

BOOK103R

Notes:

"HTRE U(4.2) F₆ U(4.89) Rods #1" on spine

Blank pages: page opposite page 1, 102, 110-112, 292, 293, inside back cover sheets

-pages 113/114 and 127/128 have plastic clip at top of each page

-page 133 has drawing taped to it

-following pages have 1 drawing glued to it: 135, 138, 143, 144, 146, 148, 154, 156, 161, 164, 166, 169, 174, 179, 180, 182, 184, 187, 190, 193, 194, 199, 204, 207, 209, 210, 211, 216, 220, 224, 226, 229, 230, 231, 234, 235, 239, 240, 243, 245, 249, 250, 253, 255, 260, 268, 269, 288, 290, 291, 295, 296, 299

-following pages have 2 drawings glued to it: 140, 141, 152, 153, 201, 225, 263, 297

-page 184 also has small yellow post-it-note at top

-page 260 has small yellow post-it-note at top with "Pb" on it

-page 270 has small yellow post-it-note at top with "SS" on it

Scanned by:

Sheila Finch

RSICC /Oak Ridge National Lab.

September 13, 1999

14-2-1

HTRE
UF₆ cylinders



Standard Blank Book

No. 38

Journals Double \$ and Cts. no Units

S. E. Ledgers " " "

D. E. Ledgers Full Page Form "

Records with Margin Line

In 150 and 300 Pages

Made in U.S.A.

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

A BOORUM & PEASE PRODUCT

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| HTR E elements | 2 |
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2

3-17-66

H.T.R.E. Fuel Elements

3-

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|-----------------------------|-----------------------|---------|-----------------|-------------------|------------------------|
| K-1 | 3 X 10 ⁻⁰² | Meter ✓ | 7" | ✓ | 3 X 10 ⁻⁰² |
| " | " | Fast ✓ | " | ✓ | " |
| K-2 | " | Meter ✓ | 1.5" | ✓ | 10 X 10 ⁻⁰² |
| " | " | Fast ✓ | " | ✓ | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700 ✓ | Alarm ✓ | Cent | ✓ | 500 ✓ |
| PM-2 | 1200 ✓ | Low ✓ | 14" | ✓ | 900 ✓ |
| " | " | Alarm ✓ | 2" | ✓ | " |
| LOG N CALIBRATE ✓ | | | OPERATE ✓ | SOURCE No. B-80 ✓ | |
| DUMP WELL PROBE LIGHT _____ | | | | | |

START-UP CHECK LIST

Equipment checked by AKH Personnel check by 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 AKH

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

Red light on by AKH Time 1215

Start-up OK'd by CC- AKH Date 3-17-66

13

13

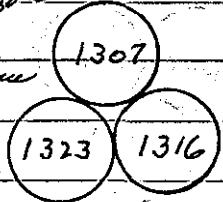
3-17-66

When water ht = 0.0 cm "on back scales" water is even with top of table; "78.5 cm water even with top of fuel."

Fuel rate = 7.5 cm/min.

3" drain = 15.2 cm/30 sec

3 dump = 20.4 cm/30 sec



Separation = 0.0"

more 3.657 kg

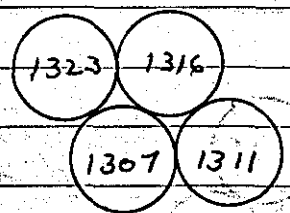
Now have 3 elements in triangular array on "shunt" above. elements in contact.

1313

Water ht = 94.30 cm

System sub critical.

Drain.



Separation = 0.0"

1335

Now have 4 elements in triangular array as shown above.

1356

Water ht = 94.60 cm

System sub critical

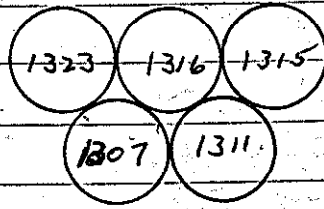
Drain.

over!

4

3-17-66

1410



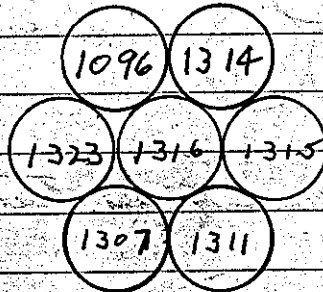
avg separation = 0.045"

Now have 5 elements in triangular array as shown above.

1439

Water ht = 95.00 cm
System sub-critical
Drain.

1450



"avg" separation = 0.045"

Now have 7 elements in triangular array as shown above.

1520

Water ht = 94.60 cm
System sub-critical
Drain.

3-18-66

5

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|---------------------|---------|-----------------|-----|---------------------|
| K-1 | 3×10^{-12} | Meter ✓ | 1" | — | 3×10^{-12} |
| " | " | Fast ✓ | " | — | " |
| K-2 | " | Meter ✓ | 2" | — | " |
| " | " | Fast ✓ | " | — | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700 V | Alarm ✓ | cont | — | 500 V |
| PM-2 | 1200 V | Low ✓ | 14" | — | 900 V |
| " | " | Alarm ✓ | 2" | — | " |

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

START-UP CHECK LIST

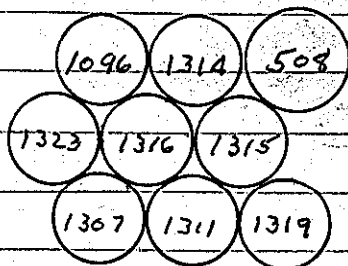
Equipment checked by AKV Personnel check by AKV
 Instruments and safeties checked and reset by AKV
 Source in checked by AKV Source No. M-23
 Emergency equipment in control room checked by AKV-cc
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by AKV Time 0305
 Start-up OK'd by cc, AKV Date 3-18-66

avr.

045

6
3/18/66

9/18



"avg" separation = 0.045"

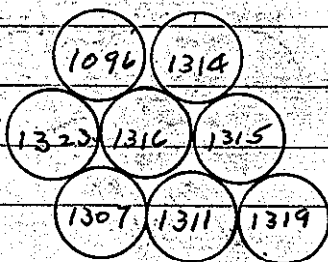
0810 Now have 9 units in triangular array as shown above.

10

0830 Water ht = 42.30 cm
system just critical
Drain.

10

0916



"avg" separation = 0.095"

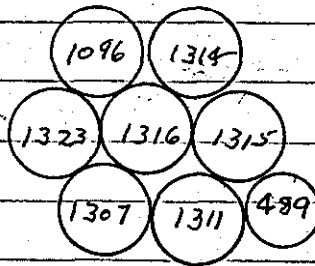
Now have 8 units in triangular array as shown above.

127

0945 Water ht = 66.10 cm
system just critical
Drain.

9/18/66

7

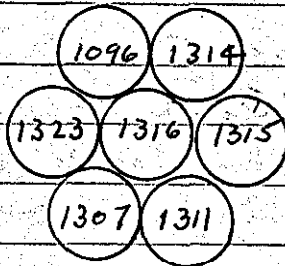


"avg" separation = 0.045"

1010 Eight elements in triangular array as shown above (replaced element # 1319 with element # 489.)

1035 Water ht = 69.80
System just critical
Drain.

Water temp $^{\circ}$
1 = 23.0
2 = 23.0



"avg" separation = 0.40"

1275 Now have 7 elements in triangular array as shown above. Elements are separated with 0.10" inch plastic spacers. The calculated separation using the 0.10" spacers & the thickness of the element support trays (0.045") gives

ans:

8
3/18/66

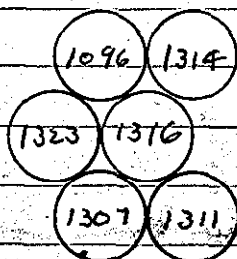
3/18/66

a separation of ~~0.544"~~
~~0.528"~~
0.549" using 2,800" as O.D.

14

1250 Water ht = 67.10 cm
system just critical,
D-rain.

Water temp
1 = 23.0
2 = 23.3



"avg" separation = 0.40"

14

Removed element number 1315. Now have 6 elements as shown above. Separation = 0.40"

1337 Water ht = 94.40 cm

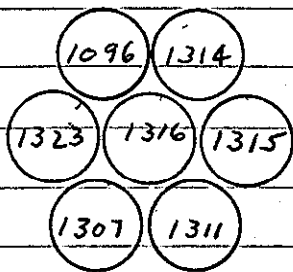
system sub critical. - P_{cr} = ~60.0 mm
D-rain.

151

3/18/66

9

1410



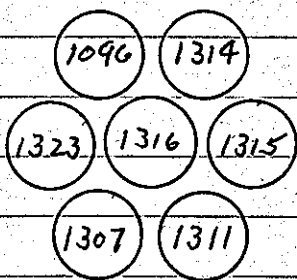
"avg" separation = 0.65"

Now have 7 elements in triangular array as shown above. Elements separated with 0.20" plastic spacers. Measured avg separation = 0.65" in.

40"

1442 Water ht = 67.40 cm
System just critical
Drain.

1515



"avg" separation = 0.85

Same array as above; 7 elements. Elements now separated with 0.30" plastic spacers. Measured avg separation = 0.85" in.

avg

10
3/18/66

Water ht = 76.00 cm, $\Delta h = .70$ cm

1546 + Per.

$\tau = 208.63 \text{ cm} = 5.4 \text{ f} = \sim 7.7 \text{ f/cm}$

1553 Water ht = 75.30 cm

System just critical
Drain

3/21/66

3/21/66

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|-----------------------|---------|-----------------|-----|-----------------------|
| K-1 | 3 x 10 ⁻¹² | Motor ✓ | 2" | - | 3 x 10 ⁻¹² |
| " | " | Fast ✓ | " | - | " |
| K-2 | " | Motor ✓ | " | - | " |
| " | " | Fast ✓ | " | - | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 7000 ✓ | Alarm ✓ | cont | | 5000 ✓ |
| PM-2 | 12000 ✓ | Low ✓ | 12" | | 9000 ✓ |
| " | " | Alarm ✓ | 3" | | " ✓ |

LOG N CALIBRATE OPERATE SOURCE No. 13-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by AKK Personnel check by T.D.C.

Instruments and safeties checked and reset by AKK

Source in checked by AKK Source No. 14-83

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

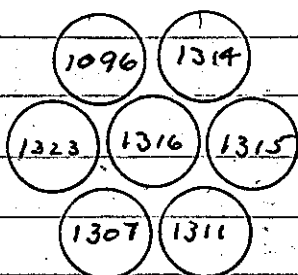
Instruments in trip circuit: K-1-2 P19-12

Red light on by AKK Time 0900

Start-up OK'd by T.D.C. AKK Date 3-21-66

avg.

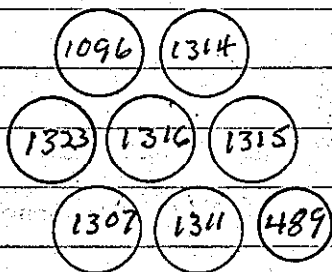
12
3/21/66



"avg" separation = 1.0"

Same as shown above, 7 elements. Elements
now separated with 0.40 plastic spacers.
Measured avg separation = 1.0"

09:38 Water ht = 95.00 cm
System sub critical
Down.



avg. separation = 1.0"

10:15 Added 1 element. Total elements 8. Elements
separated with 0.40" plastic spacers.
Measured ^{avg} separation = 1.0".

10:40 Water ht = 58.90 cm
System just critical
Down.

3/21/66

12:20

12:50

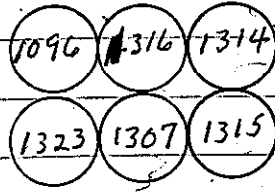
13:15

13:30

3/21/66

12:20 New hose 2x3 array, 6 elements with
avg. separation 0.010"

6.0"



"avg" separation 0.010"

Water Temp.

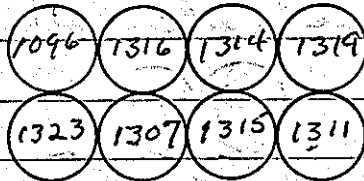
12:50 Water ht = 95.00 cm
system sub critical
Drain.

1 = 23.2

2 = 23.2

13:15 new hose 2x4 array, ~~6~~ 8 elements with
avg. separation 0.010" as shown below

0"



avg. separation 0.010"

13:35 Water ht = 94.90 cm
system sub critical
Drain.

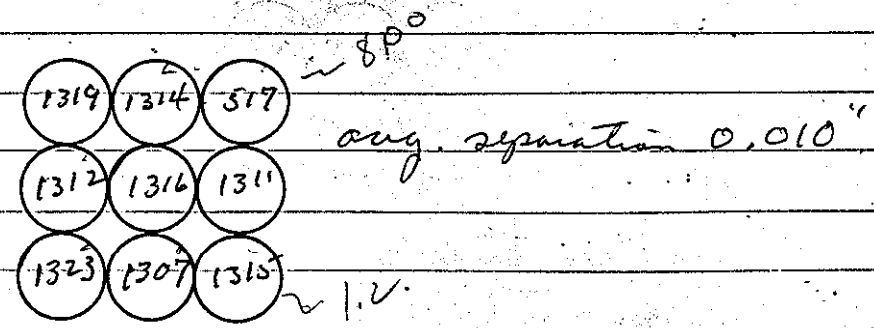
sets

3/21/66

14
3/21/66

15:30

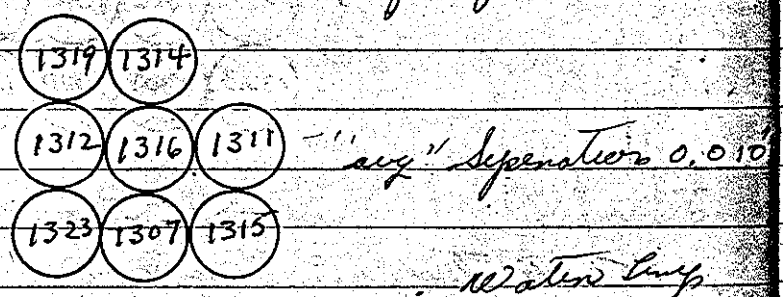
14:15 now have 3 x 3 array 9 elements inside
avg. separation of 0.010"



1540

14:34 Water ht = 44.60 cm
system just critical
Drain

15:00 removed 1 element from array as shown
below. Now have 8 elements avg. separation 0.010"

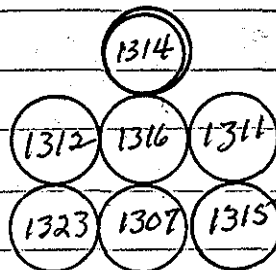


Water temp
#1 = 23.2
2 = 23.2

15:18 Water ht = 62.50 cm
system just critical
Drain

3/21/66

15:30 Remount + more element as shown below now have
7 units. Avg. separation 0.010"



avg. separation 0.010"

1548 Water ht = 94.50
system sub critical.
Drain.

Water temp °C

#1 = 23.5

#2 = 23.5

0.010

0.010

temp

= 23.2

= 23.2

16
3/22/66

3/22/66

08130

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE RANGE | SET | START-UP RANGE |
|-----------------------------|-----------------------|-----------|--------------|------------------|------------------------|
| K-1 | 3 X 10 ⁻¹² | Meter ✓ | 2" | ✓ | 3 X 10 ⁻¹² |
| " | " | Fast ✓ | " | ✓ | " |
| K-2 | " | Meter ✓ | " | ✓ | 10 X 10 ⁻¹² |
| " | " | Fast ✓ | " | ✓ | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700V | Alarm ✓ | cont | ✓ | 500V |
| PM-2 | 1200V | Low ✓ | 12" | ✓ | 900V |
| " | " | Alarm ✓ | 3" | ✓ | " |
| LOG N CALIBRATE ✓ | | OPERATE ✓ | | SOURCE No. 13-80 | |
| DUMP WELL PROBE LIGHT _____ | | | | | |

0915

START-UP CHECK LIST

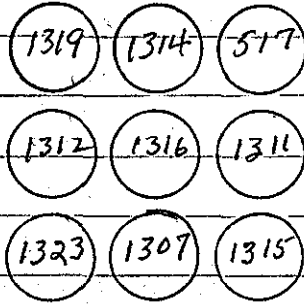
Equipment checked by AKH Personnel check by I.D.C.
 Instruments and safeties checked and reset by AKH
 Source in checked by AKH Source No. M-93
 Emergency equipment in control room checked by I.D.C.
 Instruments in trip circuit: K-1-2 PM-1-V
 Red light on by AKH Time 0830
 Start-up OK'd by I.D.C. AKH Date 3-22-66

0931

3/22/66

08130

now have 3x3 array, 9 elements with separation of .3750". elements separated with 3/8" plastic spacers.

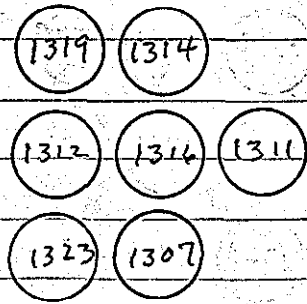


avg. sep. = .3750"

Water ht = 40.30 cm
system just critical

0915

now have 7 elements with separation of .3750 as shown below



0931

Water ht = 94.10 cm
system sub critical
Drain.

Water Temp. °C
#1 = 23.20
23.20

3/22/66

10:00

Now have 9 elements 3x3 array. Separation = 1.00". Elements separated with 1.0" plastic spacers.

(1319) (1314) (517)

(1312) (1316) (1311)

(1323) (1307) (1315)

avg. sep. 1.00"

10:22

Water ht = 69.70 cm

Temp λ 1 = 23.2

System just critical
Drain.

2 = 23.5

10:45

Done 3x3 array, 9 elements separated by 1.0" plastic spacers and 0.010" plastic spacers. Separation = 1.10"

(1319) (1314) (517)

(1312) (1316) (1311)

(1323) (1307) (1315)

avg. sep. = 1.10"

11:03

Water ht = 95.20 cm

Temp λ

1 = 23.2

System sub-critical
Drain.

2 = 23.5

3/22/66

12:30

12:4

12:5

14:00

3/22/66

Time = 12:30 Have 3x3 array 9 elements separated by 1.0" plastic spacers, and 40 mil plastic spacers. Separation 1.040"

(1319) (1314) (517)

(1312) (1316) (1311)

(1323) (1307) (1315)

avg. separation = 1.040"

23.2

23.5

12:45 Water ht = 80.20 cm

$\sigma_1 = 1.85 \text{ cm Water Temp}^\circ$

$\sigma_1 = 23.5$

System on + Per:

$\sigma_2 = 23.5$

$\sigma = 82.57 \text{ cm} = 11.44$

lastic

0"

12:50 Water ht = 78.35 cm

System just critical
Drain.

14:00

Have 3x3 array 9 elements separated by 1.0" plastic spacer and 60 mil plastic spacers. Separation = 1.060"

(1319) (1314) (517)

(1312) (1316) (1311)

(1323) (1307) (1315)

avg. sep. = 1.060"

23.2

23.5

avg.

3/20
3/22/66
10

3/23/66

1415 Water ht = 94.70 cm

Water Temp °C

- Per: - 327.26 = -4.5 f

#1 = 23.5 °C

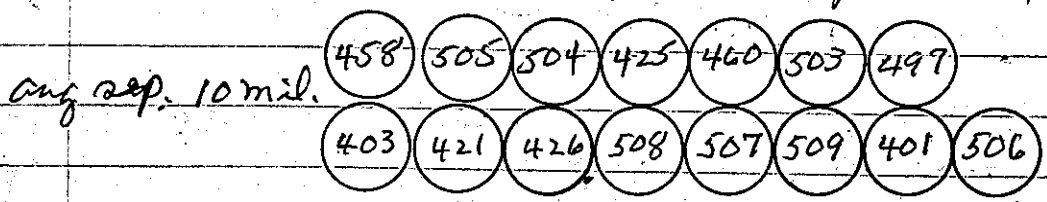
#2 = 23.5 °C

(Beginning of ^{1116g} 3.42500 Elements)

1421 Drain: 74.1 water HT even with top of fuel on hook seat

1515 New hose 15 elements (3.42500) X 29.125 L

Elements close as possible separation avg. 10 mil



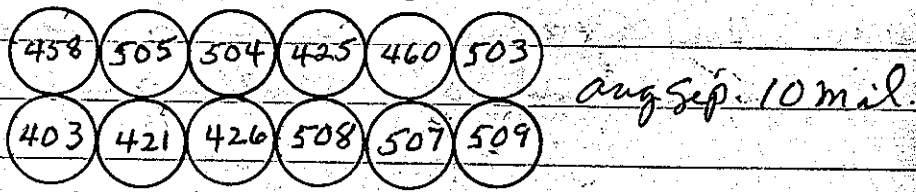
1535 Water ht = 28.0 cm

System just critical

1545 Drain

~~1445~~ New hose 12 elements close as possible

avg. separation 10 mil.



1600 Water ht = 30.15

System just critical

Drain

3/23/66

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|-----------------------|---------|-----------------|-----|------------------------|
| K-1 | 3 x 10 ⁻¹² | Meter ✓ | 2" | ✓ | 3 x 10 ⁻¹² |
| " | " | Fast ✓ | " | - | " |
| K-2 | " | Meter ✓ | " | ✓ | 10 x 10 ⁻¹² |
| " | " | Fast ✓ | " | - | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700V | Alarm ✓ | low | - | 500V |
| PM-2 | 1500V | Low ✓ | 10" | - | 900V |
| " | " | Alarm ✓ | 3" | - | " |

LOG N CALIBRATE OPERATE SOURCE No. 13-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by AKH Personnel check by ZHC

Instruments and safeties checked and reset by AKH

Source in checked by AKH Source No. M-43

Emergency equipment in control room checked by EID.C

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

Red light on by AKH Time 0815

Start-up OK'd by EID.C AKH Date 3-23-66

OVER

23.5°C
23.5°C
lock read
L)
0 mile

mil.

22

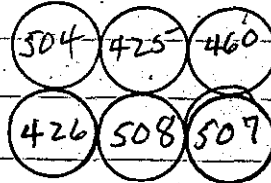
3/ 3/23/66

3/23/66

10 0820

now have 6 units close as possible
Avg. separation 10 mil.

10:00



avg. sep. 10 mil.

0845

Water ht = 74.00 cm

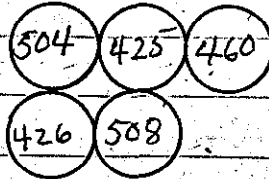
system just critical
Drain:

10:30

0900

now have 5 elements close as possible.
Avg. separation 10 mil.

10:45



avg. sep. 10 mil.

11:05

0928

Water ht = 93.00 cm

system sub critical
Drain:

Temp °C

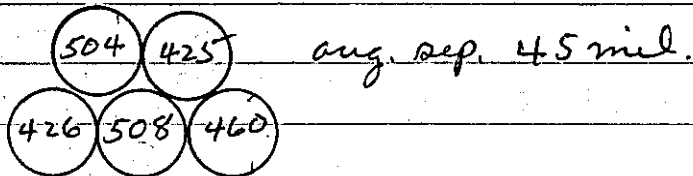
#1 = 23.5

#2 = 23.5

11:11

3/23/66

10:00 Now have triangular array 5 elements with avg. separation approx. 45 mil. as shown below

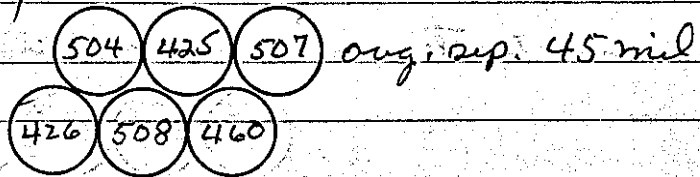


10:30 Water ht = 93.10 cm.

System sub critical.

Drain.

10:45 Now have triangular array 6 elements as shown below. Avg. separation approx. 45 mil.



11:05 System sub critical.

Water ht = 93.10 cm.

Water Temp. °C

-Peri:

1 = 23.5

$C = \sim 108.5 \text{ mm} = \sim 22.0 f$

2 = 23.5

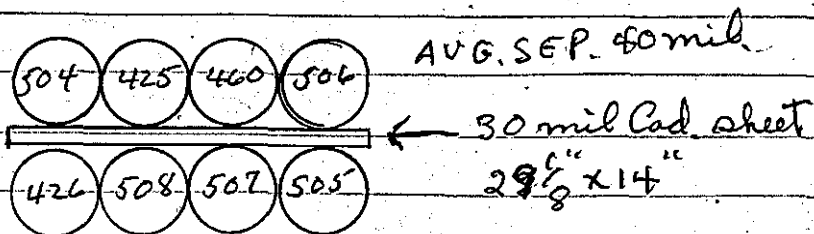
11:11 Drain.

24

3/ 3/23/66

1315

now have 8 elements with 30 mil Cad. sheet in center. as shown below. Average separation approx. ^{40 mil} 45 mil.



3/23/66

14:45

1332

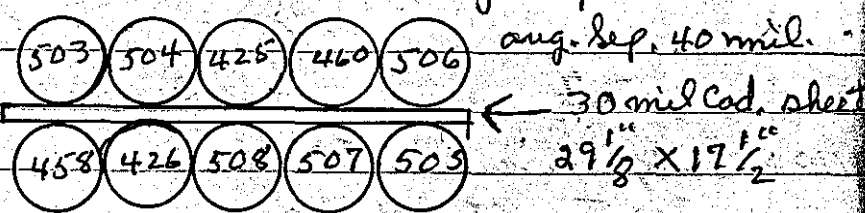
Water ht = 92.60 cm.
System sub critical
Drain.

15/0

1400

now have 10 elements with 30 mil ed sheet in center as shown below. Avg. separation 40 mil.

15/1



1420

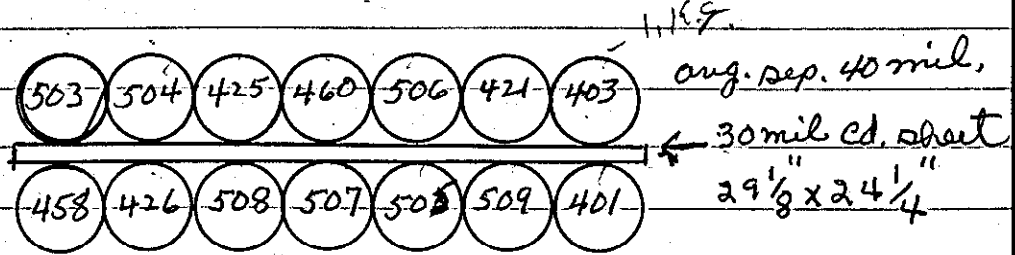
Water ht = 92.40 cm
System sub critical
Drain.

3/23/66

sheet

14:45

now have 14 elements with 30 mil ed. sheet in center as shown below. Avg. separation = 40 mil.



1510

Water ht = 75.50 $\delta h = .95$

Water Temp $^{\circ}$

(2) + Per

$T_1 = 23.5$

$Q = 160.80 \text{ cm} = 6.74 = 7.04 \text{ /cm}$

$T_2 = 23.5$

sheet

0 mil

mil.

1 sheet

cc

2

1516

Water ht = 74.55 cm

system just critical
Drain

26
3/24/66

INSTRUMENT CHECK

3/24/66
0830

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|-----------------------|---------|-----------------|-----|------------------------|
| K-1 | 3 X 10 ⁻¹² | Meter ✓ | 2" | ✓ | 3 X 10 ⁻¹² |
| " | " | Fast ✓ | " | ✓ | " |
| K-2 | " | Meter ✓ | 2" | ✓ | 10 X 10 ⁻¹² |
| " | " | Fast ✓ | " | ✓ | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700 V | Alarm ✓ | cont | ✓ | 500 V |
| PM-2 | 1200 V | Low ✓ | 10" | ✓ | 900 V |
| " | " | Alarm ✓ | 3" | ✓ | " |

LOG N. CALIBRATE ✓ OPERATE ✓ SOURCE No. B-80

DUMP WELL PROBE LIGHT _____

0946

START-UP CHECK LIST

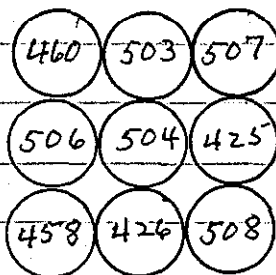
Equipment checked by AKH Personnel check by F.P.C.
 Instruments and safeties checked and reset by AKH
 Source in checked by AKH Source No. M-93
 Emergency equipment in control room checked by F.P.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by AKH Time 0820
 Start-up OK'd by F.P.C. AKH Date 3-24-66

101

3/24/66

0830

Now have 3x3 array 9 elements close as possible. Avg. separation approx. 10 mil.



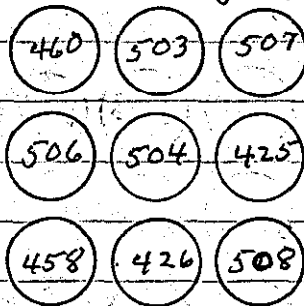
avg. Sep. = 10 mil.

Water ht = 29.30 cm

System just critical
Drain.

0945

Now have 3x3 array 9 elements with a separation of 1.0". Array separated by 1.0" plastic spacers



avg. sep. = 1.0"

1010

Water ht = 55.05 cm

System just critical
Drain.

28

3/24/66

10:45

New home 3x3 array 9 elements separated with 1.0" and 0.030" plastic spacers Separation = 1.30"

460 503 507

506 504 425

458 426 528

avg. sep. = 1.30"

11:12

Water ht = 93.00 cm

System sub critical
Drain.

Water Temp °C

#1 = 23.5

2 = 23.5

12:45

New home 3x3 array 9 elements separated by 1.0" and 0.030" plastic spacers Separation = 1.20"

460 503 507

506 504 425

458 426 528

avg. sep. = 1.20"

13:07

Water ht = 93.00 cm

System sub critical
Drain.

3/24/66

13:15

now have 3x3 array - 9 elements separated by 1.0" and 0.010" plastic spacers. Avg. separation = 1.10"

(460) (503) (507)

(506) (504) (425)

avg. sep. = 1.10"

(458) (426) (508)

0

1.5

.5

1343

Water ht = 74.70 cm

$\sigma_h = 1.30$

Water Temp $^{\circ}C$

#1 = 23.5

+ P_{so}

$\bar{v} = 120.60 \text{ cm} = 8.5 \text{ ft} = 6.5 \text{ ft/cm}$

#2 = 23.5

f

1351

Water ht = 73.40 cm

hysteresis just critical.

Drain

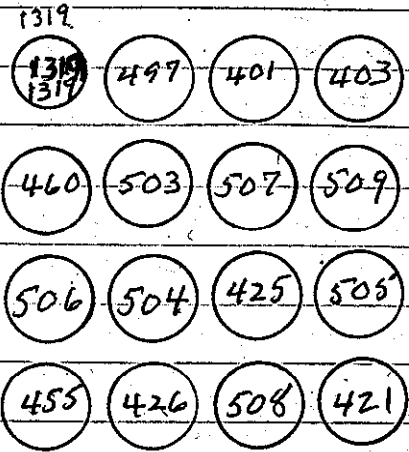
30

3/25

3/25

3/24/66

15:30 new house 4x4 array, 16 elements separated with 1.0" and 1/2" plastic spacers. Avg. separation = 1.50"



1548 water ht = 74.60 cm $\Delta h = 1.0$ cm

(2) + Pen

Temp °C
#1 = 23.5
#2 = 23.5

$$\tau = 121.68 \text{ cm} = 8.5 \text{ f} = 8.5 \text{ f/cm}$$

1558 Water ht = 73.60 cm
system just critical
Drain.

3/25/66

Th

INSTRUMENT CHECK

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

LOG N CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by AKV Personnel check by FIDC
 Instruments and safeties checked and reset by AKV
 Source in checked by AKV Source No. 12-93
 Emergency equipment in control room checked by FIDC
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by AKV Time 0815
 Start-up OK'd by FIDC AKV Date 3-25-66

(OVER)

32

3/25/66

(Recheck)
(See Page 30)

0820

Now 4x4 array 16 units separated with 1.0" and 1/2" plastic spacers. Separation = 1.50. This is a recheck of the array on page 30 for crit. ht. avg. sep. = 1.50"

0840

Water ht = 75.60 cm $s_h = 1.50$

Water Temp °C

(1) + Per

#1 = 23.2

$t = 76.06 \text{ cm} = 12.2 \text{ ft} = 8.1 \text{ ft/cm}$

2 = 23.2

0848

Water ht = 74.10 cm

~~3-25 - 74.10~~

System just critical

~~3-24 - 73.60~~

Drain

1.50 diff.

3/25

09:3

10

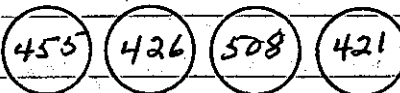
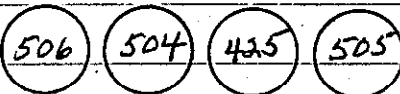
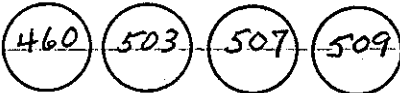
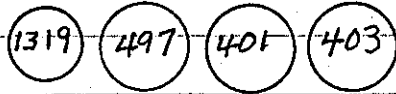
11

11

3/25/66

09:35

Now have 4x4 array 16 elements separated with 1.0" and 1/2" and 40 mil plastic spacers. Separation = 1.54"



avg. separation = 1.54"

Temp = C

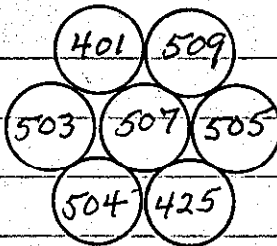
1010 Water ht = 95.10 cm

#1 = 23.5

System sub critical
Drain.

2 = 23.5

1110 Now have triangular array 7 elements as close as possible separated by hands on elements which is 4.5 mils.



avg. separation = 4.5 mils.

1130

Water ht = 38.20 cm

System just critical
Drain.

3/28/6
0930

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------------|-----------------------|--------------------|-------------------|--------------|------------------------|
| K1 | 3 x 10 ⁻¹² | Meter ✓ | 2" | ✓ | 3 x 10 ⁻¹⁰ |
| " | " | Fast ✓ | " | ✓ | " |
| K2 | " | Meter ✓ | " | ✓ | 10 x 10 ⁻¹² |
| " | " | Fast ✓ | " | ✓ | " |
| P1 | | | | | |
| P2 | | | | | |
| AM1 | 700 V | ✓ | cont | ✓ | 500 V |
| AM2 | 1200 V | ✓ | 12" | ✓ | 900 V |
| " | " | ✓ | 3" | ✓ | " |
| 100 V | ✓ | OPERATE | SOURCE | ✓ | B-602 |
| 100 V | ✓ | OPERATE | SOURCE | ✓ | B-602 |

095

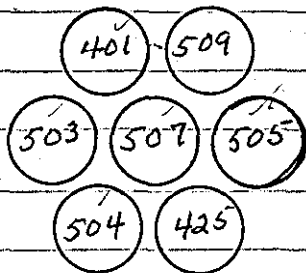
START-UP CHECK LIST

Equipment checked by AKM Personnel check by I.P.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 I.P.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by AKM Time 0910
 Start-up OK'd by I.P.C. AKM Date 3-28-66

3/28/66

0930

New home triangular array with 7 elements
separated with ^{0.100}~~0.070~~ plastic spacers.



avg. measured separation =
0.70"

0953

Water ht = 41.10 cm

system just critical
Drain.

Water Temp. °C

1 = 22.5

2 = 22.7

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|-----------------------|-----------------------|---------|-----------------|-----|------------------------|
| K-1 | 3 x 10 ⁻¹² | Meter ✓ | 2" | ✓ | 8 x 10 ⁻¹² |
| " | " | Fast ✓ | " | ✓ | " |
| K-2 | " | Meter ✓ | " | ✓ | 10 x 10 ⁻¹² |
| " | " | Fast ✓ | " | ✓ | 10 x 10 ⁻¹² |
| P-1 | | | | | |
| P-2 | | | | | |
| PM-1 | 700V | Alarm ✓ | cont | ✓ | 5000 |
| PM-2 | 900V | Low ✓ | 12" | ✓ | 900V |
| " | " | Alarm ✓ | 2" | ✓ | 4 |
| LOG N CALIBRATE | | ✓ | OPERATE | ✓ | SOURCE No. 0-80 |
| DUMP WELL PROBE LIGHT | | ✓ | | | |

START-UP CHECK LIST

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

Instruments and safeties checked and reset by AKV

Source in checked by AKV Source No. M-93

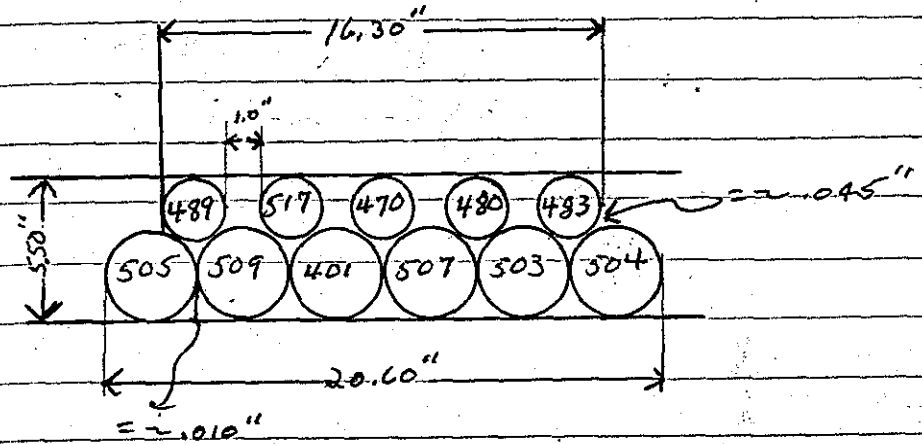
Emergency equipment in control room checked by F.D.C.

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

Red light on by AKV Time 1259

Start-up OK'd by F.D.C. AKV Date 3-29-68

Now have array as shown below. 11 elements.



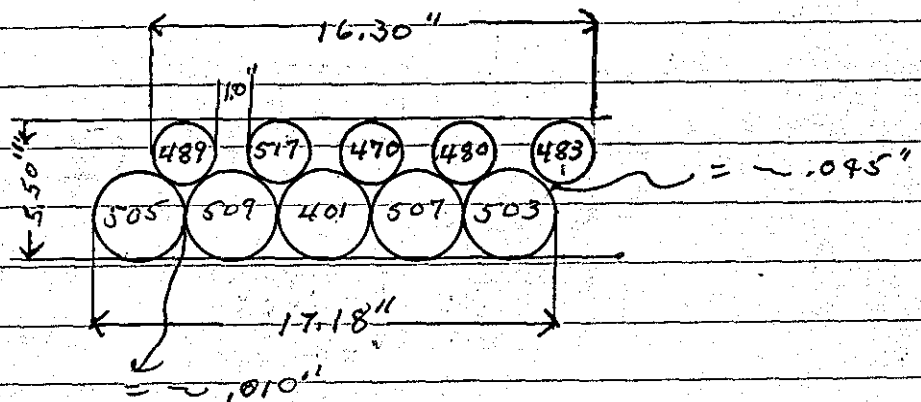
1322 Water ht = 47.90 cm

System just critical
Drain.

Water Temp.

#1 = 22.5°C

#2 = 22.5°C

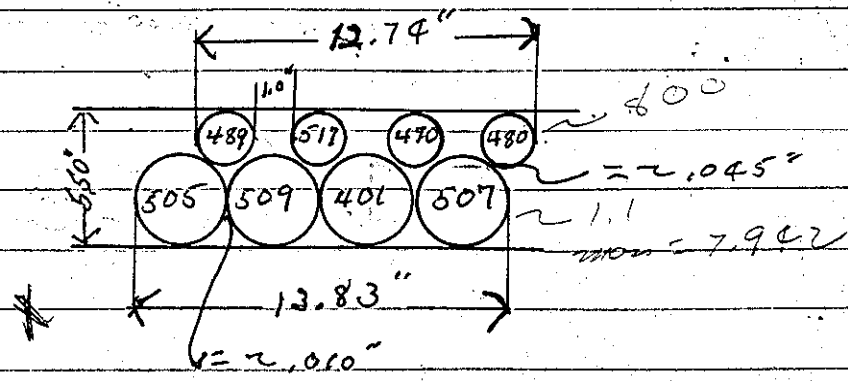


Array as shown above. 10 elements.

1355 Water ht = 53.10 cm

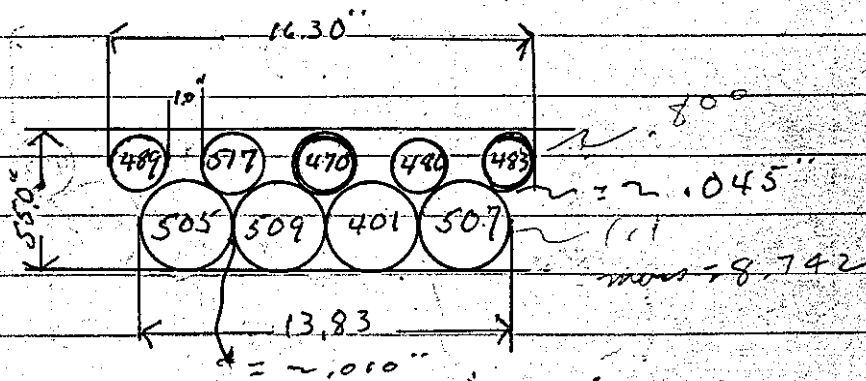
System just critical
Drain.

Now how array as shown below elements



1435 Water ht = 93.00 cm
 System sub critical
 Drain

Water temp °C
 # 1 = 22.5
 # 2 = 22.5



1504 Water ht = 66.10 cm. $D_h = 1.900m$
 + Per
 $C = 119.52 m = 8.64 = 9.54 cm$

Water temp °C
 # 1 = 22.5
 # 2 = 22.5

Water ht = 65.20 cm
 System just critical

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|---------------------|---------|-----------------|-----|----------------------|
| K-1 | 3×10^{-12} | Meter ✓ | 2" | ✓ | 3×10^{-12} |
| " | " | Fast ✓ | " | ✓ | " |
| K-2 | " | Meter ✓ | 2" | ✓ | 10×10^{-12} |
| " | " | Fast ✓ | " | ✓ | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700V | Alarm ✓ | low ✓ | ✓ | 500V |
| PM-2 | 900V | Low ✓ | 12" ✓ | ✓ | 900V |
| " | " | Alarm ✓ | 3" ✓ | ✓ | " |

LOG N CALIBRATE ✓ OPERATE ✓ SOURCE-No. B-80

DUMP-WELL PROBE LIGHT

START-UP CHECK LIST

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

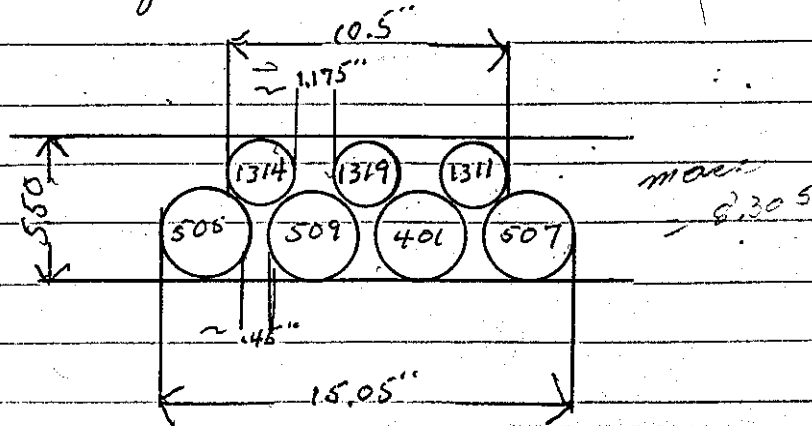
Instruments in trip circuit: K-1-2 PM-1-2

Red light on by AKL Time 0806

Start-up OK'd by I.D.C. AKL Date 3-30-66

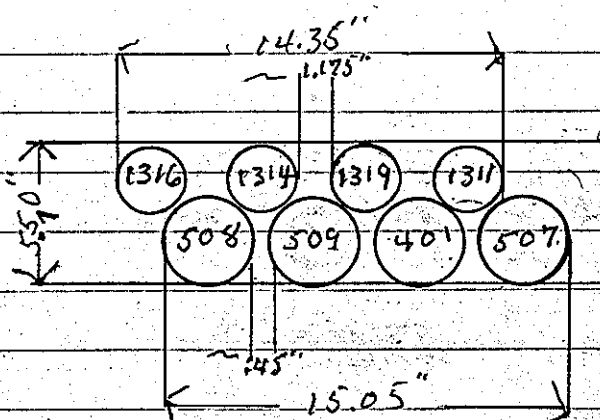
40
3/30/68
0800

Now how array as shown below elements



0828 Water ht = 94.90 cm
System sub critical
Drain

Water Temp. °C
1 = 22.5
2 = 22.5

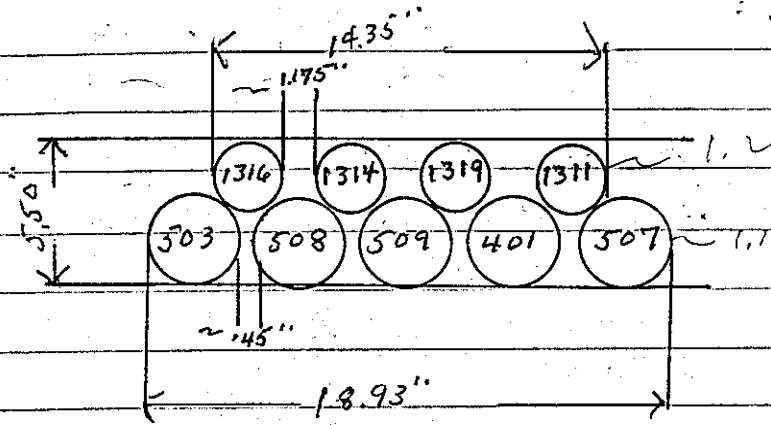


0920
10:20 Now how array as shown above elements

0945 Water ht = 95.00 cm
System sub critical
Drain

Water Temp. °C
1 = 21.5
2 = 22.5

10:20 new hole array as shown below 9 units



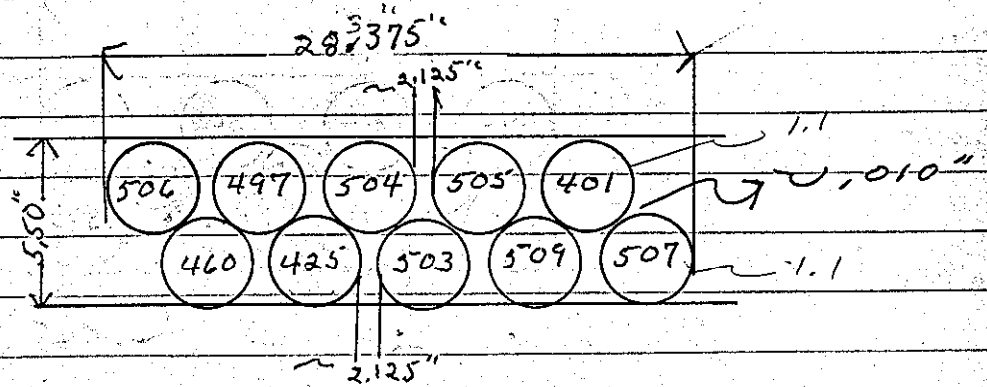
10:36 Water hts = 66.20 cm

Water hts °

System just critical
Drain

#1 = 22.2

2 = 22.2



12:20 New hole array as shown above 10 elements

Water hts = 93.50 cm

Water hts °

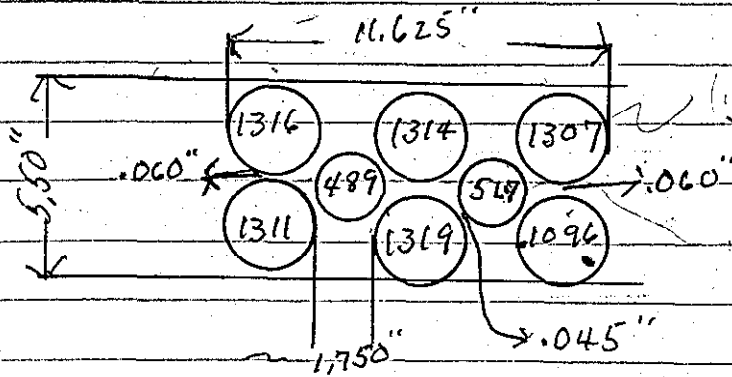
12:36 System sub critical
Drain

#1 = 22.2

#2 = 22.5

1300 now home array as shown below 8 elements

1415

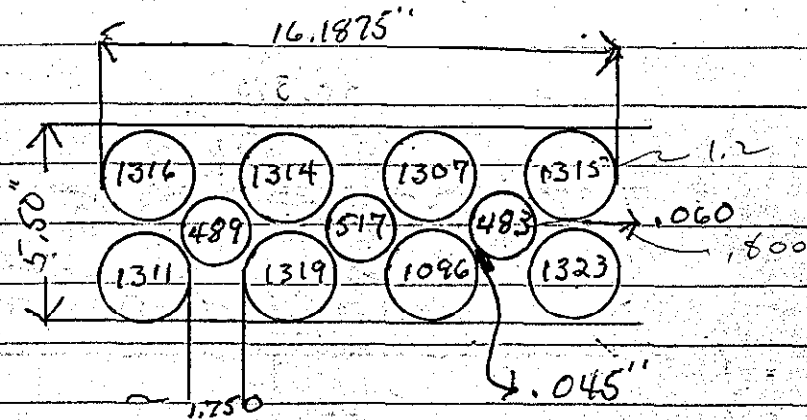


1323 Water ht = 94.50 cm
 System sub critical
 Drains

Water Temp °C
 #1 = 22.5
 #2 = 22.5

1472

1330 now home array as shown below 11 elements

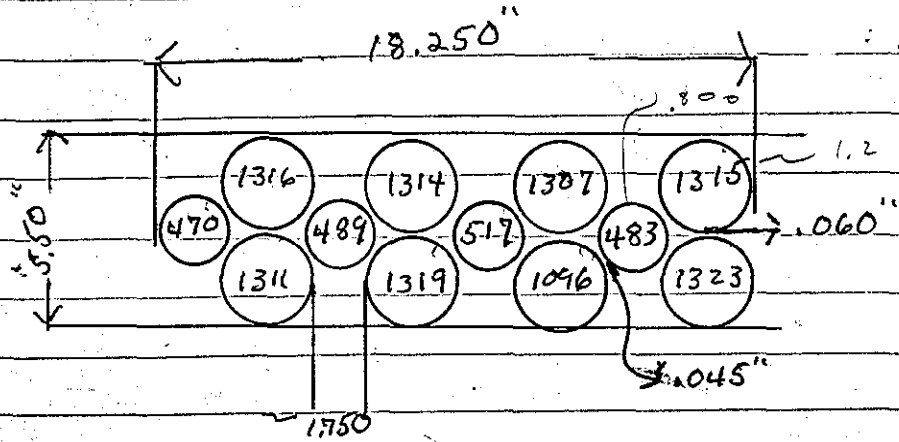


1350 Water ht = 95.00 cm
 System sub critical
 - Per
 E = -97.79 m.

Water Temp °C
 #1 = 22.5
 #2 = 22.5

1354 Drains

1415 now how array as shown below 12 elements



1425 Water ht = 69.70 cm
 system just critical
 Drain:

Water Temp °C
 #1 = 22.5
 2 = 22.5

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | STARTER RANGE |
|------------|---------------------|---------|-----------------|-----|----------------------|
| K-1 | 3×10^{-12} | Meter ✓ | 2" | ✓ | 3×10^{-12} |
| " | " | Fast ✓ | " | ✓ | " |
| K-2 | " | Meter ✓ | 2" | ✓ | 10×10^{-12} |
| " | " | Fast ✓ | " | ✓ | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700V | Alarm ✓ | cont | ✓ | 500V |
| PM-2 | 1200V | Low ✓ | 12" | ✓ | 900V |
| " | " | Alarm ✓ | 3" | ✓ | " |

LOG N CALIBRATE OPERATE SOURCE No. B-82

DUMP WELL PROBE LIGHT

093
1015

START-UP CHECK LIST

Equipment checked by AKH Personnel check by F.I.R.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.R.C.

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

Red light on by AKH Time 0910

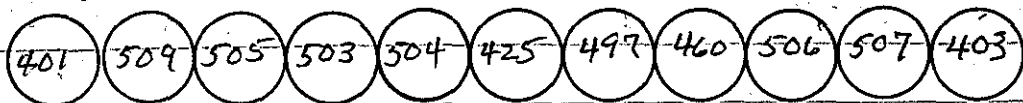
Start-up OK'd by F.I.R.C. AKH Date 3-31-66

102

3/31/66

0910

new home eleven elements in line ^{and} as close as possible as shown ~~below~~ below. Avg. sep. 2/10 mil.



Log $n = .0011$

0935

Water ht = 93.00 cm

Water Temp. $^{\circ}C$

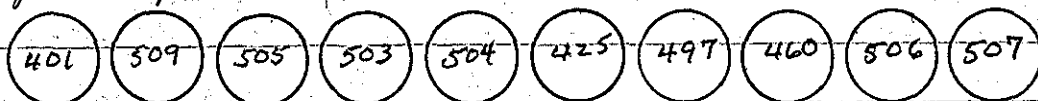
System sub critical
Drain.

