

BOOK45R

Notes:

"U (3.85) Rods #5" on spine

-I taped down all of the circle drawings (old glue)

Blank pages: page opposite page 1, 1, 2, 25, 54, 122, 123, 297-308, inside back cover sheets

-small slip of paper between front cover sheets

-pages 27/28 have paper clip at bottom of page

-pages 217/218 have a paperclip at top of page

-these pages have 1 circle drawing on each: 12, 13, 16, 20, 22, 34, 37, 41, 45, 50, 59, 61, 65, 67, 73, 75, 76, 77, 78, 80, 86, 89, 93, 95, 96, 98, 99, 101, 102, 104, 109, 112, 116, 117, 119, 134, 141, 148, 150, 155, 158, 162, 165, 166, 171, 174, 176, 178, 181, 183, 186, 188, 189, 191, 192, 194, 196, 201, 204, 207, 208, 210, 212, 216, 218, 219, 221, 223, 224, 228, 229, 233, 234, 237, 238, 240, 242, 243, 248, 250, 253, 258, 270, 273, 274, 276, 277, 278, 281, 284, 288, 290, 295

-these pages have 2 circle drawings on each: 9, 18, 56, 83, 107, 114, 121, 125, 139, 145, 247, 252, 267

Scanned by:

Sheila Finch

RSICC /Oak Ridge National Lab.

August 11, 1999

LOG BOOK'S # 1-6 5% ROD'S

SEE LOG BOOK'S ON 5% SOLUTION



Account Book

No. S 149

NO UNITS

Journal

Ledger, Single Entry . .

Ledger, Double Entry .

Record Ruled (27 Lines)

Made in 150, and 300 Pages

MADE IN U. S. A.

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

10 16 18 19

U(3.85) 5105 #4
 Continued from earlier log book
 INSTRUMENT CHECK 7.2.68 Annuli

3

INSTRUMENT	RANGE	TRIP	SOURCE RANGE	SET	START-UP RANGE
K1	3×10^{-12}	Min ✓	1"	—	3×10^{-12}
	"	—	"	—	"
K2	"	Min ✓	"	—	"
	"	—	"	✓	"
D-1					
D-2					
PM1	700V	Alarm ✓	Limit	—	500V
PM2	1200V	Low ✓	10"	—	900V
	"	Alarm ✓	2"	—	"
LOG N CALIBRATE		—	OPERATE	—	SOURCE No. <u>B-80</u>
DUMP WELL PROBE LIGHT					

START-UP CHECK LIST

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

Instruments and safeties checked and reset by AMM

Source in checked by AMM Source No. M-93

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

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

Red light on by AMM Time 0930

Start-up OK'd by F.D.C. AMM Date 7.25.68

Have 8 rods in line. Rods in contact.

1023 Water ht = 91.50 cm Temp °C
 System sub critical 21.2°C
 Drain.

1530 Now have 12 rods in line. Rods in contact.
 Water ht = 91.70 cm / Temp °C = 21.5°C
 System sub critical Log $\eta = 1.0017$
 Drain $K-1 = 12\% \text{ of scale } 3 \times 10^{-11}$

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	1"	✓	3×10^{-12}
"	"	Fest ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
"	"	Fest ✓	"	✓	"
F-1					
F-2					
PM-1	700V	Alarm ✓	Cont	✓	500V
PM-2	1200V	Low ✓	8"	✓	900V
"	"	Alarm ✓	3"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by E.I.D.C. Personnel check by AKV

Instruments and safeties checked and reset by AKV

Source in checked by AKV Source No. M-43

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

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

Red light on by AKV Time 1515

Start-up OK'd by E.I.D.C. AKV Date 3-26-68

Have 6 rods in line (see page 4). Rods in contact.

1552 Water h_t = 92.50 cm
System sub-critical
Drain

Temp =
21.0 °C

Log $\eta = .0017$

$R-1 = 12\%$ of scale 3×10^{-1}

INSTRUMENT CHECK

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

10⁻¹

LOG & CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by I.D.C. [Signature] Personnel check by F.I.C.

Instruments and safeties checked and reset by [Signature]

Source in checked by [Signature] Source No. 19-43

Emergency equipment in control room checked by I.D.C. [Signature]

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

Red light on by [Signature] Time 10:10

Start-up CK'd by I.D.C. [Signature] Date 3-27-68

Have on 2 X 5 array. Roll in contact.
Total of 10 rods.

Water ht = 60.45 cm $d_h = .85 \text{ cm.}$
+ Per
 $C = 23.90 \text{ m} = 25.9 = 30.46 \text{ f/cm}$

1055 Water ht = 59.60 cm Temp °C
system just critical 21.2 °C
Chain.

Removed 1 rod. Now have on 2 X 4 plus
1 rod. Total of 9 rods.

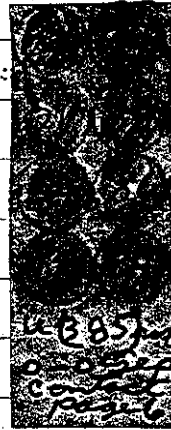
Water ht = 68.00 cm $d_h = 1.0 \text{ cm.}$ Temp °C
+ Per 21.5 °C
 $C = 60.84 \text{ m} = 14.34 = 14.34 \text{ f/cm}$

1313 Water ht = 67.00 cm
system just critical
Chain.

Removed 1 rod. Have on 2 x 4 only. Total of 8 rods.

DL = 2.85 cm

Water ht = 75.30 cm
+ Per
C = 39.11 mm = 19.34 = 6.84 mm

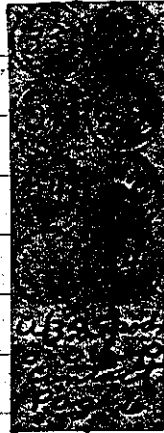


Temp °C
21.5 °C

1434 Water ht = 72.45 cm
System just critical
Drain.

Removed 1 rod. Have on 2 x 3 plus 1 rod.
Total of 7 rods.

1531 Water ht = 91.70 cm
System sub-critical
Drain.



Temp °C
21.5 °C

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE	START-UP RANGE
K-1				
K-2				
P-1				
P-2				
PM-1				
PM-2				

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

START-UP CHECK

Equipment checked by _____
 Instrument _____
 Source _____
 Energy _____
 Instrument _____
 Red light _____
 Start-up OK _____ Date _____

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 ✓	"	✓	"
	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	Cont	✓	5.00V
PM-2	1200V	Low ✓	10"	✓	900V
	"	Alarm ✓	3"	✓	"
LOG N CALIBRATE ✓			OPERATE ✓	SOURCE No. B-80	
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by F.P.C. / AKK Personnel check by F.P.C.
 Instruments and safeties checked and reset by AKK
 Source in checked by AKK Source No. 14-93
 Emergency equipment in control room checked by F.P.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by AKK Time 12:25
 Start-up OK'd by F.P.C. / AKK Date 3-28-68

2.50" separation edge-edge.
Triangular array.

Have an triangular array. 2 full rings.
Total of 19 rods.

Water ht = 70.10 cm $\Delta h = .40$ cm Temp $^{\circ}$
+ Per 21.5 $^{\circ}$
 $\sigma = 145.59 \text{ cm} = 7.3 \phi = 18.25 \text{ Hcm}$

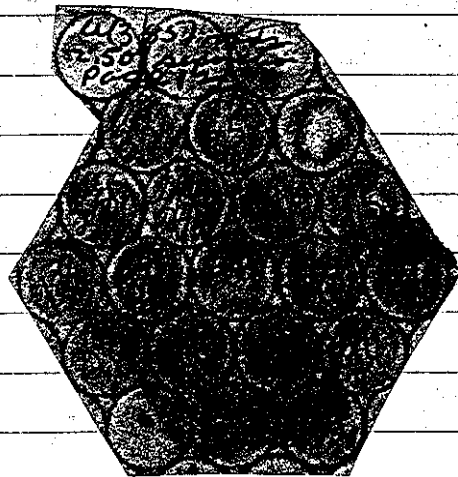
1320 Water ht = 69.70 cm. (11)
System just critical
Drain.

Remained 2 rods. 1 each from points on
opposite faces. Total of 17 rods.

Water ht = 81.80 cm $\Delta h = 1.30$ cm Temp $^{\circ}$
+ Per 21.5 $^{\circ}$
 $\sigma = 106.48 \text{ cm} = 9.9 \phi = 7.2 \text{ Hcm}$

1431 Water ht = 80.50 cm
System just critical
Drain.

(12)

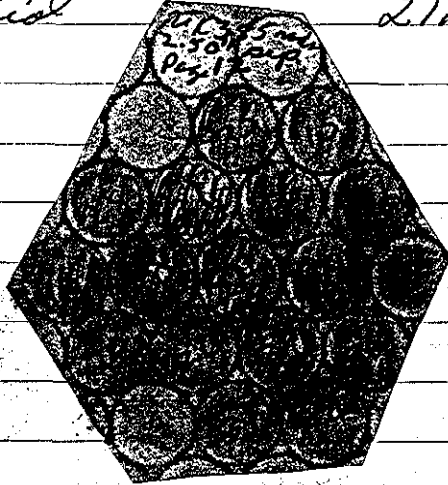


Removed 1 rod. Have 1 rod removed from every other face. Total of 16 rods.

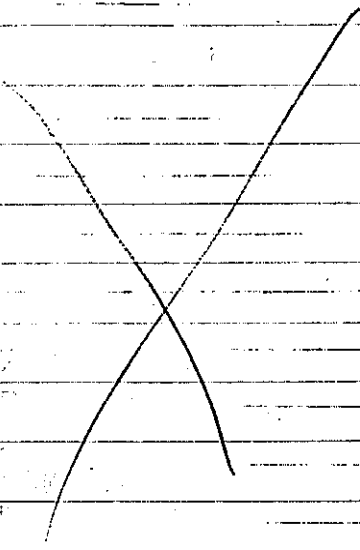
1544 Water ht = 91.50 cm
System sub-critical
Chain

Temp °
21.5 °C

(13)



INSTRUMENT	UNIT	P	ST	START-UP RANGE
K-1				
K-2				
R-1				
R-2				
PM-1				
PM-2				
LOG 'N' C		SOURCE N		
DUMP WELL - LIGHT				



INSTRUMENT CHECK

T-UP
IGE

INSTR. IMA	T	RANGE	TRIP	SOURCE	SET	START-UP RANGE
K-1		3×10^{-12}	Meter ✓	1"	✓	3×10^{-12}
		"	✓	"	✓	"
K-2		"	Meter ✓	"	✓	"
		"	✓	"	✓	"
R-1						
R-2						
PM-1		7000	X Alarm	X	X	X
PM-2		12000	Low ✓	10"	✓	9000
			Alarm ✓	3"	✓	"

LOG N CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by I.D.C. 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-2
 Red light on by AKH Time 1355
 Start-up OK'd by F.I.C. AKH Date 3-29-68

1.0" separation edge - edge.
Triangular array.

