  
 Instruments in trip circuit: K-1 PM 1-2  
 Red light on by AKK Time 0758  
 Start-up OK'd by F.P.C. AKK Date 12-9-68

(71)

(35)

(72)

2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15



64

.092" rods v(4.89)  
.890 cm separation c-c.  
60 cm length.

Top of Fuel  
H<sub>2</sub>O = 25.00 cm.

Rounded array's.

Remained 1 rod. Now have an 35x35 array,  
with 72 rods removed from 2 opposite corners,  
and 71 rods removed from 2 opposite corners.  
Total now of 939 rods.

Water H<sub>2</sub>O = 40.60 cm

Temp °C

- Per

24.2 °C

$\epsilon = -743.17 \text{ sec} = -1.8 f$

0540

Drain:

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3X10 <sup>-12</sup>	Meter ✓	2"	✓	3X10 <sup>-12</sup>
"	"	Fast ✓	"	✓	"
K-2	—	Meter —	—	—	—
"	—	Fast —	—	—	—
R-1					
R-2					
PM1	700V	Alarm ✓	.5"	—	500V
PM2	1200V	Low —	12"	—	900V
"	"	Alarm ✓	2"	—	"
LOG IN CALIBRATE		✓	OPERATE		✓
			SOURCE No.		D-80
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by <sup>F.P.C.</sup> AKK Personnel check by F.P.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.P.C.  
 Instruments in trip circuit: K-1 DM-1-2  
 Red light on by AKK TIME 1010  
 Start-up OK'd by F.P.C. AKK Date 12-5-68

66

.092" rods (4.89)  
.995 cm separation c-c.  
30 cm length.  
square array w.

Top of Fuel

H<sub>2</sub>O = 28.30 cm.

Now have an 41 x 41 array. Total of 1681 rods.

10 55 Water ht = 43.80 cm  
System sub critical  
Drain.

Temp °C  
24.0 °C

Top of Fuel

H<sub>2</sub>O = 30.10 cm

added 41 rods. Now have an 41 x 42 array.  
Total of 1722 rods.

13 12 Water ht = 45.50 cm  
System sub critical  
Drain.

Top of Fuel

H<sub>2</sub>O = 31.20 cm

added 127 rods. Now have an 43 x 43 array  
Total of 1849 rods.

Water ht = 46.50 cm

1-Per

T = -141.2 sec = -13.4 C

14 23 Drain:

Top of  
H<sub>2</sub>O =

Top of Fuel

$H_2O = 32.20 \text{ cm}$

added 14 rods. Now have on  $43 \times 43 + 14$  array. Total of 1863 rods.

Water ht = 47.90 cm

$\pm$  Per

Temp  $^{\circ}\text{C}$

24.5  $^{\circ}\text{C}$

$\tau = -309.2 \text{ sec} = -4.94$

1515 Drain:

4. added 6 rods. Now have on  $43 \times 43 + 20$  array. Total of 1869 rods.

Water ht = 47.70 cm

$\pm$  Per

Temp  $^{\circ}\text{C}$

24.5  $^{\circ}\text{C}$

$\tau = 719.26 \text{ sec} = 11.74$

1553 Water ht = 41.20 cm

system just critical  
Drain.

49

## INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	1.5"	✓	$3 \times 10^{-12}$
	"	Fast ✓	"	✓	"
K-2	—	Meter			
	—	Fast			
R-1					
E-2					
PM-1	700V	Alarm ✓	.5"	✓	500V
PM-2	1200V	Low ✓	12.0"	—	900V
	"	Alarm ✓	2"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-50
DUMP WELL FROZE LIGHT					

## START-UP CHECK LIST

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

Instruments and safeties checked and reset by AKB

Source in checked by AKB Source No. M-43

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

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

Red light on by AKB Time 0805

Start-up OK'd by F.D.C. AKB Date 12-6-68

.092 rods.  
.995 cm separation c-c  
30 cm length.  
Square array's.

Repeat of last experiment (p-67). on 43 x 43 + 20  
array. Total of 1869 rods.

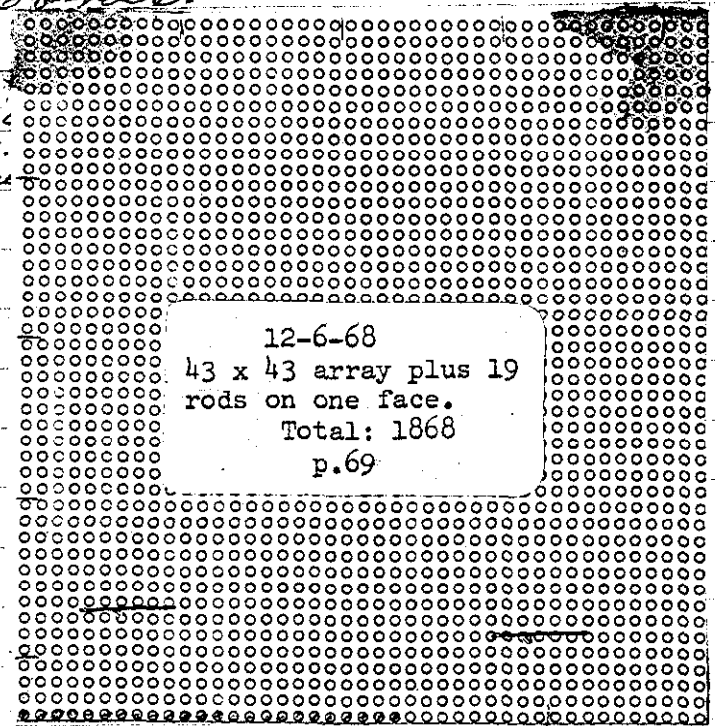
Water ht = 47.50 cm  
' + h<sub>er</sub>  
I = 612.8 μ = 2.04  
Temp = 24.0°C

0900 Water ht = 41.20 cm.  
System just critical  
Drain:

Removed 1 rod. Now have an 43 x 43 + 19  
array. Total of 1868 rods. 43

0920 Water ht = 47.80 cm  
System just critical  
Drain:  $\frac{-32.1V}{15.6}$

35



.092" rods.  
.995 cm separation c-c  
30 cm length.  
Square array's.

Repeat of last experiment (p-67), on 43 X 43 + 20  
array. Total of 1869 rods.

Water ht = 47.80 cm

Temp °C

1 + P<sub>2</sub>

24.0 °C

$I = 612.8 \text{ m} = 2.04$

0900 Water ht = 41.20 cm.

System just critical

Drain:

Removed 1 rod. Now have an 43 X 43 + 19  
array. Total of 1868 rods. 43

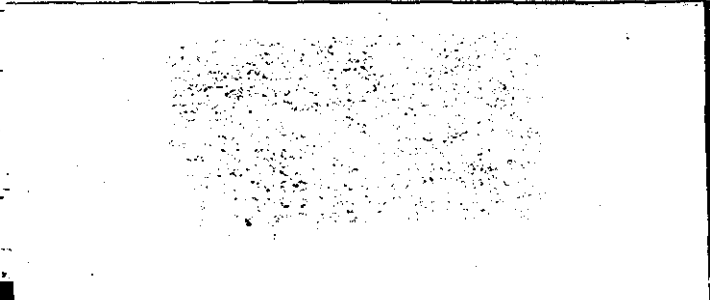
0920 Water ht = 47.80 cm.

System just critical

Drain: 32.2  
13.6

(38)

43



Log 9  
H20 =

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-13	$3 \times 10^{-12}$	Meter	2"	✓	$3 \times 10^{-12}$
"	"	Fast	"	✓	"
K-2	—	Meter	—	—	—
"	—	Fast	—	—	—
R-1	—	—	—	—	—
P-2	—	—	—	—	—
PM-1	7000	Alarm	50"	✓	5000
PM-2	12000	Low	12"	✓	9000
"	"	Alarm	2"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROBE LIGHT					

START-UP CHECK LIST

Equipment checked by F.I.D.C. AAL Personnel check by F.I.D.C.  
 Instruments and safeties checked and reset by R.K.M.  
 Source in checked by AAL Source No. M-43  
 Emergency equipment in control room checked by F.I.D.C.  
 Instruments in trip circuit: K-1 - PM-1-2  
 Red lights on by R.K.M. Time 1020  
 Start-up OK'd by F.I.D.C. R.K.M. Date 12-9-68



.092" rods.  
.995 cm separation c-c  
30 cm lengths.  
Rounded arrays.

71

Top of Fuel  
H<sub>2</sub>O = 36.30 cm

Now have an 48 x 48 array, with <sup>125 rods</sup> + 23 rods removed from each corner. Total of <sup>1804</sup> 7812 rods.

Water ht = 40.75 cm

Temp °C

+ Per

23.7°C ??

C = 69.54 sec = 13.04

1120

Water ht = 39.00 cm

System just critical  
Drain.

Removed 8 rods. 2 from each corner. Now have an 48 x 48 array, with <sup>127 rods</sup> + 25 rods removed from each corner. <sup>1796</sup> 7804 rods.

Water ht = 48.40 cm

Temp °C

+ Per

22.9°C

C = 67.36 sec = 13.34

1355 Water ht = 39.80 cm

System just critical  
Drain.

over

Remained 16 rods. 4 from each corner. New  
 law on 43x43 array, with <sup>131 rods</sup> 129 rods removed  
 from each corner. Total of <sup>1780</sup> 1788 rods.

Water ht = 51.60 cm.

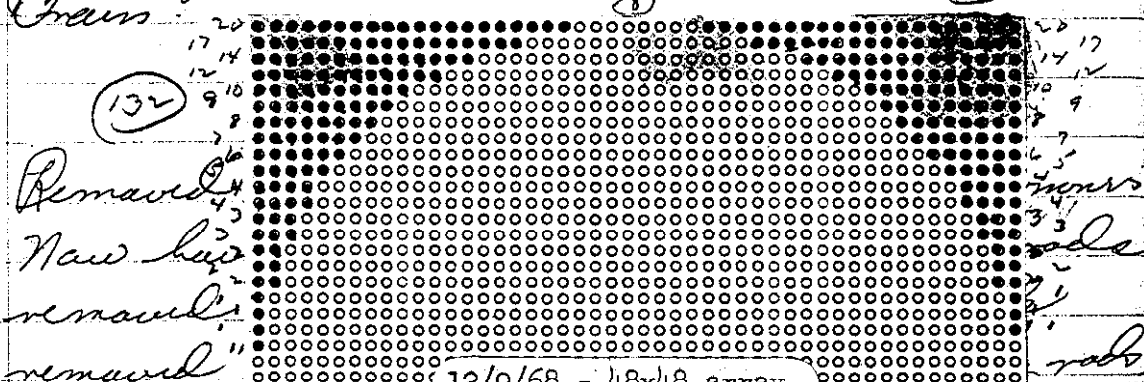
Temp °C

+ Per

To 23.0°C

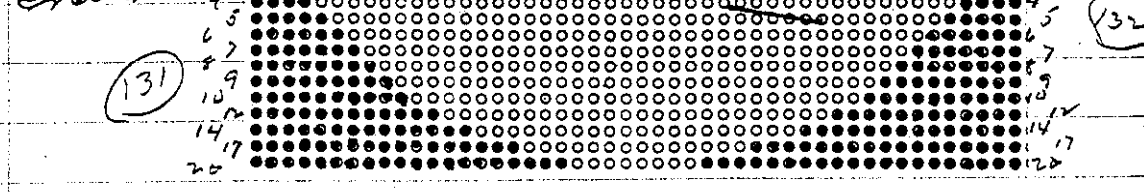
$E = 808.36 \text{ m} = 1.54$

1500 Water ht = 44.15 cm  
 system just critical  
 Drain



Removed  
 New law  
 removed  
 removed  
 12/9/68 - 48x48 array  
 with 131 rods removed  
 from 2 corners & 132  
 rods removed from 2  
 corners - TOTAL RODS -  
 1778 p. 12

1545 Water ht  
 system  
 Drain



131  
 132  
 510  
 203  
 107

Remained 16 rods. 4 from each corner. Now  
 have an  $43 \times 43$  array, with <sup>131 rods</sup> 29 rods removed  
 from each corner. Total of <sup>1780</sup> 1788 rods.

Water ht = 51.60 cm.

Temp °C

+ Per

To 23.0 °C

$E = 808.36 \text{ sec} = 1.5 \text{ f}$

1.500 Water ht = 44.15 cm  
 System just critical

Chain:

20  
17  
14  
12  
10  
9  
8  
7  
6  
5  
4  
3  
2  
1  
(131)

(8)

(131)

Remained 2 rods, 1 each from opposite corners.  
 Now have an  $48 \times 48$  array, with <sup>131 rods</sup> 30 rods  
 removed from 2 corners and <sup>132</sup> 29 rods  
 removed from 2 corners. Total of <sup>1778</sup> 1786 rods.

(131)  
(132)

1.545 Water ht = 51.60 cm.

Temp °C

System just critical

23.0 °C

Chain:

20  
19  
18  
17  
16  
15  
14  
13  
12  
11  
10  
9  
8  
7  
6  
5  
4  
3  
2  
1  
(131)

(1)

(132)

51.0  
- 36.3  
-----  
14.7

DUMP WELL FROGE LIGHT

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3 X 10 <sup>-12</sup>	✓	1.5"	✓	3 X 10 <sup>-12</sup>
K-2	—	✓	—	✓	—
P-1	—	✓	—	✓	—
P-2	7000	✓	.50"	✓	5000
PM-1	1000	✓	12"	✓	8000
LOG IN CALIBRATE	OPERATE	SOURCE No.	1.8.0		

INSTRUMENT CHECK

START-UP CHECK LIST

Equipment checked by Ball Personnel check by I.D.C.

Instruments and safeties checked and rec'd by Ball

Source in checked by Ball Source No. 14-23

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

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

Red light on by Ball Time: 0805

Start-up OK'd by I.D.C. Ball Date 12-10-68

al

ms  
ls

als

132

Repeat of last experiment. (p. 72), 1778 rods.  
After checks of number of rods remained. (1/2 h. l.)

08.47 Water ht = 51.60 cm

Temp °C

System just critical

77.6°C

Drain -

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	1.5"	✓	$3 \times 10^{-12}$
	"	Fast ✓	"	✓	"
K-2	—	Meter —	—	—	—
	—	Fast —	—	—	—
R-1					
R-2					
PM1	700 ✓	Alarm ✓	.5"	✓	500 ✓
PM2	1200 ✓	Low ✓	12.0"	✓	900 ✓
	"	Alarm ✓	2.0"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. <u>B-80</u>
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by T.D.C. Personnel check by F.D.C.  
 Instruments and safeties checked and reset by AKK  
 Source in checked by AKK Source No. M-13  
 Emergency equipment in control room checked by F.D.C.  
 Instruments in trip circuit: K-1 PM 1-2  
 Red light on by AKK Time 0930  
 Start-up OK'd by AKK.F.D.C. Date 12-11-68

.092" rods  $V(4.89)$   
 .995 cm separation c-c.  
 60 cm length.  
 Square array's.

Top of Fuel  
 $H_2O = 25.30$

Now have an  $32 \times 32$  array. Total of 1024 rods.

$\frac{1003}{10}$

Water ht = 40.80 cm  
 System sub critical  
 Drain.

Temp  $^{\circ}C$   $\neq$   
 22.6 $^{\circ}C$

1105 Added 16 rods. Now have an  $32 \times 32$  array,  
 with 16 rods on 1 face. Total of 1040 rods.

Water ht = 40.80 cm.  
 1-Per

Temp  $^{\circ}C$   
 22.8 $^{\circ}C$

$$T = -354.20 \text{ sec} = -4.14$$

Drain.

added 4 rods. Now have an  $32 \times 32 + 20$   
 array. Total of 1044 rods.

Water ht = 40.80 cm  
 2+Per

Temp  $^{\circ}C$   
 23.2 $^{\circ}C$

$$T = 139.07 \text{ sec} = 7.64$$

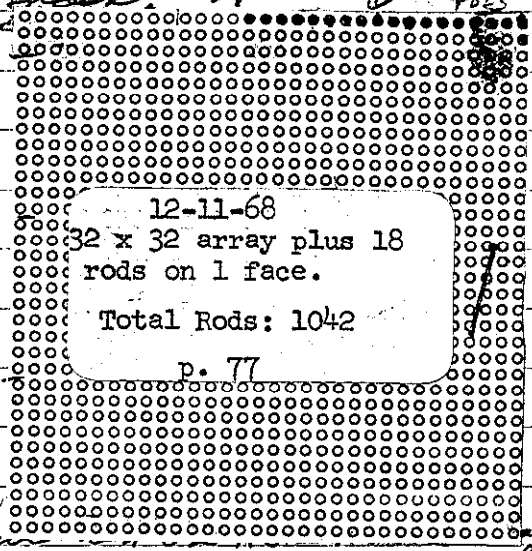
1429 Water ht = 33.40 cm  
 System just critical  
 Drain.

These positions were empty

Removed 2 rods. Now have a 32x32+18 array. Total of 1042 rods.

Water ht = 40.90 cm  
3 - Per  
 $T = 738.82 \text{ sec} = 1.7 \text{ h}$

1511 Water ht = 35.80 cm  
System just critical  
Drain:  $\frac{-25.3}{10.5 \text{ cm}}$



Removed 1 rod. Now have a 32x32+17 array. Total of 1041 rods.

Water ht = 40.90 cm - 25.3 = 15.6 cm Temp  
4 - Per  
 $T = -956.12 \text{ sec} = -1.4 \text{ h}$

1543 Drain:

(#43)



These positions were empty

Removed 2 rods. Now have an  $32 \times 32 + 18$  array. Total of 1042 rods.  $\rightarrow$  These are

Water ht = 40.90 cm

Temp  $^{\circ}$

<sup>3</sup> + Per

33

23.3  $^{\circ}$

$E = 738.82 \text{ sec} = 1.7 \text{ f}$

1511 Water ht = 35.80 cm

System just critical

Drain: -25.3

10.5 cm

Removed 1 rod. Now have an  $32 \times 32 + 17$  array.

Total of 1041 rods.  $\leftarrow 32 \rightarrow$

Water ht = 40.90 cm - 25.3 = 15.6 cm Temp  $^{\circ}$

4 - Per

$E = -956.12 \text{ sec} = -1.4 \text{ f}$

(440)

1543 Drain:

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1 <del>3X10</del>	-12	Meter ✓	1.5"	✓	3-8-10 <sup>-12</sup>
"		Feet ✓	"	✓	"
K-2		Meter			
		Feet			
R-1					
R-2					
PM-1	700 v	Alarm ✓	1.5"	✓	500v
PM-2	1200 v	Low ✓	12"	✓	900v
	1"	Alarm ✓	20"	✓	"
LOG N CALIBRATE		OPERATE		SOURCE No. B-80	
DUMP WELL PROBE LIGHT					

START-UP CHECK LIST

Equipment checked by F.O.C. A.H.H. Personnel check by F.O.C.  
 Instruments and safeties checked and reset by A.H.H.  
 Source in checked by A.H.H. Source No. M-43  
 Emergency equipment in control room checked by F.O.C.  
 Instruments in trip circuit: K-1 PM-1-2  
 Red light on by A.H.H. Time 1310  
 Start-up CR'd by F.O.C. A.H.H. Date 12-12-68

.092" rods  $\varnothing$  (4.89)  
 .995 cm separation c-c.  
 60 cm length.  
 Rounded array.

Top of fuel

$H_2O = 27.25 \text{ cm}$

Now have an  $36 \times 36$  array with 72 rods removed from each corner. Total of 1008 rods.

Water ht = 42.95 cm  
 + Per

Temp  $^{\circ}\text{C}$   
 23.3  $^{\circ}\text{C}$

$C = 123.86 \text{ sec} = 8.3 \text{ f}$

1400

Water ht = 33.35 cm

System just critical  
 Drain.

Removed 4 rods. Now have an  $36 \times 36$  array with 73 rods removed from each corner. Total of 1004 rods.

Water ht = 42.50  
 + Per

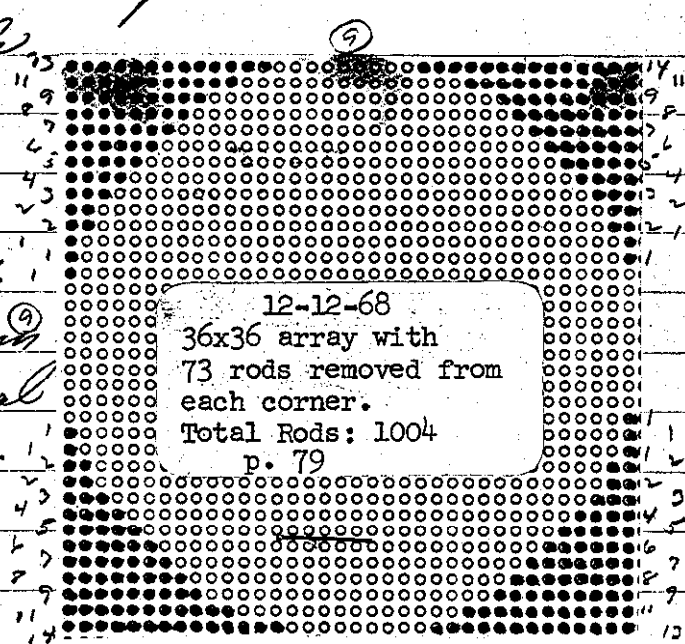
$C = 1434.2 \text{ sec} = .90 \text{ f}$

1500 Water ht = 37.60 cm

System just critical  
 Drain.

27.25  
 12.35

740



12-12-68  
 36x36 array with  
 73 rods removed from  
 each corner.  
 Total Rods: 1004  
 p. 79

avr

.092" rods  $\phi$  (4.89)  
 .995 cm separation c-c.  
 60 cm length.  
 Paunched array.

Top of fuel  
 $H_2O = 27.25 \text{ cm}$

Now have an  $36 \times 36$  array with 72 rods removed from each corner. Total of 1008 rods.

Water ht = 42.95 cm Temp  $^{\circ}\text{C}$   
 + Per 23.3  $^{\circ}\text{C}$

$C = 123.86 \text{ cm} = 8.3 \phi$

1400 Water ht = 33.35 cm  
 System just critical  
 Drain.

Removed 4 rods. Now have an  $36 \times 36$  array with 73 rods removed from each corner. Total of 1004 rods.

Water ht = 42.50 Temp  $^{\circ}\text{C}$   
 + Per 23.9  $^{\circ}\text{C}$

$C = 1434.2 \text{ cm} = 9.0 \phi$

1500 Water ht = 37.60 cm  
 System just critical  
 Drain.  $\frac{-27.25}{17.35}$

#40

35

14	11
9	8
7	6
5	4
3	2
2	1
1	1

Removed 1 rod. Now have an  $36 \times 36$  array,  
with 74 rods removed from 1 corner and  
73 rods removed from 3 corners. Total  
of 1003 rods.

Water ht = 42.70 cm

<sup>3</sup> - Per

$\tau = -1195.1 \text{ sec} = -1.1 \text{ f}$

Temp °C

23.6 °C

1545 Drain:

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-13	$10^{-12}$	Meter ✓	2"	✓	$3 \times 10^{-12}$
"		Fast ✓	"	✓	"
K-2		Meter —	—	—	—
"		Fast —	—	—	—
R-1					
R-2					
PM-1	700V	Alarm ✓	1.5"	✓	500V
PM-2	1200V	Low ✓	12.0"	✓	900V
"		Alarm ✓	2.0"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROBE LIGHT					

START-UP CHECK LIST

Equipment checked by E.P.C. / A.K.A. Personnel check by BARB

Instruments and safeties checked and reset by A.K.A.

Source in checked by A.K.A. Source No. M-43

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

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

Red light on by A.K.A. Time 1240

Start-up OK'd by E.P.C. / A.K.A. Date 12-17-68

82

1.092" Rack, U(9.89)  
 30cm length.  
 1.150cm separation c-c.  
 Square Array's.

Now have an 54x54 array. Total of 2916 rods.

1330 Water ht = 53.70 cm Temp °C  
 System sub-critical 22.5 °C  
 Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter <input checked="" type="checkbox"/>	2"	<input checked="" type="checkbox"/>	$3 \times 10^{-12}$
	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2	—	Meter <input checked="" type="checkbox"/>	—	<input checked="" type="checkbox"/>	—
	—	Fast <input checked="" type="checkbox"/>	—	<input checked="" type="checkbox"/>	—
R-1					
R-2					
PM-1	700V	Alarm <input checked="" type="checkbox"/>	1.5"	<input checked="" type="checkbox"/>	500V
FM-2	1200V	Low <input checked="" type="checkbox"/>	12"	<input checked="" type="checkbox"/>	900V
	"	Alarm <input checked="" type="checkbox"/>	20"	<input checked="" type="checkbox"/>	"

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

Log  
 H<sub>2</sub>O  
 Temp  
 H<sub>2</sub>O

12/18/68  
60 x 60 array with 10  
rods removed from each  
corner.  
Total rods 3560  
p. 83

441

Wit  
W. number

Top of fuel  
H<sub>2</sub>O = 46.20

W

Water ht = 61.65 cm.

Temp

System sub critical  
Drain.

22.4°c

Top of fuel  
H<sub>2</sub>O = 30.0<sup>cm</sup>  
Now have an 60 x 60 array, with 10 rods removed from each corner. (due to 3/8" tie rod for grid plate). Total of 3560 rods.

Water ht = 45.30 cm

Temp °c

System sub critical  
Drain.

22.0°c

The above array is in "Big Sibs"



## START-UP CHECK LIST

Equipment checked by <sup>F.P.C.</sup> A.K.V. Personnel check by F.P.C.

Instruments and safeties checked and reset by A.K.V.

Source in checked by A.K.V. Source No. M-43

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

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

Red light on by A.K.V. Time 0905

Start-up OK'd by F.P.C. A.K.V. Date 12-18-68

.092 Rads U.L. 89)

1.150 cm operation c-c

30 cm length.

Square array's

Have an 56 x 56 array. Total of 3136 rods.

Water ht = 61.55 cm.

Temp °

System sub critical

22.4 °

Drain.

Top of fuel Now have an 60 x 60 array, with 10 rods

H<sub>2</sub>O = 300 cm removed from each corner. (due to 3/8" tie rod for grid plate). Total of 3560 rods.

Water ht = 45.30 cm

Temp °

System sub critical

22.0 °

Drain.

The above array is in "Dig Sid"

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE	SET	START-UP RANGE
K-1	3X10 <sup>-12</sup>	Alarm ✓	1.5"	✓	3X10 <sup>-12</sup>
"	"	Fast ✓	"	✓	"
K-2	—	Alarm —	—	—	—
"	—	Fast —	—	—	—
R-1	—	—	—	—	—
R-2	—	—	—	—	—
PW-1	700V ✓	Alarm ✓	.5"	✓	500V
PW-2	1200V ✓	Low ✓	12"	✓	900V
"	"	Alarm ✓	2"	✓	"

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

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

START-UP CHECK LIST

Equipment checked by E.D.C Personnel check by E.D.C  
 Instruments and safeties checked and reset by AKH  
 Source in checked by AKH Source No. 14-23  
 Emergency equipment in control room checked by E.D.C  
 Instruments in trip circuit: K-1 PM-1-2  
 Red light on by AKH Time 1315  
 Start-up OK'd by E.D.C AKH Date 12-30-68

.092" Rods  
60 cm length  
1.150 cm separation c-c.  
Square array's.

85

Top of Level

-12  $t_{20} = 60.0^{\circ}\text{C}$  Now have an  $38 \times 38$  array. Total of 1444 rods.

$D_h = .45\text{ cm}$

Water ht = 61.40 cm

Temp  $^{\circ}\text{C}$

+ Per

20.0  $^{\circ}\text{C}$

$E = 165.15\text{ cm} = 0.6 \text{ ft}$

1510 Water ht = 60.95 cm

System just critical  
Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3 A10 -12	Meter ✓	1.5"	✓	3 A10 -02
	"	Fast ✓	"	✓	"
K-2	—	Meter	—	—	—
	—	Fast	—	—	—
R-1					
R-2					
PM-1	700 V	Alarm ✓	.5"	✓	500 V
PM-2	1200 V	Low ✓	12"	✓	900 V
	"	Alarm ✓	2"	✓	"
LOG IN CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROSE LIGHT _____					

START-UP CHECK LIST

Equipment checked by I.D.C. M.K.D. Personnel check by F.V.C.  
 Instruments and safeties checked and reset by M.K.D.  
 Source in checked by M.K.D. Source No. M-43  
 Emergency equipment in control room checked by I.D.C.  
 Instruments in trip circuit: K-1 PM 1-2  
 Red light on by M.K.D. Time 0810  
 Start-up OK'd by F.V.C. M.K.D. Date 12-31-68

1092" Rods  
 60cm lengths  
 11150cm separation e-e  
 Square Array's.

Removed 38 rods (see p-85). Now have on  
 37 X 38 array. Total of 1406 rods.

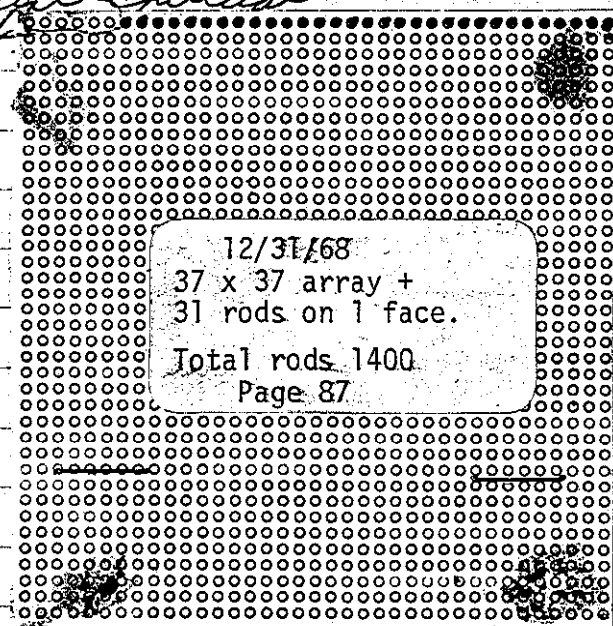
Water ht = 75.50 cm  
 + Res  
 Temp °C  
 22.6 °C  
 $E = 260.76 \text{ sec} = 4.4 \text{ f}$

0915 Water ht = 66.55 cm  
 System just critical  
 Drain.

Removed 6 rods. Now have an 37 X 37 + 31  
 array. Total of 1400 rods!

1038 Water ht = 75.50 cm  
 System just critical  
 Drain. Temp °C  
 23.0 °C

Empty  
 water  
 ↓  
 (249)



Residual  
 voids

38

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Master <input checked="" type="checkbox"/>	1.5"	<input checked="" type="checkbox"/>	$3 \times 10^{-12}$
"	"	Foot <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2	—	Master <input checked="" type="checkbox"/>	—	<input checked="" type="checkbox"/>	—
"	—	Foot <input checked="" type="checkbox"/>	—	<input checked="" type="checkbox"/>	—
R-1	—	—	—	—	—
P-2	—	—	—	—	—
PM-1	700V	Alarm <input checked="" type="checkbox"/>	1.5"	<input checked="" type="checkbox"/>	500V
PM-2	1200V	Low <input checked="" type="checkbox"/>	1.4"	<input checked="" type="checkbox"/>	900V
"	1"	Alarm <input checked="" type="checkbox"/>	2"	<input checked="" type="checkbox"/>	1"
LOG-N CALIBRATE <input checked="" type="checkbox"/>		OPERATE <input checked="" type="checkbox"/>		SOURCE No. B-80	
DUMP-WELL PROBE LIGHT <input checked="" type="checkbox"/>					

START-UP CHECK LIST

Equipment checked by T.D.C. AKC Personnel check by T.D.C.  
 Instruments and safeties checked and report by AKC  
 Source in checked by AKC Source No. M-83  
 Emergency equipment in control room checked by T.D.C.  
 Instruments in trip circuit: K-1 PM-1-2  
 Red light on by AKC Time 0845  
 Start-up OK'd by T.D.C. AKC Date 1-2-69

.092" rods  $\phi$  (4.88)

60 cm length.

1.150 cm separation c-c.

Rounded array  $\phi$ .

89

I have an  $42 \times 42$  array, with 103 rods removed from each corner. Total of 1352 rods.

Water ht = 71.60 cm  $dh = 7.90$  cm

Temp  $^{\circ}$ C

+ Per

23.2  $^{\circ}$ C

$\zeta = 47.81$  cm = 16.94

0935

Water ht = 63.70 cm

System just critical  
Drain

Removed 8 rods. 2 from each corner. Now have in  $42 \times 42$  array, with 105 rods removed from each corner. Total of 1344 rods.

Water ht = 75.50 cm

Temp  $^{\circ}$ C

+ Per

23.4  $^{\circ}$ C

$\zeta = 47.76$  cm = 7.24

Water ht = 65.50 cm.