$H_1 = 22.2$

$H_2 = 22.2$

10:15

new home 10 elements in line separated by .50" plastic strips Separation $\frac{1}{2}$ "



Log $n = .0008$

1027

Water ht = 93.40 cm

Water Temp. $^{\circ}C$

System sub critical
Drain.

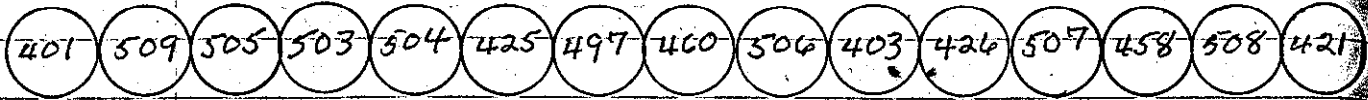
$H_1 = 22.2$

$H_2 = 22.2$

46

3/31/66

1400 now have 15 elements in line. Elements close as possible. Separation Avg. \approx 10 mil.



Log $\eta = .0019$

1420 Water ht = 96.00 cm

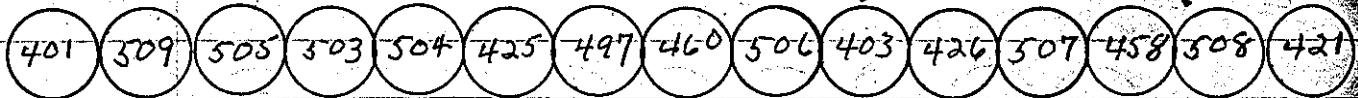
Water Temp $^{\circ}$ C

System sub critical
Drain

#1 = 23.0 $^{\circ}$

#2 = 23.0

1430 now have 15 elements in line. Separated with .50" plastic strips. Avg sep: \approx .50"



Log $\eta = .0012$

1500 Water ht = 96.00 cm

Water Temp $^{\circ}$ C

System sub critical
Drain.

#1 = 22.7

#2 = 22.7

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|-----------------------|-----------------------|---------|-----------------|-----|------------------------|
| K-1 | 3 X 10 ⁻¹² | Meter ✓ | 2" | ✓ | 10 X 10 ⁻¹² |
| " | " | Fast ✓ | " | ✓ | " |
| K-2 | " | Meter ✓ | 2" | ✓ | " |
| " | " | Fast ✓ | " | ✓ | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700 v | Alarm ✓ | cont | ✓ | 5000 |
| PM-2 | 1200 v | Low ✓ | 12" | ✓ | 9000 |
| " | " | Alarm ✓ | 3" | ✓ | " |
| LOG N CALIBRATE | | ✓ | OPERATE | ✓ | SOURCE No. 13-80 |
| DUMP WELL PROBE LIGHT | | | | | |

421

50

1

421

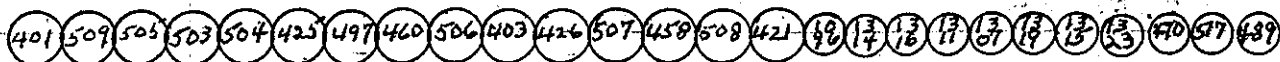
7

START-UP CHECK LIST

Equipment checked by RKAJ Personnel check by ELDC
 Instruments and safeties checked and reset by RKAJ
 Source in checked by RKAJ Source No. M-93
 Emergency equipment in control room checked by ELDC
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by RKAJ Time 0925
 Start-up OK'd by F.O.C. RKAJ Date 4-1-66

48
4/1/66
0925

Now have 26 elements in line. Elements as close together as possible.

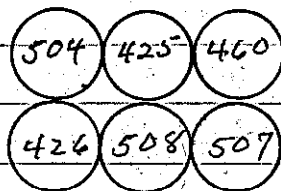


0950 Water ht = 97.50 cm
System sub critical
Drain

Temp °C
#1 = 22.2
#2 = 22.2

(Repeat)

1300 This is a repeat of experiment on page 22. To check Crit. HT. Elements close as possible



Avg. Separation = 10 mil

1329 Water ht = 74.50 cm $b_h = 2.45$ cm
(1) + ps

Water Temp °C
#1 = 24°C
#2 = 29°C

$C = 70.62 \text{ mm} = 12.9 \text{ f} = 5.3 \text{ f/cm}$

1335 Water ht = 72.05 cm
System just critical
Drain

1520

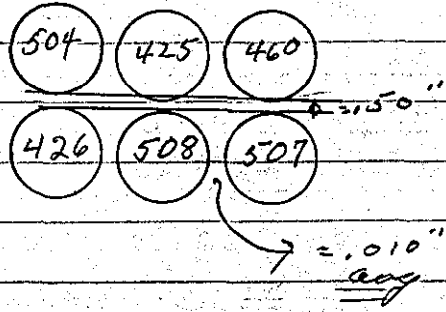
Repeat run of array shown on bottom of page 48, after removing rubber tubes used to hold spacing uniform.

7420. Water ht = 74.50 cm $d_h = 2.45 \text{ cm}$ Water Temp $^{\circ}\text{C}$
 (2) + Per $z_1 = 29.2$
 $c = 70.62 \text{ m} = 12.9 \text{ f} = 5.3 \text{ f/cm}$ $z_2 = 29.2$

7427 Water ht = 72.05 cm
 System just critical
 Drain.

1520 Now have 2 x 3 array ^{rows} separated with .50" plastic spacers as shown below.

array separated in one direction only.



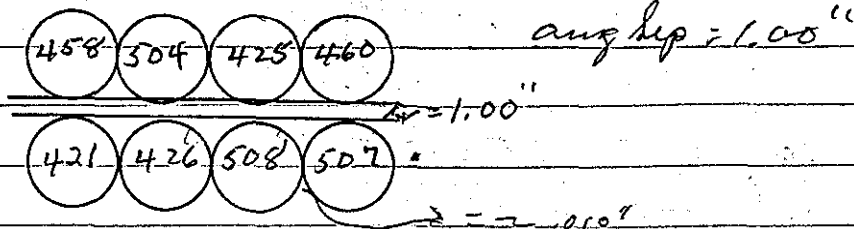
1513 Water ht = 93.10 cm Water Temp $^{\circ}\text{C}$
 System slightly sub critical $z_1 = 29.2$
 (3) Per $z_2 = 24.7$
 $c = -239.03 \text{ m} = -6.5 \text{ f}$

1520 Drain.

50
4-4-66

~~50~~ Now have 2 x 4 array elements separated by
0800 1.00" plastic spacers. As shown below.

Assay



INSTRUMENT CHECK

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

091

09

START-UP CHECK LIST

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

Instruments in trip circuit: K-1-2 P-M-1-2

Red light on by AKH Time 0805

Start-up OK'd by F.D.C. AKH Date 4-4-66

Wave array shown on page 50. 2x4 array with 1.0" separation.

Water ht = 48.10 cm

System just critical
Drain

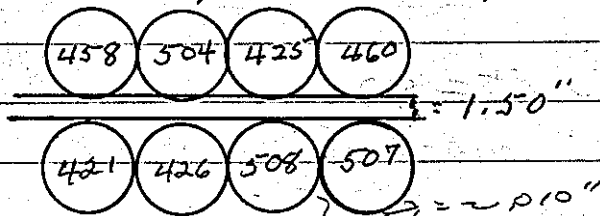
Water Temp °C

#1 = 24.0

2 = 24.0

0910

New home 2x4 array 8 elements separated by 1.00" and .50" plastic spacers. Separation = 1.50"



0925

Water ht = 73.40 cm $\Delta h = 1.50$

Water Temp °C

+ Pres

#1 = 24.0

$C = 96.70 \text{ cm} = 10.1 \text{ f} = 6.7 \text{ f/cm}$

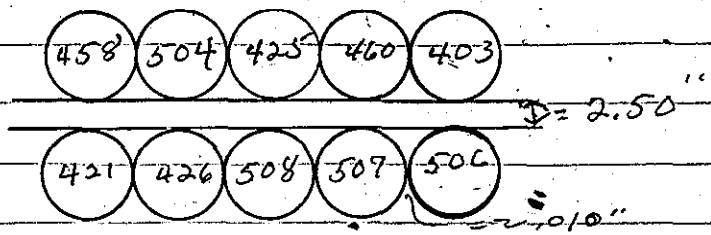
2 = 24.0

0930

Water ht = 71.90 cm

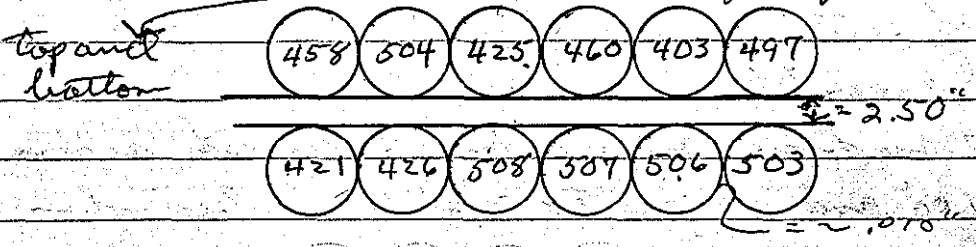
System just critical
Drain

10:30 now have 2x5 array 10 elements separated by 5 plastic spacers ^{top and bottom} .50" thick. Separation = 2.50" 12:30



10:45 Water ht = 93.10 cm Water Temp °C = 1 = 24.0 12.9
 System very sub critical
 Drain. 2 = 24.0

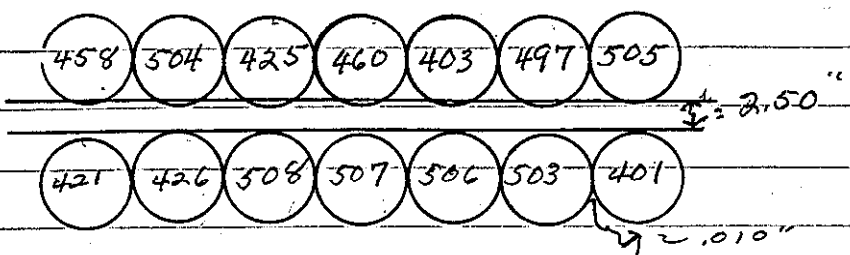
11:00 now have 2x6 array 12 elements separated by 5 plastic spacers, .50" thick - (avg. separation = 2.50") 12:5



11:25 Water ht = 93.30 cm Temp °C #1 = 24.0 13:3
 System sub critical
 Drain. 2 = 24.0

13:30

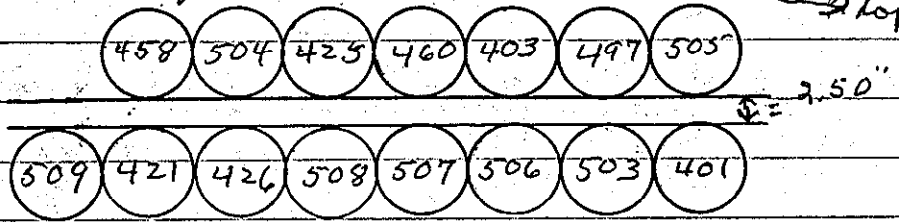
12:30 now have 2 x 7 array 14 elements separated by 5 plastic spacers .50" thick - Org. separation = 2.50" top and bottom



12:46 Water ht = 93.50 cm Water Temp °C
 - Pen #1 = 29.0
 $\tau = -135.81 \text{ sec} = -14.2 \phi$ #2 = 29.0

12:55 Drain

13:15 now have 15 elements as shown below. Elements separated by 5 plastic spacers .50" thick. Org. Sep: 2.50" top and bottom



13:32 Water ht = 78.10 cm. $D_4 = 3.25 \text{ cm}$ Water Temp °C
 + Pen #1 = 29.0
 $\tau = 52.24 \text{ sec} = 15.9 \phi = 4.9 \text{ Ham.}$ #2 = 29.2

13:36 Water ht = 74.95 cm
 System just critical Drain.

0805

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|-----------------------|-------------------|---------|-----------------|-----|------------------------|
| K-13 | 10 ⁻¹² | Meter ✓ | 2" | ✓ | 10 X 10 ⁻¹² |
| " | " | Fast ✓ | " | ✓ | " |
| K-2 | " | Meter ✓ | " | ✓ | " |
| " | " | Fast ✓ | " | ✓ | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700 V | Alarm ✓ | cont | ✓ | 500 V |
| PM-3 | 1200 V | Low ✓ | 12" | ✓ | 900 V |
| " | " | Alarm ✓ | 3" | ✓ | " |
| LOG N CALIBRATE | | ✓ | OPERATE | ✓ | SOURCE No. A-80 |
| DUMP WELL PROBE LIGHT | | ✓ | | | |

3.00

083

08

START-UP CHECK LIST

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

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

Red light on by AKH Time 0805

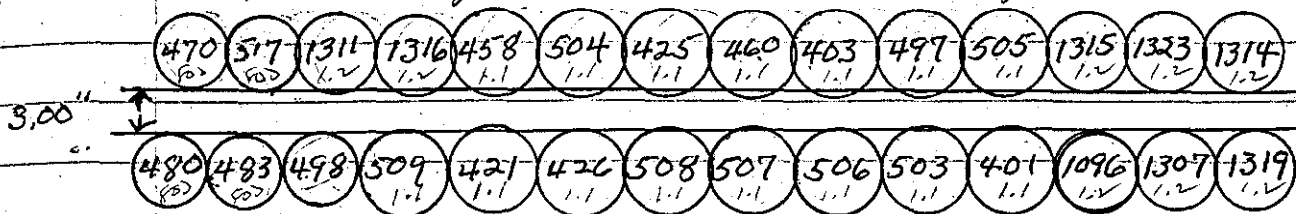
Start-up OK'd by F.I.C. AKH Date 9-5-66

094

100

top + bottom
↑

0805 New bore 28 elements separated with 1 plastic spacer
3" wide. All elements 3" separation from side to side,
only one way, as shown below. Avg. sep. = 3.00"



485

800 897.6

0835 Water ht = 95.20 cm

Temp C°

- Pres.

1 = 29.0

t = - 81.5 sec

2 = 29.0

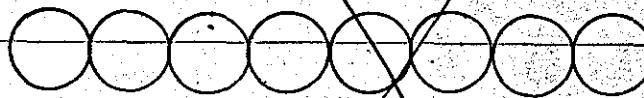
0840 Drain.

0945 Same array as above. Side-side
separation of all units now = 2.92" in.

1007 Water ht = 75.35 cm

System just Critical
Drain.

4/5/6
1300



14

15

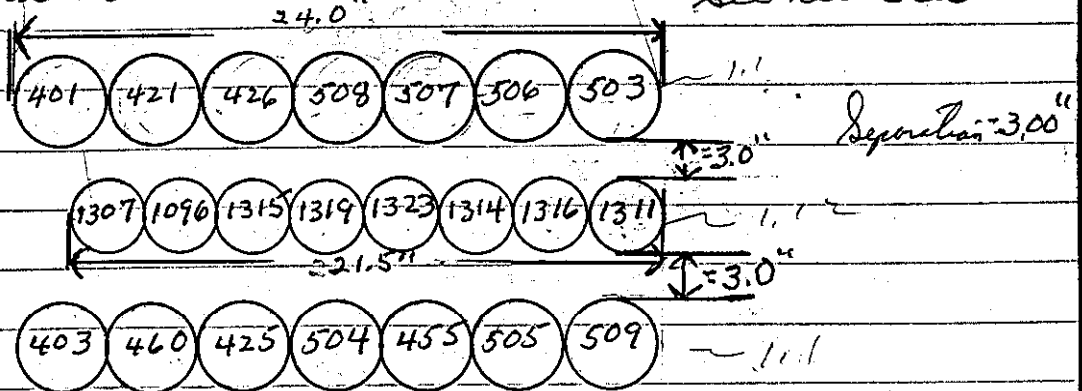
15

15

15

4/5/66
1300

new have 22 element array. Elements are 57
class as possible ^{one} ~~each~~ way and separated at
top and bottom by 3" plastic spacer. The array may
see below



Water ht = 57.70 cm
System just critical
Drain.

Temp $^{\circ}$
#1 = 29.0
2 = 29.2

14445 Same array as above except separation
now is 3.50"

Separation = 3.50"

1500 Water ht = 95.10 cm
System sub critical
Drain.

Water Temp $^{\circ}$
#1 = 29.2
#2 = 29.2

1525 Same array as above, except separation
of rows now = 3.20"

Separation = 3.20"

1541 Water ht = 95.10 cm $h = 14.05$ cm Temp $^{\circ}$
+ Pres $E = 183.62$ cm = 6.04 = .43 $\frac{1}{cm}$

#1 = 29.2
2 = 29.2

1550 Water ht = 81.05 cm
System just critical; Drain.

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|-----------------------|-----------------------|---------|-----------------|-----|------------------------|
| K-1 | 3 X 10 ⁻¹² | Meter ✓ | 2" | ✓ | 10 X 10 ⁻¹² |
| " | " | Fast ✓ | " | ✓ | " |
| K-2 | " | Meter ✓ | " | ✓ | " |
| " | " | Fast ✓ | " | ✓ | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700 V | Alarm ✓ | cont | ✓ | 500 V |
| PM-2 | 1200 V | Low ✓ | 12" | ✓ | 900 V |
| " | " | Alarm ✓ | 8" | ✓ | " |
| LOG N CALIBRATE | | ✓ | OPERATE | ✓ | SOURCE No. B-80 |
| DUMP WELL PROBE LIGHT | | ✓ | | | |

START-UP CHECK LIST

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

Instruments and safeties checked and reset by AKK

Source in checked by AKK Source No. 19-43

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

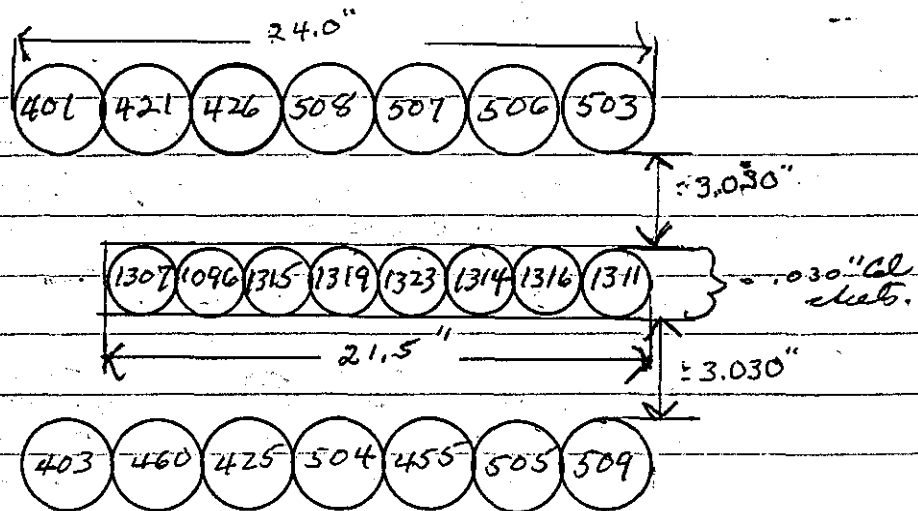
Instruments in trip circuit: K-1-2 PM-1-2

Red light on by AKK Time 1005

Start-up OK'd by F.D.C. AKK Date 4-6-66

1005

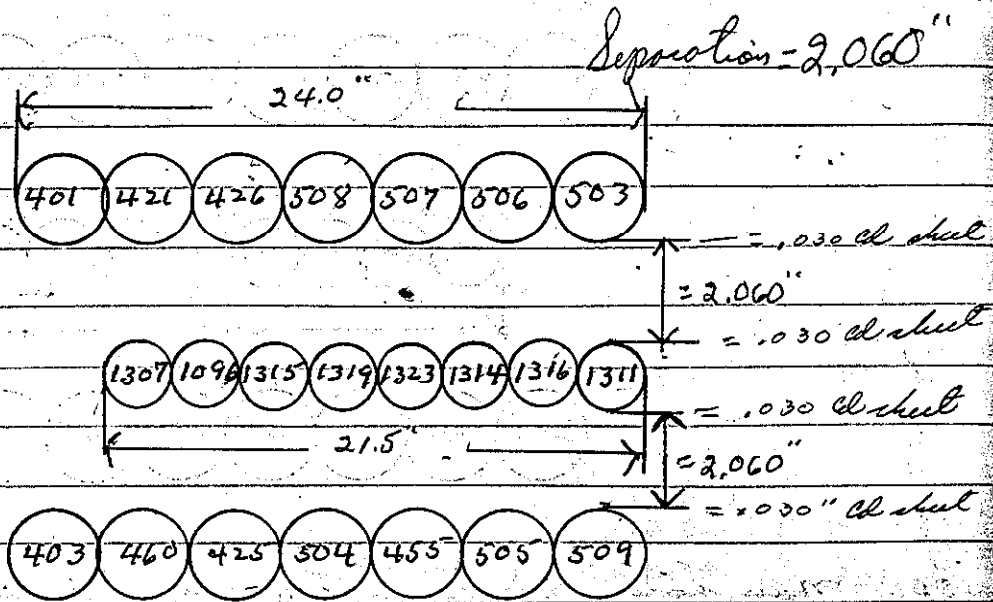
1030



1005 new home 22 element array. Elements as close as possible one way and separated at top and bottom by 3.0" plastic spacers the other way. The center row has a sheet of Cd, on each face dimensions $30 \text{ mil} \times \frac{21.5}{21.5} \times 31$ " See diagram above.

1030 Water ht = 95.00 cm
 System sub critical
 Drain

Temp °
 $H_1 = 29.0$
 $H_2 = 29.0$



13:30

13:50

14:15

11:00

Now have 22 unit array. Elements as close as possible one way. Separated at top and bottom by 2.0" plastic spacers the other way. Center row has a sheet of Cd on each face (30 mil x ~~24~~^{21.5} x 31"). The 2 outside rows has a sheet of Cd on one face (30 mil x 24 x 29").

14:28

Water ht = 96.30 cm

Temp =

System very sub-critical
 Drain

#1 = 24.2

#2 = 24.2

13:00

Same array as above except separation now = 1.060"

Separation = 1.060"

Water ht = 95.60 cm

Water Temp.

System sub-critical
 Drain

#1 = 24.2

#2 = 24.2

13:30 now have same array as on opposite page⁽⁶⁰⁾
 Except separation = .5060"
 .560" Separation = .560"

13:50 Water ht = 63.75 cm
 System just critical
 Drain.

14:15 Now have same array as on opposite
 page(60) except separation now = .660"
 Separation = .660"
 .660"

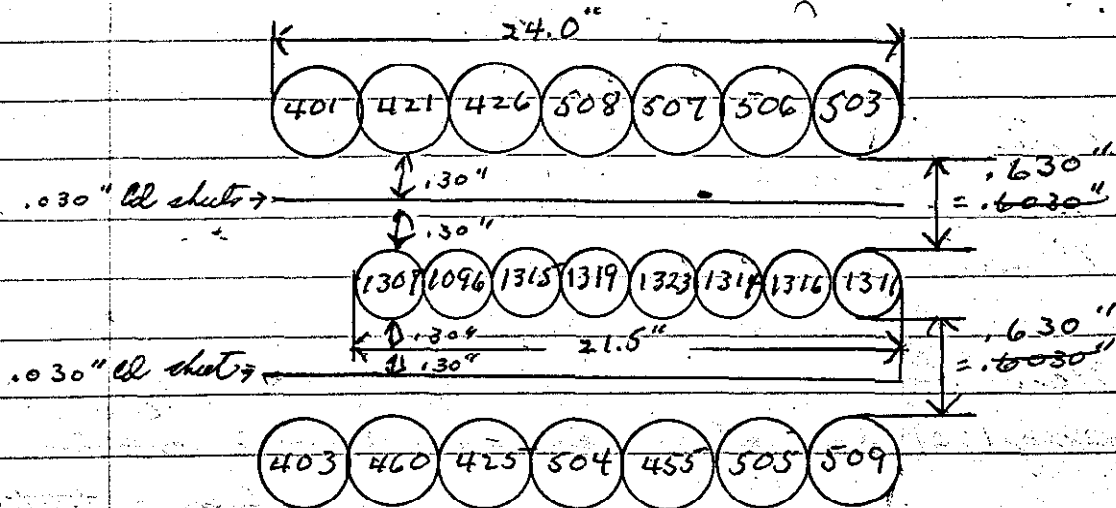
14:28 Water ht = 95.00 cm

Water Temp. °C

System very sub critical
 Drain.

$T_1 = 29.2$

$T_2 = 29.2$



1500 now have 22 unit array. Elements close as possible one may be separated at top and bottom by .60 plastic spacers the other way. Have 2 sheets of plastic (30 mil x 24" x 29") in center of rows as shown above

Water ht = 42.50 cm

Separation: $.6030$ "
 $.630$ "

System just critical

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|-----------------------------|-----------------------|---------|-----------------|-----|------------------------|
| K-1 | 3 X 10 ⁻¹² | Meter ✓ | 2" | — | 10 X 10 ⁻¹² |
| " | " | Fast ✓ | " | — | " |
| K-2 | " | Meter — | " | — | " |
| | | Fast — | " | — | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700 V 500 V | Alarm ✓ | Cont | — | 500 V |
| PM-2 | 1200 V 900 V | Low ✓ | 12" | — | 900 V |
| " | " | Alarm ✓ | 3" | — | " |
| LOG N CALIBRATE | | ✓ | OPERATE | ✓ | SOURCE No. 13-80 |
| DUMP WELL PROBE LIGHT _____ | | | | | |

START-UP CHECK LIST

Equipment checked by AKV Personnel check by ZIC
 Instruments and safeties checked and reset by AKV
 Source in checked by AKV Source No. M-43
 Emergency equipment in control room checked by EIO.C
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by AKV Time 0805
 Start-up OK'd by ZIC AKV Date 4-7-66

0805 now how same array as on opposite page (62) Except separation now: 8030"
 830"

Separation: 8030
 corr. 830"

0828 Water ht = 46.10 cm
system just critical
Drain

10:30

0900 now have same array as on page 62.
Except separation now = $\frac{1.230''}{1.2030''}$
Separation = $\frac{1.2030''}{1.230''}$

105E

1056

0922 Water ht = 60.30 cm
system just critical
Drain

Water Temp °
#1 = 23.5
2 = ~~24.2~~

0950 now have same array as on page 62.
Except separation now = 1.380''
Separation = 1.380''

22
62

1006 Water ht = 66.00 cm
system just critical
Drain

Temp °
#1 = 29.2
2 = 29.2

note

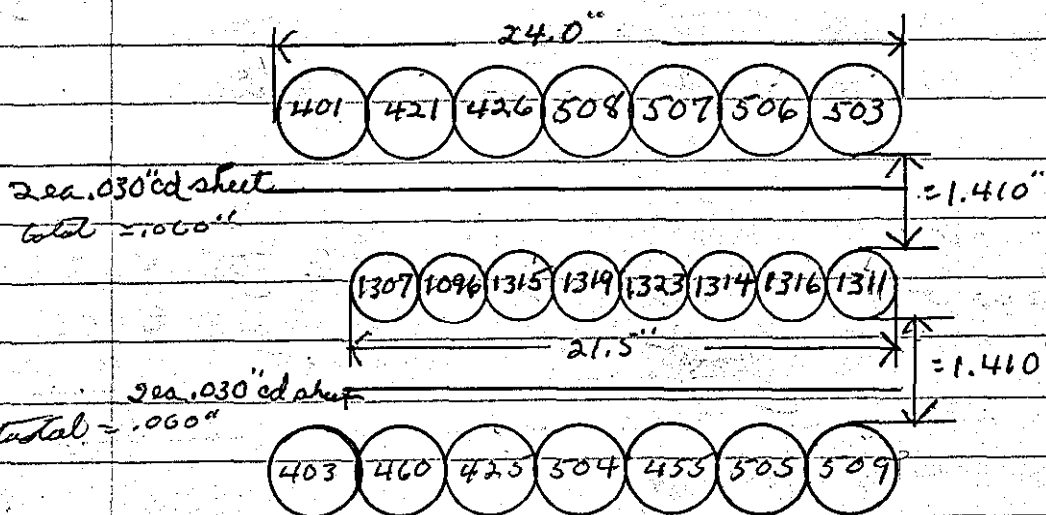
1445

150

10:30 Now how some array as on page 62,
 Except separation now = ~~1.580~~ 1.580
 Separation = 1.580"

10:50 Water ht = 95.20 cm Temp °C
 System slightly sub critical H₁ = 24.2
 + Per z = 24.2
 $\tau = -142.3 \text{ m} = -13.2 \text{ f}$

10:56 Drain.



1445 Now 22 unit array, elements close as possible one way
 separated at top and bottom with plastic spacers 1.350"
 and 2 sheet of Cd. .030" the other way. Cd. sheets in center
 of rows as shown above. Separation = 1.410"

1500 Water ht = 99.00 cm D_h = 1.90 cm. Temp °C
 + Per H₁ = 24.2
 $\tau = 95.61 \text{ m} = 10.2 \text{ f} = 5.4 \text{ f/cm}$ z = 24.2

over.

1505
~~730~~ Water ht = 77.10 cm
 System just critical
 Drain.

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|-----------------------|---------------------|---------|-----------------|-----|----------------------|
| K-1 | 3×10^{-12} | Motor ✓ | 2" | ✓ | 10×10^{-12} |
| " | " | Fast ✓ | " | ✓ | " |
| K-2 | " | Mefer ✓ | " | ✓ | " |
| " | " | Fast ✓ | " | ✓ | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700V | Alarm ✓ | cont | ✓ | 500V |
| PM-2 | 1200V | Low ✓ | 12" | ✓ | 900V |
| " | " | Alarm ✓ | 3" | ✓ | " |
| LOG N CALIBRATE | | ✓ | OPERATE | | ✓ |
| DUMP WELL PROBE LIGHT | | ✓ | SOURCE No. | | B-80 |

START-UP CHECK LIST

Equipment checked by AKM Personnel check by F.P.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.P.C.
 Instruments in trip circuit: K-1-2 K-9-1-2
 Red light on by AKM Time 0815
 Start-up OK'd by F.P.C. AKM Date 4-11-60

Same array as shown on page 65. Except center now now centered length ways between the two outer rows. Separation 1.410"

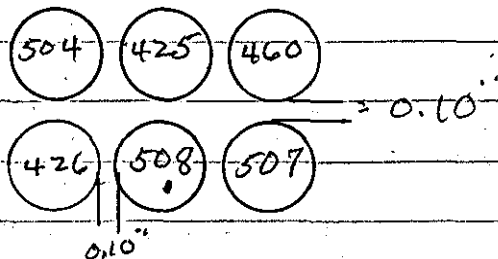
0853 Water ht = 76.80 cm $h_1 = .60 \text{ cm}$ Water Temp °C
 + Per $T_1 = 24.0$
 $t = 210.75 \text{ mm} = 5.34 = 8.18 \text{ / cm.}$ $T_2 = 24.0$

0858 Water ht = 76.20 cm
 System just critical
 Drain

68

4/11/66

1400 now have 6 Elements separated by 0.10" plastic spacers as shown below



1416 Water ht = 73.40 cm $d_h = 1.50$ cm Water Temp $^{\circ}$ C
 $^3 + \text{Per}$
 $C = 126.03 \text{ m} = 8.24 = 5.5 \text{ f/cm}$
 #1 = 24.0
 2 = 24.0

1423 Water ht = 71.90 cm
 System just critical
 Drain

1440 Same array as above except separation of units now = 0.20"

1456 Water ht = 79.60 cm $d_h = 3.50$ Temp $^{\circ}$ C
 $^3 + \text{Per}$
 $C = 97.78 \text{ m} = 10.8 \text{ f} = 2.9 \text{ f/cm}$
 #1 = 24.0
 2 = 24.0

1501 Water ht = 76.10 cm
 System just critical
 Drain

15:40 Same array as on page 68 except
average separation now ~ 10 mil

15:53 Water ht = 72.40 cm. $\Delta h = 1.30$ cm. Water Temp °C
 + Per $H_1 = 24.0$
 $S = 124.95 \text{ m} = 8.3 \text{ f} = 6.4 \text{ f/cm}$ $H_2 = 24.0$

16:03 ^{71.10} Water ht = 71.15 cm
 System just critical
 Drain

INSTRUMENT CHECK

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

LOG-N CALIBRATE _____ OPERATE _____ SOURCE No. D-80

DUMP WELL PROBE LIGHT _____

START-UP CHECK LIST

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

Instruments and safeties checked and reset by AKL

Source in checked by AKL Source No. M-43

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

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

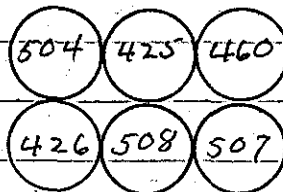
Red light on by AKL Time 0800

Start-up OK'd by I.D.C AKL Date 9-12-66

(Repeat)

0810

Same array as on page 69. Avg. Sep. = 70 mil



0825

Water ht = 72.90 cm $D_h = 1.80$ cm

Temp °C

(1) T_{fw}

$T_1 = 24.0$

$E = 85.83 \text{ sec} = 11.14 = 6.2 \text{ ft/cm}$

$T_2 = 24.2$

0830

Water ht = 71.10 cm

System just critical
Drain

0920 After rotating ^{elements} 90° repeating same array as on page 70.

0930 Water ht = 74.05 cm $D_4 = 2.40$ cm.
(24 per)

$$T = 72.80 \text{ sec} = 12.6 \text{ } \cancel{f} = 5.3 \text{ } \cancel{f}/\text{cm}$$

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

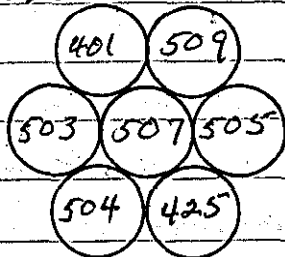
$$T_1 = 29.0$$

$$T_2 = 29.2$$

0944 Water ht = 71.65 cm
System just critical
Down

(Repeat Page 33)

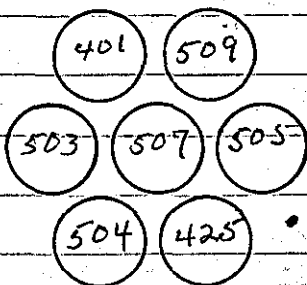
1100 Triangular array 7 elements close together as possible as shown below. Avg. separation = 45 mil



1115 Water ht = 37.65 cm
System just critical
Down

(Repeat Page 35)

1300 † triangular array 7 elements. separated by
0.100" plastic spacers. Measured avg. Sep. = 0.65" 14



Water ht = 39.85 cm
system just critical
Drain. 15

1330 Same array as above except
elements now separated by 0.300"
plastic spacers.
measured avg. Sep. = 1.050" 15

1356 Water ht = 50.30 cm
system just critical
Drain.

Temp =

T₁ = 29T₂ = 29.20

1453 Same array as on page 72. Elements separated by
0.500" plastic spacers.

Measured avg gap = 1.30"

1511 Water ht = 95.15 cm

Water Temp °C

System slightly sub critical
(3) Pe

$T_1 = 24.2$

$T_2 = 24.2$

$t = -484.58 \text{ sec} = -2.9 \text{ \textcircled{f}}$

1519 Drain.

INSTRUMENT CHECK

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

START-UP CHECK LIST

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

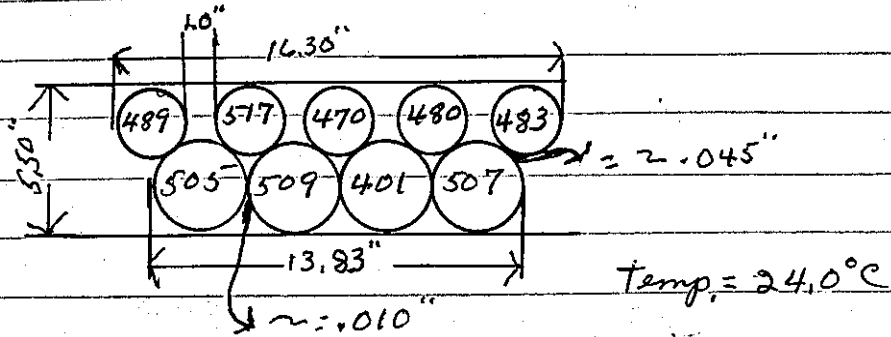
Instruments in trip circuit: K-1-2 PM-1-2

Red light on by AKH Time 1315

Start-up OK'd by F.D.C. AKH Date 4-14-66

Fred rate = 3.0 cm/min. Top of fuel = 16.85 cm.
 $\frac{1}{2}$ drain = 9.8 cm/min. 24.10 cm on mirror scale =
 3" dump = 40.6 cm/30 sec. 7.25 cm above top of fuel on
 0 Zero on mirror scale = 16.51 cm down from top of fuel.

1500 Array now in small reflector tank
 (37.75" ID. x 35.63" High) Array on 3" plastic table.
 Array shown below.



1532 Water ht = 8.60 cm = 8.25 cm below top of post. 9th check with in
 system just critical Drain. 35 cm of 9th on bottom of page 38.

of minimum
 cal =
 m of

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|---------------------|---------|-----------------|-----|---------------------|
| K-1 | 3×10^{-12} | Meter ✓ | 2" | ✓ | 3×10^{-12} |
| " | " | Port ✓ | " | ✓ | " |
| K-2 | " | Meter ✓ | " | ✓ | " |
| " | " | Port ✓ | " | ✓ | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 500V | Alarm ✓ | cont | ✓ | 500V |
| PM-2 | 1200V | Low ✓ | 12" | ✓ | 900V |
| " | " | Alarm ✓ | 3" | ✓ | " |

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

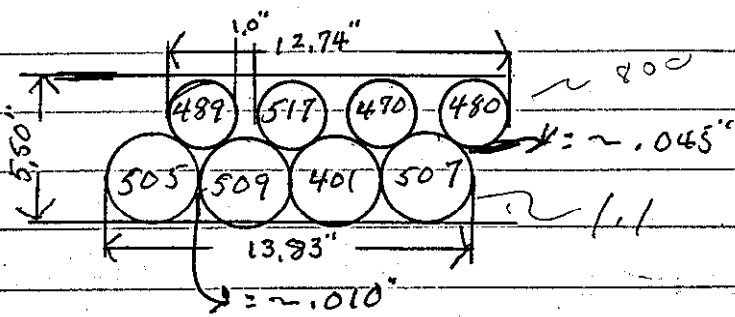
START-UP CHECK LIST

Equipment checked by AKW Personnel check by F.D.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 F.D.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by AKW Time 1500
 Start-up OK'd by F.D.C. AKW Date 4-15-66

(Array in solution in small reflector tank)
 $\sim 4.0 \text{ g/l}$

4-15-66

added 6,725 cc of solution ($\text{Co}_2(\text{NO}_3)_2 \sim 412 \text{ g/l}$)
 to reflector water. Volume of reflector tanks
 $\sim 690 \text{ l}$. This gives $\sim 4.0 \text{ g/l}$.



Now have array as shown above 8 elements.
 array above sub-critical in H_2O . (see page 38)

1530 Solution ht $\sim 1/2$ up elements; Drain for
 riping.

1546 Septer just critical. H_2O Temp $^{\circ}\text{C}$
 $\text{H}_1 = 25.0^{\circ}\text{C}$
 Solution ht = 45.5 cm = 28.60 cm below top of fuel $\text{H}_2 = 24.5^{\circ}\text{C}$
 (solution ht was not on scale, measure solution ht
 measurement made by measuring solution marks in
 reflector tanks.)

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|-----------------------|---------|-----------------|-----|-----------------------|
| K-1 | 3 X 10 ⁻¹² | Meter ✓ | 3" | ✓ | 3 X 10 ⁻¹² |
| " | " | Fast - | " | - | " |
| K-2 | " | Meter - | 4" | ✓ | " |
| " | " | Fast - | " | - | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700 V | Alarm - | Cont | - | 5000 |
| PM-2 | 1200 V | Low - | 12" | - | 9000 |
| " | " | Alarm - | 2" | ✓ | |

LOG N CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by RMF Personnel check by AKK

Instruments and safeties checked and reset by AKK

Source in checked by AKK Source No. M-43

Emergency equipment in control room checked by AKK

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

Red light on by AKK Time 0810

Start-up OK'd by D.C. AKK Date 4-18-66

0800 Removed element # 505 from array shown
on page 77.

0848 solution ht = $56.32 \text{ cm} = 17.78 \text{ cm}$ below top
system just critical of fuel.
Drain

Temp °C

#1 = 24.2

#2 = 24.5

Solution sample taken.
Two held for later.

| | |
|-------------------------|-------------|
| #1. Reg # 684498 - 7-12 | A-613 |
| G = 74.54 g | #2 X-10 |
| T = 20.02 | C = 88.52 g |
| N = 54.52 | T = 20.20 |
| | N = 68.32 |

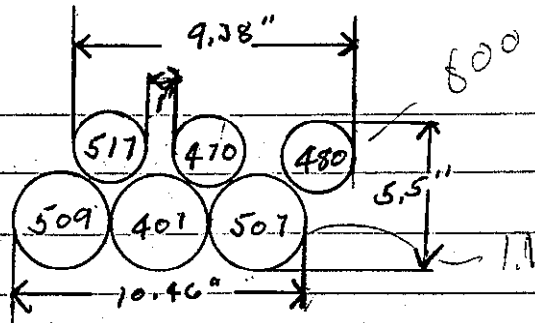
orb for.

$$\begin{aligned}
 1 &= g/g = 1.004284 \\
 2 &= sp. gr. = 1.0022 \\
 3 &= Temp. @ 26.5 \\
 &= 4.298\% \times 92.16\% \\
 &= 3.972\%
 \end{aligned}$$

$$\text{avg} = 92.46.$$

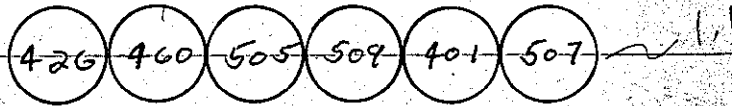
alb for.

$$\begin{aligned}
 1 &= g/g = 1.00286 \\
 2 &= sp. gr. = 1.0045 \\
 3 &= density = 1.0029 \\
 4 &= Temp. @ 21.5 \\
 &= 4.298\% \times 92.16\% \\
 &= 3.972\%
 \end{aligned}$$



1037 Solution $ht = 24.10 \text{ cm}$ (7.25 cm above top of fuel) $T_{exp} \text{ } ^\circ\text{C}$
 System sub critical $\beta_1 = 24.5$
 - Per $\alpha = 24.7$
 $\tau = -106.48 \text{ sec} = -23.5 \text{ f}$

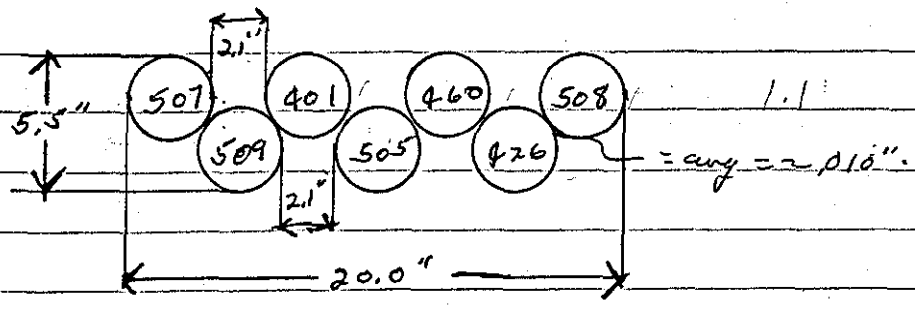
1042 Drain



Have six elements in line. Separation = .010" close as possible.

1313 Solution $ht = 24.10 \text{ cm}$ ^{7.25 cm above top of fuel} $T_{exp} \text{ } ^\circ\text{C}$
 System sub critical $\beta_1 = 24.7$
 Drain $\alpha = 24.9$

$K_1 = 3 \times 10^{-12}$ (25%)
 $K_2 = 3 \times 10^{-12}$ (20%)
 $\beta_1 = 0.0015$



Tag $\eta = .011$ same as
 $= 7.29$ cm above top of fuel
 Temp $^{\circ}$

1555 Solution $ht = 24.10$ cm

system sub critical

$k_1 = 25.0$

4.5

Per

$k_2 = 24.9$

4.7

There was some multiplication, but not enough to cause the k_{eff} upon removing source. Multiplication was enough to say that it would be critical.

1558 Drossis -

10"
 5%
 2%

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|-----------------------------|-----------------------|---------|-----------------|-----|-----------------------|
| K-1 | 3 X 10 ⁻¹² | Meter ✓ | 2" | ✓ | 3 X 10 ⁻¹² |
| " | " | Fast ✓ | " | ✓ | " |
| K-2 | " | Meter ✓ | 2" | ✓ | " |
| " | " | Fast ✓ | " | ✓ | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700 V | Alarm ✓ | cont | ✓ | 5002 |
| PM-2 | 1200 V | Low ✓ | 12" | ✓ | 9000 |
| " | " | Alarm ✓ | 2" | ✓ | " |
| LOG N. CALIBRATE | | ✓ | OPERATE | ✓ | SOURCE No. B-60 |
| DUMP WELL PROBE LIGHT _____ | | | | | |

START-UP CHECK LIST

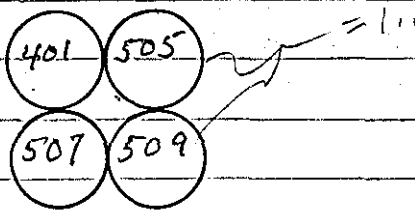
Equipment checked by AKC Personnel check by F.D.C
 Instruments and safeties checked and reset by AKC
 Source in checked by AKC Source No. M-43
 Emergency equipment in control room checked by F.D.C
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by AKC Time 0855
 Start-up OK'd by F.D.C AKC Date 4-19-66

09

09

13

1

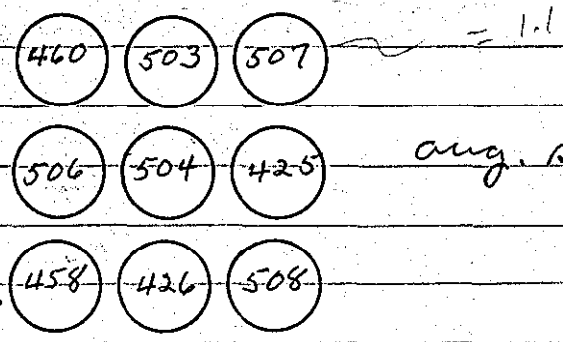


0900 new home 4 elements as close together as possible. Avg. separation = ~ 0.10 mil

Tag 1 = .0013
same in.

0943 Solution ht = ^{4/16} 29.10 cm. Temp °C
 System sub critical. #1 = 29.8
 Very little multiplication: 2 = 25.0
 Drain.

1330 New home 3x3 array separated by 1.0" and 0.030" plastic spacers. Avg. separation = 1.30"



avg. separation = 1.30"

1350 Solution ht = ^{4/16} 46.16 cm. ^{27.99 cm} below tag Temp °C
 System just critical of fuel. #1 = 29.8
 Drain. 2 = 29.2

3 x 3 array 1.1 kg elements.

1500

Same array as on bottom of page 83
 E. sept separated by 1.0" and .50" plastic spacers
 Avg. separation = 1.50"

1520

Solution ht = 56.59 cm ⁴⁴ = 17.51 cm down from
 system just critical. top of fuel.
 Drain.

INSTRUMENT CHECK

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

START-UP CHECK LIST

Equipment checked by R.H.H. Personnel check by E.D.C.

Instruments and safeties checked and reset by R.H.H.

Source in checked by R.H.H. Source No. 1M-43

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

Instruments in trip circuit: 11-1-2 PM-1-2

Red light on by R.H.H. Time 0920

Start-up OK by E.D.C. R.H.H. Date 4-20-66

Same array as shown on bottom of page 83
 Separation now ^{avg} 1.80". Separation made with
 18.50" and .30" plastic spacers.

avg separation = 1.80"

0900 Solution ht = 24.10 cm. = 7.24 cm above top of fuel.
 System sub critical. $\log n = -1.0036$
 Drain.

Temp °C
 #1 = 24.8
 2 = 25.0

1000 Same as above. avg separation now = 1.70"

Solution ht = 24.00 cm? $\log n = -1.012$ Temp °C
 System sub critical

#1 = 25.0
 2 = 25.0

avg

3 x 3 mm 1.1 kg element.

Some error described on page 85 + 83.

Aug separation now = 1.60"

1.327 Solution ht = 8.50 cm = 8.35 cm below top of fuel.
 System just critical. $\theta = 4/4 = 65.75^\circ$ Temp $^\circ$
 Drain. $\theta 1 = 25.0^\circ$
 $\theta 2 = 25.0^\circ$

4/20/66

4/20/66

$\sim 8.0 \text{ g/l}$

1500 added 6.725 cc of solution at 1500.
 and mixed solution until 1600.
 This gives $\sim 8.0 \text{ g/l}$.

4-21-66 ~ 8.09⁴²l

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|-----------------------------|----------------------|-----------|-----------------|-----------------|-----------------------|
| K-1 | 3 110 ⁻¹² | Meter ✓ | 2" | ✓ | 3 x 10 ⁻¹² |
| " | " | Fast ✓ | " | ✓ | " |
| K-2 | " | Meter ✓ | " | ✓ | " |
| " | " | Fast ✓ | " | ✓ | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700V | Alarm ✓ | Cont | ✓ | 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 AKR Personnel check by FIDC

Instruments and safeties checked and reset by AKR

Source in checked by AKR Source No. M-23

Emergency equipment in control room checked by FIDC

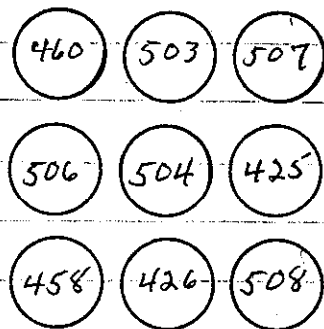
Instruments in trip circuit: K-1-2 PM-1-2

Red light on by AKR Time 8900

Start-up OK'd by FIDC AKR Date 4-21-66

(OVER)

0915 Now have 3 x 3 array separated by using plastic strips which = 1.90"



0950 Solution ht = $42.98 \text{ cm} = 31.12 \text{ cm}$ down from top of $\text{Temp. } 0^\circ \text{C}$
 System just critical. Fuel. #1 = 25.0
 Oper. #2 = 24.5

1050 Same as above: Separation row = 2.30"

1115 Solution ht = $51.56 \text{ cm} = 22.54 \text{ cm}$ down from top of fuel. $\text{Temp. } 0^\circ \text{C}$
 System just critical #1 = 25.2
 #2 = 25.5

1300 Same as above: Separation row = 2.50"

1325 Solution ht = 0.35 cm \rightarrow c/h = 51.60 cm $\text{Temp. } 0^\circ \text{C}$
 System just critical = marking on mirror scale #1 = 25
 Oper. #2 = 25

1410 Same as shown on page 88. Separation now = 2.80"

$D_h = 1.40 \text{ cm}$

1490 Solution ht = 20.10 cm

+ Per.

$C = 93.44 \text{ mm} = 10.44 = 7.44 \text{ cm.}$

Temp 2

1448 Solution ht = 18.70 cm ^{4h = 75.95 cm} _{= 1.85 cm top reference.} #1 = 25.5
#2 = 25.5

System just critical
D. vis.

1500 Solution samples taken: two for now. and two held for later.

7-12 Reg # 684499.

sub for.

1. $\rho/\rho = .008572$

2. $\rho/\rho = 1.0083$

3. Temp. = 25.4°C

#1 $C = 93.3$

$T = 19.0$

$N = 64.3g$

3-1511

7-10 A-614

Sponge "Dilas"

3:1 559 sub for

1. $\rho/\rho = 8.689 \text{ mg/ml}$

2. $\rho/\rho = 1.0111$

3. Density = 1.0085

4. Temp. = 23.5°C

#1A $C = 76.7$

$T = 18.8$

$N = 57.9g$

$8.648 \text{ g/l} \times 92.6\%$

$= 8.00 \text{ g/l}$

$= 9.698 \text{ g/l} = 8.052 \text{ g/l}$

5.2

5.5

0

1 = 25

2 = 25

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE D. RANGE | SET | START-UP RANGE |
|-----------------------|-----------------------|---------|--------------------|-----|-----------------------|
| K-1 | 3 x 10 ⁻¹² | Meter ✓ | 2" | ✓ | 3 x 10 ⁻²² |
| " | " | Fast ✓ | " | - | " |
| K-2 | " | Meter ✓ | " | - | " |
| " | " | Fast ✓ | " | - | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700 V | Alarm ✓ | cent | - | 500 V |
| PM-2 | 1200 V | Low ✓ | 10" | - | 900 V |
| " | " | Alarm ✓ | 2" | - | " |
| LOG-N CALIBRATE | | ✓ | OPERATE | ✓ | SOURCE No. B-80 |
| DUMP WELL PROBE LIGHT | | | | | |

START-UP CHECK LIST

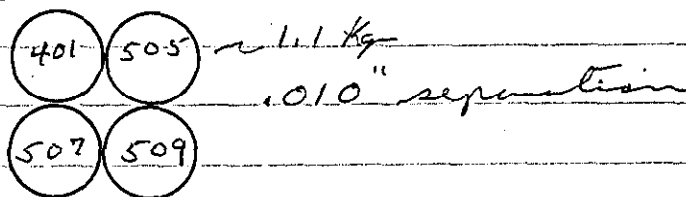
Equipment checked by AKV Personnel check by F.D.C.
 Instruments and safeties checked and reset by AKV
 Source in checked by AKV Source No. M-43
 Emergency equipment in control room checked by F.D.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by AKV Time 1040
 Start-up OK'd by F.D.C. AKV Date 4-22-66

1090 Purpose is to check + Per and critical ht shown on page 89. No changes made is okay. Hope to have a ~~lower~~ temp. lower solution temp.