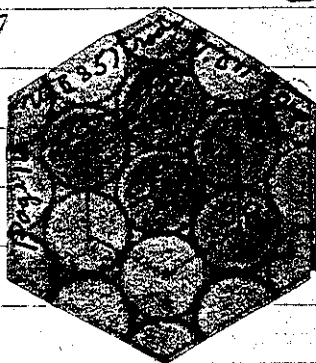
Have 4 rods in an triangular array.

1440 Water hts = 91.70 cm Temp °C
System sub critical 21.5 °C
Drain.

added 1 rod. Now have 5 rods in an
Triangular array.

Water hts = 62.05 cm. $\Delta h = .75$ cm
+ Per
 $\tau = 58.67 \text{ sec} = 14.74 = 19.55 \text{ H/cm}$

Water hts = 61.30 cm Temp °C
System just critical 21.5 °C



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 ✓	1"	✓	"
	"	Fast ✓	"	✓	"
P-1					
P-2					
PM-1	70025	Alarm ✓	ant	✓	50025
PM-2	120025	Low ✓	10"	✓	90025
	11	Alarm ✓	3"	✓	11
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. <u>B-80</u>
DUMP WELL PROBE LIGHT _____					

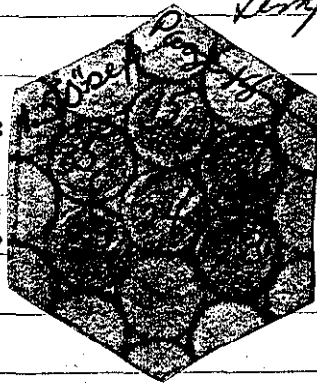
START-UP CHECK LIST

Equipment checked by EID.C Personnel check by EID.C
 Instruments and safeties checked and reset by AMV
 Source in checked by AMV Source No. M-43
 Emergency equipment in control room checked by EID.C
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by AMV Time 0900
 Start-up OK'd by EID.C AMV Date 4-1-68

1.50" separation - edge - edge.
Triangular array.

Have 6 rods in an triangular array (1 full ring with 1 rod removed) Total of 6 rods.

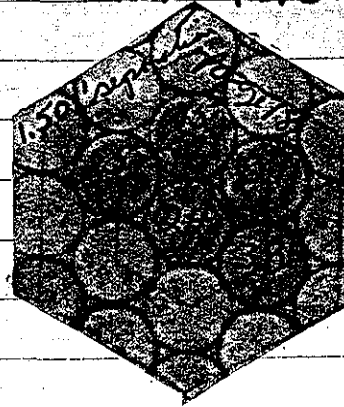
Water ht = 58.80 cm $\Delta h = 1.60$ cm Temp °C
 + Per 20.8 °C
 $E = 89.09 \text{ m} = 10.8F = 17.93 \text{ ft}$



0950 Water ht = 58.20 cm
 System just critical
 Chain.

Removed 1 rod. Now have 5 rods in an
 triangular array.

1046 Water ht = 91.80 cm Temp °C
 System sub-critical. - Per N.G. 21.4 °C
 Chain.



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 ✓	"	—	"
"	"	Fast ✓	"	—	"
P-1					
P-2					
PA-1	700V	Alarm ✓	cont	✓	500V
PA-2	1200V	Low ✓	10"	—	900V
"	"	Alarm ✓	3"	—	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by E.P.C. / M.H.H. Personnel check by E.P.C.

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

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

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

Instruments in trip circuit: K-1-2 / PA-1-2

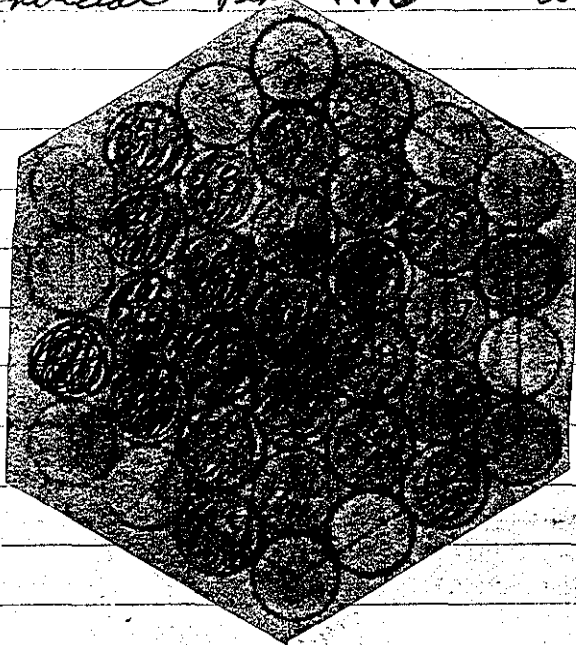
Red light on by M.H.H. Time 1455

Start-up OK'd by E.P.C. / M.H.H. Date 4-3-68

2.625" separation edge - edge.
Triangular array.

Wave on triangular array, with 2 full rings,
plus 1 rad on each face in 3rd ring. Total
of 25 nodes.

1542 Water ht = 91.50 cm $\log \eta = .055$ Temp $^{\circ}C$
System sub critical - Pen N.G. 21.0 $^{\circ}C$
Drain.



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K1	3×10^{-12}	Meter ✓	1"	✓	3×10^{-12}
"	"	Fst ✓	"	✓	"
K2	"	Meter ✓	"	✓	"
"	"	Fst ✓	"	✓	"
R-1					
R-2					
PM-1	7000	Alarm ✓	cont	✓	5000
PM-2	12000	Low ✓	10"	✓	9000
"	"	Alarm ✓	3"	✓	"
LOG N CALIBRATE ✓		OPERATE ✓		SOURCE No. B-80	
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by F.D.C. Personnel check by F.D.C.
 Instruments and safeties checked and reset by AKW
 Source in checked by AKW Source No. M-4-3
 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 0835
 Start-up OK'd by F.D.C. AKW Date 6/4/68

2.625" separation edge - edge
 Triangulon array.

Have an Triangulon array, with 2 full rings,
 plus 2 rods on very other face in 3rd
 ring. Total of 25 rods.

Temp °C
 21.0 °C

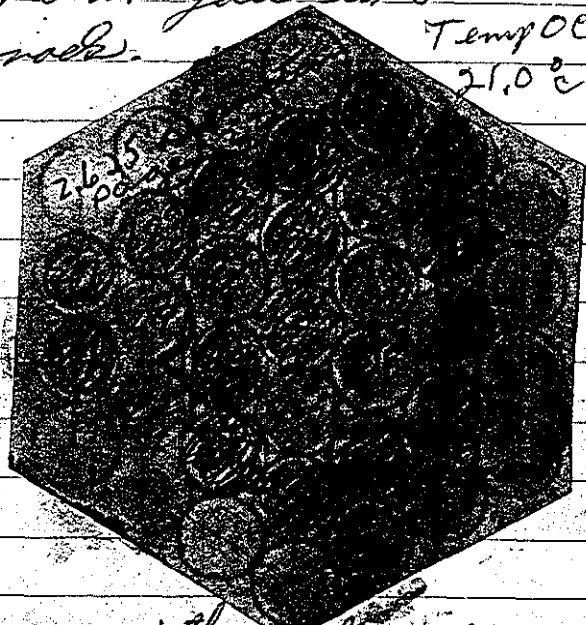
Water ht = 91.50 cm

- Per Log $\eta = 1.035$

N.G.

0932

Drain:



Have an Triangulon array, with 2 full rings,
 plus 3 rods on opposite face in third (3rd)
 ring. Total of 25 rods.

1043 Water ht = 91.50 cm

Temp °C

21.0 °C

System sub critical

Drain: Log $\eta = 1.035$

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE	
K-1	3×10^{-12}	Motor	3"	-	3×10^{-12}	
"	"	Fast	"	-	"	
K-2	"	Motor	5"	-	"	
"	"	Fast	"	-	"	
R-1						
R-2						
PM-1	700V	Alarm	1"	-	500V	
PM-2	1200V	Low	12"	-	900V	
"	"	Alarm	2"	-		
LOG N CALIBRATE		<input checked="" type="checkbox"/>	OPERATE		<input checked="" type="checkbox"/>	SOURCE No. D-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 0800
 Start-up OK'd by D.C. AKH Date 4-5-68

24

1.0 separation edge - edge
Triangular array.

Have 5-rad in an triangular array.

Water ht = 62.25 cm $D_h = .65$ cm

+ Per
 $\tau = 84.75 \text{ cm} = 11.24 = 17.224 \text{ cm}$

0.845 Water ht = 61.60 cm

system just critical
Drain.

Same array as above, except have 1" x ~~28~~³/₄"
styrofoam inserts centered in each hole.

Water ht = 69.30 cm $D_h = .40$

+ Per
 $\tau = 380.27 \text{ cm} = 3.14 = 7.754 \text{ cm}$

10.50 Water ht = 68.90 cm

system just critical
Drain.

Temp °C
21.0 °C

26

"hid"

3-19/69 Feed rate = 3.50 cm/min

Drain rate = 9.20 cm/min

Decomp rate = 9.20 cm/min

$H_{20} = 76.20 \text{ cm} = \text{top of feed rods}$

" = 91.44 cm = 6" top reflector

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 ✓	"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm	1.5"	✓	500V
PM-2	1200V	Low	10"	✓	900V
"	"	Alarm	2"	✓	"
LOG N. CALIBRATE		✓	OPERATE	✓	SOURCE No. M-F3
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by F.D.C. Personnel check by F.D.C.
 Instruments and safeties checked and reset by AKV
 Source in checked by AKV 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 AKV Time 1415
 Start-up OK'd by F.D.C. AKV Date 3-19-69



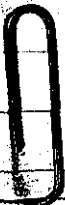
28

UL3.857 Rods.
Mon 2.56" O.D. x 30" long.

3
Have on 2 x 2 array: Rods in contact.

Water ht = 91.50 cm
System sub critical
DRAIN

Temp °C
29.1 °C



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	3×10^{-12}
	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2	"	Meter <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
R-1					
R-2					
PM-1	700v	Alarm <input checked="" type="checkbox"/>	15"	<input checked="" type="checkbox"/>	500v
PM-2	1200v	Low <input checked="" type="checkbox"/>	10"	<input checked="" type="checkbox"/>	900v
	"	Alarm <input checked="" type="checkbox"/>	2"	<input checked="" type="checkbox"/>	"

LOG & CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by F.D.C. Personnel check by F.D.C.
 Instruments and safeties checked and reset by 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 0830
 Start-up OK'd by F.D.C. AKW Date 3-20-69

Have an 3×3 array. Rods are in contact.