System just critical  
Drain

over

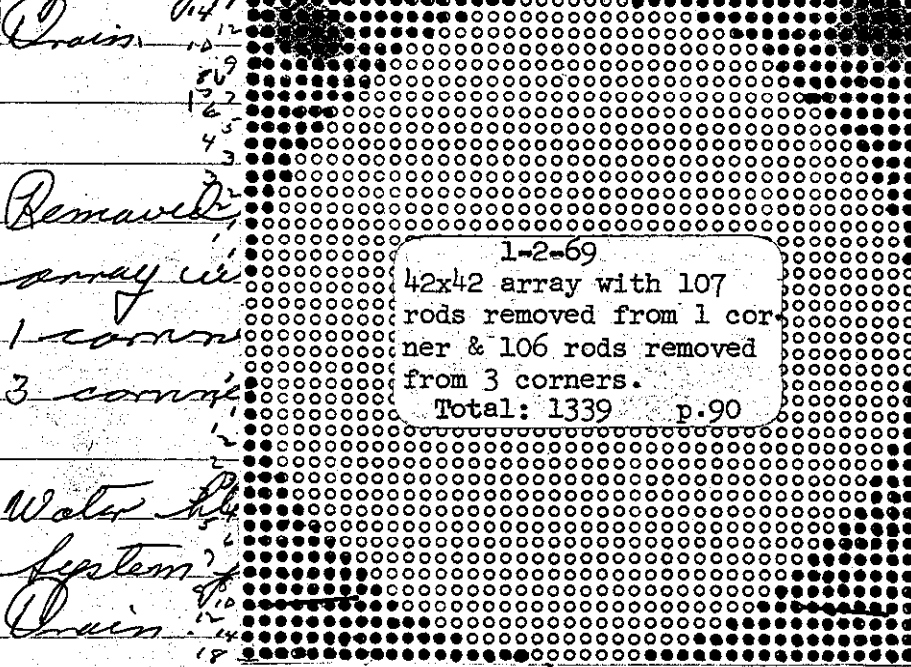
Remained 4 rods, 1 from each corner. Now have an 42x42 array with 106 rods removed from each corner. Total of 1340 rods

Water ht = 75.50 cm  
<sup>3</sup>+Per  
 $t = 677.96 \text{ sec} = 1.8 \text{ hr}$

Temp °  
 23.3°

1345 Water ht = 68.20 cm

System just critical



Drain

Remained  
 array in  
 1 corner  
 3 corners

1-2-69  
 42x42 array with 107 rods removed from 1 corner & 106 rods removed from 3 corners.  
 Total: 1339 p.90

18-14  
 15-10  
 14-06  
 12-6  
 10-4  
 8-2  
 6-0  
 4-2  
 2-0  
 0-2  
 2-4  
 4-6  
 6-8  
 8-10  
 10-12  
 12-14  
 14-16  
 16-18

1435 Water ht

System?  
 Drain

107

106

#46



Removed 4 rods. 1 from each corner. Now have an  $42 \times 42$  array with 106 rods removed from each corner. Total of 1340 rods

Water ht = 75.50 cm

Temp  $^{\circ}$

+ Per

23.3  $^{\circ}$

$C = 677.96 \text{ sec} = 1.8 \text{ f}$

1345 Water ht = 68.20 cm

System just critical

Drain  
147  
10  
89  
127  
165  
43

1844  
110  
7806  
76  
54  
33  
24

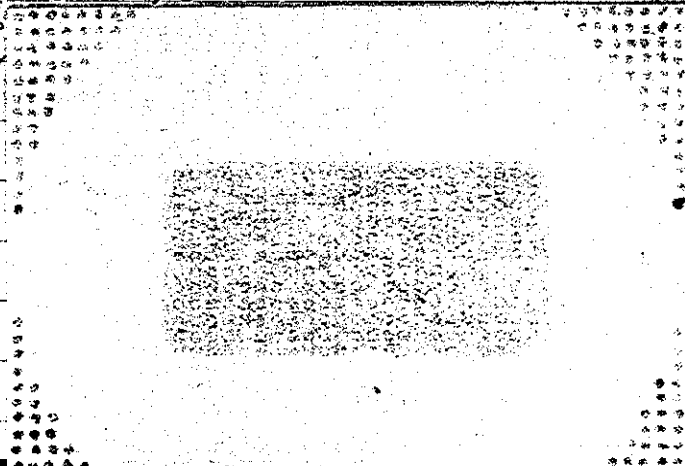
Removed 1 rod. Now have an  $42 \times 42$  array with 107 rods removed from 1 corner, and 106 rods removed from 3 corners. Total of 1339 rods.

1435 Water ht = 75.50 cm

System just critical

Drain  
110  
144  
18

11  
11  
22  
33  
45  
67  
89  
101  
147



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SFT	START-UP RANGE
- K-1	$3 \times 10^{-12}$	Meter	1"	✓	$3 \times 10^{-12}$
-	"	Fast	"	✓	"
- K-2		Meter			
-		Fast			
- R-1					
- R-2					
- PM-1	700V	Alarm	15"	✓	500V
- PM-2	1200V	Low	10"	✓	900V
-	"	High	2"	✓	"

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

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

START-UP CHECK LIST

Equipment checked by F.D.C. BKL Personnel check by TKM

Instruments and safeties checked and reset by BKL

Source in checked by BKL Source No. 12-43

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

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

Red light on by BKL Time 1020

Start-up OK'd by F.D.C. BKL Date 1-7-68

.092" rods  
 30 cm length.  
 .630 cm separation c-c.  
 Square array's

Top of fuel

H<sub>2</sub>O = 22.60 cm.

I have an 43 x 43 array. Total of 1849 rods.

bh = .40 cm

Water ht = 25.50 cm

Temp °C

+ Per

21.9 °C

t = 57.15 sec = 15.9 f

1112 Water ht = 25.10 cm

System just critical  
 Drain.

Removed 21 rods. Now have an 43 x 43 - 21  
 array. Total of 1828 rods.

Water ht = 25.60 cm

Temp °C

+ Per

21.9 °C

t = 58.67 sec = 14.7 f

1330 Water ht = 25.35 cm

System just critical  
 Drain.

Tap of fuel

$$H_{20} = 22.15 \text{ cm}$$

Removed 43 rods, now have an  $42 \times 42 + 21$  array. Total of 1785 rods.

$$\text{Water ht} = 26.80 \text{ cm}$$

3 + pier

Temp °C

$$22.0^\circ \text{C}$$

$$E = 73.88 \text{ m} = 12.9 \text{ f}$$

$$1431 \text{ Water ht} = 26.35 \text{ cm}$$

System just critical  
Drain.

Removed 42 rods, now have an  $42 \times 42 - 21$  array. Total of 1743 rods.

$$\text{Water ht} = 37.60$$

4 + pier

Temp °C

$$22.2^\circ \text{C}$$

$$E = 80.40 \text{ m} = 11.7 \text{ f}$$

$$1517 \text{ Water ht} = 29.80 \text{ cm}$$

System just critical  
Drain.

aver:

Removed 8 rods. Now have an  $42 \times 42 - 29$   
array. Total of 1735 rods.

Water ht = 37.60 cm

Temp  $^{\circ}\text{C}$

5 - Per

22.2  $^{\circ}\text{C}$

$$E = -738.82 \text{ m} = -1.8 \text{ f}$$

1.550 Drain:

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	1"	✓	$3 \times 10^{-12}$
"	"	Fast ✓	"	✓	"
K-2	—	Meter —	—	—	—
"	—	Fast —	—	—	—
R-1					
R-2					
PM-1	700 V	Alarm ✓	.5"	✓	500 V
PM-2	1200 V	Low ✓	1.4"	✓	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. M.A.C. Personnel check by M.A.C.  
 Instruments and safeties checked and reset by M.A.C.  
 Source in checked by M.A.C. Source No. M-93  
 Emergency equipment in control room checked by F.D.C.  
 Instruments in trip circuit: K-1 PM 1-2  
 Red light on by M.A.C. Time 0805  
 Start-up OK'd by F.D.C. M.A.C. Date 1-8-69

.092" rods  
30 cm length  
1.630 cm separation c-c  
square array's.

#5 added 1 rod. Now have an 42x42-28 array. Total of 1736 rods.

Water ht = 37.60 cm Temp °C  
= per  $\frac{37.60}{1.515}$  cm 22.2 °C  
C = -2825.0 rods = -.474

0853 Drain.

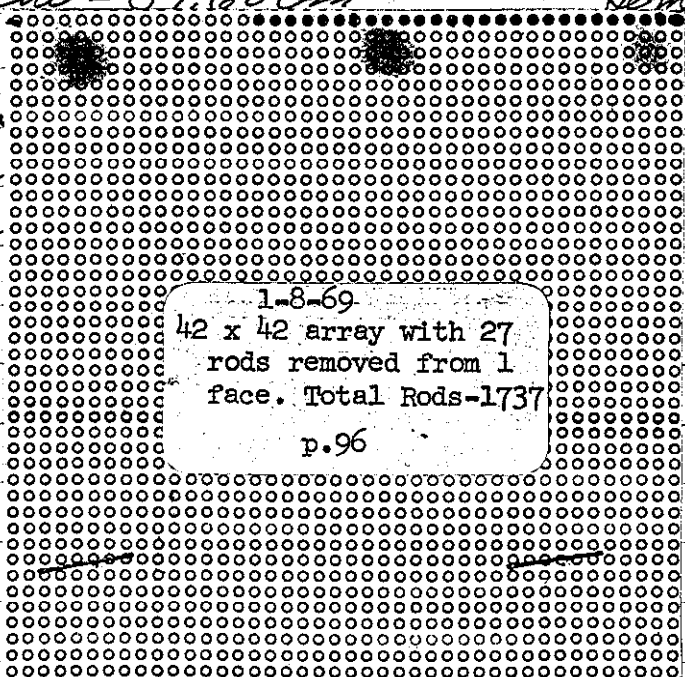
added 1 rod. Now have an 42x42-27 array. Total of 1737 rods.

Water ht = 37.60 cm Temp °C  
the 22.2 °C

C = 478.06 rods

0928 Water System Drain.

#6



1-8-69  
42 x 42 array with 27 rods removed from 1 face. Total Rods-1737

p.96

.092" rods  
 30 cm length  
 1.630 cm separation c-c  
 square array's.

#5 added 1 rod. Now have an  $42 \times 42 - 28$   
 array. Total of 1736 rods.

Water ht = 37.60 cm Temp  $^{\circ}\text{C}$   
 - per  $\frac{15.7 \text{ cm}}{15.7 \text{ cm}}$  22.2  $^{\circ}\text{C}$   
 $C = -2825.0 \text{ cm} = -.474$

0853 Drain.

added 1 rod. Now have an  $42 \times 42 - 27$   
 array. Total of 1737 rods.

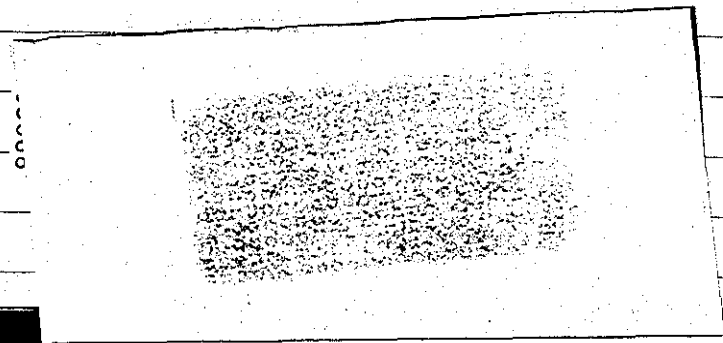
Water ht = 37.60 cm Temp  $^{\circ}\text{C}$   
 the  $\bullet$   $\bullet$   $\bullet$  22.2  $^{\circ}\text{C}$

$C = 478.06 \text{ cm} = 2.54$

0928 Water ht = 32.80 cm - 22.1 = 10.7

System just critical  
 Drain.

#6





.092" rods.  
30 cm length.  
.630 cm separation c-c  
Rounded Array w.

97

Top of fuel

H<sub>2</sub>O = 23.50 cm

Now have an 46 x 46 array, with 113 rods removed from each corner. Total of 1664 rods.

Water ht = 38.95 cm

Temp °C

~~System just critical~~

22.3 °C

System sub critical.

Added 16 rods. Now have an 46 x 46 array with 109 rods removed from each corner. Total of 1680 rods.

1.590 Water ht = 38.90 cm

System sub critical  
Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	$3 \times 10^{-12}$
"	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2	—	Meter <input type="checkbox"/>	—	<input type="checkbox"/>	—
"	—	Fast <input type="checkbox"/>	—	<input type="checkbox"/>	—
R-1					
R-2					
PM-1	700 V	Alarm <input checked="" type="checkbox"/>	.5"	<input checked="" type="checkbox"/>	500 V
PM-2	1200 V	Low <input checked="" type="checkbox"/>	12"	<input checked="" type="checkbox"/>	900 V
"	"	Alarm <input checked="" type="checkbox"/>	2"	<input checked="" type="checkbox"/>	"
LOG N CALIBRATE <input checked="" type="checkbox"/>		OPERATE <input checked="" type="checkbox"/>		SOURCE No. <u>B-80</u>	
DUMP WELL PROBE LIGHT <input type="checkbox"/>					

START-UP CHECK LIST

Equipment checked by F.D.C. / A.M.P. Personnel check by F.D.C.  
 Instruments and safeties checked and reset by A.M.P.  
 Source in checked by A.M.P. Source No. M-43  
 Emergency equipment in control room checked by F.D.C.  
 Instruments in trip circuit: K-1 - PM-1 - 2  
 Red light on by A.M.P. Time 0810  
 Start-up OK'd by F.D.C. / A.M.P. Date 1-9-68

*Top H<sub>2</sub>O*

.092" rods.  
30cm length.  
.630cm separation c-c.  
Rounded array's.

99

Top of fuel  
 $H_2O = 23.50cm$

Added 8 rods. Now have an  $46 \times 46$  array  
with 107 rods removed from each corner.  
Total of 1688 rods.

Water ht = 38.90cm Temp °C  
- Per.  
 $\epsilon = -630.17 = -2.2 \%$

1000

Added 2 rods. 1 to each opposite face. Now  
have an  $46 \times 46$  array, with 107 rods  
removed from 2 corners, and 106 rods  
removed from 2 corners. Total of 1690  
rods.

Water ht = 38.90cm Temp °C  
+ Per = 22.7°C

$\epsilon = -1130.0 \text{ rods} = -1.1 \%$

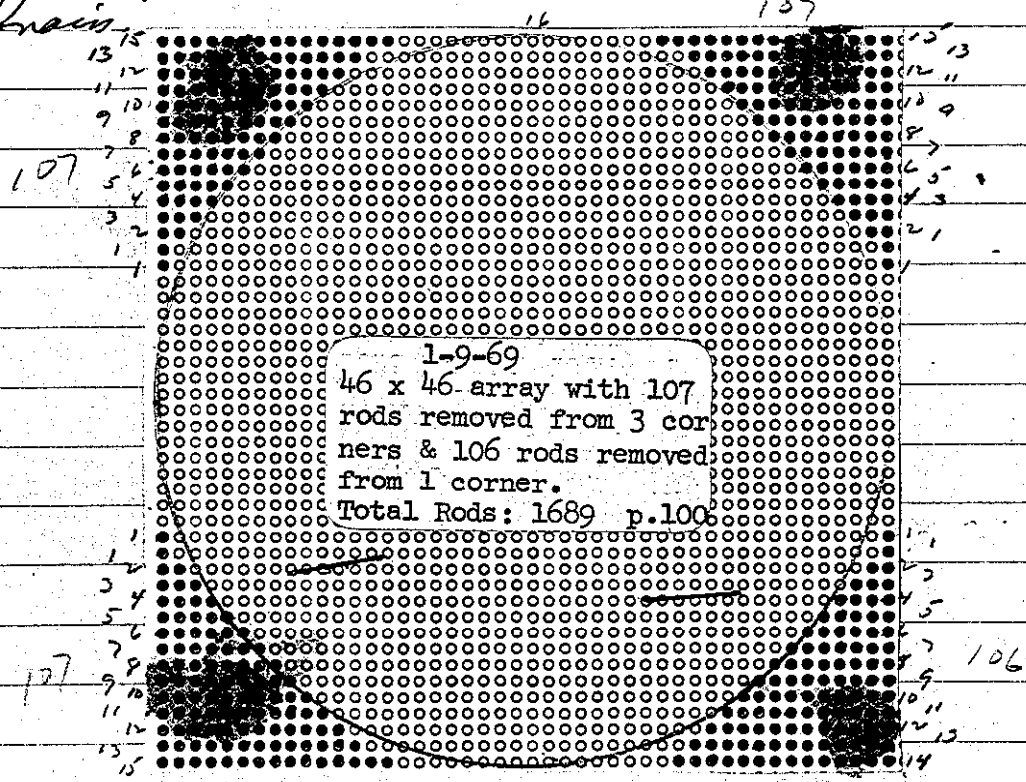
1036 Drain. Water ht = 34.0cm  
System just critical  
Drain.

arr:

Removed 1 rod. Now have an 46 x 46 array, with 107 rods removed from 3 corners, and 106 rods removed from 1 corner. Total of 1689 rods.

1058. Water ht = 38.90 cm - 23.5... Temp = Septem just critical 72.7 °

Drain



INSTRUMENT CHECK

INSTRUMENT	RANGE	ISP	DATE	BY	REMARKS
K-1	3 X 10 <sup>-12</sup>	✓	1"	✓	3 X 10 <sup>-12</sup>
"	"	✓	"	✓	"
K-2	"	✓	"	✓	"
R-1	"	✓	"	✓	"
R-2	"	✓	"	✓	"
PM-1	700V	✓	5"	✓	500V
PM-2	1200V	✓	12"	✓	900V
"	"	✓	2"	✓	"

LOG-N CALIBRATE  OPERATE  SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

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

Instruments and safeties checked and reset by A.H.V.

Source in checked by A.H.V. No. M-43

Emergency equipment in back of room checked by F.D.C.

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

Red light on by A.H.V. Time 0935

Start-up OK'd by F.D.C. A.H.V. Date 1-19-69

.092" rods.  
60 cm length  
.630 cm separation c-c  
square array 2.

Top of fuel  
 $H_2O = 20.20 \text{ cm}$

Have an  $36 \times 36$  array. Total of 1296 rods.

Water ht = 23.10 cm

Temp °C

+ per

22.2

$\epsilon = 84.75 \text{ sec} = 11.2 \text{ f}$

1040 Water ht = 23.00 cm

System just critical  
Drain.

Removed 36 rods. Now have an  $35 \times 36$  array.  
Total of 1260 rods.

Water ht = 24.60 cm

Temp °C

+ per

22.5 °C

$\epsilon = 42.46 \text{ sec} = 18.2 \text{ f}$

1400 Water ht = 24.20 cm

System just critical  
Drain.

1445 Removed ~~70~~ rods. Now have an  $34 \times 35$   
array. Total of 1190 rods.

Top of fuel  
 $= 19.60 \text{ cm}$

Water ht = 35.00 cm

System sub critical  
Drain.

Added 16 rocks. New haul on 35x35-19 array.  
Total of 1206 rocks.

Water ht = 35.00 cm  
3 - Per N. G.

Temp °C  
22.5°

1535 Drain.

2/2/68  
H-0

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-13 X10 <sup>-2</sup>	"	Meter	"	-	3A10 <sup>-2</sup>
K-2	"	Meter	"	-	"
K-1	"	Fast	"	-	"
K-3	"	Meter	"	-	"
K-4	"	Fast	"	-	"
K-5	"	Meter	"	-	"
K-6	"	Fast	"	-	"
K-7	"	Meter	"	-	"
K-8	"	Fast	"	-	"
K-9	"	Meter	"	-	"
K-10	"	Fast	"	-	"
K-11	"	Meter	"	-	"
K-12	"	Fast	"	-	"
K-13	"	Meter	"	-	"
K-14	"	Fast	"	-	"
K-15	"	Meter	"	-	"
K-16	"	Fast	"	-	"
K-17	"	Meter	"	-	"
K-18	"	Fast	"	-	"
K-19	"	Meter	"	-	"
K-20	"	Fast	"	-	"
K-21	"	Meter	"	-	"
K-22	"	Fast	"	-	"
K-23	"	Meter	"	-	"
K-24	"	Fast	"	-	"
K-25	"	Meter	"	-	"
K-26	"	Fast	"	-	"
K-27	"	Meter	"	-	"
K-28	"	Fast	"	-	"
K-29	"	Meter	"	-	"
K-30	"	Fast	"	-	"
K-31	"	Meter	"	-	"
K-32	"	Fast	"	-	"
K-33	"	Meter	"	-	"
K-34	"	Fast	"	-	"
K-35	"	Meter	"	-	"
K-36	"	Fast	"	-	"
K-37	"	Meter	"	-	"
K-38	"	Fast	"	-	"
K-39	"	Meter	"	-	"
K-40	"	Fast	"	-	"
K-41	"	Meter	"	-	"
K-42	"	Fast	"	-	"
K-43	"	Meter	"	-	"
K-44	"	Fast	"	-	"
K-45	"	Meter	"	-	"
K-46	"	Fast	"	-	"
K-47	"	Meter	"	-	"
K-48	"	Fast	"	-	"
K-49	"	Meter	"	-	"
K-50	"	Fast	"	-	"
K-51	"	Meter	"	-	"
K-52	"	Fast	"	-	"
K-53	"	Meter	"	-	"
K-54	"	Fast	"	-	"
K-55	"	Meter	"	-	"
K-56	"	Fast	"	-	"
K-57	"	Meter	"	-	"
K-58	"	Fast	"	-	"
K-59	"	Meter	"	-	"
K-60	"	Fast	"	-	"
K-61	"	Meter	"	-	"
K-62	"	Fast	"	-	"
K-63	"	Meter	"	-	"
K-64	"	Fast	"	-	"
K-65	"	Meter	"	-	"
K-66	"	Fast	"	-	"
K-67	"	Meter	"	-	"
K-68	"	Fast	"	-	"
K-69	"	Meter	"	-	"
K-70	"	Fast	"	-	"
K-71	"	Meter	"	-	"
K-72	"	Fast	"	-	"
K-73	"	Meter	"	-	"
K-74	"	Fast	"	-	"
K-75	"	Meter	"	-	"
K-76	"	Fast	"	-	"
K-77	"	Meter	"	-	"
K-78	"	Fast	"	-	"
K-79	"	Meter	"	-	"
K-80	"	Fast	"	-	"
K-81	"	Meter	"	-	"
K-82	"	Fast	"	-	"
K-83	"	Meter	"	-	"
K-84	"	Fast	"	-	"
K-85	"	Meter	"	-	"
K-86	"	Fast	"	-	"
K-87	"	Meter	"	-	"
K-88	"	Fast	"	-	"
K-89	"	Meter	"	-	"
K-90	"	Fast	"	-	"
K-91	"	Meter	"	-	"
K-92	"	Fast	"	-	"
K-93	"	Meter	"	-	"
K-94	"	Fast	"	-	"
K-95	"	Meter	"	-	"
K-96	"	Fast	"	-	"
K-97	"	Meter	"	-	"
K-98	"	Fast	"	-	"
K-99	"	Meter	"	-	"
K-100	"	Fast	"	-	"

INSTRUMENT CHECK

START-UP CHECK LIST

Equipment checked by T.O.C. AKK Personnel check by F.O.C.  
 Instruments and safeties checked and reset by AKK  
 Sources in checked by AKK Source No. M-43  
 Emergency equipment in control room checked by F.O.C.  
 Instruments in trip circuit: N-1 PM 1-2  
 Red light on by AKK Time 0810  
 Start-up OK'd by F.O.C. AKK Date 1-15-68



1.092" rods.  
60 cm length.  
1.630 cm separation c-c  
Square array's.

Top of fuel

H<sub>2</sub>O = 19.60 cm.

Added 4 rods. Now have an 35x35-15 array.  
Total of rods = 1210 rods.

Water ht = 35.00 cm

Temp °C

1-Per

22.3

G = -391.14 mW = -3.74

0840

Drain

Added 2 rods. Now have an 35x35-13 array.  
Total of rods = 1212 rods.

Water ht = 35.00 cm. — —

Temp °C

2+Per

22.4°

G = 456.33 mW = 2.64

1025

Water ht = 30.80 cm

System just critical

Drain to 2.0 cm and removed 1 rod.

over.

Removed 1 rod. Now have an 35 x 35 - 14 array. Total of rods = 1211

1045 Water ht = 35.00 cm - 15.6 = 19.4 Temp °C  
Septum just critical 22.4 °C  
Drain

#13

1/15/69  
35 x 35 array with 14 rods removed from 1 face. Total Rods: 1211  
P. 106

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	1"	✓	$3 \times 10^{-12}$
"	"	Fast ✓	"	✓	"
K-2	—	Meter —	—	—	—
—	—	Fast —	—	—	—
R-1	—	—	—	—	—
R-2	—	—	—	—	—
PM-1	700 V	Alarm ✓	1.5"	—	500 V
PM-2	1200 V	Low ✓	10"	✓	900 V
"	"	Alarm ✓	2"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. <u>B-80</u>
DUMP WELL PROBE LIGHT					

START-UP CHECK LIST

Equipment checked by I.P.C. P.M.V. Personnel check by I.P.C.  
 Instruments and safeties checked and reset by P.M.V.  
 Source in checked by P.M.V. Source No. M-93  
 Emergency equipment in control room checked by I.P.C.  
 Instruments in trip circuit: K-1 PM-1-2  
 Red light on by P.M.V. Time 1345  
 Start-up OK'd by I.P.C. P.M.V. Date 1-16-69

.092" Rods (C.C. 89)  
 60 cm length.  
 0.630 cm separation C-C.  
 Rounded array's.

Top of Fuel

H<sub>2</sub>O = 20.90 cm

Now have an 39 x 39 array, with 90 rods removed from each corner. Total of 1161 rods.

1412 Water ht = 36.20 cm

Temp °C

System sub critical

22.5 °C

Drain.

Added 8 rods. Two to each corner.

Now have an 39 x 39 array, with 88 rods removed from each corner. Total of 1169 rods.

1538 Water ht = 36.20 cm

Temp °C

System sub critical

22.6 °C

Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	1"	✓	$3 \times 10^{-12}$
"	"	Fast ✓	"	✓	"
K-2	—	Meter	—	—	—
"	—	Fast	—	—	—
R-1	—	—	—	—	—
R-2	—	—	—	—	—
PM-1	700V	Alarm ✓	5"	—	500V
PM-2	1200V	Low ✓	10"	—	900V
"	"	Alarm ✓	2"	✓	"
LOG N CALIBRATE		✓	OPERATE	—	SOURCE No. <u>B-80</u>
DUMP WELL PROSE LIGHT					

START-UP CHECK LIST

Equipment checked by F.D.C. AMV Personnel check by F.D.C.  
 Instruments and safeties checked and reset by AMV  
 Source in checked by AMV Source No. M-43  
 Emergency equipment in control room checked by F.D.C.  
 Instruments in trip circuit: K-1 PM-1-2  
 Red light on by AMV Time 0805  
 Start-up OK'd by F.D.C. AMV Date 1-17-69

.092" Rods (Ø 2.89)  
60 cm lengths  
0.630 cm separation e-e.  
Rounded array's.

Top of fuel

$H_2O = 20.90 \text{ cm}$

Added 8 rods, 2 to each corner. Now have an  $39 \times 39$  array with 86 rods removed from each corner. Total of 1177 rods.

0835. Water ht = 36.20 cm

Temp °C

System sub critical  
Drain.

22.5 °C

Added 8 rods 2 to each corner. Now have an  $39 \times 39$  array with 84 rods removed from each corner. Total of 1185 rods.

0930 Water ht = 36.20 cm

Temp °C

-Per

22.7 °C

$E = -284.66 \text{ m} = -5.3 \text{ f}$

Drain

Added 9 rods, 1 to each corner. Now have an  $39 \times 39$  array with 83 rods removed from each corner. Total of 1189 rods.

Water ht = 36.20 cm

+Per.

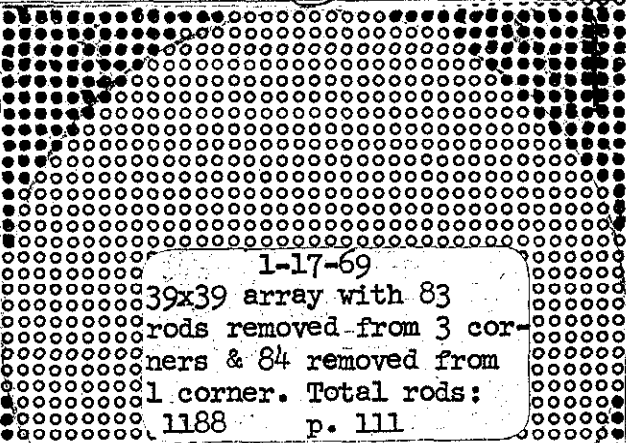
$E = 299.87 \text{ m} = 3.9 \text{ f}$

1015 Water ht = 30.25 cm  
 System just critical  
 Drain.

Removed 2 rods, 1 each from opposite corners.  
 Now have an 39x39 array, with 84 rods  
 removed from 2 corners, and 83 rods  
 removed from 1 corner. Total of 1187 rods.

Water ht = 36.30 cm Temp °C  
 3-Per 22.9 °C  
 $\tau = -1586.0 \text{ sec} = -.84 \text{ f}$

1046 Drain  
 added 1 rod  
 with 83 rods  
 and 84 rods  
 1188 rods.



array,  
 and  
 total of

1-17-69  
 39x39 array with 83  
 rods removed from 3 cor-  
 ners & 84 removed from  
 1 corner. Total rods:  
 1188 p. 111

Water ht =  
 4-Per  
 $\tau = 814.87 \text{ sec}$

1122 Water ht = 30.10 cm.  
 System just critical  
 Drain.

See p. 10  
 report  
 corrected Diagram OK

1015 water ht = 30.25 cm  
 System just critical  
 Drain.

Removed 2 rods, 1 each from opp  
 Now have an 39 X 39 array, with  
 removed from 2 corners. and  
 removed from 2 corners. Total

Water ht = 36.30 cm  
 3 - Per  
 $\epsilon = -1586.0 \text{ sec} = -.847$  (12)

1046 Drain (83)

Added 1 rod. Now have an 39 X 39 array,  
 with 83 rods removed from 3 corners and  
 84 rods removed from 1 corner. Total of  
 1188 rods.

Water ht = 36.20 cm.  
 4 + Per (84)  
 $\epsilon = 814.87 \text{ sec} = 1.54$

Temp °C  
 23.51 °C  
 8.7 (83)  
 10.9

1122 Water ht = 32.10 cm.  
 System just critical  
 Drain.

See p. 113  
 report of  
 CD unit  
 Diagram OK



INSTRUMENT-CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	1"	✓	$3 \times 10^{-12}$
"		Fast ✓	"	✓	"
K-2	—	Meter			
		Fast			
R-1	—				
R-2	—				
PM-1	700V	Alarm ✓	5"	—	500V
PM-2	1200V	Low ✓	10"	—	900V
"		Alarm ✓	2"	—	"
LOG N CALIBRATE		—	OPERATE	—	SOURCE No. <u>880</u>
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by F.O.C. Personnel check by R.K.H.  
 Instruments and safeties checked and reset by AKL  
 Source in checked by AKL Source No. M-43  
 Emergency equipment in control room checked by F.O.C.  
 Instruments in trip circuit: K-1 PM-1-2  
 Red light on by AKL Time 0804  
 Start-up OK'd by F.O.C. R.K.H. Date 1-20-69

.092" radius  $V(2.89)$   
60 cm length.  
0.630 cm separation c-c.  
Rounded arrays.

- 113

Repeat of last experiment described on page  
111. Note (after removing array from tank  
on last experiment found that <sup>(1)</sup>one rod  
in lower half of grid plate was displaced  
1 hole, or 0.630 cm. The displacement was toward  
the center of the array.)

0945 Water ht = 36.20 cm  $\frac{1}{2} \text{ in } \approx 1.27 \text{ cm}$  Temp  $^{\circ}\text{C}$   
System just critical  $\frac{1}{2} \text{ in}$  23.1  $^{\circ}\text{C}$   
Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	$3 \times 10^{-12}$
"	"	" <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2	—	Meter <input checked="" type="checkbox"/>	—	<input checked="" type="checkbox"/>	—
R-1	—	<input checked="" type="checkbox"/>	—	<input checked="" type="checkbox"/>	—
R-2	—	<input checked="" type="checkbox"/>	—	<input checked="" type="checkbox"/>	—
PM-1	700V	Alarm <input checked="" type="checkbox"/>	.50"	<input checked="" type="checkbox"/>	500V
PM-2	1200V	" <input checked="" type="checkbox"/>	12"	<input checked="" type="checkbox"/>	900V
"	"	Alarm <input checked="" type="checkbox"/>	2"	<input checked="" type="checkbox"/>	"
LOG N CALIBRATE <input checked="" type="checkbox"/>		OPERATE <input checked="" type="checkbox"/>		SOURCE No. B-80	
DUMP WELL PROBE LIGHT <input checked="" type="checkbox"/>					

START-UP CHECK LIST

Equipment checked by E.P.C. [Signature] Personnel check by E.P.C.

Instruments and safeties checked and reset by [Signature]

Source in checked by [Signature] Source No. M-93

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

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

Red light on by [Signature] Time 1345

Start-up OK'd by E.P.C. [Signature] Date 1-21-68

Joy H2

.092" hole  $\phi$  (4.89)  
30 cm length  
0.514 cm separation c-c  
square array.

Top of fuel  
H<sub>2</sub>O = 21.30 cm.

Have an 45 x 45 array. Total of 2025 rods.

1430 Water ht = 36.80 cm. Temp °C  
System sub critical 24.1 °C  
Drain.

Added 91 rods. Now have an 46 x 46 array.  
Total of 2116 rods.

1520 Water ht = 36.70 cm Temp °C  
System sub critical 24.1 °C  
Drain.

Joy  
H<sub>2</sub>

INSTRUMENT-CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	1"	✓	$3 \times 10^{-12}$
	"	Fast ✓	"	✓	"
K-2		Meter —	—	—	—
		Fast —	—	—	—
R-1	—				
R-2	—				
PM-1	700V	Alarm —	15"	✓	500V
PM-2	1200V	Low —	12"	✓	900V
	1'	Alarm —	3"	✓	"

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

START-UP CHECK LIST

Equipment checked by F.D.C. Personnel check by 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 F.D.C.  
 Instruments in trip circuit: K-1 PM 1-2  
 Red light on by AKH Time 0800  
 Start-up OK'd by F.D.C. AKH Date 1-22-69

.092" Rods. 0 (2.89)  
30 cm length.  
0.514 cm separation c-c.  
Square array.

Top of fuel  
H<sub>2</sub>O = 21.90 cm.

added 188 rods.

Now have an 48x48 array. Total of 2304 rods.

0840

Water ht = 37.50 cm  
System sub critical  
Drain.

Temp °C  
23.1 °C

added 97 rods. Now have an 49x49 array.  
Total of 2401 rods.

1330

Water ht = 37.50 cm  
System sub critical  
Drain.

Temp °C  
24.3 °C

added 99 rods. Now have an 50x50 array.  
Total of 2500 rods.

Top of Fuel  
H<sub>2</sub>O = 22.90 cm

Water ht = 28.30 cm  
+ Per  
C = 69.54 = 13.0 %

Temp °C  
24.3 °C

1435

Water ht = 27.70 cm  
System just critical  
Drain.

over

Removed 20 rods. Now have an  $50 \times 50 - 20$  array. Total: 2480 rods.

Water ht = 29.50 cm Temp °C  
 + Res 24.8 °C  
 $t = 65.19 = 13.6 \text{ } \&$

1530 Water ht = 28.40 cm  
 System just critical  
 Drain.

Top of Fuel

$H_2O = 21.90 \text{ cm}$

Removed 30 rods. Now have an  $49 \times 50$  array. Total of 2450 rods.