1118 Solution ht = 20.05 cm. Temp °C
+ Per H₁ = 25.0
2 = 25.0

1127 Solution ht = 18.70 cm
hepton just critical
Draiss.

1310 now have 4 elements as close as possible
any separation = .010". ~~As shown below~~



1335 Solution ht = 46.16 cm = 27.94 cm down from top of fuel #1 = 25.2
Temp °C
hepton just critical 2 = 25.2
Draiss. X see bottom page 92

ans.

1400 same array shown on bottom page 91. 2×2 .
separation now = 0.20"

1430 solution ht = ^{4/4} 53.78 cm = 20.96 cm \checkmark Temp °C
system just critical down from top of fuel #1 = 25.2
Drain. 2 = 25.2

1500 same as above: separation now = 0.50"

1525 solution ht = ^{4/4} 55.64 cm = 18.93 cm \checkmark Temp °C
system just critical from top of fuel #1 = 25.5
Drain. 2 = 25.5

1548 same as above: separation ~~now~~ built to .010"
to recheck point:

1605 solution ht = ^{4/4} 53.78 cm = 20.32 cm \checkmark Temp °C
system just critical top of fuel. #1 = 25.5
after checking above: found error in 2 = 25.5
math with first point at .010"
when measuring down from top of tank

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|---------------------|---------|-----------------|-----|---------------------|
| K-1 | 3×10^{-12} | Motor - | 2" | ✓ | 3×10^{-12} |
| " | " | Fest - | " | - | " |
| K-2 | " | Motor ✓ | " | - | " |
| " | " | Fest ✓ | " | ✓ | " |

R-1

R-2

| | | | | | |
|------|--------|---------|------|---|------|
| PM-1 | 700 V | Alarm ✓ | cont | - | 5000 |
| PM-2 | 1200 V | Low ✓ | 10" | ✓ | 9000 |
| " | " | Alarm ✓ | 2" | - | " |

LOG N CALIBRATE ✓ OPERATE ✓ SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by AKV Personnel check by FIDC

Instruments and safeties checked and reset by AKV

Source in checked by AKV Source No. M-93

Emergency equipment in control room checked by FIDC

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

Red-light on by AKV Time 0815

Start-up OK'd by FIDC AKV Date 9-25-66

3,2
1,2

25.5
25.5

5.5
5.5

over

Same array as show on page 91. 2x2 array
separation now = .80"

0953 Solution ht = 2.0 cm. $\eta/h = 59.25 \text{ cm}$

System just critical

Drain

Temp °C

$T_1 = 24.5$

$T_2 = 24.5$

0915 Repeat of above, with making any changes.

0943 Solution ht = 2.0 cm $\eta/h = 59.25 \text{ cm}$

System just critical

Drain

Temp °C

$T_1 = 24.7$

$T_2 = 24.7$

1008 Same as above, separation now = 1.30"

1044 Solution ht = 24.20 cm. $\log \eta = .013$
 $\eta/h = 7.35 \text{ cm}$

System sub critical

- Per. = 290.0 sec.

above top of
fuel.

Temp °C

$T_1 = 25.0$

$T_2 = 25.0$

1048 Drain

1220 Same array: 2×2 .

Separation now = 1.20"

1300 Solution ht = 22.90 cm $h_1 = 3.05$ cm. Temp °C

+ Per.

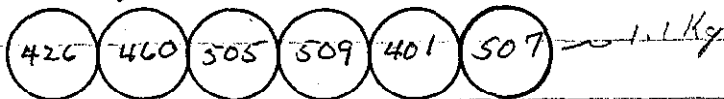
#1 = 25.0

$\tau = 106.48 \text{ sec} = 9.4\phi = 3.14/\text{cm}$.

2 = 25.0

1306 Solution ht = 19.85 cm $h_1 = 77.10$ cm
 System just critical $h_1 = 3.0$ cm above
 top of fuel.
 Drain.

1410 now have 6 elements in line, close to gather
 as possible. Avg. separation = .010"



1435 Solution ht = 4.30 cm $h_1 = 67.50$ cm
 $h_1 = 12.60$ cm down Temp °C
 System just critical, from top of fuel. #1 = 25.0
 Drain. 2 = 25.0

1500 Removed element # 507. from above. now have
 5 elements
 Solution ht = 24.10 cm $h_1 = 81.35$ cm. Temp °C
 $h_1 = 7.75$ cm above top
 - Per. Filed. #1 = 25.3
 $\tau = -209.69 \text{ sec} = -7.7\phi$ 2 = 25.0

1540 Drain.

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|-----------------------|---|-----------------|-------------------------------------|-----------------------|
| K-1 | 3 x 10 ⁻¹² | Meter <input checked="" type="checkbox"/> | 1" | <input checked="" type="checkbox"/> | 3 x 10 ⁻¹² |
| " | " | Fest <input checked="" type="checkbox"/> | 1" | <input checked="" type="checkbox"/> | " |
| K-2 | " | Meter <input checked="" type="checkbox"/> | 1" | <input checked="" type="checkbox"/> | " |
| " | " | Fest <input checked="" type="checkbox"/> | 1" | <input checked="" type="checkbox"/> | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700V | Alarm <input checked="" type="checkbox"/> | 10" | <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 OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

0900

09

094

START-UP CHECK LIST

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

Instruments and safeties checked and reset by AKH

Source in checked by AKH Source No. M-93

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

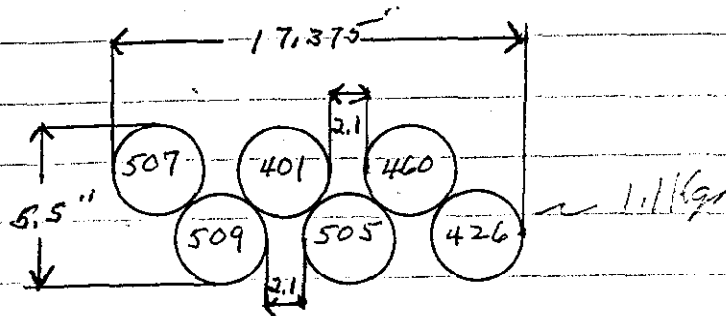
Instruments in trip circuit: K-1-2 PM-1-2

Red light on by AKH Time 0845

Start-up OK'd by F.D.C. AKH Date 4-26-66

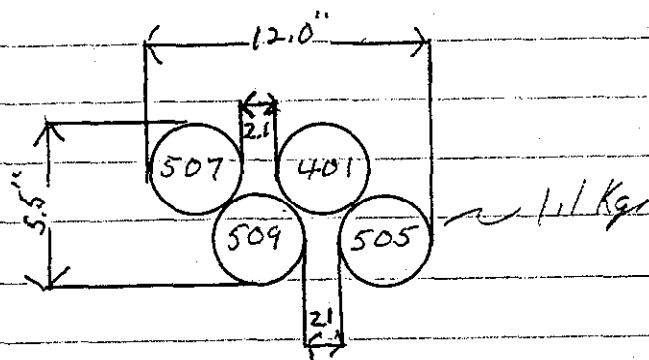
11

0960 now have 6 elements as shown below.



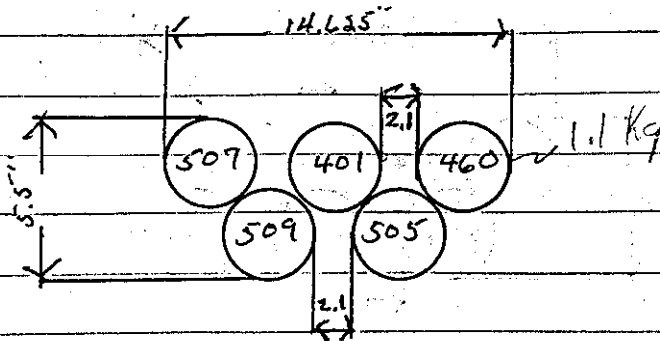
0919 Solution $h_t = 45.85 \text{ cm} = 28.25 \text{ cm}$ Temp $^{\circ}\text{C}$
 System just critical shown from $\beta = 2.5$
 Drain top of fuel $\alpha = 29.5$

0945 Have 4 elements as shown below.



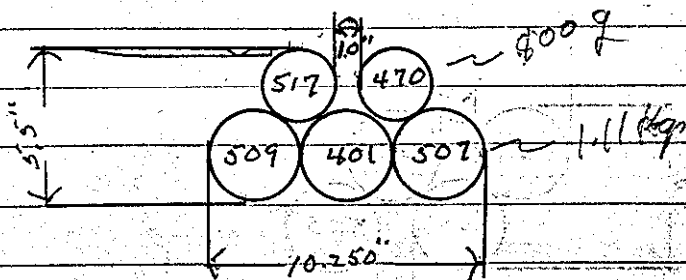
1017 Solution $h_t = 29.10 \text{ cm} = 7.25 \text{ cm}$ Temp $^{\circ}\text{C}$
 System sub critical shown $\beta = 25.0$
 Pen top of fuel $\alpha = 25.0$
 $\tau = \sim 88.0 \text{ sec.}$

10:45 Now have 5 elements as shown below.



1100 Solution $ht = 53.78 \text{ cm} = 20.32 \text{ cm}$ $T_{eq} = 0$
 System just critical down from top of feet $h = 25$
 Drain $z = 25$

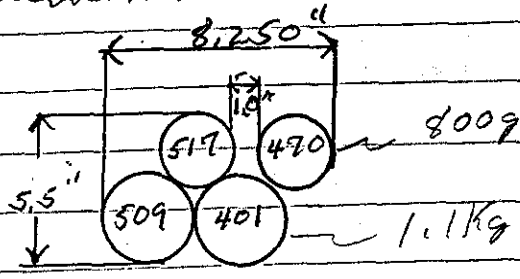
1225 Now have 5 elements as shown below.



1225 Solution $ht = 51.87 \text{ cm} = 22.23 \text{ cm}$
 System just critical down from top of feet.
 Drain

1300

Now have 4 elements as shown below...



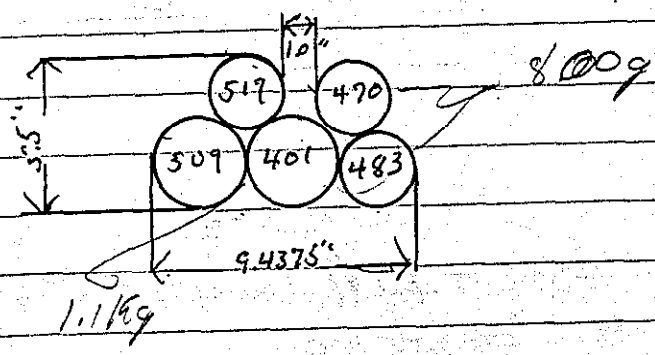
1330

$\sigma/\rho = 81.35 \text{ cm}$
 Solution $ht = 29.10 \text{ cm} = 7.25 \text{ cm}$ below top of fuel.
 System sub critical
 Drain
 $\#1 = 25.5$
 $\#2 = 25.5$

25.0
25.0

14:30

Now have 5 unit array as shown below.



1507

$\sigma/\rho = 60.40 \text{ cm}$
 Solution $ht = 3.15 \text{ cm} = 13.70 \text{ cm}$ below top of fuel.
 System just critical
 Drain
 $\#1 = 25.5$
 $\#2 = 25.5$

INSTRUMENT CHECK

0810

| INSTRUMENT | RANGE | TRIP | SOURCE RANGE | SET | START-UP RANGE |
|------------|---------------------|---------|--------------|-----|---------------------|
| K-1 | 3×10^{-12} | Meter ✓ | 1" | ✓ | 3×10^{-12} |
| " | " | Fast ✓ | " | ✓ | " |
| K-2 | " | Meter ✓ | 2" | ✓ | " |
| " | " | Fast ✓ | " | ✓ | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700V | Alarm ✓ | ent | ✓ | 500V |
| PM-2 | 1200V | Low ✓ | 10" | ✓ | 900V |
| " | " | Alarm ✓ | 2" | ✓ | " |

0848

LOG N CALIBRATE OPERATE SOURCE No. U-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by AKH Personnel check by Z.M.C.

Instruments and safeties checked and reset by AKH

Source in checked by AKH Source No. M-93

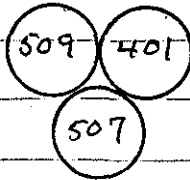
Emergency equipment in control room checked by Z.M.C.

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

Red light on by AKH Time 0805

Start-up OK'd by Z.M.C. AKH Date 4-27-66

0810 now have 3 elements as close together as possible
 As shown below. Avg. separation .010"



0848 Solution ht = 29.10 cm

$\log \eta = +0.16$

Temp °C

System sub critical.

$H_1 = 25.0$

Drain

$\rho = 25.0$

End Data
 summary

R-25 Cylinders
4.2 95 UFG

103

7/6/64

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|--------------------------|---------------------|-------------------|-----------------|-----|---------------------|
| K-1 | 3x15 ⁻¹² | Meter ✓ Fast ✓ | 4" | ✓ | 3x15 ⁻¹² |
| K-2 | 3x15 ⁻¹² | Meter ✓ Fast ✓ | ? | ✓ | 3x15 ⁻¹² |
| R-1 | — | | | | |
| R-2 | — | | | | |
| PM-1 | 2000 | Alarm ✓ | ? | ✓ | 5000 |
| PM-2 | 12000 | Low ✓ Alarm ✓ | ? | ✓ | 5000 |
| LOG IN CALIBRATE ✓ | | OPERATE ✓ | SOURCE No. B-80 | | |
| DUMP WILL FREE LIGHT ——— | | | | | |

START-UP CHECK LIST

Equipment checked by CC & EJ Personnel check by CC

Instruments and safeties checked and reset by EJ, ER, R

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

Emergency equipment in control room checked by CC

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

Red light on by EJ Time 12:10

Start-up OK'd by EJ, CC, WT, ER, R Date 7/6/64

7/6/66

5 cylinders essentially in contact in triangular pattern in lid.

Feed rate: 3.8 cm/min, 4.0 cm/min.

Drain rate: 15 cm/min.

Dump rate: 17 cm/min

1400 Water at 127.75 cm (head scale) Subcritical

Log N 0.0055; K-2 25 (3×10^{-11}); K-1 36 (10×10^{-12})

Dump + drain rate: 22.8 cm/min

Drain.

Source level: Log N: 0.0011, K-1 8 (3×10^{-14}); K-2 14 (3×10^{-14})

1510 Same level (no water) K-2 16 (3×10^{-14}); K-1 5 (2×10^{-12})

Log N 0.0065

Added one more cylinder. Now have to straighten the others so everything is in contact.

1530 Water at 134 cm. (side scale) Subcritical

Log N 0.005, K-1 36 (10×10^{-12}) K-2 37 (3×10^{-11})

Drain to 73.5 cm (head scale)

~ 8" K-1 out of water; Log N ~ 1/2" out; ~ 2" K-2 above water.

Drain

7/7/66

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|-----------------------|-----------------------|-------------------|-----------------|-----|-----------------------|
| K-1 | 3 X 15 ⁻¹² | Meter ✓ Fast ✓ | 4" | ✓ | 3 X 15 ⁻¹² |
| K-2 | 3 X 15 ⁻¹² | Meter ✓ Fast ✓ | 4" | ✓ | 3 X 15 ⁻¹² |
| R-1 | — | — | — | — | — |
| R-2 | — | — | — | — | — |
| PM-1 | 700V | Alarm ✓ | Constant | ✓ | 500V |
| PM-2 | 1200V | Low ✓ Alarm ✓ | 5" 5" | ✓ | 900V |
| LOG N CALIBRATE | | ✓ | OPERATE | ✓ | SOURCE No. B-80 |
| DUMP WELL PROBE LIGHT | | — | — | — | — |

START-UP CHECK LIST

Equipment checked by WCT, E, DC Personal check by WCTInstruments and safeties checked and reset by EJSource in checked by WCT Source No. M-43Emergency equipment in control room checked by EJInstruments in trip circuit: K-1, K-2, PM-1, PM-2Red light on by DC Time 0930Start-up OK'd by DC, EJ Date 7/7/66Placed 7th cylinder in contact with lengthens.

1040 Top of cylinders 204 cm (side seal)

1045 Wetw at 204.5 cm. Lg N 0.005, K-1 ix (10 X 15⁻¹²)K-2 43 (3 X 15⁻¹²). Subcritical. Drain.

7/8/66

7/8/66

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE | SET | START-UP RANGE |
|------------|---------------------|-------------------|-----------|--------|---------------------|
| K-1 | 3x10 ⁻¹² | Meter ✓ Fast ✓ | Contact | ✓ | 3x10 ⁻¹² |
| K-2 | 3x10 ⁻¹² | Meter ✓ Fast ✓ | Contact | ✓ | 3x10 ⁻¹² |
| R-1 | — | — | — | — | — |
| R-2 | — | — | — | — | — |
| PM-1 | 700V | Alarm ✓ | Contact | ✓ | 500V |
| PM-2 | 1200V | Low ✓ Alarm ✓ | 15" 3" | ✓ ✓ | 500V ✓ |

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

START-UP CHECK LIST

Equipment checked by WCT, E9 Personnel check by WCT
 Instruments and safeties checked and reset by E9
 Source in checked by WCT Source No. M-43
 Emergency equipment in control room checked by E9
 Instruments in trip circuit: K-1, K-2, PM-1, PM-2
 Red light on by _____ Time 0830
 Start-up OK'd by WCT, E9 Date 7/8/66

2/8/66

Now have 7 cylinders spaced 1" surface to surface average.

Water at top of cylinders identical.

Log N 0.0045, K-1 35 (10×10^{-12}), K-2 50 (10×10^{-12})

found out; no change in Log N, K-1; K-2 to ⁴⁵ (13×10^{-12})

Drain

108

7/11/66

INSTRUMENT CHECK

7/11/66

| INSTRUMENT | RANGE | TRIP | SOURCE | SET | START-UP RANGE |
|------------|-----------------------|-------------------|----------|-----|-----------------------|
| K-1 | 3 x 10 ⁻¹² | Meter ✓ Fast ✓ | 4" | ✓ | 3 x 10 ⁻¹² |
| K-2 | 3 x 10 ⁻¹² | Meter ✓ Fast ✓ | 4" | ✓ | 3 x 10 ⁻¹² |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700V | Alarm ✓ | constant | ✓ | 500V |
| PM-2 | 1200V | Low ✓ Alarm ✓ | 5" | ✓ | 900V |

LOG IN CALIBRATE OPERATE SOURCE No. B-8
 DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by EJ Personnel check by ---
 Instruments and safeties checked and reset by EJ
 Source in checked by IDC Source No. M-43
 Emergency equipment in control room checked by IDC
 Instruments in trip circuit: K-1, K-2, PM-1, PM-2
 Red light on by --- time 10:45
 Start-up OK'd by EJ, IDC time 7/11/66

Movies made.
 Now leave 2 cylinders in 2nd. Chambers & source positioned on fuel full tank.

7/11/66

source level: $J_{og} \mu: 0.001$; $K-1$ 10 (3×10^{-14}); $K-2$ 25 (3×10^{-14})

1445 water at 125.2 cm (local scale).

$L_{g} \mu: 0.004$; $K-1$ 33 (10×10^{-14}); $K-2$ 2 (3×10^{-14})

Pulled source. No change in level.

Drain

0(4.89) Rods - 0.5 in. diam x 30 cm long 113

5/23/66

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|---------------------|-------------------|-----------------|-----|---------------------|
| K-1 | 3x10 ⁻¹² | Meter ✓ Fast ✓ | 6" | | 3x10 ⁻¹² |
| K-2 | 3x10 ⁻¹² | Meter Fast | 5" | | 3x10 ⁻¹² |
| R-1 | — | | | | |
| R-2 | — | | | | |
| PM-1 | 700 | Alarm ✓ | Contact | | 500 |
| PM-2 | 1200 | Low ✓ Alarm ✓ | | | 500 |

LOG N CALIBRATE ✓ OPERATE ✓ SOURCE No. B-10

DUMP WELL BARGE LIGHT

START-UP CHECK LIST

Equipment checked by DCS Personnel check by IDC

Instruments and safeties checked and reset by IDC

Source in checked by IDC Source No. M-13

Emergency equipment in control room checked by TDC

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

Red light on by EJ Time 09:00

Start-up OK'd by EJ, IDC Date 5/23/66

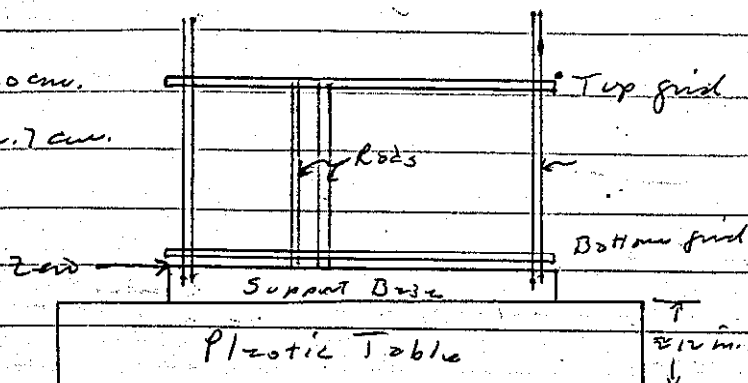
The 12-in-high plastic table is on the floor of Hall. Sitting on it are the three chambers and their support stand. The plates are drilled in

9/23/66

square pattern with 1.1-cm edge separation between
 tubes. There is an 11×11 lattice of 0.5-in. dia
 tubes installed in the grid plates. Lattice height
 36 cm.

Top of fuel = 30.0 cm.

$5''$ top reflector = 42.7 cm.



→ Zero set at bottom of rods (back scale on manometer)

→ Feed rate: 3.5 cm/min.

1012 Water at 34.5 cm. + Period

1016 Water at 34.3 cm. Critical.

Drain

Drain rate: 27.6 cm/min

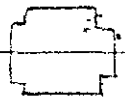
Now have 117 rods at same spacing; the 4
 corners were removed.

1135 Water at 38.3 cm. + Period

1138 Water at 37.5 cm. Critical

Drain

9/23/66

Removed 2 more pins, each adjacent to corner position on the east side. Now have 115 rods. 

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE | |
|------------------|---------------------|-------------------------------------|-----------------|-------------------------------------|---------------------|------|
| K-1 | 3×10^{-12} | Meter | 6" | | 3×10^{-12} | |
| | | Fast | | | | |
| K-2 | 3×10^{-12} | Meter | 5" | | 3×10^{-12} | |
| | | Fast | | | | |
| R-1 | | | | | | |
| R-2 | | | | | | |
| PM-1 | 700 | Alarm | Contact | | 5000 | |
| PM-2 | 1200 | Low | $\approx 12"$ | | 5000 | |
| | | Alarm | 6" | | | |
| LOG TO CALIBRATE | | <input checked="" type="checkbox"/> | OPERATE | <input checked="" type="checkbox"/> | SOURCE No. | B-80 |
| DUMP WELL LIGHT | | <input type="checkbox"/> | | | | |

START-UP CHECK LIST

- Equipment checked by EQ, IDC Personnel check by IDC
- Instruments and safeties checked and reset by EQ
- Source in checked by EQ Source No. M-43
- Emergency equipment in control room checked by IDC
- Instruments in trip circuit: K-1, K-2, PM-1, PM-2
- Red light on by DC Time 0845
- Start-up OK'd by EQ, IDC Date 9/26/66

Red trip lights on K-1 & PM-2 (both trips) are sluggish to

9/26/66

response, if they ever do. Checked function with
dump valve.

Situation in tank same as top of p. 115. 115 rods.

0920 W21W at 43.6 cm. (5" top reflector). Slightly subcritical
Drain.

Added 1 rod. Now same 116.

0955 W21W at 43.6 cm. Just barely subcritical.

0959 Remove source for ref period #1.

$T = 680$ sec; $\rho = 2.03\%$
Drain.

60 cm rods

At same spacing, use same square lattice of
81 60-cm-long rods. Added 3rd grid plate to
provide top support for top layer.

1145 W21W at 75.2 cm. Subcritical.

Drain

9/27/66

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|-----------------------|-------------------|-----------------|-----|-----------------------|
| K-1 | 3 x 10 ⁻¹² | Meter / Fast / | 5" | | 3 x 10 ⁻¹² |
| K-2 | 3 x 10 ⁻¹² | Meter / Fast / | 5" | | 3 x 10 ⁻¹² |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700V | Alarm / | | | 500V |
| PM-2 | 1200 500V | Low / Alarm / | 10" 1" | | 500V |

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

START-UP CHECK LIST

Equipment checked by EJ, IDC Personnel check by IDC

Instruments and safeties checked and reset by EJ

Source in checked by EJ Source No. M-43

Emergency equipment in control room checked by IDC

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

Red light on by IDC Time 2:45

Start-up OK'd by EJ, IDC Date 9/27/66
 S.

Now lower square lattice, 5 x 10, of 6.5 cm long rods. Same spacing (1.1 cm).
 0900 water at 50.4 cm. Critical.
 Drain

9/27/66

Removed 4 corners. Now have $9 \times 10 - 4 = 86$ double length rods.

1023 Water at 56.05 cm. Critical
Drain

Removed 2 rods from adjacent to opposite corners.
Now have 84 double length rods.

1113 Water at 59.55 cm. Critical
Drain

Removed 2 rods from adjacent to opposite corners.
Now have 82 double length rods in "rounded" square

1337 Water at 72.2 cm. + point #1
 $T = 139.8 \text{ sec } p = 7.6 \%$

1345 Water at 65.55 cm. Critical.
Drain

Probably about 10% excess.

INSTRUMENT CHECK

9/28/66

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|----------------------------|---------------------|------------------|-----------------|----------------|---------------------|
| K-1 | 3x15" ¹² | Meter ✓ Fst ✓ | 5" | | 3x15" ¹² |
| K-2 | 3x15" ¹² | Meter ✓ Fst ✓ | 5" | | 3x15" ¹² |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 200V | Alarm ✓ | Contact | | 502V |
| PM-2 | 1200V | Low ✓ Alarm ✓ | 10" 1" | | 900V 900V |
| LOG IN CALIBRATE ✓ | | OPERATE ✓ | | SOURCE No. B-8 | |
| DUMP WELL TRIP LIGHT _____ | | | | | |

START-UP CHECK LIST

Equipment checked by EDC Personnel check by EDC
 Instruments and safeties checked and reset by EDC
 Source in checked by EDC Source No. M-43
 Emergency equipment in control room checked by EDC
 Instruments in trip circuit: K-1, K-2, PM-1, PM-2
 Red light on by EDC Time 1400
 Start-up OK'd by EDC Date 9/28/66

Spacing 1.65 in. surface. 11x11 - 4 corners 30.6cm
 high bottom of 117 pins.

1430 Water at 30.35 cm. Critical (2 rods has changed)
 Drain (see p. 12)

9/28/66

Removed 4 rods from positions adjacent to the 4 corners.

Feed line changed because we put a thickened base support plate on the stand. Will need to make length to still direct-reading. D.D.

1503 Water at 28.6 cm. Slightly supercritical.
Drain

Now have a complete 10x11 lattice.

1540 Water at 31.2 cm. Critical
Drain

9/29/66

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|---------------------|-------------------|-----------------|-----|---------------------|
| K-1 | 3×10^{-12} | Meter ✓ Fast ✓ | 5" | | 3×10^{-12} |
| K-2 | 3×10^{-12} | Meter ✓ Fast ✓ | 4" | | 3×10^{-12} |
| R-1 | — | | | | |
| R-2 | — | | | | |
| PM-1 | 200V | Alarm ✓ | | | 500V |
| PM-2 | 1200V | Low ✓ Alarm ✓ | 10" 1" | | 900V |

LOG IN CALIBRATE _____ OPERATE _____ SOURCE No. B-10

DEAFEN WITH RED LIGHT _____

START-UP CHECK LIST

Equipment checked by EJ IDC Personnel check by IDCInstruments and safeties checked and reset by EJSource in checked by EJ Source No. H-43Emergency equipment in control room checked by IDCInstruments in trip circuit: K-1, K-2, PM-1, PM-2Red light on by EJ Time 1045Start-up OK'd by EJ, IDC Date 9/29/66

Removed 4 corners from 10x11 lattice, leaving 106 rods,
at 1.65 cm surface spacing.

122

9/29/66

1115 Water at 32.0 cm. Critical
Drain

Now lower complete 10x12 rod lattice

1325 Water at 36.4 cm. + Period #1

1325 Water at 36.0 cm. Critical.
Drain

Removed 2 corner rods from east side. Now have
98 rods at 1.65 in. spacing separation.

1552 Water at 41.55 cm. + Period

1604 Water at 39.5 cm. Critical
Drain

9/30/66

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|---------------------|---------|-----------------|-----|---------------------|
| K-1 | 3x15 ⁻¹² | Meter ✓ | 5" | ✓ | 3x15 ⁻¹² |
| | | Fast ✓ | | ✓ | |
| K-2 | 3x15 ⁻¹² | Meter ✓ | 4" | ✓ | 3x15 ⁻¹² |
| | | Fast ✓ | | | |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 7000 | Alarm ✓ | Contact | | 5000 |
| PM-2 | 1200 | Low ✓ | 10" | | 900 |
| | | Alarm ✓ | 1" | | |

LOG N CALIBRATE

OPERATE

SOURCE No.

B-80

DUMP WELL PRIZE LIGHT

START-UP CHECK LIST

Equipment checked by IDC, EP Personnel check by IDCInstruments and safeties checked and reset by EPSource in checked by EP Source No. M-43Emergency equipment in control room checked by IDCInstruments in trip circuit: K-1, K-2, PM-1, PM-2Red light on by IDC Time 0815Start-up OK'd by IDC, ES Date 9/30/66

(12)

Now have a 5x11 lattice at 1.65-cm surface spacing
30 cm high.

0855

Water at 42.1 cm. Subcritical.

Drain

9/30/66

(13) Now have a 5x14 lattice = 108 rods.

0955 Water at 32.6 cm. Critical

Drain

(11)

Now have an 8x13 lattice = 104 rods

1025 Water at 41.5 cm. Subcritical

Drain

(9)

Now have an 8x14 lattice = 112 rods

1102 Water at 34.05 cm. Critical

Drain

Removed 2 rods from end of 8-rod row. Now have
110 rods.

1135 Water at 34.75 cm. Critical

Drain

(10)

Removed 2 more rods from 8-rod row; 12 row now out.

Now have 108 rods.

1325 Water at 38.5 cm. + Period #1

1325 Water at 36.65 cm. Critical

Drain

9/30

154

10/3/66

INSTRUMENT CHECK

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

START-UP CHECK LIST

Equipment checked by DC, JDC. Personnel check by EDCInstruments and safeties checked and reset by EQSource in checked by EQ Source No. M-43Emergency equipment in control room checked by EDCInstruments in trip circuit: K-1, K-2, PM-1, PM-2Red light on by DC Time 0830Start-up OK'd by EQ, EDC Date 10/3/66

From the lattice on p. 125, one rod was removed from each face. Total now 52.

0904 Water at 45.0 cm. Subcritical.

Drain

10/3/

053

053

131

131

13

10/3/66

Returned 2 rods to opposite faces. Now have 54.

0931 Water at ~~44~~ 45.3 cm. Subcritical. Too much for
 leg. print.
 Drain

⑧ Returned 1 more rod to center of face. Now have 55.

0955 Water at 45.4 cm. Subcritical.

Pull service for leg. print #1.

Drain $T = 3.011 \text{ sec}$; $p = 4.9684$

60-cm-long Lattice

Now have 60-cm-long 8×8 lattice at 1.65 cm
 surface spacing, 72 rods 60 cm long.

1313 Water at 53.0 cm. + Print #2

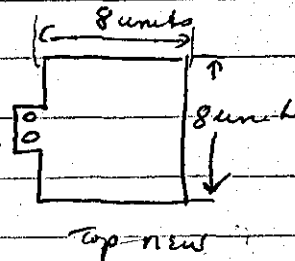
$T = 83.4 \text{ sec}$; $p = 11.4 \%$

1319 Water at 52.65 cm. Critical

Drain

1340 Remove 6 rods - 60 cm long.

i.e. $8 \times 8 \times 60 \text{ cm}$ plus 2 rods
 on one side



Water height = 75 cm. Subcritical -

128

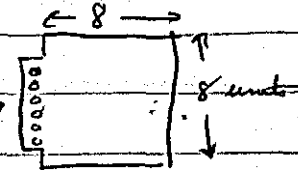
10/3/66

5% Rd - 1/2" dia.

14:20 Replaced 4 rods - 60 cm long

Now 8x8x60cm plus 6 on one side

140 30 cm-long pieces



14:47 Ht, H₂₀ = 55.40 cm Super.

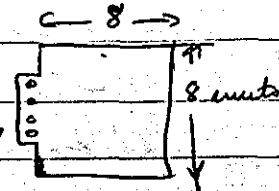
T = 131.1 mm; ρ = 8.0%

14:56 Ht, H₂₀ = 55.10 cm CRITICAL

Removed 2 rods 60 cm long

15:05 now 8x8x60cm with four on one side?

136 - 30 cm-long pieces



15:38 H₂₀ Ht = 60.50 cm (H₂₀ above top 8 rods!?) Super

H₂₀ Ht = 60.30 cm (H₂₀ at top of rods) Super

15:44 H₂₀ Ht = 60.10 T = 108.1 mm; ρ = 9.3% Critical
= 60.05 cm Critical

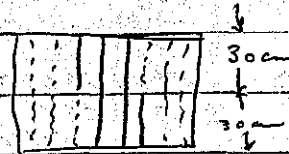
15:50 (14) Removed 2 1/2 rods - 30 cm long. one from upper

layer, one from lower layer, ends of

above partially filled 5th row -

side view from left

134 - 30 cm-long pieces



67 rods w 66 full length + 2 half length

INSTRUMENT CHECK

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

START-UP CHECK LIST

Equipment checked by D. H. C. Personnel check by D. C.
 Instruments and safeties checked and reset by D. H. C.
 Source in checked by D. C. Source No. M-43
 Emergency equipment in control room checked by D. H. C.
 Instruments in trip circuit: K1, K2, PM1, PM2
 Red light on by D. C. Time 0820
 Start-up OK'd by D. H. C. D. C. Date 10-14-66

130

10/6/66

5% Rods. 1/2 in. in diameter

8:30 Looking as described on pg. 128-

8:55 Ht = 60.50 cm Top of rods - ^{filling} Substrate

Ht = 60.30 - - - - - Drain

9:05 Ht. H₂O = 75.10 cm Super. + Period #1T = 63.6 sec; $\rho = 13.9 \%$

9:13

Ht = 64.35 cm

Critical

64.40

Critical

Now leave 7x10 lattice of 60-cm-long rods.

In checking "zero", found that it had, indeed, shifted downward. Reset scale to read zero at the bottom of the rods.

10:44 Water over rods at 59.4 cm ⁰

Drained slightly to come back up.

10:45 Water over rods at 59.3 cm.

10:51 Water at 68.8 cm. + Period #2

T = 24.9 sec; $\rho = 25.3 \%$

10:55

Water at 63.2 cm. Critical

Drain a little to check top of rods = 60.8 cm

Bottom of rods = 0.5 cm. Rest zero.

Drain

→ No change in lattice. Zero checks. Top of rods 59.50

13:40

Water at 67.3 cm + Period #3

T = 26.8 sec; $\rho = 24.2 \%$ Do not use
zero troubles.

10/4/66

Water at 62.5 cm. Critical.

(16) Drain 30 ft of

Removed 1 full length road from corner. Now leave
69 goods

1520 Water at 75.2 cm. Slightly subcritical.

1530 Remove source for very period #4

 $T = 7.8$ sec; $\rho = -1.75$ ft

Drain

1 132 357 rods $\frac{1}{2}$ " dia.
10/17/66

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|-----------------------|---|-----------------|-------------------------------------|-----------------------|
| K-1 | 3 X 10 ⁻¹² | Meter <input checked="" type="checkbox"/> Fast <input checked="" type="checkbox"/> | 5' | <input checked="" type="checkbox"/> | 3 X 10 ⁻¹² |
| K-2 | 3 X 10 ⁻¹² | Meter <input checked="" type="checkbox"/> Fast <input checked="" type="checkbox"/> | 5' | <input checked="" type="checkbox"/> | 3 X 10 ⁻¹² |
| R-1 | — | — | — | — | — |
| R-2 | — | — | — | — | — |
| PM-1 | 500V | Alarm <input checked="" type="checkbox"/> | Contact | <input checked="" type="checkbox"/> | 500V |
| PM-2 | 1200V | Low <input checked="" type="checkbox"/> Alarm <input checked="" type="checkbox"/> | 12' | <input checked="" type="checkbox"/> | 500V |

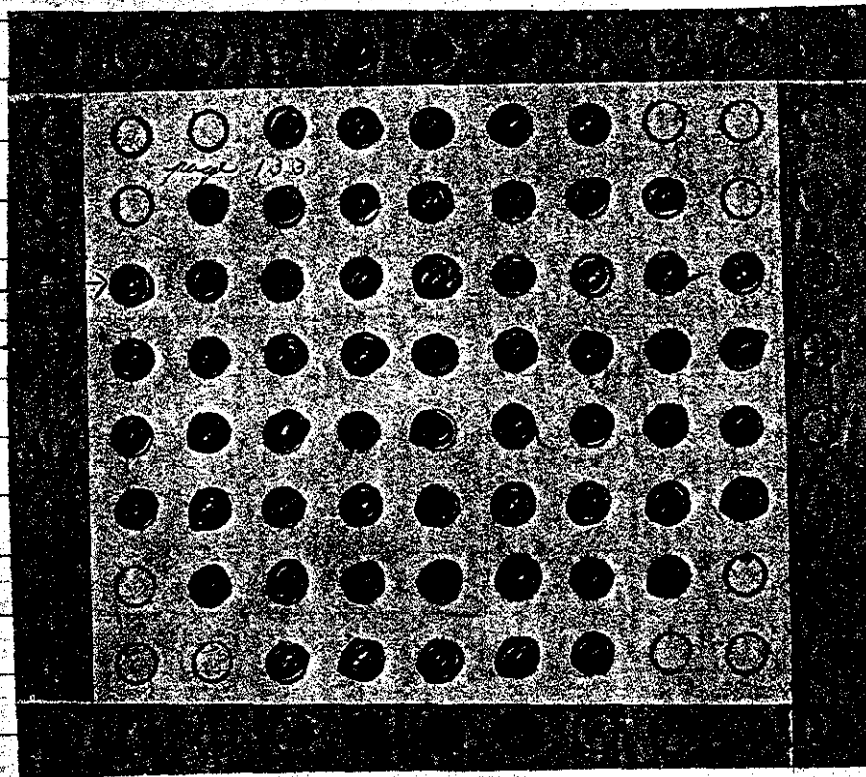
LOG N CALIBRATE OPERATE SOURCE No. D-82

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by EQ, IDC Personnel check by IDC
 Instruments and safeties checked and reset by EQ
 Source in checked by EQ Source No. M-43
 Emergency equipment in control room checked by IDC
 Instruments in trip circuit: K-1, K-2, PM-1, PM-2
 Red light on by EQ Time 0940
 Start-up OK'd by EQ, IDC Date 10/17/66

10
10
1
1



46 rods 60 cm long arranged at 1.65 cm separation as shown above.

1015 Water at 68.5 cm. + Period #1

$T = 51.4$ sec $p = 16.0$ ft

1020 Water at 63.3 cm. Critical

Drain

(17) Removed 30 cm long rod from position shown by arrow on above drawing.

1335 Water at 75.5 cm. Subcritical

1345 Remove sensor for long Period #2

134

10/7/66

T=350.1 m $\rho = 3.78$

Drain

PM

Installed 1-in gold plate with a 10x12 (2 dia) 30 cm high

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|---|---------------------|---|-----------------|-------------------------------------|---------------------|
| K-1 | 3×10^{-12} | Meter | 5" | <input checked="" type="checkbox"/> | 3×10^{-12} |
| " | " | Fast | " | <input checked="" type="checkbox"/> | " |
| K-2 | " | Meter | " | <input checked="" type="checkbox"/> | " |
| " | " | Fast | " | <input checked="" type="checkbox"/> | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700v | Alarm | vert | <input checked="" type="checkbox"/> | 500v |
| PM-2 | 200v | Low | 10" | <input checked="" type="checkbox"/> | 900v |
| " | " | Alarm | 1" | <input checked="" type="checkbox"/> | " |
| LOG N CALIBRATE <input checked="" type="checkbox"/> | | OPERATE <input checked="" type="checkbox"/> | | SOURCE No. D-80 | |
| DUMP WELL FLYE LIGHT <input type="checkbox"/> | | | | | |

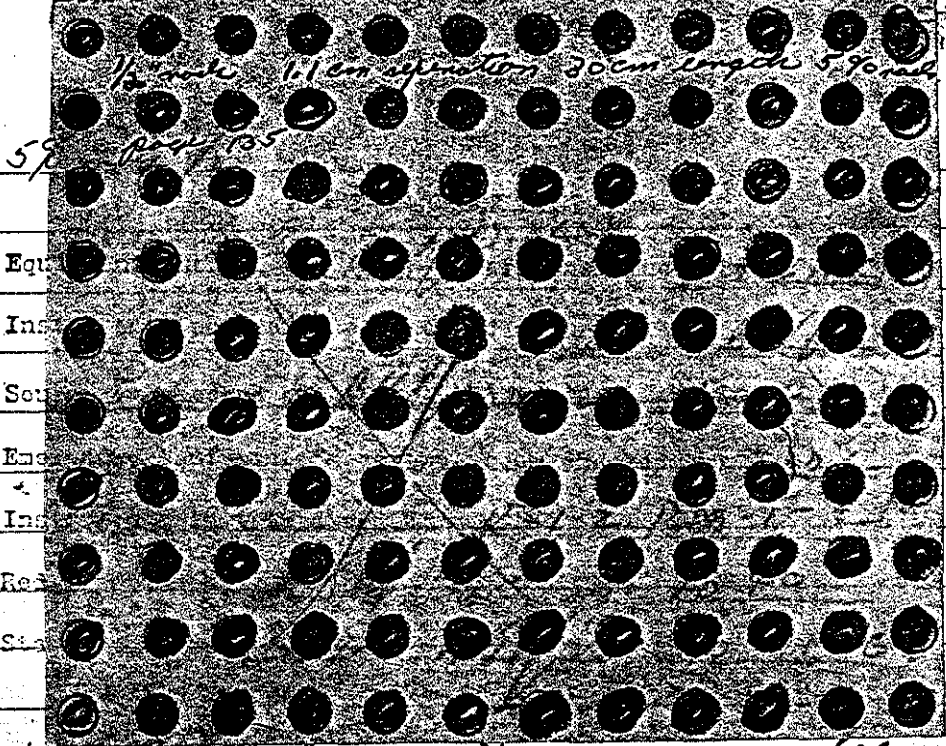
10

16

11

10-11-66

135



59

Eq

Ins

So

En

Ins

Re

So

120 12 nodes, 10 x 12 array. Separation = 1.1 cm.
as shown above:

$$0.4 = .75 \phi$$

1106 + Per

Water ht = 36.20 cm
 $E = 51.07 \text{ mm} = 16.0 \phi = 21.33 \phi / \text{cm}.$

1111 Water ht = 35.95 cm
 System just critical
 Drains

10-11-66

5% rods $\frac{1}{2}$ "

START-UP CHECK LIST

Equipment checked by AKK ^{I.D.C.} Personnel check by I.D.C.Instruments and safeties checked and reset by AKKSource in checked by AKK Source No. M-93Emergency equipment in control room checked by I.D.C.Instruments in trip circuits: K-1-2 PM-1-2Red light on by AKK Time 10:40Starting shift by I.D.C. AKK Date 10-11-66120 $\frac{1}{2}$ " rods, 10 X 12 array, separation = 1.1 cm,
as shown above:

$$0.4 = .75f$$

1106

+ Power

Water ht = 36.20 cm

$$E = 51.07 \text{ m} = 16.0 \text{ f} = 21.33 \text{ f/cm.}$$

1111

Water ht = 35.45 cm

System just critical
Drains

DUPLICATE LIGHT

| LOG N CALIBRATE | OPERATE | SOURCE No. |
|-----------------|---------|------------|
| Alarm | | |
| PM-2 | Low | |
| PM-1 | Alarm | |
| P-2 | | |
| P-1 | | |
| K-2 | Master | |
| K-1 | Master | |

INSTRUMENT CHECK

INSTRUMENT RANGE TRIP SOURCE DISTANCE SET START-UP RANGE

START-UP CHECK LIST

Equipment checked by AMH FID Personnel check by FID-C
 Instruments and safeties checked and reset by AKIK
 Source in checked by AMH Source No. M-93
 Emergency equipment in control room checked by FID-C
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by AMH Time 0855
 Start-up OK'd by FID-C, AMH Date 10-12-66

LOG N CALIBRATE _____ OPERATE _____ SOURCE No. _____
 DUMP WELL PROBE LIGHT _____

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|-------|-------|-----------------|-----|----------------|
| K-1 | | Meter | | | |
| | | Fast | | | |
| K-2 | | Meter | | | |
| | | Fast | | | |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | | Alarm | | | |
| | | Low | | | |
| PM-2 | | Alarm | | | |
| | | Low | | | |

INSTRUMENT CHECK

INSTRUMENT CHECK

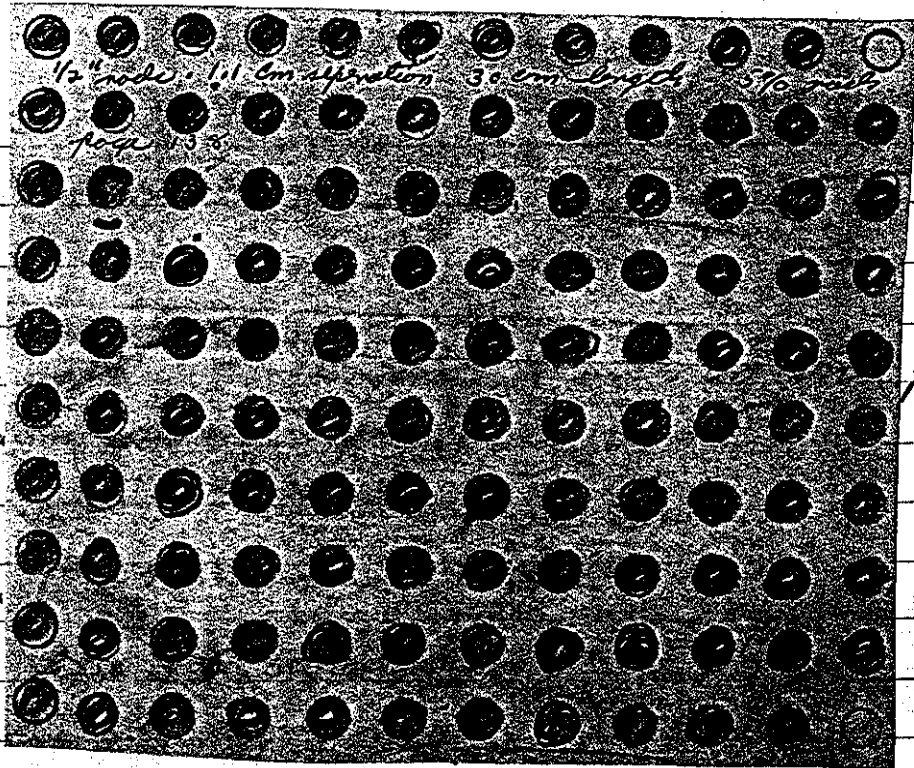
| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|---------------------|---------|-----------------|-----|---------------------|
| K-1 | 3×10^{-12} | Meter ✓ | 5" | - | 3×10^{-12} |
| | " | Fast ✓ | " | - | " |
| K-2 | " | Meter ✓ | " | - | " |
| | " | Fast ✓ | " | - | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700 ✓ | Alarm ✓ | cont | - | 500 ✓ |
| PM-2 | 1200 ✓ | Low ✓ | 10" | - | 900 ✓ |
| | " | Alarm ✓ | 11" | - | " |

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

over

138

10-12-66



0900 118 1/2

or sha

face

0925 + Per

Water

(W)

0930 Water ht = 37.55 cm

Kepton joint critical

Drain to ~ 15.0 cm

0935 Removed 1 rod. Now have 117, 1/2 rods.
10 x 11 plus 7 units on one face.

0946 Water ht = 45.35 cm

(W)

- Per.

$$E = -369.41 \text{ cm} = -3.9 \text{ f}$$

0955 Drain:

138

10-12-66

0900 118 $\frac{1}{2}$ " rods, 10 x 11 plus 8 units on one face.
as shown above. Separation = 1.1 cm

0925 + Per: $\bar{C} = 70.62 \text{ cm} = 12.9 \text{ f}$
Water ht = 45.30 cm

(W)

0930 Water ht = 37.55 cm
Kept just critical
Drain to ~ 15.0 cm.

0935 Removed 1 rod. Now have 117 $\frac{1}{2}$ " rods.
10 x 11 plus 7 units on one face.

0946 Water ht = 45.35 cm

(W)

- Per.
 $\bar{C} = -369.41 \text{ cm} = -3.9 \text{ f}$

0955 Drain:

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|-----------------------|-----------------------|-------|-----------------|-----------------|-----------------------|
| K-1 | 3 X 10 ⁻¹² | Meter | 9" | ✓ | 3 X 10 ⁻¹² |
| " | " | Fast | " | ✓ | " |
| K-2 | " | Meter | " | ✓ | " |
| " | " | Fast | " | ✓ | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700 V | Alarm | cont | ✓ | 500 V |
| PM-2 | 1200 V | Low | 10" | ✓ | 900 V |
| " | " | Alarm | 1" | ✓ | " |
| LOG N CALIBRATE | | | OPERATE | SOURCE No. B-80 | |
| DUMP WELL PROBE LIGHT | | | | | |

START-UP CHECK LIST

Equipment checked by F.D.C.M. Personnel check by E.D.C.

Instruments and safeties checked and reset by OKM

Source in checked by OKM Source No. M-93

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

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

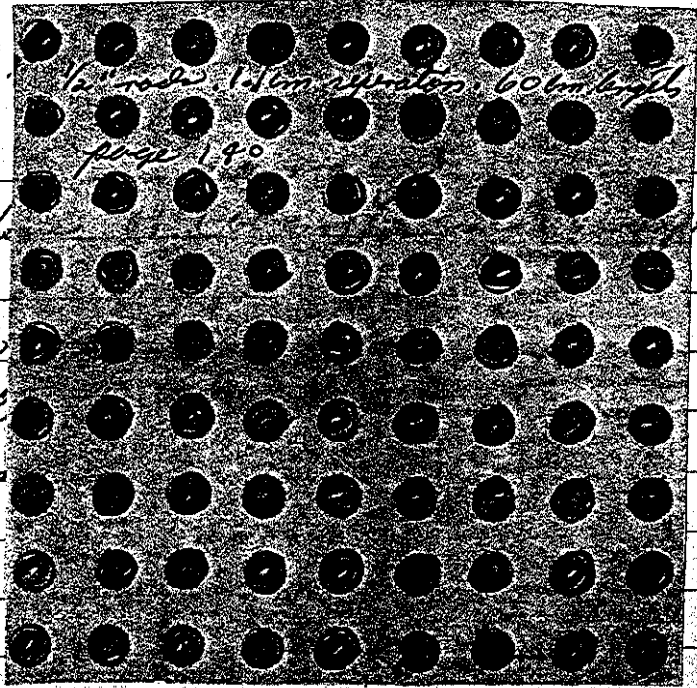
Red light on by AKD Time 0815

Start-up OK'd by E.D.C. Date 10-13-66

OVER

140

10-13-66



0830

Naive h...