0938 Water ht = 91.50 cm Temp $^{\circ}$ C
 System sub critical 23.5 $^{\circ}$ C
 Drain.

Added 7 rods. Now have an 4×4 array. Total of 16 rods. Rods are in contact.

1108 Water ht = 91.50 cm Temp $^{\circ}$ C
 System sub critical 23.9 $^{\circ}$ C
 Drain.

Added 9 rods. Now have an 5×5 array. Total of 25 rods. Rods are in contact.

1400 Water ht = 91.50 cm Temp $^{\circ}$ C
 System sub critical 24.0 $^{\circ}$ C
 Drain.

.10" separation
edge - edge.

31

fact.

Have an 5x5 array. Total of 25 rods.
Separation = .10" edge - edge.

c

1.5.55 Water h₀ = 91.50 cm
System sub critical
D_{max}.

Temp °C
29.0°C

INSTRUMENT CHECK

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

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

START-UP CHECK LIST

Equipment checked by F.P.C. [Signature] Personnel check by F.P.C. [Signature]
 Instruments and safeties checked and reset by [Signature]
 Source in checked by [Signature] Source No. M-83
 Emergency equipment in control room checked by F.P.C. [Signature]
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by [Signature] Time 0825
 Start-up OK'd by F.P.C. [Signature] Date 3-21-69

.50" separation
edge - edge.

33

RTUP
INGE

10-12

11

12

13

25

26

Have an $18 \times 5 \times 5$ array. Total of 25 radi.
separation = .50" edge - edge.

Water ht = 38.0 cm

Temp $^{\circ}$ C

+ Per

23.5 $^{\circ}$ C

$$t = 299.89 \text{ sec} = 3.94$$

0915 Water ht = 38.0 cm

System just critical
Drain.

Removed 5 radi. Now have an 4×5 array.
Total of 20 radi. .50" separation edge - edge.

Water ht = 52.50 cm

$\Delta h = .70$

Temp $^{\circ}$ C

+ Per

23.8 $^{\circ}$ C

$$t = 58.67 \text{ sec} = 14.64 = 20.84 \text{ cm}$$

1023 Water ht = 51.80 cm

System just critical
Drain.

over!

50" separation
edge - edge

Removed 4 rods. Now have an 4x4 array. Total of 16 rods. 50" separation edge - edge.

1123 Water ht = 91.50 cm.
System sub critical
Drain.

Temp °C
23.8 °C

Added 2 rods. Now have an
Two rods added to 1 face.
rods. 50" separation edge - edge



Water ht = 66.50 cm.
+ Per

$\sigma = .900$

23.9 °C

$$E = 69.54 \text{ m} = 13.0 \text{ f} = 14.4 \text{ f/cm}$$

1330 Water ht = 65.60 cm
System just critical
Drain.

Removed 1 rod. Now have an 4x4+1 array. Total of 17 rods. 50" separation edge - edge.

.50" separation
edge - edge

Removed 4 rods. Now have an 4x4 array. Total of 16 rods. .50" separation edge - edge.

1123 Water ht = 91.50 cm.
System sub critical
Drain.

.50" sep
edge - edge
3,560 D. Rods
3.85 D 225

Added 2 rods. Now have an 4x4 + 2 array. Two rods added to 1 face. Total of 18 rods. .50" separation edge - edge.

Water ht = 66.50 cm. $\sigma_x = .90 \text{ cm}$
Temp °C
+ Per 23.9 °C
 $\tau = 69.54 \text{ sec} = 13.0 \text{ } \phi = 14.4 \text{ } \phi / \text{cm}$

1330 Water ht = 65.60 cm
System just critical
Drain.

Removed 1 rod. Now have an 4x4 + 1 array. Total of 17 rods. .50" separation edge - edge.

50" separation
edge - edge.

35

1431 Water ht = 91.50 cm Temp °C
System sub critical 23.9
Drain.

75" separation
edge - edge.

Have an 9x9 + 2 array: Total of 18
rads, 75" separation edge - edge.

Water ht = 48.20 cm $\Delta h = .55$ cm Temp °C
7 per 24.0 °C

$$U = 56.50 \text{ sec} = 15.14 = 27.4 \text{ ft/cm}$$

1550 Water ht = 47.65 cm
System just 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 ✓	"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	1.5"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	2"	✓	"

LOG N CALIBRATE _____ OPERATE _____ SOURCE No. _____

DUMP WELL PROBE LIGHT _____

START-UP CHECK LIST

Equipment checked by F.D.C. A.K.V. Personnel check by I.D.C.Instruments and Safeties checked and reset by A.K.V.Source in checked by A.K.V. Source No. M-83Emergency equipment in control room checked by A.K.V.Instruments in trip circuit: K-1-2 PM-1-2Red light on by A.K.V. Time 0825Start-up OK'd by I.D.C. A.K.V. Date 3-29-69

.75" separation
edge - edge.

37

Removed 2 rods. Have an 4x4 array. Total
of 16 rods. .75" separation edge - edge.

$\Delta L = .60 \text{ cm}$

Water ht = 56.80 cm

Temp °C

+ Per

22.8 °C

$T = 63.02 \text{ sec} = 14.0 \phi = 23.3 \text{ \#}/\text{cm}$

0926 Water ht = 56.20 cm.

system just critical
Drain.

Removed 1 rod. Have an 4
Total of 15 rods. .75" separation

$\Delta L = .7$

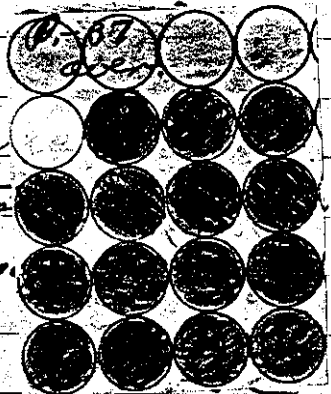
Water ht = 65.50 cm

+ Per

$T = 80.40 \text{ sec} = 11.7 \phi = 16.7 \text{ \#}/\text{cm}$

10 44 Water ht = 64.80 cm

system just critical
Drain.



.75" separation
edge - edge.

ART. UP
ANGE

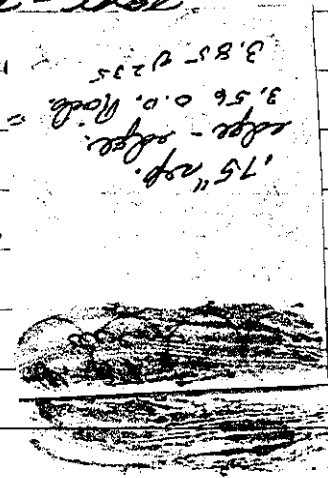
0922
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0950

Removed 2 rods. Have an 4x4 array. Total
of 16 rods. .75" separation edge - edge.

Water ht = 56.80 cm

7 Per

$T = 63.02 \text{ sec} = 14.0 \phi = 23.3 \text{ } \phi/\text{cm}$



0926 Water ht = 56.20 cm.

System just critical
Drain.

Removed 1 rod. Have an 4x4-1 array.
Total of 15 rods. .75" separation edge - edge.

Water ht = 65.50 cm

7 Per

$T = 80.40 \text{ sec} = 11.7 \phi = 16.7 \text{ } \phi/\text{cm}$

Temp °

23.2 °

1044 Water ht = 64.80 cm

System just critical
Drain.

over:

.75" separation
edge - edge.

Removed 1 rod. Now have an 4x4-2
array. Total of 14 rods. .75" separation
edge - edge.

1303 Water ht = 91.50 cm Temp °C
system sub-critical 23.3 °C
Drain.

1.0" separation
edge - edge.

Have an 4x5 array. Total of 20 rods.
1.0" separation edge - edge.

Water ht = ~~42.00~~ ^{42.00} cm Temp °C
3 + Per $\Delta h = ??$ 23.5 °C

1550 Water ht = 42.00 cm
system just critical
Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3 X 10 ⁻¹²	Meter ✓	15"	✓	3 X 10 ⁻¹²
	"	Fest ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
	"	Fest ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	15"	✓	500V
PM-2	1200V	Low ✓	9"	✓	900V
	"	Alarm ✓	2"	✓	"
LOG-N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP-WELL PROBE LIGHT					

START-UP CHECK LIST

Equipment checked by AKL Personnel check by AKLInstruments and safeties checked and reset by AKLSource in checked by AKL Source No. M-43Emergency equipment in control room checked by AKLInstruments in trip circuit: K-1-2 PM-1-2Red light on by AKL Time 0758Start-up OK'd by CC, AKL Date 3-25-69

1.0th separation
edge - edge.

Repeat of experiment described on bottom of
page 38. Have an 4x5 array. Total of
20 rads.

Water ht = 42.40 cm $z_h = .90$ cm Temp °C
1 + Per 23.0 °C
 $t = 69.54 \text{ sec} = 13.0 \phi = 32.50 \text{ Hem}$

0.915 Water ht = 42.00 cm
System just critical
Drain.

Remained 4 rads. Now have an 4x4
array. Total of 16 rads.

Water ht = 57.40 cm $z_h = .70$ cm Temp °C
2 + Per 23.2 °C
 $t = 60.84 \text{ sec} = 14.3 \phi = 20.4 \text{ Hem}$

1020 Water ht = ~~56.70~~ 56.70 cm
System just critical
Drain.

1.0" separation
edge - edge.

41

Removed 2 rods; now have an $4 \times 4 - 2$
array. Total of 14 rods.

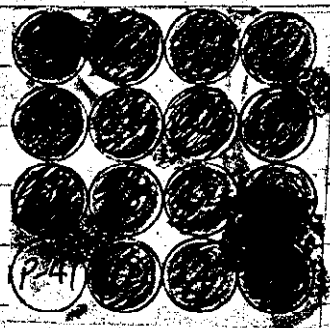
1315 Water ht = 92.0 cm. Temp $^{\circ}\text{C}$
system sub critical 23.2 $^{\circ}\text{C}$
Drain.

added 1 rod. now have an $4 \times 4 - 1$
array. Total of 15 rods.

Water ht = 65.90 cm. $d_s = .70\text{ cm}$ Temp $^{\circ}\text{C}$
³ + Per 23.5 $^{\circ}\text{C}$

$$73.88\text{ cm} - 12.97 = 60.91\text{ cm}$$

1410 Water ht = 65.20 cm
system just critical
Drain.



over.

1.5" separation
edge - edge.

Now have an 4x4 array. Total of 16 rods.