1551 Water ht = 37.70 cm  $21.9 = 15.8 \text{ cm}$  Temp °C  
 System just critical 24.9 °C  
 Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3x10 <sup>-12</sup>	Meter ✓	1"	✓	3x10 <sup>-12</sup>
"	"	Fast ✓	"	✓	"
K-2	—	Meter —	—	—	—
		Fast —			
R-1	—	—			
R-2	—	—			
PM-1	700V	Alarm ✓	15"	✓	500V
PM-2	1200V	Low ✓	12"	✓	900V
"	"	Alarm ✓	13"	—	"
LOG N <sup>o</sup> CALIBRATE ✓		OPERATE ✓		SOURCE No. B-80	
DUMP WELL PROBE LIGHT —					

START-UP CHECK LIST

Equipment checked by F.D.C. Personnel check by F.D.C.  
 Instruments and safeties checked and reset by AMM  
 Source in checked by AMM Source No. 19-93  
 Emergency equipment in control room checked by F.D.C.  
 Instruments in trip circuit: K-1 PM-1-2  
 Red light on by AMM Time 0805  
 Start-up OK'd by F.D.C. AMM Date 1-23-69

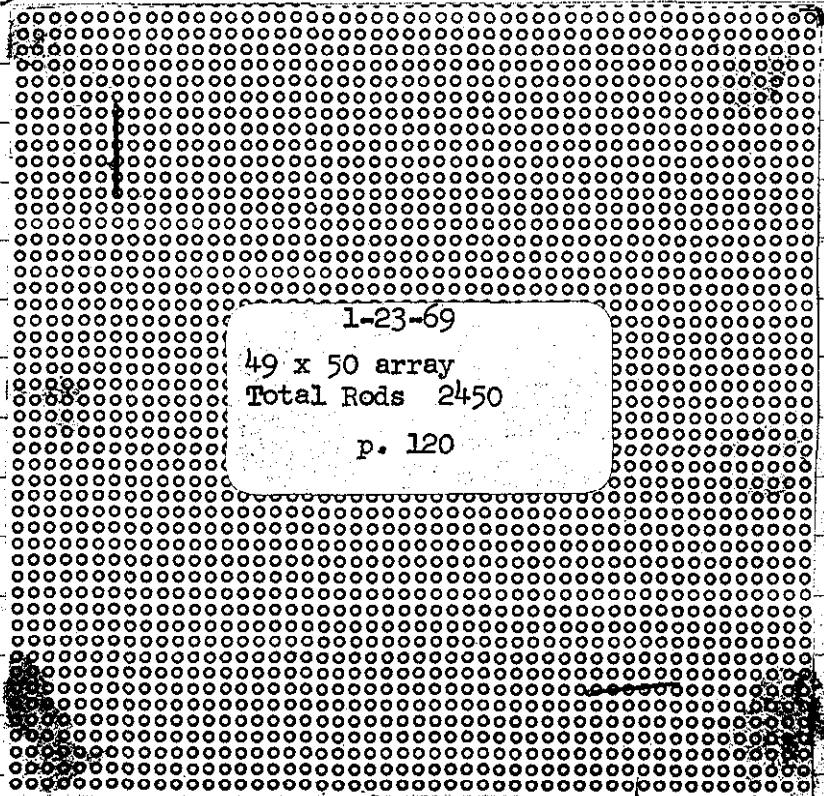


120

.092" rods U(4.89)  
30 cm lengths.  
0.514 cm separation c-c.  
Square array.

Repeat of last experiment (p-115.) Have  
an 49 x 50 array. Total of 2450 rods.

0840 Water ht = 37.70 cm. - 21.9-15.8 cm Temp °C  
Systems just critical 24.4°C  
Dmin.



#1

.092" rods, U(4.39)  
30 cm length  
0.514 cm separation c-c.  
Rounded array's.

121

Top of Fuel  
H<sub>2</sub>O = 23.40 cm.

Now have an 55 x 55 array. With 162 rods  
removed from each corner. Total of 2377  
rods.

Water ht = 38.80 cm

Temp °C

~ Per.

25 °C

N. G

1.535

Drain:

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 —	—	—	—
"	—	Fast —	—	—	—
R-1	—	—	—	—	—
R-2	—	—	—	—	—
PM-1	700 V	Alarm ✓	5"	✓	500 V
PM-2	1200 V	Low ✓	10"	✓	900 V
"	"	Alarm ✓	3"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. 13-80
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

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

Instruments and safeties checked and reset by AKV

Source in checked by AKV Source No. M-43

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

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

Red light on by AKV Time 0825

Start-up OK'd by F.I.D.C. AKV Date 1-28-69

.092" Rods. UG.82  
30 cm length.  
0.514 cm separation e-c.  
Rounded array.

- 123

added 8 rods. Now have an 55x55 array,  
with 160 rods removed from each corner.  
Total of 2385 rods.

0915 Water ht = 38.85 cm

Temp °C

- Per

24.7°C

N.G

0925 Drain.

added 8 rods. Now have an 55x55 array,  
with 158 rods removed from each corner.  
Total of 2393 rods.

Water ht = 38.60 cm

Temp °C

- Per

25.0°C

$t_s = -988.7 \text{ sec} = -1.4 \text{ f}$

1315 Drain.

added 1 rod to 1 corner. Now have an  
55x55 array with 158 rods removed from  
3 corners and 157 rods removed from  
1 corner. Total of 2394 rods.

acc.

1358

Water ht = 38.70 cm.  
System just critical  
Drain.

23.4 - 15.3 cm

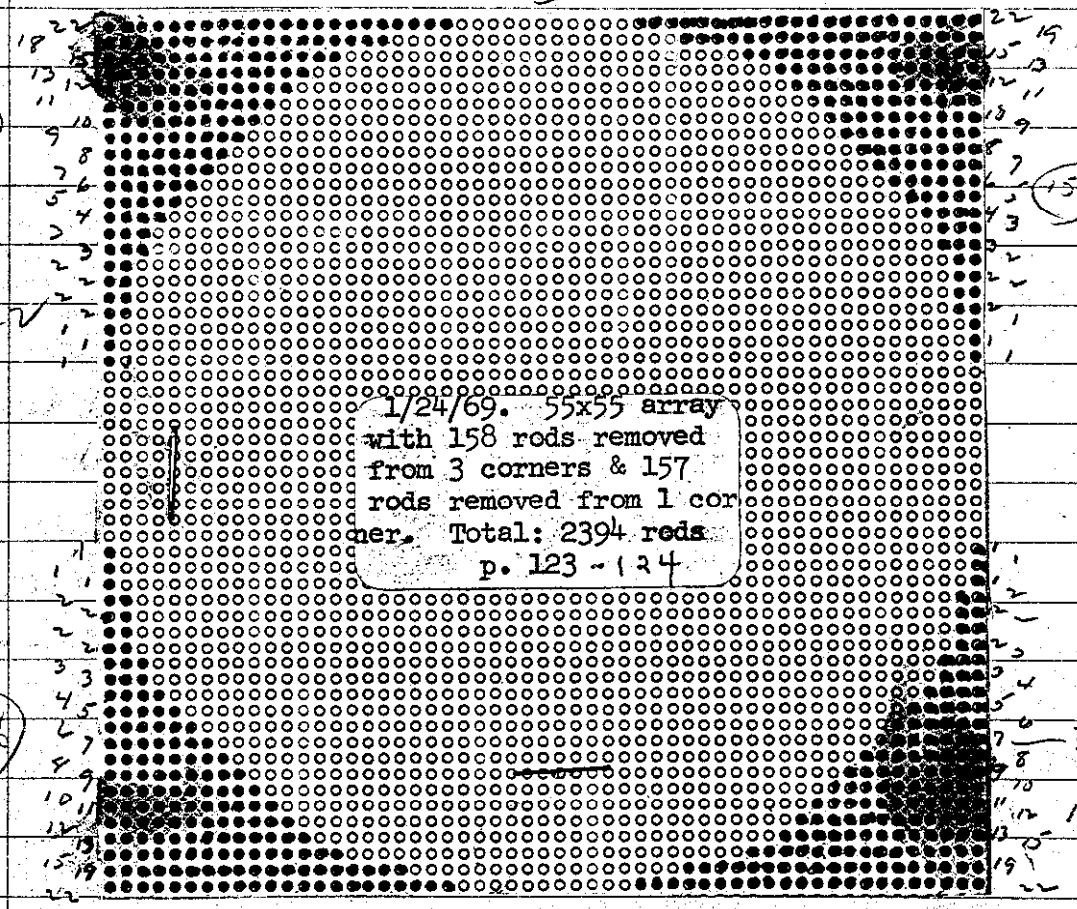
Temp °  
25.0 °

(157)

HV

(154)

(158)



1/24/69. 55x55 array  
with 158 rods removed  
from 3 corners & 157  
rods removed from 1 cor  
ner. Total: 2394 rods  
p. 123-124

158

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-2}$	Meter ✓	1"	✓	$3 \times 10^{-2}$
"	"	Fast ✓	"	✓	"
K-2	—	Meter —	—	—	—
"	—	Fast —	—	—	—
R-1	—	—	—	—	—
R-2	—	—	—	—	—
PIA-1	700V	Alarm —	50"	✓	500V
PM-2	1200V	Low —	10"	✓	900V
"	"	Alarm —	2"	—	"

LOG N CALIBRATE  OPERATE  SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by F.D.C. Personnel check by F.D.C.  
A.M.H.  
 Instruments and safeties checked and reset by A.M.H.  
 Source in checked by A.M.H. Source No. M-93  
 Emergency equipment in control room checked by F.D.C.  
 Instruments in trip circuit: K-1 PM-1-2  
 Red light on by R.K.R./ Time 0815  
 Start-up OK'd by F.D.C. A.M.H. Date 1-28-69

126

1092" Rods. U(4.89)  
60 cm length.  
0.514 cm separation c.c.  
Square array's.

Top of fuel

H<sub>2</sub>O = 18.80 cm.

Have an 38 x 38 array. Total of 1444 rods.

0950 Water ht = 34.20 cm.

Temp °C ?

System sub critical  
Drain.

22.7 °C

Added 77 rods. Now have an 39 x 39  
array. Total of 1521 rods.

1043 Water ht = 34.60 cm

Temp °C

System sub critical  
Drain.

22.9 °C

Added 160 rods. Now have an 41 x 41 array.  
Total of 1681 rods.

Top of fuel

20.40  
H<sub>2</sub>O = ~~18.80~~ cm

1435 Water ht = 35.70 cm

Temp °C

System sub critical  
Drain.

23.0 °C

Top of level

H<sub>2</sub>O = 20.90 cmAdded 41 rods. Now have an 41 x 42 array.  
Total of 1722 rods.

Water ht = 35.80 cm

Temp °C

+ P<sub>ex</sub>

23.2 °C

T<sub>2</sub> = 304.22 mm = 3.8 f

1552 Water ht = 31.20 cm.

System just critical  
Drain.



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE	REF	START-UP RANGE
K-1	3 X 10 <sup>-12</sup>	✓	1"	✓	3 X 10 <sup>-12</sup>
"	"	✓	"	✓	"
K-2	—	—	—	—	—
R-1	—	—	—	—	—
R-2	—	—	—	—	—
PM-1	700V	Alarm ✓	5"	✓	500V
PM-2	1200V	Alarm ✓	12"	✓	900V
"	"	Alarm ✓	2"	✓	"

LOG N. CALIBRATE  OPERATE  SOURCE No.

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by F.D.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 F.D.C.

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

Red light on by AKM Time 0815

Start-up OK'd by F.D.C. AKM Date 1-29-69

1092" Rods (14.88)  
60 cm length.  
0.514 cm separation c-c  
Square array.

129

Removed 3 rods. Now have an 41x41 + 38  
array. Total of 1719 rods.

0900 Water ht = 35.80 cm. - 20.4 - 15.4 Temp °C  
system just critical 22.9 °C  
Drain.

#3

1-29-69  
41 x 41 array plus 38  
rods on 1 face.  
Total Rods: 1719  
p. 129

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-13X10	-12	Meter ✓	1"	✓	10K10 <sup>-12</sup>
"		Fast ✓	"	—	"
K-2	—	Meter —	—	—	—
—	—	Fast —	—	—	—
R-1	—	—	—	—	—
D-2	—	—	—	—	—
PA-1	700V	Alarm ✓	5"	✓	500V
"	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 F.D.C 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 PM 1-2  
 Red light on by AKH Time 0910  
 Start-up OK'd by F.D.C AKH Date 1-29-69  
1-30-69

.092" Rods (U-59)

60 cm length.

0.514 cm separation c-c

Rounded array's.

Top of Fuel

H<sub>2</sub>O = 21.90 cm.

Have an 47x47 array, with 128 rods removed from each corner. Total of 1697 rods.

Water ht = 36.80 cm

Temp °C

23.2 °C

- Per

$\tau = -195.57 \mu = -8.44 ?$

1005 Drain.

Added 8 rods. Now have an 47x47 array, with 126 rods removed from each corner. Total of 1705 rods.

Water ht = 36.70 cm

dh = 1.2 cm

Temp °C

23.5 °C

+ Per

$\tau = 136.90 \mu = 7.24$

1110 Water ht = 29.60 cm

System just critical  
Drain.

over.

Removed 4 rods. 1 from each corner.  
Have an  $47 \times 47$  array, with 127 rods  
removed from each corner. Total of  
1701 rods.

Water ht = 36.80 cm <sup>55,10</sup> Temp  $^{\circ}$ C  
<sup>3</sup>+Per 23.7  $^{\circ}$ C  
 $t = 1,021.3 \text{ sec} = 1.24$

1327 Water ht = 31.70 cm see p-135  
 System just critical  
 Drain.

Remaind 1 rod from 1 corner. Have an  
 $47 \times 47$  array, with 128 rods removed  
from 1 corner and 127 rods removed  
from 3 corners. Total of 1700 rods.

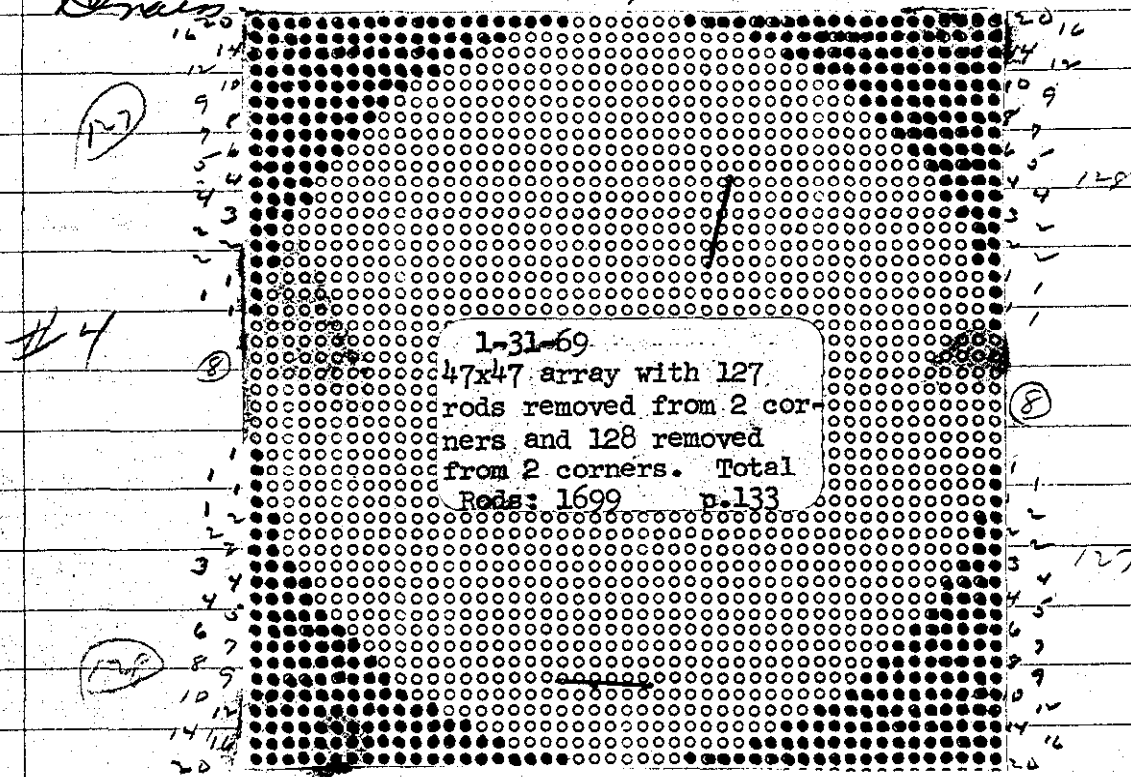
Water ht = 36.80 cm Temp  $^{\circ}$ C  
<sup>4</sup>+Per 23.9  $^{\circ}$ C

$t = 1,053.9 \text{ sec} = 1.24$  see p 135-136

1408 Water ht = 32.70 cm  
 System just critical  
 Drain.

Removed 1 rod. Have an 47x47 array,  
with 127 rods removed from 2 corners  
and 128 rods removed from 2 corners.  
Total of 1699 rods.

1452 Water ht = 36, 80 cm - 21.4 = 15.4 Temp °  
System just critical 29.2 °  
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 —	—	—	—
"	—	Fast —	—	—	—
R-1	—	—	—	—	—
R-2	—	—	—	—	—
PA-1	700 V	Alarm ✓	50"	✓	5000
PM-2	1200 V	Low ✓	10"	✓	9000
"	"	Alarm ✓	2"	✓	"
LOG IN CALIBRATE		✓	OPERATE	—	SOURCE No. B-80
DUMP WELL PROBE LIGHT		—	—	—	—

START-UP CHECK LIST

Equipment checked by F.D.C. 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 F.D.C.

Instruments in trip circuit: AKK PM-1-2

Red light on by AKK Time 0805

Start-up OK'd by F.D.C. AKK Date 1-31-69

Repeat of experiment described on p-133.

0845 Water ht = 36.80 cm. Temp °C  
 System just critical 15.4 sec 24.0°C  
 Drain.

Added 2 rods. Repeat of experiment described on top of p-132. 47x47 array with 127 rods removed from each corner. Total of 1701 rods.

Water ht = 36.80 cm Temp °C  
 + Per 24.1°C  
 $\tau = 308.57 \text{ sec} = 3.8 \phi$  cf 1.2  $\phi$  (p.132)

0933 Water ht = 30.80 cm cf 31.7 (p.132)  
 System just critical  
 Drain.

Removed 1 rod. Repeat of experiment described on top bottom of page 132. 47x47 array with 128 rods removed from 1 corner, and 127 rods removed from 3 corners. Total of 1700 rods.  
 Water ht = 36.80 cm. Temp °C  
 + Per 24.2°C  
 $\tau = 453.07 \text{ sec} = 2.7 \phi$  avr!



1036 Water ht = 31.35 cm.  $\approx 4.329$  (11.132)  
 systems just critical  
 drain.

2-3-69 Sample of reflector water: (after using  
 in 0.92" rad.)

Reg # 684549

ask for.

$\frac{g}{g} = .00000236$

Dumped to hold tanks

6-16-69 Reg # 684552

Reflector H<sub>2</sub>O. (small tank).

ask for.

1.  $\frac{g}{g}$

2. Paper 40



REQUISITION

684549

FLOOR  
LAB

'69 FEB

3

PM

3

:00

REPORT TO

R. K. Ready

BUILDING NO.

9213

PHONE NO.

3-5237

## INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	$3 \times 10^{-12}$
		Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2	-	Meter			
		Fast			
R-1					
R-2					
PM-1	700V	Alarm	.5"	<input checked="" type="checkbox"/>	500V
PM-2	1200V	Low	10"	<input checked="" type="checkbox"/>	900V
	"	Alarm	2"	<input checked="" type="checkbox"/>	"
LOG N CALIBRATE <input checked="" type="checkbox"/>		OPERATE <input checked="" type="checkbox"/>		SOURCE No. <u>B-80</u>	
DUMP WELL PROBE LIGHT <input type="checkbox"/>					

## START-UP CHECK LIST

Equipment checked by F.D.C. Personnel check by F.D.C.  
 Instruments and safeties checked and reset by AKV  
 Source in checked by AKV Source No. 1A-93  
 Emergency equipment in control room checked by F.D.C.  
 Instruments in trip circuit: K-1 PM-1-2  
 Red light on by AKV Time 1300  
 Start-up OK'd by F.D.C. AKV Date 6-11-69

15 (4.89) rods.

.50" O.D.

30 cm length. Rounded array's.

Check point: see page 83 (log levels 112)

Separation = 2.99 cm separation c-c.

Sub rate = 4.40 cm/min.

$\frac{3}{4}$  dump rate = 9.40 cm/min.

3.0" dump rate = 26.0 cm/10 sec.

Have an 12 x 12 array, with 12 rods removed from each corner. Total of 96 rods.

$\Delta h = 7.0 \text{ cm}$

Water ht = 27.10 cm

Temp °C

+ Per

25.0 °C

$U = 110.82 \text{ sec} = 9.1 \text{ ft} = 1.3 \text{ ft/cm}$

Water ht = 20.10 cm

System just critical

Drain.

INSTRUMENT CHECK

2)

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	$3 \times 10^{-12}$
"		Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2	-	Meter			
		Fast			
R-L	-				
R-2	-				
PM-1	700V	Alarm <input checked="" type="checkbox"/>	50"	<input checked="" type="checkbox"/>	500V
PM-2	1200V	Low <input checked="" type="checkbox"/>	10"	<input checked="" type="checkbox"/>	900V
"		Alarm <input checked="" type="checkbox"/>	2"	<input checked="" type="checkbox"/>	"

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

START-UP CHECK LIST

Equipment checked by T.D.C. Personnel check by T.D.C.  
 Instruments and safeties checked and reset by APR 6  
 Source in checked by APR 6 Source No. 10-93  
 Emergency equipment in control room checked by T.D.C.  
 Instruments in trip circuit: K-1 PM-1-2  
 Red light on by APR 6 Time 1245  
 Start-up OK'd by T.D.C. APR 6 Date 6-18-69

140

Start of 0.14099L

10.00 added 520.6 g  $H_3BO_3$  to small  
drying tank.

12.45 Now have on 13 X 13 array. with 12 rods  
removed from 2 opposite corners and 11  
rods removed from 2 opposite corners.  
Total of 123 rods. (Check point: see page  
89 log book #2.)

15.27 Water ht = 27.50 cm  
System just critical  
Drain.

Temp  $^{\circ}C$   
25.0  $^{\circ}C$

6-19-69

Rad samples (Y-12)

#1

.098"  $\sigma = 45.3$   
 $T = 19.7$   
 $N = 25.6$

Reg # 684554

ask for each sample.

$r^{2/3} = .999774$

Spec =

conv.  $\gamma = 4.93$

#2

.30"  $\sigma = 58.3$   
 $T = 19.3$   
 $N = 39.0$

Reg # 684555

$r^{2/3} = .999781$

Spec =

conv = 4.97

#3

.50"  $\sigma = 40.0$   
 $T = 19.0$   
 $N = 21.0$

Reg # 684556

$r^{2/3} = .999507$

Spec =

conv = 4.95

#4

.75"  $\sigma = 75.6$   
 $T = 33.5$   
 $N = 42.1$

Reg # 684557

$r^{2/3} = .999768$

Spec =

conv = 4.97

#5

1.0"  $\sigma = 88.5$   
 $T = 34.5$   
 $N = 54.0$

Reg # 684558

$r^{2/3} = .999993$

Spec =

conv = 4.92

conv conv = 4.95

$r^{2/3} \text{ conv} = .999765$



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	1"	✓	$3 \times 10^{-12}$
	"	Fast ✓	"	✓	"
K-2	-	Meter	-	-	-
	-	Fast	-	-	-
R-1					
R-2					
PM-1	700V	Alarm ✓	.5"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
	"	Alarm ✓	2"	✓	"
LOG N CALIBRATE		✓	OPERATE		✓
			SOURCE No.		B-80
DUMP WELL PROBE LIGHT		_____			

START-UP CHECK LIST

Equipment checked by F.D.C. AKL Personnel check by F.D.C.  
 Instruments and safeties checked and reset by AKL  
 Source in-checked by AKL Source No. 14-43  
 Emergency equipment in control room checked by F.D.C.  
 Instruments in trip circuit: K-1 PM 1-2  
 Red light on by A.K.R. Time 10:00  
 Start-up OK'd. by F.D.C. AKL Date 6-19-69

## Spacings for 0.092-in.-diam U(4.89) Rods in Water

Nominal Rod Diam. (in.)	Mass of $^{235}\text{U}$ /Rod (g)	Concentration (g of $^{235}\text{U}$ /liter)	Square Pattern	
			Center Spacing (cm)	Estimated Critical Mass (kg of $^{235}\text{U}$ )
0.092	1.189	200	0.445	4.1-4.2
		120	0.575	2.4-2.5
		150	0.514	2.9-3.0
		100	0.630	2.1-2.2
		70	0.753	1.7-1.8
		55.5	0.845	1.7-1.8
		50	0.890	1.7-1.8
		40	0.995	1.9-2.0
		30	1.150	2.5-2.6

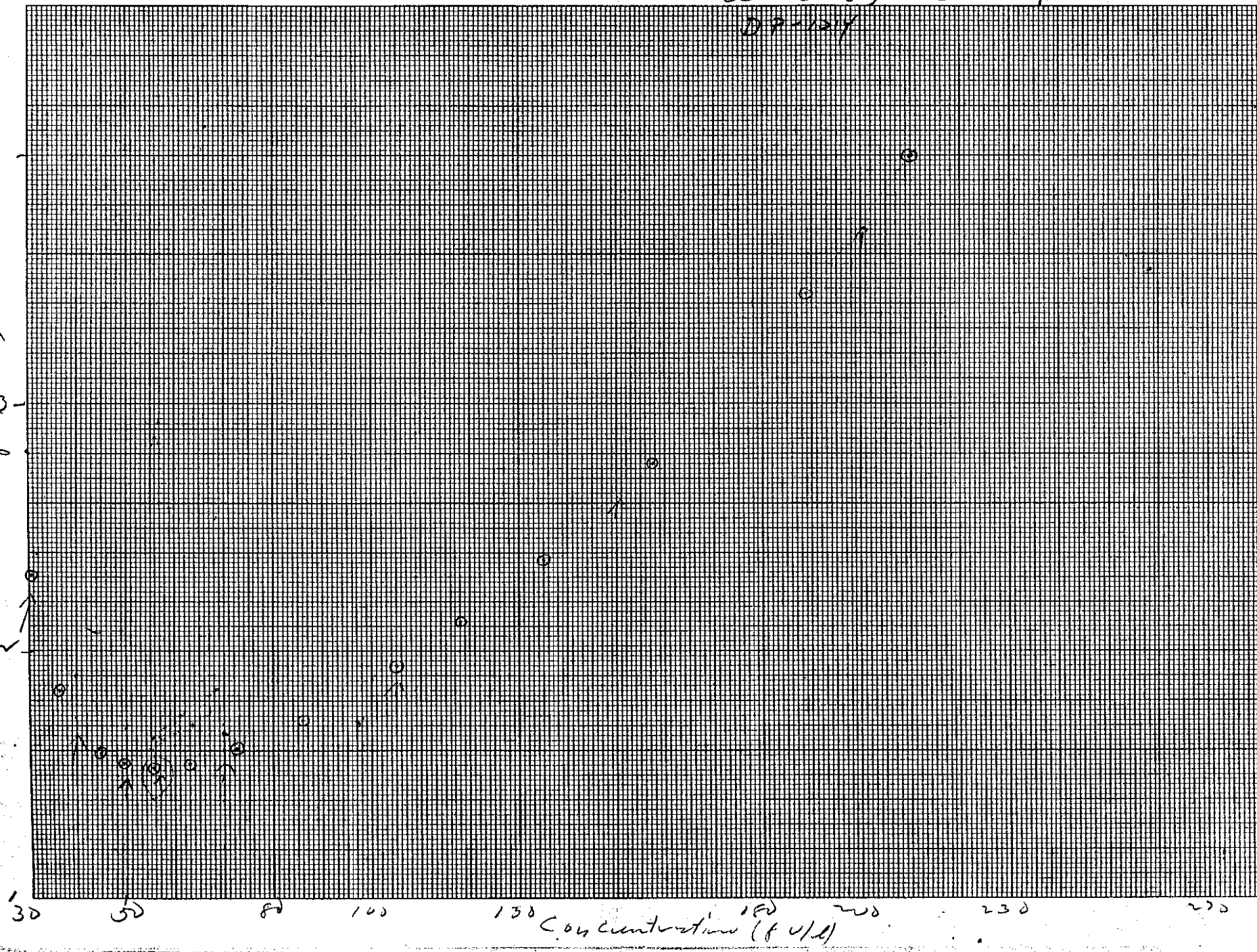
*Grid plate**hole drill #40 drill**.0980"*

0.1" diam U(5) rods  
D.P. - 127

4.81  
↑

8.11  
↑

Critical Mass (kg of U<sup>235</sup>)



Repeat of experiment described on page 140.

1038 Water h<sub>t</sub> = 27.50 cm Temp ° 24.5°  
 System just critical  
 Drain.

Sample taken from dump tank:

6-19-69 samples:

Y-12 (1)

X-10 (2)

Reg # 684559

A-632

G = 282.00 g

N = 243.40 g

T = 36.80

Rec 6-25-69

N = 245.20

orb for:

orb for:

1 - g O/L = 0.14

1 - g O/L = 0.139

2 - density = 0.9972

2 - density = 0.9974

3 - temp. = @ 25°

3 - Temp = @ 25.0°

147

. 50" rods.  
2.99 cm separation e-c.  
60 cm length.  
Rounded array's

Have on 10 X 10 array, with 5 rods removed  
from 3 corners and 4 rods removed from  
1 corner. Total of 81 rods. (See p. 98-99)

log. holes (# 2)

$$\Delta h = 1.40 \text{ cm}$$

Water ht = 45.30 cm

Temp °

+ Per

24.4°

$$E = 63.01 \text{ sec} = 13.97 = 9.9 \text{ f/cm}$$

1536 Water ht = 43.90 cm

System just critical  
Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-13	$3 \times 10^{-12}$	Meter	1"	<input checked="" type="checkbox"/>	$3 \times 10^{-12}$
"	"	Fast	"	<input checked="" type="checkbox"/>	"
K-2		Meter			
		Fast			
R-1					
R-2					
PM-1	700V	Alarm	5"	<input checked="" type="checkbox"/>	500V
PM-2	1200V	Low	10"	<input checked="" type="checkbox"/>	900V
	"	Alarm	2"	<input checked="" type="checkbox"/>	"

LOG N CALIBRATE  OPERATE  SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by F.P.C. Personnel check by F.P.C.

Instruments and safeties checked and reset by AKM

Source in checked by AKM Source No. 19-43

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

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

Red light on by AKM Time 0930

Start-up CK'd by F.P.C. AKM Date 6-20-69

Repeat of experiment described on page 144

Water ht = 45.30 cm  $o_h = 1.30 \text{ cm}$  Temp  $^{\circ}\text{C}$   
 7 per. 24.2  $^{\circ}\text{C}$

$$t = 70.62 \text{ sec} = 12.84 = 9.84/\text{cm}$$

10.76 Water ht = 44.00 cm

System just critical  
 Drain.

Repeat of above, after moving Leg - 21  
 outside of tank.

Water ht = 45.30 cm  $o_h = 1.30 \text{ cm}$  Temp  $^{\circ}\text{C}$   
 7 per. 24.4  $^{\circ}\text{C}$

$$t = 65.19 \text{ sec} = 13.64 = 10.54/\text{cm}$$

1309 Water ht = 44.00 cm

System just critical  
 Drain.

Repeat of experiment described on pages 140  
+ 143.

Water ht = 27.50 cm

3-Per

$T_s = -934.39 \text{ sec} = -1.47$

1500 Drain:



**INSTRUMENT CHECK**

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-13	10 <sup>-12</sup>	Meter <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	3x10 <sup>-12</sup>
"		Fast <input type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2		Meter <input type="checkbox"/>			
		Fast <input type="checkbox"/>			
R-1					
R-2					
PM-1	700V	Alarm <input checked="" type="checkbox"/>	.5"	<input checked="" type="checkbox"/>	500V
PM-2	1200V	Low <input checked="" type="checkbox"/>	10"	<input checked="" type="checkbox"/>	900V
"		Alarm <input checked="" type="checkbox"/>	2"	<input checked="" type="checkbox"/>	"
LOG N CALIBRATE <input type="checkbox"/>		OPERATE <input checked="" type="checkbox"/>		SOURCE No. B-80	
DUMP WELL PROBE LIGHT <input type="checkbox"/>					

**START-UP CHECK LIST**

Equipment checked by F.V.C. / A.K.K. Personnel check by I.O.C.

Instruments and safeties checked and reset by A.K.K.

Source in checked by A.K.K. Source No. M-93

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

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

Red light on by A.K.K. Time 0820

Start-up OK'd by I.O.C. / A.K.K. Date 6-23-69

.50" rods.  
30 cm length.  
2.99 cm c-c separation.

149

Repeat of experiment described on page 147. (143  
140).

Water ht = 27.70 cm

Temp °C

- Per

24.0 °C

$E = -445.46 \text{ sec} = -2.74$

0900 Drain.

Added 1 rod. Now have 13 x 13 array, with  
12 rods removed from 1 corner, and 11  
rods removed from 3 corners. Total of  
124 rods.

Water ht = 21.20 cm.

$\Delta h = 1.90 \text{ cm}$

Temp °C

2+ Per

24.0 °C

$E = 139.07 \text{ sec} = 7.64 = .254/\text{cm.}$

Water ht = 19.30 cm

System just critical

Drain.

over!

50" rods.  
 30 cm length.  
 3.4 cm separation c-c.  
 Rounded array's.

Now have an 13 X 13 array. With 10 rods removed from each corner. Total of 129 rods.

1420 Water ht = 28.00 cm. Temp °C  
 System sub critical 24.2 °C  
 Drain.

Added 4 rods. 1 to each corner. Now have an 13 X 13 array with 9 rods removed from each corner. Total of 133 rods.

1445 Water ht = 27.50 cm Temp °C  
 System sub critical 29.3 °C  
 Drain.

Added 4 rods. 1 to each corner. Now have an 13 X 13 array with 8 rods removed from each corner. Total of 137 rods.

1506 Water ht = 27.80 cm.

System sub critical

Drain.

Temp °C

~~24.5~~

24.3 °C

Added 8 rods. 2 to each corner. Now have an 13x13 array with 6 rods removed from each corner. Total of 145 rods.

1530 Water ht = 27.60 cm

System sub critical

Drain.

Temp °C

24.3 °C

Added 4 rods. 1 to each corner. Now have an 13x13 array with 5 rods removed from each corner. Total of 149 rods.

1550 Water ht = 27.50 cm

System sub critical

Drain.

Temp °C

24.3 °C

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	1"	✓	$3 \times 10^{-12}$
	"	Fest ✓	"	✓	"
K-2	-	Meter			
	-	Fest			
R-1	-				
R-2	-				
PM-1	700V	Alarm ✓	5"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
	"	Alarm ✓	2"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by RKAL Personnel check by RKAL  
 Instruments and safeties checked and reset by RKAL  
 Source in checked by RKAL Source No. M-93  
 Emergency equipment in control room checked by F.P.C  
 Instruments in trip circuit: K-1 PM-1-2  
 Red light on by RKAL Time 0810  
 Start-up OK'd by F.P.C RKAL Date 6-29-69

1.50" rods,  
30 cm lengths  
3.4 cm separation e-e.