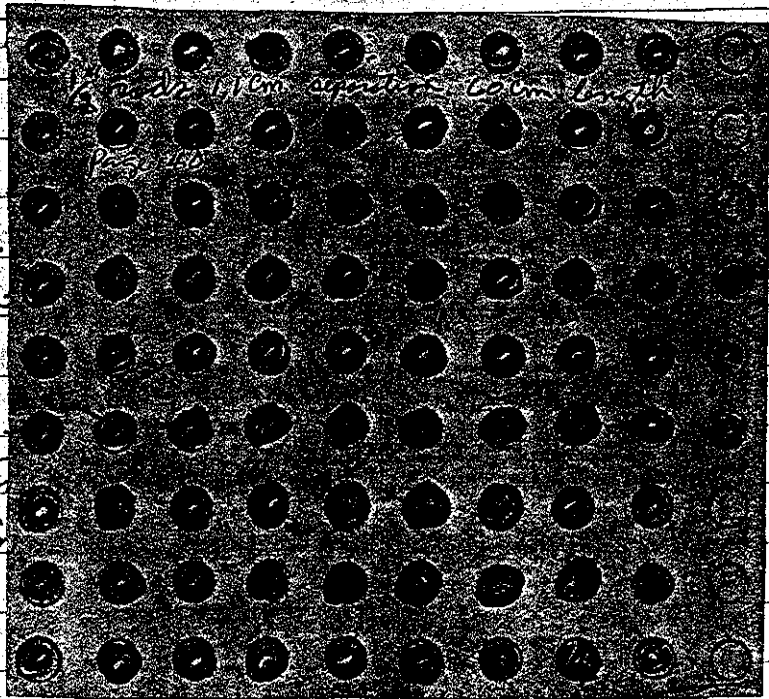
separation = 1.5 cm

0908 Water

lyst
Dra...

0920

Naive h... (89. 1/2 inch (60 cm length). Have a
9x9 plus 3 rods (60 cm) ~~are~~ extend on one
face.



0947

Water

+ Per...

C = 44.5

0951

Water

lyst

Dra...

km
7

140

10-13-66

0830 ^{9x9 array.} New haul 81" (60 cm) ^{1/2"} rads. Separations = 1.1 cm

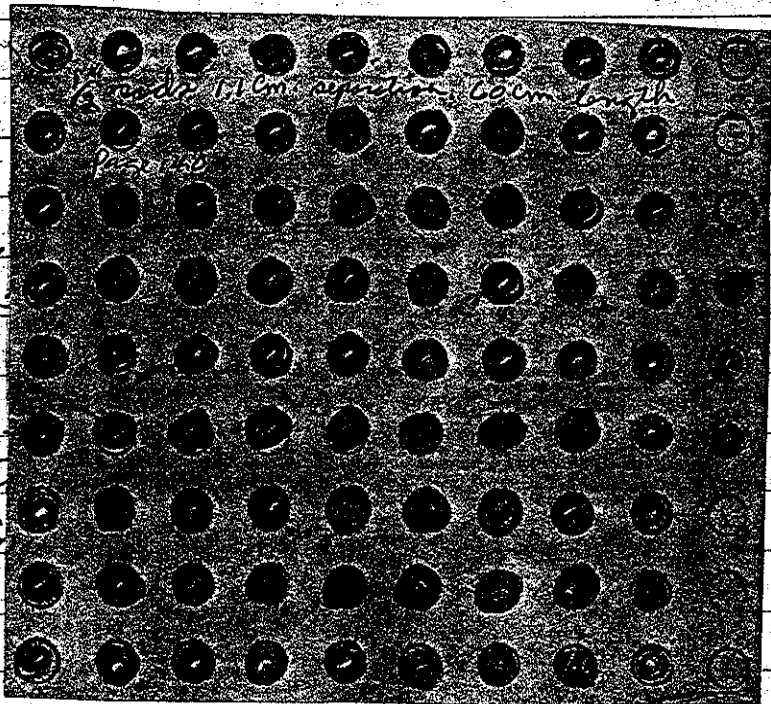
0908 Water ht = 76.00 cm
Lyster sub critical
Drain.

0920 New haul 84" ^{1/2"} rads (60 cm length). Have a
9x9 plus 3 rads (60 cm) ~~on~~ extend on one
face.

0947 Water
+ Per.
C = 44.

0951 Water
Lyster
Drain

VNY
77

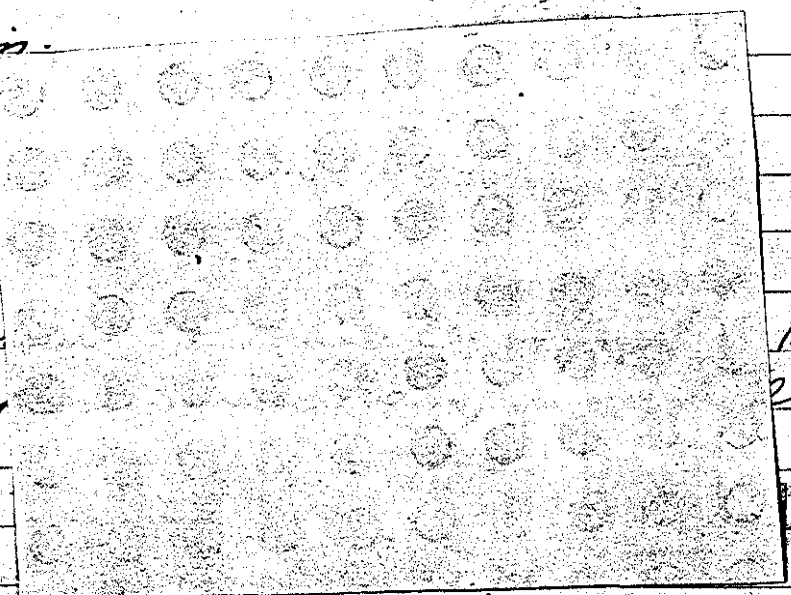


140

10-13-66

0830 New haul 81 (60 cm) ^{9x9 error} ~~1/20~~ " nodes. Separation = 1.1 cm

0908 Water ht = 76.00 cm
system sub critical
Drain.



0920 New
9x9
faces.

1dave a
2 on one.

0947 Water ht 61.10 cm ^{sh = 1.1 cm}
+ Per.
 $C = 44.55 u = 17.74 = 16.1 f/cm$

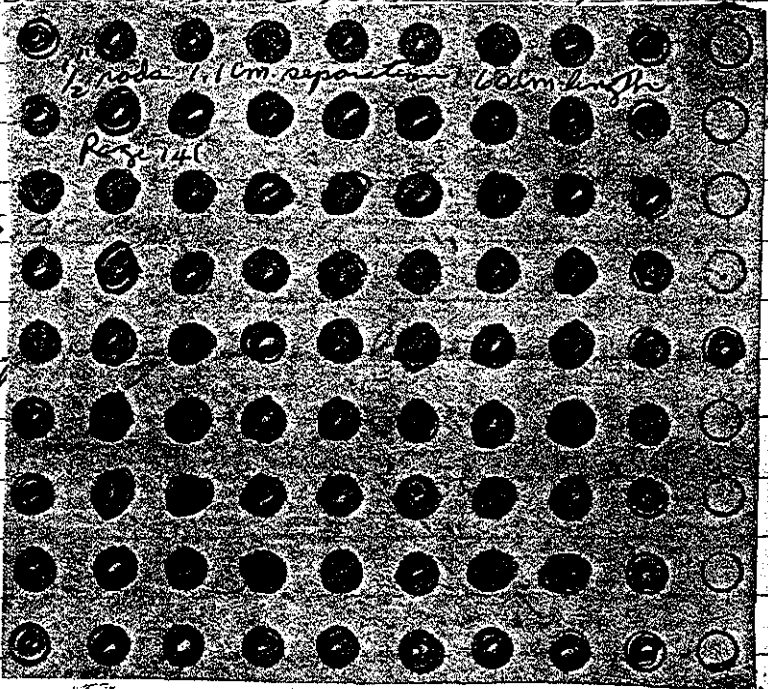
0951 Water ht = 60.00 cm
system just critical
Drain.

1/2
1/2

10-13-66

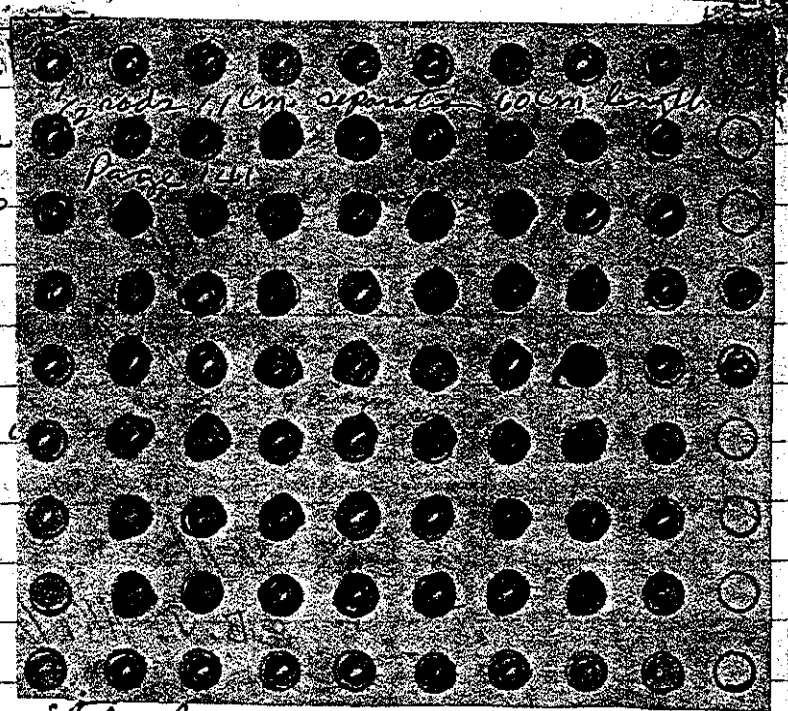
141

10:00 Now have 8 2 1/2" rods (60cm length). Have a
9x9 plus 1 rod (60cm) centered on one
face.



10:30 Water ht = 76.0
- Per.
system to sub

10:36 Drain



10:45 Now have 9 3 1/2
rods
9x9 plus 2 (60

11:10 Water ht = 64.0
+ Per.
B = 127.12 m

11:20 Water ht = 63.
system just critical
Drain

10-13-66

1000 Now have 82 1/2
9x9 plus 1 row
face.

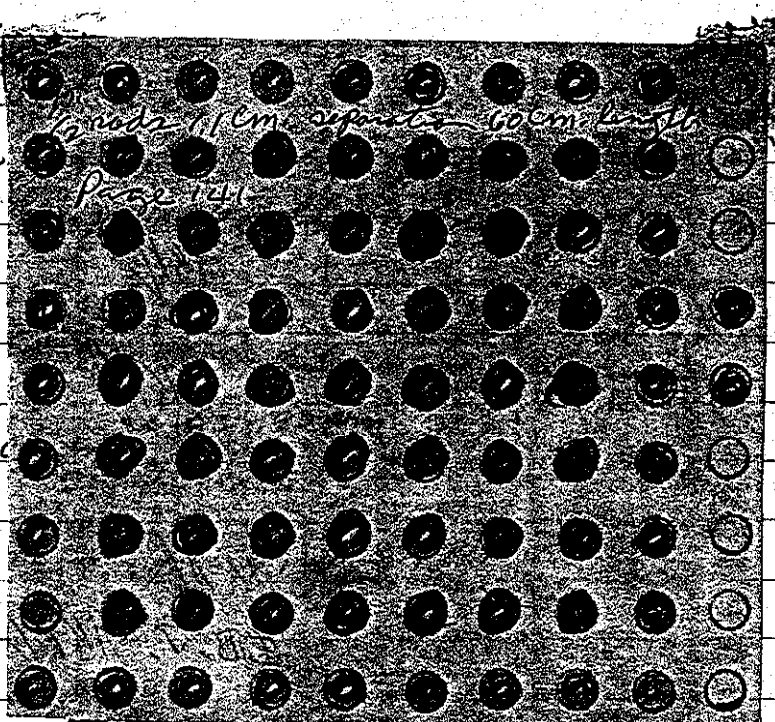
1030 Water ht = 76.00 cm

- Per.

System to sub for good - Per.

1036 Drain:

1045 Now have 83 1/2
9x9 plus 2 (60



1110 Water ht = 64.0
+ Per.
E = 127.12 mm

1120 Water ht = 63.

System just critical
Drain.

10-13-66

1000 New laws 82 1/2

9x9 plus 1 row
face.

1030 Water ht = 76.1

- Per.
System to sub p

1036 Drain:

1045 New laws 83 1/2" rods (60 cm length). Have a
9x9 plus 2 ^{rods} (60 cm) centered on one face.

1110 Water ht = 64.00 cm $\pm h = .90$ cm.

+ Per:

$$B = 127.12 \text{ sec} = 8.24 = 9.14 \text{ cm}$$

1120 Water ht = 63.10 cm.

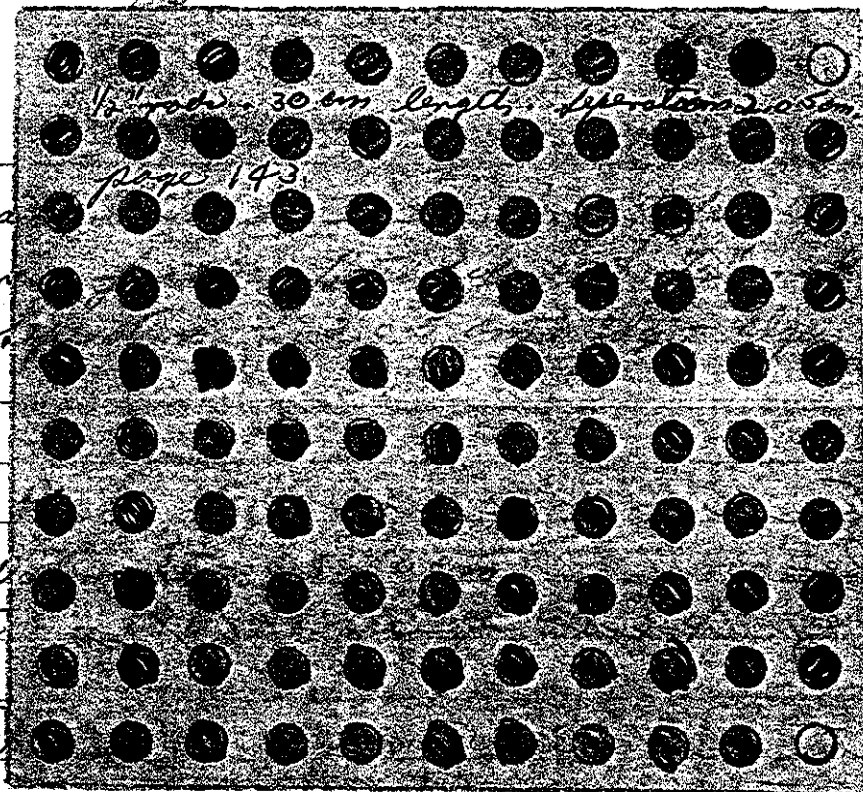
System feet critical
Drain.

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|-----------------------|-----------------------|---------|-----------------|-----|-----------------------|
| K-1 | 3 X 10 ⁻¹⁰ | Meter | 3" | ✓ | 3 X 10 ⁻¹⁰ |
| | | Foot | | ✓ | |
| K-2 | " | Meter | 3" | ✓ | 3 X 10 ⁻¹⁰ |
| | | Foot | | ✓ | |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 7000 | Alarm | Contact | ✓ | 5000 |
| PM-2 | 12000 | Low | 10" | ✓ | 9000 |
| | | Alarm | 2" | ✓ | |
| LOG N CALIBRATE | | OPERATE | SOURCE No. B-80 | | |
| DUMP WELL PROBE LIGHT | | | | | |

START-UP CHECK LIST

Equipment checked by AKM ^{E.B.T.} Personnel check by AKM
 Instruments and safeties checked and reset by AKM
 Source in checked by AKM Source No. M-93
 Emergency equipment in control room checked by AKM
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by AKM Time 1300
 Start-up OK'd by E.B.T. AKM Date 10-17-66



Na

on

units on

30 cm long.

1310

W
C

1400

D

1410 Now have a 10 x 10 array, plus 9 units on one face. Total of 109 $\frac{1}{2}$ " radii. 30 cm long separation = 2.05 cm. Edge - Edge.

(18)

1442 - Per

water ht = 45.50 cm.

C = -564.98 rev. = -2.5

1450

Drain:

over

Now have a 10 x 10 array, plus 8 units on
one face. Total of 108 $\frac{1}{2}$ " rods, 30 cm long.
Separation = 2.05 cm. Edge - Edge.

1310 - Per:

Water ht = 45.50 cm.

$$C = -194.98 \text{ cm} = -8.5 \text{ f}$$

1400 Drain:

1410 Now have a 10 x 10 array, plus 9 units on
one face. Total of 109 $\frac{1}{2}$ " rods. 30 cm long
Separation = 2.05 cm. Edge - Edge.

(18)

1442 - Per

Water ht = 45.50 cm.

$$C = -564.98 \text{ cm} = -2.5$$

1450 Drain:

over:

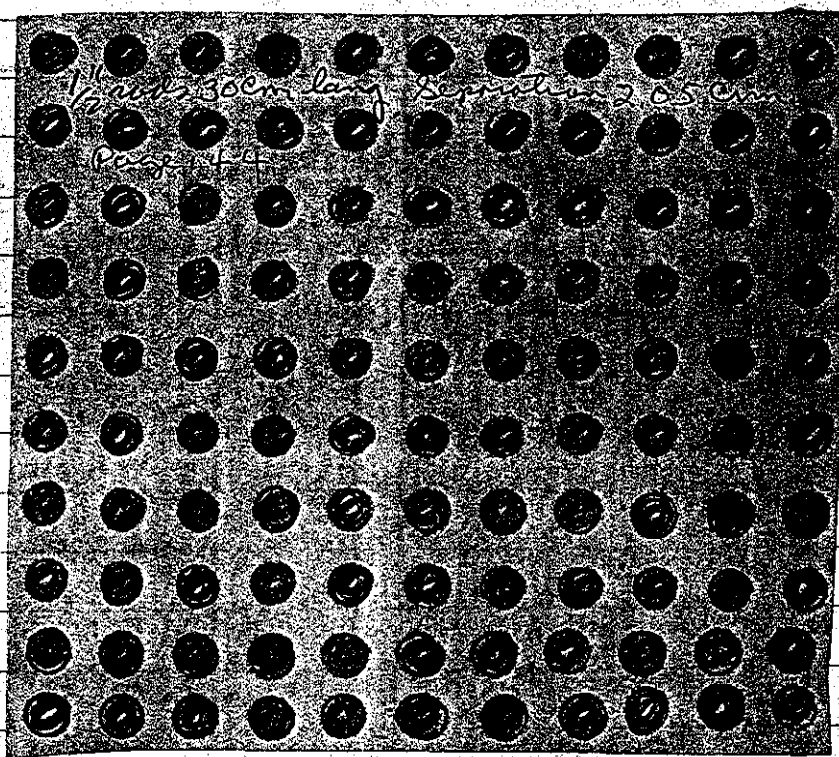
1454 Now have a 10×11 array. Total of 110 $\frac{1}{2}$ rods
30 cm long. Separation - 2.05 cm edge-edge

1512 Water ht = 45.25 cm.

$\textcircled{19}^3 + \text{Per.}$
 $5 = 147.76 \text{ sec} = 7.2 \phi = 1.6 \phi \text{ cm.}$

1521 Water ht = 38.50 cm

System just critical
 Drain



INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|-----------------------|-------|-----------------|-----|------------------------|
| K-1 | 3 x 10 ⁻¹² | Motor | 1" | ✓ | 10 x 10 ⁻¹² |
| " | " | Fast | " | ✓ | " |
| K-2 | " | Motor | 2" | ✓ | " |
| " | " | Fast | " | ✓ | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700 v | Alarm | Cont | ✓ | 500 v |
| PM-2 | 900 v | Low | 10" | ✓ | 900 v |
| " | " | Alarm | 1" | ✓ | " |

LOG N CALIBRATE _____ OPERATE _____ SOURCE No. Q-80

DUMP WELL PROBE LIGHT _____

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-93

Emergency equipment in control room checked by FID.C

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

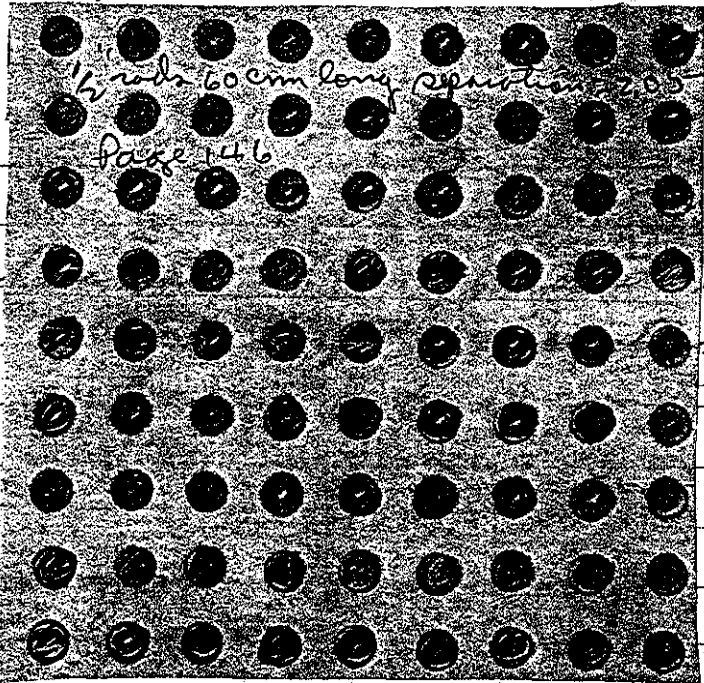
Red light on by AKH Time 0900

Start-up OK'd by FID.C AKH Date 10-18-66

over,

146

10-18-66



0900 Now
made,
edge

of $8\frac{1}{2}$ "
= 2.05 cm,

0933 System
values

Drain

0940 Water ht = 45.55 cm
System just critical
Drain.

0950

Now have a 8×9 array plus 4 rod on one
face. Total of 76 $\frac{1}{2}$ " rods, 60 cm length.
Separation = 2.05 cm, edge-edge.

1015 Water ht = 49.75 cm.
System just critical.
Drain.

146

10-18-66

0900 Now have a 9×9 array. Total of $81 \frac{1}{2}$ "
nodes, 60 cm length. Separation = 2.05 cm,
edge - edge.

0935 System screamed by $K-1$ when drain
value ρ activated.

0940 Water ht = 45.55 cm
System just critical
Drain.

0950

Now have a 8×9 array plus 9 nodes on one
face. Total of $76 \frac{1}{2}$ " nodes, 60 cm length.
Separation = 2.05 cm, edge - edge.

1015 Water ht = 49.75 cm,
System just critical.
Drain.

10-18-66

147

Now have a 8×8 array plus 6 rods on one face. Total of $70 \frac{1}{2}$ rods, 60 cm length.
Separation = 2.05 cm edge - edge.

(23)

1049 Water ht = 61.90
+ Per.

1059 Water ht = 60.60 cm
System just critical
Drain.

1100 Now have a 8×8 array plus 2 rods on one face. Total of 66 $\frac{1}{2}$ rods, 60 cm length.
Separation = 2.05 cm edge - edge.

1132 Water ht = 76.00 cm
System sub critical
Drain.

over

148

p-14-66

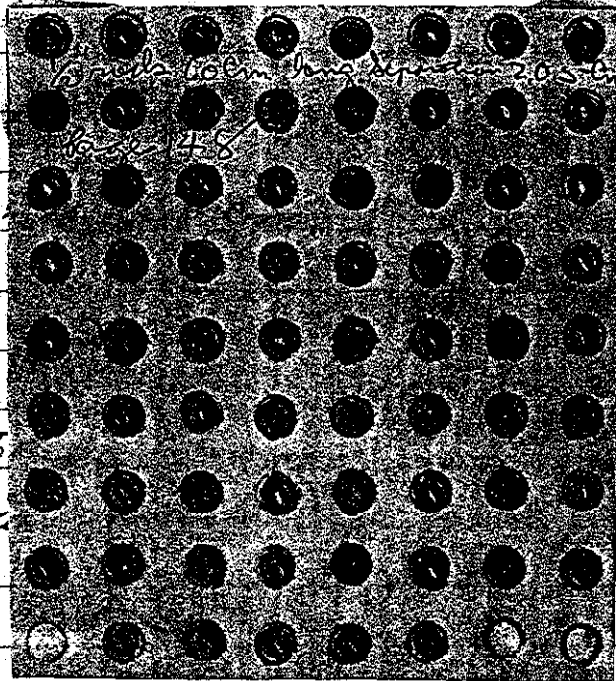
1220 Now have a 8x8 array plus 4 rods on one face. Total of 68 1/2" rods, 60 cm lengths, separation = 2.05 cm.

(21)

1306 Water ht = 76.00 cm

System sub critical
Drain.

1315 Now have a 8x8 array plus 5 rods on one face. Total of 69 1/2" rods, 60 cm lengths, separation = 2.05 cm.



1334 Water ht
2 + Per

1341 Water ht
System of

148

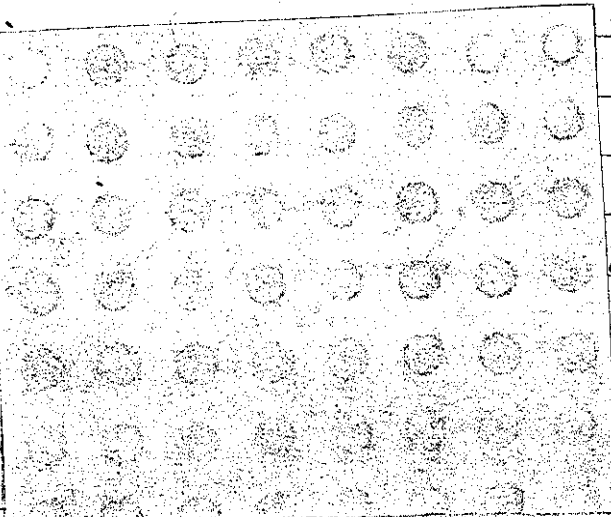
p-14-60

1220 Now have a 8 x 8 array plus 4 rods on one face. Total of 68 $\frac{1}{2}$ " rods, 60 cm lengths, separation = 2.05 cm.

(21)

1306 Water ht = 76.00 cm
System sub critical
Drain.

1315 Now in
face, to
separate



5 rods on one
cm lengths

1334 Water ht = 65.50 cm.
+ Per

1341 Water ht = 63.45 cm
System just critical

1405 Now have a 7x11 array. Total rods = 77.
Rods are 1/2" o.d., 60 cm length, separation = 2.05

1435 Water ht = 56.00 cm
System just critical
Drain.

1450 ²⁹ Now have a 7x10 array plus 3 rods on one
face. Total of 73, 1/2" rods, 60 cm length.
Separation = 2.05 cm

29
11/15/67
cont'd

1511 Water ht = 62.50 cm.
3 + Per

1524 Water ht = 61.40 cm.
System just critical
Drain.

Water Temp.
= 23.5°C

INSTRUMENT CHECK

10/19/66

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|----------------------|--------------------|-------------------|-----------------|-----|--------------------|
| K-1 | 3x15 ⁱⁿ | Meter ✓ Fast ✓ | 3" | ✓ | 3x15 ⁱⁿ |
| K-2 | 3x15 ⁱⁿ | Meter ✓ Fast ✓ | 3" | ✓ | 3x15 ⁱⁿ |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700V | Alarm ✓ | Contact | ✓ | 500V |
| PM-2 | 1200V | Low ✓ Alarm ✓ | 10" 1" | ✓ | 900V |
| LOG N CALIBRATE | | ✓ | OPERATE | ✓ | SOURCE No. B-80 |
| DUMP WELL FREE LIGHT | | | | | |

START-UP CHECK LIST

Equipment checked by EJ IDC Personnel check by IDC
 Instruments and safeties checked and reset by EJ
 Source in checked by EJ Source No. M-43
 Emergency equipment in control room checked by IDC
 Instruments in trip circuit: K-1, K-2, PM-1, PM-2
 Red light on by IDC Time 0845
 Start-up OK'd by EJ IDC Date 10/19/66

Installed thermocouples #1 is near bottom of tank, #2 on support post ~ 30 in from bottom of lattice.

12/19/46

(25) Now there are 7 x 10 lattice with 2 rods on a 7-rod face. Total 72, ~~70~~⁶⁰ cm high, 0.5-in. diam rods.

0925 Water at 76.0 cm. Period #1 - Some in subcritical. #1 24.5°C

0935 Water at 65.60 cm. Critical #2 24.7°C

Drain

(24) Removed one rod. Now there are 7 x 10 lattice with 1 rod on 7-rod face. Total 71.

1013 Water ht = 76.0 cm.
System sub critical
Drain:

Water Temp.
#1 = 24.7°C
#2 = 25.0°C

over.

152

10-19-66

Now
Sept
60

Now:
Sept:

1113 Water
Sept
Dna

Water Temp °C
#1 = 29.7
#2 = 25.0

Now have 6 & 1/2 nodes. In array on
shows separation = 2.05 cm. edge-edge
60 cm length

1330 Water
Sept

Temp °C
#1 = 29.7 °C
#2 = 25.0 °C

152

10-19-66

Now (6 $\frac{1}{2}$ nodes) in an array as shown:
Separation = 2.05 cm. Edge - Edge:
60 cm length.

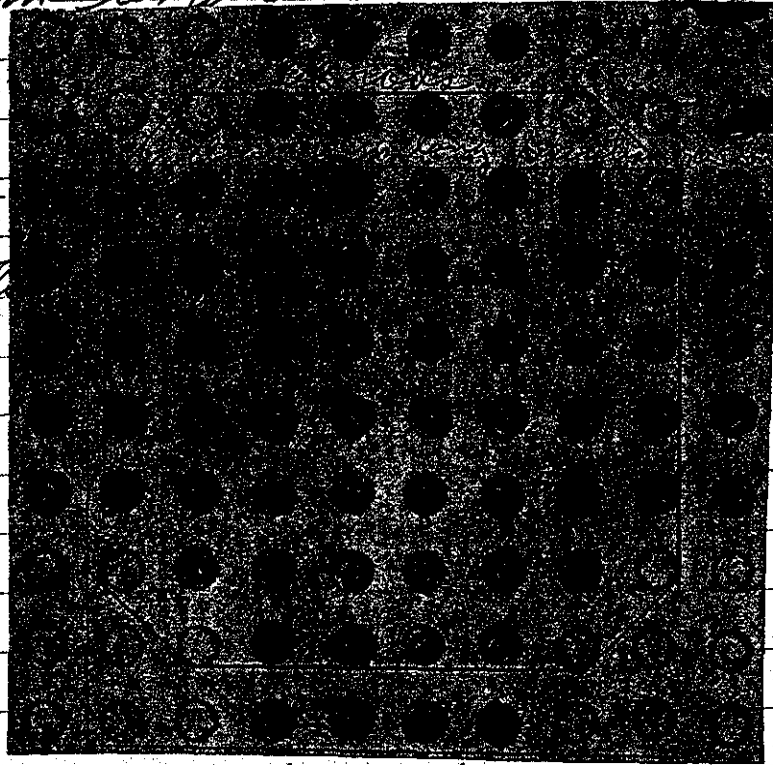
1113 Water ht = 76.0 °C
System Sub Critical
Drain.

Water Temp °C
1 = 29.7 °C
2 = 25.0 °C

Now have 6 $\frac{1}{2}$ nodes. In array as
shown separation = 2.05 cm. edge - edge
60 cm length

1330 Water
System

Temp °C
1 = 29.7 °C
2 = 25.0 °C



152

10-19-66

Now (64 nodes) ^{1/2"} in an array or shown:
Separation = 2.05 cm. Edge - Edge:
60 cm length.

1113 Water
level
Dna

Now
shown
60 cm

Water Temp °C

1 = 29.7°

2 = 25.0°

or

edge

1330

Water level = 76.0 cm
system sub critical

Water Temp °C

1 = 29.7°

2 = 25.0°

Now ha
Separate
lengths

66 rods
60 cm length
Separate 2.05 cm

as shown
60 cm

1412 Water
System
Drain

Water Temp °C
#1 = 25.0 °C
#2 = 25.1 °C

Now ha
Separate
lengths

66 rods
60 cm length
Separate 2.05 cm

as shown
60 cm

1506 + Per
Water hl

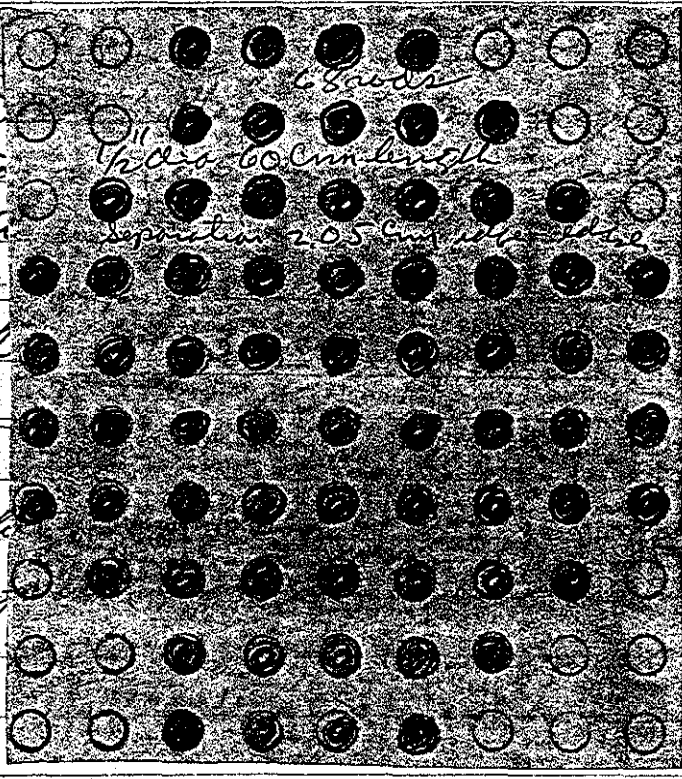
Water Temp.
#1 = 25.0 °C
#2 = 25.1 °C

(27)
1515 Water
System
Drain

Now have 66 1/2 nodes. In array as shown.
 Separation = 2.05 cm edge-edge. 60 cm
 length.

3 °C 1412 Water ht = 76.00 cm Water Temp °C
 4.7 °C Sub-Atm. #1 = 25.0 °C
 5.0 °C System just critical. ? #2 = 25.1 °C
 Drain.

Now have 66 1/2 nodes. In array as shown.
 Separation = 2.05 cm edge-edge. 60 cm
 length.
 1500 + Per.
 Water ht.
 (27)
 1515 Water ht.
 System just critical.
 Drain.



Water Temp °C
 #1 = 25.0 °C
 #2 = 25.1 °C

Now have 66 1/2 0 0
 Separation
 lengths

on slawn.
 60 cm

°C
 9.7
 5.0

1412 Water
 system
 Drain

Temp °C
 #1 = 25.0 °C
 2 = 25.1 °C

Now lower 0 + 0.05 m error on slawn.
 Separation = 2.05 cm. edge - edge : 60 cm
 lengths.

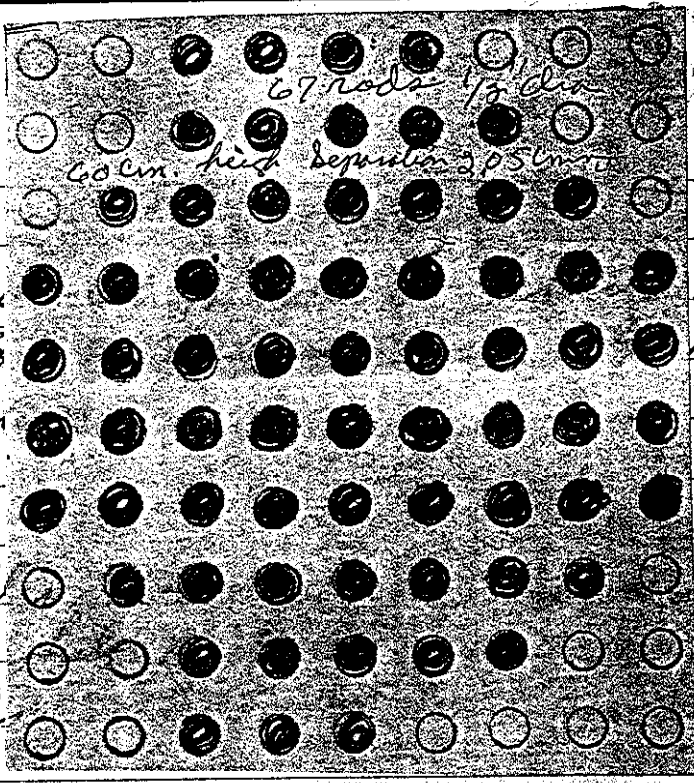
1500 + Per.
 Water ht = 67.30 cm.

°C
 7
 0

(27)

1515 Water ht = 64.40 cm.
 System just critical
 Drain.

Water Temp.
 #1 = 25.0 °C
 2 = 25.1 °C



67 rods 1/8 dia

60 cm high separator 3.05 cm

New bar
separator
60 cm

15.5% water h
system
Draisi

Top Temp °C
#1 = 25.0
2 = 25.7

10
INS

154

Now have 67 1/2 rods or slawm.
separation = 2.05 cm edge - edge.
60 cm length.

1558 Water ht = 76.0 cm
system sub critical
Drain

Water Temp °C
#1 = 25.0
2 = 25.7

INSTRUMENT CHECK

10/20/66

| INSTRUMENT | RANGE | TRIP | SOURCE | SET | START-UP RANGE |
|-----------------------|-----------------------|-------------------|---------|------------------------|-----------------------|
| K-1 | 3 x 15 ⁻¹² | Meter ✓ Fast ✓ | 2" | | 3 x 15 ⁻¹² |
| K-2 | 3 x 15 ⁻¹² | Meter ✓ Fast ✓ | 2" | | 3 x 15 ⁻¹² |
| R-1 | | | | | |
| PM-1 | 7000 | Alarm ✓ | | | 5000 |
| PM-2 | 12000 | Low ✓ Alarm ✓ | 10" | | 5000 |
| LCO IN CALIBRATE | | | OPERATE | SOURCE No. <u>B-20</u> | |
| DUMP WELL PROBE LIGHT | | | | | |

START-UP CHECK LIST

Equipment checked by EA, IDC Personnel check by IDC

Instruments and safeties checked and reset by EA

Source in checked by SA Source No. M-43

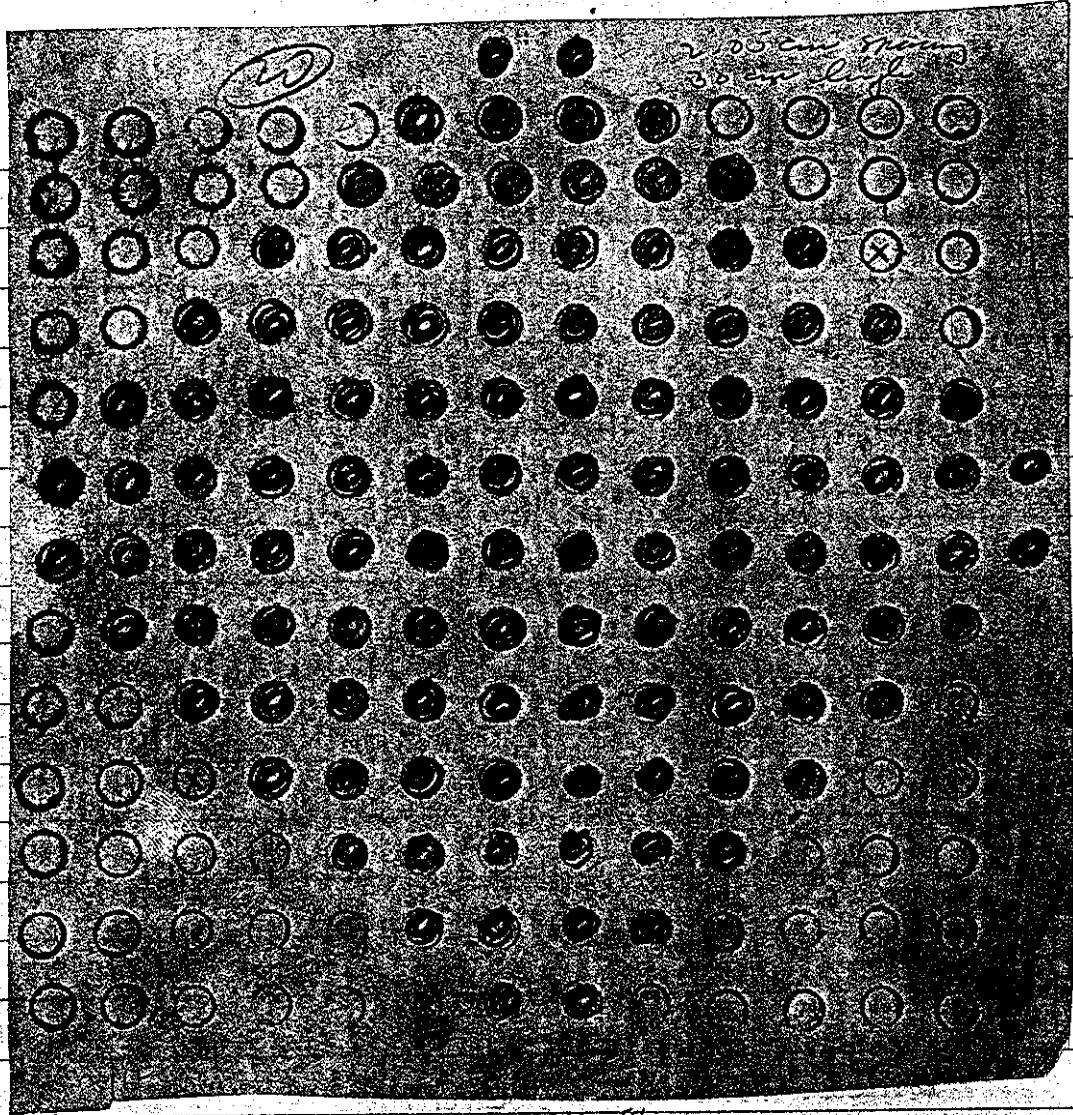
Emergency equipment in control room checked by IDC

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

Red light on by EA Time 1340

Start-up CK'd by EA, IDC Date 10/20/66

10/20/66



Modified
 6/20/69
 Z1

11/20/83
 11/20/83
 6/20/69

Above ^{net} lattice with ~~rod~~ rods 30 cm long, 1/2" diam, spaced 2.05 cm. Surface

1410 Wet w at 35.4 cm #1

#1 24.7
 #2 25.8

T=35.5 sec p=20.5 g

1417 Wet w at 34.6 cm. Critical.

Drains.

12/22/66

110
112

Removed 2 rods from the east face. Now have rod

1445 Water at 35.65 cm. Critical

#1 24.7°C

#2 25.0°C

Drain

Removed 4 rods, 2 from little north + south faces.

Now have ¹²⁷ ¹⁰⁶ rods.

1510 Water at 45.2 cm. Subcritical.

1515 Remove some for leg period #2 Too steep to measure

Drain

Moved 2 rods on west face to positions shown as blue X's on diagram, p. 156. Total still ¹⁰⁶ rods.

This number traces these rods

1545 Water at 45.1 cm. Subcritical of a very little.

1550 Remove some for leg period #3 Revised gage:

#1 24.7°C

#2 25.0°C

(20) Critical at above water height.

Drain

158

10/21/66

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|---------------------|-------------------|-----------------|--------|---------------------|
| K-1 | 3x10 ⁻¹² | Meter ✓ Fist ✓ | 4" | ✓ | 3x10 ⁻¹² |
| K-2 | 3x10 ⁻¹² | Meter ✓ Fist ✓ | 3" | ✓ | 3x10 ⁻¹² |
| R-1 | — | | | | |
| R-2 | — | | | | |
| PM-1 | 700V | Alarm ✓ | | ✓ | 500V |
| PM-2 | 1200V | Low ✓ Alarm ✓ | 10" 1" | ✓ ✓ | 900V |

1015

109

LOG N CALIBRATE _____ OPERATE _____ SOURCE No. B-8
 DUMP WELL PROB LIGHT _____

START-UP CHECK LIST

Equipment checked by EJ, IDC Personnel check by IDC
 Instruments and safeties checked and reset by EJ
 Source in checked by EJ Source No. M-43
 Emergency equipment in control room checked by IDC
 Instruments in trip circuit: K-1, K-2, PM-1, PM-2
 Red light on by EJ Time 9:50
 Start-up OK'd by EJ, IDC Date 10/21/66

111

Have an 11x11 notice with 4 corners missing (117 rods)
 at 2.65 spacing, 30 cm high.

1015 Water ht = 45 cm. Day subcritical. #1 24.5°C
 Drain. #2 24.7°C

Now have a 11x14 with 4 corners missing, 128 rods.

1042 Water ht = 45.0 cm Water Temp °C
 System sub critical #1 = 24.7
 Drain. #2 = 25.0

Now have a 12x12 with 4 corners missing
 total of 140 rods

1113 Water ht = 45.0 cm Water Temp °C
 System sub critical #1 = 24.7
 Drain. #2 = 25.0

160

10-21-66

Now have an 13x13, with the 4 corner rods removed. Total of 165 1/2" rods. Separation = 2.65 cm, edge-edge.

130.5 Water ht = 45.0 cm
System sub critical
Drain

Water Temp °C
#1 = 24.7
2 = 25.0

142
144

Now have an 14x14 array. Total rods = 196.

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

(5)
14

133.7 Water ht = 33.50 cm.

+ Per

→

Water Temp °C

#1 = 24.7

2 = 25.0

1346 Water ht = 33.40 cm.

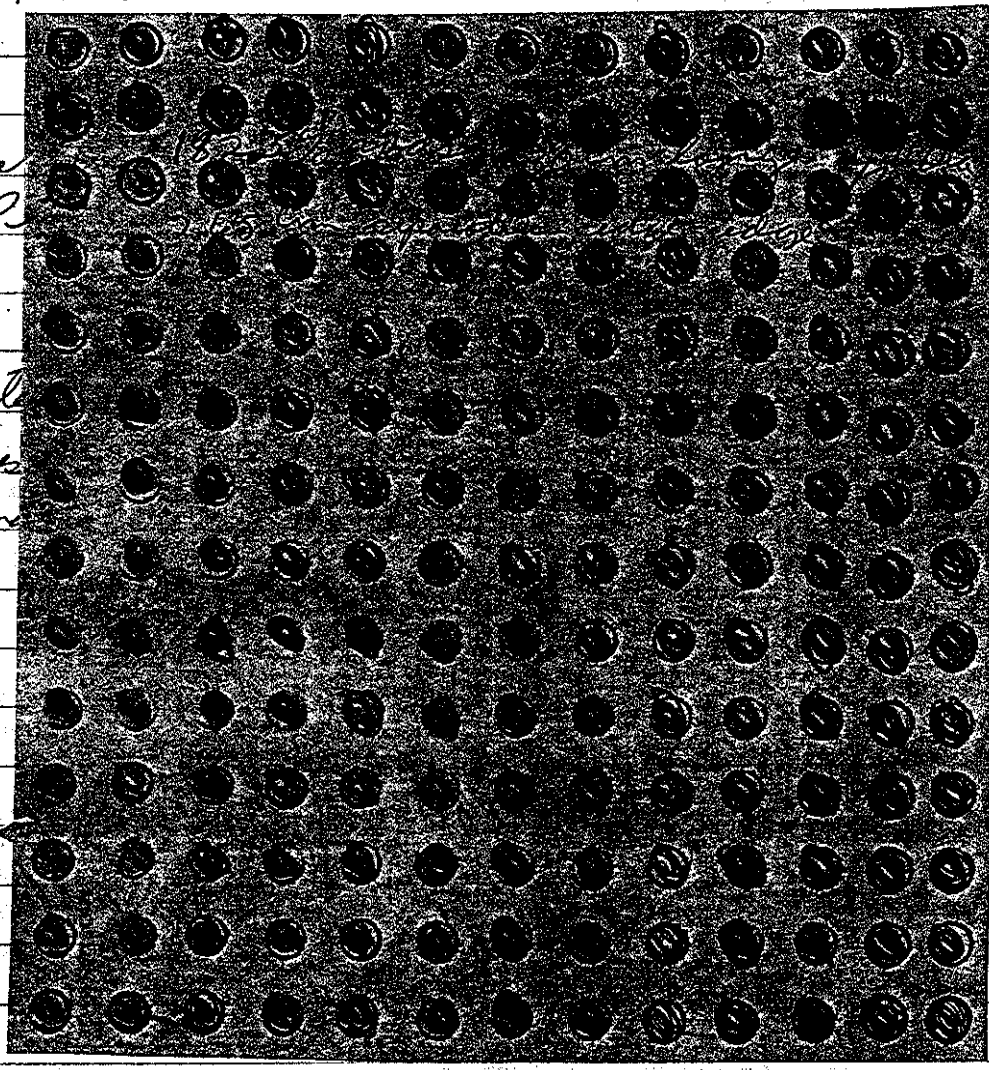
System just critical
Drain

now have an 13 x 14 array. Total nodes

(28) = 182.

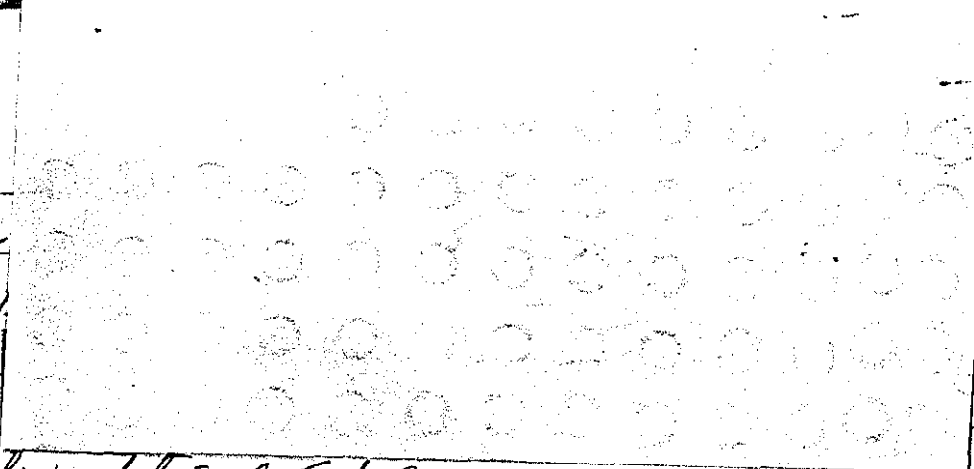
1423 wa
2 + P
E =

1440 wa
Sep
Don



New

(28) = 1



1923 water ht = 45.6 cm.

² + P_{or}

$E = 554.1 \text{ m} = 2.2 \text{ f}$

3.0
4.7
5.0

1490 water ht = 40.90 cm

system just critical
Drains.

4.0
4.7
5.0

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|-----------------------------|-----------------------|-----------|-----------------|----------------------------|------------------------|
| K-1 | 3 X 10 ⁻¹² | Meter ✓ | 2" | ✓ | 10 X 10 ⁻¹² |
| " | " | Fast ✓ | " | ✓ | " |
| K-2 | " | Meter ✓ | 3" | ✓ | " |
| " | " | Fast ✓ | " | ✓ | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700v | Alarm ✓ | cont | ✓ | 500v |
| PM-2 | 1200v | Low ✓ | 10" | ✓ | 900v |
| " | " | Alarm ✓ | 11" | ✓ | " |
| LOG N CALIBRATE ✓ | | OPERATE ✓ | | SOURCE NO. B-80 | |
| DUMP WELL PROBE LIGHT _____ | | | | | |

START-UP CHECK LIST

Equipment checked by RKA Personnel check by F.D.C
 Instruments and safeties checked and reset by RKA
 Source in checked by RKA Source No. M-43
 Emergency equipment in control room checked by F.D.C
 Instruments in trip circuit: K-1-2 PM1-2
 Red light on by RKA Time 0803
 Start-up OK'd by F.D.C RKA Date 10-29-66

Now have an 14x14 array with 6 nodes removed from each corner. Total of a 172 $\frac{1}{2}$ " nodes. Separation 2.65 cm edge-edge. 30 cm ht.

0837 Water ht = 45.20 cm

Water Temp °C

(1) - Per.

#1 = 24.3

$C = 182.53 \text{ mm} = -9.2 \text{ f}$

2 = 24.3

0843 Drain to 0.0 cm.

Now have 14x14 array with 5 nodes removed from each corner. Total of a 176 $\frac{1}{2}$ " nodes. Separation = 2.65 cm edge-edge. 30 cm ht

0920 Water ht = 39.10 cm.

D.L. = 1.65 cm.