1545 Water ht = 91.80 cm
system sub critical
Drain.

Temp °
23.5°

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	STARTUP RANGE
K-1	3×10^{-12}	Meter ✓	1"	✓	3×10^{-12}
"	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
"	"	Fast ✓	"	✓	"
R-1	"	"	"	"	"
	700V	Alarm ✓	5"	-	500V
PM-2	1200V	Low ✓	8"	✓	900V
"	"	Alarm ✓	2"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by ^{J.T.L.} ~~A.K.H.~~ Personnel check by ~~A.K.H.~~
 Instruments and safeties checked and reset by ~~A.K.H.~~
 Source is checked by ~~A.K.H.~~ Source No. 1A-43
 Emergency equipment in control room checked by ~~A.K.H.~~
 Instruments in trip circuits: K-1-2 PM-1-2
 Red light on by ~~A.K.H.~~ Time 0840
 Start-up OK'd by J.T.L. A.K.H. Date 3-26-69

1.5" separation
 edge - edge.

Now have an 4x5-3 array. Total of 17 rods

0930 Water ht = 91.50 cm Temp °C
 System sub critical 22.5°C
 Drain.

Added 3 rods. Now have an 4x5 array.
 Total of 20 rods.

1050 Water ht = 91.50 cm Temp °C
 System sub critical 22.5°C
 Drain.

over.

1.5" separation
edge - edge.

Added 5 rods. Now have an 5x5 array.
Total of 25 rods.

Water ht = 59.50 cm $dx = .25$ Temp °C
+ hr. 23.0 °C

$$C = 139.07 \text{ sec} = 7.6 = 30.4 \text{ ft/cm}$$

1353 Water ht = 59.25 cm

System just critical
Drain.

Removed 1 rod. Now have an 5x5-1 array.
Total of 24 rods.

Water ht = 62.50 cm $dx = .90$ Temp °C
+ hr. 23.0 °C

$$C = 154.28 \text{ sec} = 6.9 = 7.6$$

1446 Water ht = 61.60 cm

System just critical
Drain.

Removed 1 rod. Now have an 5x5-2
array. Total of 23 rods.

1.5" separation
edge - edge.

45

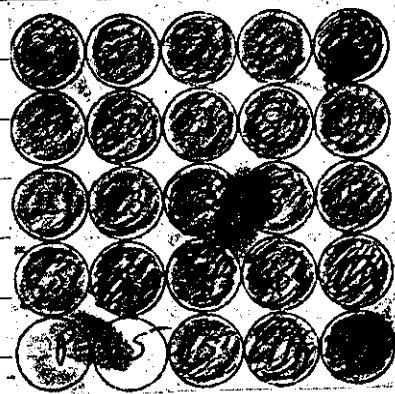
Water ht = 70.80 cm

³ + Per

$\sigma = 56.50 \text{ cm} = 15.1 \text{ ft} = 7.9 \text{ ft/cm}$

1541 Water ht = 68.90 cm

system just artificial
Drain.



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE	SET	SPARE RANGE
K1	3 x 10 ⁻¹²	✓	5"	✓	3 x 10 ⁻¹²
"	"	✓	"	✓	"
K2	"	✓	1"	✓	"
"	"	✓	"	✓	"
P1					
P2					
PM 1	700V	Alarm ✓	cont	✓	500V
PM 2	1200V	L.w ✓	8"	✓	900V
"	"	Alarm ✓	2"	✓	"

LOG N CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by A.R.H. Personnel check by V.T.C.
 Instruments and safeties checked and reset by A.R.H.
 Source in checked by A.R.H. Source No. M-93
 Emergency equipment in control room checked by A.R.H.
 Instruments in trip circuit: N-1-2 PM-1-2
 Red-light on by A.R.H. Time 0810
 Start-up OK'd by V.T.C. A.R.H. Date 3-27-69

1.5" separation
edge - edge.

47

Removed 1 rod. Now have an 5x5-3
array. Total of 22 rods.

0850 Water ht = 92.0 cm Temp °C
System sub critical 23.0 °C
Drain.

1.6" separation
edge - edge.

Now have an 5x5 array. Total of 25 rods.

1107 Water ht = 93.50 cm Temp °C
System sub critical 23.0 °C
Drain.

1.250" separation
edge - edge.

Now have an 5x5 array. Total of 25 rods.

1408 Water ht = 94.00 cm Temp °C
System sub critical 23.5 °C
Drain.

.350" separation
edge - edge.

Have an 5×5 array. Total of 25 rods.

Water ht = 52.00 cm $dh = .50$ Temp $^{\circ}C$
 + per 23.5 $^{\circ}C$

$$S = 86.92 \text{ mm} = 11.0 \text{ } \phi = 22.0 \text{ } \phi / \text{cm}$$

15.43 Water ht = 51.50 cm

System just critical
 Drain

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter <input checked="" type="checkbox"/>	Cont	<input checked="" type="checkbox"/>	3×10^{-12}
"	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2	"	Meter <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
"	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
R-1					
R-2					
PM-1	700V	Alarm <input checked="" type="checkbox"/>	.5"	<input checked="" type="checkbox"/>	500V
PM-2	1200V	Low <input checked="" type="checkbox"/>	8"	<input checked="" type="checkbox"/>	900V
"	"	Alarm <input checked="" type="checkbox"/>	2"	<input checked="" type="checkbox"/>	"

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

START-UP CHECK LIST

Equipment checked by ^{J.J.C.} MMJ Personnel check by MMJ
 Instruments and safeties checked and reset by MMJ
 Source in checked by MMJ Source No. M-43
 Emergency equipment in control room checked by MMJ
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by J.J.C. Time 0825
 Start-up OK'd by J.J.C. MMJ Date 7-28-69

.350" separation
edge - edge.

Have an $5 \times 5 - 2$ array. Total of 23 rods.

Water ht = 60.90 cm $\Delta h = 1.60$ cm Temp $^{\circ}$ C
+ Per \checkmark 22.5 $^{\circ}$ C

$$C = 69.54 \mu = 13.0 \phi = 21.6 \text{ f/cm}$$

0915 Water ht = 60.30 cm

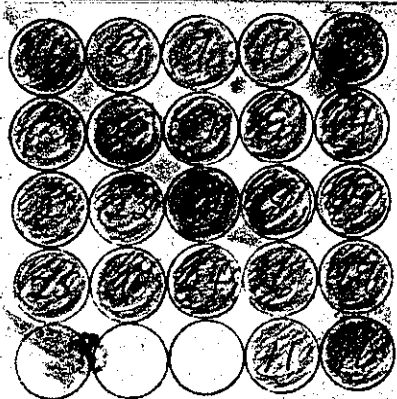
System just critical
Drain.

Remove 1 rod. Now have an $5 \times 5 - 3$ array
Total of 22 rods.

Water ht = 73.90 cm $\Delta h = 1.60$ cm Temp $^{\circ}$ C
+ Per \checkmark 23.0 $^{\circ}$ C

$$C = 76.05 \mu = 12.2 \phi = 9.6 \text{ f/cm}$$

Water ht = 72.30 cm
System just critical
Drain.



.350" separation
edge - edge.

5

Removed 1 rod. Now have on 5 X 5 - 4 array.
Total 21 rods.

1335 Water ht = 92.00 cm
System sub critical
Drain.

1.0" separation
edge - edge.

Now have on 2 X 13 - 1 array. Total of 25 rods.

1520 Water ht = 91.50 cm
System sub critical
Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	STARTUP RANGE
K-1	3×10^{-12}	Meter ✓	1"	✓	3×10^{-12}
	"	Foot ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
	"	Foot ✓	"	✓	"
R-1				✓	
R-2					
PM	700V	Alarm ✓	15"	✓	500V
PM2	1200V	Low ✓	12"	✓	900V
	"	Alarm ✓	2"	✓	"

LOG N CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by F.D.C. [Signature] Personnel check by [Signature]
 Instruments and safeties checked and reset by [Signature]
 Source in checked by [Signature] Source No. M-93
 Emergency equipment in control room checked by F.D.C.
 Instruments in this circuit: K-1-2 AM-1-2
 Red light on by [Signature] Time 1230
 Started by F.D.C. [Signature] Date 3-31-69

Triangular array:
~~All~~ Rods in contact.

53

Have an triangular array. Two full rings,
plus 1 rod on each face. Total of 25
rods.

13.15 Water ht = 91.50 cm

Temp °C

System sub critical

22.5 °C

Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIPP	SOURCE DISTANCE	SETT	START-UP RANGE
K-1	3 X 10 ⁻¹²	Meter ✓	1"	✓	3 X 10 ⁻¹²
	"	Fast ✓	"	✓	"
K-2		Meter			
		Fast			
R-1					
R-2					
PM-1	700V	Alarm ✓	15"	✓	500V
PM-2	1200V	Low ✓	12"	✓	900V
	"	Alarm ✓	2"		"

NOG-N CALIBRATE OPERATE SOURCE No. 0-801
 BUMP WELL PRGBE LIGHT

START-UP CHECK LIST

Equipment checked by E.I.C. Personnel check by E.I.C.
 Instruments and safeties checked and reset by AMH
 Source in checked by AMH Source No. M-93
 Emergency equipment in control room checked by E.I.C.
 Instruments in trip circuit: K-1 PM-1-2
 Red light on by AMH Time 0835
 Start-up OK'd by E.I.C. AMH Date 4-3-69

7.2" O.D. ϕ (3.85) Rods.
 2.6" I.D.
 30" height.

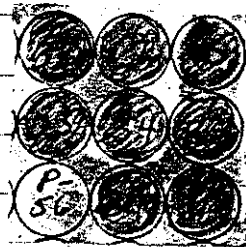
"Rod in contact."

Have an $3 \times 3 - 1$ array. Total of 8 rods.

Water ht = 58.70 cm. $\rho = 0.56$ Temp $^{\circ}C$
 + Per. 22.6 $^{\circ}C$

$$t = 417.22 \text{ sec} = 2.9 \phi = 58.04 \text{ cm}$$

0931 Water ht = 58.65 cm
 System just critical
 Drain.



7.2" O.D. Rods with 2.56" O.D. Inerts Rods.

"Rod in contact."

Have an $3 \times 3 - 1$ array. (Same as above) Total of 8 rods.

1340 Water ht = 91.50 cm
 System sub critical
 Drain. Lag $\eta = .0014$



Now have an 3 x 9 array. Total of 12 rods.
"Rod in contact."

1.548 Water ht = 91.80 Temp °C
System sub critical 23.0 °C
Drain Log n = 1.01

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE	
K-1	3 x 10 ⁻¹²	Meter ✓	1"	✓	3 x 10 ⁻¹²	
"	"	Fast ✓	"	✓	"	
K-2	"	Meter ✓	"	✓	"	
"	"	Fast ✓	"	✓	"	
R-1						
R-2						
PM-1	700V	Alarm ✓	5"	✓	500V	
PM-2	1200V	Low ✓	10"	✓	900V	
"	"	Alarm ✓	8"	✓	1"	
LOG N CALIBRATE		✓	OPERATE		✓	SOURCE No. B-80
DUMP WELL PROBE LIGHT _____						

START-UP CHECK LIST

Equipment checked by ^{F.I.D.C.} ~~A.K.J.~~ Personnel check by F.I.D.C.
 Instruments and safeties checked and reset by A.K.J.
 Source in checked by A.K.J. Source No. M-43
 Emergency equipment in control room checked by F.I.D.C.
 Instruments in trip circuit: K-1 PM-1-2
 Red light on by A.K.J. Time 0935
 Start-up OK'd by F.I.D.C. A.K.J. Date 4-7-69

"Rod in contact."