153

Rounded array's.

See p's 150-151: added 7 rods.  
Now have an 14x14 array, with 10 rods  
removed from each corner. Total of  
156 rods.

0845 Water ht = 27.60 cm

Temp °C

System sub critical  
Drain.

24.2 °C

added 2 rods 1 each to opposite corners:  
Now have an 14x14 array, with 10 rods  
removed from 2 corners and 9 rods  
removed from 2 corners. Total of 158  
rods.

~~0845~~ Water ht = 27.75 cm

4.5 cm

Temp °C

l + P<sub>2</sub>

24.2 °C

$$t = 63.01 \text{ sec} = 13.9 \text{ d} = 1.63 \text{ d/cm}$$

0913 Water ht = 18.95 cm

System just critical  
Drain.

over:

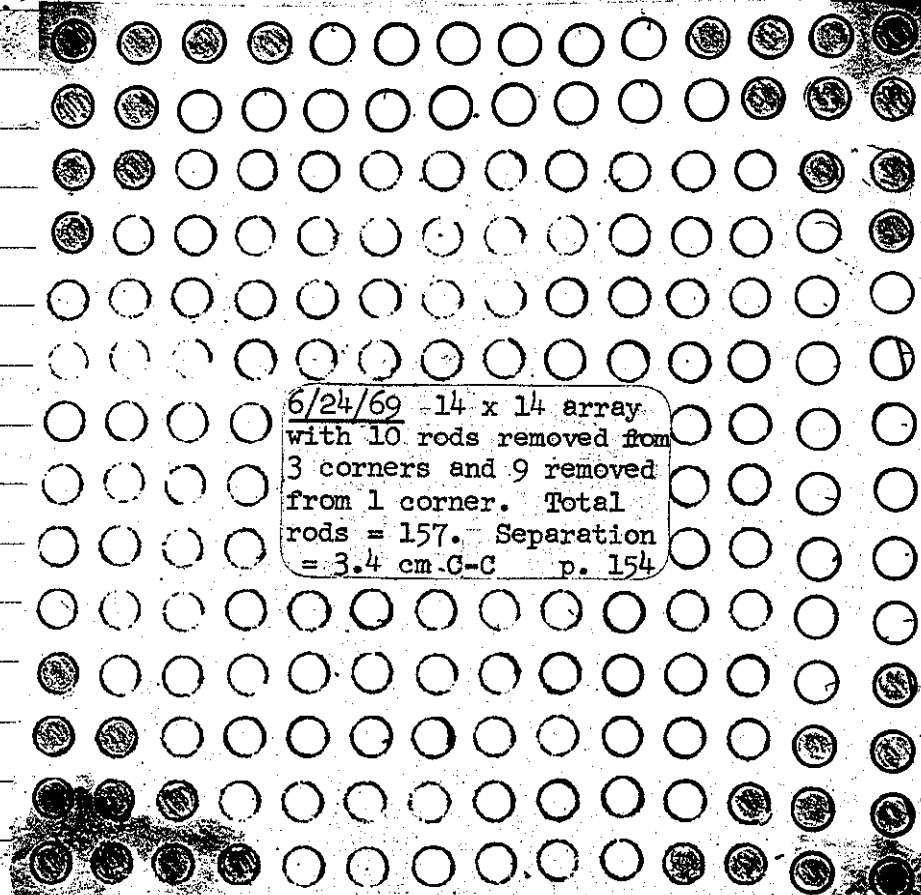
Removed 1 rod. Have on 14 x 14 array  
with 10 rods removed from 3 corners  
and 9 rods removed from 1 corner.  
Total of 157 rods.

Water ht = 27.60 cm  $s = 6.5$  cm Temp °C  
+ Per 29.3 °C

$$G = 284.66 \text{ m} = 4.1 \text{ f} = 1.63 \text{ f/cm}$$

0950 Water ht = 21.10 cm

System just critical  
Drain



6/24/69 - 14 x 14 array  
with 10 rods removed from  
3 corners and 9 removed  
from 1 corner. Total  
rods = 157. Separation  
= 3.4 cm G-C p. 154

.50 rods.  
30 cm length.  
2.82 cm C-C separation.  
Rounded array's

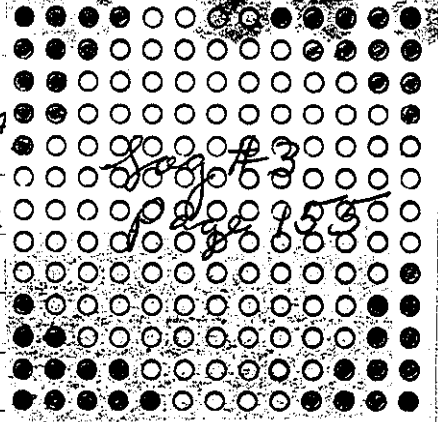
I have an 13 x 13 array: with 12 rods removed from each corner. Total of 121 rods.

Water ht = 27.60 cm  
3 + Per

h = 4

$\Delta = 1216.88 \text{ sec} = 1.04 = .244 \text{ cm}$

1426 Water ht = 23.50 cm  
system just critical  
Drain.

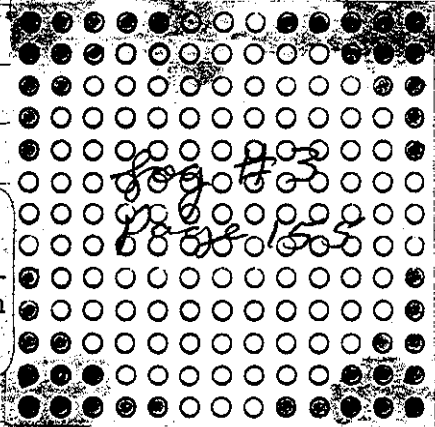


13 x 13 array: with 12 rods removed from each corner.  
Rounded the array: as shown in diagram:

Water ht = 19.90 cm h = 2.15 Temp = 29.5°C  
4 + Per

$\Delta = 36.94 \text{ sec} = 19.94 = 9.24 \text{ cm}$

1451 Water ht = 17.75 cm  
system just critical  
Drain.



6/25/69 13 x 13 array  
with 12 rods removed  
from each corner. Total  
rods = 121. Separation  
= 2.82 cm C-C  
30 cm length p. 155

over



.50 rods.  
30 cm length.  
2.82 cm C-C separation:

*Rounded array* 6/25/69 13x13 array  
with 12 rods removed from  
each corner. Total rods  
= 121. Separation = 2.82  
cm C-C  
30 cm length p. 155

Have an 13x13 array: w  
removed from each corner  
rods.

Water ht = 27.60 cm  $h = 4.10$  cm Temp °C  
3 + Per → 24.5 °C

$U = 1216.88 \text{ sec} = 1.04 = .244/\text{cm}$

1426 Water ht = 23.50 cm  
System just critical  
Drain.

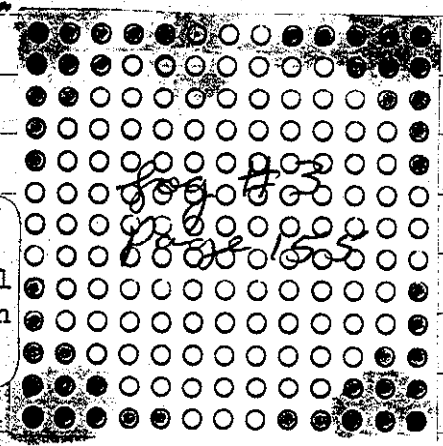
13x13 array: with 12 rods removed from each corner.  
Rounded the array as shown in diagram:

Water ht = 19.90 cm  $h = 2.15$  Temp °C  
4 + Per 24.5 °C

$U = 36.94 \text{ sec} = 19.94 = 9.24/\text{cm}$

1451 Water ht = 17.75 cm  
System just critical  
Drain.

6/25/69 13 x 13 array  
with 12 rods removed  
from each corner. Total  
rods = 121. Separation  
= 2.82 cm C-C  
30 cm length p. 155



over

13x13 array: with 12 rods removed from 2 corners and 13 rods removed from 2 corners. Total of ~~119~~ 119 rods.

1518 Water ht = 27.50 cm  
system sub critical  
Chain -

Temp °  
29.5 °

Added 1 rod. Have an 13x13 array, with 12 rods removed from 3 corners and 13 rods removed from 1 corner. Total of 120 rods.

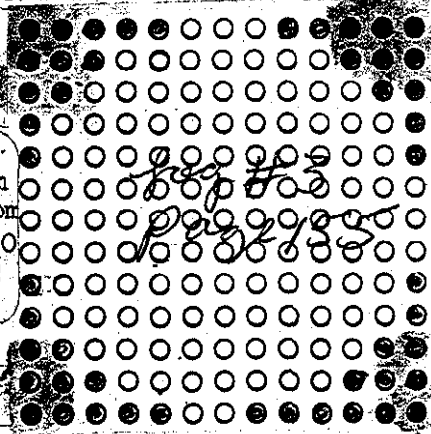
Water ht = 27.50 cm  $D_h = 7.25 \text{ cm}$   
5 + Per

$$t = 182.53 \text{ sec} = 6.0 \text{ f} = .83 \text{ f/cm}$$

1542 Water ht = 20.25 cm  
system just critical  
Chain.

Temp °  
29.7 °

6/25/69: 13x13 array  
with 12 rods removed from  
3 corners & 13 removed from  
1 corner. Total rods=120  
Separation=2.82 cm C-C  
30 cm length p. 155



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	1"	✓	$3 \times 10^{-12}$
"	"	Fast ✓	"	✓	"
K-2	—	Meter			
		Fast			
R-1					
R-2					
PM-1	700V	Alarm ✓	.50	✓	900V
PM-2	1200V	Low ✓	10"	✓	1200V
"	"	Alarm ✓	2"	✓	"
LOG N CALIBRATE ✓		OPERATE ✓		SOURCE No. B-80	
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by <sup>E.P.C.</sup> AKW Personnel check by E.P.C.  
 Instruments and safeties checked and reset by AKW  
 Source in checked by AKW Source No. M-43  
 Emergency equipment in control room checked by E.P.C.  
 Instruments in trip circuit: R-1 PM-1-2  
 Red light on by AKW Time 0915  
 Start-up OK'd by E.P.C. AKW Date 6-25-69

1.50" rods.  
 30 cm length.  
 2.82 cm separation c-c.  
 Rounded array's.

Repeat of last experiment described on page 156.

Water ht = 27.50 cm  $b_h = 6.8$  cm Temp °C  
 + Re  $24.3$  °C  
 $\epsilon = 247.72 \text{ sec} = 4.64 = .68 \text{ f/cm}$

0915 Water ht = 20.70 cm  
 System just critical  
 Drain.

Removed 1 rod. Have an 13 x 13 array. with  
 12 rods removed from 2 corners and 13 rods  
 removed from 2 opposite corners. Total of 119  
 rods.

1050 Water ht = 27.60 cm Temp °C  
 System sub critical  $24.3$  °C  
 Drain.

6-25-69 Solution samples taken from dump tanks.

Y-12. Rig # 684560  
Sample # 2

X-10 A-633  
Sample # 2-A.

cal for:

1.  $\gamma_{fl} = 0.139$
2. density = 0.9974
3. Temp. = @ 25.0°C

cal for:

1.  $\gamma_{fl} = 0.137$
2. density = 0.9972
3. Temp. = @ 25.0°C

.50" rods.

2.82 cm separation c-c

60 cm length.

Have an 11x11 array: with 8 rods removed from each corner. Total of ~~89~~ 89 rods.

Water ht = 30.95 cm.

62 = .50 cm

Temp °C

<sup>2</sup>+ Per

29.9°C

$T = 80.9 \text{ sec} = 11.74 = 23.48 \text{ cm}$

1600

Water ht =  $\neq$  30.45 cm.

System just critical  
Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	1"	✓	$3 \times 10^{-12}$
"	"	Fast ✓	"	✓	"
K-2		Meter			
		Fast			
R-1					
R-2					
PA 1	700V	Alarm ✓	5"	✓	500V
PA 2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	2"	✓	"
LOG 'N CALIBRATE _____		OPERATE _____		SOURCE No. <u>B-80</u>	
DUMP WELL PRQSE LIGHT _____					

START-UP CHECK LIST

Equipment checked by F.I.C. [Signature] Personnel check by F.I.C.  
 Instruments and safeties checked and reset by A.K.A.  
 Source in checked by [Signature] Source No. M-93  
 Emergency equipment in control room checked by F.I.C.  
 Instruments in trip circuit: Z-1 DM-1-2  
 Red light on by [Signature] Time 0805  
 Start-up OK'd by F.I.C. [Signature] Date 6-26-69

.50" rods.  
60 cm length.  
2.82 cm separation c.c.

- 161

Repeat of experiment described on bottom  
of page 159.

Water ht = 30.95 cm

$\delta h = .45$

Temp  $^{\circ}$ C  
29.2 ~~00~~

<sup>1</sup> + per

$$C = 82.57 \text{ sec} = 11.84 = 25.3 \text{ f/cm}$$

0848

Water ht =  $\pm$  30.50 cm.

System just critical  
Drain.

Removed 2 rods. Now have an 11x11 array  
with 9 rods removed from 2 corners and  
8 rods removed from 2 corners. Total of  
~~77 rods.~~ 87 rods.

Water ht = 33.60 cm

$\delta h = .55 \text{ cm}$

Temp  $^{\circ}$ C  
29.5  $^{\circ}$ C

<sup>2</sup> + per

$$C = 71.71 \text{ sec} = 12.74 = 23.0 \text{ f/cm}$$

0955

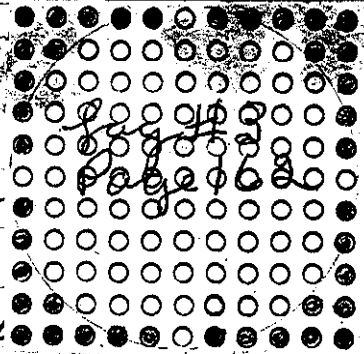
Water ht = 33.05 cm

System just critical  
Drain.

Removed 6 rods. 11x11 array with 10 rods  
removed from each corner. Total of 81  
rods.  
over.

162

6/26/69: 11x11 array  
with 10 rods removed  
from each corner. 60  
cm high. Total Rods =  
81.  
p. 161



Water ht = 50.25

<sup>3</sup>+ Per

$T = 102.13 \text{ sec} = 9.79$

Temp °C

24.5 °C

1057 Water ht = 46.15 cm

system just critical  
Drain.

Removed 4 rods. Now have an 9x9 array  
with 1 rod removed from each corner.  
Total of 77 rods.

1530

Water ht = 57.70 cm

system sub critical  
Drain:

Temp °C

24.5 °C



162

6/26/69: 11x11 array  
with 10 rods removed  
from each corner. 60  
cm high. Total Rods =  
81.

p. 161

$\Delta h = 4.1 \text{ cm}$

Water ht = 50.25 cm.

Temp °C

<sup>3</sup> + per

29.5 °C

$\tau = 102.13 \text{ sec} = 9.74 = 2.4 \text{ ft/cm}$

1057 Water ht = 46.15 cm

System just critical

Drain.

Removed 4 rods. Now have an 9x9 array  
with 1 rod removed from each corner.  
Total of 77 rods.

1530

Water ht = 57.70 cm

Temp °C

System sub critical

29.5 °C

Drain:

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3 X 10 <sup>-12</sup>	Meter <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	3 X 10 <sup>-12</sup>
"		Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2		Meter			
		Fast			
R-1					
R-2					
PM-1	700V	Alarm <input checked="" type="checkbox"/>	15"	<input checked="" type="checkbox"/>	500V
PM-2	1200V	Low <input checked="" type="checkbox"/>	10"	<input checked="" type="checkbox"/>	900V
	"	Alarm <input checked="" type="checkbox"/>	2"	<input checked="" type="checkbox"/>	"
LOG N CALIBRATE <input checked="" type="checkbox"/>		OPERATE <input checked="" type="checkbox"/>		SOURCE No. <u>P-80</u>	
DUMP-WELL PROBE LIGHT <input type="checkbox"/>					

START-UP CHECK LIST

Equipment checked by AKH Personnel check by 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 F.D.S.  
 Instruments in trip circuit: R-1 PM-1-2  
 Red light on by AKH Time 0800  
 Start-up OK'd by F.D.S. AKH Date 6-27-69

.50" rods.  
60 cm length.  
2.82 cm separation c-e

Have an 10x10 array. With 5 rods removed from each corner. Total of 80 rods.

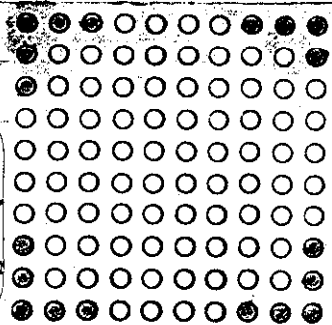
0843 Water ht = 57.80 cm Temp °C  
System sub critical 24.5  
Drain.

Added 1 rod. Now have an 10x10 array with 5 rods removed from 3 corners and 4 rods removed from 1 corner. Total of 81 rods.

Water ht = 49.10 cm Dh = 4.1 cm Temp °C  
+ Per 24.5°C  
 $\tau = 49.98 \text{ m} = 16.4 \text{ f} = 4.0 \text{ g/cm}$

0920 Water ht = 45.00 cm.  
System just critical.  
Drain.

6/27/69: 10x10 array  
with 5 rods removed from  
3 corners & 4 rods removed  
from 1 corner. Total  
of 81 rods 60 cm length  
p. 164



6/30/69

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓ Post ✓	5"	✓	$3 \times 10^{-12}$
K-2	---	Meter Post			
R-1	---				
R-2	---				
PM-1	7000	Alarm ✓	1/2"	✓	5000
PM-2	12000	Low ✓ Alarm ✓	10" 2"	✓ ✓	9000
LOG IN CALIBRATE ✓		OPERATE ✓	SOURCE No. B-8		
DUMP WELL PROBE LIGHT					

START-UP CHECK LIST

Equipment checked by E.O.F. [Signature] Personnel check by [Signature]  
 Instruments and safeties checked and reset by [Signature] E.O.F.  
 Source in checked by [Signature] Source No. M-83  
 Emergency equipment in control room checked by [Signature]  
 Instruments in trip circuit: K-1 PM-1-2  
 Red light on by E.O.F. Time 1010  
 Start-up OK'd by E.O.F. [Signature] Date 6-30-69

1.50" rods  
60 cm length  
2.82 cm separation c.c.

167

Repeat of experiment described on bottom of  
page 164, after cleaning <sup>rods</sup> with mineral oil,  
and reassembling exactly.

Water ht = 47.90 cm

$D_h = 2.4$  cm

Temp °

1 + Per

24.0 °

$$\bar{c} = 97.78 \text{ m} = 10.0 \text{ f} = 4.2 \text{ f/cm}$$

1051 Water ht = 45.50 cm

System just critical

Drain.

Repeat of above.

Water ht = 47.90 cm

$D_h = 2.2$  cm

Temp °

2 + Per

24.0 °

$$\bar{c} = 110.82 \text{ m} = 9.1 \text{ f} = 4.1 \text{ f/cm}$$

1410 Water ht = 45.70 cm

System just critical

Drain.

Water ht = 48.00 cm.

$D_h = 2.3$  cm

Temp °

3 + Per

24.05 °

$$\bar{c} = 106.48 \text{ m} = 9.4 \text{ f} = 4.1 \text{ f/cm}$$

1440 Water ht = 45.70

System just critical

Drain.

Temp °

24.10 °

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3X10 <sup>-12</sup>	Meter ✓	1"	✓	3X10 <sup>-12</sup>
"	"	Fast ✓	"	✓	"
K-2		Meter			
		Fast			
R-1					
R-2					
PM-1	700V	Alarm ✓	5"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	2"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by F.P.C. Personnel check by AKC  
 Instruments and safeties checked and reset by F.P.C.  
 Source in checked by AKC Source No. M-93  
 Emergency equipment in control room checked by F.P.C.  
 Instruments in trip circuit: K-1 PM-1-2  
 Red light on by AKC Time 0950  
 Start-up OK'd by F.P.C. AKC Date 7-1-69

.50" rods,  
30 cm length.  
2.41 cm separation e-e

169

Have an 13 x 13 array, with 6 rods removed  
from each corner. Total of 145 rods.

Water ht = 13.35 cm <sup>.10 cm</sup> Temp °C  
+ Per 24.1 °C

$$T = 110.82 \text{ m} = 9.1 \phi = 91.0 \phi / \text{cm}$$

10.23 Water ht = ± 13.25 cm  
system just critical  
Drain.

Remained 8 rods. 2 from each corner. Now  
have an 13 x 13 array with 8 rods removed  
from each corner. Total of 137 rods.

Water ht = 16.20 cm <sup>0.55 cm</sup> Temp °C  
+ Per 24.2 °C

$$45.63 = 17.4 \phi = 31.6 \phi / \text{cm}$$

10.40 Water ht = 15.65 cm  
system just critical  
Drain.

over.

Removed 8 more rods. Now have an  
13 X 13 array, with 10 rods removed  
from each corner. Total of 129 rods.

1056 Water ht = 27.70 cm Temp °C  
System sub critical 24.2 °C  
Drain:

Added 2 rods. Now have an 13 X 13 array  
with 10 rods removed from 2 corners and  
9 rods removed from 2 corners. Total of  
131 rods.

1110 Water ht = 27.60 cm  
Sub Critical  
Drain

Added 1 rod. Now have an 13 X 13 array with  
9 rods removed from 3 corners and 10 rods  
removed from 1 corner. Total of 132 rods.

1123 Water ht = 27.70 cm Temp °C  
System sub critical 24.2 °C  
Drain.



added 1 rod. Now have an 13x13 array with  
9 rods removed from each corner. Total of  
133 rods.

Water ht = 27.60 cm  $\Delta h = 4.70$  cm Temp  $^{\circ}$ C  
3 + per 29.5  $^{\circ}$ C

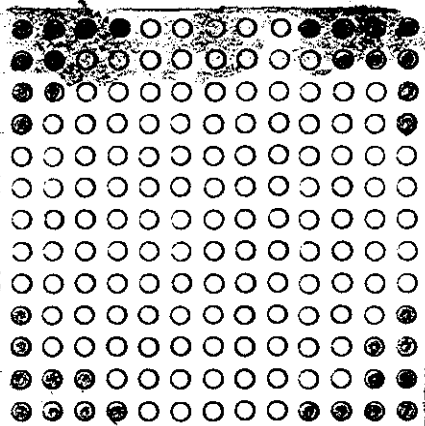
$\epsilon = 875.72 = 1.4 \phi = .30 \text{ f/cm}$

1.3 2.3 Water ht = 22.90 cm

System just critical  
Drain:

7/1/69: 13x13 array with  
9 rods removed from each  
corner. Total 133 rods  
Separation 2.41 cm C-C  
30 cm length

p. 169



.50" rods.

60 cm length

2.41 cm separation c.c.

Have an 10x10 array, with ~~5 rods~~ 1 rod.  
removed from each corner. Total of  
96 rods.

Water ht = 43.50 cm  $\Delta h = 1.1$  cm Temp  $^{\circ}$ C  
4 + per 29.5  $^{\circ}$ C

$\epsilon = 54.32 \text{ sec} = 15.5 \phi = 14.1 \text{ f/cm}$

Water ht = 42.40 cm. System just critical. Drain:

7/2/69

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3 x 10 <sup>-12</sup>	Meter ✓ Fast ✓	1"	✓	3 x 10 <sup>-12</sup>
K-2	—	Meter Fast			
R-1	—				
R-2	—				
PM-1	7000	Alarm ✓	12"	✓	5000
PM-2	12000	Low ✓ Alarm ✓	10" 2"	✓	9000
LOG N CALIBRATE ✓		OPERATE ✓		SOURCE No. 13-80	
DUMP WELL PROBE LIGHT					

START-UP CHECK LIST

Equipment checked by AKM Personnel check by AKM  
 Instruments and safeties checked and reset by E.P.V.  
 Source in checked by AKM Source No. M-93  
 Emergency equipment in control room checked by R.K.M.  
 Instruments in trip circuit: K-1, PM-1-2  
 Red light on by AKM Time 0915  
 Start-up OK'd by E.P.V. AKM Date 7-2-69

1.50" rods.  
60 cm length.  
2.41 cm separation c-c.

Now have an 11x11 array, with 7 rods removed from each corner. Total of 93 rods.

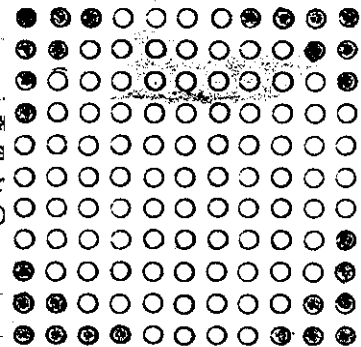
Water ht = 57.60 cm  $o_b = 9.1$  cm Temp  $^{\circ}C$   
+ Pr 24.2  $^{\circ}C$

$\tau = 378.10$  cm = 3.14 = .32  $\frac{1}{4}$  cm

1020 Water ht = 48.50 cm

System just critical  
Drain.

7/2/69: 11x11  
with 7 rods  
each corner  
93 rods. 60



Removed 1 rod. Now have an 11x11 array, with 8 rods removed from 1 corner and 7 rods removed from 3 corners. Total of 92 rods.

1039 Water ht = 57.60 cm  
System sub critical  
Drain.

.50" rods.  
 3.40 cm separation c-c.  
 60 cm length.

Have an 10x10 array. Total of 100 rods.

Water ht = 36.30 cm  $s_2 = .60$  cm Temp °C  
<sup>2</sup> + Per 24.5°C

$$I = 56.50 \text{ sec} = 15.14 = 25.27/\text{cm}$$

1427 Water ht = 35.70 cm

system just critical  
 Drain

Removed 12 rods. 3 from each corner. Have  
 an 10x10 array with 3 rods removed from  
 each corner. Total of 88 rods.

1458 Water ht = 57.50 cm

system sub critical  
 Drain

P-175

Now have an 11x11 array, with 7 rods  
removed from each corner. Total of 93  
rods.

Water ht = 41.70 cm  $\sigma_s = 1.15$  Temp  $^{\circ}\text{C}$   
3 + Br 29.6  $^{\circ}\text{C}$

$$C = 34.77 \text{ sec} = 20.7 \phi = 18.0 \text{ f/cm}$$

1602 Water ht = 40.55 cm  
system just critical  
Drain.

176

7/3/65

## INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3X10 <sup>-12</sup>	Meter ✓ Fast ✓	2"	✓	3X10 <sup>-12</sup> ✓
K-2	—	Meter Fast			
R-1	—				
R-2	—				
PM-1	700V	Alarm ✓	12"	✓	500V
PM-2	1200V	Low ✓ Alarm ✓	8" 2"	✓ ✓	500V

LOG N CALIBRATE ✓

OPERATE ✓

SOURCE No.

B-8D

DUMP WELL PROBE LIGHT

## START-UP CHECK LIST

Equipment checked by EQ-DC Personnel check by EQInstruments and safeties checked and reset by EQSource in checked by EQ Source No. M-4BEmergency equipment in control room checked by DCInstruments in trip circuit: K-1, PM-1, PM-2Red light on by DC Time 0915Start-up OK'd by DC-EJ Date 7/3/65

60 cm long, 0.5" dia  
3.4 cm center separation  
- 0.14 g B/l

Removed two rods from the lattice described on p. 175. Now have 11x11 with 7 rods removed from 2 corners and 8 rods removed from the other 2 corners. Total 91 rods.

0955  $\Delta h = .30 \text{ cm}$   
Wet W @ 44.2 cm, + Period #1  
 $\epsilon = 315.08 \text{ sec} = 3.74 = 12.34/\text{cm}$  Temp. 24.5°C

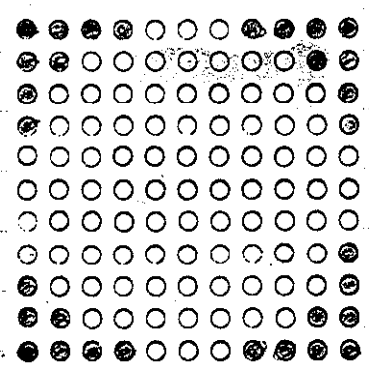
1017 Wet W @ 43.9 cm. Critical.  
Drain.

Remove 1 rod to result in 8 rods out of 3 corners and 7 out of 1 corner. Total 50 rods.

1120  $\Delta h = 10.20 \text{ cm}$   
Wet W @ 58.1 cm, + Period #2 Temp 24.5°C  
 $\epsilon = 271.63 \text{ sec} = 4.34 = .434/\text{cm}$  24.8°C

1145 Wet W @ 47.9 cm. Critical.  
Drain.

11 x 11 with 8 rods removed from 3 corners and 7 rods removed from 1 corner. Total 90  
7/3/69



0.3 rods  
 2.25-cm center spacing  
 30 cm high  
 0.148 B/l

17x17 lattice with 8 rods removed from  
 each of 4 corners and 9 rods from each of  
 the other four. 255 rods total.

1625 Water @ 24.3 cm T Read 23  
 $\Delta h = 8.0 \text{ cm}$  Temp. 24.5°  
 24.8°  
 $G = 113.00 \text{ sec} = 9.04 = 1.14/\text{cm}$

1640 Water @ 16.3 cm, Critical.  
 Drain.

7-3-69 Sample taken; #3

Y-12 Reg # 684561

X-10 Reg # A-634

sub for

1.  $g \text{ B/l} = 0.141 g \text{ B/l}$

1.  $g \text{ B/l} = 0.138$

2. density = 0.997

2. density = 0.9976

3. Temp ° = 25°

3. Temp ° = 25°

Sample #3

7-3-69

#2

#2A

G = 180.30

G = 182.90

T = 30.00

T = 32.50

N = 150.30

N = 150.40



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	STARTUP RANGE
K-1	3 X 10 <sup>-12</sup>	Meter ✓	1"	✓	3 X 10 <sup>-12</sup>
"	"	Fast ✓	"	✓	"
K-2	—	Meter —	—	—	—
"	—	Fast —	—	—	—
R-1	—	—	—	—	—
R-2	—	—	—	—	—
PM-1	700V	Alarm ✓	50"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	2"	✓	"

LOG N. CALIBRATE  OPERATE  SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by I.D.C. Personnel check by I.D.C.  
 Instruments and safeties checked and reset by A.T.M.  
 Source in checked by A.T.M. Source No. 19-23  
 Emergency equipment in control room checked by I.D.C.  
 Instruments in trip circuit: K-1 - PM-1-2  
 Red light on by A.T.M. Time 0910  
 Start-up OK'd by I.D.C. A.T.M. Date 7-8-69

50  
80

2

Repeat of experiment described on p-178

Water ht = 27.60 cm  $\Delta z = 7.0$  cm Temp °C  
 1 Per 23.5 °C

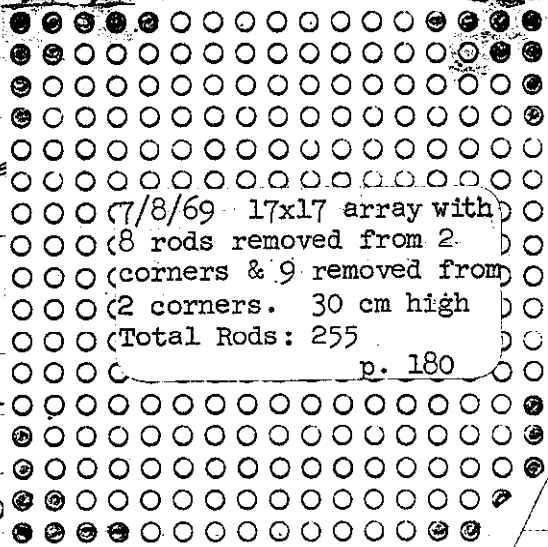
$E = 228.16 \text{ sec} = 6.0 \phi = -71 \phi / \text{cm}$

1005 Water ht = 20.60 cm  
 System just critical  
 Drain: and repeat

Water ht = 27.60 cm  
 2 Per

$E = 173.89 \text{ sec} = 6.3 \phi =$

1050 Water ht = 20.20 cm  
 System just critical  
 Drain:



Removed 1 rod: have an 17 x 17 array with 9 rods removed from 3 corners and 8 rods removed from 1 corner. Total of 254

1105 Water ht = 27.60 cm  
 3-Per

Temp °C  
 23.6 °C

$E = -1955.70 \text{ sec} = -0.68 \phi$

1120 Drain:

Repeat of experiment

Water ht = 27.60 cm  
1 Per

$$T = 228.16 \text{ sec} = 6.04 =$$

1005. Water ht = 20.60 cm

System just critical

Drain: and repeat above:

Water ht = 27.60 cm  $\Delta h = 7.4 \text{ cm}$  Temp  $^{\circ}\text{C}$   
2 Per 23.6  $^{\circ}\text{C}$

$$T = 173.89 \text{ sec} = 6.24 = 0.854 \text{ /cm}$$

1050 Water ht = 20.20 cm

System just critical  
Drain:

Removed 1 rad: have an 17 x 17 array with  
9 rads removed from 3 corners and 8 rads  
removed from 1 corner. Total of 254

1105 Water ht = 27.60 cm Temp  $^{\circ}\text{C}$   
3 - Per 23.6  $^{\circ}\text{C}$

$$T = -1955.70 \text{ sec} = -0.684$$

1120 Drain:

7-8-69

1230

Sample taken #9

Y-12 Reg # 684562

only for

X-10 Reg # A635

1.  $\rho_{fl} = 0.1412 \rho_L$

2. density = 0.997

3. Temp  $^{\circ} = 25^{\circ}$

1.  $\rho_{fl} = 0.139$

2. density = 0.9975

3. Temp  $^{\circ} = 25^{\circ}$

Sample #9 (7-8-69)

#1

C = 185.2

T = 32.5

N = 152.9

#7-A

G = 178.9

T = 32.5

N = 146.4

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3 K10 <sup>-12</sup>	Meter ✓	1"	✓	10 K10 <sup>-12</sup>
"	"	Fist ✓	"	✓	"
K-2	✓	Meter ✓	✓	✓	✓
"	✓	Fist ✓	✓	✓	✓
R-1	✓				
R-2	✓				
PM-1	700V	Alarm ✓	1.5"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	2"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. 13-80
DUMP WELL PROBE LIGHT		✓			

START-UP CHECK LIST

Equipment checked by F.D.C. Personnel check by F.D.C.  
 Instruments and safeties checked and reset by A.W.M.  
 Source in checked by A.W.M. Source No. M-43  
 Emergency equipment in control room checked by F.D.C.  
 Instruments in trip circuit: X-1 PM 1-2  
 Red light on by A.W.M. Time 0610  
 Start-up OK'd by F.D.C. A.W.M. Date 7-9-68

0.300" rods.  
2.05 cm separation c-c.  
60 cm length.