(2) + Per

Water Temp °C

$C = 118.43 \text{ mm} = 8.6 \text{ f} = 5.29 \text{ cm}$

#1 = 24.3

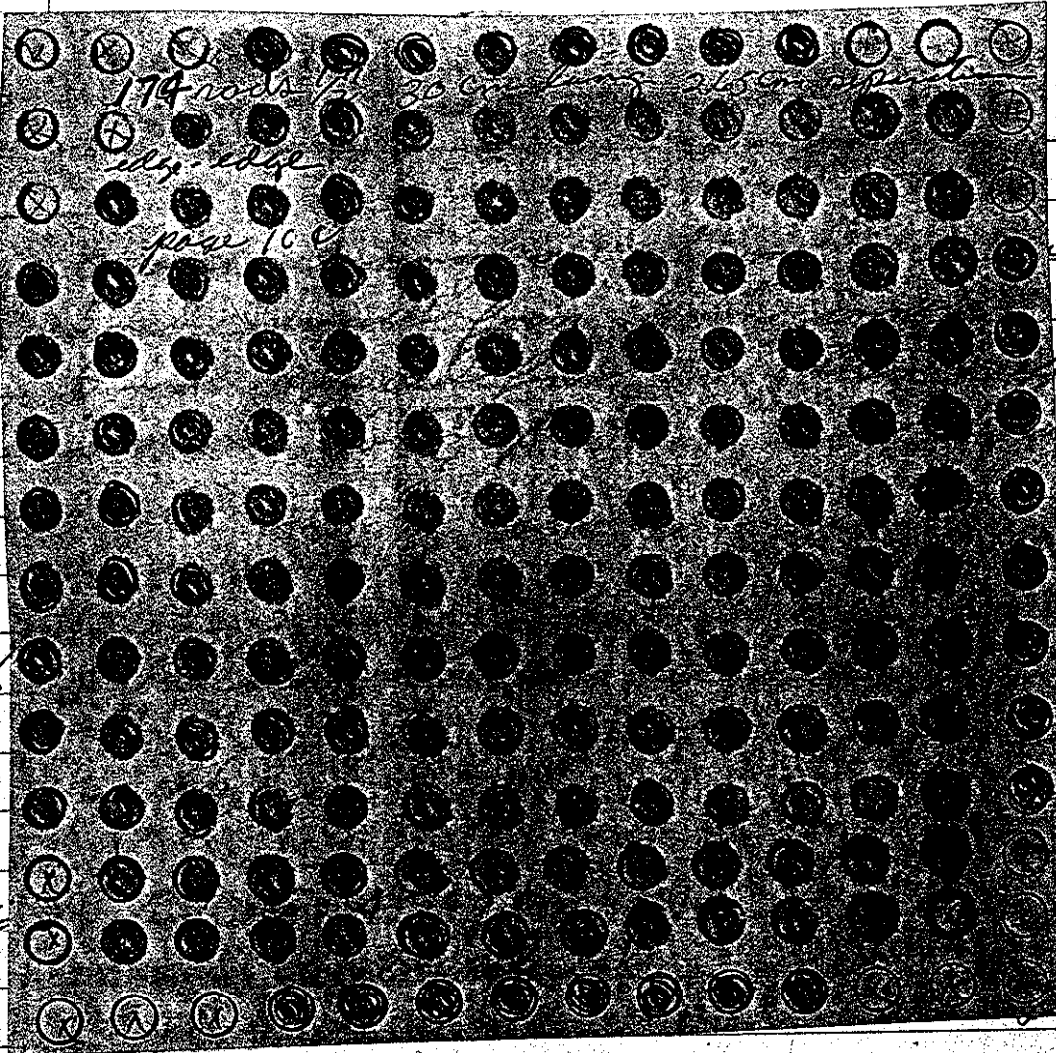
0926 Water ht = 37.45 cm.

2 = 24.3

Sister joints critical
Dress.

over.

164



179 nodes 30 2.65

edge edge

page 100

30

with
and
white
Temp = 2.65

1018

1026

Temp °
24.3 °
24.5 °

③

Now have array as shown, 14x14 with
 5 rods removed from opposite corners, and
 6 rods removed from the other 2 opposite
 corners. Total of 174 $\frac{1}{2}$ " rods. Spacing = 2.65
 30 cm ht.

1018₃ Water ht = 45.0 cm.
 + Per
 $E = 499.7 \text{ sec} = 2.84$

1026 Water ht = 40.60 cm
 System just critical
 Drain

Water Temp °
 #1 = 24.3°
 #2 = 24.5°

10-24-66

60 cm

length. Now have a 9 x 9 array. or down: 81 rods
 $\frac{1}{2}$ " rods. 60 cm length. Separation = 2.65 cm.

.650

1257

Water ht = 75.22 cm

System sub critical
 Drain

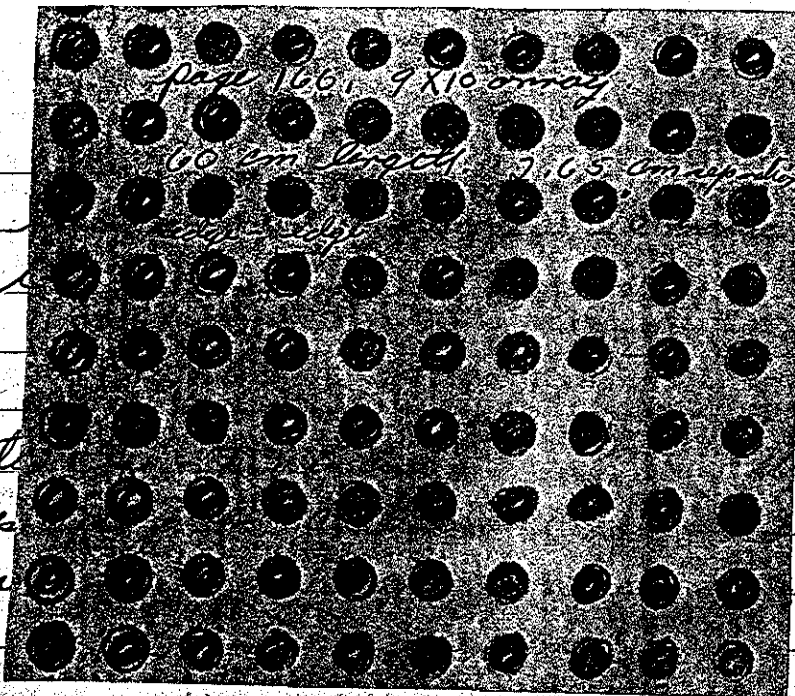
Now have a 10 x 10 array. 100 rods. 60 cm
 length. Separation = 2.56 cm.

1333

Water ht = 52.20 cm.

System just critical
 Drain.

over



(3)

Now
length

60 cm

1415

Water
Temp
Drain

Water Temp °C
= 24.7
= 25.0

Now have an 10x10 array with 5 rods removed from each corner. 60 cm length. Spacing = 2.65 cm. Total of 80 rods.

1536

Water ht = 75.0 cm
System sub critical
Drain

Water Temp °C
t₁ = 29.7
t₂ = 29.7

166

(3)

Now have an 9×10 array. 90 rods 60 cm length. Separation 2.65 cm.

1415 Water ht = 75.0 cm
System just critical.
Drain.

Water Temp. $^{\circ}$
 $T_1 = 24.7$
 $T_2 = 25.0$

Now have an 10×10 array with 5 rods removed from each corner. 60 cm length. Separation = 2.65 cm. Total of 80 rods.

1536 Water ht = 75.0 cm
System sub critical
Drain.

Water Temp. $^{\circ}$
 $T_1 = 29.1$
 $T_2 = 29.1$

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|-----------------------|--------|---------|-----------------|-----|----------------|
| K-1 | 3 X 10 | Meter | 2.5" | | |
| | " | Fast | 1" | | |
| K-2 | " | Meter | 3" | | |
| | " | Fast | 1" | | |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700V | Alarm | cont | | |
| PM-2 | 1200V | Low | 10" | | |
| | " | Alarm | 1" | | |
| LOG-N CALIBRATE | | OPERATE | SOURCE No. A-80 | | |
| DUMP WELL PROBE LIGHT | | | | | |

START-UP CHECK LIST

Equipment checked by AKH Personnel check by F.D.C.
 Instruments and safeties checked and reset by AKH
 Source in checked by AKH Source No. 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 AKH Time 0805
 Start-up OK'd by F.D.C. AKH Date 10.25-66

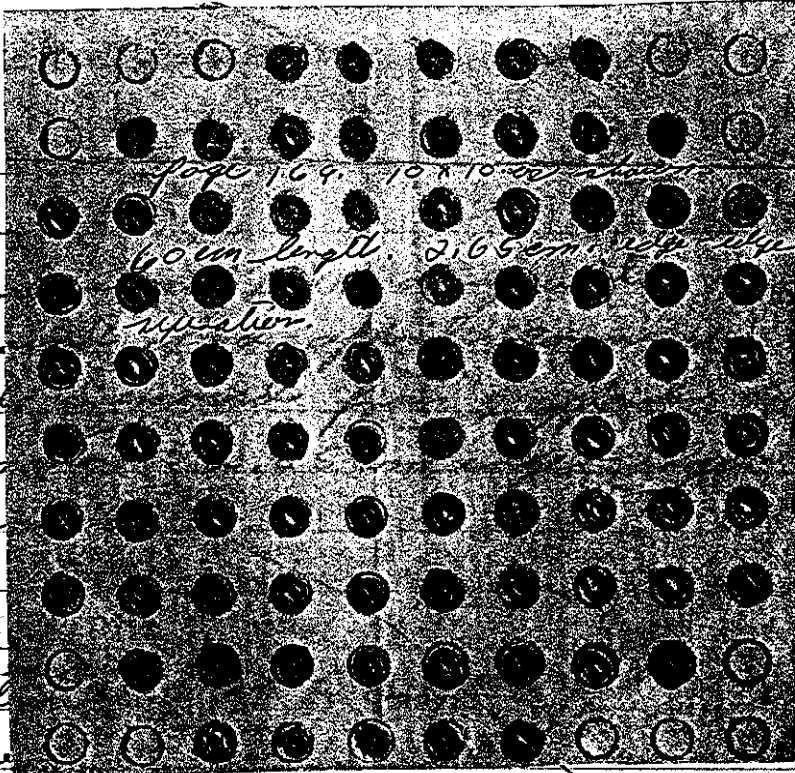
Now have an 10×10 array with 4 rods removed from each corner. 60 cm length. Separation = 2.65 cm edge-edge. Total of 8 rods.

0855 Water ht = 75.00 cm Water Temp $^{\circ}\text{C}$
 System sub critical #1 = 29.5
 Drain. #2 = 29.5

(33) Now have an 10×10 array with 3 rods removed from each corner. 60 cm length. Separation 2.65 cm edge-edge. Total of 8 rods.

0932 Water ht = 62.60 cm ^{$z_h = 1.05$} Water Temp $^{\circ}\text{C}$
 + Per #1 = 29.7
 $z = 65.19 \text{ cm} = 13.0 \text{ ft}$ #2 = 29.7

0936 Water ht = 61.55 cm
 System just critical
 Drain.



page 169, 10 x 10.00

60 in length 2.65 in

repetition

New

rem

rad

sp

86

6.476

1026

Water

- p

5 = 221.65 m = - 7.24

rad

and 3

more.

Total of

Water Temp °

1 = 29.7

2 = 29.7

87 rods.

? 8/83

1032

Drain.

red
65

7

7

New have an 10x10 array with 4 rods removed of 2 opposite corners, and 3 rods removed from 2 opposite corners.

3-

Separation = 2.65 cm edge-edge. Total of 86 rods.

6.476

1026 Water ht = 75.60 cm

Water Temp °C

r = Per

#1 = 29.7

C = -221.65 mm = -7.24

#2 = 29.7

87 rods.

? 8/93

1032 Drain.

oil
.65

.7
.7

INSTRUMENT CHECK

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

START-UP CHECK LIST

Equipment checked by AKK Personnel check by FIDC
 Instruments and safeties checked and reset by AKK
 Source in checked by AKK Source No. M-93
 Emergency equipment in control room checked by FIDC
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by AKK Time 1255
 Start-up OK'd by FIDC AKK Date 10-26-66

10-26-66

171

Now have a 14 x 14 array. 196 $\frac{1}{2}$ " ^{rods} ~~rods~~
30 cm length. Rods are in contact. (Note
Rods are as close as possible due to fact that
some rods are bent and set.)

Water ht = 45.0 cm.
System sub critical.
Drain.

Water Temp °
#1 = 29.7
2 = 29.7

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|-----------------------|---------------------|---------|-----------------|-----|---------------------|
| K-1 | 3X10 ⁻¹² | Meter ✓ | 2" | ✓ | 3X10 ⁻¹² |
| " | " | Fast ✓ | " | ✓ | " |
| K-2 | " | Meter ✓ | " | ✓ | " |
| " | " | Fast ✓ | " | ✓ | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 500V | Alarm ✓ | cont | ✓ | 500V |
| PM-2 | 1200V | Low ✓ | 10M | ✓ | 900V |
| " | " | Alarm ✓ | 1" | ✓ | 4 |
| LOG N CALIBRATE | | ✓ | OPERATE | ✓ | SOURCE No. B-80 |
| DUMP WELL PROBE LIGHT | | 7 | | | |

START-UP CHECK LIST

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

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

Red light on by AKM Time 0815

Start-up OK'd by F.I.C. AKM Date 10-27-66

10-27-66 $\frac{1}{2}$ " rad. Triangular array.
2.59 cm. center-center.

now have 121 rad. triangular array as described
~~status~~. Separation = 2.59 cm. ^{C-c} 30 cm length
6 full rings, ²¹including center ~~element~~, with points
removed.

0948 Water ht = 31.85 $R_h = .12$ cm. Water Temp °C
① + P_{sw} $T_1 = 29.5$
 $T = 82.57 = 11.54$ $T_2 = 29.3$

0959 Water ht = 31.73 cm
system just critical
Drain.

Removed 6 rods. Now have 115 rods.
2 rods removed from each face in 6th
row.

0921 Water ht = 35.35 cm $R_h = .60$ cm. Water Temp °C
② + P_{sw} $T_1 = 29.7$
 $T = 67.36 = 12.34$ $T_2 = 29.5$

0928 Water ht = 34.80 cm ⁷⁵
system just critical
Drain.

over.

10-27-66

Removed 3 rods. Now have 112, 4 rods on every other face in 6 rows, and 3 rods on every other face in 6 rows.

10.00 Water ht = 45.0 cm

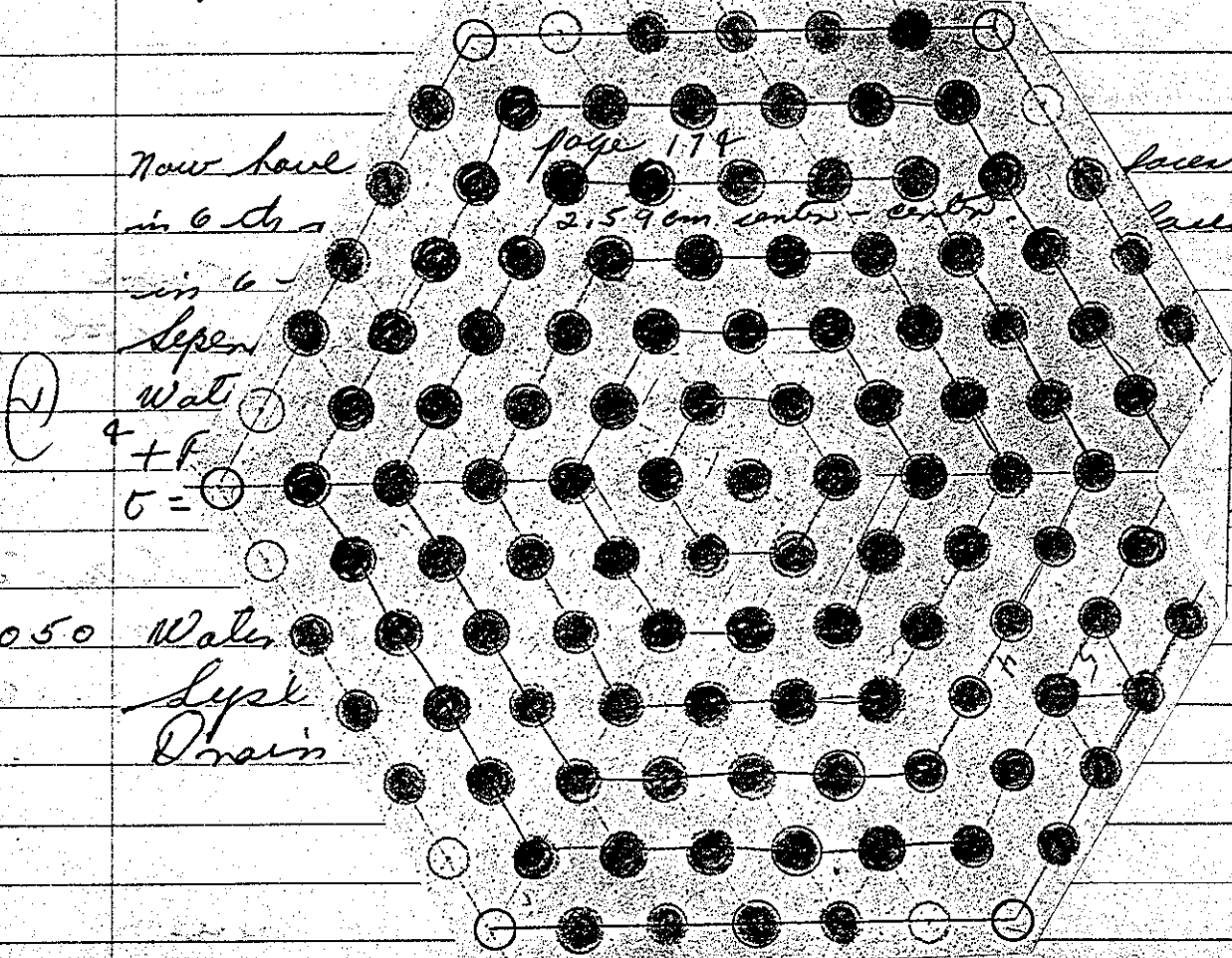
Water Temp °C

①³ - Pen
- E - - 117.34 sec = 18.6 f

H = 1.247

2 = 29.6

10.05 Drain.



10.50 Water Sept Drain

174

10-27-66

Removed
on eve
on eve

4 rods
rods

10-2

10.00 No

3 -
1 -

°
C

= 24.7

= 24.6

10.05 On

Now have 113 rods. 3 rods on 2 opposite faces
in 6th row, and 4 rods on 4 opposite faces
in 6th row. Array as shown.

Separation = 2.59 cm c-c.

(1)

Water ht = 45.50 cm

Water Temp °C

+ Per

#1 = 24.7

$U = 371.58 \text{ sec} = 3.2 \text{ f}$

#2 = 24.6

10.50 Water ht = 40.0 cm = 10 cm

System just critical
Drain.

142.5

10-27-66

2.59 cm center-center. 60 cm length.

Now have 85 rods. 60 cm long. 4 full rings plus 4 rods on each face in 5th ring.

Water ht = 53.00 cm
System just critical
Drain

Water Temp °C

#1 = 24.7

#2 = 24.7

Remained 2 rods from each face. Now have 4 full rings plus 2 rods on each face in 5th row. Total of 73 rods.

1425 Water ht: 75.00

System sub critical
Drain

Water Temp °C

#1 = 24.7

#2 = 24.7

Now have 76 rods. Four full rings plus
3 rods on 3 faces and 2 rods on 3 faces
in 5th ring.

1533 Water ht = 75.0 cm
System sub critical
Drain.

~~97.~~

Now have 79 rods. Four full rings plus
3 rods on each face in 5th ring.

1410 Water ht = 74.0 cm
System sub Critical
Drain.

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|---------------------|---------|-----------------|-----|---------------------|
| K-1 | 3×10^{-12} | Meter ✓ | 1" | — | 3×10^{-12} |
| " | " | Fast ✓ | " | — | " |
| K-2 | " | Meter ✓ | 2" | — | " |
| " | " | Fast ✓ | " | — | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700V | Alarm ✓ | cont | — | 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 AKV Personnel check by FIDC

Instruments and safeties checked and reset by AKV

Source in checked by AKV Source No. M-23

Emergency equipment in control room checked by FIDC

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

Red light on by AKV Time 0812

Start-up OK'd by FIDC AKV Date 10-28-66

10-28-66

Now have 82 rods. Four full rings, plus
4 rods on 3 faces, and 3 rods on 3 faces in
5th ring. 60 cm length, 2.59 cm c-c.

0848 Water ht = 60.60 cm

Water Temp °C

10

① + Per.

1 = 24.7

③

2 = 24.8

0955 Water ht = 60.00 cm

System just critical.

Now have 81 rods. Four full rings, plus
4 rods on 2 faces, and 3 rods on 4 faces in
5th ring. 60 cm length, 2.59 cm c-c

0938 Water ht = 63.90 cm

Water Temp °C

② + Per

1 = 24.7

④

2 = 24.8

62.80 cm

Water ht = 63

System just critical
Drain.

Now have 80 rods. Four full rings, plus
 3 rods on 5 faces, and 4 rods on 1 face in
 5th ring. 60 cm length, 2.59 cm c-c.

1026 Water ht = 75.00

Temperature °C

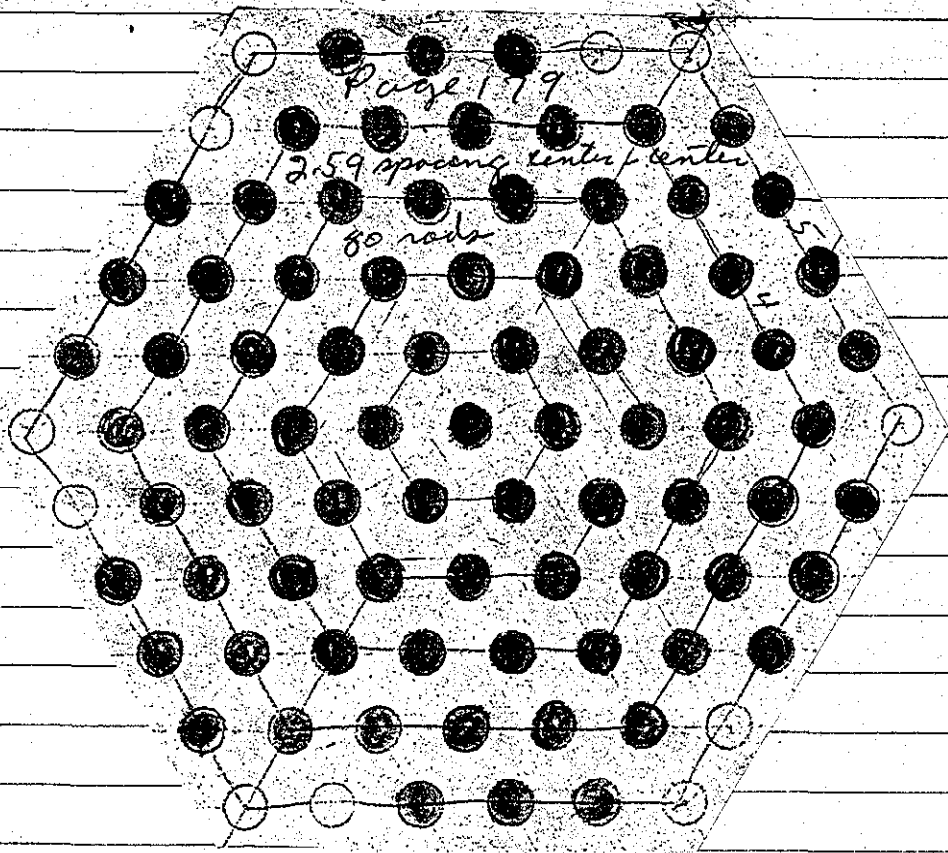
System sub critical.

#1 = 25.0

Drain

2 = 24.7

(5)



10/28/66

$1.53 = 3.21 - 1.31$

Installed grid plates with 1.53 cm surface spacing (3.21 cm center spacing). 9.7 rods 30 cm long and 1/4" diam; 5 rings + 1 rod in center of face in 6th ring.

#1: 25.0 °C

#2: 24.5 °C

1528 W & W at 45.3 cm. Subcritical

Drain

Added 2 rods in 6th ring on same face as odd one alone.

#1: 25.0 °C

1538 W & W at 4

#2: 25.0 °C

Added 5 rings

9.5 rods, in 6th face.

1600 W & W

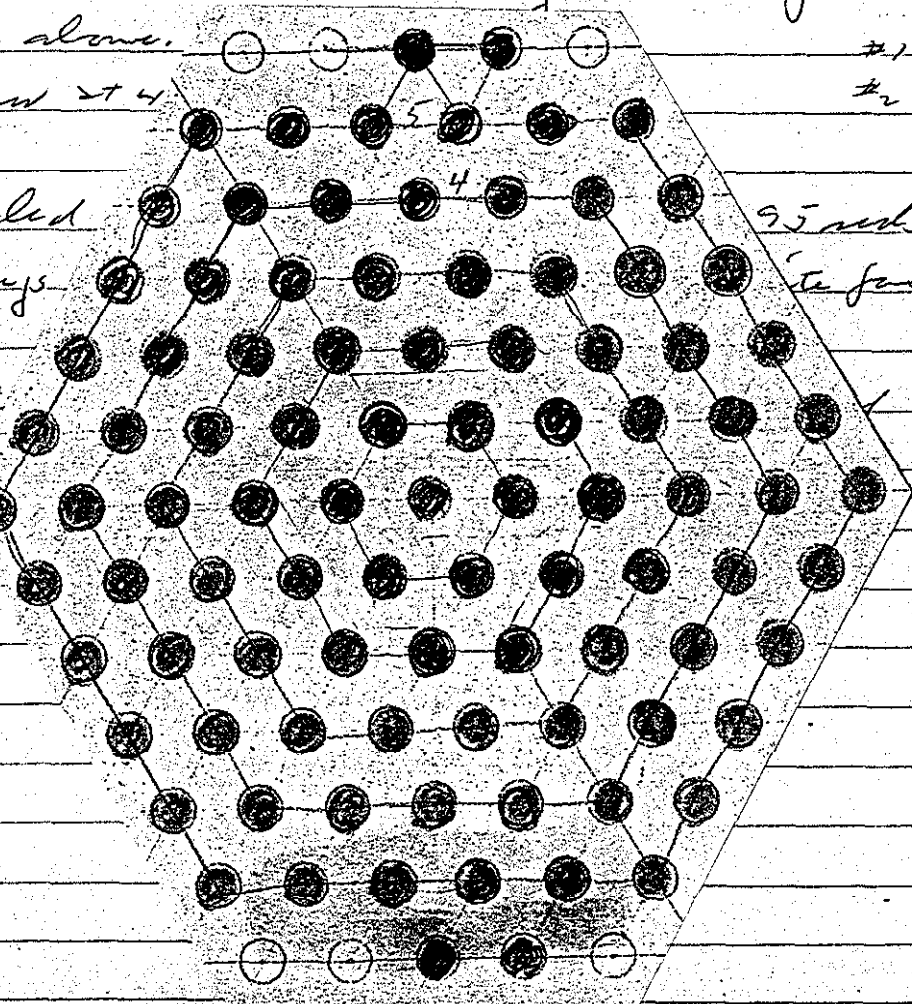
#1: 25.0

1605 W & W

#2: 25.0

(6)

D



10/28/66

$$1.93 = 3.21 - 1.31$$

Installed grid plates with 1.85^{cm} surface spacing (3.21 cm center spacing), 97 rods 30 cm long and 1/4" diam; 5 rings + 1 rod in center of face in 6th ring.

#1: 25.0 °C

#2: 24.5 °C

1528 W to W at 45.3 cm. Subcritical
Drain

Added 2 rods in 6th ring on same face as odd one above. Now have 94 rods.

#1: 25.0 °C

1530 W to W at 45.0 cm. Subcritical

#2: 25.0 °C

Added 1 and moved 1. Now have 95 rods, in 5 rings with 2 on each of two opposite faces.

1600 W to W at 45.3 cm. Slightly supercritical #1: 25.0

1605 W to W at 42.85 cm. Critical #2: 25.0

Drain

(6)

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|---------------------|----------|-----------------|-----|----------------------|
| K-1 | 3×10^{-12} | ✓ | 2" | ✓ | 10×10^{-12} |
| " | " | ✓ | " | ✓ | " |
| K-2 | " | Master ✓ | 2" | ✓ | " |
| " | " | ✓ | " | ✓ | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 300V | Alarm ✓ | cont | ✓ | 500V |
| PM-2 | 1200V | Low ✓ | 10" | ✓ | 900V |
| " | " | Alarm ✓ | 1" | ✓ | " |

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

START-UP CHECK LIST

Equipment checked by AMC Personnel check by FIDC
 Instruments and safeties checked and reset by AMC
 Source in checked by AMC Source No. M-93
 Emergency equipment in control room checked by FIDC
 Instruments in trip circuit: K-1-2 R19-1-2
 Red light on by AMC Time 0855
 Start-up OK'd by FIDC Date 10-31-66

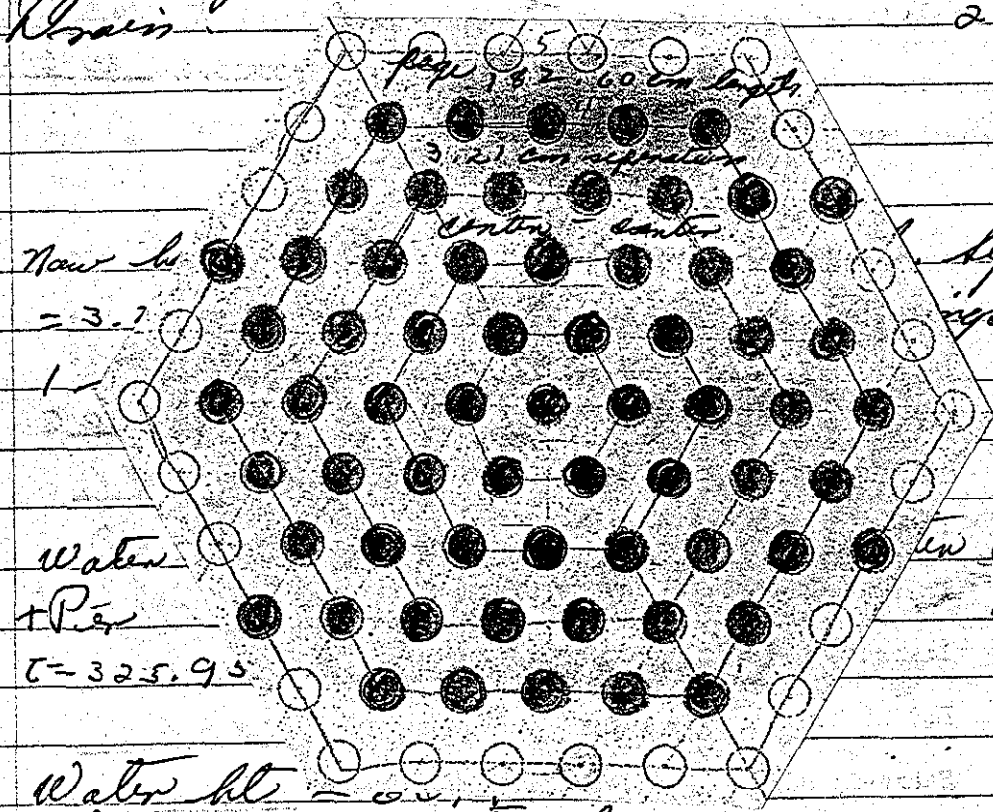
182

10-31-66

Now have 67 rods. 60 cm length.
Separation = 3.21 cm center - center. 1/2 rods
Have 4 full rings, and 1 rod on each
face in 5th ring.

Water ht = 57.00
 57.05 cm
Separation just critical
Drain

Water Temp °C
#1 = 24.5
#2 = 24.5



Now ht
= 3.7
1

Separation
just critical

Water
+ P
t = 325.95

Water Temp °C
#1 = 24.7
#2 = 24.7

Water ht = 60
Separation just critical
Drain

182

10-31-66

Now have 67 rods, 60 cm length.
 Separation = 3.21 cm center-to-center. 1/2 rod
 Have 4 rods on each face

Water
 Temp
 1 = 29.5
 2 = 29.5

Water Temp °C
 1 = 29.5
 2 = 29.5

Now have 65 rods, 60 cm length. Separation = 3.21 cm, c-c. Have 4 full rings, and 1 rod on 4 faces in 5th ring.

(7)

Water ht = 75.00 cm $D_h = 8.7$ cm Water Temp °C
 + Per $Q_1 = 24.7$
 $Q = 325.95$ sec = 3.6 ft = 4.1 ft $Q_2 = 29.7$

Water ht = 66.40 cm.
 Separation just critical
 Drain.

10-31-66 30 cm length. 3.66 cm spacing - center-center.
 Triangular array.

Now have 109 rods. 5 full rings, plus
 3 rods on each face in 6th ring.

1350 Water ht = 33.60 cm.

+ Per.

$$C = 111.91 \text{ sec} = 9.14$$

Water Temp. °C

$$\#1 = 24.70$$

$$\#2 = 24.7$$

1358 Water ht = 33.50 cm

System just critical
 Drain

Removed 1 rod from 1 face in 6 ring. Now
 have 108 rods. Separation same as above.

1417 Water ht = 34.30 cm.

+ Per.

$$C = 95.61 \text{ sec} = 10.34$$

Water Temp. °C

$$\#1 = 24.7$$

$$\#2 = 24.9$$

1423 Water ht = 34.15

System just critical
 Drain

over

10-31-66

Remained 2 more rods. Now have 106 rods.
 5 full rings. plus 3 rods on opposite face, and
 on 31 face, and 2 rods on opposite face on
 3 face in 6th row. Separation = 3.66 cm
 center-center. 30 cm length
 30 cm length

Water ht = 37.40 cm.
 + Per
 C = 67.36 sec = 13.34

Water ht =
 #1 = 29.7
 2 = 29.9

1500 Water ht =
 Septen y

(8)

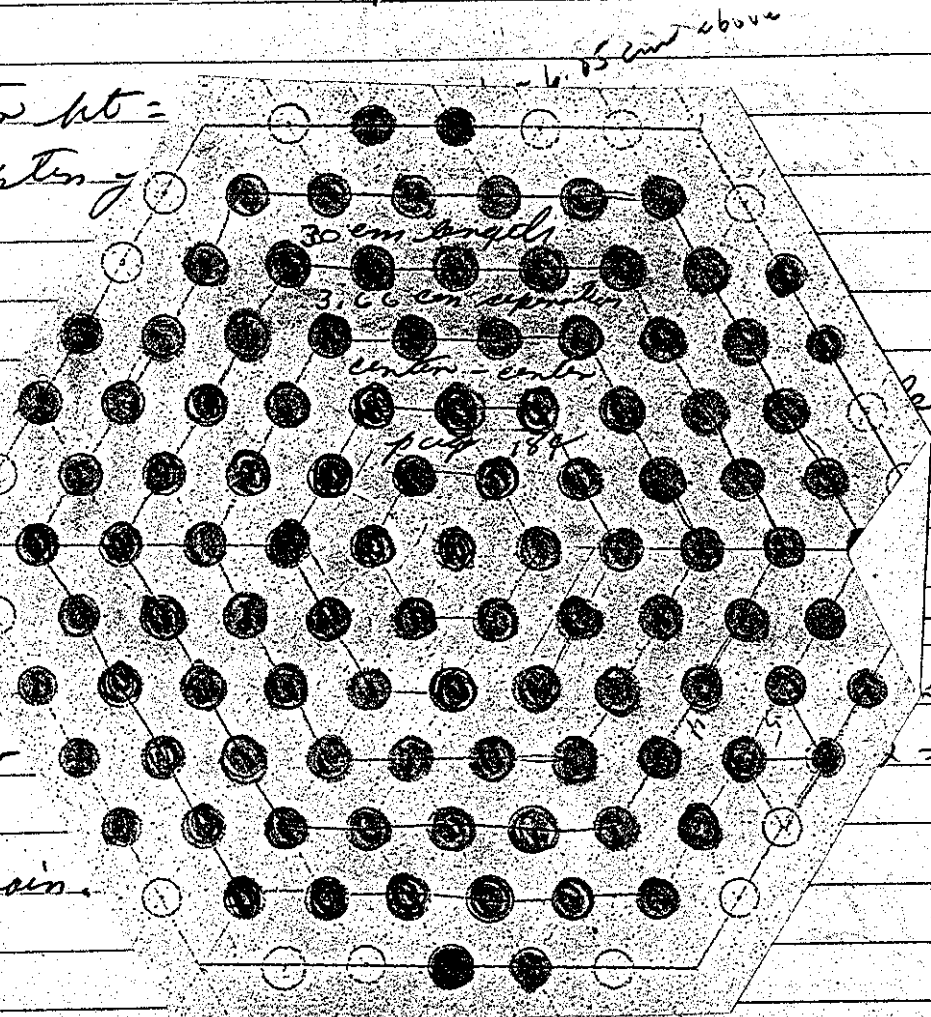
Rem

1523

W.
 -
 C = -

1531

Drain.



= 29.7
 = 25.0

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE | SET | START-UP RANGE |
|-----------------------|-----------------------|-----------|--------|------------------------|------------------------|
| K-1 | 3 X 10 ⁻¹² | Meter ✓ | 2" | ✓ | 10 X 10 ⁻¹² |
| " | " | " ✓ | " | " | " |
| K-2 | " | Meter ✓ | " | " | " |
| " | " | " ✓ | " | " | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700 V | Alarm ✓ | cont | ✓ | 500 V |
| PM-2 | 1200 V | Low ✓ | 10" | ✓ | 900 V |
| " | " | Alarm ✓ | 1" | " | 11" |
| LOG N CALIBRATE ✓ | | OPERATE ✓ | | SOURCE No. <u>B-80</u> | |
| DUMP WELL PROBE LIGHT | | | | | |

START-UP CHECK LIST

Equipment checked by AKL Personnel check by AKL

Instruments and safeties checked and reset by AKL

Source in checked by AKL Source No. M-93

Emergency equipment in control room checked by FIDC

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

Red light on by AKL Time 1300

Start-up OK'd by FIDC AKL Date 11-1-60

over

11-1-66 60 cm length, 3.66 cm separation center-center

now have 73 rods, 4 full rings, plus
2 rods on each face in 5 ring, 60 cm
length, 3.66 cm separation - e-e.

13 34 Water ht = 50.50 cm

Water Temp °C

system just critical
Drain.

#1 = 24.7

2 = 25.0

Now have 70 rods, 4 full rings, plus 1 rod on
even other faces, and 7 rods on even other face
in 5th row, 3.66 cm separation e-e - 60 cm
length.

1406 Water ht = 56.35 cm

Water Temp °C

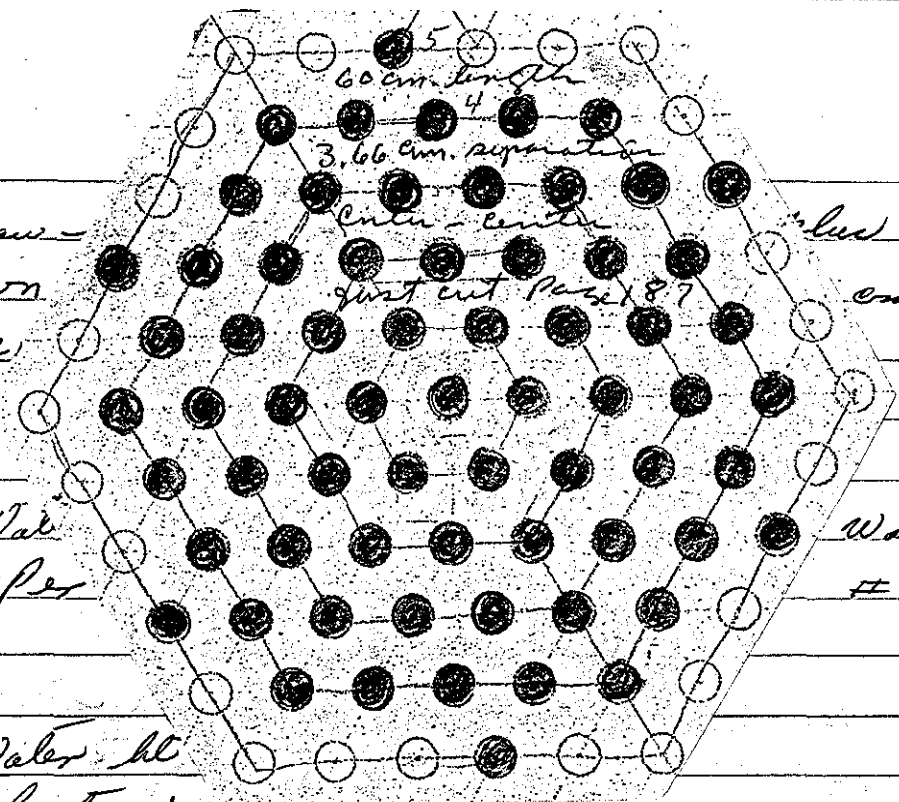
system just critical
Drain.

#1 = 24.7

2 = 25.0

11-1-66

Now -
cm
c



plus 1 rod
cm separation

1436 Water
U + Per

Water Temp °C
#1 = 29.7
#2 = 25.0

247
50
(10)

1445 Water hl
System just entered
Drain

Now have 66 rods, 4 full rings, plus 1 rod
on 5 faces in 5th ring, 3.66 cm separation
c-c, 60 cm length.

1515 Water ht = 75.20 cm
System sub critical
Drain

Water Temp °C
#1 = 29.7
#2 = 25.0

11-1-66

Now have 67 rods, 4 full rings, plus 1 rod
on each face in 5th ring. 3.66 cm separation
c-c. 60 cm length.

1436 Water ht = 66.65 cm. $\delta h = 1.95$ cm

Water Temp $^{\circ}$

① + Per

#1 = 29.7 $^{\circ}$

#2 = 25.0 $^{\circ}$

24.7

25.0

1445 Water ht = 64.70 cm

System just critical
Drain

Now have 66 rods, 4 full rings, plus 1 rod
on 5 faces in 5th ring. 3.66 cm separation
c-c. 60 cm length.

1515 Water ht = 75.20 cm.

Water Temp $^{\circ}$

System sub critical
Drain

#1 = 29.7

#2 = 25.0

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|-----------------------|-----------------------|---------|-----------------|-----|------------------------|
| K1 | 3 X 10 ⁻¹² | Meter ✓ | 1" | ✓ | 10 X 10 ⁻¹² |
| " | " | Fast ✓ | " | ✓ | " |
| K2 | " | Meter ✓ | 2" | ✓ | " |
| " | " | Fast ✓ | " | ✓ | " |
| PM 1 | 700V | Alarm ✓ | cont | ✓ | 500V |
| PM 2 | 1200V | Low ✓ | 10" | ✓ | 900V |
| " | " | Alarm ✓ | 1" | ✓ | " |
| LOG-N-CALIBRATE | | ✓ | OPERATE | ✓ | SOURCE No. B-80 A |
| DUMP WELL PROBE LIGHT | | _____ ? | | | |

START-UP CHECK LIST

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

Instruments and safeties checked and reset by AKK

Source in checked by AKK Source No. M-43

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

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

Red light on by RKM Time 1412

Start-up OK'd by F.D.C RKM Date 11-6-66

Now have a 10 x 11 array, 110 $\frac{1}{2}$ " rods,
30 cm length; separation = 2,825 cm
center - center. Square pattern

1429 Water ht = 31.0 cm Water Temp $^{\circ}$ C
+ Per. #1 = 24.7
 $\bar{v} = 89.09 \text{ sec} = 10.8 \text{ f}$ $\alpha = 24.5$

1433 Water ht = 30.95 cm
System just critical
Drain

Now have a 10 x 10 array, plus 6 rods
on one face, 106 $\frac{1}{2}$ rods, 30 cm length,
separation = 2,825 cm c-c.

1455 Water ht = 31.90 cm. Water Temp $^{\circ}$ C
27 Per. #1 = 25.0
 $\bar{v} = 54.3 \text{ sec} = 15.5$ $\alpha = 24.7$

1459 Water ht = 31.85
System just critical
Drain.

over.

190

Now
30 cm

34

1517 Water
3 + Per
C = 9

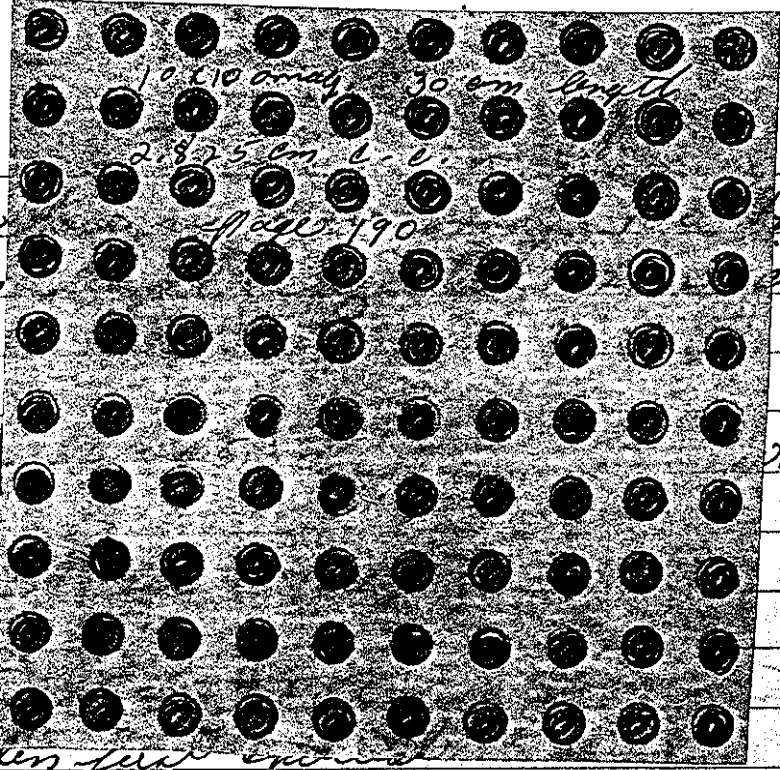
1525 Wat

Hepten feet

Now have a 9 x 10 with 8 nodes on one
face. 98 1/2" node. 30 cm length. Separation
= 2,825 cm. c-c.

Water ht = 45.0 cm
Hepten feet critical
Drain.

Water Temp
H1 = 25.0
2 = 29.7



190

Now have a 10 x 10 array, 100 1/2 rods,
30 cm length, separation = 2.825 cm, c.c.

(34)

1517 Water ht = 45.3 cm.

Water Temp °C

3 + Per

H1 = 25.0

C = 97.79 mm = 10.1 f

2 = 29.5

1525 Water ht = 37.95 cm.

Justen just critical

Now have a 9 x 10 with 8 rods on one
face. 98 1/2" rods, 30 cm length, separation
= 2.825 cm, c-c.

Water ht = 45.0 cm

Water Temp

Justen sub critical

H1 = 25.0

Drain.

2 = 29.7

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|-----------------------|---------|-----------------|-----|------------------------|
| K-1 | 3 X 10 ⁻¹² | Meter ✓ | 3" | ✓ | 10 X 10 ⁻¹² |
| " | " | Fact ✓ | " | ✓ | " |
| K-2 | " | Meter ✓ | 2" | ✓ | " |
| " | " | Fact ✓ | " | ✓ | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700V | Alarm ✓ | local | ✓ | 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 AKH Personnel check by F.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.D.C.

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

Red light on by AKH Time 0825

Start-up OK'd by F.D.C. AKH Date 11-7-66

Now have a 9 X 12 cm. 10 1/2" radii, 30 cm length, separation = 2.825 c-i.e.

over.

e.
6.0
25.0
29.7

11/15
9.0
9.7

192

" - 7-66

0847 Water ht = 32.50 cm

Water Temp °C

+ Per

#1 = 24.7

$C = 115.12 \text{ sec} = 4.8 \text{ f}$

2 = 24.7

0853 Water ht = 32.40 cm

System just critical
Drain

Now have an ^{1.12 rods} 8x14 array, 30 cm length.
2.825 cm separation c-c.

0923 Water ht = 34.30 cm

Water Temp °C

+ Per

#1 = 24.7

$C = 73.88 \text{ sec} = 12.4 \text{ f}$

2 = 24.7

Water ht = 34.00 cm.

System just critical

Now have an 9x11 array, 99 rods, 30 cm length.
2.825 cm separation c-c.

11-7-66

Water Temp °

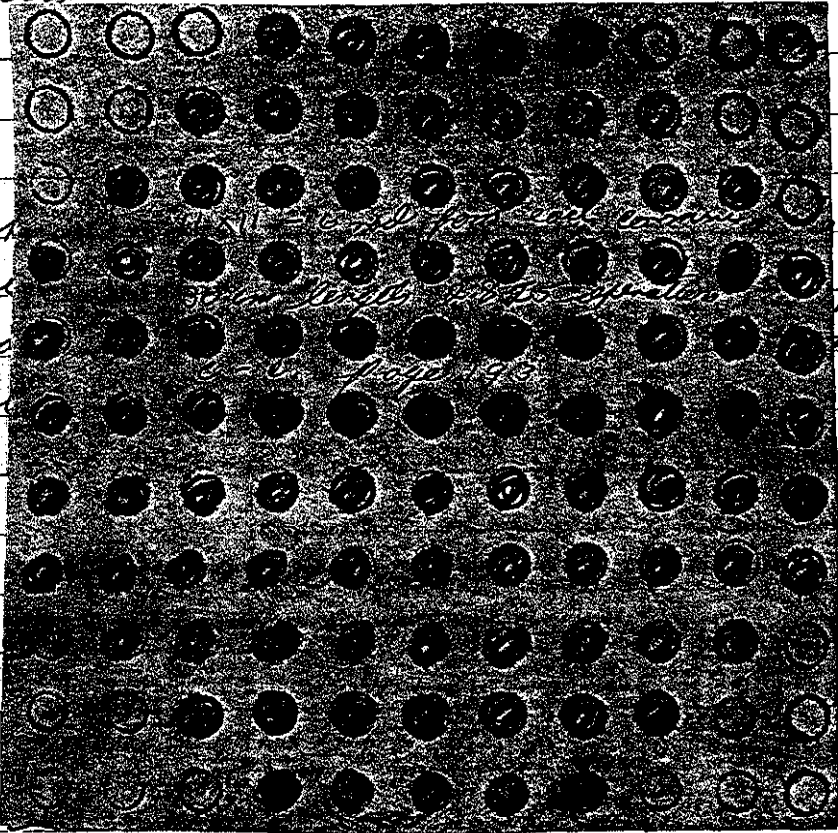
0.958 Water ht = 45.40 cm.

H1 = 29.7

System sub critical

Z = 29.7

Drain



Now have
 removed
 97 rods
 replaced

rods
 of
 (35)

Water
 + P.S.

1120

Water

System just critical
Drain

Now have an 11x11 array with 6 rods removed from 3 corners and 7 rods removed from 1 corner. Total of 96 rods, replacement lengths same as above.

over.

11-7-66

0 0958 Water
 4.7 System
 4.7 Drain

Diff^o
 1 = 29.7
 2 = 29.7

Now have an 11 x 11 array with 6 rods removed from each corner. Total of 97 rods. 30 cm length. 2.825 cm separation c-c.

Water ht = 39.60 cm.
 + Prr.

4.7
 4.7 1120 Water ht = ^{36.70}~~36.80~~ cm
 System just critical
 Drain.

Now have an 11 x 11 array with 6 rods removed from 3 corners and 7 rods removed from 1 corner. Total of 96 rods. separation & lengths same as above.

over.