Have an $4 \times 4 - 2$ array. Total of 14 rods.

(7) 0928 Water ht = 91.90 cm Temp $^{\circ}$
 System sub critical 22.2 $^{\circ}$
 Drain Log $\eta = .039$

Added 2 rods. Now have an 4×4 array.
 Total of 16 rods.

(1) Water ht = 69.40 cm $\delta h = .95$ cm Temp $^{\circ}$
 + Pw 22.7 $^{\circ}$
 $E = 102.13 \mu = 9.7\% = 10.2\% / \text{cm}.$

10.45 Water ht = 68.45 cm
 System just critical
 Drain

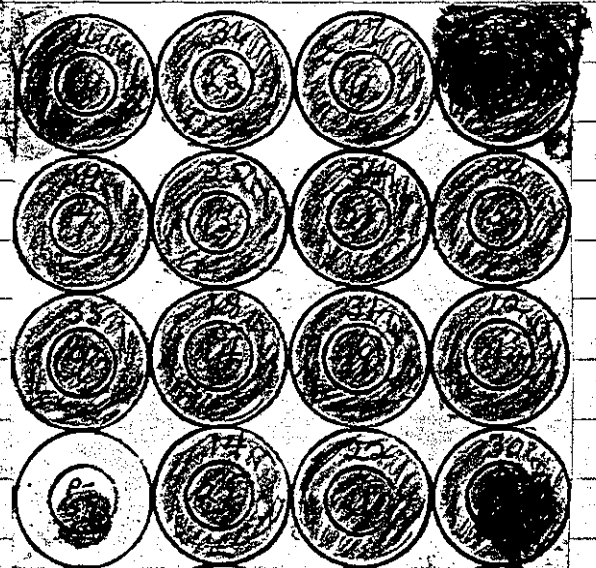
Removed 1 rad. Now have an 4x4-1 array. Total of 15 radi.

Water ht = 79.00 cm $D_h = 1.20 \text{ cm}$ Temp $^{\circ}\text{C}$
+ low 22.7 $^{\circ}\text{C}$

$L = 58.67 \text{ m} = 14.99 = 12.49 / \text{cm}$

13.25 Water ht = 77.80 cm.

System just critical
Drain.



f
20
f
10

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
"	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2	"	Meter <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
"	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
R-1					
P-2					
PM-1	700V	Alarm <input checked="" type="checkbox"/>	1.5"	<input checked="" type="checkbox"/>	500V
PM-2	1200V	Low <input checked="" type="checkbox"/>	10.0"	<input checked="" type="checkbox"/>	900V
"	"	Alarm <input checked="" type="checkbox"/>	2.0"	<input checked="" type="checkbox"/>	"

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

START-UP CHECK LIST

Equipment checked by F.I.C. P.H.N. Personnel check by F.I.C.
 Instruments and safeties checked and reset by P.H.N.
 Source in checked by P.H.N. 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 P.H.N. Time 0820
 Start-up OK'd by F.I.C. P.H.N. Date 4-2-69

.50" separation
edge - edge.

61

Have an 3x4 array. Total of 12 rods.

Water ht = 64.10 cm $\Delta h = .85$ cm Temp $^{\circ}$ C
' + Per 72.5 $^{\circ}$ C

$\epsilon = 67.36$ cm = 13.34 = 15.64/cm

0924 Water ht = 63.25 cm

System just critical
Drain.

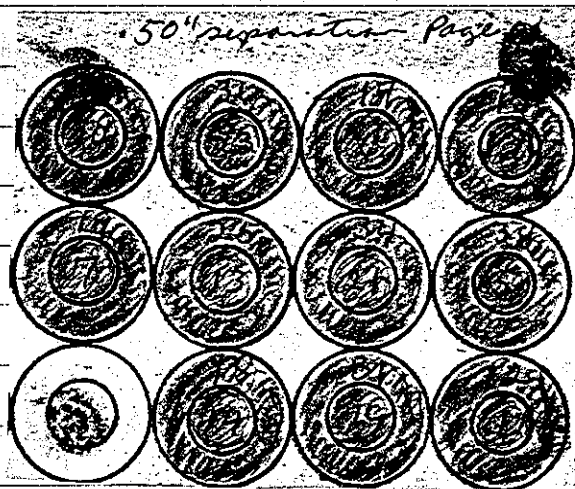
Removed 1 rod. Now have an 3x4-1
array. Total of 11 rods.

Water ht = 78.00 cm $\Delta h = .90$ cm Temp $^{\circ}$ C
2 + Per 72.7 $^{\circ}$ C

$\epsilon = 65.19$ cm = 13.64 = 15.14/cm

1103 Water ht = 77.10 cm

System just critical
Drain.



.50" separation
edge - edge.

Removed 1 rod. Now have an 3x4-2 array. Total of 10 rods.

1340 Water ht = 92.20 cm
System sub critical
Drain.

Temp °C
22.7 °C

.750" separation
edge - edge.

Now an 3x4-2 array. Total of 10 rods.

1545 Water ht = 91.70 cm
System sub critical
Drain.

Temp °C
23.0 °C

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START/STOP
K-1		Meter			
		Foot			
K-2		Meter			
		Foot			
R-1					
R-2					
PM-1		Alarm			
PM-2		Low			
		Alarm			

LOG N CALIBRATE _____ OPERATE _____ SOURCE No. _____

DUMP WELL PROBE LIGHT _____

START-UP CHECK LIST

- Equipment checked by _____ Personnel check by _____
- Instruments and safeties checked and reset by _____
- Source in checked by _____ Source No. _____
- Emergency equipment in control room checked by _____
- Instruments in trip default _____
- Red light on by _____
- Start up OK by _____

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	3×10^{-12}
"	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2	"	Meter <input checked="" type="checkbox"/>	1.5"	<input checked="" type="checkbox"/>	"
"	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
R-1					
R-2					
PM-1	700V	Alarm <input checked="" type="checkbox"/>	1.5"	<input checked="" type="checkbox"/>	500V
PM-2	1200V	Low <input checked="" type="checkbox"/>	10"	<input checked="" type="checkbox"/>	900V
"	"	Alarm <input checked="" type="checkbox"/>	2"	<input checked="" type="checkbox"/>	"
LOG N CALIBRATE <input checked="" type="checkbox"/>		OPERATE <input checked="" type="checkbox"/>		SOURCE No. B-80	
DUMP WELL PROSE LIGHT <input type="checkbox"/>					

START-UP CHECK LIST

Equipment checked by F.I.D.C. [Signature] Personnel check by F.I.D.C. [Signature]

Instruments and safeties checked and reset by [Signature]

Source in checked by [Signature] Source No. 19-93

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

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

Red light on by [Signature] Time 0820

Start-up OK'd by F.I.D.C. [Signature] Date 4-9-68

* 750" separation
edge - edge.

65

Have an 3x4-1 array, total of 11 nodes.

$$2h = 1.99 \text{ cm}$$

Water ht = 74.30 cm
1 + Per

Temp °C
22.5 °C

$$t = 47.81 \text{ sec} = 16.9 \phi = 8.9 \text{ Hcm}$$

1030 Water ht = 72.40 cm

System just critical

Repeat of above:

3:35

Water ht = 73.7 ° cm

$$2h = 1.50 \text{ cm}$$

Temp = 23 °C

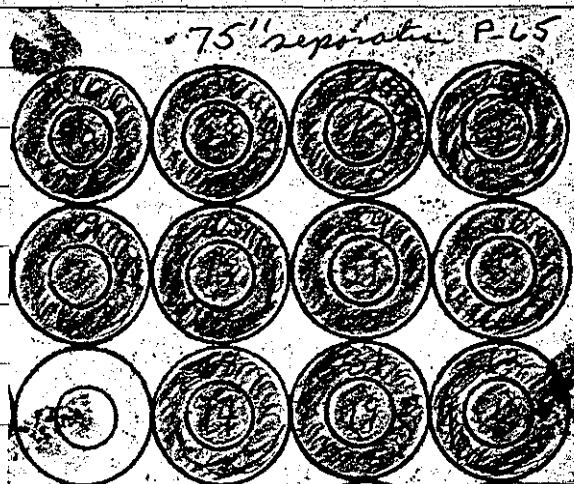
2 + Period

$$t = 60.85 = 14.3 \phi = 9.5 \phi / \text{cm}$$

water ht = 72.2 cm

System just critical

Draw



66

4-10-69

INSTRUMENT CHECK

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

START-UP CHECK LIST

Equipment checked by IDC Personnel check by IDCInstruments and safeties checked and reset by IDC + JLLSource in checked by JLL Source No. M-43Emergency equipment in control room checked by IDCInstruments in trip circuit: IDC + JLLRed light on by IDC Time 08:35Start-up OK'd by JLL + IDC Date 4-10-69

Repeat runs of p. 65

09:10

Water ht = 73.3 cm

 $\Delta h = 0.9$ cm

+ Period

Temp = 22.5°C

 $t = 117.3$ sec = 8.7 ϕ Water ht = 72.4 cm = 9.7 ϕ /cm

System Just Critical

Nrain

1.0" Separation

Edge to Edge.

(3 x 4) + 1 array. 13 Units

13:30

2

+ Period, water ht = 68.9 cm

 $t = 171.7$ sec = 6.36 ϕ

Temp = 22.7°C

Water ht = 68.4 $\Delta h = 0.5$ cm

System Just Critical

 $\frac{\Delta P}{\Delta h} = 12.72$ ϕ

Nrain

3 x 4 array

Water ht = 71.0

14:50

3

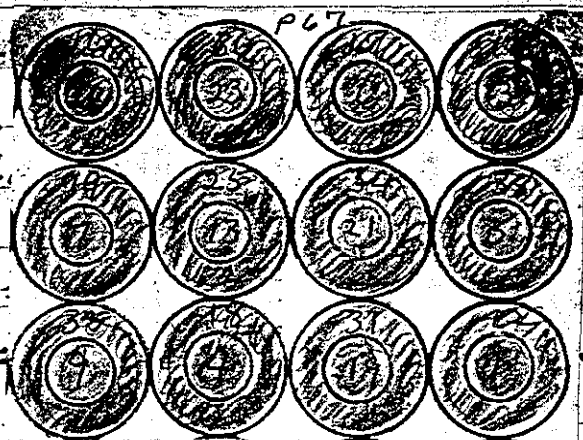
+ Period

 $t = 220.6$ sec :

Water ht = 70.0

System Just

Nrain

 $\frac{\Delta P}{\Delta h} = 6.4$ ϕ /cm

Repeat runs of p. 65

09:10

Water ht = 73.3 cm

 $\Delta h = 0.9$ cm

+ Period

Temp = 22.5°C

 $t = 117.3$ sec = 8.7 ϕ Water ht = 72.4 cm = 9.7 ϕ /cm

System Just Critical

Nrain

1.0" Separation

Edge to Edge.