183

Have an 14x14 array: with 7 rods removed from 2 corners and 8 rods removed from 7 opposite corners. 166 rods total.

Water h<sub>t</sub> = 57.70 cm

Δh = 11.

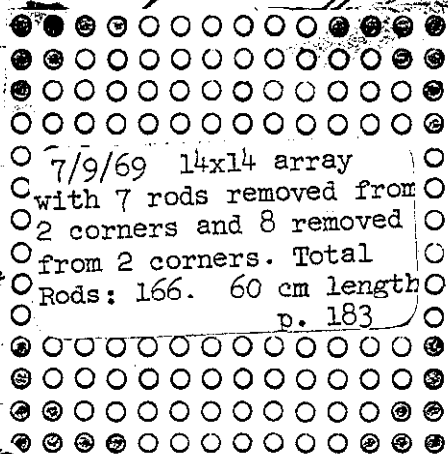
+ P<sub>2</sub>

$$v = 73.98 \text{ sec} = 12.97 = 1.024 \text{ cm}$$

0900 Water h<sub>t</sub> = ± 45.80 cm

System just critical

Drain: to 0.0 cm and 17



Δh = 12.0 cm

Water h<sub>t</sub> = 57.70 cm

Temp °

+ P<sub>2</sub>

23.7 °

$$v = 73.88 \text{ sec} = 12.97 = 1.034 \text{ cm}$$

0940 Water h<sub>t</sub> = 45.70 cm

System just critical

Drain: to 0.0 cm and removed 1 rod. (Found air in manometer line.)

Now have an 14x14 array with 7 rods removed from 1 corner, and 8 rods removed from 3 corners. Total of 165 rods.

Water h<sub>t</sub> = 57.70 cm

Temp °

<sup>3</sup> - P<sub>2</sub>. N.E.

24.0 °

1025 Drain:

0.31  
2.05.  
60 cm.

183

Have an 14x14 array: w  
2 corners and 8 rods  
corners. 166 rods total.

moved from  
from 7 opposite

Water ht = 57.70 cm  $\Delta h = 11.9 \text{ cm}$  Temp  $^{\circ}\text{C}$   
1 + Per 23.6  $^{\circ}\text{C}$

$$U = 73.48 \text{ sec} = 12.94 = 1.044 \text{ cm}$$

0900 Water ht =  $\pm 45.80 \text{ cm}$

System just critical

Drain: to 0.0 cm and repeat above:

Water ht = 57.70 cm  $\Delta h = 12.0 \text{ cm}$  Temp  $^{\circ}\text{C}$   
2 + Per 23.7  $^{\circ}\text{C}$

$$U = 73.48 \text{ sec} = 12.94 = 1.034 \text{ cm}$$

0940 Water ht = 45.70 cm

System just critical

Drain: to 0.0 cm and removed 1 rod. (Found  
air in westerly line.)

Now have an 14x14 array. with 7 rods  
removed from 1 corner. and 8 rods removed  
from 3 corners. Total of 165 rods.

Water ht = 57.70 cm Temp  $^{\circ}\text{C}$   
3 - Per. N.E. 24.0  $^{\circ}\text{C}$

10.25 Drain:

.300" rods.  
 2.453 cm separation center - center.  
 30 cm lengths.

Have an 18 X 18 array, with 11 rods removed from each corner. Total of 280 rods.

1356 Water ht = 27.50 cm  
 System sub critical  
 Drain.

Added 13 rods. Now have an 19 X 19 array with 17 rods removed from each corner. Total of 293 rods.

1432 Water ht = 28.00 cm  
 System sub critical  
 Drain. Temp = 24.2°

Added 8 rods, 2 to each corner. Have and 19 X 19 array with 15 rods removed from each corner. Total of 301 rods.

1500 Water ht = 27.80 cm  
 System sub critical  
 Drain.



added 12 rods, 3 to each corner. Have on  
19x19 array with 12 rods removed from  
each corner. Total of 313 rods.

1528 Water ht = 27.60 cm  
system sub critical  
Drain.

added 24 rods, 6 to each corner. Have an  
19x19 array with 6 rods removed from each  
corner. Total of 337 rods.

1550 Water ht = 27.70 cm  
Dam system still sub critical.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	$3 \times 10^{-12}$
"		F-est <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2	-	Meter <input checked="" type="checkbox"/>	-		-
"	-	F-est <input checked="" type="checkbox"/>	-		-
R-1	-				
R-2	-				
PM-1	7000	Alarm <input checked="" type="checkbox"/>	5"	<input checked="" type="checkbox"/>	5000
PM-2	12000	Low <input checked="" type="checkbox"/>	10"	<input checked="" type="checkbox"/>	9000
"		Alarm <input checked="" type="checkbox"/>	2"		"
LOG IN CALIBRATE <input checked="" type="checkbox"/>		OPERATE <input checked="" type="checkbox"/>		SOURCE No. <u>0-80</u>	
DUMP WELL PROBE LIGHT <input checked="" type="checkbox"/>					

START-UP CHECK LIST

Equipment checked by E.I.D.C. Personnel check by h.c.f.  
 Instruments and safeties checked and reset by h.c.f.  
 Source in checked by h.c.f. Source No. M-93  
 Emergency equipment in control room checked by E.I.D.C.  
 Instruments in trip circuit: K-1 PM 1-2  
 Red light on by h.c.f. Time 0800  
 Start-up OK'd by E.I.D.C. h.c.f. Date 7-10-69

.300 rods  
2,453 cm separation c-c.  
30 cm lengths.

187

added 2 rods. Now have an 19 x 19 array.  
Total of 361 rods.

0845 Water ht = 27.70 cm  
System sub critical  
Drain.

Temp °C  
24.2 °C

added 11 rods. Now have an 22 x 22 array.  
with 28 rods removed from each corner.  
Total of 372 rods.

Water ht = 17.40 cm  
+ Per

$\Delta h = .40 \text{ cm}$

Temp °C  
24.2 °C

$C = 143.42 \text{ sec} = 7.74 = 18.5 \text{ f/cm}$ .

0950 Water ht = 17.00 cm  
System just critical  
Drain.

Removed 8 rods, 1 from each corner. Have an  
22 x 22 array, with 29 rods removed from  
each corner. Total of 368 rods.

Water ht = 21.00 cm  $\Delta h = 3.1 \text{ cm}$  Temp °C  
+ Per 24.2 °C

$C = 39.11 \text{ sec} = 19.34 = 6.2 \text{ f/cm}$

1043 Water ht = ± 17.90 cm.

System just critical. Drain. over.

Removed 8 rods. Now have an  $22 \times 22$  array  
with 31 rods removed from each corner.  
Total of 360 rods.

Water ht = 27.60 cm.

Temp  $^{\circ}\text{C}$

<sup>3</sup> - Per

24.3  $^{\circ}\text{C}$

$$T = -432.43 \text{ sec} = -3.34$$

11.17 Drain:

Added 2 rods, 1 each to opposite corners.  
Have an  $22 \times 22$  array, with 31 rods  
removed from 2 corners and 30 rods  
removed from 2 corners. Total of 362  
rods.

Water ht = 27.70 cm  $D_h = 6.4 \text{ cm}$

Temp  $^{\circ}\text{C}$

<sup>4</sup> - Per

24.3  $^{\circ}\text{C}$

$$T = 312.91 \text{ sec} = 3.74 = .584/\text{cm.}$$

Water ht = 21.30 cm

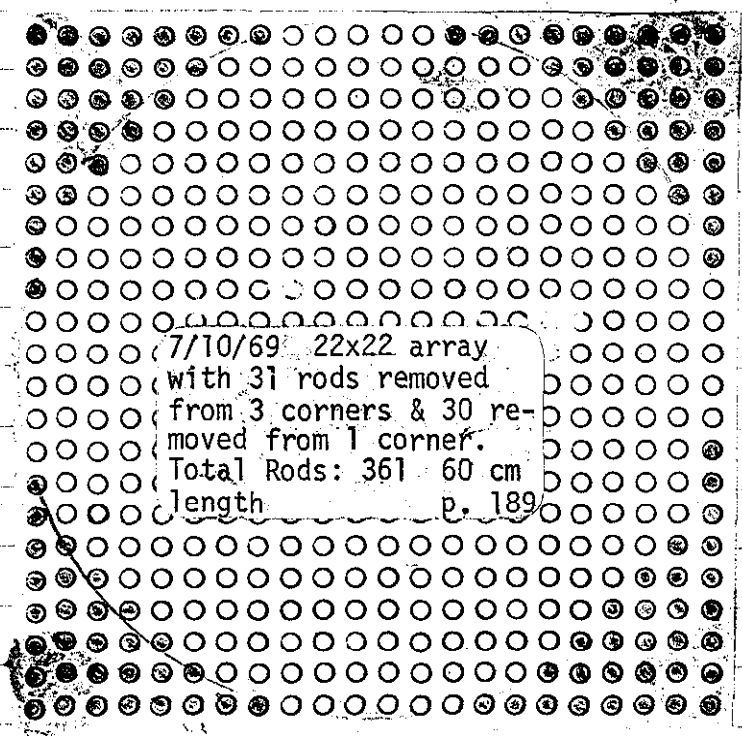
System just critical

Drain:

Removed 1 rod. Now have an 22x22 array, with 31 rods removed from 3 corners and 30 rods removed from 1 corner. Total of 361 rods.

1330 Water ht = 27.70 cm  
system just critical.  
Drain.

Temp °C  
24.3 °C



190

7-10-69

1300 rods.  
2.453 cm separation c-c.  
60 cm lengths.

Have and 16 x 16 array, with 15 rods removed  
from each corner. Total of 196 rods.

Water ht = 43.95 cm  $\Delta h = 1.05$  Temp °C  
+ Per 29.5 °C

$$5 = 54.32 \text{ cm} = 15.54 = 14.84 \text{ cm}$$

1553 Water ht = 42.90 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			
		Fast			
R-1	✓				
R-2	✓				
PM 1	700V	Alarm ✓	1.5"	✓	500V
PM 2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	1"	✓	"
LOG N CALIBRATE ✓		OPERATE ✓		SOURCE No. B-80	
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by ATM Personnel check by ATM  
 Instruments and safeties checked and reset by ATM  
 Sources in checked by ATM Source No. M-43  
 Emergency equipment in control room checked by F.P.C.  
 Instruments in trip circuit: K-1 PM-1-2  
 Red light on by ATM Time 0800  
 Start-up OK'd by I.D.C. ATM Date 7-11-69

1300" rods.  
 2.453 cm separation c-c.  
 60 cm length.

Have an 16x16 array, with 16 rods removed from each corner. Total of 192 rods.

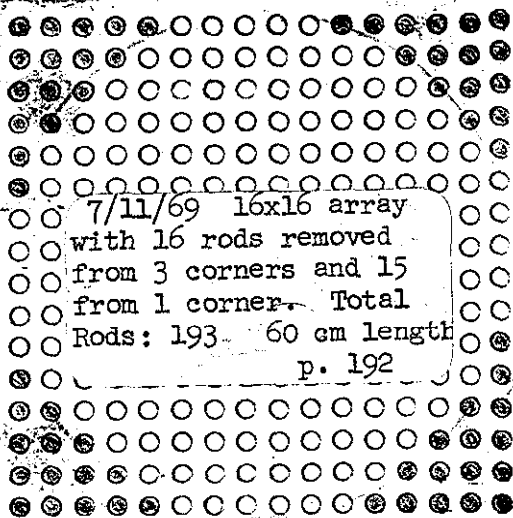
0850 Water ht = 57.50 cm Temp °C  
~~1 Per~~ - Per 24.2 °C  
 $\epsilon = -1521.10 \text{ au} = -.88 \%$

0914 Drain: added 1 rod. Now have an 16x16 array, with 16 rods removed from 3 corners and 15 rods removed from 1 corner. Total of 193 rods.

Water ht = 57.60 cm  $\delta h = 11.35 \text{ cm}$  Temp °C  
 27 Per 24.5 °C  
 $\epsilon = 95.61 \text{ au} = 10.2 \%$

Water ht = 46.25 cm

System just critical  
 Drain.





.300" rods.  
1.80 cm separation e-e,  
30 cm length.

193

Have an 19x19 array. With 21 rods removed from each corner. Total of 277 rods.

Water ht = 13.50 cm  $\Delta z = .300$  cm  
3 + Per Temp °C  
24.3 °C

$$U = 47.81 \text{ m} = 16.9 = 56.3 \text{ ft/cm}$$

1512 Water ht =  $\pm 13.20$  cm

System just critical  
Drain.

Removed 4 rods, 1 from each corner. Now have an 19x19 array, with 22 rods removed from each corner. Total of 273 rods.

Water ht = 14.10 cm  $\Delta z = .40$  cm  
4 + Per Temp °C  
24.3 °C

$$U = 30.92 = 22.5 \text{ ft} = 56.2 \text{ ft/cm}$$

1531 Water ht =  $\pm 13.70$  cm

System just critical  
Drain.

over:

Removed 16 rods. 4 from each corner.  
 Have an  $19 \times 19$  array with 26 rods  
 removed from each corner. Total of 257  
 rods.

Water ht = 18.70 cm  $dh = 1.2$   
 5 + per

Temp  $^{\circ}C$   
 24.9  $^{\circ}C$

$6 - 67.36 = 13.3 = 11.17$  cm

1610 Water ht = 17.50 cm

System just critical  
 Crisis.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter	1"	-	$3 \times 10^{-12}$
	"	Fast	"	-	"
K-2		Meter			
		Fast			
R-1					
R-2					
PM-1	700V	Alarm	1.5"	-	500V
PM-2	1200V	Low	10"	-	900V
	"	Alarm	2"	-	"

LOG N-CALIBRATE  OPERATE  SOURCE No. B-801

DUMP WELL PROBE LIGHT

START-UP CHECKLIST

Equipment checked by I.D.C. AKK Personnel checked by F.D.C.  
 Instruments and safeties checked and reset by AKK  
 Source checked by AKK Source No. M-43  
 Emergency equipment in control room checked by F.D.C.  
 Instruments and trip circuits: K-1 PM-1-2  
 Red light on by AKK Time 0830  
 Start-up OK'd by F.D.C. AKK Date 7-19-69

.300" rods.  
~~1.452~~ cm separation c-c.  
 30 cm length

Repeat of experiment described on page 194.

Water ht = 19.50 cm  $24 = 1.9$  cm. Temp =  
 + ps. 23.2 °C

$$5 = 52.15 \text{ sec} = 15.9 = 8.44 \text{ cm}$$

0845 Water ht = 17.60 cm  
 System just critical  
 Crisis.

Removed 4 rods, 1 from each corner.  
 Have an 19x19 array, with 27 rods  
 removed from each corner. Total of  
 253 rods.

0930 Water ht = 27.50 cm  
 System sub critical  
 Crisis.

Added 2 rods.  
Have an 19x19  
removed from  
removed from  
rods.

7/14/69: 19x19 array  
(with 26 rods removed from  
2 corners & 27 from 2  
corners. Total rods 255  
Separation 1.80 cm C-C  
30 cm length p.197

255  
2  
5

Water ht = 27 Per

$B = 149.94 \text{ sec} = 7.1 = .93 \text{ f/cm}$

1010 Water ht = 19.90 cm  
System just critical  
Drain.

Removed 1 rod. Have an 19x19 array with  
<sup>27</sup>~~26~~ rods removed from 3 corners, and <sup>26</sup>~~27~~  
rods removed from 1 corner. Total of 254  
rods.

Water ht = 27.50 cm  
3-Per

Temp °  
27.5 °C

$B = 1129.96 \text{ sec} = 1.2 \text{ f}$

1030 Drain.

well.

Added 2 rods. Leads to opposite corners.  
Have an 19x19 array with 26 rods  
removed from 2 corners, and 27 rods  
removed from 2 corners. Total of 255  
rods.

Water ht = 27.50 cm  $\Delta h = 7.6$  Temp  $^{\circ}$   
27 Per 23.5

$$E = 149.94 \text{ sec} = 7.1 = .934/\text{cm}$$

1010 Water ht = 19.90 cm  
System just drained  
Drain.

Removed 1 rod. Have an 19x19 array with  
~~26~~<sup>27</sup> rods removed from 3 corners, and ~~27~~<sup>26</sup>  
rods removed from 1 corner. Total of 254  
rods.

Water ht = 27.50 cm Temp  $^{\circ}$   
3-Per 23.5 $^{\circ}$

$$E = 1129.96 \text{ sec} = 1.2 f$$

1030 Drain.

aver.

300 rods.  
1.80 cm separation c-c,  
30 cm length.

Have an 17x17 array, with 9 rods removed from 2 corners, and 8 rods removed from 2 corners. Total of 255 rods. (See p. 180: 2.05 cm up)

140.5 Water ht = 27.50 cm

7-Per

Temp °C  
23.5

$$C = -923.52 \text{ sec} = -1.54$$

Drain: added 1 rod. Have 17x17 array with 9 rods removed from 1 corner and 8 rods removed from 3 corners. Total of 256 rods.

Water ht = 27.50 cm

Δh = 7.4 cm

7-Per

Temp °C  
23.6 °C

$$C = 167.32 \text{ sec} = 6.54 = .884 \text{ /min.}$$

1443 Water ht = 20.10 cm.

System just critical  
Drain.

7/14/69: 17x17 array  
with 9 rods removed from  
1 corner & 8 from 3 cor-  
ners. Total rods 256.  
Separation = 1.80 cm C-C  
30 cm length p. 198

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	1"	✓	$3 \times 10^{-12}$
"	"	Fast ✓	"	✓	"
K-2	—	Meter —			
	—	Fast —			
R-1	—				
R-2	—				
PM-1	700V	Alarm ✓	0.5"	✓	500V
PM-2	700V	Alarm ✓	10"	✓	900V
"	"	Alarm ✓	2"	—	"
LOG IN CALIBRATE		✓	OPERATE	✓	SOURCE No. <u>B-80</u>
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

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

Instruments and safeties checked and reset by ATM

Source is checked by ATM Source No. M-93

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

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

Red light on by ATM Time 0940

Start-up OK'd by F.I.D.C. ATM Date 7-15-68



1300 rods.  
~~1180~~ 1180 cm separation c-c.  
 60 cm length.

Have an  $14 \times 14$  array. With 8 rods removed from 2 corners and 7 rods removed from 2 corners. Total of 166 rods.

1018 Water ht = 57.60 cm  
 System sub critical  
 Drain.

Temp  $^{\circ}\text{C}$   
 23.5  $^{\circ}\text{C}$

Added 18 rods. Have an  $14 \times 14$  array with 3 rods removed from each corner. Total of 184 rods.

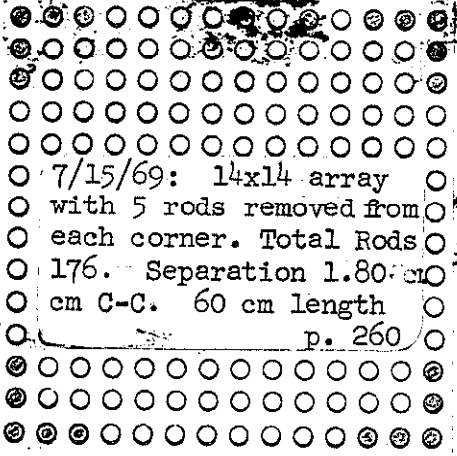
Water ht = 39.10 cm  $\Delta h = 1.15$   
 + head

Temp  $^{\circ}\text{C}$   
 23.5  $^{\circ}\text{C}$

$t = 39.11 \text{ sec} = 19.3 \text{ ft} = 16.8 \text{ ft/cm}$

1056 Water ht = 37.95 cm  
 System just critical  
 Drain.

Removed 8 rods. 2 from each corner.  
 Now have an  $14 \times 14$  array with 5 rods removed from each corner. Total of 176 rods.



Water ht = 57.50 cm

2-Per

$t = 99.96 \text{ sec} = 9.9 = 1.8$

1326 Water ht = 46.20 cm

System just critical  
Drain

7/15/69: 14x14 array  
 with 5 rods removed from  
 each corner. Total Rods  
 176. Separation 1.80  
 cm C-C. 60 cm length  
 p. 260

Removed 1 rod. Now have an 14x14 array,  
 with 6 rods removed from 1 corner. and 5  
 rods removed from 3 corners. Total of 175 rods.

Water ht = 57.60 cm

3-Per  
N-G.

Temp °C  
23.5 °C

1413 Drain

Have an 15x15 array, with 13 rods removed  
 from each corner. Total of 173 rods.

Water ht = 57.60 cm

System sub critical

Temp °C  
23.8

ans:

red  
20m

2.1 = 11.3

Water ht = 57.50 cm.

Temp °C

2-Per

23.5 °C

$t = 99.96 \text{ sec} = 9.9 = .884/\text{cm}$

1326 Water ht = 46.20 cm

System just critical  
Drain.

th  
0

Removed 1 rod. Now had on 14x14 array,  
with 6 rods removed from 1 corner. and 5  
rods removed from 3 corners. Total of 175 rods.

Water ht = 57.60 cm

Temp °C

3-Per

23.5 °C

N-G.

1413 Drain

Have an 15x15 array, with 13 rods removed  
from each corner. Total of 173 rods.

Water ht = 57.60 cm

Temp °C

System sub critical

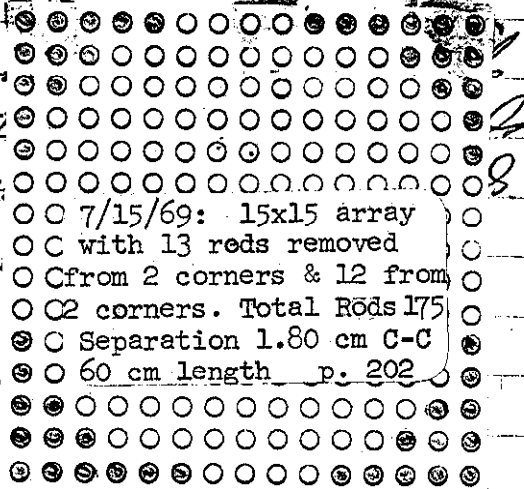
23.8

avg!

202

1300" rods.  
1.80 cm separation c-c.  
60 cm length.

added 2 rods. Have an  
13 rods removed from 2  
removed from 2 corners



Water ht = 57.60 cm

4 + Per

$$5 = 102.13 \text{ sec} = 9.74 = 1.85$$

1534 Water ht = 46.20 cm

System just critical  
Drain

Removed 1 rod. Have an 15x15 array  
with 12 rods removed from 1 corner. and  
13 rods removed from 3 corners. Total of  
174 rods.

Water ht = 57.70 cm

5 - Per

N-G.

Temp °C

23.9 °C

1558

Drain

202

1300" rods.  
1.80 cm sp  
60 cm long

added 2 rods. Have an 15 x 15 array, with  
13 rods removed from 2 corners; and 12 rods  
removed from 2 corners. Total of 175 rods.

Water ht = 57.60 cm

$\Delta h = 11.4$

Temp °C

23.9 °C

4 + Per

$$5 = 102.13 \text{ sec} = 9.74 = .854/\text{cm}$$

1536 Water ht = 46.20 cm

system just critical

Drain

Removed 1 rod. Have an 15 x 15 array  
with 12 rods removed from 1 corner. and  
13 rods removed from 3 corners. Total of  
174 rods.

Water ht = 57.70 cm

Temp °C

5 = Per

23.9 °C

N-G.

1558

Drain

INSTRUMENT CHECK

203

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	19"	✓	$10 \times 10^{-12}$
"	"	F-1 ✓	"	✓	"
K-2		Meter ✓			
		Fest ✓			
R-1					
R-2					
PM-1	7002 ✓	Alarm ✓	15"	✓	5002 ✓
PM-2	1200 ✓	Low ✓	10"	✓	900 ✓
"	"	Alarm ✓	2"	✓	"

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

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

START-UP CHECK LIST

Equipment checked by I.P.C. Personnel check by I.P.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 I.P.C.  
 Instruments in trip circuit: K-1 PM-1-2  
 Red light on by AKM Time 1020  
 Start-up OK'd by I.P.C. AKM Date 7-16-68

1300 rods,  
2.050 cm separation c-c,  
30 cm length.

See p 180 + 198

Have an 19x19 array with 27 rods removed from 2 corners, and 26 rods removed from 2 corners. Total of 255 rods.

Water ht = 27.50 cm  
1 + 1/2 ft

dh = 7.8 cm

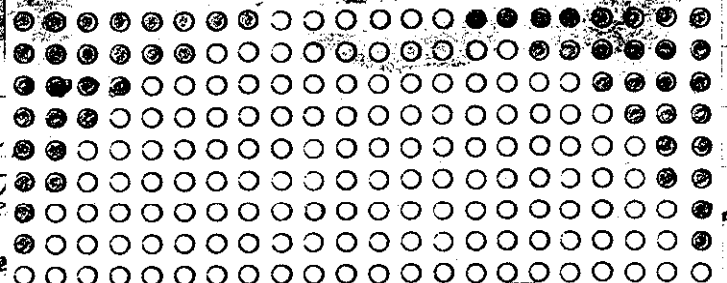
Temp °C  
22.7 °C

$T = 123.86 \text{ sec} = 8.34 = 1.1 \text{ H/cm}$

1116 Water ht = 19.70 cm

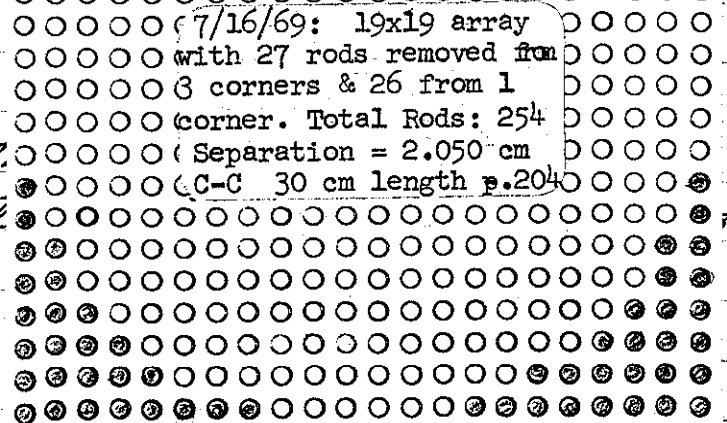
System just critical  
Drain

Removed one  
with 27 rods  
26 rods rema  
254 rods.



1120 Water ht = 27

System just  
Drain



7/16/69: 19x19 array  
with 27 rods removed from  
3 corners & 26 from 1  
corner. Total Rods: 254  
Separation = 2.050 cm  
C-C 30 cm length p.204

1300 " rods.  
2.050 cm separation c-c.  
30 cm length.

See p 180

Have run 79  
from 2 corners  
2 corners.

well

"

Water ht = 2  
' + 1/2

7°

$T = 123.86 \text{ sec} =$

1116 Water ht = 1  
System just  
Drain

Remained one rod. Have run 19 x 19 orney  
with 27 rods removed from 3 corners and  
26 rods removed from 1 corner. Total of  
254 rods.

1120 Water ht = 27.50 cm  
System just critical  
Drain.

Temp °

22.8°



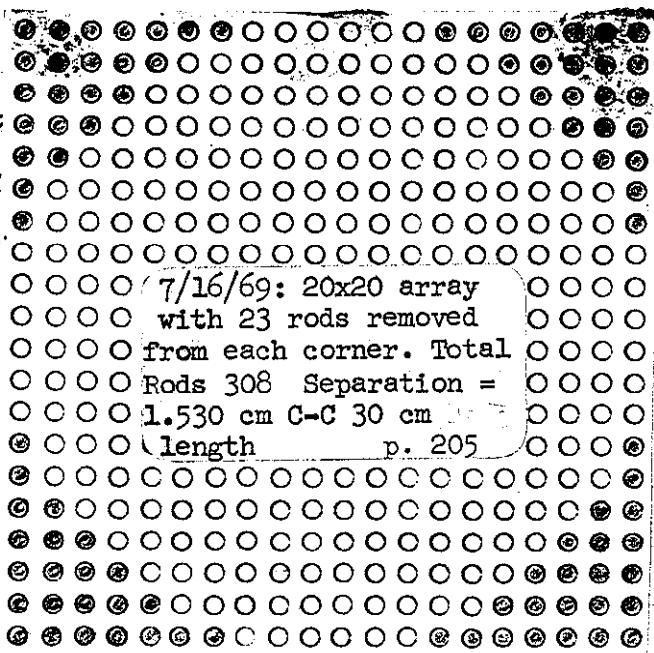
.300 rods.  
 1.530 cm separation c-c.  
 30 cm length.

Have an 20x20 array, with 25 rods removed from each corner. Total of 300 rods.

1413 Water ht = 27.60 cm  
 system sub critical  
 Drain.

Temp °  
 22.7 °

Added 8 rods.  
 in 20x20 array  
 from each cor.



Water ht = 27.5  
 2 + Per  
 $\tau = 86.92 \text{ sec} = 11.4$

Water ht = 19.2  
 System just crit  
 Drain.

Removed 2 rods, 1 each from opposite corners.  
 Have an 20x20 array with 24 rods removed from 2 corners and 23 rods removed from 2 corners. Total of 306

Water ht = 27.65  
 System sub critical  
 Drain.

avg.

Have an  $20 \times 20$   
from each corner

1413 Water ht = 27.6  
system sub  
Drain.

Added 8 rods. 2 to each corner. Have  
an  $20 \times 20$  array with 23 rods removed  
from each corner. Total of 308 rods.

Water ht = 27.50 cm  $\Delta h = 8.3$  cm Temp  $^{\circ}C$   
2 + Per 22.8  $^{\circ}C$

$C = 86.92 \text{ sec} = 11.07 = 1.34 \text{ /cm}$

Water ht = 19.20 cm  
system just critical  
Drain.

Removed 2 rods. 1 each from opposite corners.  
Have an  $20 \times 20$  array with 24 rods removed  
from 2 corners and 23 rods removed from  
2 corners. Total of 306

Water ht = 27.66  
system sub critical  
Drain.

avg.

added 1 road. Have an  $20 \times 20$  array.  
 with 23 rods removed from 3 corners  
 and 24 rods removed from 1 corner.  
 Total of 307 rods.

Water ht = 27.60 cm

Temp  $^{\circ}$ C

<sup>3</sup>-Pyr

22.8

$T = -499.8 \text{ sec} = -2.84$

1524

Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	1"	✓	$3 \times 10^{-12}$
"	"	Fast ✓	"	✓	"
K-2	$3 \times 10^{-12}$	Meter ✓	.5"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	.5"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	2"	✓	"

LOG IN CALIBRATE  OPERATE  SOURCE No. 0-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by I.D.C. / A.H.H. Personnel check by F.I.C.

Instruments and safeties checked and reset by A.H.H.

Source in checked by A.H.H. Source No. M-93

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

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

Red light on by A.H.H. Time 1035

Start-up OK'd by F.I.C. / A.H.H. Date 7-17-69

1,300" rods  
 1,530 cm separation C-C.  
 60 cm length.

Have an 16 X 16 array, with 5 rods removed from each corner. Total of 236 rods.

Water ht = 32.20 cm  $\Delta h = .50$  cm Temp  $^{\circ}$ C  
 + Per. 21.6  $^{\circ}$ C

$$t = 63.02 \text{ sec} = 13.94 = 27.8 \text{ } \mu\text{sec}$$

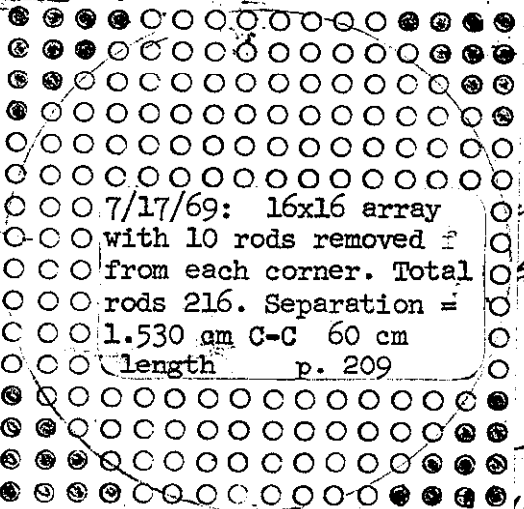
1115 Water ht = 31.70 cm  
 System just critical  
 Drain.

Removed 12 rods. 3 from each corner.  
 Now have an 16 X 16 array with 8 rods removed from each corner. Total of 224 rods.

Water ht = 39.50 cm  $\Delta h = .70$  cm Temp  $^{\circ}$ C  
 + Per. 21.5  $^{\circ}$ C

$$t = 54.32 \text{ sec} = 15.54 = 22.17 \text{ } \mu\text{sec}$$

1347 Water ht = 38.80 cm  
 System just critical  
 Drain.



Removed 8 rods. an 16x16 array with 10 rods removed from each corner. Total rods 216. Separation = 1.530 am C-C 60 cm length p. 209

Water ht = 57.6  
 $3 + \text{Per } \bar{L} = 804.01 \text{ cm}$   $1.5^\circ \text{C}$

1452 Water ht = 49.60 cm system just critical.  
 Drain:

Removed 1 rod. Now have an 16x16 array with 17 rods removed from 1 corner and 10 rods removed from 3 corners. Total of 215 rods.

1515 Water ht = 57.60 cm Temp  $21.5^\circ \text{C}$   
 System sub-critical  
 Drain:

Samples taken. # 5

Y-12 Reg # 684563

$\bar{L} = 613.0$

$T = 65.8$

$N = 547.2$

X-10 Reg # 4636

$\bar{L} = 299.1$

$T = 33.5$

$N = 265.6$

sub for  $\rho_{\text{B/L}} = 0.143$   
 density = 0.9974  
 Temp =  $25^\circ \text{C}$

$\rho_{\text{B/L}} = 0.139$   
 density = 0.9976  
 Temp  $25^\circ \text{C}$

Removed 8 rods, 2 from each corner. Have an 16 X 16 array with 10 rods removed from each corner. Total of 216 rods.

Water ht = 57.60 cm  $\Delta h = 8.0$  cm Temp  $^{\circ}$ C  
 $^3 +$  Per  $\bar{v} = 804,01 \text{ cm}^3 = 1.54 = .194/\text{cm}$  21.5  $^{\circ}$ C  
 1452 Water ht = 49.60  $^{\text{cm}}$  system just critical.

Drain:

Removed 1 rod. Now have an 16 X 16 array with 11 rods removed from 1 corner and 10 rods removed from 3 corners. Total of 215 rods.