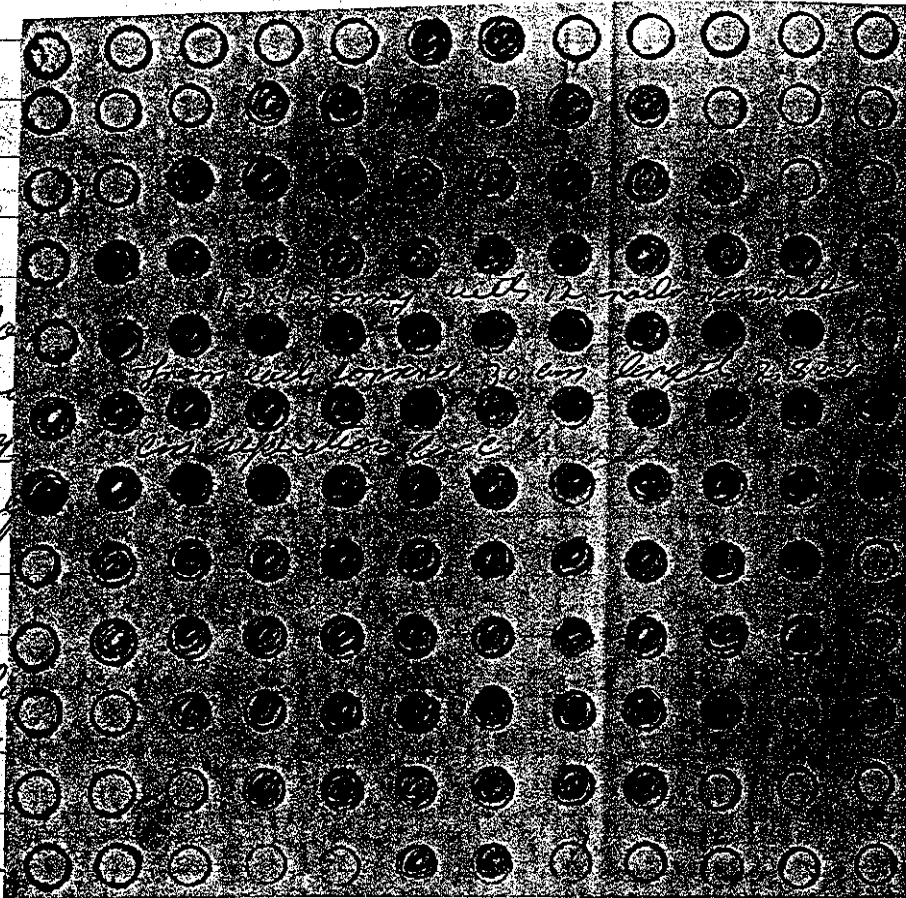
194

11-7-60

1258 Water ht = 45.4 cm
System - Per.

Water Temp °C
#1 = 29.7
#2 = 29.7

1306 Drain



No. 12
from the bottom 20 cm depth
of the water in the
system

#12
Total
on e-e

1350 5

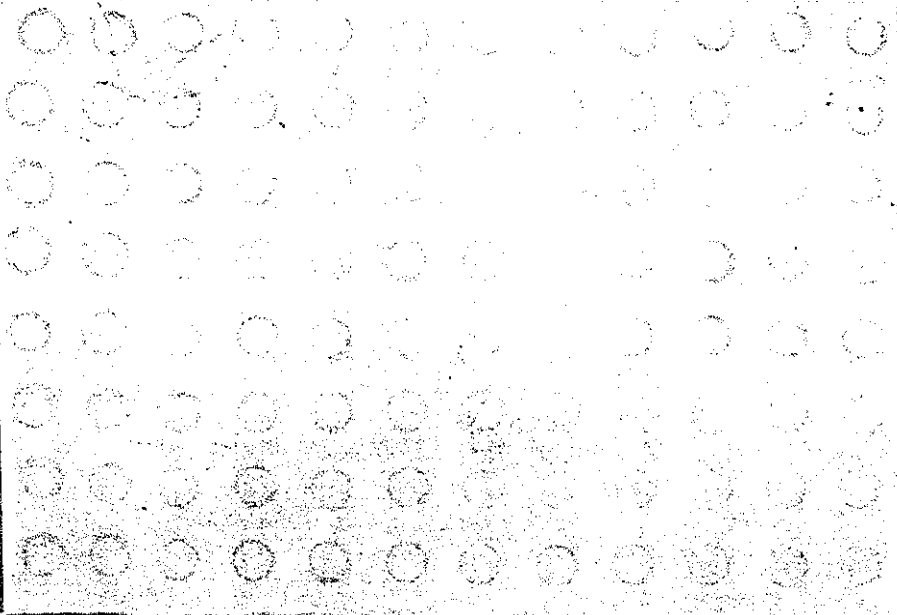
1356 Drain

194

11-7-60

1258 u

1306



Temp °C

#1 = 29.7

#2 = 29.7

Now have an 12x12 array with each 12 nodes removed from each corner. Total of 96 nodes. 30 cm length, 2.825 cm c-c separation.

1350 Water ht = 46.0 cm
5 - Per

1356 Drain.

11-7-66

60 cm length. 2.825 cm center-center separation. $\frac{1}{2}$ " radi. 195

Now have an 7x10 array. 70 $\frac{1}{2}$ " radi. 60 cm length. 2.825 cm separation e-e.

1.525 Water ht = 75.5
System ~~sub~~ critical
Drain

Water Temp °C
 $T_1 = 25.0$
 $T_2 = 24.7$

Now have an 9x8 array. 72 $\frac{1}{2}$ " radi. 60 cm length. 2.825 cm separation e-e.

Water ht = 56.10 cm
System just critical
Drain

Water Temp °C
 $T_1 = 25.0$
 $T_2 = 25.0$

11/8/66

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|-----------------------|-------------------|-----------------|-----|------------------------|
| K-1 | 3 x 10 ⁻¹² | Meter ✓ Fast ✓ | 2" | | 10 x 10 ⁻¹² |
| K-2 | 3 x 10 ⁻¹² | Meter ✓ Fast ✓ | 3" | | 10 x 10 ⁻¹² |
| R-1 | — | | | | |
| R-2 | — | | | | |
| PM-1 | 700V | Alarm ✓ | Contact | | 500V |
| PM-2 | 1200V | Low ✓ Alarm ✓ | 10" 1" | | 900V |

LOG IN CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by EJ, IDC Personnel check by IDC
 Instruments and safeties checked and reset by EJ
 Source in checked by EJ Source No. M-43
 Emergency equipment in control room checked by IDC
 Instruments in trip circuit: K-1, K-2, PM-1, PM-2
 Red light on by EJ Date 0845
 Start-up valid by EJ, IDC Date 11/8/66

11/8/66

Now have 7x11 1/2 hole, same pattern, 60 cm
high, 2.825 cm center spacing.

#1 25.0°C

0920 Water at 53.4 cm. Critical.

#2 25.0°C

Drain

Now have an 6x12 array, 72 1/2 rods,
60 cm length, 2.825 cm separation c-c.

10.00 Water ht = 75.10 cm

Water Temp

System sub critical

#1 = 25.0

Drain.

#2 = 25.0

Now have an 8x8 array, 64 1/2 rods,
60 cm length, 2.825 cm separation c-c.

13.23

Water ht = 75.00 cm

System sub critical

Drain.

over

Now have an 8×9 array. (or 8×8 with
4 rods on 1 face. Total of 68 rods. 60
cm lengths. 2.825 cm separation c-c.

1356 Water ht = 75.00 cm
System sub critical
Drain.

150

Now have an 8×9 array. (or 8×8 with 6 rods
on 1 face. Total of 70 rods. 60 cm lengths.
2.825 cm separation c-c.

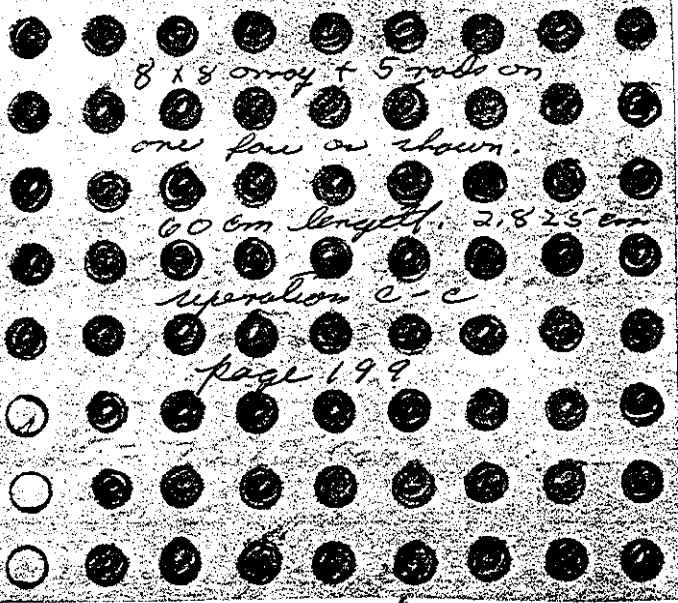
151

Water ht = 60.90
System just critical
Drain.

Water Temp $^{\circ}$

1 = 25.0

2 = 25.0



8 x 8 orog + 5 rods on
one row as shown.

Now h
on 1 ft
2.825

60 cm length. 2.825 m
operation e-c
page 199

with 5 rods.
m length

3 to

1507 Water
- P_{rs}
5 = -6

Water Temp °C
F1 = 25.0
2 = 25.0

1516 Drain.

- 7x10 orog - sub
- 9x8 " - super
- 7x10 " - super
- 6x12 " - sub
- 8x8 " - sub

2
76

5.0
5.0

Now have on 8x9 array. (or on 8x8 with 5 rods.
 on 1 face. Total of 69 rods. 60 cm lengths
 2.825 cm separation e-e. 3 to

1507 Water ht = 75.10 cm

Water Temp °C

Pr

#1 = 25.0

$\bar{c} = 630.17 \text{ mm} = 2.2 \text{ f}$

2 = 25.0

1516 Drain.

7x10 array - sub

9x8 " - super

7x12 " - super

6x12 " - sub

8x8 " - sub

de
 1/2

25.0
 25.0

11/9/66

START-UP CHECK

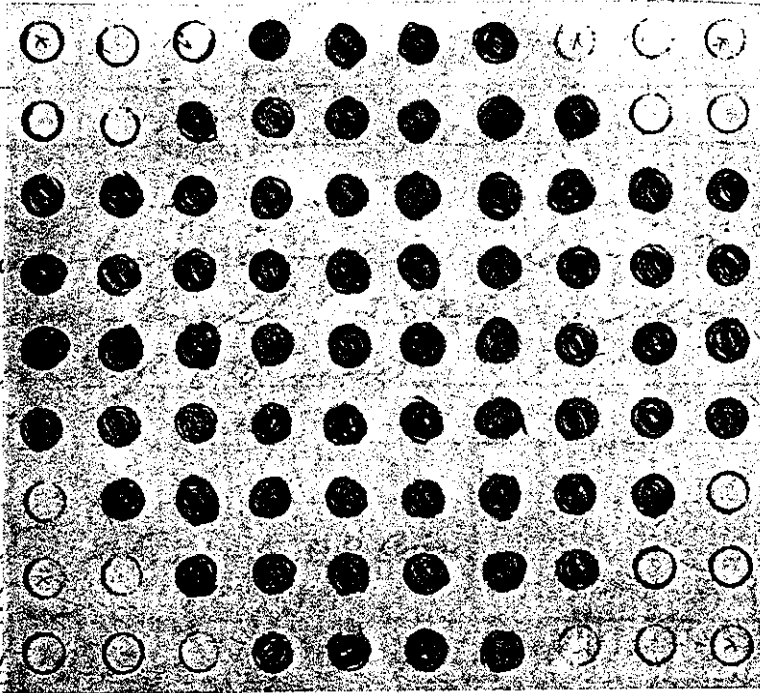
| | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------|-----------|---------|-----------------|-----|----------------|
| | 3 X 15-12 | ✓ | 2" | ✓ | 10 X 10 - 12 |
| | | ✓ | | ✓ | " |
| K-1 | 3 X 15-12 | ✓ | 3" | ✓ | " |
| | | Fast ✓ | | | " |
| PM-1 | 7000 | Alarm ✓ | Contract | ✓ | 5000 |
| PM-2 | 12000 | Low ✓ | 10' | ✓ | 9000 |
| | | Alarm ✓ | 1" | | " |

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

START-UP CHECK LIST

Equipment checked by AKH Personnel check by FIDC
 Instruments and safeties checked and reset by EJH
 Source in checked by RKH Source No. M-43
 Emergency equipment in control room checked by IDC
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by RKH Time 12:35
 Start-up OK'd by FIDC RKH Date 11-9-66

Na
60
To



o rounded.
two e-c.

(37)

1313

Wa
+ 1
E=1

Water Temp °

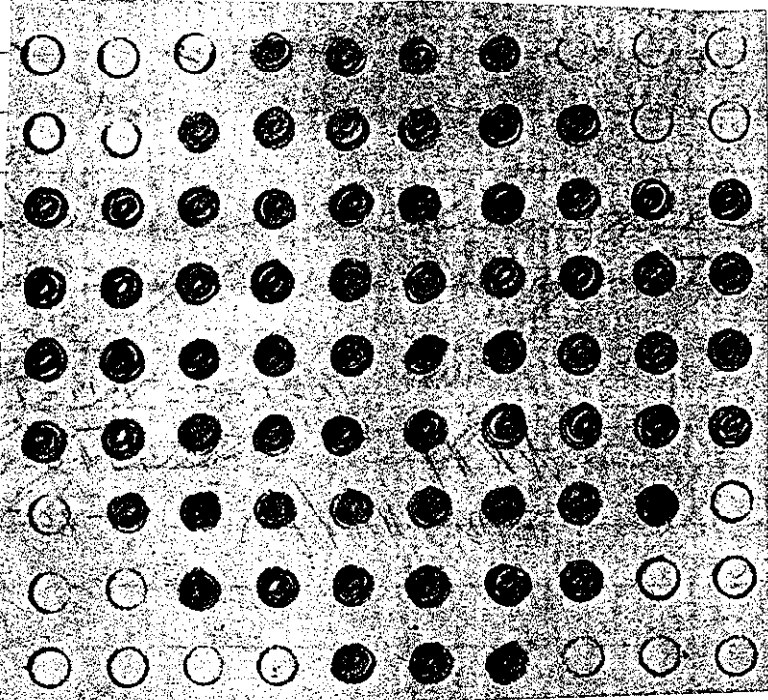
#1 = 25.0

2 = 25.0

1321 Water ht = 63.10 cm

system just critical
Drain

Res
60



level 67 rods
a-a.

Wa
h

Water Temp °

#1 = 25.0

2 = 25.0

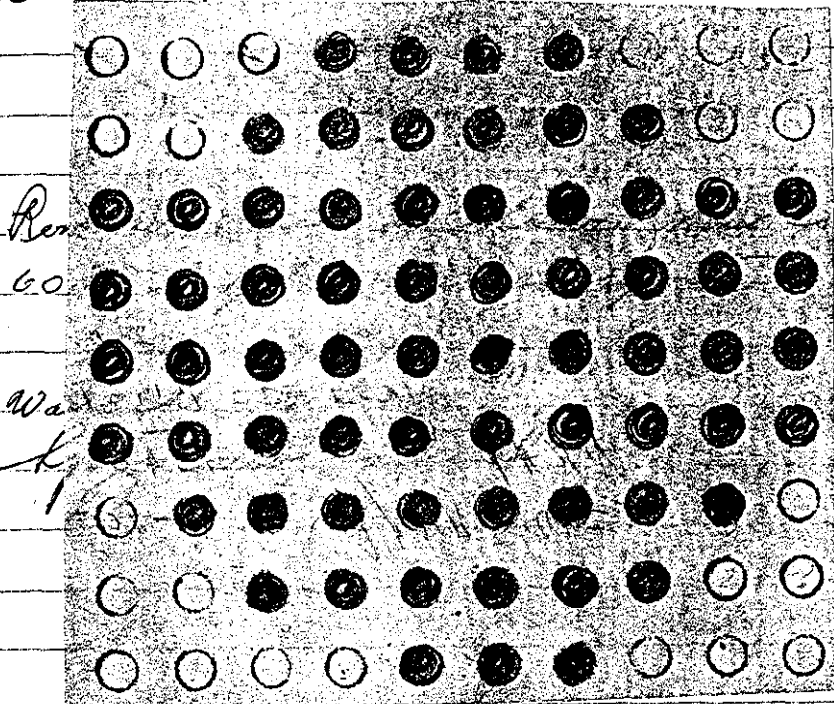
Now have array as shown, 9 x 10 rounded.
 60 cm length, 2.825 cm separation c-c.
 Total of 68 rods.

(37)

13.13 Water ht = 64.00 cm.
 + Per
 $\tau = 139.07 \text{ mm} = 7.0 \text{ } \phi$

Water Level
 #1 = 25.0
 #2 = 25.0

13.21 Water ht = 63.10 cm
 System just critical
 Drain



level 67 rods
 a-a

Water Level
 #1 = 25.0
 #2 = 25.0

Now have array as shown, 9 x 10 rounded.
60 cm length, 2.825 cm separation c-c.
Total of 68 rods.

(37)

1313 Water
+ P
E=1

Water Temp °C
#1 = 25.0
#2 = 25.0

1321 Water
by
D

Remained 1 rod as shown. Now have 67 rods
60 cm length 2.825 cm separation c-c.

75.30
Water ht = 75.30 cm^{9/11}
System sub critical
Drain.

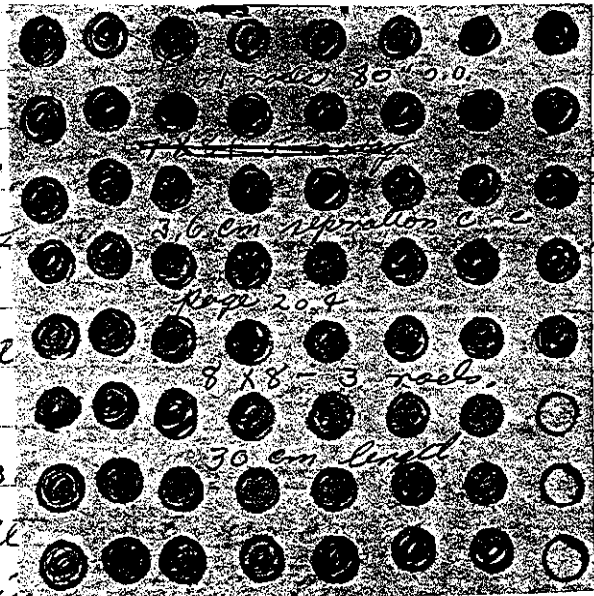
Water Temp °C
#1 = 25.0
#2 = 25.0

Removed 2 ~~more~~ more rods. Now have
 $8 \times 8 - 4$
 an $7 \times 8 + 4$ rods on 1 face. Total of 60 rods

1510 Water ht = 47.50 cm

System sub critical

Drain-



added 1
 1 face.

$8 \times 8 - 3$
 $7 \times 8 + 5$ rods on
 or shown.

1525 Water ht

³ + Per

$U = 130, 3$

Water Temp °C

1:25.1

2:25.1

1534 Water ht

System
 Drain:

(4)

Remained 2 ~~rows~~
^{8 x}
 on 7 x 2

Now have
 total of 60 rods.

15.10 Water h
 system
 Drain-

added 1 rods. Now have on ^{8 x 8 - 3} 7 x 8 + 5 rods on
 1 face. total of 61 rods. array as shown.

15.25 Water ht = 45.5 cm
³ + Per
 $t = 130.38 \text{ sec} = 6.0$

Water Temp °C
 $t = 25.1$
 $t = 25.1$

15.34 Water ht = 38.40 cm
 system just critical
 Drain:

(5)

New base on 7x9 array, 63, .80" rods, 3.6 cm
separation e-e.

15.52 Water ht = 35.70 cm

⁴ + Per

$$C = 63.02 = 14.0 f$$

15.58 Water ht = 35.05 cm

System just critical

Drain

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|-----------------------------|------------|---------|-----------------|-----|----------------------|
| K-1 | 10^{-12} | Meter ✓ | 2" | ✓ | 10×10^{-12} |
| " | " | Fast — | " | — | " |
| K-2 | " | Meter ✓ | " | — | " |
| " | " | Fast — | " | — | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700V | Alarm ✓ | cont | — | 500V |
| PM-2 | 1200V | Low ✓ | 10" | — | 900V |
| " | " | Alarm ✓ | 1" | — | " |
| LOG N CALIBRATE | | ✓ | OPERATE | ✓ | SOURCE No. B-80 |
| DUMP WELL FROSE LIGHT _____ | | | | | |

START-UP CHECK-LIST

Equipment checked by AKK Personnel check by EDC
 Instruments and safeties checked and reset by AKK
 Source in checked by AKK Source No. M-43
 Emergency equipment in control room checked by VIO.C
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by AKK Time 0812
 Start-up OK'd by I.V.C AKK Date 11-11-66

11-11-66

New law on 7X9-1. 62 .80" rods, 3.6 cm
separations c-c. 30 cm length

0830 Water ht = 37.80 cm

Water Temp °C

1 + Per

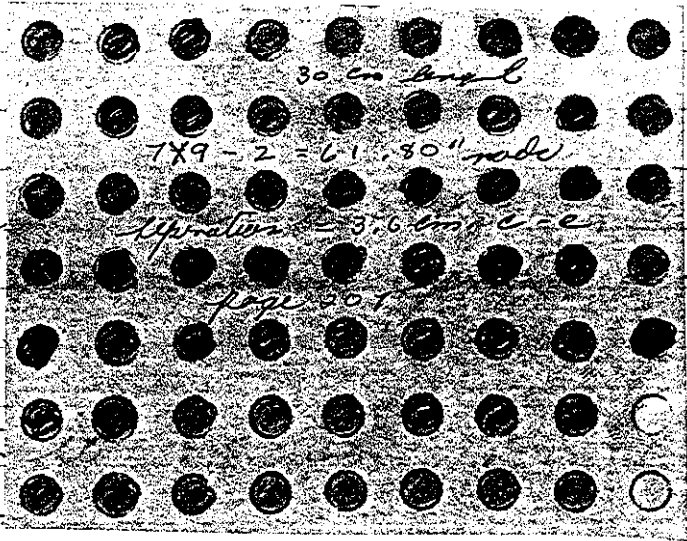
(9)

#1 = 25.0°

$\bar{v} = 112.99 \text{ m} = 9.0 \text{ f}$

#2 = 25.0°

0835 Water ht = 36.90 cm
System just critical
Drain.



Remain
.80"

7X9-2, 61

(10)

0853 Water

Water Temp °C

2 - Per

#1 = 25.0

$\bar{v} = 128.21 \text{ m} = -15.8 \text{ f}$

#2 = 25.0

0900 Drain.

11-11-66

Now have on 7x9-1. 62 .80" rods; 3.6 cm
separation c-c. 30 cm length

0830 Water ht = 37.80 cm

1 + Per

$\bar{v} = 112.99 \text{ cm} = 9.0 \text{ \AA}$

Water Temp °C

#1 = 25.0°

#2 = 25.0°

(9)

0835 Water 15

by
Don

Removed 1 rod. Now have on 7x9-2. 61
.80" rods. 3.6 cm separation c-c.

(10)

0853 Water ht = 45.5 cm

2 - Per

$\bar{v} = 128.21 \text{ cm} = 15.8 \text{ \AA}$

Water Temp °C

#1 = 25.0

#2 = 25.0

0900 Drain.

11-11-66

Now have an $6 \times 11 = 6.6$.80" rods. 30 cm
length. 3.6 cm separation c-c

0925 Water ht = 45.1 cm

Water Temp °C

System sub critical

#1 = 25.0

Drain

#2 = 25.0

Rounded array's 30 cm length.
3.6 cm separation c-c.

Now have an 8×8 array with 1 rod removed
from early summer. Total of 60 rods. 30 cm
length. 3.6 cm separation c-c.

1005³ Water ht = 38.20 cm

Water Temp °C

+ Per

#1 = 25.0

 $\sigma = 151.69 \text{ rad} = 7.1 \text{ f}$

#2 = 25.0

1012 Water ht = 36.65 cm

System just critical
Drain

11-11-66

Removed
30 cm

30 cm length, 3.6 cm

separation, c-c

59 rods

8 x 8 - 5 rods,
e-c.

1027

Water
System
Drain

Water Temp °C
T1 = 25.0
T2 = 25.0

60 cm length, 3.6 cm separation c-c.

Now have an 6x6 array, 36, 80" rods, 3.6 cm separation c-c, 60 cm length.

Water ht: 75.0
System sub critical
Drain

Water Temp °C
T1 = 25.1
T2 = 25.1

over

11-11-66

Removal 1 rod. new hole on 8 1/8" - 5 rods.
30 cm length. 3.6 cm separation c-c.

| | | |
|------|---------------------|---------------|
| 1027 | Water ht = 45.8 | Water Temp °C |
| | System sub critical | #1 = 25.0 |
| | Drain. | #2 = 25.0 |

5.0
5.0

60 cm length. 3.6 cm separation c-c.

5.0
5.0

New hole on 6x6 array. 36 80" rods. 3.6 cm
separation c-c. 60 cm length.

5.0
5.0

| | |
|---------------------|---------------|
| Water ht = 75.0 | Water Temp °C |
| System sub critical | #1 = 25.1 |
| Drain | #2 = 25.1 |

over

11-11-66

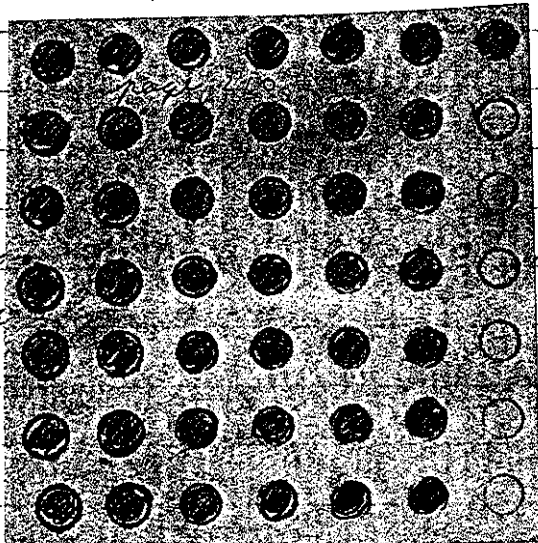
Now have an 6x7 array, 42, 80" rods, 60 cm length, 3.6 cm separations e-e.

1335 Water ht = 75.30 cm
System sub critical
Drain

Water Temp °C
#1 = 25.1
#2 = 25.1

Now have an ~~7x7~~ 4 array, 45, 80" rods, 60 cm length, 3.6 cm separations e-e.

1400 Water ht = 54.8 cm
System just critical
Drain



Now have
3.6 cm sep

rods, 60 cm length

1435 Water ht =
Per

Water Temp °C
#1 = 25.1
#2 = 25.1

CF = 299.87 m = -5.09

1443 Drain

11-11-66

Now have an 6x7 array. 42.80" rods. 60 cm length. 3.6 cm separation c-c.

1335 Water ht = 75.30 cm
System sub critical
Draw,

Water Temp °C
#1 = 25.1
2 = 25.1

Now have an ~~7x7~~ ^{7x7-4} array. 45.80" rods. 60 cm length. 3.6 cm separation c-c.

1400 Water ht.
System of
Draw.

#1:

(1) Now have an 7x7-6. 43.80" rods. 60 cm length. 3.6 cm separation c-c.

1435 Water ht = 75.30 cm.
- Per.

Water Temp °C
#1 = 25.1

CF = 299.89 m = -5.0 f

2 = 25.1

1443 Draw.

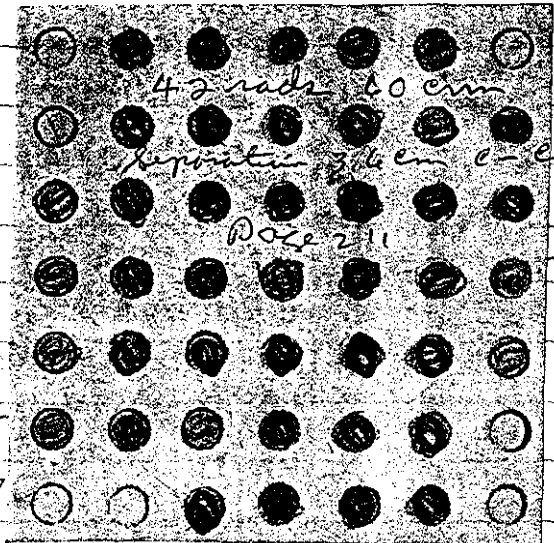
11-11-66

Now have on 7x7 array, with 2 rods removed from each corner. Total of 41, .80" rods. 3.6 cm separation c-c.

1
 1 1520 Water ht = 75.0 cm 14 Water Temp °C
 System sub critical #1 = 25.1
 Drain. #2 = 25.1

Now have on 7x7 array, with 2 rods removed from 3 corners and 1 rod removed from 1 corner. Total of 42, .80" rods. 3.6 cm separation c-c.

5
 Water ht = 63.55
 + Per
 G = 65.19 sec = 13.9 f



1550 Water ht = ~~62.30~~ 62.75 cm
 System just critical
 Drain.

11-11-66

Now have on 7x7 array, with 2 rods removed
from each corner. Total of 41, 80" rods.
3.6 cm separation c-c.

1520

Water ht = 75.0 cm

System sub critical
Drain

Water Temp °C

#1 = 25.1

#2 = 25.1

Now have on 7x7 array
from 3 corners and 1
corner. Total of 42
rods, separation c-c.

Water ht = 63.55

5 + Per

G = 65.19 sec = 13.9 f

Water Temp °C

#1 = 25.1

#2 = 25.1

1550

Water ht = 62.30 cm

System just critical
Drain

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|-----------------------------|-----------------------|---------|-----------------|-----|------------------------|
| K-1 | 3 X 10 ⁻¹² | Motor ✓ | 2" | ✓ | 10 X 10 ⁻¹² |
| " | " | Fast ✓ | " | ✓ | " |
| K-2 | " | Motor ✓ | 2" | ✓ | " |
| " | " | Fast - | " | ✓ | " |
| P-1 | | | | | |
| P-2 | | | | | |
| PM-1 | 700V | Alarm ✓ | Cont | ✓ | 500V |
| PM-2 | 1200V | Low ✓ | 10" | ✓ | 900V |
| " | " | Alarm ✓ | 1" | ✓ | " |
| LOG N CALIBRATE | | ✓ | OPERATE | ✓ | SOURCE No. 73-30 |
| DUMP WELL PROBE LIGHT _____ | | | | | |

START-UP CHECK LIST

Equipment checked by AKN Personnel check by FIDC
 Instruments and safeties checked and reset by AKL
 Source in-checked by AKL Source No. M-93
 Emergency equipment in control room checked by FIDC
 Instruments in trip circuit: K-1-C PM-1-2
 Red light on by AKN Time 1315
 Start-up OK'd by FIDC AKL Date 11-15-66

11-15-66

.50" rods. Triangular array.

Separation = 4.2 cm. Length = 30.0 cm.
 Center-center.

Now have 6 full rings, plus 2 rods on each face in 7th ring. Total of 139 .50 rods. Separation = 4.2 cm.

1335 Water ht = 45.60 cm.

Water Temp °C

System sub critical
 Drain

#1 = 25.0

#2 = 25.0

Now have 6 full rings, plus 3 rods on each face in 7th ring. Total of ~~139~~¹⁴⁹ .50 rods. Separation = 4.2 cm. Length = 30.0 cm.

1357 Water ht = 45.5 cm

Water Temp °C

System sub critical
 Drain

#1 = 25.1

#2 = 25.0

over.

11-15-66

now have 6 full rings, plus 4 rods on each
face in 7th ring. Total of 151 rods. Separation
= 4.20 cm. length = 30.0 cm.

Water ht = $45.2 - 2.54 = 42.66$ cm Water Temp $^{\circ}$ C

System sub critical

#1 = 25.1

Drain.

#2 = 25.0

Note: the change in water ht is due to 1" thick plate
used to extend base.

now have 7 full rings. Total of 169 rods.
Separation = 4.20 cm e-e. length = 30.0 cm.

1443 Water ht = 37.90 cm. Water Temp $^{\circ}$ C

(1) + Per $\frac{-2.54}{35.36}$ cm

#1 = 25.1

$\sigma = 73.9$ sec $\tau = 12.4$ f

#2 = 25.1

1448 Water ht = 37.40 cm. - 2.54 = 34.86 cm

System just critical

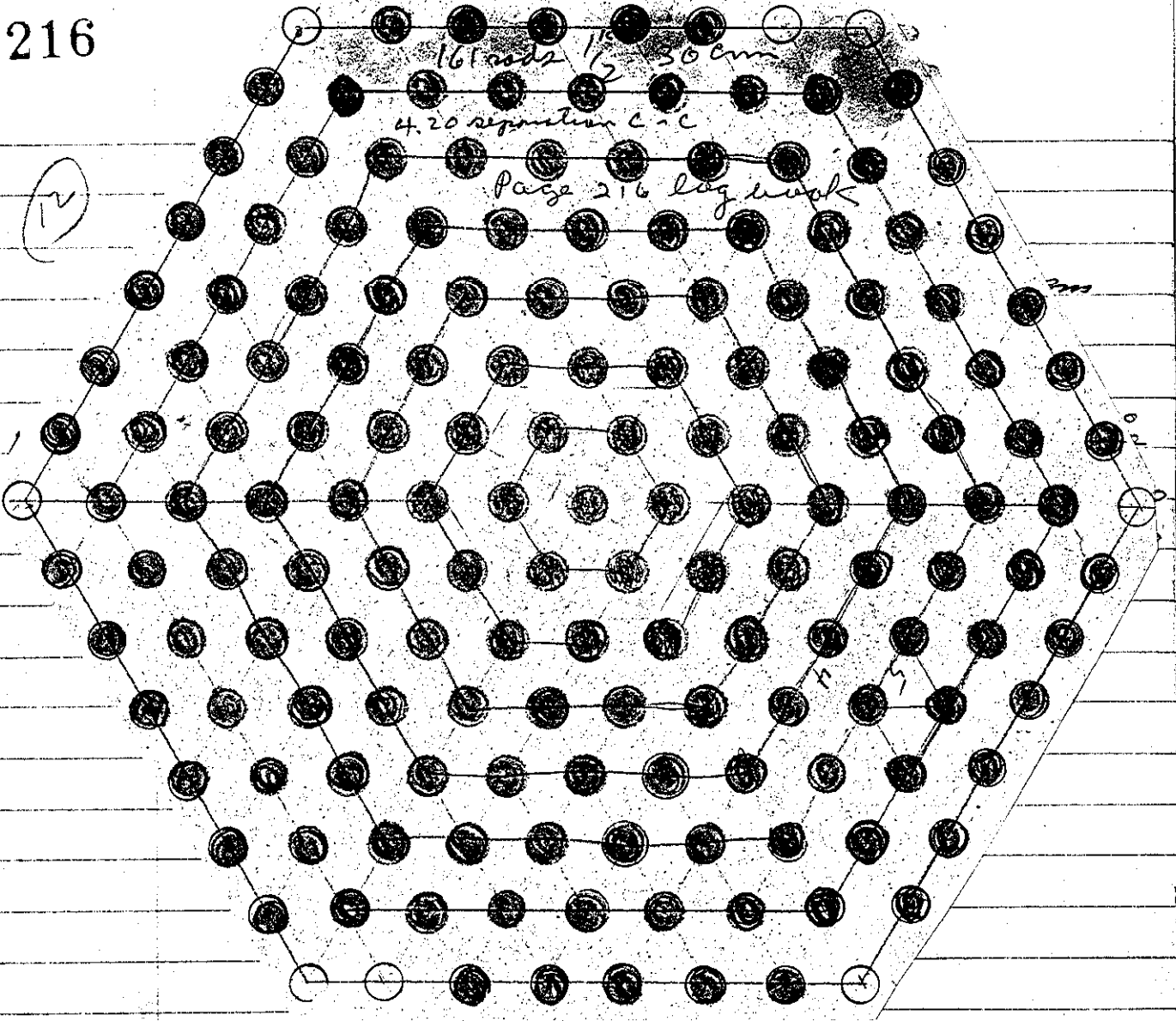
Drain

16 boards 1/2" 30 cm

4.20 separation c-c

Page 216 log mark

(12)



(12)

Replaced 1 rad. Now have 161 rads.
 Separation = 4.20 cm. c-c. Length = 30.0 cm
 See array on shown.

160.5 Water ht = 48.10 cm

4 - Pr.

5 = -295.5 sec = -5.14

Water Temp °

#1 = 25.10

2 = 25.10

Drain

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|-----------------------------|---------------------|---------|-----------------|-----|----------------------|
| K-1 | 3×10^{-12} | Meter ✓ | 2" | ✓ | 10×10^{-12} |
| " | " | Fast ✓ | " | ✓ | " |
| K-2 | " | Meter ✓ | " | ✓ | " |
| " | " | Fast ✓ | " | ✓ | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700V | Alarm ✓ | cont | ✓ | 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 AKH Personnel check by I.V.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 I.V.C.

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

Red light on by AKH Time 0940

Start-up OK'd by I.V.C. AKH Date 11-16-66

over

218

60 cm length. Triangular array.

11-16-66

.50" rods. Separation = 4.2 cm c-c.

Now have 85 rods. Separation = 4.2 cm. c-c
Length = 60 cm.

Water ht = 63.05
- 2.54
60.51 cm.

System just critical
Drain.

Water temp °

17.1 = 25.1

2 = 25.1

Remained 6 rods, Now have 79 rods. 4 full rings plus 3 rods on each face in 5th rings. 4.2 cm - c - c. separation, 60 cm length. .50" rods.

10 40 Water ht = 78.50 cm

System sub critical
Drain.

11-16-66

added 2 rods. Now have 81 rods. 4 full rings, plus 3 rods on 4 faces, and 4 rods on 2 faces in 5th ring. 4.2 cm e-e separation. 60 cm length. .50" rods.

1112 Water ht = 78.0 cm.
System sub critical
Drain

added 1 rod. Now have 82 rods. 4 full rings, plus 3 rods on 3 faces and 4 rods on 3 faces in 5th ring. 4.2 cm e-e separation. 60 cm length. .50" rods.

Water ht = 78.2 cm
System sub critical
Drain

Water h₁ = 25.1
h₂ = 25.1

over.

Added 1 rods. Now have 43 rods. 4 full rings plus 4 rods on 4 faces, and 3 rods on 2 faces in 5th ring. 4.2 cm separation c-c. 6.0 cm length. 50" rods.

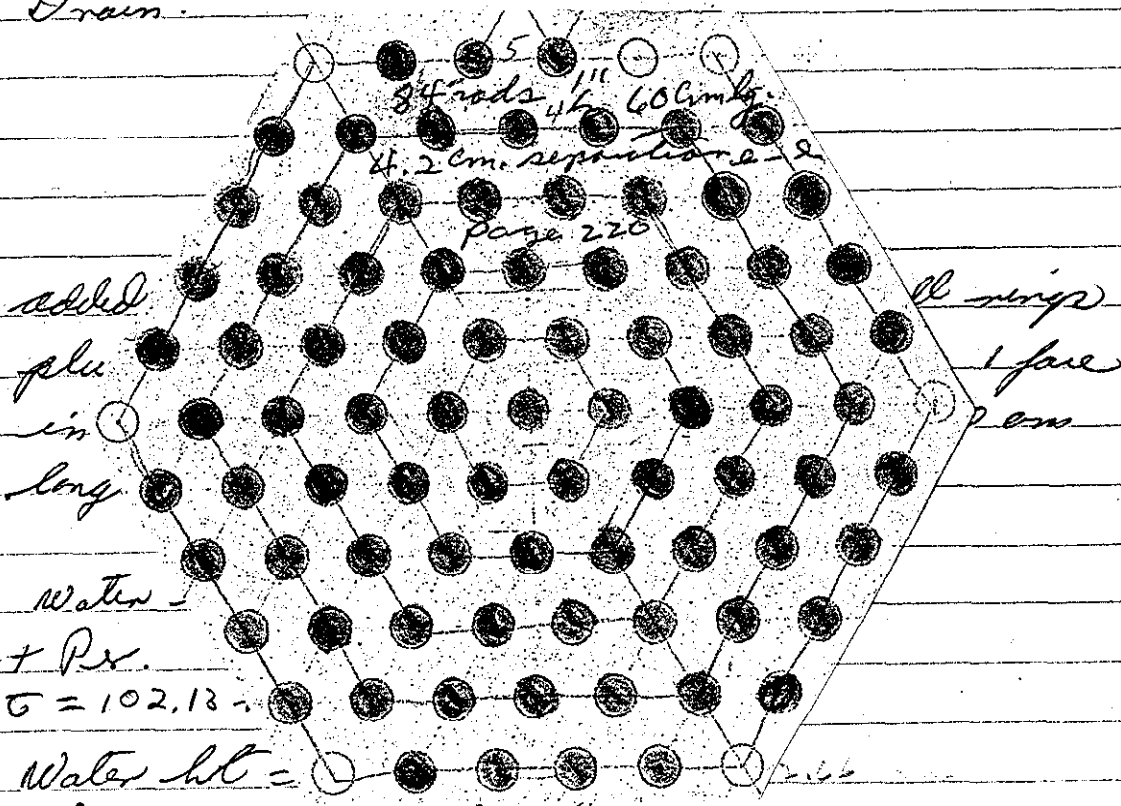
13.90 Water ht = 78.10 cm
 - Per. $\frac{2.54}{75.56}$ cm

Water Temp °C
 #1 = 25.1
 2 = 25.1

$\sigma = -269.45 \text{ mm} = -5.7 \text{ ft}$

(B)

Drain.



14.25 Water ht =
 System just critical
 Drain

Added 1 rad. Now have 8.3 rad. 4 full rings plus 4 rods on 4 faces, and 3 rods on 2 faces in 5th ring. 4.2 cm separation c-c. 60 cm l. \rightarrow

13.40 Water.

- Per

$\sigma = \dots$

(B)

D.

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

#1 = 25.1

2 = 25.1

Added 1 rad. Now have 8.4 rad. 4 full rings plus 4 rods on 5 faces, and 3 rods on 1 face in 5th ring. 4.2 cm separation c-c. 60 cm length. 50" rods.

(A)

$$\begin{aligned} \text{Water ht} &= 66.410 \text{ cm} & \pm h &= 1.20 \text{ cm} \\ & - 2.54 \\ \hline & 63.86 \text{ cm} \\ + \text{Per.} & \\ \sigma &= 102.13 \text{ sec} = 9.84 \end{aligned}$$

14.25. Water ht = 65.20 cm - 2.54 = 62.66

System just critical
Drain

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|-----------------------|---------|-----------------|-----|------------------------|
| K-1 | 3 X 10 ⁻¹² | Meter ✓ | 2" | ✓ | 10 X 10 ⁻¹² |
| " | " | Fast - | " | ✓ | " |
| K-2 | " | Meter ✓ | " | - | " |
| " | " | Fast - | " | - | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700V | Alarm ✓ | 10" | - | 500V |
| PM-2 | 1200V | Low ✓ | 10" | - | 900V |
| " | " | Alarm - | 1" | - | " |

LOG N CALIBRATE OPERATE SOURCE No. B-82

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by AKH Personnel check by F.D.C
 Instruments and safeties checked and reset by AKH
 Source in checked by AKH Source No. 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 F.D.C Time 0806
 Start-up OK'd by F.D.C AKH Date 11-17-66

over

222

80 Rods.

30 cm length.

11-17-66

4.14 cm separation c-c.

11-1

Source Pattern

Now have an 6x6 array. 30 cm length.
4.14 cm separation c-c.

0

0830 Water ht = 45.0 cm
System sub critical,
Drain.

Water Temp °C

#1 = 25.0

#2 = 25.0

09

added 6 rods. Now have a 6x7 array. 30 cm
length. 4.14 cm separation c-c.

0850 Water ht = 45.0 cm
System sub critical
Drain.

10

11-17-66

added 7 rods. Now have an 7x7 array.
30 cm length. 4.14 cm separation c-c.

0912 Water ht = 45.0 cm
System sub critical
Drain

added 7 rods. Now have an 7x8 array.
30 cm length. 4.14 cm separation c-c.

0934 Water ht = 45.0 cm
System sub critical
Drain

Water Temp °C
#1 = 25.1
#2 = 25.1

added 8 rods. Now have an 8x8 array.
30 cm length. 4.14 cm separation c-c.

Water ht = 31.50 cm.
+ P.V.
5 = 60.84 cm = 14.34.

Water Temp °C
#1 = 25.1
#2 = 25.1

1003 Water ht = 31.40
System just critical
Drain

over.

11-17-66

Removed 3 rods. Now have one
4 x 8 - 3 rods on 1 face. Total of 61 rods.
Separation = 4.14 cm. 30 cm lengths.

Water ht = 33.50 cm

Water Temp °C

+ Per.

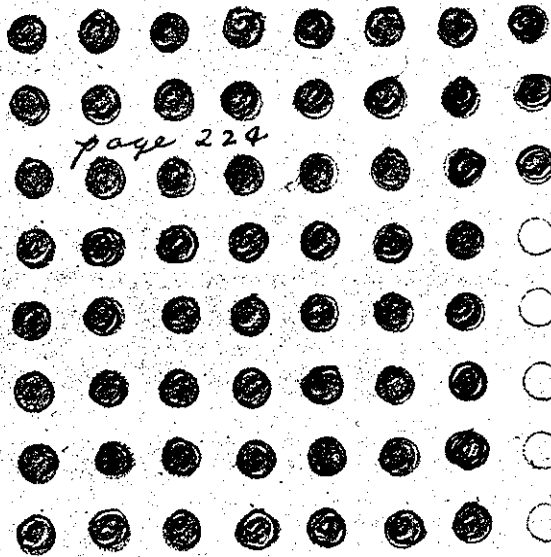
#1 = 25.1

C = 36.94 sec = 19.94

2 = 25.1

1025 Water ht = 33.20 cm

System just critical



page 224

Removed 2 rods
1 face. Total
3.0 cm long

- 5 rods on
n = 4.14 cm

1040 Water ht =

Water Temp °C

3 - Per

#1 = 25.1

C = 252.07 sec = 4.17

2 = 25.1

1045 Drain.

13

110

130

224

11-17-66

~~Now~~ Removed 3 rods. Now have on
8 x 8 - 3 rods on 1 face. Total of 61 rods.
Separation = 4.14 cm. 30 cm length.

Water ht = 37 -
+ Per.
C = 36.99 su

Water Temp °

#1 = 25.1

2 = 25.1

1025 Water ht =
heights given

(17)

Removed 2 rods. Now have on 8 x 8 - 5 rods on
1 face. Total of 59 rods. Separation = 4.14 cm
30 cm length.

1040 Water ht = 45.4 cm

³ - Per

C = - 252.07 su = - 6.14

Water Temp °

#1 = 25.1

2 = 25.1

1045 Drain.

11-1

110

130

131

11-17-66

page 225

New
shar
long

8 x 8 array or
e-c. 30 cm

Wak

Water Temp °C

47 Pa

#1 = 25.1

$t = 76.06 \text{ m} = 12.24$

$2 = 25.1$

1106 Water ht = 34.85 cm

System just critical
Drain

page 225

New ha
4.14 cm

array or slawn.
length.

130.5 Water

5 - Per

$t = 91.27$

(17)

131.2 Drain

acm

11-17-60

New have 58. rads. in on 8x8 array of
shafts. 4.14 cm separation e-e. 30 cm
length.

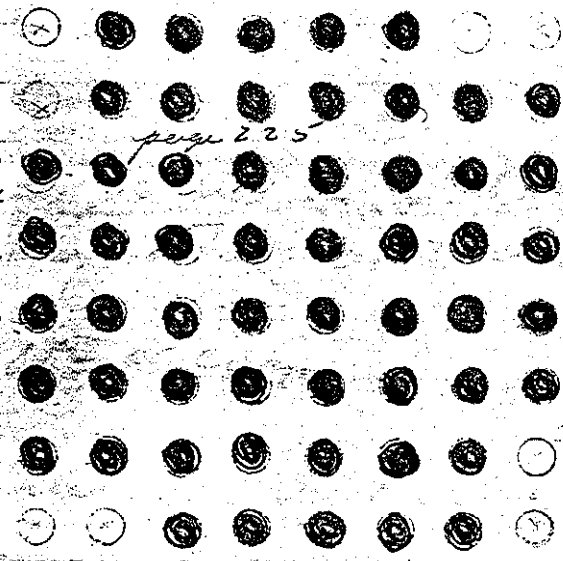
4°C
25.1
25.1

Water ht = 35.50 cm
44 Per.
C = 76.06 m = 12.24

Water Temp °C
H1 = 25.1
Z = 25.1

1106 Water ht = 34.85 cm
System just critical
Drain

57
32



New ha
4.14 cm

array of shafts.
length.

2°C
25.1
25.1

1305 Water
5 - Per.
C = 91.27
1312 Drain

(17)

accn

11/17/60

New have 58 rods in an 8 x 8 array as shown. 4.14 cm separation c-c. 30 cm length.

Water ht = 35.50 cm

47 Per.

$\bar{c} = 76.0$ - 11.0 d.

Water Temp °C

#1 = 25.1

#2 = 25.1

1106 Water

System
Drain

New have 56 rods in an 8 x 8 array as shown. 4.14 cm separation c-c. 30 cm length.

1305 Water ht = 45.40 cm

5 - Per.

$\bar{c} = 91.27$ sec = 27.04

1312 Drain

all

226

11-17-66

(14)

page 226

Now to

4.14 cm

$\frac{2}{14}$

Water

+ Per

5 = 95.61

ing or shown
length.

1330 Water ht = 37.70 cm

System just critical

Dress

11-17

15.

15.

226

11-17-66

(16)

Now have 57 in an 8 x 8 array as shown.

4.19 cm separation c-c. 30 cm length.

$\frac{3}{16}$

Water ht = 41.90 cm.

$\frac{6}{16}$ + Per

$5 = 95.61 \text{ cm} = 10.2 \text{ ft}$

1330 Water ht = 37.70 cm

System just critical

Draws

35 10
30" rods
60 cm lengths.
4.14 cm separation e - e.

227

11-17-66

Now have an 6x7 array. Total of 42, 60
cm lengths. 4.14 cm separation e - e.

1520 Water ht = 52.60 cm
System just critical
Drain

Now have an 6x6 array. Total of 36 rods.
60 cm lengths. 4.14 cm separation e - e.

1550 Water ht = 75.0 cm.
System sub critical
Drain

INSTRUMENT CHECK

11-18

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|------------|---------|-----------------|-----|----------------------|
| K-13 | 10^{-12} | Alarm ✓ | 2" | ✓ | 10×10^{-12} |
| " | " | Fast ✓ | " | ✓ | " |
| K-2 | " | Alarm ✓ | 2" | ✓ | " |
| " | " | Fast ✓ | " | ✓ | " |
| P-1 | | | | | |
| P-2 | | | | | |
| PM-1 | 700V | Alarm ✓ | cont | ✓ | 500V |
| PM-2 | 1200V | Low ✓ | 10" | ✓ | 900V |
| " | " | Alarm ✓ | 1" | ✓ | " |

08

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

START-UP CHECK LIST

09

Equipment checked by AKK Personnel check by AKK
 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.D.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by AKK Time 0806
 Start-up OK'd by F.D.C. AKK Date 11-18-66

11-1800

190 rods.

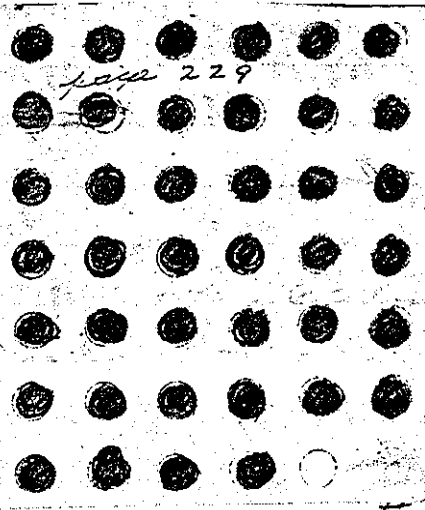
New have on 6x7-4 = 38 rods. 60 cm length. 4.14 cm separation e-c.

0838 Water ht = 75.00 cm
System sub critical
Drain.

New have on 6x7-3 = 39 rods. 60 cm length. 4.14 cm separation e-c.

(19)

0907 Water ht = 75.00 cm
System sub critical
Drain.



(19) New have on 6x7-2
length: 4.14 cm sep.

Water ht = 60.80
+ Per.

Water ht = 60.20 cm
System just critical.

Leq 0
= 25.1
2 = 25.1

11-1965

, 90 rods.

New haul on 6x7-4 = 38 rods. 60 cm
length. 4.14 cm separation c-c.

0838 Water ht = 75.00 cm
System sub critical
Drain

New haul on 6x7-3 = 39 rods. 60 cm
length. 4.14 cm sep

0907 Water ht = 75.00 cm
System sub critical
Drain.

(1) New haul on 6x7-2 = 40 rods. 60 cm
length: 4.14 cm separation c-c.

Water ht = 60.80
+ Per.

Water Temp °C
#1 = 25.1
#2 = 25.1

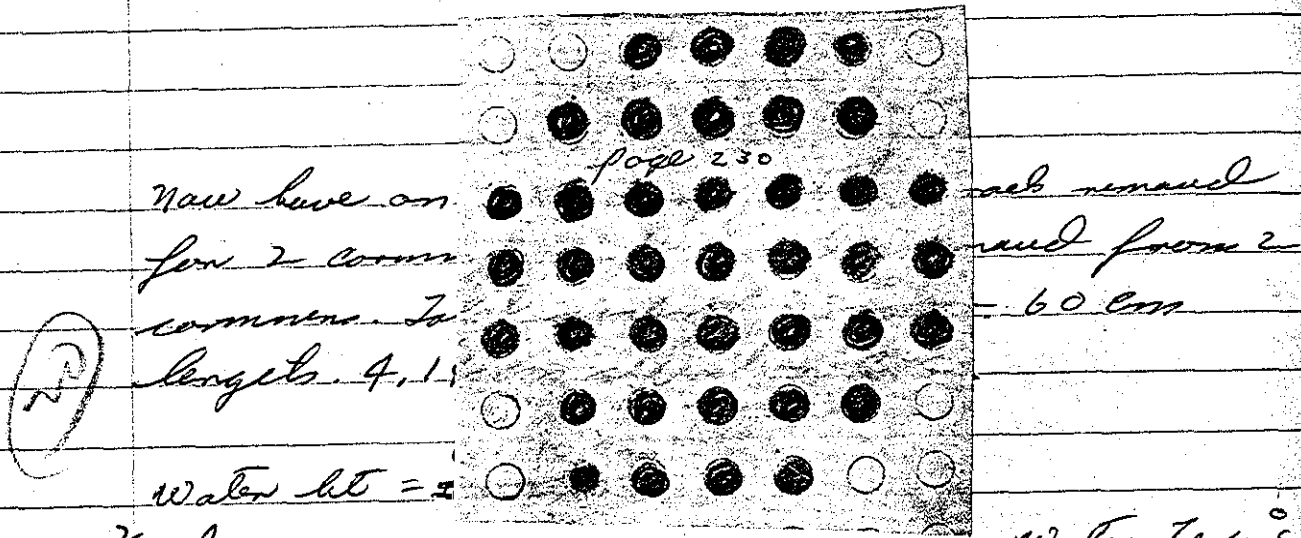
Water ht = 60.20 cm
System just critical.