13:30

2

(3 x 4) + 1 array.

13 Units

+ Period

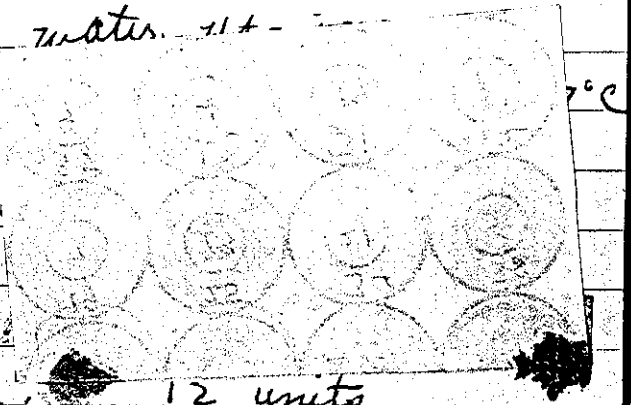
Water ht =

 $t = 171.7$ sec

Water ht =

System Just Crit

Nrain



3 x 4 array.

12 units

Water ht = 71.0 cm

14:50

3

+ Period

Temp = 22.8°C

 $t = 220.6$ sec = 5.12 ϕ

Water ht = 70.2

 $\Delta h = 0.8$ cm

System Just Critical

Nrain

 $\frac{\Delta P}{\Delta h} = 6.4 \phi / \text{cm}$

4-11-69

INSTRUMENT CHECK

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

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

DUMP WELL PROBE LIGHT _____

START-UP CHECK LIST

Equipment checked by IDC Personnel check by IDC

Instruments and safeties checked and reset by IDC + JLL

Source in checked by JLL Source No. M-43

Emergency equipment in control room checked by IDC

Instruments in trip circuit: IDC + JLL

Red light on by IDC Time 08:25

Start-up OK'd by JLL + IDC Date 4-11-69

09:10 (3 x 4) - 1 11 units Temp
 Water Height = 91.7 cm 22.4° C
 System Sub-Critical. { t = -178.3 sec = -9.3 #
 Drain ? } at Low Log N. Reading

1.5" Separation: Edge to Edge

4 x 4 Array 16 units

Water Ht = 91.5 cm

System Sub Critical

Temp = 22.5°C

15524

Drain

2

3 4

ing

70

4-14-69

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	1"	✓	3×10^{-12}
	"	Fest ✓		✓	
K-2	3×10^{-12}	Meter ✓	1"	✓	3×10^{-12}
	"	Fest ✓		✓	
R-1					
R-2					
PM-1	700V	Alarm ✓	1/2"	✓	500V
PM-2	1700V	Low ✓	10"	✓	900V
	"	Alarm ✓	2"	✓	
LOG N. CALIBRATE	JL	OPERATE	✓	SOURCE No.	B-80

DUMP WELL PROBE LIGHT _____

START-UP CHECK LIST

Equipment checked by JL Personnel check by JLInstruments and safeties checked and reset by JL + JLSource in checked by JL Source No. M-43Emergency equipment in control room checked by JLInstruments in trip circuit: JL + JLRed light on by JL Time 08:45Start-up OK'd by JL + JL Date 4-12-69

(4x4) + 12 Array 18 Units

Water Ht = 91.9 cm

Temp 21.9°C

System Sub critical

09:30

Drain

4x5 Array 20 Units

Water Ht = 91.7 cm

Temp = 22.3°C

System Sub Critical

11:20

Drain

(4x5) + 1 Array 21 Units

Water Ht = 92.0 cm

Sub Critical

Temp = 22.5°C

15:00

Drain

72

4-15-69

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE	
K-1	3×10^{-12}	Water ✓	1"		3×10^{-12}	
	"	" ✓			"	
K-2	"	Water ✓	1"		"	
	"	" ✓			"	
R-1						
R-2						
PM-1	700 ✓	Alarm ✓	$\frac{1}{2}$ "		500 V	
PM-2	1200 ✓	Alarm ✓	10"		900 V	
	"	Alarm ✓	2"			
LOG IN CALIBRATE		JJL	OPERATE	✓	SOURCE No.	B-80

DUMP WELL PROBE LIGHT _____

START-UP CHECK LIST

Equipment checked by IDC Personnel check by IDCInstruments and safeties checked and reset by IDC + JJLSource in checked by JJL Source No. M-43Emergency equipment in control room checked by IDCInstruments in trip circuit: IDC + JJLRed light on by IDC Time 08:30Start-up OK'd by JJL + IDC Date 4-15-69

(4x5) + 2 Array 2.2 units

13

Water Ht = 91.6 cm

Temp = 22.2°C

System Sub-Critical

09:09

Brain

(5x5) - 1 Array

24 units

Temp = 22.5°C

Water Ht = 75.9 cm

14

Res. Period

$\Delta h = 0.9 \text{ cm}$

$t = 162.97 \text{ sec}, 6.66^{\#}$

$\frac{\Delta P}{\Delta h} = 7.4^{\#}/\text{cm}$

Water Ht = 75.0 cm

∞ , Just Crit

11:18

Brain

Depth 1.50" P-7

(5x5)

2

Res. Period

$t = 80 \text{ sec}$

Water Ht

System

12



(4x5) + 2 Array 2.2 units

13

Water Ht = 91.6 cm

Temp = 22.2°C

System Sub Critical

09:09

Drain

(5x5) - 1

Water Ht =

Pos. Period

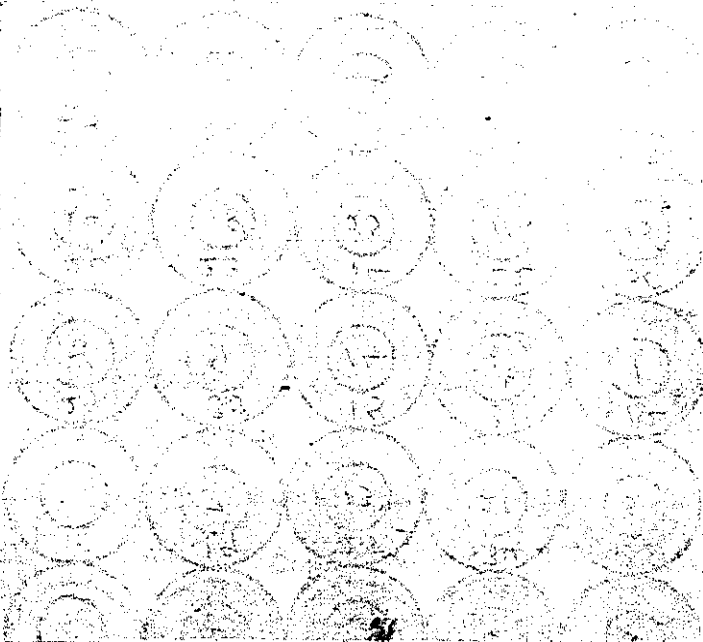
t = 162.97

Water Ht

∞, Jc

11:18

Drain



(5x5) - 2 Array 2.3 Units

2

Pos. Period, Water Ht = 80.0 cm Temp = 22.5°C

t = 80 sec = 11.72 s

Water Ht = 79.1 cm

$\Delta h = 0.9$ cm

System just Critical

$\frac{\Delta T}{\Delta h} = 13.09 \frac{s}{cm}$

12

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	cut	Meter			3×10^{-12}
		Fast			"
K-2	3×10^{-12}	Meter	✓ 1"	✓	"
	"	Fast	✓	✓	"
R-1					
R-2					
PM-1	700 V	Alarm	✓ 1/2"	✓	500 V
PM-2	1200 V	Low	✓ 10"	✓	900 V
		Alarm	✓ 2"	✓	
LOG N CALIBRATE		DC	OPERATE	✓	SOURCE No. B-80

DUMP WELL PROSE LIGHT

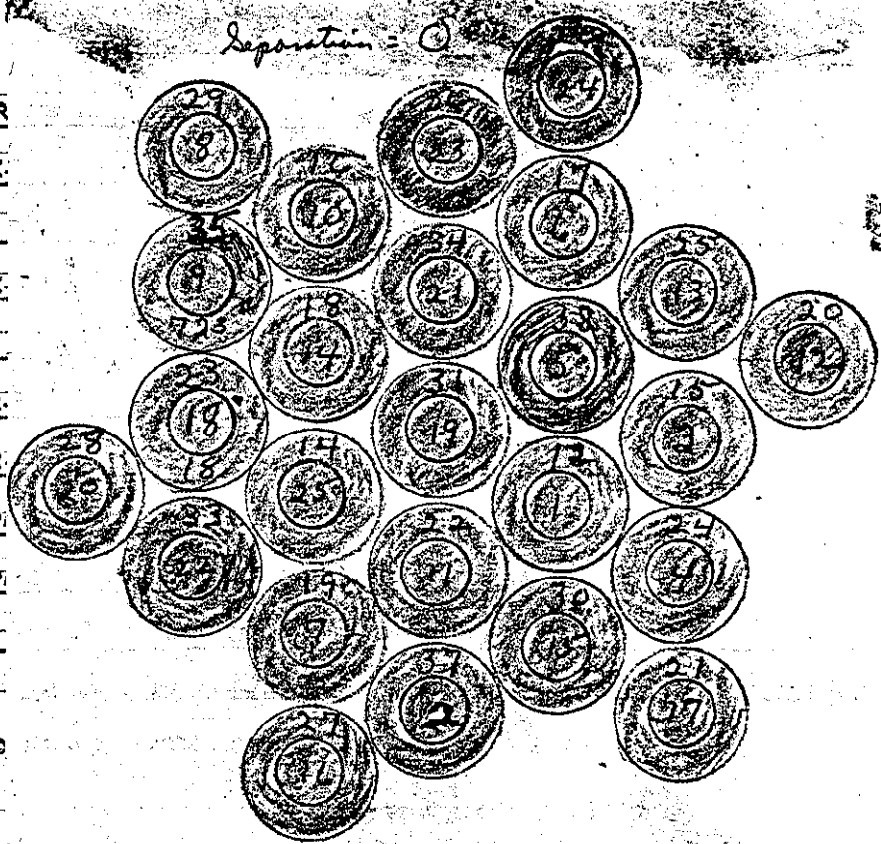
START-UP CHECK LIST

Equipment checked by DC Personnel check by DCInstruments and safeties checked and reset by DC & JLLSource in checked by JLL Source No. M-43Emergency equipment in control room checked by DCInstruments in trip circuit: DCRed light on by DC Time 13:10Start-up On'd by JLL & DC Date 4-16-69Triangular arrays