1515 Water ht = 57.60 cm Temp  $^{\circ}$ C  
 system sub critical 21.5  $^{\circ}$ C  
 Drain:

Samples taken. # 5

Y-12 Reg # 684563

$\bar{v} = 613.0$

T = 65.8

N = 547.2

sub for  $\rho_{\text{OIL}} = 0.143$   
 density = 0.9974  
 Temp = 25  $^{\circ}$ C

X-10 Reg # A-636

$\bar{v} = 299.1$

T = 33.5

N = 265.6

$\rho_{\text{OIL}} = 0.139$   
 density = 0.9976  
 Temp  $^{\circ}$ C = 25  $^{\circ}$ C

## INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE RANGE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	$3 \times 10^{-12}$
"	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2	"	Meter <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
"	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
R-1					
R-2					
PM-1	700V	Alarm <input checked="" type="checkbox"/>	1.5"	<input checked="" type="checkbox"/>	500V
PM-2	1200V	Low <input checked="" type="checkbox"/>	10"	<input checked="" type="checkbox"/>	900V
"	"	Alarm <input checked="" type="checkbox"/>	2"	<input checked="" type="checkbox"/>	"
LOG N CALIBRATE <input checked="" type="checkbox"/>		OPERATE <input checked="" type="checkbox"/>		SOURCE No. B-80	
DUMP WELL PROBE LIGHT <input checked="" type="checkbox"/>					

## START-UP CHECK LIST

Equipment checked by I.D.C. Hall Personnel check by I.D.C.

Instruments and safeties checked and reset by A.K.H.

Source in checked by A.K.H. Source No. 19-93

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

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

Red light on by A.K.H. Time 1420

Start-up OK'd by I.D.C. A.K.H. Date 7-18-69



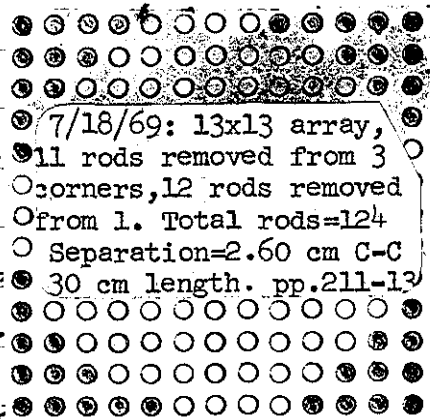
1516" rods.  
 30 cm length.  
 2.60 cm separation c-c.

Have an 13x13 array, with 12 rods removed from each corner. Total of 121 rods.

1500 Water ht = 27.60 cm 20.7 °C  
 System sub critical  
 Drain.

Added 2 rods: 1 each to opposite corners.  
 Now have an 13x13 array with 12 rods removed from 2 corners, and 11 rods removed from 2 corners. Total 123 rods.

1515 Water ht = 27.70 cm  
 System sub critical  
 Drain.



7/18/69: 13x13 array,  
 11 rods removed from 3  
 corners, 12 rods removed  
 from 1. Total rods = 124  
 Separation = 2.60 cm C-C  
 30 cm length. pp. 211-13

Added 1 rod. Now have an  
 with 11 rods removed from  
 and 12 rods removed from  
 Total of 129 rods.

Water ht = 27.50 cm Temp °C  
 + Per 20.7 °C

$E = 241.20 \text{ cm} = 4.74 = .69 \text{ H/cm}$

Water ht = 20.65 cm

System just critical. Drain

15 1/16" rods.  
30 cm length.  
2.60 cm separation c-c.

- 211

Have an 13 X 13 array, with 12 rods removed from each corner. Total of 121 rods.

1500 Water ht = 27.60 cm      20.7 °  
System sub critical  
Drain.

Added 2 rods. 1 each to opposite corners.  
Now have an 13 X 13 array with 12 rods removed from 2 corners, and 11 rods removed from 2 corners. Total 123 rods.

1515 Water ht = 27.70 cm  
System sub critical  
Drain.

Added 1 rod. Now have an 13 X 13 array with 11 rods removed from 3 corners, and 12 rods removed from 1 corner. Total of 129 rods.

Water ht = 27.50 cm       $\delta h = 6.85 \text{ cm}$  Temp °  
' + Per      20.7 °

$$E = 241.20 \text{ cm} = 4.74 = .69 \text{ Hcm.}$$

Water ht = 20.65 cm

System just critical. Drain: ~~out~~

212

7/21/69

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	STARTUP RANGE
K1	3x10 <sup>-2</sup>	Meter ✓	1"	✓	3x10 <sup>-12</sup>
		Fast ✓		✓	"
K2	3x10 <sup>-2</sup>	Meter ✓	1 1/2"	✓	"
		Fast ✓		✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	1/2"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
		Alarm ✓	2"	✓	"
LOCK IN CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
BUMP VOLT PRESS LIGHT					

STARTUP CHECK LIST

Equipment checked by E.B.T. AMAL Personnel checked by AMAL

Instruments and safeties checked and reset by E.B.T.

Source in checked by AMAL Source No. 19-93

Emergency equipment in control room checked by E.B.T.

Instruments in trip circuit: K-7-2 PM-1-2

Red light on by E.B.T. Time 0910

Started shift by E.B.T. AMAL Date 7-21-69

.516" rods.  
30 cm length.  
2.60 cm separation c-c.

213

Repeat of experiment described on p. 271.

Water ht = 27.60 cm  $D_h = 5.10$  cm Temp  $^{\circ}$ C  
+ Per 19.3

$$\tau = 890.93 = 1.44 = .27 \text{ f/cm}$$

1019 Water ht = 22.50 cm

System just critical  
Drain.

.516" rods.  
60 cm length.  
2.60 cm separation c-c

Have an 11x11 array, with 8 rods removed from 2 corners, and 9 rods removed from 2 corners. Total of 87 rods.

Water ht = 43.20 cm  $D_h = 11.75$  cm Temp  $^{\circ}$ C  
+ Per 19.5  $^{\circ}$ C

$$\tau = 49.98 \text{ sec} = 16.47 = 9.4 \text{ f/cm}$$

1344 Water ht = 41.45 cm

System just critical  
Drain.

over!

Removed 2 rods. Now have an 11x11 array with 9 rods removed from each corner. Total of 85 rods.

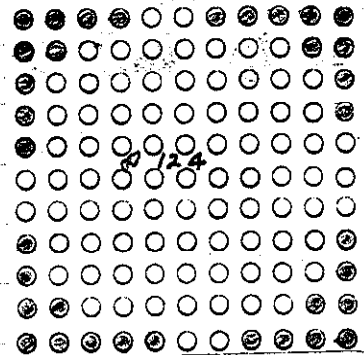
1435 Water ht = 57.60 cm Temp °C  
 System sub critical 19.5 °C  
 Drain

Added 1 rod. Now have an 11x11 array with 9 rods removed from 3 corners and 8 rods removed from 1 corner. Total of 86 rods.

Water ht = 46.25 cm  $\Delta h = 2.15$  Temp °C  
 3 + per 19.6 °C

$G = 45.63 \text{ sec} = 17.4 \text{ } = 8.1 \text{ } / \text{cm}$

1504 Water ht = ± 44.10 cm  
 System just critical  
 Drain



7/21/69: 11x11 array, 3 rods removed from 3 corners, 8 rods removed from 1 corner. Total Rods 86. Separation=2.60 cm C-C, 60 cm length.p.214

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Motor <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	$3 \times 10^{-12}$
	"	Trips <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2	"	Motor <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
	"	Shot <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
R-1					
R-2					
PM-1	700V	Alarm <input checked="" type="checkbox"/>	.5"	<input checked="" type="checkbox"/>	500V
PM-2	1200V	Low <input checked="" type="checkbox"/>	10"	<input checked="" type="checkbox"/>	900V
	"	Alarm <input checked="" type="checkbox"/>	2"	<input checked="" type="checkbox"/>	"
LOG N CALIBRATE <input checked="" type="checkbox"/>		OPERATE <input checked="" type="checkbox"/>		SOURCE No. <u>B-80</u>	
DUMP WELL PROSE LIGHT <input type="checkbox"/>					

START-UP CHECK LIST

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

Instruments and safeties checked and reset by AWH

Source in checked by AWH Source No. 14-43

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 AWH Time 10:00

Start-up OK'd by F.I.D.C. AWH Date 7-22-69

Non 1.0" rods,  
4.39 cm separation c-c,  
30 cm length.

Have an 9x9 array. With 6 rods removed  
from 3 corners and 5 rods removed from  
1 corner. Total of 58 rods.

Water ht = 27.50 cm

Temp °C

- Per

20.0 °C

N. G.

1055 Drain:

~~Removed 4 rods.~~ Added 1 rod. Now  
have an 9x9 array. With 6 rods removed  
from 2 corners and 5 rods removed from  
2 corners. Total of 59 rods.

Water ht = 18.50 cm  $\Delta h = .75 \text{ cm}$

Temp °C

<sup>2</sup> + Per

20.0 °C

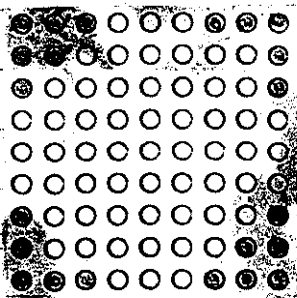
$T = 104.30 \text{ sec} = 9.5 \text{ s} = 12.7 \text{ s/cm}$ .

1119 Water ht =  $\pm 17.750 \text{ cm}$

System just critical

Drain.

X  
7/22/69: 9 x 9 array  
with 6 rods removed from  
2 corners & 5 from 2  
corners. Total rods: 59  
Separation = 4.39 cm C-C  
30 cm length p.216



1.0" rods, - 217  
 4.39 cm separation c.c.  
 60 cm lengths.

Now have on 7x7 array, with 3 rods removed from 3 corners and 2 rods removed from 1 corner. Total 38 rods.

1334 Water ht = 57.50 cm Temp °C  
 System sub critical 20.0 °C  
 Drain.

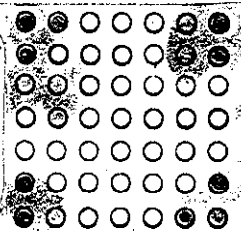
Added 1 rod; Now have on 7x7 array with 3 rods removed from 2 corners, and 2 rods removed from 2 corners. Total of 39 rods.

Water ht = 43.90 cm  $\Delta h = 1.6$  cm Temp °C  
<sup>3</sup>+R<sub>cr</sub> 20.0 °C

$T = 32.59 \text{ sec} = 21.6 \text{ ft} = 13.5 \text{ ft/cm}$

1409 Water ht = ± 42.30 cm  
 System just critical  
 Drain.

7/22/69: 7x7 array with 3 rods removed from 2 corners & 2 from 2 corners. Total rods: 39 Separation=4.39 cm C-C 60 cm length p.217



array:



1545 Sample taken from small dump trucks.  
#6

Y-12 Reg # 684564

G = 585.4

T = 53.5

N = 531.9

sub for:

g of l = 0.144

density = 0.9974

Temp ° = ?

X-10 A-637

N = 261.5g

sub for:

g of l = 0.142

density = .9973

Temp ° = 25°

Resample of Batch #1 6-19-69

Y-12 Reg # 684565

G = 594.5

T = 54.8

N = 539.7

sub for:

g of l = 0.138

density = 0.9974

Temp ° = 25°

X-10 A-638

N = 267.9

sub for:

g of l = 0.139

density = .9974

Temp ° = 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 ✓	"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	.5"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	2"	✓	"

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

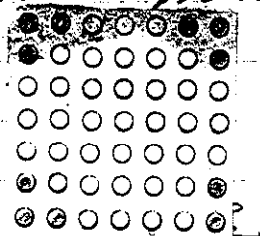
START-UP CHECK LIST

Equipment checked by F.I.D.C. Personnel check by R.M.C.  
 Instruments and safeties checked and reset by A.K.A.  
 Source in checked by A.K.A. 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 A.K.A. Time 1015  
 Start-up OK'd by F.I.D.C. A.K.A. Date 7-23-69

1.0" rods.  
 4.39 cm separation  
 60 cm length.

7/23/69: 7x7 array with  
 3 rods removed from 3  
 corners & 2 from 1 cor-  
 ner. Total rods: 38  
 Separation = 4.39 cm C-C  
 60 cm length p.220

Have an 7x7 array, with 3 rods removed  
 from 3 corners, and 2 rods removed from  
 1 corner. Total of 38 rods.



1055. Water ht = 57.60 cm  
 System sub critical  
 Drain:

1100-1521 Added ~ 14.0 L/H<sub>2</sub>O to small reflector  
 dump tank. Purpose is to try to adjust  
 H<sub>3</sub>BO<sub>3</sub> solution in order to repeat the above  
 experiment done in 10-30-67. Tag Book #2.

1525 Water ht = 57.60 cm  
 System just critical  
 Drain:

Temp °  
 20.0 °C

1.0" rods.

4.39 cm separation, 7/23/69: 7x7 array with  
60 cm length. 3 rods removed from 3

corners

ner. To

Separat

60 cm

Have an 7x7 array, with 3 rods  
from 3 corners, and 2 rods from  
1 corner. Total of 38 rods.

1055. Water ht = 57.60 cm  
System sub critical  
Drain:

Temp °C  
19.9°C

1100-1521 added ~ 14.0 l/H<sub>2</sub>O to small reflector  
dump tank. Purpose is to try to adjust  
H<sub>2</sub>O<sub>3</sub> solution in order to repeat the above  
experiment done in 10-30-67. Tag Book #2.

1525 Water ht = 57.60 cm  
System just critical  
Drain:

Temp °C  
20.0°C

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE RANGE	SET	START-UP RANGE
K-1	3K10 <sup>-12</sup>	Meter ✓	1"	✓	3K10 <sup>-12</sup>
	"	Test ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
	"	Test ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	1.5"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
	"	Alarm ✓	2"	✓	"

LOG IN CALIBRATE  OPERATE  SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by A.K.C. Personnel check by A.K.C.  
F.I.R.C.

Instruments and safeties checked and reset by A.K.C.

Source in checked by A.K.C. Source No. M-93

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

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

Red light on by A.K.C. Time 0800

Start-up OK'd by F.I.C. A.K.C. Date 7-29-69

Repeat of last experiment described on page  
220.

Water hts = 57.70 cm

Temp °

- Per

19.5 °

$I = -315.08 \text{ sec} = -4.74$

0909

Drain:

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3K10 <sup>-12</sup>	Meter ✓	1"	✓	3K10 <sup>-12</sup>
"	"	Feet ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
"	"	Feet ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	.5"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	2"	✓	"

LOG N CALIBRATE  OPERATE  SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by F.D.C. Personnel check by I.R.C.  
 Instruments and safeties checked and reset by A.H.A.  
 Source in checked by A.H.A. Source No. M-83  
 Emergency equipment in control room checked by F.D.C.  
 Instruments in trip circuit: K-1 - 2 PM-1 - 2  
 Red light on by A.H.A. Time 0915  
 Start-up OK'd by F.D.C. A.H.A. Date 7-25-68

1.0° rads.  
4.39 cm separation e-e.  
6.0 cm lengths.

Repeat of last experiments, p's 220-222.

Water ht = 57.60 cm

Temp °C

-Per

19.0 °C

$\tau = 338.98 \mu\text{s} = -4.3 \mu\text{s}$

10:00 Drain

12:27 Have increased room temp. and have had reflector water pump running. Purpose to raise temp of reflector water also moved Log-71 chamber to wet in 6.5" of array. Wad ~ 8.0".

1:310 Water ht = 57.65 cm

Temp °C

System just critical

20.5 °C

Drain

Water ht = 57.60 cm.

$\Delta r = 9.8 \text{ cm}$

Temp °C

+Per

22.5 °C

$\tau = 217.30 \mu\text{s} = 5.2 \mu\text{s} = .53 \mu\text{s/cm}$

1:525 Water ht = 47.80 cm

System just critical

Temp °C

Drain

22.5 °C



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3 x 10 <sup>-12</sup>	Alarm ✓	1"	✓	3 x 10 <sup>-12</sup>
"	"	✓	"	✓	"
K-2	"	Alarm ✓	"	✓	"
"	"	✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	5"	✓	500V
PM-2	1300V	Low ✓	10"	✓	900V
"	"	Alarm ✓	2"	✓	"

LOG N CALIBRATE  OPERATE  SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by F.I.C. Personnel check by A.T.P.

Instruments and safeties checked and reset by A.T.P.

Source in checked by A.T.P. Source No. M-93

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

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

Red light on by A.T.P. Time 0757

Start-up OK'd by F.I.C. A.T.P. Date 7-28-69

1.0" rods.  
 4.39 cm separation c-c.  
 60 cm length.

Repeat of last experiment's p<sup>o</sup> 220-224.

Water ht = 57.60 cm  $\Delta h = 11.20 \text{ cm}$   
 1 + per Temp °C  
24.5 °C

$T = 89.09 \text{ sec} = 10.84 \cdot 96 \text{ cm}$

0852 Water ht = 46.40 cm 11

system just critical  
 Drain:

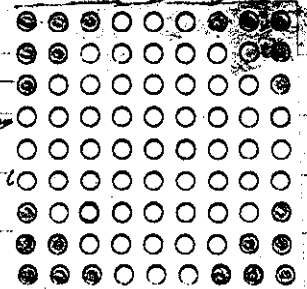
1.0" rods  
 4.39 cm separation c-c  
 30 cm length.

X I have an 9x9 array. With 6 rods removed from 3 corners, and 5 rods removed from 1 corner. Total of 58 rods.

Water ht = 27.60 cm  
 2 + per

$T = 69.54 \text{ sec} = 13.04 = 1.54 \text{ cm}$

1024 Water ht = 19.20 cm  
 system just critical  
 Drain:



7/28/69: 9x9 array with 5 rods removed from 3 corners & 5 from 1 corner. Total rods: 58. Separation = 4.39 cm C-C. 30 cm length p.226

1.0" rods.  
 4.39 cm separation c-c.  
 60 cm length.

Repeat of last experiment's p's 220-224.

Water ht = 57.60 cm  $\Delta h = 11.20$  cm  
 Temp °C  
 24.5 °C

1 + Per

$T = 89.09 \text{ sec} = 10.84 \cdot 96 \text{ sec}$

0852 Water ht = 46.40 cm

system just critical  
 Drain:

1.0" rods  
 4.39 cm separation c-c  
 30 cm length.

X I have an 9x9 array. Will  
 remove from 3 corners, a  
 remove from 1 corner. ~~...~~

Water ht = 27.60 cm  $\Delta h = 8.4$  cm  
 Temp °C  
 24.8 °C

2 + Per

$T = 69.54 \text{ sec} = 13.07 \cdot 5.3 \text{ sec}$

1024 Water ht = 19.20 cm

system just critical  
 Drain:

7/28/69: 9x9 array with  
 6 rods removed from 3 cor-  
 ners & 5 from 1 corner.  
 Total rods: 58. Separation=4.39 cm C-C. 30  
 cm length p.226

Samples taken: II 7

Y-12 Reg # 684566

X-10 + BH A-639

G. = 624.0

G. = 306.0

T. = 65.8

T. = 31.5

N. = 558.2

N. = 274.5

cal for:

1. g  $\text{H}_2\text{O}$  = 0.138

2. density = 0.9973

3. Temp  $^{\circ}\text{C}$  = 25.0

cal for

1. g  $\text{H}_2\text{O}$  = 0.140

2. density = 0.9974

3. Temp  $^{\circ}\text{C}$  = 25.0

Y-12 Reg # 684567

Reference solution

cal for:

1. g  $\text{H}_2\text{O}$  = 0.00000325

1.0" rods.  
 4.84 cm separation C-C.  
 30 cm length.

Have an 9x9 array, with 5 rods removed from each corner. Total of 61 rods.

1420 Water ht = 27.50 cm Temp °C  
 System sub critical 25.0°C  
 Drain.

Added 4 rods, 1 to each corner. Have an 9x9 array with 4 rods removed from each corner. Total of 65 rods.

1531 Water ht = 27.60 cm Temp °C  
 System sub critical 25.0°C  
 Drain.

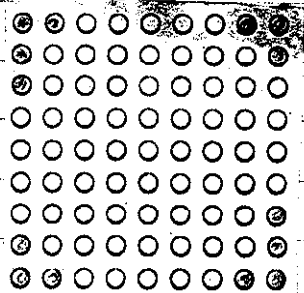
7/28/69: 9x9 array with 4 rods removed from 2 corners & 3 from 2 corners. Total rods: 67  
 Separation = 4.84 cm C-C  
 30 cm length p. 228

X added 2 rods, 1 each to opposite corners. Have an 9x9 array with 4 rods removed from 2 corners and 3 rods removed from 2 corners. Total of 67 rods.

Water ht = 18.00 cm  $\Delta h = .70 \text{ cm}$   
 3 + Per

$t = 91.27 \text{ sec} = 10.6 \text{ f} = 15.1 \text{ Hcm}$

1555 Water ht = 17.30 cm  
 System just critical: Drain.



1.0" rods.  
4.84 cm separation c-c.  
30 cm length.

Have an 9x9 array, with 5 rods removed from each corner. Total of 61 rods.

1420 Water ht = 27.50 cm Temp °C  
system sub critical 25.0°C  
Drain.

Added 4 rods, 1 to each corner. Have an 9x9 array with 4 rods removed from each corner. Total of 65 rods.

1531 Water ht = 27.60 cm Temp °C  
system sub critical 25.0°C  
Drain.

7/28/69: 9x9 array with 4 rods removed from 2 corners & 3 from 2 corners. Total rods = 67  
Separation = 4.84  
30 cm length

X added 2 rods, 1 each to opposite  
Have an 9x9 array with 4 from 2 corners and 3 rods from 2 corners. Total of 67

Water ht = 18.00 cm  $\Delta h = .70$  cm Temp °C  
3 + Per 25.1°C

$$T = 91.27 \text{ sec} = 10.6 \text{ f} = 15.1 \text{ Hcm}$$

1555 Water ht = 17.30 cm

system just critical: Drain.

## INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	$3 \times 10^{-12}$
	"	Feet <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	"
K-2	"	Meter <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
	"	Feet <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
R-1					
R-2					
PM-1	700V	Alarm <input checked="" type="checkbox"/>	5"	<input checked="" type="checkbox"/>	500V
PM-2	1200V	Low <input checked="" type="checkbox"/>	10"	<input checked="" type="checkbox"/>	900V
	"	Alarm <input checked="" type="checkbox"/>	2"	<input checked="" type="checkbox"/>	"
LOG N CALIBRATE <input checked="" type="checkbox"/>		OPERATE <input checked="" type="checkbox"/>		SOURCE No. <u>B-80</u>	
DUMP WELL PROBE LIGHT <input checked="" type="checkbox"/>					

## START-UP CHECK LIST

Equipment checked by AJK Personnel check by F.O.C.

Instruments and safeties checked and reset by AJK

Source in checked by AJK Source No. 19-83

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

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

Red light on by AJK Time 0826

Start-up OK'd by F.O.C. AJK Date 7-29-69

110 rods.  
4.84 cm separation c-c  
30 cm length.

Repeat of last experiment described on  
p. 228.

Water ht = 18.20 cm  $\Delta h = .80$  cm Temp °C  
+ Per 24.6 °C

$$C = 89.09 \text{ sec} = 10.8 \text{ f} = 13.5 \text{ f/cm}$$

Water ht = 17.40 cm Temp °C  
System just critical 24.6 °C

Drain:

Removed 1 rod. Now have an 9 x 9  
array with 4 rods removed from 3  
corners and 3 rods removed from  
1 corner. Total of 66 rods.

Water ht = 27.50 cm  $\Delta h = 3.75$  Temp °C  
+ Per 24.7 °C

$$C = 1608.02 \text{ sec} = 1.80 \text{ f} = 2.1 \text{ f/cm}$$

09.95 Water ht = 23.75 cm Temp °C  
24.7 °C

System just critical  
Drain.



1.0" rods.  
4.89 cm separation e-c  
60 cm length. 231

Now have an 8x8 array with 6 rods removed from 3 corners and 7 rods removed from 1 corner. Total of ~~39 rods~~ 39 rods.

1310 Water ht = 57.60 cm Temp °C  
System sub critical 24.8  
Drain.

Now have an 7x7 array with 2 rods removed from 2 corners and 3 rods removed from 2 corners. Total of 39 rods. (all usable 1.0" rods)

1350 Water ht = 57.60 cm. Temp °C  
System sub critical 25.0 °C  
Drain.

1.0" rods.  
3.96 cm separation e-c.  
30 cm length.

Have an 9x9 array, with 3 rods removed from each corner. Total of 69 rods.

Water ht = 10.40 cm Temp °C  
System just critical 24.8 °C  
Drain.

over:

Removed 4 rods. 1 from each corner. Have an 9x9 array with 4 rods removed from each corner. Total 65 rods.

1537 Water ht = 13.90 cm  
 System just critical  
 Drain.

Temp<sup>o</sup>  
 24.9<sup>o</sup>C

X Removed 4 rods. 1 from each corner. Now have an 9x9 array with 5 rods removed from each corner. Total of 61 rods.

Water ht = 16.20 cm  
 + Per

sh = 20 cm

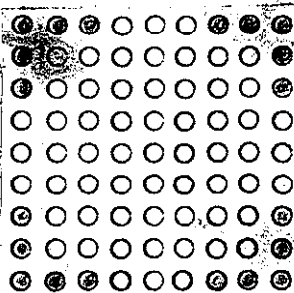
Temp<sup>o</sup>  
 25.0<sup>o</sup>C

$t = 117.39 \text{ sec} = 8.74 = 43.50 \text{ fms}$

1558 Water ht = 16.00 cm (This + Per next to system just critical Drain.)

7/29/69: 9x9 array with 5 rods removed from each corner. Total rods: 61 Separation = 4.84-cm C-C 60 cm length

p.232



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	$3 \times 10^{-2}$
"	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2	"	Meter <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
"	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
R-1					
R-2					
PM-1	700V	Alarm <input checked="" type="checkbox"/>	1.5"	<input checked="" type="checkbox"/>	500V
PM-2	1200V	Low <input checked="" type="checkbox"/>	10"	<input checked="" type="checkbox"/>	900V
"	"	Alarm <input checked="" type="checkbox"/>	2"	<input checked="" type="checkbox"/>	"
LOG IN CALIBRATE <input checked="" type="checkbox"/>		OPERATE <input checked="" type="checkbox"/>		SOURCE No. 13-80	
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by F.I.D.C. Personnel check by F.I.D.C.  
 Instruments and safeties checked and reset by [Signature]  
 Source in checked by [Signature] Source No. 14-93  
 Emergency equipment in control room checked by F.I.D.C.  
 Instruments in trip circuit: K-1-2 P09-1-2  
 Red light on by [Signature] Time 0805  
 Start-up OK'd by F.I.D.C. [Signature] Date 7-30-31

1.0" rods.  
3.96 cm separation e-e.  
30 cm lengths.

Repeat of last experiment described on  
p. 232.

Water ht = 16.60 cm  $\Delta h = .55$  cm Temp  $^{\circ}$ C  
+ Per 29.2  $^{\circ}$ C

$\Delta h = 49.96$  mm = 16.44 = 29.84 cm

0846 Water ht = 16.05 cm

System just critical  
Drain.

Removed 2 rods. 1 each from opposite  
corners. Now have an 9x9 array  
with 5 rods removed from 2 corners  
and 6 rods removed from 2 corners.  
Total of 59 rods.

0908 Water ht = 27.70 cm Temp  $^{\circ}$ C  
System sub critical 29.2  $^{\circ}$ C  
Drain.

x added 1 rod. Have an 9x9 array, with 5 rods removed from 3 corners and 6 rods removed from 1 corner. Total 60 rods.

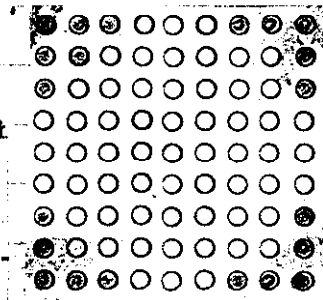
Water ht = 19.20 cm 2h = 1.95 cm Temp °C  
 2 Per 24.3 °C

$b = 52.15 \text{ cm} = 16.1 \text{ ft} = 11.1 \text{ ft/cm}$

1095 Water ht = 17.75 cm

System just critical  
 Drain.

7/30/69: 9x9 array with 5 rods removed from 3 corners & 6 from 1 corner. Total rods: 60. 1.0" rods. 3.96 cm separation. C-C. 30 cm length. p. 235

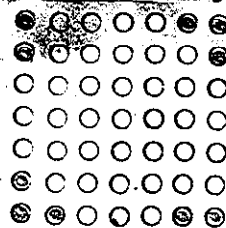


1.0 rods.  
 3.96 cm separation c-c  
 60 cm lengths.

x Have an 7x7 array, with 2 rods removed from 2 corners and 3 rods removed from 2 corners. Total of 39 rods.

1326 Water ht = 57.60 cm. Temp °C  
 System sub-critical 24.9 °C

Drain: 7/30/69: 7x7 array with 2 rods removed from 2 corners & 3 from 2 corners. Total rods: 39 Separation=3.96 cm C-C 60 cm length p.235



INSTRUMENT	RANGE	TRIP	SOURCE	SET	START-UP RANGE
K1	3X10 <sup>-12</sup>	✓	1"	✓	3X10 <sup>-12</sup>
"	"	✓	"	✓	"
K2	"	✓	"	✓	"
"	"	✓	"	✓	"
RM 1	700V	Alarm ✓	5"	✓	500V
RM 2	1200V	✓	10"	✓	900V
"	"	Alarm ✓	2"	✓	"
LOG IN CASSETTE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROBE LIGHT		7			

START-UP CHECK LIST

Equipment checked by F.O.C. AKM Personnel check by F.O.C.  
 Instruments and safeties checked and reset by AKM  
 Source in checked by AKM Source No. 18-43  
 Emergency equipment in control room checked by F.O.C.  
 Instruments in trip circuit: K-1-2 PM-1-2  
 Red light on by AKM Time 0825  
 Start-up OK'd by F.O.C. AKM Date 7-31-69

1.80" rods.  
 4.14 cm separation c-c. - 237  
 30 cm lengths.

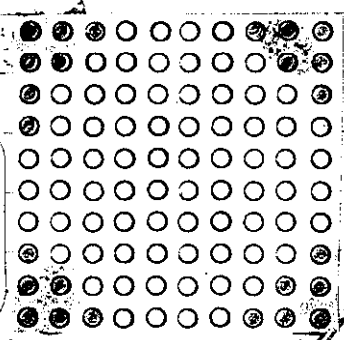
Have an 10x10 array. With 6 rods removed from 3 corners and 7 rods removed from 1 corner. Total of 75 rods.

Water ht = 27.50 cm  $\Delta h = 8.00$  cm Temp  $^{\circ}$ C  
 24.1  $^{\circ}$ C

$\tau = 99.96 \text{ sec} = 9.9 \text{ f} = 1.2 \text{ f/cm}$

0902 Water ht = 19.50 cm  
 System just critical  
 Drain

7/31/69: 10x10 array with 6 rods removed from 3 corners & 7 from 1 corner. Total rods: 75 Separation 4.14 cm C-C 30 cm length p.237



Removed 1 rod. Have an 10x10 array with 6 rods removed from 2 corners and 7 rods removed from 2 corners. Total of 74 rods.

Water ht = 27.60 cm Temp  $^{\circ}$ C  
 System sub critical 24.2  $^{\circ}$ C  
 Drain

180" rod.  
 4.14 cm separations c-c.  
 60 cm lengths.

Have an 8x9 array. With 6 rods removed from each corner. Total of 48 rods.

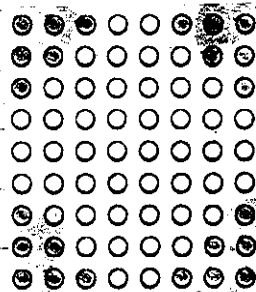
Water ht = 57.60 cm 28 = 6.1 cm Temp =  
 $\frac{z}{2} + P_{ev}$  24.2°C

$C = 2303.38 \text{ cm} = .56 \text{ f} = .09 \text{ f/cm}$

1500 ~~Water~~ Water ht = 51.50 cm  
 System just critical  
 Drain:

7/31/69: 8x9 array with  
 6 rods removed from each  
 corner. Total rods: 48  
 Separation 4.14 cm C-C  
 60 cm length

p.238





INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	1"	✓	$3 \times 10^{-12}$
"	"	Fast ✓	1"	✓	"
K-2	"	Meter ✓	1"	✓	"
"	"	Fast ✓	1"	✓	"
P-1					
P-2					
PAS-1	700V	Alarm ✓	.5"	✓	500V
PAS-2	1200V	Low ✓	10"	✓	900V
"	12	Alarm ✓	2"	✓	"

LOG N CALIBRATE  OPERATE  SOURCE No. B-80

~~DUMP WELL PROBE LIGHT~~

START-UP CHECK LIST

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

Instruments and safeties checked and reset by A.K.H.

Source in checked by A.K.H. Source No. M-93

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

Instruments in trip circuit: TK-1-2 NM 1-2

Red light on by A.K.H. Time 0925

Start-up OR'd by F.D.C., A.K.H. Date 8-4-69

.80" rods.  
 4.80 cm separations c.c.  
 30 cm length.

Have an 11 x 11 array, with 8 rods removed from each corner. Total of 89 rods.

0951. Water ht = 27.50 cm      Temp °C  
 System sub critical      23.5 °C  
 Drain:

added 8 rods. Now have an 11 x 11 array, with 6 rods removed from each corner. Total of 97 rods.

1010 Water ht = 27.60 cm      Temp °C  
 System sub critical      23.5 °C  
 Drain:

added 7 rods. Have an 12 x 12 array, with 10 rods removed from each corner. Total of 104 rods.

1032 Water ht = 27.70 cm      Temp °C  
 System sub critical      23.6 °C  
 Drain:

added 8 rods. Now have an 12x12 array, with 8 rods removed from each corner. Total of 112 rods. ✓

1106 Water ht = 27.70 cm Temp °  
 system sub critical 23.7 °  
 Drain.

added 8 rods. Now have an 12x12 array with 6 rods removed from each corner. Total 120 rods. ✓

1250 Water ht = 27.50 cm Temp °  
 system sub critical 23.7 °  
 Drain.

added 9 rods. 1 to each corner. Now an 12x12 array with 5 rods removed from each corner. Total of 129 rods. ✓

1306 Water ht = 27.70 cm Temp °  
 system sub critical 23.9 °  
 Drain.

added 8 rods. 2 to each corner.  
 Now have an 12x12 array, with 3  
 rods removed from each corner.  
 Total of 132 rods.

Water ht = 21.10 cm  $dh = 2.95$  Temp °C  
 7 Per 24.0°C

$$\tau = 39.11 \text{ sec} = 19.3 \phi = 6.5 \phi / \text{cm}$$

1330 Water ht = 18.15 cm

System just critical  
 Drain.

Removed 2 rods. Each from opposite  
 corners. Now have an 12x12 array  
 with 3 rods removed from 2 corners,  
 and 4 rods removed from 2 corners.  
 Total of 130 rods.