30" rods.

Now have an 7x7 array, with 3 rods removed from each corner. Total of 37 rods. 60 cm lengths, 4.14 cm separation c-c.

10.27 Water ht = 75.00 cm
System sub critical
Drain

132



now have on for 2 corner corners. Total lengths. 4, 1
Water ht = 2
2 + Per

Water Temp °C
#1 = 25.1
2 = 25.1

1100 Water ht = 60.90 cm
System just critical
Drain -

30" rods.

Now have an 7x7 array, with 3 rods removed from each corner. Total # of 37 rods. 60 cm length, 4.14 cm separation c-c.

1027 Water ht = 71

System sub
Drain

Now have an 7x7 array, with 3 rods removed from 2 corners and 3 rods removed from 2 corners. Total number of 39 rods. 60 cm length, 4.14 cm separation c-c.

Water ht = ~~61.10~~ 61.10 cm.

2 + Per

Water Temp °C

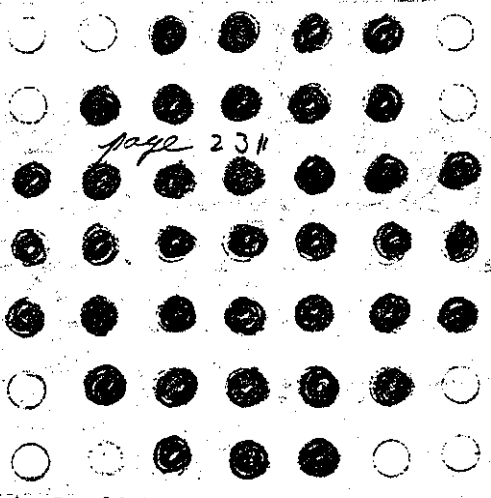
1 = 25.1

2 = 25.1

1100 Water ht = 60.90 cm

System just critical

Drain -



Now have
 from 3 cor
 1 corner
 60 cm len

rods removed
 removed from
 38 rods
 in c-c.

(v)

1320

Water ht = 11.1
 System sub critical
 Drain

78.0" rock

30 cm ht.

0.0" separation (unglac)

Now have an 11x12 array. Rods in contact.

30 cm length, 0.0 separation c-c (unglac)

water ht = 7 fawled

System very sub critical
 Drain

Now have 7x7 array, with 3 rods removed
 from 3 corners, and 2 rods removed from
 1 corner. Total number of rods = 38 rods.
 60 cm length, 4.14 cm separation c-c.

1320

Water ht = 75.00

System sub critical

Drain.

.80" rods

30 cm ht.

0.0" separation. (Surfact)

Now have an 11x12 array. Rods in contact.

30 cm length, 0.0 separation c-c. (Surfact)

Water ht = ? flooded

System very sub critical

Drain.

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|--------------------|---------|-----------------|-----|------------------------|
| K-1-3 | X10 ⁻¹² | Motor ✓ | 2" | ✓ | 10 X 10 ⁻¹² |
| " | " | Fst ✓ | " | ✓ | " |
| K-2 | " | Motor ✓ | " | ✓ | " |
| " | " | Fst ✓ | " | ✓ | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700 V | Alarm ✓ | cont | ✓ | 500 V |
| PM-2 | 1200 V | Low ✓ | 10" | ✓ | 900 V |
| " | " | Alarm ✓ | 1" | ✓ | " |

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

START-UP CHECK LIST

Equipment checked by AKH Personnel check by F.D.C.
 Instruments and safeties checked and reset by AKH
 Source in checked by AKH Source No. M-43
 Emergency equipment in control room checked by F.D.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by AKH Time 0900
 Start-up OK'd by F.D.C. AKH Date 11-21-00

09

09

.80 " Rods 30 cm length.

Triangular array.

Now have 3 full rings, plus 2 rods on each face in 4th ring. Total of 49 rods. Separation = 3.88 cm C-C.

0925 Water ht = 45.00 cm

Water Temp °C

Lepton sub critical

1 = 25.0

Drain

2 = 25.0

added 6 rods. Now have 3 full rings, plus 3 rods on each face in 4th ring. Total of 55 rods. Separation = 3.88 cm. C-C.

0947 Water ht = 45.00 cm

Water Temp °C

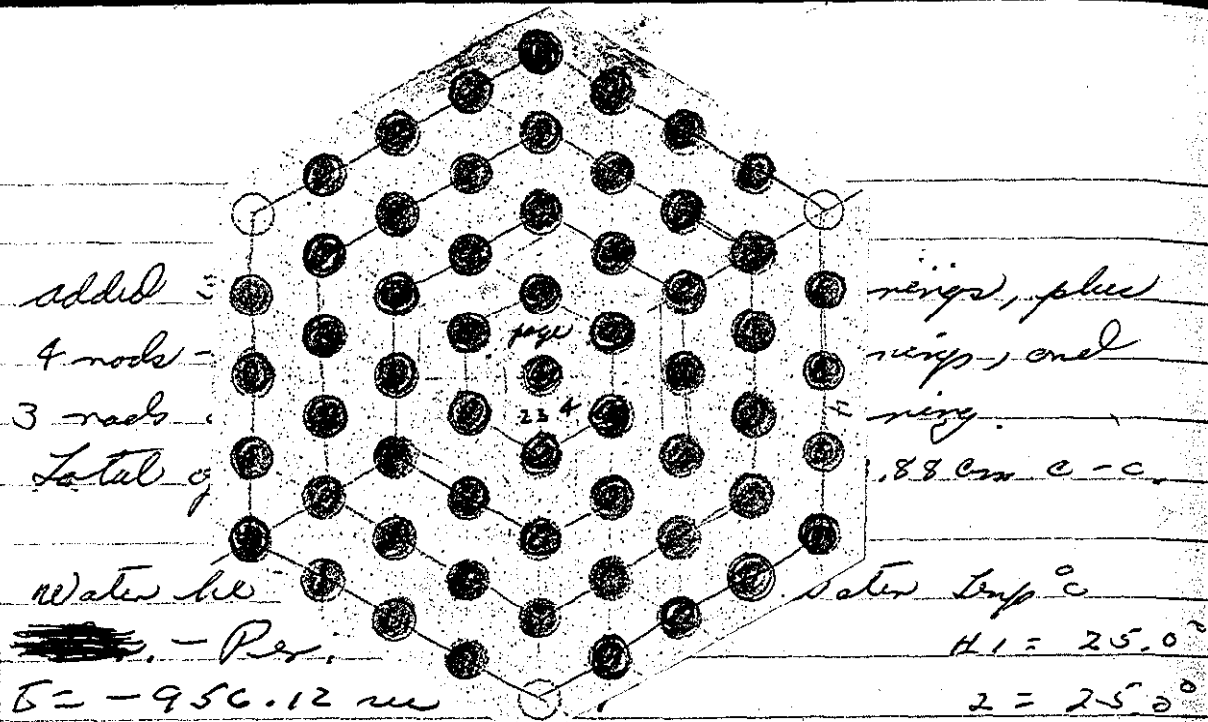
Lepton sub critical

1 = 25.0

Drain

2 = 25.0

over



1055' Drain

80" rods, 60 cm length
3.88 cm separation c-c

Now have 3 full rings, plus 1 rod on every
other face in 4th ring, total of 40 rods
separation = 3.88 cm c-c, 60 cm length

13.14 Water ht = 75.50 cm
System sub critical
Drain

added 3 rods. Now have 3 full rings, plus
4 rods ^{on} three face in 4th ring, and
3 rods on three face in 4th ring.
Total of 58 rods. Separation = 3.88 cm c-c.

45.5 cm.
Water ht = ~~45.5~~ cm Water Temp °C
~~Peri~~ - Peri: H1 = 25.0°
S = -956.12 m = -1.4 f 2 = 25.0°

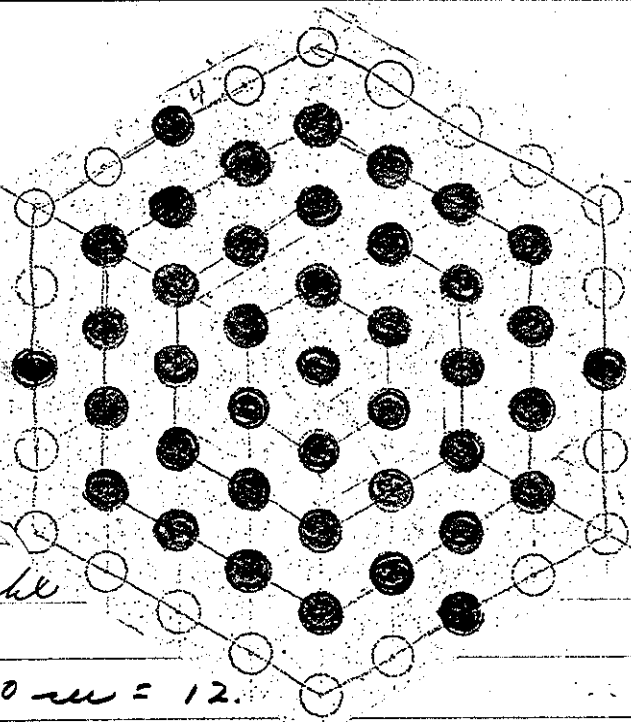
1055' Drain

.80" rods. 60 cm length.
3.88 cm separation c-c

Now have 3 full rings, plus 1 rod on every
other face in 4th ring. Total of 40 rods.
Separation = 3.88 cm c-c. 60 cm length.

13.14 Water ht = 75.50 cm
System sub critical
Drain

13



added
4 rods
of 41 -
length

Water ht
+ Per.
 $T = 71.70 \text{ cm} = 12.$

ring, plus
at ring. Total
- c. 60 cm

Water Temp °C
#1 = 25.0
#2 = 25.0

1350 Water ht = 63.75 cm
System just critical
Drain

added 1 rod. Now have 3 full rings, plus
4 rods on opposite face in 4th ring. Total
of 41 rods. Separation = 3,88 cm c-c. 60 cm
lengths.

Water ht = 66.70 cm

Water Temp °C

+ P.S.

#1 = 25.0

$T = 71.70 \text{ m} = 12.7 \text{ f}$

#2 = 25.0

1.3.50 Water ht = 63.75 cm

System just critical
Drain

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|-----------------------------|-------------------------|-----------|-----------------|------------------|----------------------|
| K-1 | 3×10^{-12} | Meter ✓ | 2" | ✓ | 10×10^{-12} |
| " | " | Fast ✓ | " | ✓ | " |
| K-2 | " | Meter ✓ | " | ✓ | " |
| " | " | Fast ✓ | " | ✓ | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700V 700V | Alarm ✓ | cont | ✓ | 500V |
| PM-2 | 1200V | Low ✓ | 10" | ✓ | 900V |
| " | | Alarm ✓ | 1" | ✓ | " |
| LOG N CALIBRATE ✓ | | OPERATE ✓ | | SOURCE NO. 19-80 | |
| DUMP WELL PROSE LIGHT _____ | | | | | |

START-UP CHECK LIST

Equipment checked by AKV Personnel check by FIDC

Instruments and safeties checked and reset by AKV

Source in checked by AKV Source No. M-43

Emergency equipment in control room checked by FIDC

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

Red light on by AKV Time 0920

Start-up OK'd by FIDC AKV Date 11-22-66

• 80 " Rods.

5.2" separation c-c.
Square + rounded arrays.

Now have an 8 x 8 array, 30 cm length.
Separation = 5.2 cm c-c.

0950 Water ht = 45.0 cm.

System sub critical.

Drain.

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

#1 = 25.0

#2 = 25.0

Now have an 8 x 9 array, 30 cm length.
Separation = 5.2 cm c-c.

1020 Water ht = 45.0 cm.

System sub critical.

Drain.

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

#1 = 25.0

#2 = 25.0

Now have an 9 x 10 array, 30 cm length.
Separation = 5.2 cm c-c.

1040 Water ht = 45.0 cm

System sub critical

Drain.

over

New haul on 10 x 10 array. 30 cm length.
 Separation = 5.2 cm. c-c.

Water Temp °C

11.15 Water ht = 45.0 cm
 System sub critical
 Drain

H₁ = 25.0

h = 25.0

New haul on 10 x 11 array. 30 cm length.
 Separation = 5.2 cm c-c

12.45 Water ht = 45.0 cm
 System sub critical
 Drain

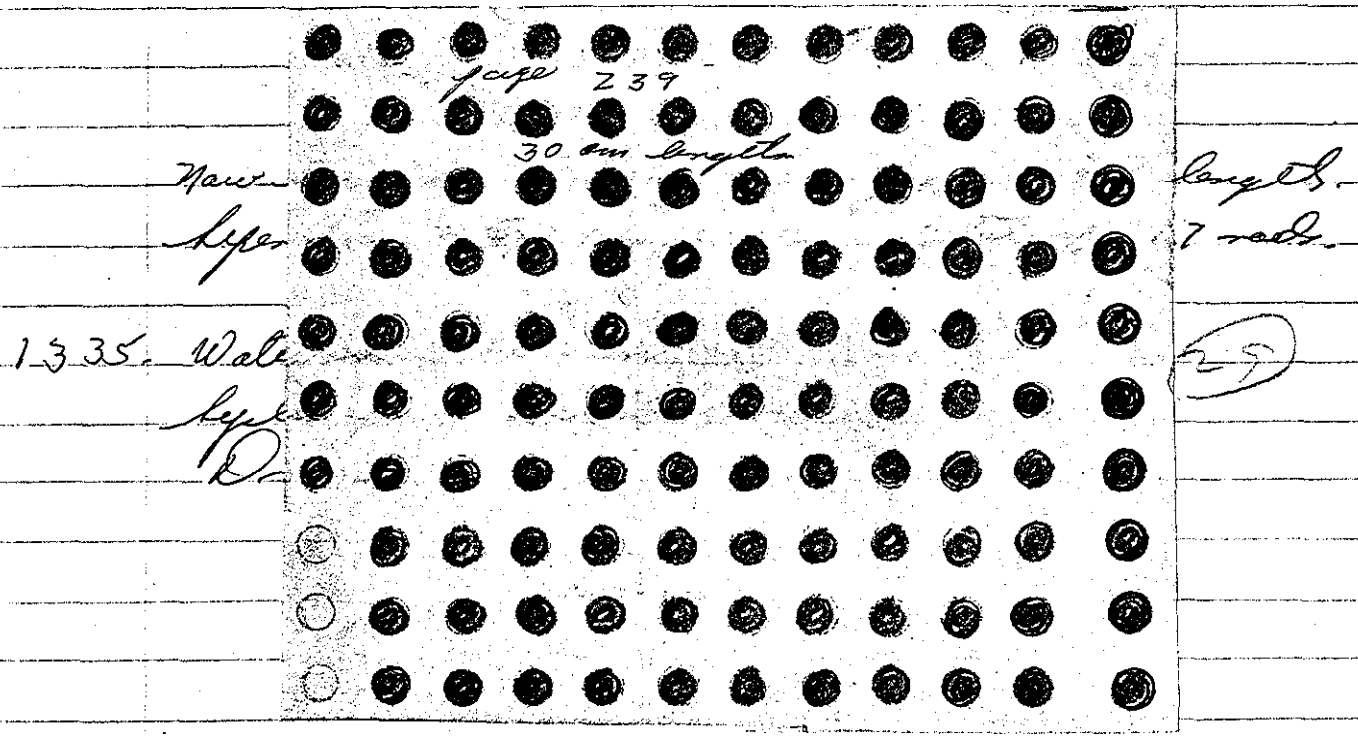
Now have on 10x12 array, 30 cm length
separation = 5.2 cm. c-c. (note) can not
get on full 11x11 due to construction of
tube sheet.

5.0
5.0

Water ht = 37.10
+ Per.

Water Temp °
#1 = 25.0
2 = 25.0

Water ht = 36.45 cm
System just critical



Now have on 10x12 array, 30 cm length.
 Separation = 5.2 cm. c-c. (note) can not
 get on full 11x11 due to construction of
 tube sheet.

Water

+ P.

Water

hys

Temp °C

1 = 25.0

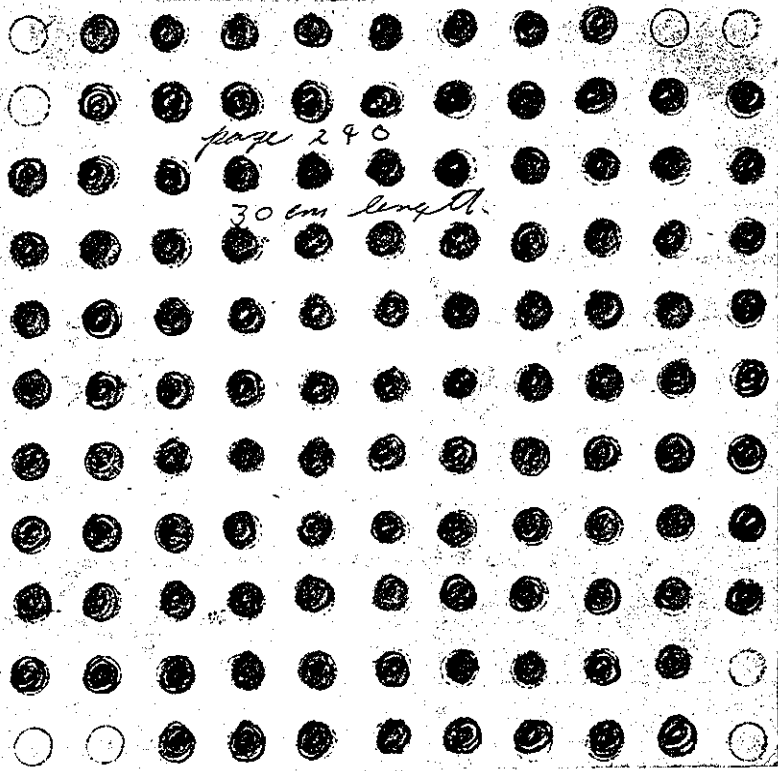
2 = 25.0

Now have on 10x12-3 array, 30 cm length.
 Separation = 5.2 cm. c-c. Total of 117 rods.

1.3.35. Water ht = 46.0 cm
 System just critical
 Drain.

(27)

240.



page 240
30 cm length.

Now -
from
cm
water
Sept
Drain

removed
to 30
-c

16

80" radii, 5.2 cm separation e-c.
60 cm lengths.

Now have an 8x9-1 array. Total of 71, 60 cm
lengths radii. Separation = 5.2 cm e-c.

15.3.5 Water at - 49.50 cm
Septer just critical
Drain.

240.

2) Now have an 11×11 array, with 2 rods removed from each corner. Total of 113 rods, 30 cm lengths, 5.2 cm separation c-c.

Water ht = 45.40 cm
System just critical
Drain.

80" rods, 5.2 cm separation c-c,
60 cm lengths.

Now have an $8 \times 9 - 1$ array. Total of 71, 60 cm lengths rods. Separation = 5.2 cm c-c.

1535 Water ht = 49.50 cm
System just critical
Drain.

New haul on 8 x 8 - 4. The four corner rods
are removed. 60 cm lengths. 5.2 cm separation
e - e. Total of 60 rods.

1600 water ht = 52.50
System just critical
Drain.

242

11/23/66

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|----------------------|---------------------|-----------|-----------------|-----------------|-----------------------|
| K-1 | 3X10 ⁻¹² | Meter ✓ | 2" | ✓ | 1.0X10 ⁻¹² |
| " | " | Fast ✓ | | ✓ | |
| K-2 | " | Meter ✓ | 2" | ✓ | 1.0X10 ⁻¹² |
| " | " | Fast ✓ | | | |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700V | Alarm ✓ | Contact | | 5000 |
| PM-2 | 1200V | Low ✓ | 15" | | 9000 |
| | | Alarm ✓ | 1" | | |
| LOG IN CALIBRATE ✓ | | OPERATE ✓ | | SOURCE No. B-80 | |
| DUMP WELL FREE LIGHT | | | | | |

START-UP CHECK LIST

Equipment checked by RRR, IDC personnel check by IDCInstruments and safeties checked and reset by EGSource in checked by EG Source No. M-43Emergency equipment in control room checked by IDCInstruments in trip circuit: K-1, K-2, PM-1, PM-2Red light on by EG Time 0810Start-up OK'd by EG, IDC Date 11/23/66

S

Now $u_{200} = 7 \times 7 + 4$. Tot = 150. 0.8 rods, 5.2 cm center separation.

0915' $W_{21W} = 75.0$ cm. Subcritical.

#1 25.0 °C

#2 25.0 °C

Drain

Now $u_{200} = 7 \times 7 + 6$. Tot = 155.

0945' $W_{21W} = 75.0$ cm. Subcritical.

#1 25.0 °C

#2 25.0 °C

1. Remove sensor for key period.

$C = -123.86 \text{ sec} = -16.7 \text{ f}$

Drain

added 1 rod. Now have an 7×8 array. (56 rods) 80" rods. 60 cm length. Separation = 5.2 cm c-c.

(31)

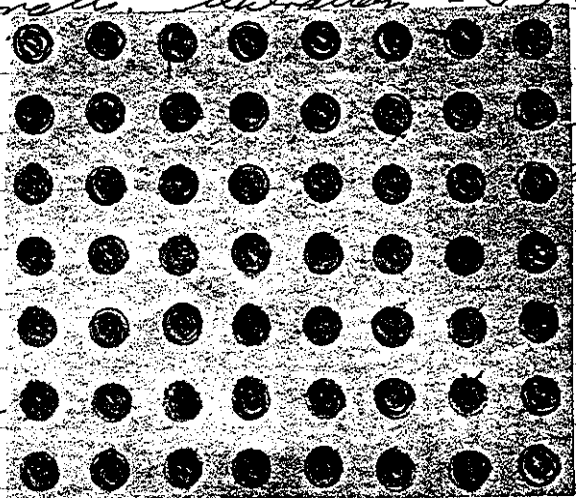
Water ht = 75.20 cm

+ Pr,

$t = 139.73 \text{ sec} = 7.8 \text{ f}$

1030 Water ht = 65.30 cm

system just critical
Drain



S

Now $u_{200} = 7 \times 7 + 4$. Total = 153. 0.8 rods, 5.2 cm center separation:

0915 Water = 75.0 cm. Subcritical. Drain
#1 25.0°C
#2 25.0°C

Now $u_{200} = 7 \times 7 + 4$. Total = 153.

0945 Water = 75.0 cm. Subcritical. Drain
#1 25.0°C
#2 25.0°C
- Remove sensor for long period.
 $C = -123.86 \text{ cm} = -16.7 \text{ f}$

added 1 rod. Now 8 rods. 60 cm c-c. (31)

6 rods
cm

Water ht = 75.20 cm. #1 = 25.0
+ Per, #2 = 25.1

$C = 139.73 \text{ cm} = 7.8 \text{ f}$

1030 Water ht = 65.30 cm
system just critical
Drain

Now have an 8x8 array, with 3 rods
removed from each corner. Total of
52 rods. 60 cm length. 5.2 cm
separation c-c.

11.10 Water ht = 77.00 cm
System sub critical
Drain.

Added 1 rod. Now have an 8x8 array, with
3 rods removed from 3 corners, and 2 rods
removed from 1 corner. Total of 53 rods.
60 cm length. 5.2 cm separation c-c.

13.29 Water ht = 75.00 cm

3 - P.S.

$$v = -109.80 = -29.87$$

Water Temp °C

#1 = 25.0

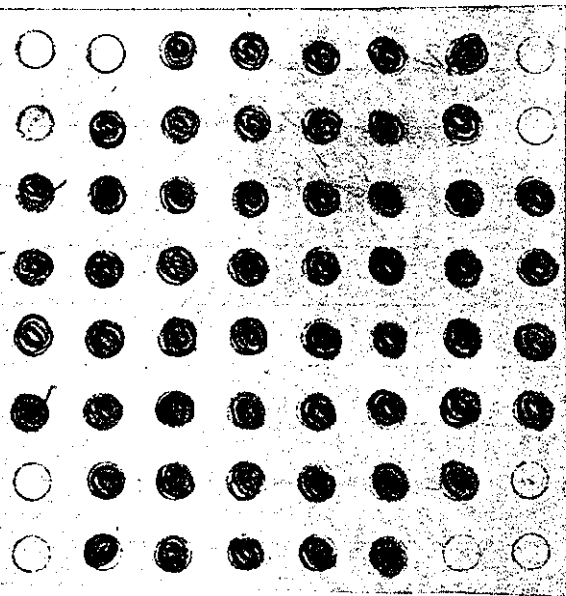
2 = 25.0

Added 1 rad. Now have on 8x8 array, with
 3 rads removed from 2 corners, and 2 rads
 removed from 2 corners in array as shown.
 Total of 54 rads, 60 cm length, 5.2 cm
 separation c-c.

Water ht = 75.0 cm
 + Per.
 $t = 130.38 \text{ sec} = 9.0 \text{ f}$

1421 Water ht = 65.20 cm
 System just critical
 Drain

32



diver

6.0
 5.0
 5.0

246

How

1.80" Rads.

Triangular array's

30 cm length.

Now have 3 full rings, plus 2 rods on
each face in 4th ring. Total of 49 rods.
Separation = 4.45 cm c-c. 30 cm length.

1552 Water ht = 45.00 cm

Water Temp °

System sub critical

H1 = 25.0

Drain

2 = 25.0

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|-----------------------|---------|-----------------|-----|------------------------|
| K-1 | 3 x 10 ⁻¹² | Meter ✓ | 2" | - | 10 x 10 ⁻¹² |
| | 3 x 10 ⁻¹² | Fast ✓ | " | - | " |
| K-2 | 3 x 10 ⁻¹² | Meter ✓ | " | - | " |
| | 3 x 10 ⁻¹² | Fast ✓ | " | - | " |
| R-1 | | | | | |
| P-2 | | | | | |
| PM-1 | 700V | Alarm ✓ | cont | - | 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 FIDC Personnel check by FIDC

Instruments and safeties checked and reset by AKML

Source in checked by AKML Source No. M-93

Emergency equipment in control room checked by FIDC

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

Red light on by AKML Time 0812

Start-up OK'd by FIDC AKML Date 11-28-66

248

11-28-66

Now have 3 full rings, plus 3 rods on 3
faces, and 2 rods on 3 faces in 4th ring.
Total of 52 rods. Separation = 4.45 cm c.c.
30 cm lengths.

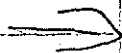
0906 Water ht = 45.50 cm
System sub critical
Drain.

Water Temp °C

T1 = 28.2

T2 = 29.7

added 3 rods. Now have 3 full rings, plus
3 rods on each face in 4 ring. Total of
55 rods, Separation = 4.45 cm c.c. 30 cm
length.



0937 Water ht = 45.20 cm

- Per

$\sigma = -139.7 \text{ psi} = -14.5 \text{ f}$

0941 Drain

added 2 rods. Now have 3 full rings, plus
 4 rods on 2 faces, and 3 rods on 4 faces in
 the 4th ring. Total of 57 rods. 4.95 cm c-c
 30 cm length.

10 20 Water ht = 35.00 cm

+ P₁

$$C = 73.88 \text{ cm} = 12.4 \text{ ft}$$

Water Temp °C

$$T_1 = 25.0$$

$$T_2 = 25.0$$

10 29 Water ht = 34.51 cm

System just critical

10 30 Scrapped system by feeding water K-1
 scrapped on 3 x 10⁻¹² for safety
 review committee.)

Removed 1 rod from

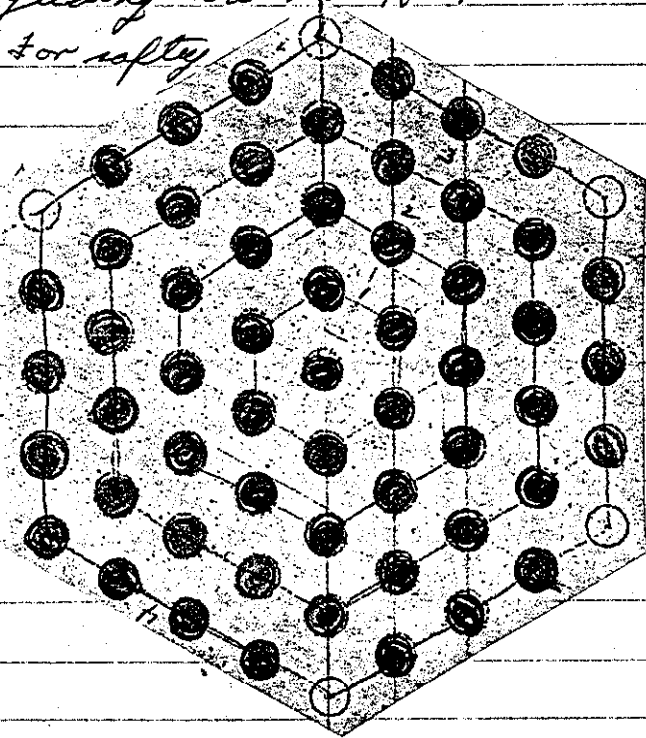
Now have 56 rods.

10 59 W_{stW} = 39.5 cm. T

$$C = 63.02 \text{ cm} = 14.0 \text{ ft}$$

11 06 W_{stW} = 36.8 cm. C₁

Drain



added 2 rods. Now have 3 full rings, plus
4 rods on 2 faces, and 3 rods on 4 faces in
the 4th ring. Total of 57 rods. 4.95 cm e-c
30 cm length.

Water Level^B

1020 Water ht = 35.00 cm

#1 = 25.0

+ P₄

25.0

$$C = 73.88 \text{ sec} = 12.4 \text{ d}$$

1029 Water ht = 34.57 cm

System just critical

1030 Screened system by
screened on 3 x 10⁻¹²
review committee.)

Removed 1 rod from NW corner in 4th ring.

Now have 56 rods.

1059 WSW = 39.5 cm. T Point #3

#1 = 25.0

#2 = 25.0

$$C = 63.02 \text{ sec} = 14.0 \text{ d}$$

1106 WSW = 36.8 cm. Critical

Drain

11/28/66

60 cm height

Now have 40 rods 60 cm long spaced 4.45 cm between centers. Triangular pattern, 3 full rings with one rod on each of 3 alternate faces in 4th ring.

#1 25.0°C

1328 Wet W at 54.35 cm. Critical

#2 25.0°C

Drain.

Removed 3 rods from 4th ring. Now have 37.

1400 Wet W at 75.0 cm. Subcritical.

Drain.

Added 1 rod to center of a face. Now have 38 rods.

1445 Wet W at 64.20 cm. T Point #4

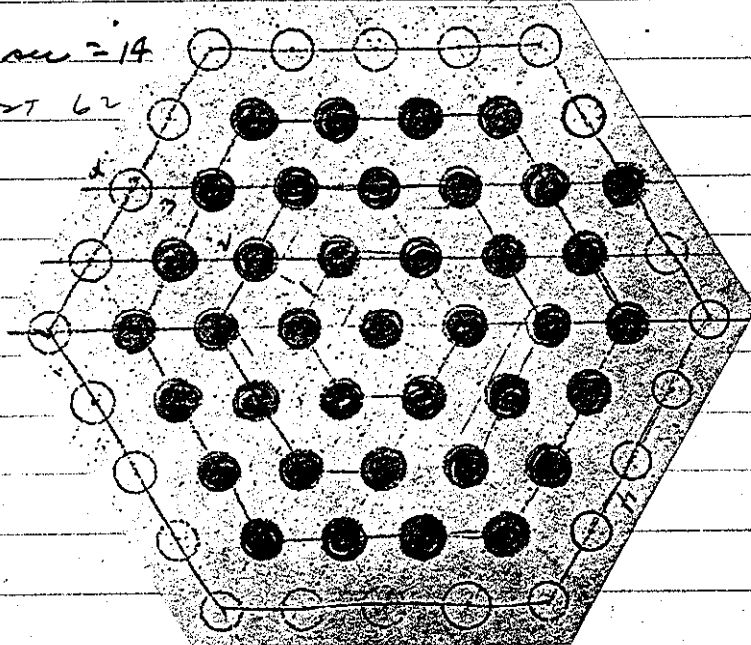
#1 25.0°C

$t = 58.67 \text{ sec} = 14$

#2 25.0°C

1450 Wet W at 62

Drain.



250

11/28/66

∴ 60 cm height

Now have 40 rods 60 cm long; spaced 4.45 cm between centers. Triangular pattern, 3 full rings with one rod on each of 3 alternate faces in 4th ring.

1328 W at W at 54.35 cm. Critical
Drain.

#1 25.0°C

#2 25.0°C

Removed 3 rods from 4th ring. Now have 37.

1400 W at W at 75.0 cm. Subcritical.
Drain.

Added 1 rod to center of a face. Now have 38 rods.

1445 W at W at 64.20 cm. T Point #4

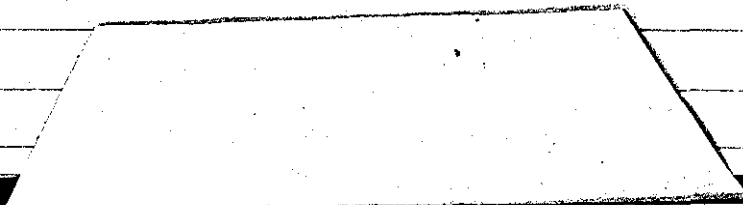
#1 25.3°C

$$t = 58.67 \text{ sec} = 14.7 \text{ ft}$$

#2 25.3°C

1450 W at W at 62.7 cm. Critical.

Drain.



INSTRUMENT CHECK

| INSTRUMENT | SS | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|-------------------------|----|---------|-----------------|-----|----------------------|
| K-1 3x10 ⁻¹² | | ✓ | 2" | ✓ | 10x10 ⁻¹² |
| " | | ✓ | " | ✓ | " |
| K-2 " | | ✓ | 2" | ✓ | " |
| " | | ✓ | " | ✓ | " |
| PM-1 700v | | Alarm ✓ | cont | ✓ | 500v |
| PM-2 1200v | | Low ✓ | 10" | ✓ | 900v |
| " | | Alarm ✓ | 1" | ✓ | " |

LOG IN OPERATE SOURCE No. B-80

DUMP W/OUT LIGHT

START-UP CHECK LIST

Equipment checked by FIDIC personnel check by FIDIC

Instruments and safeties checked and reset by AKH

Source in checked by AKH No. M-43

Emergency equipment in control room checked by FIDIC

Instruments in control room: K-1-2 PM-1-2

Red light on by AKH Time 0935

Start-up OK'd by FIDIC Date 11-29-66

over

2525

11-29-66

5.58 cm separation c-c.
30 cm lengths.
Triangular array:

Note: (The change in water ht is due to 1" thick plywood plate used to extend base. (when water reach 2.6 cm on back scale: water ht = bottom of rods.)

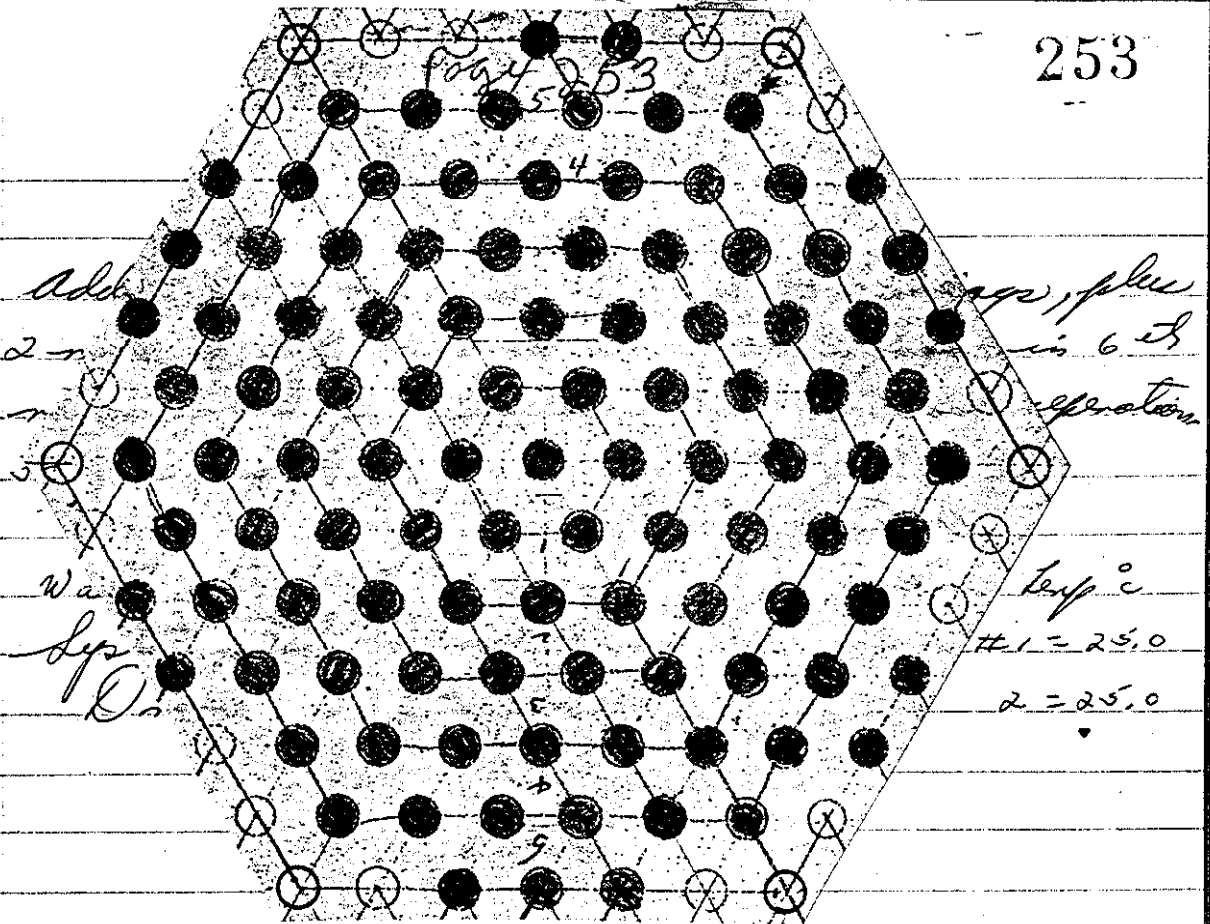
Now have 5 full rings. Total of 91 rods.
Separation = 5.58 cm c-c. 30 cm length.

Water ht = 48.0 cm
Septon sub critical
Drawn

Water Temp °C
T1 = 25.0
T2 = 25.0

Added 12 rods. Now have 5 full rings, plus 2 rods on each face in 6th ring. Total of 103 rods. Separation = 5.58 cm c-c. 30 cm lengths.

Water ht = 48.80 cm.
Septon sub critical - Per = $\tau = -76.06 \mu$



5.58 cm separation c-c
 60 cm length. Triangular array.

Now have 3 full rings, plus 2 rods on each
 face in 4th ring. Total of 49 rods.
~~5.8~~ 5.58 cm separation c-c. 60 cm length.

15.10 Water ht = 79.00 cm.
 System sub critical
 Drain

Added 3 rods. Now have 5 full rings, plus
2 rods on 3 face, and 3 rods on 3 face in 6th
ring. Total of 106 rods. 5.58 cm c-c separation
30 cm length.

Water ht = 48.20 cm

System just critical
Drain.

Water temp °C

#1 = 25.0

#2 = 25.0

5.58 cm separation c-c

60 cm length. Triangular array.

Now have 3 full rings, plus 2 rods on each
face in 4th ring. Total of 49 rods.
5.58 cm separation c-c. 60 cm length.

15.10 Water ht = 79.00 cm.

System sub critical
Drain

added 6 rods. Now have 3 full rings, plus 3 rods on each face in 4th ring. Total of 55 rods. 5.58 cm separation c-c. 60 cm length.

1542 Water ht = 59.85 cm
 System just critical
 Drain

Water Temp °C
 H1 = 25.0
 2 = 25.0

11-30-66

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | S.T. | START-UP RANGE |
|------------|--------------|---------|-----------------|------|----------------------|
| K-13 | 10^{-12} | Meter ✓ | 2" | ✓ | 10×10^{-12} |
| " | " | *Fast ✓ | " | ✓ | " |
| K-2 | " | Meter ✓ | " | ✓ | " |
| " | " | Fast ✓ | " | ✓ | " |
| R-1 | | | | | |
| R-2 | | | | | |
| FM-1 | 700V 500V | Alarm ✓ | cont | ✓ | 500V |
| FM-2 | 1200V | Low ✓ | 10" | ✓ | 900V |
| " | " | Alarm ✓ | 1" | ✓ | " |

LOG N CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL FLOOD LIGHT

START-UP CHECK LIST

11-30-66

Equipment checked by F.I.C. AKH 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: X-1-2 PM-1-2

Red light on by AKH Time 0850

Start-up OK'd by F.I.C. AKH Date 11-30-66

5.58cm separation e-c
60 cm length. Triangular array.

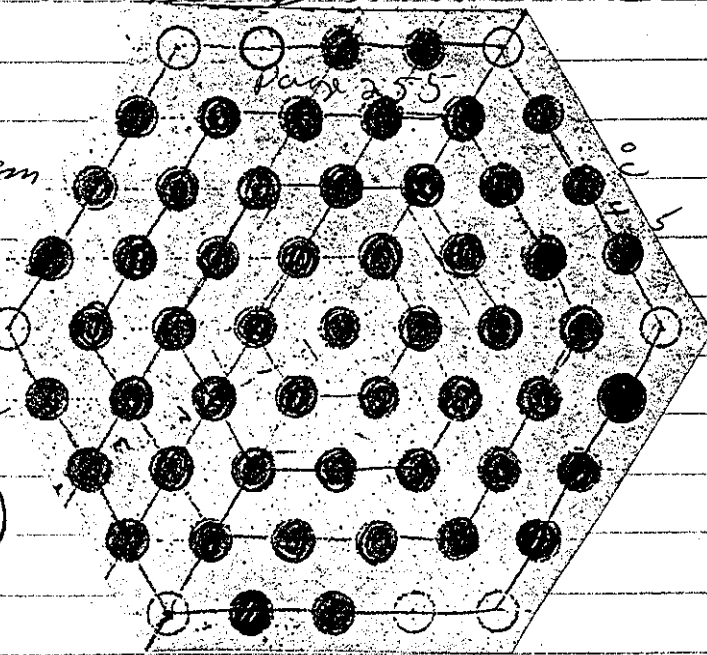
Remained 2 rods. Now have 3 full rings, plus
3 rods on 4 faces, and 2 rods on 2 faces.
Total of 53 rods. 60 cm length. 5.58 cm
separation e-c.

Water ht = 67.10 cm
+ Per

1033

Water ht = ^{66.}66
System just en
Drain

(15)



acc.

START-UP CHECK LIST

11-30-66

Equipment checked by F.I.C. AKH 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: X-1-2 PM-1-2

Red light on by AKH Time 0950

Start-up OK'd by F.I.C. AKH Date 11-30-66

5.580

60 cm l

Remained 2 rods.
3 rods on 4 faces
Total of 53 rods
separations a-c

Water ht = 67.10 cm
+ Per

Water Temp °C

#1 = 29.5

#2 = 29.8

1033

66.10
Water ht = 66.05 cm

System just critical
Dmin

(15)

over

256

11-30-66

Removed 1 node. Now have 3 full rings, plus
3 nodes on 3 feet, and 2 nodes on 3 feet, ~~total~~
Total of 52 nodes. 60 cm length, 5.58 cm separation
c-c.

1330

Water ht = 79.30 cm.

Water Temp °C

System sub critical

#1 = 24.8

Drain.

#2 = 25.0

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|-----------------------|---------|-----------------|-----|------------------------|
| K-1 | 3 x 10 ⁻¹² | Meter ✓ | 2" | ✓ | 10 x 10 ⁻¹² |
| " | " | Fast ✓ | " | ✓ | " |
| K-2 | " | Meter ✓ | " | ✓ | " |
| " | " | Fast ✓ | " | ✓ | " |
| R-1 | | | | | |
| P-2 | | | | | |
| PM-1 | 7000 | Alarm ✓ | cont | ✓ | 5000 |
| PM-2 | 12000 | Low ✓ | 10" | ✓ | 9000 |
| " | " | Alarm ✓ | 1" | ✓ | " |

LOG N CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by AKH/EDC Personnel check by EDC

Instruments and safeties checked and reset by AKH/EDC

Source in checked by AKH Source No. M-83

Emergency equipment in control room checked by EDC

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

Red light on by AKH Time 0905

Start-up OK'd by EDC AKH Date 12-1-60

over

258

1.0" dia rods.
30 cm length.

12-1-66

Now have an 8 X 10 array. Rods in contact.

Water ht = 47.0 cm
System sub critical
Drain:

Water Temp °C
H1 = 24.5
H2 = 24.8

12-2-66

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | TT | START-UP RANGE |
|------------|-----------------------|---------|-----------------|----|------------------------|
| K-1 | 3 X 10 ⁻¹² | Motor ✓ | 2" | ✓ | 10 X 10 ⁻¹² |
| | " | " ✓ | " | ✓ | " |
| K-2 | " | Motor ✓ | " | ✓ | " |
| | " | Fast ✓ | " | ✓ | " |
| P-1 | | | | | |
| P-2 | | | | | |
| PM-1 | 700V ✓ | Alarm ✓ | cont | ✓ | 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 AKM Personnel check by FIDC

Instruments and safeties checked and reset by AKM

Source in checked by AKM Source No. M-43

Emergency equipment in control room checked by FIDC

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

Red light on by AKM Time 0850

Start-up OK'd by FIDC AKM Date 12-2-66

.80" rods.

4.14 cm separation c-c.

Base point for lead reflectors worth.

Square pattern

Have an 8x8 - 4 rods on 1 face. Total of 60 rods. Separation = 4.14 cm c-c. 30 cm length.

Water ht = $\frac{36.00 \text{ cm}}{24} = 1.50 \text{ cm}$

Water Temp °C

+ Per.

$t = 63.02 \text{ in} = 13.84 = 19.82 \text{ Hcm}$

#1 = 24.5

2 = 24.5

0928 Water ht = 35.30 cm Temp = .50

System just critical.

0928 Drain to ~ 32.50 cm

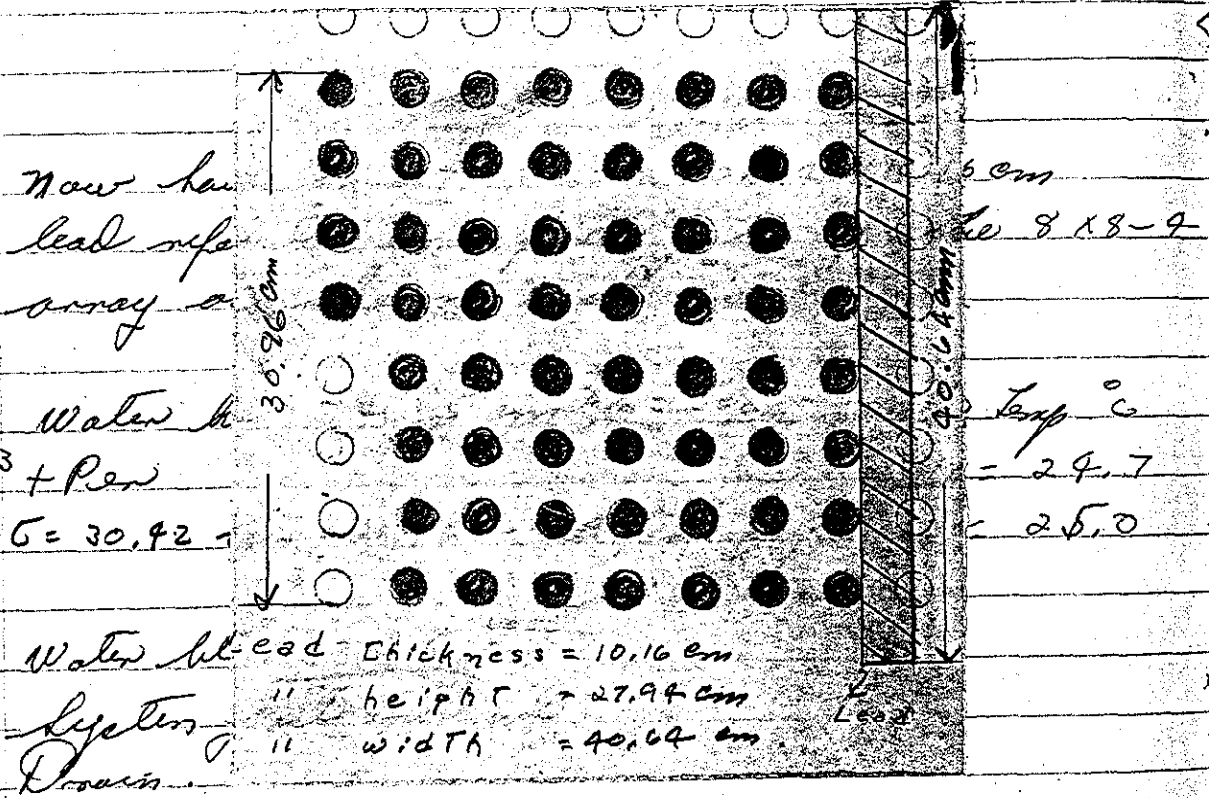
see.

260

PL

0938 Water ht = 36.00 $z_4 = .70 \text{ cm}$ Water Temp $^{\circ}\text{C}$
 $^2 + \text{Pen}$ #1 = 24.5
 $\epsilon = 78.23 \text{ sec} = 11.94 = 16.74 \text{ /cm}$ $z = 24.8$

0948 Water ht = 35.30 cm Temp = 25.50
 System just entered
 Drawn



1112 Water bleed thickness = 10.16 cm
 System height = 27.94 cm
 width = 40.64 cm
 Drawn

260

96

0938 Water h
² + Per
E = 78.23 cm

Temp °C
#1 = 24.5
2 = 24.8

0948 Water h
System of
Down

Now have an 27.94 cm x 40.64 x 10.16 cm
lead reflection on 1 face of the 8 x 8 - 4
array or shown lead in contact

Water ht = 34.35 cm $\delta h = .50$ cm, Water Temp °C
³ + Per #1 = 24.7
E = 30.42 sec = 21.7 f = 43.4 f/cm. 2 = 25.0

1112 Water ht = 33.85 cm
System just critical
Down

have $16'' \times 11'' \times 16''$
New ~~book~~ on $15.24\text{cm} \times 27.94\text{cm} \times 40.64\text{cm}$

lead reflection on 1 face of the $3 \times 3 = 4$ array,
lead in contact

Water ht = 34.10cm $\Delta h = .45\text{cm}$ water temp $^{\circ}\text{C}$

+ per $\#1 = 24.7$

$\bar{c} = 30.92\text{cm} = 22.5\% = 49.50\text{off cm}$ $2 = 25.0$

1495 Water ht = 33.65 cm

system just critical
Drain

8-9

0

.7

0

262

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|---------------------|------|-----------------|-----|-----------------------|
| K-1 | 3X10 ⁻¹² | ✓ | 2" | ✓ | 10-110 ⁻¹² |
| " | " | ✓ | " | ✓ | " |
| K-2 | 2" | ✓ | " | ✓ | " |
| " | " | ✓ | " | ✓ | " |

| | | | | |
|-------|--------|-------|---|-------|
| PIV 1 | 700 V | Alarm | ✓ | 500 V |
| PIV 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 AKH Personnel check by F.D.C.
 Instruments and safeties checked and reset by AKH
 Source in checked by AKH Source No. M-43
 Emergency equipment in control room checked by F.D.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by AKH Time 0930
 Start-up OK'd by F.D.C. AKH Date 12-5-66

125-66

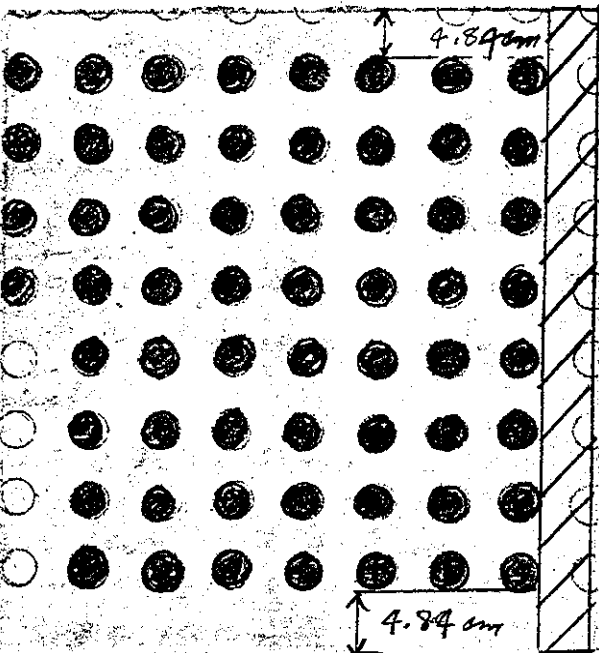
Now have
lead reflector
80" rods
lead in con

0853

Water ht
+ Per
 $T = 60.84 \text{ sec}$

0859

Water ht
Septon
Drain



40.64 cm

4.84 cm

- e

4.84 cm

Water Temp °C

$T_1 = 27.0$

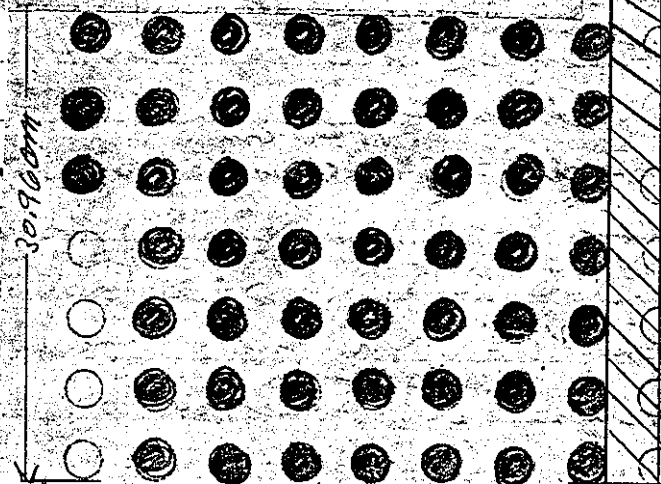
$T_2 = 27.0$

Lead Thickness = 5.08 cm

" height = 27.94 cm

" width = 40.64 cm

Now have
lead reflector
4.14 cm sep
array or
Water ht = 3
+ Per
 $T = 52.15 \text{ sec}$



cm

80" rods

Water Temp °C

$T_1 = 24.2$

$T_2 = 24.5$

Lead Thickness = 5.08 cm

" height = 27.94 cm

" width = 30.96

0930

Water ht =
Septon
Drain

17-5-66

2" x 11" x 14"

Now have an 5.08 cm x 27.94 cm x 40.64 cm
lead reflector on 1 face of an 8 x 8 - 4 array
80" rack. 4.14 cm separation c-c,
lead in contact

0853

Water ht = 34.30 cm

8.4 = .20 cm

Water Temp °

+ Per

H1 = 29.0

T = 60.84 sec = 14.3 = 71.50 H/cm.