Contact 19 units ^{Hex} Pattern
 water $\Delta x = 96.9$ cm Temp = 22.5°C
 System Sub-critical

Deposition: 0

INSTR
K
K
R
R
P
P
D



START-UP RANGE

3×10^{-12}

"

500V

900V

B-80

Equipment checked by IDC Personnel check by DCS

Instruments and safeties checked and reset by DCS + JLL

Source in checked by JLL Source No. M-43

Emergency equipment in control room checked by IDC

Instruments in trip circuit: IDC

Red light on by IDC Time 10:15

Start-up OK'd by JLL + IDC Date 4-17-69

Contact : 25 units, added 1 to
 each face of 19 unit Hex
 water $7H = 91.9 \text{ cm}$ Temp = 22.5°C
 Sub Critical

2.5°C

INSTRUMENT CHECK

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

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

START-UP CHECK LIST

Equipment checked by IPC Personnel check by IPC

Instruments and safeties checked and reset by IPC + JLL

Source in checked by JLL Source No. M-43

Emergency equipment in control room checked by IPC

Instruments in trip circuit: IPC

Red light on by IPC Time 10:15

Start-up OK'd by JLL + IPC Date 4-17-69

Contact : 25 units, added 1 to
 each face of 19 Unit Hex.
 water Ht = 91.9 Cm Temp = 22.5°C
 Sub Critical

UP
E

2.5°C

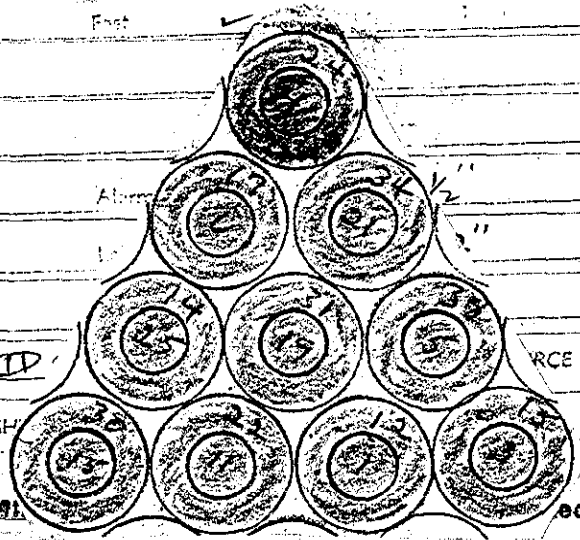
INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	2"		3×10^{-12}
		Feet ✓			
K-2	3×10^{-12}	Meter ✓	0		3×10^{-12}
		Feet ✓			

4-18-69

R-1					
R-2					
PM-1	700 V	Alarm ✓	2"		500V ✓
PM-2	1200		"		900V ✓

LOG IN CALIBRATE IDC SOURCE No. B-80

DUMP WELL PROBE LIGHT



18

Equipment checked by IDC

Instruments and safeties checked and reset by IDC

Source in checked by JL source No. M-43

Emergency equipment in control room checked by IDC

Instruments in trip circuit: IDC

Red light on by IDC Time 10:50

Start-up OK'd by JL + IDC Date 4-18-69

Triangular Array - True Triangle

0.50" Separation : 10 Units

Water H_t = 71.0 cm Temp = 22.7°C

+ Period

t = +59.21 sec, = 14.58" Δh = 1.5 cm

Water H_t = 69.5 cm

System just Critical $\frac{\Delta p}{\Delta h} = 9.72 \frac{+}{cm}$

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	2"		3×10^{-12}
		Est. ✓			
K-2	3×10^{-12}		0		3×10^{-12}
P.			$\frac{1}{2}$ "		500V
PM-2			12"		900V
		Alarm ✓	2"		
LOG N C.		OPERATE ✓		SOURCE No.	B-80
DUMP WELL F					

4-18-69

Separation 0.5"
Page 74

START-UP CHECK LIST

Equipment checked by IDL Personnel check by IDC

Instruments and safeties checked and reset by IDC

Source in circuit by JL Source No. M-43

Emergency equipment in control room checked by IDC

Instruments in trip circuit: IDC

Red light on by IDC Time 10:50

Start-up OK'd by JL + IDC Date 4-18-69

18

4-

Triangular Array. True Triangle
 0.50" Separation : 10 Units
 Water H₁ = 71.0 cm Temp = 22.7°C
 + Period
 t = +59.21 sec, = 14.58"
 Water H₂ = 69.5 cm
 System just Critical $\frac{\Delta \rho}{\Delta h} = 9.72 \frac{\text{g}}{\text{cm}}$

Threading

0.5" Separation

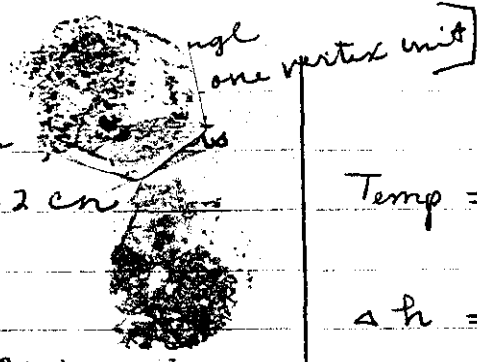
Water Ht = 92.2 cm

+ Period

t =

Water Ht = 83.1

- Just Critical



Temp = 22.7°C

Δh = 9.1 cm

$\frac{\Delta P}{\Delta h} = 0.92 \frac{\#}{\text{cm}}$

(17)

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-RANGE
K-1	3×10^{-2}	Meter	1"		3×10^{-12}
		Fast			
K-2	out	Meter			
		Fast			
R-1					
R-2					
PM-1	700	Alarm	1/2"		500
PM-2	1200	Low	10"		900
	1	Alarm	2"		

4-21-69

LOG N CALIBRATE RKR OPERATE SOURCE No. B-80

BUMP WELL TRIP LIGHT _____

START-UP CHECK LIST

Equipment checked by DC Personnel check by DC

Instruments and safeties checked and reset by DC

Source in checked by JL Source No. M-43

Emergency equipment in control room checked by DC

Instruments in trip circuit: JL

Red light on by DC Time 08:30

Start-up by JL + DC

7°C
cm
72 #/cm

Triangular Array ^{Triangle} less one vertex unit

0.5" Separation; 9 Units

Water $h_t = 92.2$ cm

+ Period

$t_0 =$

Water $h_t = 83$

- Just critical

Temp = 22.7°C

$\Delta h = 9.1$ cm

$\frac{e}{h} = 0.92 \frac{\#}{cm}$

(79)

INSTRUMENT RANGE

K-1 3×10^{-2}

K-2 out

Meter

Fast

R-1

R-2

PM-1 700

Alarm

2"

500

PM-2 1200

Low

10"

900

1

Alarm

2"

LOG N CALIBRATE RKR OPERATE SOURCE No. B-80

DUMP WELL FROZE LIGHT

START-UP CHECK LIST

Equipment checked by IDC Personnel check by IDC

Instruments and safeties checked and reset by IDC

Source in checked by JL Source No. M-43

Emergency equipment in control room checked by IDC

Instruments in trip circuit: JL

Red light on by IDC Time 08:30

Start up crew: JL + IDC

4-21-69

°C

cm

2 $\frac{\#}{cm}$

4-21-69

Triangular Array
 7 unit Hex + 2
 0.5" Separation
 Water $\Delta h = 87.0$ cm
 + Period
 $t = +103.6$ sec, 9.6 ϕ
 Water $\Delta h = 82.6$ cm

9 units
 Temp = 23.2°C
 $\Delta h = 4.4$ cm
 $\frac{\Delta P}{\Delta h} = 2.18 \frac{\phi}{cm}$

1

20

Triangular Array
 7 unit Hex + 1
 0.5" Separation
 Water $\Delta h = 91.7$ cm
 Sub critical

8 units
 Temp = 23.2°C

21

Triangular Array
 7 unit Hex + 1
 0.75" Separation
 Water $\Delta h = 56$ cm
 + Period
 $t = +108$ sec, 9.3 ϕ
 Water $\Delta h = 55.6$ cm

8 units
 Temp = 23.2°C
 $\Delta h = 0.4$ cm
 $\frac{\Delta P}{\Delta h} = 23.25 \frac{\phi}{cm}$

21

2

4-21-69

Triangular Array
7 unit Hex + 2

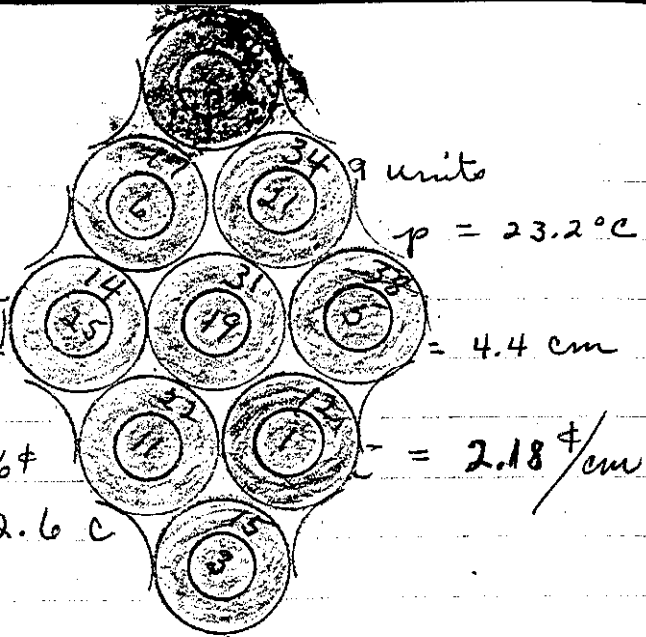
0.5" Separation

Water $h_f =$

+ Period

$t = +103.6$ sec, 9.6¢

Water $h_f = 82.6$ C



Triangular Array
7 unit Hex + 1

0.5" Separation

Water $h_f = 91.7$ cm

Sub Critical

8 units

Temp = 23.2°C

Triangular Array

7 unit Hex + 1

0.75" Separation

Water $h_f = 56$ cm

+ Period

$t = +108$ sec, 9.3¢

Water $h_f = 55.6$ cm

8 units

Temp = 23.2°C

$\Delta h = 0.4$ cm

$\frac{\Delta p}{\Delta h} = 23.25 \frac{\text{¢}}{\text{cm}}$

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SEE	START-UP RANGE
K-1	3A10 ⁻¹²	Master ✓	1"	✓	3x10 ⁻¹²
"	"	Trips ✓	"	✓	"
K-2	"	Master ✓	"	✓	"
"	"	Trips ✓	"	✓	"
P-1	"	"	"	"	"
P-2	"	"	"	"	"
PM-1	700V	Alarm ✓	5"	✓	500V
PM-2	1200V	Low ✓	8"	✓	1200V
"	"	Alarm ✓	2"	✓	"

LOG N CALIBRATE OPERATE SOURCE No. B-80

BUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by IDC Personnel check by IDC

Instruments and safeties checked and reset by RKR Jr

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

Emergency equipment in control room checked by IDC

Instruments in trip circuits: RKR Jr

Red light on by IDC Time 08:15

Start-up OK'd by JJL Date 4-22-69

Triangular Array
 7 Unit Hex minus 1
 0.75" Separation
 Water Ht = 91.5 cm
 Sub critical

6 units

Temp = 23.7°C

Added 1 rad. Now have an triangular
 array. 7 tracks. Separation = .750" edge-edge.