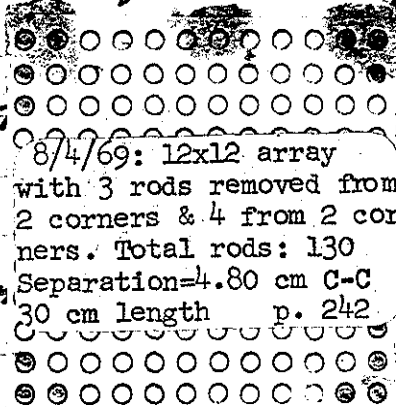
Water ht = 27.70 cm  $dh = 1$

7 Per

$$\tau = 186.88 \text{ sec} = 5.9 \phi = .84 \phi / \text{cm}$$

1355 Water ht = 20.70 cm

System just critical  
 Drain!



added 8 rods. 2 to each corner.  
 Now have an 12x12 array, with 3  
 rods removed from each corner.  
 Total of 132 rods.

Water ht = 21.10 cm  $dh = 2.95$  Temp °C  
 7 Per 24.0°C

$$\tau = 39.11 \text{ sec} = 19.3 \phi = 6.54 \text{ /cm}$$

1330 Water ht. = 18.15 cm  
 System just critical  
 Drain.

Removed 2 rods. 1 each from  
 corners. Now have an  
 with 3 rods removed from  
 and 4 rods removed from  
 Total of 130 rods.

Water ht = 27.70 cm  $dh = 7.0 \text{ cm}$  Temp °C  
 7 Per 24.0°C

$$\tau = 186.88 \text{ sec} = 5.9 \phi = .84 \text{ /cm}$$

1355 Water ht = 20.70 cm  
 System just critical  
 Drain!

Removed 1 rad, Now have an 12x12 array with 4 rads removed from 3 corners and 3 rads removed from 1 corner. Total of 129 rads.

Water ht = 27.60 cm  
<sup>3</sup> - per

Temp °C  
 24.1 °C

$E = -447.64 \text{ m} = -3.2 \text{ f}$

Drain:

1500 Drain small reflector tank into outside dump tanks. Prepare to clean small reflector & hold tanks. Then refill with clean  $\text{H}_2\text{O}$  and  $\text{H}_3\text{BO}_3$ .

8-5-69 after cleaning reflector & dump tanks. Filled with clean  $\text{H}_2\text{O}$ . Then added 520.6 grams of  $\text{H}_3\text{BO}_3$  to dump tanks.

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>
"	"	Fat ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
"	"	Fat ✓	"	✓	"
R-1					
R-2					
PM-1	700 V	Alarm ✓	.50"	✓	500 V
PM-2	1200 V	Low ✓	10"	✓	900 V
"	"	Alarm ✓	2"	✓	"
LOG IN CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROBE LIGHT		✓			

START-UP CHECK LIST

Equipment checked by F.D.C. Personnel check by F.D.C.  
 Instruments and safeties checked and reset by A.K.H.  
 Source in checked by A.K.H. Source No. M-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 A.K.H. Time 1410  
 Start-up OK'd by F.D.C. A.K.H. Date 8-1-69

Repeat of experiment described on page 242.

Have an  $12 \times 12$  array. With 3 rods removed from 2 corners and 8 rods removed from 2 corners. Total of 130 rods.

Water ht = 27.60 cm  $DR = 9.1$  cm Temp  $^{\circ}C$   
 1 + Per 23.5  $^{\circ}C$

$$T = 41.29 \text{ sec} = 18.6 \text{ } \phi = 2.04 \text{ } \phi/\text{cm}$$

1495 Water ht = 18.50 cm  
 System just critical.  
 Drain.

Repeat of above:

Water ht = 27.60 cm  $DR = 9.2$  cm Temp  $^{\circ}C$   
 2 + Per 23.7  $^{\circ}C$

$$T = 34.77 \text{ sec} = 20.7 \text{ } \phi = 2.2 \text{ } \phi/\text{cm}$$

1520 Water ht = 18.90 cm Temp  $^{\circ}C$   
 System just critical 23.7  $^{\circ}C$   
 Drain.

avg.



Removed 1 rad. There have an  $12 \times 12$  array with 4 rods removed from 3 corners, and 3 rods removed from 1 corner. Total of 129 rods.

Water ht = 27.60 cm  $o_h = 8.25 \text{ cm}$  Temp  $^{\circ}\text{C}$   
 7 Per 23.7  $^{\circ}\text{C}$

$t = 82.57 \text{ sec} = 11.4 \text{ s} = 1.4 \text{ s/cm}$ .

1551 Water ht = 19.35 cm Temp  $^{\circ}\text{C}$   
 System just critical 23.8  $^{\circ}\text{C}$   
 Drain.

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 ✓	"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700 V	Alarms ✓	.50"	✓	500 V
PM-2	1200	Low ✓	10"	✓	900 V
	✓	Alarm ✓	2"	✓	"
LOG N CALIBRATE ✓			OPERATE ✓		SOURCE No. <u>W-80</u>
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by F.V.C. Personnel check by F.V.C.  
 Instruments and safeties checked and reset by A.K.H.  
 Source in checked by A.K.H. Source No. 14-93  
 Emergency equipment in control room checked by F.V.C.  
 Instruments in trip circuit: K-1-2 PM-1-2  
 Red light on by A.K.H. Time 1035  
 Start-up OK'd by F.V.C. A.K.H. Date 8-7-68

.50 " rods,  
2.99 cm separation e-e  
30 cm lengths.

Have an 13 x 13 array. With 12 rods removed from 2 corners, and 11 rods removed from 2 corners. Total of 123 rods. (Check point: see p's 89, log back to 2 and p's 140 of this book.)

Water ht = 27.60 cm

Temp °

- Per

23.7

$t = -352.03 \text{ sec} = -4.1 \text{ f}$

Drain.

Repeat of above:

Water ht = 27.60 cm

Temp °

- Per

23.7 °

$t = -349.85 \text{ sec} = -4.2 \text{ f}$

1340 Drain.

DUMP WELL PROBE LIGHT

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3 X 10 <sup>-12</sup>	Meter	1.0"	✓	3 X 10 <sup>-12</sup>
	"	Fast	"	✓	"
K-2	"	Meter	"	✓	"
	"	Fast	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm	5"	✓	500V
	"	Low	10"	✓	500V
	"	Alarm	2"	✓	500V
LOG N-CAL GRATE		OPERATE			B-80
SOURCE No.					

INSTRUMENT CHECK

START-UP CHECK LIST

Equipment checked by I.V.C. Personnel check by F.I.C.  
 Instruments and safeties checked and reset by A.K.D.  
 Source in checked by A.K.D. Source No. M-93  
 Emergency equipment in control room checked by T.I.C.  
 Instruments in trip circuit: K-1-2 P14-1-2  
 Red light on by A.K.D. Time 1305  
 Start-up OK'd by F.I.C. & T.I.C. Date 8-13-69

.50" rods.  
2.99 cm separation C-C  
30 cm length.

Repeat of experiment described on p. 248.

Have an 13 x 13 array, with 12 rods removed from 2 corners, and 11 rods removed from 2 corners. Total of 123 rods.

1335 Water ht = 27.70 cm Temp °C  
1 - Per 23.5°C

$$C = -228.16 \text{ sec} = -6.9 \text{ f}$$

Drain: Then repeat above.

1405 Water ht = 27.70 cm Temp °C  
2 - Per 23.6°C

$$C = 265.11 \text{ sec} = -5.8 \text{ f}$$

Drain:

.50" rods.  
2.99 cm separation C-C.  
60 cm length.

Have an 10 x 10 array, with 4 rods removed from 1 corner, and 5 rods removed from 3 corners. Total of 81 rods.

Water ht = 46.00 cm  $d = 1.4$  cm Temp °C  
 + Per 23.7 °C

$$L = 91.27 \text{ cm} = 10.6 \text{ ft} = 7.6 \text{ ft/cm}$$

1540 Water ht = 44.60 cm Temp °C  
 System just critical 23.7 °C  
 Drain.

Sample Taken from dump tins

Y-12

Reg # ~~655~~ 684568

X-10

8-1-A

orb for:

1 =  $\rho_{fl}$  = 0.1387  
 2 = density = 0.9970  
 3 = Temp °C = 25°

Net = 542.3 g

orb for

1 =  $\rho_{fl}$  = 0.14  
 2 = density = 0.9973  
 3 = Temp °C = 25°

Net = 268.4 g

## INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	1"	✓	$3 \times 10^{-12}$
"	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700 v	Alarm ✓	.50	✓	500V
PM-2	1200 v	Low ✓	10"	✓	900V
"	"	Alarm ✓	2"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-10
DUMP WELL PRQBE LIGHT		_____	7		

## START-UP CHECK LIST

Equipment checked by F.P.C. A.K.V. Personnel check by F.P.C.

Instruments and safeties checked and reset by A.K.V.

Source in checked by A.K.V. Source No. M-93

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

Instruments in trip circuit: K-1 - 7 PM 1-2

Red light on by A.K.V. Time 1255

Start-up OK'd by F.P.C. A.K.V. Date 8-14-69

~~4.80~~  
 .80" rods.  
 4.80 cm separation c-c.  
 30 cm lengths.

Have an 12x12 array. With 3 rods removed from 2 corners and 4 rods removed from 2 corners. Total of 130 rods. (See pp 242 243, 245, 246.)

Water ht = 27.70 cm  $\Delta h = 9.15$  Temp °C  
 + Per 24.0°C

$\tau = 43.46 \text{ sec} = 18.04 = 2.04 \text{ f/cm}$

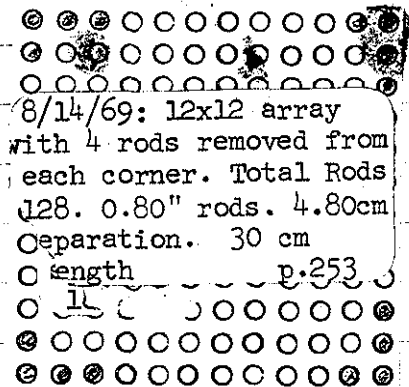
1330 Water ht = 18.55 cm  
 System just critical  
 Drain.

Removed 2 rods. Now have an 12x12 array with 4 rods removed from each corner. Total of 128 rods.

Water ht = 27.60 cm  $\Delta h = 3.4 \text{ cm}$  Temp °C  
 + Per 24.0°C

$\tau = 1303.80 \text{ sec} = .914 = .28 \text{ f/cm}$

1475 Water ht = 24.20 cm  
 System just critical  
 Drain.





INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	1"	✓	$3 \times 10^{-12}$
	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V ✓	Alarm ✓	.50"	✓	500V ✓
PM-2	1200V ✓	Low ✓	10"	✓	900V ✓
		Alarm ✓	2"	✓	"
LOG IN CALIBRATE ✓		OPERATE ✓		SOURCE No. B-10	
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by I.D.C. Personnel check by AKK

Instruments and safeties checked and reset by I.D.C.

Source in checked by AKK Source No. M-93

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

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

Red light on by I.D.C. Time 0915

Start-up OK'd by I.D.C. AKK Date 8-15-69

1.80" rods  
 4.80 cm separation c-c,  
 60 cm length.

12

Have an 9x9 array, with 2 rods removed from 2 corners. And 3 rods removed from 2 corners. Total of 71 rods. (all 1.80" rods)

0945 Water ht = 32.10 cm Temp °C  
 System just critical Drain. 23.7

Removed 10 rods. Now have an 9x9 array, with 5 rods removed from each corner. Total of 61 rods.

1020 Water ht = 57.50 cm Temp °C  
 System sub critical Drain. 29.0°C

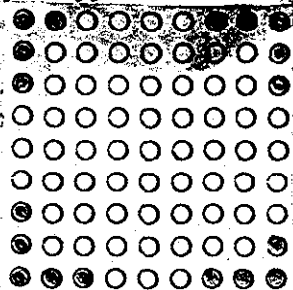
8/15/69: 9x9 array with 4 rods removed from 2 corners & 5 from 2 corners. Total 63. 0.80" rods. 4.80 cm separation C-C 60 cm length p.255

added 2 rods. Have an 9x9 array, with 4 rods removed from 2 corners, and 5 rods removed from 2 corners. Total of 63 rods.

Water ht = 48.55 cm  $\Delta h = 3.70$  cm  
 + P<sub>air</sub>

$T = 41.29 \text{ sec} = 18.64 = 5.03 \text{ f/cm}$

Water ht = 49.85 cm System just critical Drain: aer!



Removed 1 rod. Now have an 9x9 array  
with 4 rods removed from 1 corner. And  
5 rods removed from 3 corners. Total  
of 62 rods.

Water ht = 57.60 cm

2-Per

N.G

1432

Drain

Temp °C

24.1 °C

CHECK

INSTRUMENT	RANGE	TRIP	SOURCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	<input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	$3 \times 10^{-12}$
	"	<input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2	"	Meter <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
	"	Post <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
R-1					
R-2					
PM-1	700V	Alarm <input checked="" type="checkbox"/>	500V	<input checked="" type="checkbox"/>	500V
PM-2	1200V	Low <input checked="" type="checkbox"/>	900V	<input checked="" type="checkbox"/>	900V
	"	Alarm <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
LOG N CALIBRATE <input checked="" type="checkbox"/>		OPERATE <input checked="" type="checkbox"/>		SOURCE No. B-80	
DUMP WELL PROBE LIGHT <input checked="" type="checkbox"/>					

START-UP CHECK LIST

Equipment checked by F.I.R.C. Personnel check by F.I.R.C.  
 Instruments and safeties checked and reset by A.K.H.  
 Source in checked by A.K.H. Source No. M-43  
 Emergency equipment in control room checked by F.I.R.C.  
 Instruments in trip circuit: K-1-2 PM-1-2  
 Red light on by A.K.H. Time 1325  
 Start-up OK'd by F.I.R.C. A.K.H. Date 8-18-69

1.80" rods.  
3.60 cm separation c-c.  
30 cm length.

Have an 10x10 array, with 6 rods removed from each corner. Total of 76 rods.

Water ht = 14.10 cm  $\Delta h = .15$  Temp  $^{\circ}$   
+ Per 23.5  $^{\circ}$

$$E = 65.18 \text{ sec} = 13.84 = 92.0 \text{ f/cm}$$

1355 Water ht = 13.95 cm  
System just critical  
Chain.

Removed 4 rods, 1 each from each corner.  
Have an 10x10 array with 7 rods removed from each corner. Total of 72 rods.

Water ht = 13.25 cm  $\Delta h = .95$  Temp  $^{\circ}$   
+ Per 23.5  $^{\circ}$

$$E = 65.54 \text{ sec} = 13.64 = 14.31 \text{ f/cm}$$

1431 Water ht = 17.30 cm  
System just critical  
Chain.

Removed 8 rods. 1 from each corner.  
 Now have an 10x10 array, with 8  
 rods removed from each corner.  
 Total of 68 rods.

Water ht = 27.70 cm  
 System sub critical  
 Drain

Temp °C  
 23.5

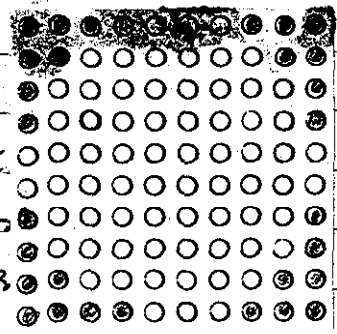
Added 2 rods, 1 each to opposite corners.  
 Now an 10x10 array, with 8 rods  
 removed from 2 corners. and 2 rods  
 removed from 2 corners. Total of 70  
 rods.

Water ht = 27.70 cm  
 System sub critical  
 Drain

Temp °C  
 23.6 °C

8/18/69: 10x10 array with  
 8 rods removed from 1  
 corner & 7 from 3 corner  
 Total rods: 71  
 Rods: 3.00 cm separation  
 C-C: 30 cm length p. 259

Added 1 rod. Now have an 10x10  
 with 8 rods removed from 1 corner  
 7 rods removed from 3 corners  
 71 rods.



$\Delta h = 6.50$

Water ht = 27.70 cm

Temp °C

$T = 304.872 \text{ K} + P_{\text{rod}} = 3.84 = .584 \text{ cm}$

23.7 °C

Water ht = 21.20 cm  
 System just critical  
 Drain

Removed 8 rods, 1 from each corner.  
 Now have an 10x10 array, with 8  
 rods removed from each corner.  
 Total of 68 rods.

Water ht = 27.70 cm  
 System sub critical  
 Drain

Temp °C  
 23.5

Added 2 rods, 1 each to opposite corners.  
 Now an 10x10 array, with 8 rods  
 removed from 2 corners, and 7 rods  
 removed from 2 corners. Total of 70  
 rods.

Water ht = 27.70 cm  
 System sub critical  
 Drain

8/18/69: 10x10 array with  
 8 rods removed from 1  
 corner & 7 from 3 corner  
 Total rods: 71, 0.80 in.  
 rods, 3.00 cm separation  
 C-C, 30 cm length, p. 259

Added 1 rod, Now have an 10x10 array  
 with 8 rods removed from 1 corner, and  
 7 rods removed from 3 corners. Total of  
 71 rods.

DR = 6.50

Water ht = 27.70 cm

Temp °C

+ P<sub>ev</sub> = 3.84 = .584/cm

23.7 °C

Water ht = 21.20 cm  
 System just critical  
 Drain

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 ✓	"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	1.5"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	2"	✓	"
LOG N CALIBRATE ✓			OPERATE ✓		SOURCE No. B-80
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by E.P.C. AKA Personnel check by E.P.C.  
 Instruments and safeties checked and reset by AKA  
 Source in checked by AKA Source No. M-93  
 Emergency equipment in control room checked by E.P.C.  
 Instruments in trip circuit: K-1, 2 PM-1, 2  
 Red light on by AKA Time 0840  
 Start-up OK'd by E.P.C. AKA Date 8-19-69



180 rods  
3.60 cm separation c.c. -- 261  
30 cm length.

Repeat of last experiment described on p. 259.

Have an 10 x 10 array, with 8 rods removed from 1 corner, and 7 rods removed from 3 corners. Total of 71 rods.

Water ht = 27.60 cm  $\rho_h = 6.25$  Temp  $^{\circ}$   
+ Per 23.6  $^{\circ}$ C

$$U = 473.71 \text{ cm} = 2.6 \text{ ft} = .42 \text{ ft/cm}$$

0935 Water ht = 21.35 cm

System just critical  
Drain.

.80 rods  
3.60 cm separation c-c  
60 cm length.

Have an 8 x 8 array, with 5 rods removed from each corner. Total of 49 rods.

1.300 Water ht = 57.60 cm Temp  $^{\circ}$   
System sub critical 23.6  $^{\circ}$ C  
Drain.

see p. 1

0.80" rods.  
3.60 cm separation c-c.  
60 cm length.

Added 9 rods. Now have an 8x9 array,  
with 6 rods removed from each corner.  
Total of 48 rods.

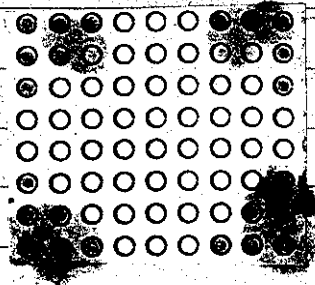
1445 Water ht = 57.50 cm Temp °  
system sub critical 29.1 °  
Drain.

Added 1 rod. Now have an 8x9 array, with  
6 rods removed from 3 corners and 5  
rods removed from 1 corner. Total of  
49 rods.

Water ht = 46.30 cm  $\Delta h = 1.60 \text{ cm}$  Temp °  
+Pr 24.2 °  
 $t = 69.59 \text{ sec} = 13.0 \text{ ft} = 8.1 \text{ Hem.}$

1520 Water ht = 44.70 cm  
system just critical  
Drain.

8/19/89. 8x9 array with  
6 rods removed from 3  
corners & 5 from 1 cor-  
ner. Total rods: 49.  
0.80" rods. 3.60 cm sepa-  
ration C-C. 60 cm length  
P. 222



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3 X 10 <sup>-12</sup>	Meter <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	3 X 10 <sup>-12</sup>
"	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2	"	Meter <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
"	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
R-1					
R-2					
PM-1	700 V	Alarm <input checked="" type="checkbox"/>	5"	<input checked="" type="checkbox"/>	5000
PM-2	1200 V	Low <input checked="" type="checkbox"/>	10"	<input checked="" type="checkbox"/>	9000
"	"	Alarm <input checked="" type="checkbox"/>	2"	<input checked="" type="checkbox"/>	"
LOG N CALIBRATE <input checked="" type="checkbox"/>		OPERATE <input checked="" type="checkbox"/>		SOURCE No. <u>13-80</u>	
DUMP WELL PROBE LIGHT <input type="checkbox"/>					

START-UP CHECK-LIST

Equipment checked by F.P.C. M.H.H. Personnel check by A.H.H.  
 Instruments and safeties checked and reset by A.H.H.  
 Source in checked by A.H.H. Source No. M-93  
 Emergency equipment in control room checked by F.P.C.  
 Instruments in trip circuit: K-1-2 PM-1-2  
 Red light on by A.H.H. Time 0930  
 Start-up OK'd by F.P.C. M.H.H. Date 8-20-69

Repeat of last experiment - p 262.

Have an 8x9 array, with 6 rods removed from 3 corners and 5 rods removed from 1 corner. Total of 49 rods.

Water ht = 46.80 cm  $\Delta h = 2.0 \text{ cm}$  Temp  $^{\circ}\text{C}$   
 + Per - 24.0 $^{\circ}\text{C}$

$$E = 63.02 \text{ sec} = 13.94 = 6.95$$

10.22 Water ht = 44.80 cm  
 System just critical  
 Drain

.80" rods.

3.2 cm separation c-c.

30 cm length.

Have an 11x11 array, with 8 rods removed from each corner. Total of 89 rods.

Water ht = 13.90 cm  $\Delta h = .10$  Temp  $^{\circ}\text{C}$   
 + Per - 24.2 $^{\circ}\text{C}$

$$E = 182.53 \text{ sec} = 6.0 = 60.0 \text{ f/cm}$$

13.40 Water ht = 13.80 cm  
 System just critical  
 Drain =

Removed 4 rods, 1 from each corner. Have an 11x11 array with 9 rods removed from each corner. Total of 95 rods.

1410 Water ht = ~~14.10~~ <sup>14.10</sup> cm  
 System just critical  
 Drain.

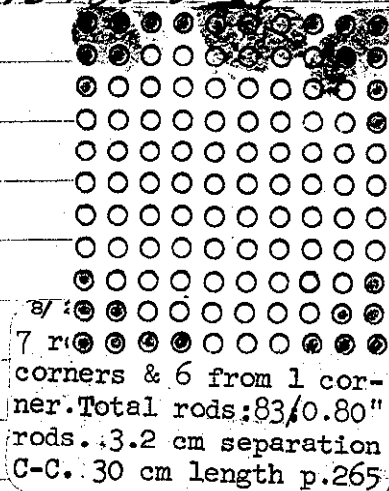
Now have an 10x11 array. With 7 rods removed from each corner. Total of 82 rods.

1500 Water ht = 27.60 cm Temp °C  
 System sub critical 29.1 °C  
 Drain.

Added 1 rod. Have an 10x11, with 7 rods removed from 1 corner, and 7 rods removed from 3 corners. Total of 83 rods.

Water ht = 27.60 cm  $\Delta z = 7.2$   
 $3 \times \text{per}$   
 $C = 186.88 = 5.94 = .824 \text{ cm}$

1546 Water ht = 20.40 cm  
 System just critical  
 Drain.



Removed 4 rods, 1 from each corner. Have an 11x11 array with 9 rods removed from each corner. Total of 95 rods.

1410 Water ht = ~~19.01~~<sup>14.10</sup> cm  
System just critical  
Drain.

Now have an 10x11 array. With 7 rods removed from each corner. Total of 82 rods.

1500 Water ht = 27.60 cm  
System sub critical  
Drain.

Temp °C  
29.1 °C

Added 1 rod. Have an 10x11, u  
With 6 rods removed from 1 u  
7 rods removed from 3 corners.  
83 rods.

Water ht = 27.60 cm  
3 + per

$\Delta z = 7.2$

Temp °C  
29.1 °C

1546 Water ht = 20.40 cm  
System just critical  
Drain.

$$C = 186.88 = 5.9 \phi = 1.824 \text{ cm}$$

8/2069. 10x11 array with  
7 rods removed from 3  
corners & 6 from 1 cor-  
ner. Total rods: 83 / 0.80"  
rods. 3.2 cm separation  
C-C. 30 cm length p.265

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	1"	✓	$3 \times 10^{-12}$
"	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	1.5"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	2"	✓	"
LOG N CALIBRATE ✓		OPERATE ✓		SOURCE No. B-80	
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

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

Instruments and safeties checked and reset by AKM

Source in checked by AKM Source No. M-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 0930

Start-up OK'd by F.D.C. AKM Date 8-21-69

1/80" rods.  
3.2 cm separation c-c. 267  
30 cm length.

Repeat of last experiment p-265.

Have an 10x11 array, with 6 rods removed from 1 corner, and 7 rods removed from 3 corners. Total of 93 rods.

Water ht = 27.60 cm  $D_h = 7.1 \text{ cm}$  Temp  $^{\circ}\text{C}$   
7 per 24.0 $^{\circ}\text{C}$

~~6 = 5.24 = .734 cm~~

1029 Water ht = 20.50 cm

System just critical  
Drain.

1/80" rods.

3.2 cm separation c-c  
60 cm length.

Have an 9x9 array, with 6 rods removed from each corner. Total of 57 rods.

Water ht = 57.60 cm Temp  $^{\circ}\text{C}$   
7 per 24.0 $^{\circ}\text{C}$   
N. G.

1332 Drain:

over:



added 1 rod. Now have an 9x9 array,  
with 5 rods removed from 1 corner and  
6 rods removed from 3 corners. Total of  
58 rods.

Water ht = 49.00 cm  $\Delta h = 1.3$  cm Temp  $^{\circ}$   
3 + Pen 24.0  $^{\circ}$

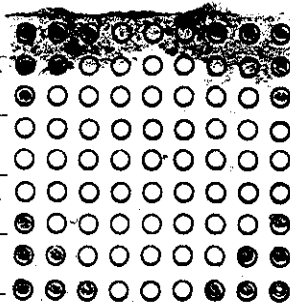
$t = 41.29$  sec = 18.6 s = 14.3 #/cm

1421 Water ht = 42.70 cm

System just critical

Drain.

8/21/69. 9x9 array with  
6 rods removed from 3  
corners & 5 from 1 corner.  
Total rods: 58 0.80 in.  
rods. 3.2 cm separation  
C-C. 60 cm length p.268



Sample take

Y-12 Reg # 684568

sub for

- 1 =  $\rho$   $^{\circ}$ /l = 0.141
- 2 = density = 0.9972
- 3 = Temp  $^{\circ}$  = 25.0  $^{\circ}$
- Net = 546.7 g

X-10

9-1-A

sub for

- 1 =  $\rho$   $^{\circ}$ /l = 0.138
- 2 = density = 0.9972
- 3 = Temp  $^{\circ}$  ?
- Net = 227.2 g

End of  $\approx 0.140$  g  $^{\circ}$ /l

8-25-69 added 223.0 g of  $H_2BO_3$  to small dump tank. of 42 now should be ~0.209%

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3x10 <sup>-12</sup>	Meter ✓	1"	✓	3x10 <sup>-12</sup>
"	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	1.50"	✓	5000
PM-2	1200V	Lcw ✓	10"	✓	9000
"	"	Alarm ✓	2"	✓	"

LOG N CALIBRATE  OPERATE  SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by <sup>F.P.C.</sup> A.K.H. Personnel check by F.P.C.  
 Instruments and safeties checked and reset by A.K.H.  
 Source in checked by A.K.H. Source No. M-93  
 Emergency equipment in control room checked by F.P.C.  
 Instruments in trip circuit: K-1-2 PM-1-2  
 Red light on by A.K.H. Time 1444  
 Start-up OK'd by F.P.C. A.K.H. Date 8-25-68

270 ~ 0.29  $\mu$ l

.80" rods.  
3.2 cm separation - e - e.  
60 cm length.

Have an 10 x 10 array. With 7 rods removed from 3 corners. and 8 rods removed from 1 corner. Total 71 rods.

1520. Water ht = 23.80 cm

System just critical  
Drain.

Temp °

24.2°

Removed 3 rods. Have an 10 x 10 array. With 8 rods removed from each corner. Total of 67 rods.

1542 Water ht = 26.85 cm

System just critical  
Drain.

Temp °

24.5°

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	$3 \times 10^{-2}$
"	"	<input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2	"	Meter <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
"	"	<input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
R-1					
R-2					
PM-1	700V	Alarm <input checked="" type="checkbox"/>	15"	<input checked="" type="checkbox"/>	500V
PM-2	1200V	Low <input checked="" type="checkbox"/>	10"	<input checked="" type="checkbox"/>	900V
"	"	Alarm <input checked="" type="checkbox"/>	2"	<input checked="" type="checkbox"/>	"

LOG N CALIBRATION  OPERATE  SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

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

Instruments and safeties checked and reset by A.T.M.

Source in checked by A.T.M. Source No. M-93

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

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

Light on by A.T.M. Time 0840

Start-up OK'd by F.D.C. A.T.M. Date 8-26-69

1.80" rods  
 3.2 cm separation c-c,  
 60 cm length.

Have an 9x9 array with 5 rods removed from each corner. Total of 61 rods.

0915 Water ht = 39.35 cm  
 System just critical  
 Drain

Temp °C  
 24.0°

Removed 2 rods. Now have an 9x9 array with 6 rods removed from 2 corners and 5 rods removed from 2 corners. Total of 59 rods.

0955 Water ht = ~~57.60~~ 57.60 cm  
 System sub critical  
 Drain

Temp °C  
 24.2°

added 1 rod. Now have an 9x9 array with 6 rods removed from 1 corner, and 5 rods removed from 3 corners. Total of 60 rods.

8/25/69: 9x9 array with 6 rods removed from corner & 5 removed from 3 corners. Total rods: 60. 0.80" rods. 3.2 cm separation C-C 60 cm length p. 272

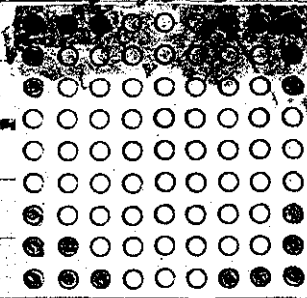
Water ht = 43.80 cm  $z_h = 80 cm$

1 + Pen

$E = 97.78 sec = 10.04 = 12.504/cm$

Water ht = 43.00 cm

System just critical: Drain



1.90" rods  
3.2 cm separation c-c.  
60 cm length.

Have an 9x9 array with 5 rods removed from each corner. Total of 61 rods.

0915 Water ht = 39.35 cm Temp °  
System just critical 24.0°  
Drain

Removed 2 rods. Now have an 9x9 array with 6 rods removed from 2 corners and 5 rods removed from 2 corners. Total of 59 rods.

0955 Water ht = ~~51.5~~ 57.60 cm Temp °  
System sub critical 24.2°  
Drain

Added 1 rod. Now have an array with 6 rods removed from 1 corner and 5 rods removed from 3 corners of 60 rods.

Water ht = 43.80 cm  $\Delta h = .80 \text{ cm}$  Temp °  
+ Per 24.2°

$$L = 97.78 \text{ sec} \approx 10.0 \text{ f} = 12.50 \text{ f/cm}$$

Water ht = 43.00 cm

System just critical: Drain

8/25/69: 9x9 array with 6 rods removed from 1 corner & 5 removed from 3 corners. Total rods: 60. 0.80" rods. 3.2 cm separation C-C 60 cm length p. 272

1230

Samples taken from small deep tanks.

Y-12 Reg #684570

X-10

#70

oil for

1 =  $g \text{ BK} = 0.201$

2 = density = 0.997

3 = Temp =  $25^{\circ}\text{C}$

net = 535.0g

oil for

1 =  $g \text{ BK} = 0.20$

2 = density = ?

3 = Temp = ?

net = 266.8g

.80" rods

3.2 cm separation c-c

30 cm length.

Have an 10x11 array, with 6 rods removed from each corner. Total of 86 rods.

1522

Water ht = 27.60 cm

System sub-critical  
Drain

Temp =

 $24.2^{\circ}\text{C}$ 

over!

Added 1 rod. Have an 10x11 array, with 5 rods removed from 1 corner. And 6 rods removed from 3 corners. Total of 87 rods.

Water ht = 27.60 cm

Temp °

2-Per

24.2°

$$t = -184.70 \text{ sec} = -9.14$$

154-1 Drain: Added 1 rod. Have an 10x11 array with 5 rods removed from 2 corners, and 6 rods removed from 2 corners. Total of 98 rods.

Water ht = 21.00 cm.

Temp °

3+Per

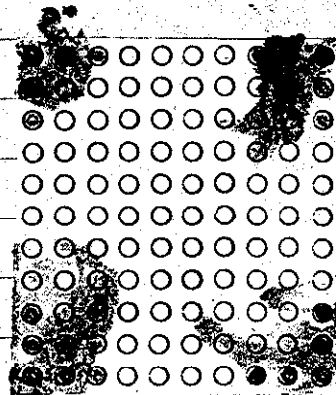
24.2°

$$t = 67.36 \text{ sec} = 13.34 = 5.24 \text{ /cm}$$

1602 Water ht = 18.45 cm

System just critical  
Drain.

8/26/69: 10x11 array with 5 rods removed from 2 corners & 6 from 2 corners. Total rods: 88.  
0.80" rods. 3.2 cm separation C-C. 30 cm length. p. 274





## INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter —	1"	—	$3 \times 10^{-12}$
"	"	Fast —	"	—	"
K-2	"	Meter ✓	"	—	"
"	"	Fast ✓	"	—	"
R-1					
R-2					
PM-1	700V	Alarm ✓	1.5"	—	500V
PM-2	1200V	Low —	10"	—	900V
"	"	Alarm ✓	2"	—	"
LOG N CALIBRATE ✓			OPERATE ✓	SOURCE No. <u>B-80</u>	
DUMP WELL PROBE LIGHT					

## START-UP CHECK LIST

Equipment checked by <sup>F.D.C.</sup> A.T.H. Personnel check by I.O.C.

Instruments and safeties checked and reset by A.T.H.

Source in checked by A.T.H. 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 A.T.H. Time 0830

Start-up OK'd by F.D.C. A.T.H. Date 8-27-69

Stopped  
12-15-69

.80" rods.  
3.2 cm separation c-c  
30 cm length.