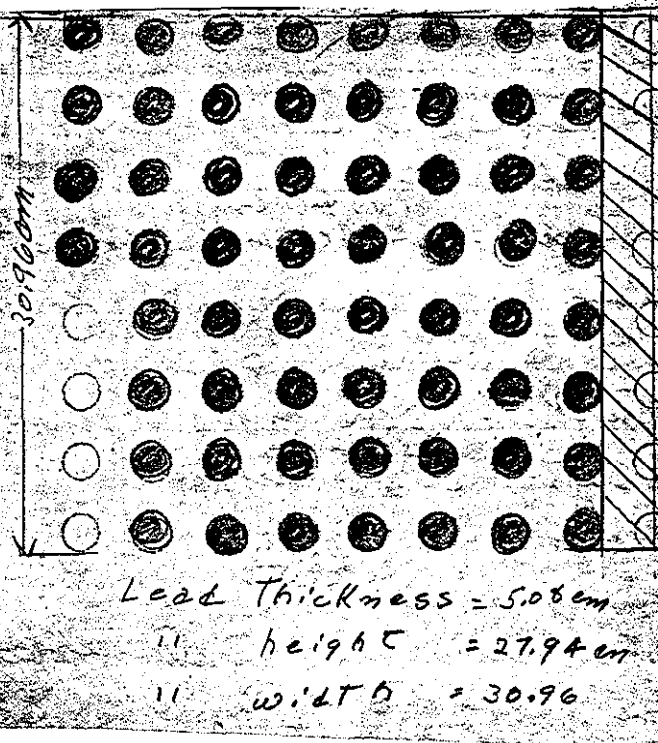
2 = 29.0

0859

Water ht = 34.10 cm

System just critical
Drain.

Now have a
lead reflector
4.14 cm sep
array on a
Water ht = 3
+ Per
T = 52.15 sec



80" rack
Water Temp °
H1 = 24.2
2 = 24.5

Lead Thickness = 5.08 cm

0930

Water ht =

height = 27.94 cm

System just
Drain.

width = 30.96

12-5-66

2" x 11" x 16"

Now have an 5.08 cm x 27.94 cm x 40.64 cm
lead reflector on 1 face of an 8 x 8 - 4 array
80" rack.

lead in contact

0853 Water ht:

+ Per

T = 60.84 sec

Temp °C

H1 = 29.0

2 = 29.0

0859 Water ht =

System just
Drain.

Now have an 5.08 cm x 27.94 cm x 30.96 cm
lead reflector on 1 face of an 8 x 8 - 4 array. 80" rack
4.14 cm separation a-c. lead in contact
array or shawl.

Water ht = 34.50 cm

 $\Delta h = .30$ cm

Water Temp °C

+ Per

H1 = 24.2

T = 52.15 sec = 15.94 = 52.954 / cm.

2 = 24.5

0930

Water ht = 34.20 cm.

System just critical
Drain.

8"

Now have an 20.32 cm x 27.94 cm x 40.64 cm lead reflector on 1 face of an 8x8 - 4 array, .80" rods, 4.14 cm separation c-c.

Water ht = 34.00 cm $\Delta h = .30$ Water Temp $^{\circ}\text{C}$
 3⁺ + Per #1 = 24.2
 $\bar{c} = 47.81 \text{ sec} = 16.9 = 56.28 \text{ f/cm}$ #2 = 24.5

1055 Water ht = 33.70 cm

kepters just critical

Now have an 5.08 cm x 27.94 cm x 30.96 cm lead reflector on 1 face of an 7x8 - 4 array. Lead reflector separation from core = 2.54 cm .80" rods, 4.14 cm separation c-c.

Water ht = 34.40 cm $\Delta h = .50$

4 + Per.
 $\bar{c} = 36.94 \text{ sec} = 20.0 \text{ f} = 40.0 \text{ f/cm}$

1350 Water ht = 33.90 cm

kepters just critical

Drain.

Same as above, lead reflector separation from core now = 3.81 cm.

Water ht = 34.80 $\Delta h = .50 \text{ cm}$ Water Temp $^{\circ}\text{C}$
 5 + Per #1 = 24.5
 $\bar{c} = 45.63 \text{ sec} = 17.4 \text{ f} = 34.80 \text{ f/cm}$ #2 = 24.5

1405 Water ht = 34.30 cm.

System just critical
Drain

Same array as described on page 264. Lead
reflector ^{refraction} $\Delta h = 6.35$ cm.

Water ht = 35.10 cm. $\Delta h = .30$ cm

6 + Per.

$\tau = 93.44 \mu = 10.4 \mu = 34.63 \mu/cm$

Water ht = 34.80 cm.

System just critical
Drain

Same as above. Lead reflector refraction now
= ~~7.67~~ cm.
= 7.62 cm.

Water ht = 35.80 cm. $\Delta h = .80$

7 + Per

$\tau = 43.46 \mu = 18.0 \mu = 22.50 \mu/cm$

Water ht = 35.00 cm

System just critical
Drain

INSTRUMENT CHECK

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

09

START-UP CHECK LIST

Equipment checked by ER. AME Personnel check by F.D.C.
 Instruments and safeties checked and reset by PKA
 Source in checked by PKA 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 PKA Time 0845
 Start-up OK'd by F.D.C. PKA Date 12-6-66

09

12-6-66

Same array as described on page 264.
Lead reflector separation now = 10.16 cm

Water ht = 36.00 cm. $d_1 = .80$ cm Water Temp °C
+ Per #1 = 29.5
 $t = 49.98 \text{ sec} = 16.4 \text{ } \mu = 20.50 \text{ } \mu/\text{cm}$ #2 = 29.5

0905 Water ht = 35.20 cm
System just critical
Drain.

Same as above. Lead reflector separation
now = 1.27 cm.

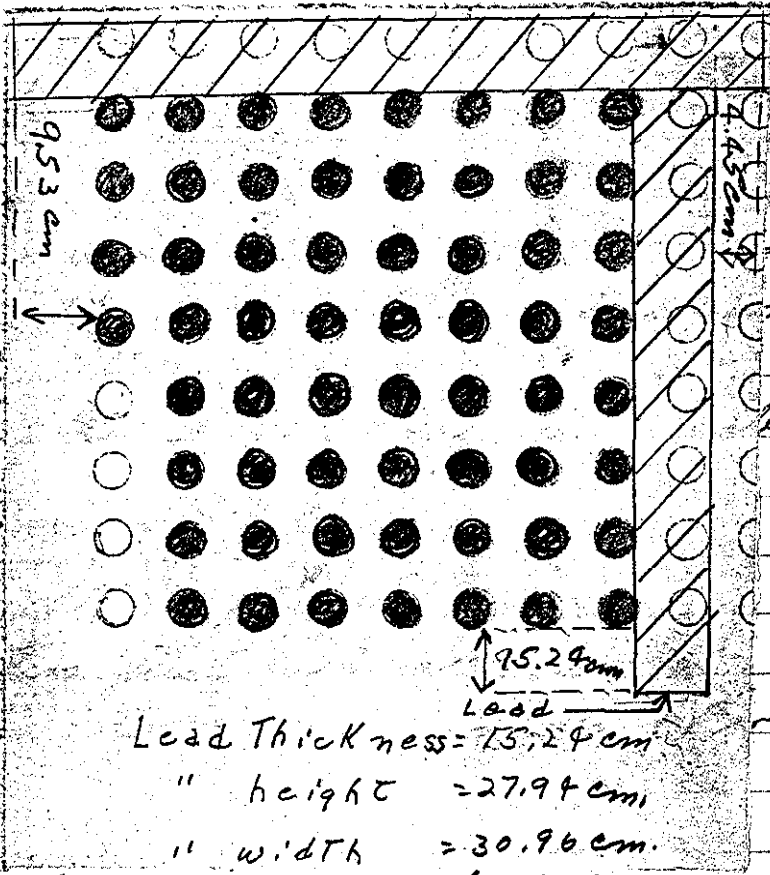
Water ht = 34.30 cm $d_1 = .40$ cm Water Temp °C
+ Per #1 = 29.5
 $t = 39.11 \text{ sec} = 19.3 \text{ } \mu = 48.25 \text{ } \mu/\text{cm}$ #2 = 29.7

0933 Water ht = 33.90 cm
System just critical
Drain.

clear

12-6-60

Now
lead
contact
Water
+ Per
 $\sigma = 71.7$
11:00 Water
level
Down



Lead Thickness = 15.24 cm
" height = 27.94 cm
" width = 30.96 cm

Water ht = 33.00 cm

$\Delta h = 2.00$ cm

+ Per

$\sigma = 41.29 \text{ new} = 18.3 \text{ } \phi = 91.50 \text{ } \phi / \text{cm.}$

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

H.C. = 29.5

2 = 29.7

11:15 Water ht = 32.30 cm

system just critical
Down

12-6-

268

12.6.60

12-

Now have an 8x8-4 array, with an 15.2 ϕ cm lead reflector on 2 faces as shown. Lead in contact with array. ??

Water ht = 32.80 cm
3 + Per
 $\sigma = 71.71 \mu = 12.7 \phi$

Water temp $^{\circ}C$
#1 =
2 =

11.00 Water ht = 32.80 cm
System just critical
Drain to \approx 0.0. run + Per.

Water ht = 33.00 cm $\Delta h = .20$ cm
4 + Per
 $\sigma = 41.29 \mu = 18.3 \phi = 91.50 \phi/cm.$

Water Temp $^{\circ}C$
#1 = 29.5
2 = 29.7

11.15 Water ht = 32.80 cm
System just critical
Drain:

12-6-66

Mass beam

$\lambda = 27.94$

reflector

edge of

on chain

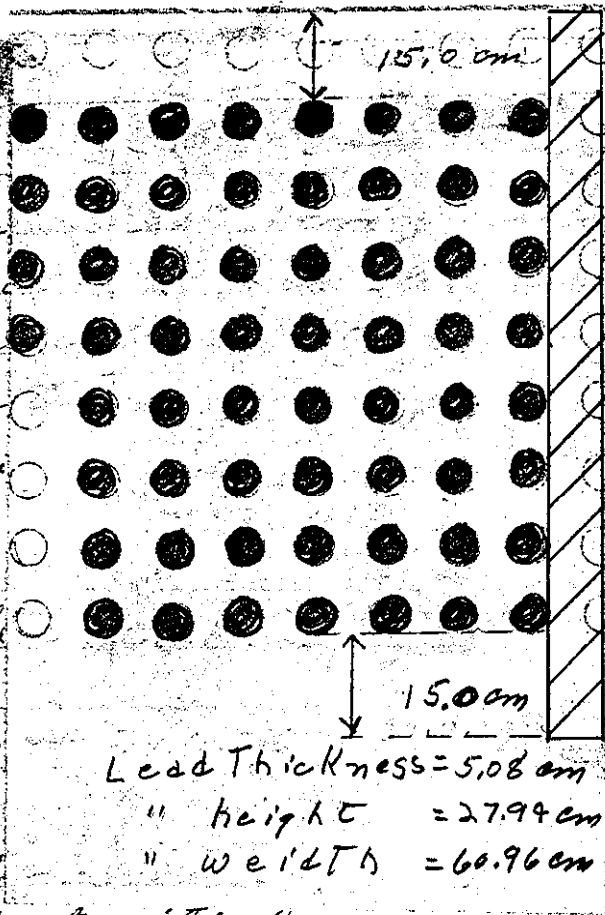
Water level

5 H₂O

$C = 54.32$

Water level

System just critical
Chain.



15.0 cm

15.0 cm

Lead Thickness = 5.08 cm

" height = 27.94 cm

" width = 60.96 cm

2" x 11.0" x 24

an 5.08 cm

reflector. Lead

around each

fuel array

is in contact.

Water level

$\lambda = 29.5$

$C = 29.7$

12-6-66

2" x 11.0" x R4

Mau base on 8x8 array with an 5.08 cm
 x 27.94 cm x 60.96 cm lead reflector. Lead
 reflector extends 15.0 cm beyond each
 edge of the array on 1 face. See array
 on drawing. See page 263. Lead in contact.

Water ht = 34.60 cm $\sigma_h = .50$ Water Temp =
 $5 + P_{24}$ $T_1 = 29.5$
 $C = 54.32 \text{ mm} = 15.5 f = 31.0^\circ \text{ from}$ $2 = 29.7$

Water ht = ~~34.60~~ 34.10 cm

System just critical
 Drain.

°C
 29.5
 29.7

270

55

12-7

| INSTRUMENT | RANGE | | URCE RANGE | SET | START-UP RANGE |
|-----------------------|---------------------|---------|---------------|-----|------------------------|
| K-1 | 3×10^{-12} | Meter ✓ | 2" | ✓ | 10×10^{-12} |
| " | " | Fest ✓ | " | ✓ | " |
| K | " | Meter ✓ | " | ✓ | " |
| " | " | Fest ✓ | " | ✓ | " |
| R-1 | | | | | |
| PM-1 | 700 V | Alarm ✓ | cont | - | 5000 |
| PM-2 | 1200 V | Low ✓ | 10" | - | 9000 |
| " | " | Alarm ✓ | 1" | ✓ | " |
| LOG 'N CALIBRATE | | ✓ | OPERATE | ✓ | SOURCE No. <u>B-80</u> |
| DUMP WELL PROBE LIGHT | | | | | |

102

START-UP CHECK LIST

Equipment checked by RKH ^{FIP.C} Personnel check by FIP.C
 Instruments and safeties checked and reset by RKH
 Source in checked by RKH Source No. M-4-3
 Emergency equipment in control room checked by FIP.C
 Instruments in trip circuit: K-1-2 P-M-1-2
 Red light on by RKH Time 0955
 Start-up OK'd by FIP.C RKH Date 12-7-66

103

12-7-66

Have an 8 x 8 - 4 corrug. .80" radi. 4.19 ^{cm} separation
 e-e. With an ^{1.716} 3.65 cm x ^{10.79} 27.78 cm x ^{12.196} 32.86 cm
^{27.62 cm KKA}
stainless-steel reflector on 1 face.

1028 Water ht = 45.40 cm
 System sub critical
 Drain.

added 3.65 cm thick stainless-steel. Now
 have an ^{27.62 cm KKA} 7.30 cm x 27.78 cm x 32.86 cm
 stainless-steel reflector on 1 face.

Water ht = 45.20 cm
 - Per
 $t = -471.54 = -3.04$

Water Temp °
 H1 = 24.2
 H2 = 24.5

1315 Drain.

over.

272

55

12-7-66

Rep. $\frac{1}{2}$ ft

Added 3.65 cm thick stainless-steel. Now
have on 10.95 cm ^{27.62 cm thick} x 27.78 cm x 32.86 cm
stainless steel reflector on 1 face.

Water ht = 38.40 cm. $\Delta h = 1.30$
²+ Per
 $t = 119.52 \text{ sec} = 8.6 \text{ ft} = 6.6 \text{ ft/cm}$

Water Temp $^{\circ}$
 $T_1 = 24.5$
 $T_2 = 25.0$

1355 Water ht = 37.10 cm $\Delta h = 1.30$
System just critical
Drain

Added 3.65 cm thick stainless-steel. Now
have on 14.60 cm ^{27.62 cm thick} x 27.78 cm x 32.86 cm stainless
-steel reflector on 1 face.

Water ht = 36.80 cm. $\Delta h = .40$
³+ Per
 $t = 123.80 \text{ sec} = 8.3 \text{ ft} = 20.75 \text{ ft/cm}$

Water Temp $^{\circ}$
 $T_1 = \underline{24.7}$
 $T_2 = 25.0$

1510 Water ht = 36.40 cm
System just critical
Drain

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|-----------------------|-------|-----------------|-----|------------------------|
| K-1 | 3 X 10 ⁻¹² | Fast | 2" | ✓ | 10 X 10 ⁻¹² |
| " | " | Fast | " | ✓ | " |
| K-2 | " | Fast | " | ✓ | " |
| " | " | Fast | " | ✓ | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 700 V | Alarm | Cont | ✓ | 500 V |
| PM-2 | 1200 V | Low | 10" | ✓ | 900 V |
| " | " | Alarm | 1" | ✓ | " |

LOG N CALIBRATE OPERATE SOURCE No. B-8

BUMP WELL PROSE LIGHT

START-UP CHECK LIST

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

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

Red light on by AKH Time 0835

Start-up OK'd by E.P.C AKH Date 12-8-66

AKH

274

12-8-66

I have the same array as described in ^{27.62 AHK} page 271. Now have an 18.20 cm x 27.78 cm x 32.86 cm stainless steel reflector on 1 face.

Water ht = 36.50 cm $\theta_h = 1.7^\circ$
+ Per
 $t = 76.06 \text{ sec} = 12.2 \text{ f} = 17.45 \text{ f/cm}$

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

11: 24.7

2 = 25.0

10.5c

0910 Water ht = 35.80 cm
System just critical
Drain

added 3.65 cm thick stainless-steel. Now have an ^{27.62 AHK} 21.85 cm x 27.78 cm x 32.96 cm stainless-steel reflector on 1 face.

2 Water ht = 36.50 cm $\theta_h = 1.9^\circ$
+ Per
 $t = 69.54 \text{ sec} = 13.0 \text{ f} = 16.25 \text{ f/cm}$

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

Water ht = 35.70 cm
System just critical
Drain

14c

added 3.65 cm thick stainless-steel. Now
have on 25.50 cm x ^{27.62 mm}~~27.78 cm~~ x 32.86 cm
stainless-steel reflector on 1 face.

Water ht = 36.50 cm $\phi h = .80$ Water Temp °C
³ + Per #1 = 29.5
 $C = 65.19 \mu = 13.6 \mu = 17.0 \mu/cm$ #2 = 29.5

10.50 Water ht = 35.70 cm
System just critical
Drain.

43.81
11
52.8 cm wire
5.5 cm overhang

Now have on 10.95 cm x ^{27.62 mm}~~27.78 cm~~ x 43.81 cm
stainless steel reflector on 1 face. (See top of
page 272 for bore point.)

Water ht = 37.10 cm $\phi h = 1.10$
⁴ + Per
 $C = 52.15 \mu = 15.9 \mu$

1427 Water ht = 36.00 cm
System just critical
Drain.

276

9

~~Now~~ Now have ^{27.62 1611} 10.95 cm x 27.18 cm x 58.42 cm
staircase - steel reflector on 1 face.

$$\begin{array}{r} 32.8 \\ 2 \overline{) 65.62} \end{array} \begin{array}{r} 16.81 \\ \underline{32.8} \\ 32.82 \end{array}$$

Water ht = 36.50

Water temp °C

⁵ f Per
t = 80.40 cm = 11.7 f

1 = 25.0

16

2 = 25.0

1500 Water ht = ^{35.70 ? 6K} ~~36.00~~ _{4K 1.28}

System just critical
Drain

Repeat of experiment described at top of
page 272.

Water ht = 37.50 cm

⁶ f Per
t = 94.75 cm = 11.2 f

1530 Water ht = 36.45 cm?

System just critical.

Drain water, critical ht changed: Check
to see if man line is plugged, or set and
recheck spec. Found some scale and set in man
line,

Water ht = 37.50 cm
 + loss
 $5 = 89.09 \text{ cm} = 11.8 \text{ f}$

1600 Water ht = 36.45.

System just critical
 Drain.

Checked man line again, and found (after
 applying pressure) loose seal and vent.

278

INSTRUMENT-CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP |
|------------------|--------|---------|-----------------|-----|-----------------|
| K-13 X10 | -12 | Meter ✓ | 2" | ✓ | |
| " | " | Fast ✓ | " | ✓ | |
| K-1 | " | Meter ✓ | " | ✓ | |
| " | " | Fast ✓ | " | ✓ | |
| P-1 | | | | | |
| PM-1 | 700 V | Alarm ✓ | 10" | ✓ | |
| PM-2 | 1200 V | Low ✓ | 10" | ✓ | |
| " | " | Alarm ✓ | 1" | ✓ | |
| LOG IN CALIBRATE | | ✓ | OPERATE | ✓ | SOURCE No. A-80 |
| PROBE LIGHT | | | | | |

START-UP CHECK LIST

Equipment checked by AKH Personnel check by F.D.C.Instruments and safeties checked and reset by AKHSource in checked by AKH Source No. M-03Emergency equipment in control room checked by F.D.C.Instruments in trip circuit: K-1-2 PM-1-2Red light on by AKH Time 0825Start-up OK'd by F.D.C. AKH Date 12-9-66

12960

Purpose to try to repeat expt. described
~~it~~ on top of page 272. after cleaning out
 man line. Rechecked zero, "ok."

| | |
|--|------------------|
| Water ht = 37.50 | Water Temp °C |
| (1) + Pen | #1 = 25.0 |
| $\bar{z} = 56.92 \text{ cm} = 11.0 \text{ ft}$ | $\bar{z} = 25.0$ |

Water ht = 36.95
 System just critical

Remained the stainless steel reflector. Purpose
 to repeat how point described on page
 259.

| | |
|--|------------------|
| Water ht = 36.00 cm | Water Temp °C |
| ² + Pen | #1 = 25.0 |
| $\bar{z} = 56.50 \text{ cm} = 15.1 \text{ ft}$ | $\bar{z} = 25.0$ |

Water ht = 35.25 cm 4th check ok.
 System just critical
 Drain.

280

12-9-66

Now have an $7.3 \text{ cm} \times 27.78 \text{ cm} \times 32.86 \text{ cm}$
 stainless steel reflector on 1 face. prepare for
 repeat expt on page 271.

1015 Water ht = 45.20 cm.

³ - Per.
 $\sigma = 651.90 \text{ cm} = 2.1 \text{ f}$

Water Temp °C

1 = 25.0

2 = 25.0

1022 Drain:

added 7.3 cm stainless steel. Now have on
 $14.60 \text{ cm} \times 27.78 \text{ cm} \times 32.86 \text{ cm}$ reflector on
 1 face. see bottom of page 272.

Water ht = 37.20 cm

⁴ + Per.
 $\sigma = 69.54 \text{ cm} = 13.0 \text{ f}$

Water Temp °C

1 = 25.0

2 = 25.0

1100 Water ht = 36.05 cm.

system just critical
 Drain.

added 3.6 cm stainless steel. Now have on
 $18.20 \text{ cm} \times 27.78 \text{ cm} \times 32.86 \text{ cm}$ reflector on
 1 face. see top of page 274.

12-9-66

Water ht = 36.50 cm
 5 + Per
 $\tau = 106.48 \text{ cm} = 9.9 \phi$

Water Temp °C
 #1 = 25.0
 2 = 25.0

1122 Water ht = 35.80 cm
 System just critical
 Drain

added 3.6 cm stainless steel. Now have on
^{27.62 AHAG}
 21.85 cm x 27.78 cm x 32.86 cm reflector on
 1 face. see bottom of page 272

Water ht = 36.55
 6 + Per
 $\tau = 69.54 \text{ cm} = 13.0 \phi$

Water Temp °C
 #1 = 25.0
 2 = 25.0

Water ht = 35.70
 System just critical

added 3.6 cm stainless steel. Now have on
^{27.78 AHAG}
 25.45 cm x 27.78 cm x 32.86 cm reflector on
 1 face. see top of page 275.

Water ht = 36.70 cm
 7 + Per
 $\tau = 54.32 \text{ cm} = 15.5 \phi$

Water Temp °C
 #1 =
 2 =

Water ht = 35.70 cm.
 System just critical. Drain

282

12-9-66

12181 cm
overlapping

New base am 10,95 cm X 27,62 cm X 58,42 cm
stainless steel reflector on 1 face. Purpose
is to check point shown on top of
page 27c.

Water ht = 36,60 cm.
+ Pen
5263,02 m = 14,0 f

Water temp °
#1 = 25.0
25.1
2.25

Water ht = 35.65
system just critical
Drain.

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|-------------------------|-------|---------|-----------------|-----|----------------------|
| K-1 3x10 ⁻¹² | | Meter ✓ | 2" | - | 10x10 ⁻¹² |
| " | | Fast ✓ | " | - | " |
| K-2 " | | Meter ✓ | " | - | " |
| " | | Fast ✓ | " | - | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 700V | | Alarm ✓ | cont - - - | - | 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 AKH ^{E.I.C.} Personnel check by E.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 E.I.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by AKH Time 0820
 Start-up OK'd by AKH E.I.C. Date 12-12-66

284

12-12-66

Have an 10.95 cm x 27.62 cm x 32.86 cm stainless-
steel reflector on 1 face.

Water ht = 37.60 cm Dh = 1.10 Water Temp °C
 (1) + Per H1 = 24.7
 $\tau = 97.78 \mu = 10.14 = 9.29/cm$ 2 = 25.0

08.55 Water ht = 36.50 cm
 System just critical
 Drains.

Have the 10.95 cm x 27.62 cm x 32.86 cm stainless
 steel reflector separated 1.27 cm from nozzle.

Water ht = 35.00 cm Dh = .55 cm
 2 + Per Water Temp °C
 $\tau = 47.91 \mu = 16.94 = 30.84/cm$ H1 = 24.7

09.25 Water ht = 34.45 cm
 System just critical
 Drains. 2 = 25.0

12-12-06

Separation of stainless steel reflector from array now = 2.54 cm

Water ht = 34.60 cm $\Delta h = .350m$ Water Temp $^{\circ}C$
 \pm Per #1 = 24.7
 $\sigma = 52.15 \mu m = 15.9 \mu = 45.5 \mu / cm$ $\sigma = 25.0$

4.7 1010 Water ht = 34.25
 5.0 System just critical
 Drain.

Separation of stainless steel reflector from array now = 3.81 cm.

Water ht = 34.70 cm $\Delta h = .400m$ Water Temp $^{\circ}C$
 \pm Per #1 = 24.7
 $\sigma = 49.98 \mu m = 16.9 \mu = 41.0 \mu / cm$ $\sigma = 25.0$

24.7 1040 Water ht = 34.30 cm
 25.0 System just critical
 Drain.

over.

286

12-12-66

Separation of reflector stainless-steel
reflector now = 5.08 cm.

Water ht = 34.90 cm $\delta h = .35$

Water Temp $^{\circ}C$

⁵ + Per

#1 = 24.7

$\tau = 69.54 \mu = 13.0 \phi = 37.2 \phi$

2 = 25.0

13:

1105 Water ht = 34.55 cm

System just critical,
Drain.

Separation of stainless-steel reflector now
= 6.35 cm.

Water ht = 35.40 cm $\delta h = .65$

Water Temp $^{\circ}C$

⁶ + Per

#1 = 25.0

$\tau = 49.98 \mu = 16.4 \phi = 25.3 \phi / \text{cm}$

2 = 25.0

14:

1300 Water ht = 34.75 cm

System just critical
Drain.

Separation of stainless-steel reflection now = 7.62 cm.

Water ht = 35.30 cm $\Delta h = .35$ cm Water Temp $^{\circ}$ C
 $\frac{1}{2}$ + Per # 1 = 25.0
 $\frac{1}{2}$ = 24.7 E = 67.36 mm = 13.3 f = 39.4 Hcm # 2 = 25.0
 25.0

1337 Water ht = 34.95 cm
 System just critical
 Drains

Separation of stainless-steel reflection now = 10.16 cm.

Water ht = 35.90 cm $\Delta h = .90$ cm Water Temp $^{\circ}$ C
 $\frac{1}{2}$ + Per # 1 =
 $\frac{1}{2}$ = 25.0 E = 43.46 mm = 18.0 f = 22.50 Hcm # 2 =
 25.0

1403 Water ht = 35.10 cm
 System just critical
 Drains

ans.

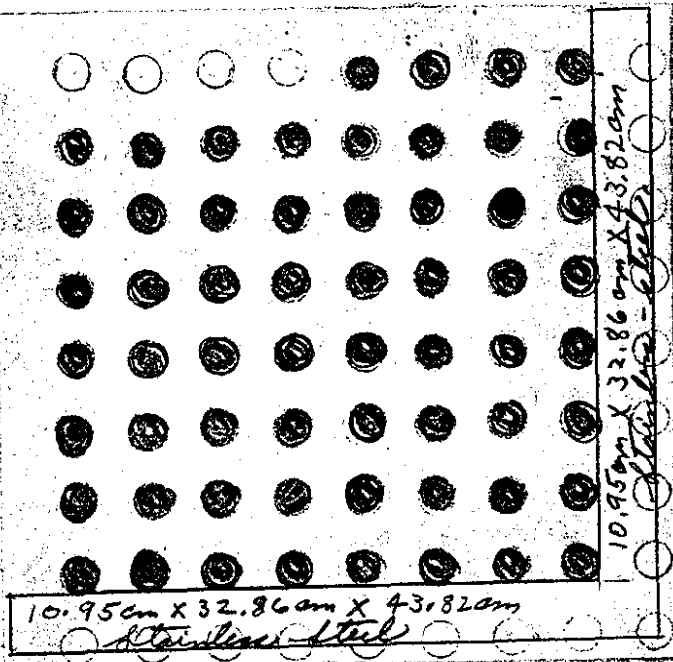
288

Now h
reflected
4-3.82 a
shown

Water
9 + Pico

$t = 113.00 \text{ sec} = 9.0 \text{ f} = 8.27 \text{ cm}$

150.5 Water ht = 36.90 cm
system just critical
Coain:



expansion e-e)
5 cm x 32.86 x
ray on

Water Temp °
#1 = 25.0
#2 = 25.0

288

Now have the array (8x8-ft 4.14cm separation c-c)
reflected on two face with 10.95cm x 32.86 x
4-3.82 cm. similar - etc. see array as
shown.

Water ht = 38.00 cm $\Delta h = 1.10$ cm Water Surf \circ
+ Pie #1 = 25.0
5 = 113.00 cm = 9.0 ft = 8.2 ft cm 2 = 25.0

150.5 Water ht = 36.90 cm
System just critical
Drain.

INSTRUMENT CHECK

c-e)
86 X

250
250

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|-----------------------|-----------------------|---------|-----------------|-----|------------------------|
| K-1 | 3 X 10 ⁻¹² | ✓ | 1" | ✓ | 10 X 10 ⁻¹² |
| " | " | ✓ | " | ✓ | " |
| K-2 | " | Water ✓ | " | ✓ | " |
| " | " | ✓ | " | ✓ | " |
| R-1 | | ✓ | " | ✓ | " |
| R-2 | | ✓ | " | ✓ | " |
| PM-1 | 700 V | Alarm ✓ | cont | ✓ | 500 V |
| PM-2 | 1200 V | Low ✓ | 10" | ✓ | 900 V |
| " | " | Alarm ✓ | 1" | ✓ | " |
| LOG N CALIBRATE | | ✓ | OPERATE | ✓ | SOURCE No. B-80 |
| DUMP WELL PROBE LIGHT | | | | | |

START-UP CHECK LIST

Equipment checked by AKM ^{E.I.C.} Personnel check by AKM ^{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: V-1-2 PM-1-2

Red light on by AKM Time 1240

Start-up OK'd by F.D.C. AKM Date 12-13-66

290

0.4 mls.
3.2 cm separation c.e. 30 cm length.

Now have an 9x8 array. Separations = 3.2 cm
center - center separation. 30 cm length.
.80" radii.

1305 Water ht = 45.20 cm
System sub critical
Drain:

Water Temp °C
T1 = 25.0
T2 = 25.0

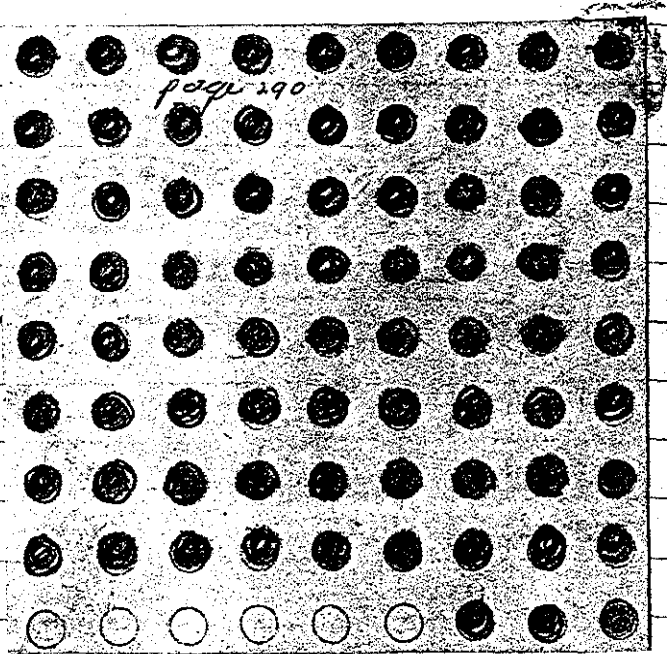
Now have an 9x9-6 array. Separation = 3.2 cm
center - center separation. 30 cm length. Total
of 75 radii. .80" radii

Water ht = 45.30 cm

(2) + Pen

$\tau = 471.5 \text{ g} = 2.6 \text{ g} =$

1337 Water ht = 40.40 cm.
System just critical
Drain -



290

0.18 m/s
 3.2 cm separation c.e. 30 cm length.

Now have an 9x8 array; separation = 3.2 cm
 center - center separation, 30 cm length,
 80" radii.

1305 Water ht = 45.20 cm
 System sub critical
 Drain:

Water Temp °C
 #1 = 25.0

Now have an 9x9-6
 center - center separation
 of 75 radii, 80" radii

Water ht = 45.30 cm $\Delta h = 4.9$ cm Water Temp °C
 + Pen #1 =

(2) $\tau = 471.5 \text{ g} = 2.6 \text{ g} = .53 \text{ g/cm}$ #2 =

1337 Water ht = 40.40 cm.
 System just critical
 Drain -

now have an 9x9 array; with 3 rods removed from each corner. Total of 69 rods, 3.2 cm center-center separation, 30 cm length, 80" rods.

Water ht = 45.40 cm.

Water Temp °C

System sub critical

#1 = 25.0

#2 = 25.0

5.0
5.0

added 2 rods, 1 to opposite corners. Now have a total of 71 rods, 80" rods.

15.20 Water ht = 45.40 cm.

Water Temp °C

2 - Per $\tau = 95.6 \text{ cm} = 729.0 \text{ f}$

#1 = 25.0

#2 = 25.0

Drain.

(3)

Page 291

added 1 →

2 rods →

removed 1

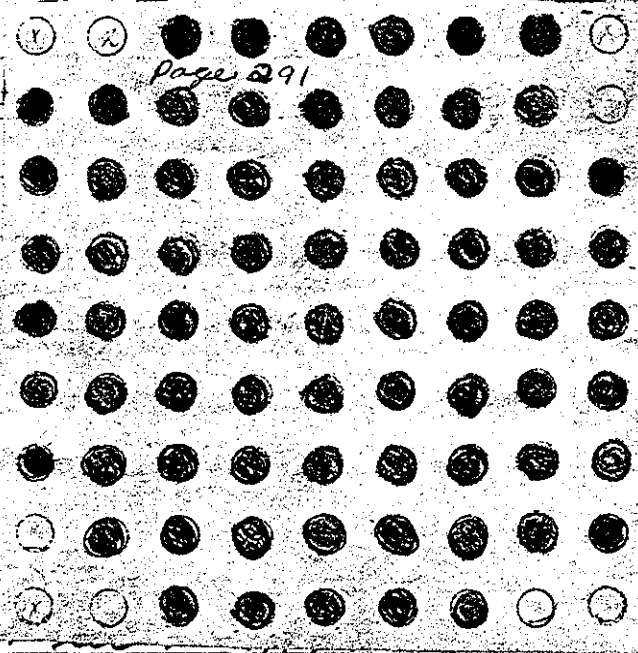
. 80" rod

15.42 Water ht:

System stg

$\tau = 771.$

4, with
rod 3 rods
72 rods.



Now have an 9x9 array; with 3 rods removed from each corner. Total of 69 rods. 3.2 cm center - center separation, 30 cm length.

.80" rods.

Water ht = 45.40 cm.

System sub critical

Water Temp °C

#1 = 25.0

#2 = 25.0

added 2
have a

15.20 Water
2 - Per

Drain.

(3)

rod. Now
do.

Water Temp °C

#1 = 25.0

#2 = 25.0

added 1 rods. Now have in 9x9 array, with 2 rods removed from 3 corners, and 3 rods removed from 1 corner. Total of 72 rods.

.80" rods.

15.42 Water ht = 45.40 cm.

System slightly - Neg. 3 - Per. =

$\tau = -771.4 \text{ sec} = -1.7 \text{ d.}$

294

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|------------|-----------------------|---------|-----------------|-----|------------------------|
| K-1 | 3 X 10 ⁻¹² | Meter ✓ | 2" | ✓ | 10 X 10 ⁻¹² |
| | " | Fast ✓ | " | ✓ | " |
| K-2 | " | Meter ✓ | " | ✓ | " |
| | " | Fast ✓ | " | ✓ | " |
| P-1 | | | | | |
| P-2 | | | | | |
| PM-1 | 700 V | Alarm ✓ | Cont | ✓ | 500 V |
| PM-2 | 1200 V | Low ✓ | 10" | ✓ | 900 V |
| | " | Alarm ✓ | 1" | ✓ | " |

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

START-UP CHECK LIST

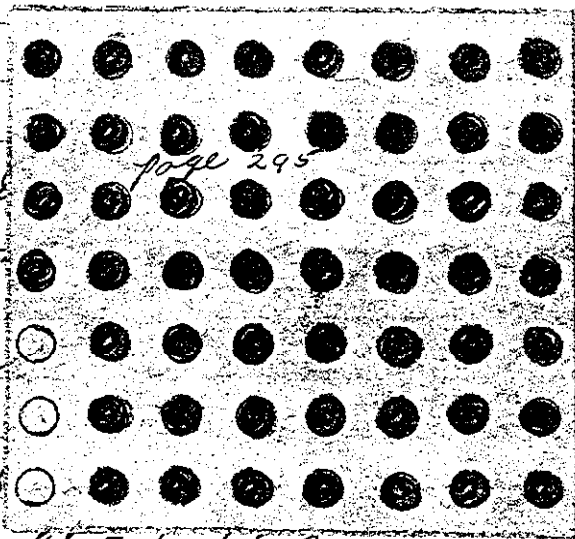
Equipment checked by RAH/Idc Personnel check by F.D.C
 Instruments and safeties checked and reset by RAH/Idc
 Source in checked by RAH/Idc Source No. M-83
 Emergency equipment in control room checked by F.D.C
 Instruments in trip circuit: K-1-2 P19-1-2
 Red light on by RAH/Idc Time 0925
 Start-up OK'd by F.D.C/RAH/Idc Date 12-18-60

3.2 cm separation c-c. 60 cm length. 295

Now have on 7x8 array. 3.2 cm separation
center-center. 60 cm length. 1/8" rods.

1014 Water ht = 51.40 cm
System just critical
Drain.

Water Temp °C
T1 = 25.0
T2 = 25.0



Removal
of 53 -

7x7 + 4 on 1 face.
7x8 + 3. Total
down.

Water
Temp
T = 82.5

Water Temp °C
T1 = 25.0
T2 = 25.0

1048 Water ht = 60.65 cm
System just critical
Drain.

over

3.2 cm separation c-c. 60 cm length. 295

Now have on 7x8 array. 3.2 cm separation
center - center. 60 cm length. 8.0" rods.

1014 Water
Syst.
Drain

Water Temp °C
T1 = 25.0
2 = 25.0

Remained 3 rods. Now have on 7x8 ^{7x7+4 on 1 fur.} 53. Total
of 53 rods. see array on shown.

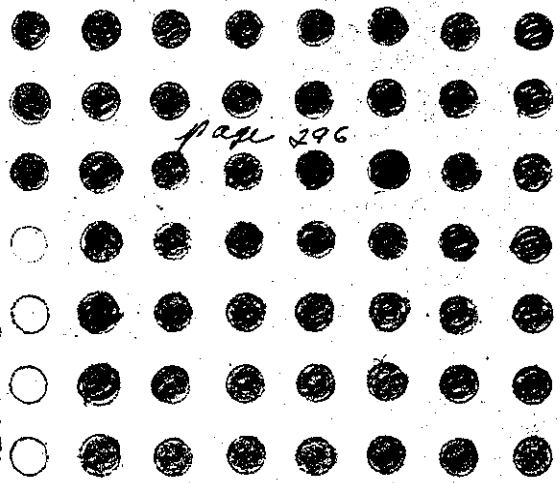
(4)

Water ht = 61.20 cm. $\Delta h = .55$ cm. Water Temp °C
T Per T1 = 25.0
T = 82.57 sec = 11.46 = 20.74 cm. 2 = 25.0

1048 Water ht = 60.65 cm
System just critical
Drain.

over

296



②

Removed
Total of
60 cm

X 7 + 3 on 1 face.
center - center

1320

Water ht

2 - Pen

$\tau = -223.82 \text{ mm} = -7.1$

Drain

Water Temp °C

#1 = 25.0

2 = 25.0

Now have an 8x8 array, with 3 rods removed from each corner. 3.2 cm separation center - center. 60 cm lengths. 90 rods. Total of 52 rods.

1406

Water ht = 58.0 cm

System just critical

Drain

⑤ Removed 1 rod. Now have an $7 \times 7 + 3$ on 1 full.
 Total of 52 rods. 3.2 cm separation center - center.
 60 cm length.

1320 Water ht = 75.70

²-Per

$\tau = -223.82 \text{ m} = -7.1$

Drain.

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

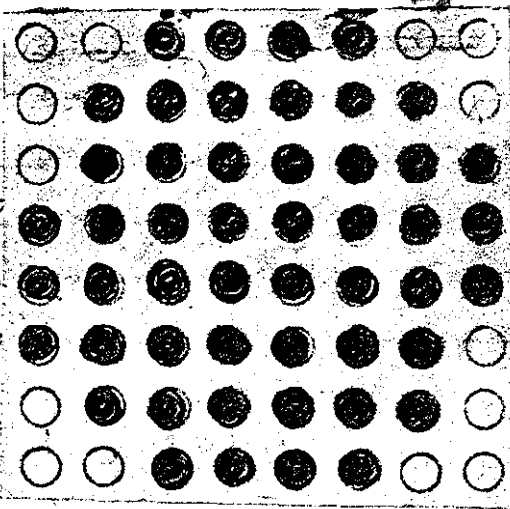
#1 = 25.0

#2 = 25.0

Now have an 8×8 array, with 3 rods removed
 from each corner. 3.2 cm separation center - center.
 60 cm length. 90 rods. Total of 52 rods.

1406 Water ht = 58.0 cm

Septer just critical
 Drain.



Removed 5
50 rods. 3
the array is

now, now have
0cm. length. 90 rods

1.515 Water ht
3+ Per

Water Temp °C

$T = -102.13 \text{ cm} = -26.0 \text{ f}$

#1 = 25.0
#2 = 25.0

1.520 Drain

added 1 rod. Now have 51 rods. see array shown.

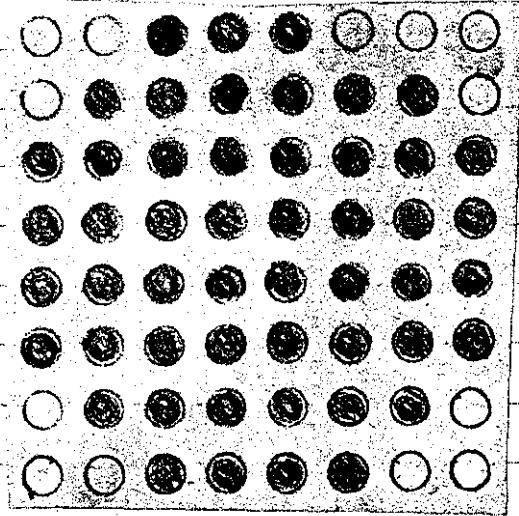
Water ht = 63.20 cm. 0.4 = 1.05 cm.
4+ Per

Water Temp °C
#1 = 25.0

$T = 95.61 \text{ cm} = 10.2 \text{ f} = 9.7 \text{ f/cm}$

#2 = 25.0

1.550 Water ht = 62.15 cm
system just critical
Drain



(6)

Removed 2 rods from opposite corners, now have
 50 rods. 3.2 cm separation c-c, 60 cm length. 90 rods
 see array shown.

1515 Water ht = 75,40 cm.

Water Temp °C

3 - per

#1 = 25.0

$\tau = -102.13 \text{ cm} = -26.0 \text{ f}$

2 = 25.0

1520 Drain.

Added 1 rod. Now have 51 rods. see array shown.

Water ht = 63,20 cm. $d_h = 1.05 \text{ cm}$.

Water Temp °C

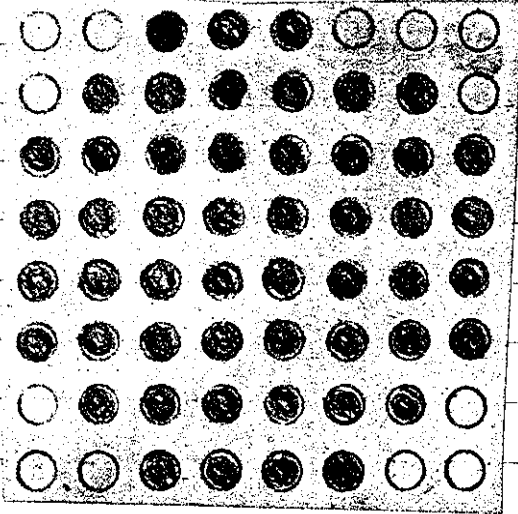
4 - per

#1 = 25.0

$\tau = 95.61 \text{ cm} = 10.2 \text{ f} = 9.7 \text{ Hom.}$

2 = 25.0

1550 Water ht = 62.15 cm
 system just critical
 Drain.



6

INSTRUMENT CHECK

| INSTRUMENT | RANGE | TRIP | SOURCE DISTANCE | SET | START-UP RANGE |
|-----------------------------|---------------------|-----------|-----------------|-----------------|----------------------|
| K-1 | 3×10^{-12} | Meter ✓ | 2" | ✓ | 10×10^{-12} |
| " | " | Fast ✓ | " | ✓ | " |
| K-2 | " | Meter ✓ | " | ✓ | " |
| " | " | Fast ✓ | " | ✓ | " |
| R-1 | | | | | |
| R-2 | | | | | |
| PM-1 | 7000 | Alarm ✓ | cont | ✓ | 5000 |
| PM-2 | 12000 | Low ✓ | 10" | ✓ | 9000 |
| " | " | Alarm ✓ | 11" | ✓ | " |
| LOG N CALIBRATE ✓ | | OPERATE ✓ | | SOURCE No. B-80 | |
| DUMP WELL PROBE LIGHT _____ | | | | | |

START-UP CHECK LIST

Equipment checked by AKK Personnel check by FIDC

Instruments and safeties checked and reset by AKK

Source in checked by AKK Source No. M-93

Emergency equipment in control room checked by FIDC

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

Red light on by AKK Time 0950

Start-up OK'd by FIDC AKK Date 12-15-66

10-15-66

4.8 cm separations Center - Center.
1.80" rads.

Now have on 9 x 9 array. 4.2 cm separation
center - center. 30 cm length. 1.80"
rads.

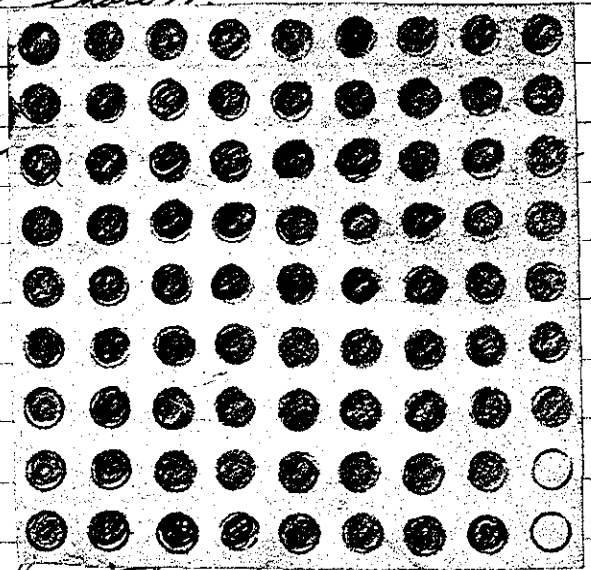
Water ht = 34.0 cm, $\phi = 1.45$ cm Water Temp °C
+ Per #1 = 29.5
 $\tau = 47.81 \text{ m} = 16.9 \text{ f} = 37.5 \text{ Hcm}$ #2 = 29.7

10 22 Water ht = 33.55 cm
System just critical
Draws.

Remained 2 rads. Now have on 9 x 9 - 2 = 79
rads. See array as shown.

Water ht = 34.70 cm
+ Per.
 $\tau = 63.02 \text{ m} = 13.9 \text{ f} = 46.3$

1042 Water ht = 34.40 cm
System just critical
Draws for 15 cm.



See other log books

10-15-66

4.8 cm separation center-center.
80" rads.Now have an 9x9 array, 4.2 cm separation
center-center, 30 cm length, 80"
rads.Water ht = 34.0 cm, $b_h = .45$ cm Water Temp °C
+ Per #1 = 29.8
 $\tau = 47.81 \text{ sec} = 16.9 \text{ f} = 37.5 \text{ f/cm}$ #2 = 24.710 22 Water ht = 33.55 cm
System just critical
Draw.Remained 2 rads. Now
rads. see array atWater ht = 34.70 cm Water Temp °C
+ Per $b_h = .30$ cm #1 = 29.5
 $\tau = 63.02 \text{ sec} = 13.9 \text{ f} = 46.3 \text{ f/cm}$ #2 = 24.710 42 Water ht = 34.40 cm
System just critical
Draw in 15 cm.

see other log books

300

Measured Rod Diameters

| "0.5 in." ^a | "0.75 in." | "1.0 in" |
|--|--------------------|--------------------|
| 0.524 | 0.816 | 0.982 |
| 0.517 | 0.818 | 0.990 |
| 0.493 | 0.811 | 0.987 |
| 0.522 | 0.806 | 0.983 |
| 0.520 | 0.819 | 0.970 |
| 0.522 | 0.810 | 0.981 |
| 0.520 | 0.814 | 0.982 ^b |
| 0.516 | 0.816 | |
| 0.513 | 0.819 | |
| 0.516 | 0.821 | |
| | 0.807 | |
| | 0.814 | |
| | 0.817 | |
| Average 0.516 ± 0.008 $- 0.023$ | 0.814 ^b | |

a. Random sample

b. Each number is the average of 3 measurements on each rod - each end and center.