Repeat of last experiment p-274. 10x11 array with 5 rods removed from 2 corners and 6 rods removed from 2 corners. Total of 88 rods

Water ht = 20.85 cm  $\Delta h = 2.35 \text{ cm}$  Temp °C  
+hr 23.7 °C

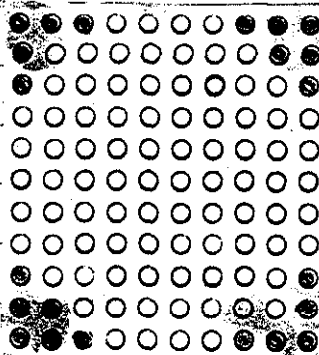
G = 73.88 sec = 12.44 = 5.34 f/cm

0923

Water ht = 18.50 cm

System just artificial Drain.

8/27/69: 10x11 array with  
5 rods removed from 2  
corners & 6 removed from  
2 corners. Total rods:  
88. 0.80" rods. 3.2 cm  
separation C-C. 30 cm  
length p.276



.80" rods

3.6 cm separation c-c

30 cm length.

Have an 10 x 10 array with 6 rods removed from each corner. Total of 76 rods.

1100 Water ht = 27.70 cm

System sub artificial Drain.

Temp °C  
23.9 °C

added 1 rod. Have an 10x10 array, with 5 rods removed from 1 corner, and 6 rods removed from 3 corners. Total of 77 rods.

Water ht = 20.30 cm  $\Delta h = 2.15$

Temp  $^{\circ}$   
24.0 $^{\circ}$

$^2 + Per$

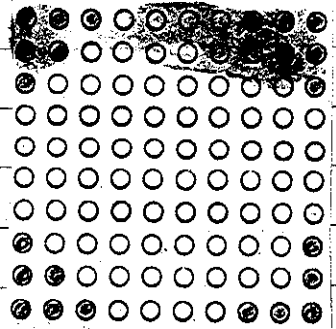
$C = 63.02 \text{ sec} = 13.9 \text{ sec} = 6.5 \text{ ft/cm}$

1118 Water ht = 18.15 cm

System just critical

Drain:

8/27/69: 10x10 array with 5 rods removed from 1 corner & 6 from 3 corners. Total rods: 77. 0.80" rods. 3.6 cm separation C-C. 30 cm length p.277



.80" rods.

3.6 cm separation c-c

60 cm length.

Have an 8x8 array, with 3 rods removed from each corner. Total 52 rods.

Water ht = 44.15 cm  $\Delta h = 1.45$

Temp  $^{\circ}$   
24.0 $^{\circ}$

$^3 + Per$

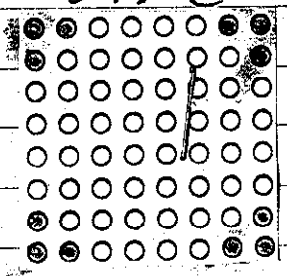
$C = 47.29 \text{ sec} = 18.6 \text{ sec} = 12.8 \text{ ft/cm}$

Water ht = 42.70 cm

System just critical

Drain:

8/27/69: 8x8 array with 3 rods removed from each corner. Total rods 52. 0.80" rods. 3.6 cm separation C-C 60 cm length p.277



over!

.80" rods,  
3.6 cm separation c-c  
60 cm length.

Removed 1 rod. Have an 8x8 array, with  
4 rods removed from 1 corner, and 3 rods  
removed from 3 corners. Total of 51 rods.

1355 Water ht = 57.50 cm

Temp °C

System sub critical  
Drain.

29.2 °C

Have an 8x9 array, with 5 rods removed  
from each corner. Total of 52 rods.

Water ht = 46.30 cm  $\Delta h = 2.3$  cm

Temp °C

4 + Per

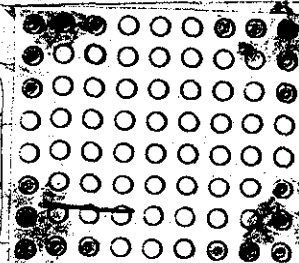
29.2 °C

$$E = 39.11 \text{ sec} = 19.3 \text{ } \phi = 8.2 \text{ } \phi / \text{cm}$$

1435 Water ht = 44.00 cm

System just critical  
Drain.

8/27/69: 8x9 array with  
5 rods removed from each  
corner. Total rods: 52.  
0.80" rods. 3.6 cm sepa-  
ration C-C. 60 cm  
length p.278



START-UP CHECK

INSTRUMENT	RANGE	TRIP	SOURCE RANGE	TT	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter	1"	-	$3 \times 10^{-12}$
"	"	Fst	"	-	"
K-2	"	Meter	1"	-	"
"	"	Fst	"	-	"
R-1					
R-2					
PM-1	700V	Alarm	1.5"	-	500V
PM-2	1200V	Low	10"	-	900V
"	"	Alarm	2"	-	"

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

START-UP CHECK LIST

Equipment checked by F.V.C. A.K.V. Personnel check by F.V.C.  
 Instruments and safeties checked and reset by A.K.V.  
 Source in checked by A.K.V. Source No. 14-43  
 Emergency equipment in control room checked by F.V.C.  
 Instruments in trip circuit: K-1-2 PM-1-2  
 Red light on by A.K.V. Time 0830  
 Start-up OK'd by F.V.C. A.K.V. Date 8-28-69

0.80" rods.  
 4.14 cm separation c-c.  
 30 cm length.

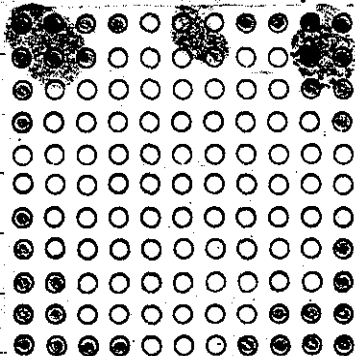
Have an 11x11 array, with 10 rods removed from each corner. Total of 81 rods.

0905 Water ht = 27.70 cm Temp °C  
 System just critical Drain. 29.0 °C

Added 4 rods. Have an 11x11 array with 9 rods removed from each corner. Total of 85 rods.

8/28/69: 11x11 array with 10 rods removed from each corner. Total rods 81. 0.80" rods. 4.14 cm Separation C-C. 30 cm length. p. 280

Water ht = 27.60 cm  
 System just critical Drain.

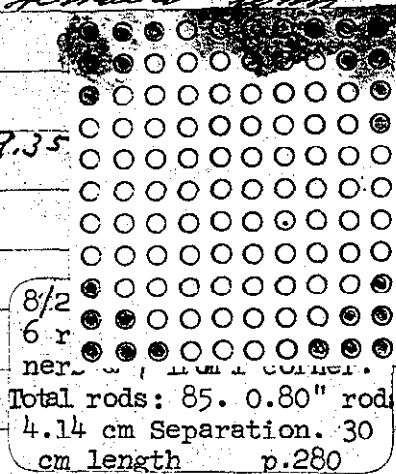


Have an <sup>10x11</sup> array: with 6 rods removed from 3 corners, and 7 rods removed from 1 corner. Total of 85 rods.

Water ht = 27.70 cm  $\Delta h = 9.35$   
 + Per

$t = 47.81 \text{ cm} = 16.94 = 1.84 / \text{cm}$

1050 Water ht = 18.35 cm  
 System just critical Drain.



8/2  
 6 r  
 ner  
 Total rods: 85. 0.80" rod  
 4.14 cm Separation. 30  
 cm length p.280

.90" rods.  
4.14 cm separation c-c.  
30 cm lengths.

Have an 11x11 array, with 10 rods removed from each corner. Total of 81 rods.

0905 Water ht = 27.70 cm  
System sub critical  
Drain.

Added 4 rods. Have an 11x11  
9 rods removed from each corner.  
85 rods.

8/28/69: 11x11 array  
with 9 rods removed from  
each corner. Total rods  
85. 0.80" rods. 4.14 cm  
Separation C-C 30 cm  
length. p. 280

Water ht = 27.60 cm  
System just critical  
Drain.

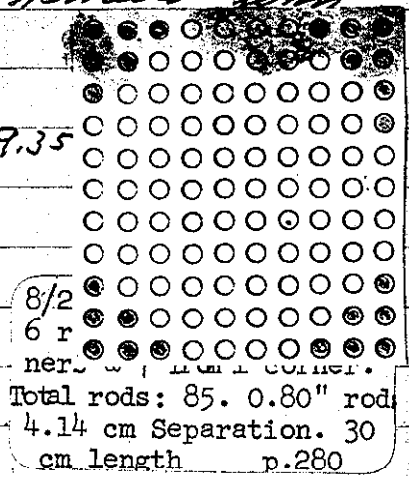
Temp °C  
24.0 °C

Have an <sup>10x11</sup> array: with 6 rods removed from 3 corners, and 7 rods removed from 1 corner. Total of 85 rods.

Water ht = 27.70 cm  $\Delta h = 9.35$   
+ Per

$$C = 47.81 \text{ cm} = 16.94 = 1.84 / \text{cm}$$

1050 Water ht = 18.35 cm  
System just critical  
Drain.



.80" rods.  
4.14 cm separation c-c.  
30 cm length.

Have an 11x11 array, with 10 rods removed from each corner. Total of 81 rods.

0905 Water ht = 27.70 cm  
System sub critical  
Drain.

Added 4 rods. Have an 11x11  
9 rods removed from each cor.  
85 rods.

Water ht = 27.60 cm  
System just critical  
Drain.

8/28/69: 11x11 array  
with 10 rods removed from  
each corner. Total rods  
81. 0.80" rods. 4.14 cm  
Separation C-C. 30 cm  
length. p. 280

Have an <sup>10x11</sup> ~~11x11~~ array: with 6 rods  
from 3 corners, and 7 rods removed  
1 corner. Total of 85 rods.

Water ht = 27.70 cm  $D_h = 9.35$  Temp °C  
+ per 24.0 °C

$E = 47.81 \text{ cm} = 16.94 = 1.84/\text{cm}$

1050 Water ht = 18.35 cm  
System just critical  
Drain.

8/28/69: 10x11 array with  
6 rods removed from 3 cor-  
ners & 7 from 1 corner.  
Total rods: 85. 0.80" rod  
4.14 cm Separation. 30  
cm length p. 280



Removed 1. Now have an  $10 \times 11$  array, with 7 rods removed from 2 corners, and 6 rods removed from 2 corners. Total of 84 rods.

Water ht = 27.60 cm

Temp  $^{\circ}$

$^{\circ}$  Per

28.1  $^{\circ}$

N.G

1112

Drain:

80" rods,

4.14 cm separation c-c

60 cm length.

Have an  $9 \times 9$  array, with 6 rods removed from each corner. Total of 57 rods.

Water ht = 32.90 cm

System just critical

Drain

Removed 4 rods, Have an  $9 \times 9$  array, with 7 rods removed from each corner. Total of 53 rods.

over

282

.90" rods  
4.14 cm separation c-c.  
60 cm length.

Water ht = 45.40 cm  $\Delta h = 1.5$  cm  
+ Per

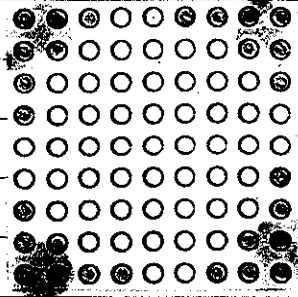
$t = 60.84 \text{ sec} = 14.3 \text{ ft} = 9.5 \text{ ft/cm}$

1545 Water ht = 43.90 cm

System just critical  
Drain.

Temp °C  
24.3 °C

8/28/69: 9x9 array with  
7 rods removed from each  
corner. Total rods: 53.  
0.80" rods. 4.14 cm sep-  
aration C-C. 60 cm  
length. p. 282



INSTRUMENT CHECK				
INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET
K-1	3 X 10 <sup>-12</sup>	Meter	"	3 X 10 <sup>-12</sup>
	"	Fast	"	"
K-2	"	Meter	"	"
	"	Fast	"	"
R-1				
R-2				
PM 1	7000	Alarm	5"	5000
PM 2	12000	Low	10"	9000
	"	Alarm	2"	"
LOC. CALIBRATE		OPERATE	SOURCE No.	B-80
DUMP WELL FROGE LIGHT				

START-UP CHECK LIST

Equipment checked by I.D.C. A.M. Personnel check by F.D.C.

Instruments and safeties checked and reset by A.M.

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

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

Instruments in trip circuit: K-1-2 019-12

Red light on by A.M. Time 0845

Start-up OK'd by I.D.C. A.M. Date 8-29-68

<sup>1.80"</sup>  
4.4 cm separation c-c  
60 cm length.

Repeat of last experiment. Have an 9x9 array with 7 rods removed from each corner. Total of 53 rods.

Water ht = 45.90 cm <sup>dh = 1.85 cm</sup> Temp °C  
+1.2 24.0°C

$E = 54.32 \text{ m} = 15.54 = 8.4 \text{ ft/m}$

0935 Water ht = 49.05 cm  
System just critical  
Drain.

Removed 1 rod. Have an 9x9 array, with 8 rods removed from 1 corner, and 7 rods removed from 3 corners. Total of 52 rods

0958 Water ht = 57.60 cm Temp °C  
System sub critical 24.0°C  
Drain.

avg:

.80" rods.  
4.14 cm separation c-c  
60 cm length.

x Have an 8x8 array, with 3 rods removed from each corner. Total of 52 rods.

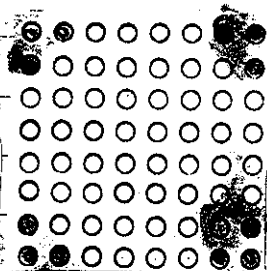
Water ht = 57.60 cm  $\lambda_h = 12.50$  Temp °C  
2 + Per 24.2°C

$E = 45.63 \text{ or } 17.44 = 1.44/\text{cm}$

1119 Water ht = 45.10 cm

System just critical  
Drain.

8/29/69: 8x8 array with 3 rods removed from each corner. Total rods: 52. .80" rods. 4.14 cm separation C-C. 60 cm length. p. 284



Removed 1 rod. Now have an 8x8 array with 3 rods removed from 3 corners and 1 rod removed from 1 corner. Total of 51 rods.

1320 Water ht = 57.60 cm.

System sub critical  
Drain.

Temp °C  
29.3°C

.80"  
rad.  
4.8 cm separation c-c  
30 cm length.

285

Have an 12x12 array, with 2 rad removed.  
1 each from opposite corners. Total of 142 rad.  
(ad of .80" rad.)

1540 Water ht = 27.60 cm  
system sub critical  
Drain.

Temp °C  
24.4°C

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	1"	✓	$3 \times 10^{-12}$
"	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	.50	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	2"	✓	"

LOG N CALIBRATE  OPERATE  SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by F.D.C. / A.K.A. Personnel check by F.D.C.

Instruments and safeties checked and reset by A.K.A.

Source in checked by A.K.A. Source No. M-83

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

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

Red light on by A.K.A. Time 0900

Start-up OK'd by F.D.C. / A.K.A. Date 9-2-69

.80" rods.  
4.8 cm separation c-c.  
60 cm length.

287

Have an 9x9 array, with 2 rods removed from 2 corners and 3 rods removed from 2 corners. Total 71 rods. (all of .80" rods).

0945 Water ht = 57.60 cm  
System sub critical  
Drain.

Temp °C  
23.5 °C

1.0" rods.  
4.39 cm separation c-c  
30 cm separation  
length

Have an 9x9 array, with 4 rods removed from each corner. Total 65 rods

Water ht = 17.10 cm  
Temp °C  
23.5 °C

$\delta = 65.19 \text{ sec} = 13.6 \text{ sec} = 19.4 \text{ sec}$

1320 Water ht = 16.40 cm  
System just critical  
Drain.

over:

Removed 2 rods. 1 each from opposite corners.  
 Have an 9x9 array with 4 rods removed  
 from 2 corners and 5 rods removed from  
 2 corners. Total of 63 rods.

1335 Water ht = 27.70 cm

Temp °

System sub critical

23.6 °

Drain.

x Added 1 rod. Have an 9x9 array with  
 4 rods removed from 3 corners and  
 5 rods removed from 1 corner. Total  
 of 64 rods.

Water ht = 27.70 cm

DL = 9.5 cm

Temp °

27 ft

23.7

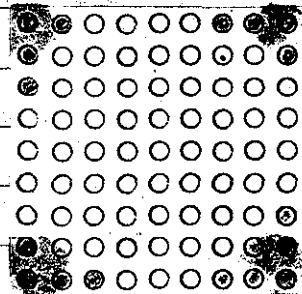
$C = 39.11 \text{ cm} = 19.3 \text{ ft} = 2.03 \text{ ft/cm}$

Water ht = 18.20 cm

System just critical

Drain.

9/2/69: 9x9 array with  
 4 rods removed from 3  
 corners & 5 from 1 cor-  
 ner. Total rods: 64.  
 1.0" rods. 4.39 cm sepa-  
 ration C-C. 30 cm  
 length. p. 288





11.0" rods.

4.39 cm separation c-c

60 cm length.

289

Have an 7x7 array, with 2 rods removed from 2 corners and 3 rods removed from 3 corners. Total of 39 rods.

15.35 Water ht = 57.70 cm

System sub critical

Drain.

Temp °C

24.0 °C

**INSTRUMENT CHECK**

INSTRUMENT	RANGE	TRIP	SET	START UP RANGE
K1	3 X 10 <sup>-12</sup>	✓	✓	3 X 10 <sup>-12</sup>
"	"	✓	✓	"
K2	"	✓	✓	"
"	"	✓	✓	"
R-1				
R-2				
PM-1	700 V	Alarm -	✓	500 V
PM-2	1200 V	Low -	✓	900 V
"	"	Alarm -	✓	"

LOG N CALIBRATE  OPERATE  SOURCE No. B-80

DUMP WELL PROBE LIGHT

**START-UP CHECK LIST**

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

Instruments and safeties checked and reset by ATK

Source in checked by ATK Source No. M-93

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

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

Red light on by ATK Time 0835

Start-up OK'd by F.D.C. ATK Date 9-3-69

9/3/69: 9x9 array with 3 con... removed from 3 con...

1.0" rods.  
 4.84 cm separation c-c.  
 30 cm length.

Have an 9x9 array, with 1 rod removed from each corner. Total of 77 rods.

Water ht = 27.60 cm      Temp °C  
 - Per:      23.7 °C

$G = -608.49 \text{ sec} = -2.3 \text{ f}$

0920

Drain:

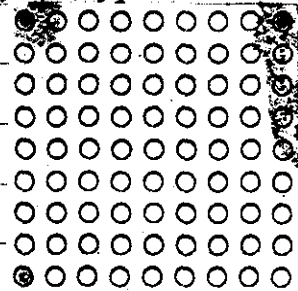
Added 1 rod: Have an 9x9 array, with 3 rods removed, 1 each from 3 corners. Total of 78 rods. (all usable rods).

9/3/69: 9x9 array with 1 rod removed from 3 corners. Total rods: 78 1.0" rods. 4.84 cm separation C-C. 30 cm length. p. 291

Water ht = 27.70 cm.       $\Delta h = 7.9 \text{ cm}$

+ Per:

$G = 126.03 \text{ sec} = 8.2 \text{ f} = 1.04 \text{ f/cm}$



0945 Water ht = 19.80 cm

System just critical  
 Drain:

Sample taken:

Y-12 Reg # 684571

X-10

# 11-1A

ask for

- 1  $\rho_{sl} = 0.204$
- 2 density = 0.9974
- 3 Temp °C = 25.0°

- $\rho_{sl} = 0.20$
- density = 0.9976
- Temp °C

$N = 539.89$

$N = 266.39$

aver:

1.0" rods.  
3.96 cm separation c.c  
30 cm length.

Have an 9x9 array, with 4 rods removed from each corner. Total of 65 rods.

Water ht = 17.25 cm      Temp °C  
3 + Per      Δh = 6.5 cm      23.8 °C  
 $C = 67.36 \text{ sec} = 13.3 \text{ } \phi = 20.5 \text{ } \phi/\text{cm}$

1315 Water ht = 16.60 cm  
System just critical  
Chain.

Removed 2 rods, 1 each from opposite corners.  
Have now an 9x9 array, with 4 rods removed from 2 corners, and 5 rods removed from 2 corners. Total of 63 rods.

1325 Water ht = 27.60 cm      Temp °C  
System sub critical      23.9 °C  
Chain.

Added 1 rod. Have an 9x9 array, with 4 rods removed from 3 corners and 5 rods removed from 1 corner. Total of 69 rods.

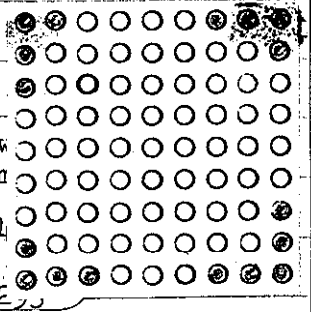
x Water ht = 22.25 cm  $\Delta h = 3.45$  Temp °C  
 4 + Per 24.1 °C

$C = 76.05 \text{ sec} = 12.2 \text{ f} = 3.5 \text{ f/cm}$

Water ht = 18.80 cm

System just critical  
 Drain.

9/3/69: 9x9 array w  
 4 rods removed from  
 corners & 5 from 1  
 ner. Total rods: 64  
 1.0" rods. 3.96 cm  
 aration C-C. 30 cm  
 length. p. 22



1.0" rods.

3.96 cm separation c-c

60 cm length.

Have an 7x7 array, with 2 rods removed  
 from 2 corners and 3 rods removed from  
 opposite corners. Total of 39 rods.

1609 Water ht = ~~27.60~~ 57.70 cm Temp °C  
 System sub critical 24.1 °C  
 Drain.

## INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter ✓	1"	✓	$3 \times 10^{-12}$
"	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	1.5"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	2"	✓	"
LOG 'N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP-WELL PROBE LIGHT		✓			

## START-UP CHECK LIST

Equipment checked by F.I.O.C. / A.K.A. Personnel check by F.I.O.C.

Instruments and safeties checked and reset by A.K.A.

Source in checked by A.K.A. Source No. M-93

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

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

Red light on by A.K.A. Time 1020

Start-up OK'd by F.I.O.C. / A.K.A. Date 9-4-69

150 rods.  
3.40 cm separation c-c. - 295  
30 cm length.

Have an 14 x 14 array, with 6 rods removed from each corner. Total of 172 rods.

10.46 Water ht = 27.60 cm Temp °C  
System sub critical 29.0°C  
Drain.

added 12 rods, 3 to each corner. Have now an 14 x 14 array, with 3 rods removed from each corner. Total of 189 rods.

11.15 Water ht = 27.60 cm Temp °C  
System sub critical 29.1°C  
Drain.

added 12 rods. Now have an 14 x 14 array. Total of 196 rods. (size of grid plates)

13.55 Water ht = 27.70 cm Temp °C  
System sub critical 29.2°C  
Drain.

296

# change made  
by Wilb. 9-5-69

.50" rads.  
2.99 cm separation c-c  
30 cm length.

1 have on ~~13 x 14~~ array, with 8 rads removed  
from each corner. Total of rads = ~~13~~ 150

Water ht = 14.00 cm  $DL = .20 \text{ cm}$  Temp °C  
+ Per 29.2°

$$C = 49.98 \text{ sec} = 16.94 = 82.0 \text{ f/cm}$$

1418 Water ht = ± 13.80 cm

system just critical  
Drain:

Removed 9 rads. 1 from each corner.  
1 have on ~~13 x 14~~ array, with 9 rads removed  
from each ~~13~~ corner. Total of ~~13~~ 146 rads.

Water ht = 15.25 cm  $DL = .55 \text{ cm}$  Temp °C  
27 Per 29.2°

$$C = 32.59 \text{ sec} = 21.6 = 39.3 \text{ f/cm}$$

1432 Water ht = 14.70 cm

system just critical  
Drain:

Removed 9 rads. 1 from each corner. Have  
an ~~13 x 14~~ array, with 10 rads removed from  
each corner. Total of ~~13~~ 147 rads.

P-297



Water ht = 17.80 cm  $\phi h = 1.55 \text{ cm}$  Temp  $^{\circ}\text{C}$   
 $3 + \text{Per}$  24.2 $^{\circ}\text{C}$

$$C = 21.73 \text{ m} = 27.3 \text{ f} = 17.64 \text{ /cm}$$

1446 Water ht = 16.25

System just critical

Drain:

Removed 9 rods, 1 from each corner. Have an  $13 \times 14$  array, with 11 rods removed from each corner. Total  $138$  rods.

1505 Water ht = 27.60 cm Temp  $^{\circ}\text{C}$   
 $4 - \text{Per}$  24.2 $^{\circ}\text{C}$

$$C = -280.32 \text{ m} = -5.4 \text{ f}$$

Drain:

Added 1 rod. Now have an  $13 \times 14$  array, with 11 rods removed from 3 corners, and 10 rods removed from 1 corner. Total of  $139$  rods.

Water ht = 27.60 cm  $\phi h = 8.1 \text{ cm}$  Temp  $^{\circ}\text{C}$   
 $5 + \text{Per}$  24.3 $^{\circ}\text{C}$

$$123.8 \text{ m} = 8.3 \text{ f} = 1.02 \text{ /cm}$$

1534 Water ht = 19.50 cm

System just critical

Drain:

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE RANGE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Alarm	1"	-	$3 \times 10^{-12}$
"	"	Alarm	"	-	"
K-2	"	Alarm	"	-	"
"	"	Alarm	"	-	"
R-1					
R-2					
PM-1	700V	Alarm	5"	-	500V
PM-2	1200V	Low	10"	-	900V
"	"	Alarm	2"	-	"
LOG N CALIBRATE		<input checked="" type="checkbox"/>	OPERATE	<input checked="" type="checkbox"/>	SOURCE No. D-80
DUMP WELL PROBE LIGHT		<input checked="" type="checkbox"/>			

START-UP CHECK LIST

Equipment checked by F.P.C. Personnel check by F.P.C.  
 Instruments and safeties checked and reset by A.K.P.  
 Source in checked by A.K.P. Source No. M-43  
 Emergency equipment in control room checked by F.P.C.  
 Instruments in trip circuit: K-1-2 PM-1-2  
 Red light on by A.K.P. Time 0805  
 Start-up OK'd by F.P.C. A.K.P. Date 9-5-69

\* Change made  
by Hill 9-5-69

<sup>.50"</sup>  
2.99 cm separation c-c  
30 cm length.

Report of last experiment:

Have on <sup>13x14</sup> 14x13 array with 11 rods removed from 3 corners, and 10 rods removed from 1 corner. Total of <sup>139</sup> 146 rods.

Water ht = 27.60 cm

$\times h = 7.7$  cm

Temp  $^{\circ}C$

7.15

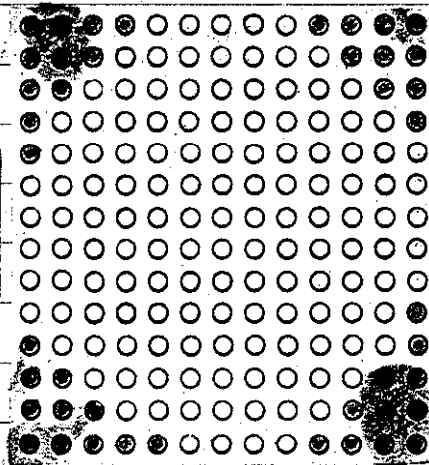
24.0  $^{\circ}C$

$C = 167.32 \text{ sec} = 6.54 = .874/\text{cm}$

0900 Water ht = 19.90 cm

System just critical  
Drain.

9-5-69 14x13 array w/  
11 rods removed from 3  
corners & 10 fr 1 cor.  
Total rods 139 .50" rod  
2.99 cm separation c-c  
30 cm length P.299





- 0.516" rods.  
 2.99 cm separation c-c. 301  
 60 cm length.

Have an 11x11 array, with 8 rods removed from each corner. Total of 89 rods.

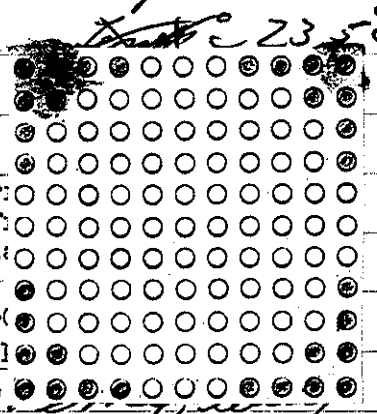
Water ht = 46.30 cm  $p_h = 2.40$  cm Temp °C  
 + Per  $T_{amb} = 23.5^\circ$

$\epsilon = 39.11 \text{ sec} = 19.34 = 8.04 \text{ f/cm}$

1017 Water ht = 43.90 cm

Septen feet circular Drain.

9/8/69: 11x11 array with 8 rods removed from each corner. Total 89. 0.516" rods. 2.99 cm separation C-C. 60 cm length.



Removed 1 rod. Have an 11x11 array with 8 rods removed from 3 corners and 9 rods removed from 1 corner. Total of 89 rods.

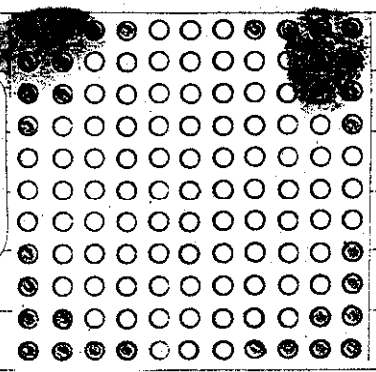
Water ht = 57.60 cm Temp °C  
 2 - Per  $T_{amb} = 23.6^\circ$

$\epsilon = -375.93 \text{ sec} = -3.84$

1046

Drain

9/8/69: 11x11 array with 8 rods removed from 3 corners & 9 from 1 corner. Total rods: 88. 0.516" rods. 2.99 cm separation C-C. 60 cm length. p. 301



array!

Same array (p 301) Except position of  
rod changed in corner where 9 rods  
are removed. See diagrams of each array.

Water ht = 57.60 cm  
3 - per

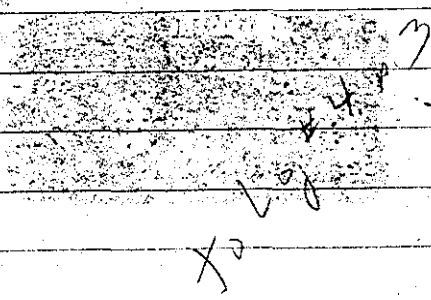
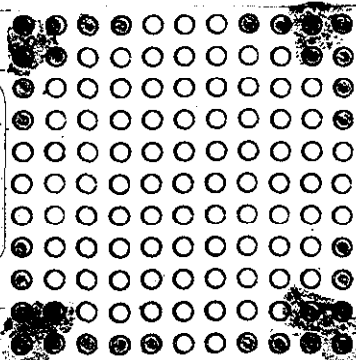
Temp °C  
23.7 °C

$t = -575.89 \text{ sec} = -2.54$

1319

Draw:

9/8/69: 11x11 array  
with 8 rods removed from  
3 corners & 9 from 1  
corner. Total rods: 88  
0.316" rods. 2.99 cm  
separation C-C. 60 cm  
length. p. 302



## INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	$3 \times 10^{-12}$	Meter <input checked="" type="checkbox"/>	2"	<input checked="" type="checkbox"/>	$3 \times 10^{-12}$
"	"	Fast <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	"
K-2	"	Meter <input checked="" type="checkbox"/>	2"	<input checked="" type="checkbox"/>	"
"	"	Fast <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	"
R-1					
R-2					
PM-1	700V	Alarm <input checked="" type="checkbox"/>	5"	<input checked="" type="checkbox"/>	500V
PM-2	1200V	Low <input checked="" type="checkbox"/>	10"	<input checked="" type="checkbox"/>	900V
"	"	Alarm <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	"
LOG N CALIBRATE <input checked="" type="checkbox"/>		OPERATE <input checked="" type="checkbox"/>		SOURCE No. <u>D-80</u>	
DUMP WELL PROBE LIGHT <input checked="" type="checkbox"/>					

## START-UP CHECK LIST

Equipment checked by F.I.C. Personnel check by F.I.C.  
 Instruments and safeties checked and reset by ATW  
 Source in checked by ATW Source No. M-43  
 Emergency equipment in control room checked by F.I.C.  
 Instruments in trip circuit: H-1-2 PM-1-2  
 Red light on by ATW Time 1250  
 Start-up OK'd by F.I.C. ATW Date 1-30-70

Feed rate = 4.30  $\text{cm}^3/\text{min}$  :

$3/4$ " deep rate = 9.4  $\text{cm}^3/\text{min}$  :

3.0" " " = 7.4  $\text{cm}^3/5 \text{ sec}$  :

304

"1-30-70"

.50" rods.

3.40 cm separation c-c.

30 cm length.

 $H_2O = 12.20 \text{ cm}$ = top of fuel 30 cm  
lengths."H<sub>2</sub>O. only"

Have an 14 x 14 array, with 21 rods removed  
from each corner. Total of 112 rods.

Water ht = 17.50 cm

DL = .45 cm

Temp °C

+ Per

24.5 °C

 $\epsilon = 102.13 \text{ sec} = 9.74 = 21.5 \text{ f/cm}$ 

1397 Water ht = 17.05 cm

System just critical  
Drain.

Removed 2 rods. 1 each from opposite faces.  
Now have an 14 x 14 array, with 22 rods  
removed from 2 corners and 21 rods removed  
from 2 corners. Total 110 rods.

Water ht = 19.50 cm

DL = 1.1 cm

Temp °C

2 + Per.

24.5 °C

 $\epsilon = 89.09 \text{ sec} = 10.84 = 9.8 \text{ f/cm}$ 

1412 Water ht = 18.40 cm

System just critical  
Drain.



Removed 2 rods. Now have an 14x14 array with 22 rods removed from each corner. Total of 108 rods.

Water ht = 28.10 cm

Temp °C

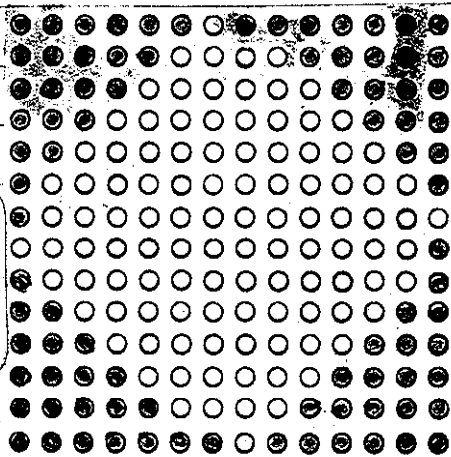
<sup>3</sup> + bar

24.70°C

$T = 1021.31 \text{ sec} = 1.24 \text{ min}$

1506 Water ht = 23.90 cm

System just critical Drain.



1/30/70: 14x14 array with 22 rods removed from each corner. Total rods = 108. 0.50" rods, 3.40 cm separation 30 cm long. p. 305

5.1  
T<sub>2</sub> 2.5