Water ht = 64.60 cm

bh = .50 cm

Temp °C

+ Per

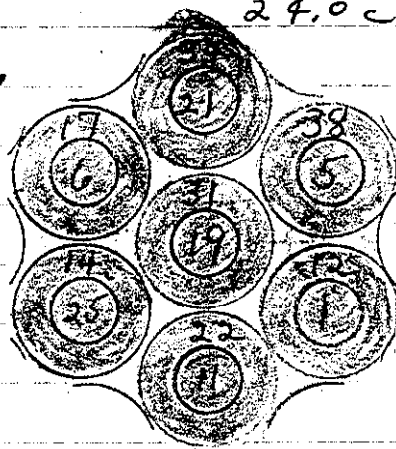
24.0°C

$T = 108.65 \text{ sec} = 9.34 = 18.6 \text{ } \frac{1}{\text{cm}}$

1106

Water ht = 64.10 cm

System just critical
 Drain.



Triangular array.

81

1.0" separation edge - edge.

Have an triangular array, 6 rods.
Separation = 1.0" separation edge - edge.

1516

Water ht = 92.4

Temp °

System sub critical

23.5°

Reactor.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	1"	✓	3×10^{-12}
"		✓	"	✓	"
K-2	-	Meter			
R-1	✓				
R-2	-				
PM-1	300V	Alarm ✓	.5"	✓	500V
PM-2	1200V	Low ✓	8"	✓	900V
"		Alarm ✓	2"	✓	"

LOG N CALIBRATE OPERATE SOURCE No. B-10

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by F.O.C. Hall Personnel check by AKH
 Instruments and safeties checked and reset by H.H.C.
 Source in checked by AKH Source No. M-23
 Emergency equipment in control room checked by F.O.C.
 Instruments in trip circuits: K-1-2 PM-1-2
 Red light on by AKH Time 0758
 Start-up OK'd by F.O.C. Hall Date 4-13-69

Triangular array
1.0" separation edge - edge.

83

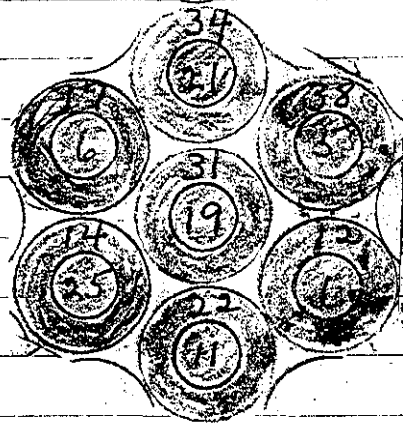
Have an Triangular array: total of 7 root.
separation = 1.0" edge - edge.

Water ht = 53.50 cm $\Delta h = 1.35$ cm Temp =
+ Per 22.6°C

$$L = 76.05 \text{ cm} = 12.24 \text{ ft} = 34.94 / \text{cm}$$

0.915 Water ht = 53.15 cm

System just critical
Drain.



Triangular array.

1.5" separation edge - edge.

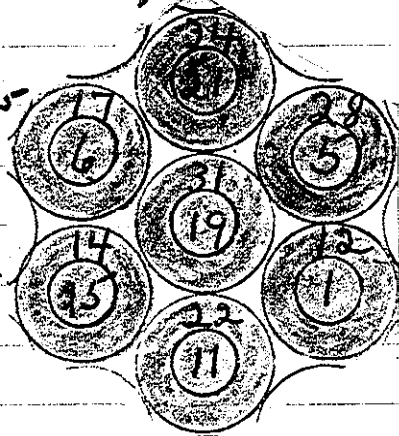
Have an Triangular array: total of 7 root
separation = ~~1.0"~~ 1.5" edge - edge.

Water ht = 67.45 $\Delta h = 1.05$
+ Per

$$L = 43.46 \text{ cm} = 17.98 \text{ ft} = 17.14 / \text{cm}$$

1.329 Water ht = 66.40 cm.

System just critical
Drain.



array

Triangular array
1.0" separation edge - edge.

83

Have an Triangular array: total of 7 rods.
separation = 1.0" edge - edge.

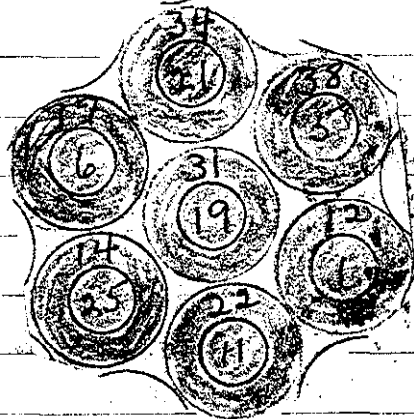
Water ht = 53.50 cm $\Delta h = 1.35$ cm Temp °C

+ Per 24.6°C

$$\tau = 76.05 \text{ sec} = 12.24 = 34.94 / \text{cm}.$$

0915 Water ht = 53.15 cm

System just critical
Drain.



Triangular array.

1.5" separation edge - edge.

Have an Triangular array: total of 7 rods
separation = ~~1.0~~ 1.5" edge - edge.

Water ht = 67.45 $\Delta h = 1.05$ cm Temp °C

+ Per 24.3°C

$$\tau = 43.46 \text{ sec} = 17.984 = 17.14 / \text{cm}.$$

1329 Water ht = 66.40 cm.

System just critical
Drain.

over

Triangular array
1.5" separation edge - edge.

Have an Triangular array. Total of 6 rods.
1.5" separation edge - edge.

1425 Water h_c = 91.80 cm
System sub critical
Down

Temp^o C
24.5^o C

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3x10 ⁻¹²	Meter ✓	1.0"	✓	3x10 ⁻¹²
"	"	Test ✓	1.0"	✓	"
K-2	—	Meter —	—	—	—
	—	Test —	—	—	—
R-1	—	—	—	—	—
R-2	—	—	—	—	—
PM-1	700V	Alarm ✓	.5"	—	500V
PM-2	1200V	Low ✓	8"	✓	900V
"	"	Alarm ✓	2"	—	"

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

START-UP CHECK LIST

Equipment checked by F.D.C. Personnel check by F.D.C.
 Instruments and safeties checked and reset by AKM
 Source in checked by AKM Source No. M-83
 Emergency equipment in control room checked by F.D.C.
 Instruments in this circuit: N-1-2 PM-1-2
 Red light on by AKM Time 0800
 Start-up OK'd by F.D.C. AKM Date 4-25-69

Triangular array
2.0" separation edge-edge.

Have an triangular array; total of 7 rods.
2.0" separation edge-edge.

0915 Water ht = 91.50 cm Temp $^{\circ}$ 26.3 $^{\circ}$ C
System sub critical
Drain.

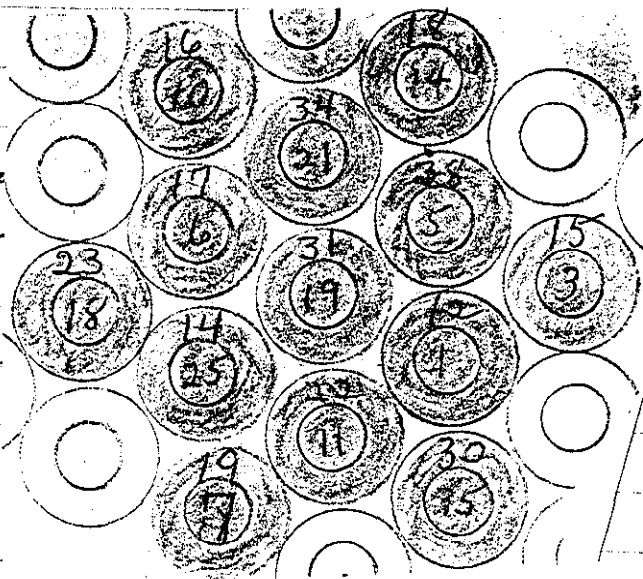
Added 3 rods; 1 each to every other
face. Total of 10 rods.

1053 Water ht = 91.50 cm Temp $^{\circ}$
System sub critical 26.3 $^{\circ}$ C
Drain.

Added 3 rods. Now
1 rod on each face
13 rods.

Water ht = 80.30
+ Per
E = 43.46 cm = 18.0

1322 Water ht = 78.80 cm
System just critical
Drain.



Triangular array
2.0" separation edge-edge.

Have an triangular array: Total of 7 rods.
2.0" separation edge-edge.

0915 Water ht = 91.50 cm Temp = 26.3°C
System sub critical
Drain.

By quarter - 2.0"
By quarter - 2.0"
Pass 9/10

Added 3 rods;
face. Total of

1053 Water ht = 91.5
System sub critical
Drain.

Added 3 rods. Now have 1 full ring; plus
1 rod on each face in 2nd ring. Total of
13 rods.

(4)

Water ht = 80.30 cm $\Delta h = 1.50$ cm Temp = 26.3°C
+ Per

$C = 43.46 \text{ m} = 18.04 = 12.04/\text{cm}$

1322 Water ht = 79.80 cm
System just critical
Drain.

Triangular array.
20" separation edge-edge.

87

(23) Removed 1 rod in 2nd ring. Now have
1 full ring, plus 1 rod on on five faces.
Total of 12 rods.

1425 Water ht = 91.60 cm
System sub critical
Drain.

Temp ^o
26.3 ^o

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE RANGE	SET	START-UP RANGE
K-1	3K10 ⁻¹²	Meter ✓	1"	✓	3K10 ⁻¹²
"	"	Fast ✓	"	✓	"
K-2	—	Meter			
	—	Fast			
R-1					
R-2					
PM-1	700V	Alarm ✓	1.5"	✓	500V
PM-2	1200V	Low —	8.0"	✓	900V
"	"	Alarm ✓	2.0"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. 0-80
DUMP WALL FROGE LIGHT					

START-UP CHECK LIST

Equipment checked by I.D.C. / AKK Personnel check by I.D.C.

Instruments and safeties checked and reset by AKK

Source in checked by AKK Source No. M-93

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

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

Red light on by AKK Time 1230

Start-up OK'd by I.D.C. / AKK Date 9-28-69

Triangular array.

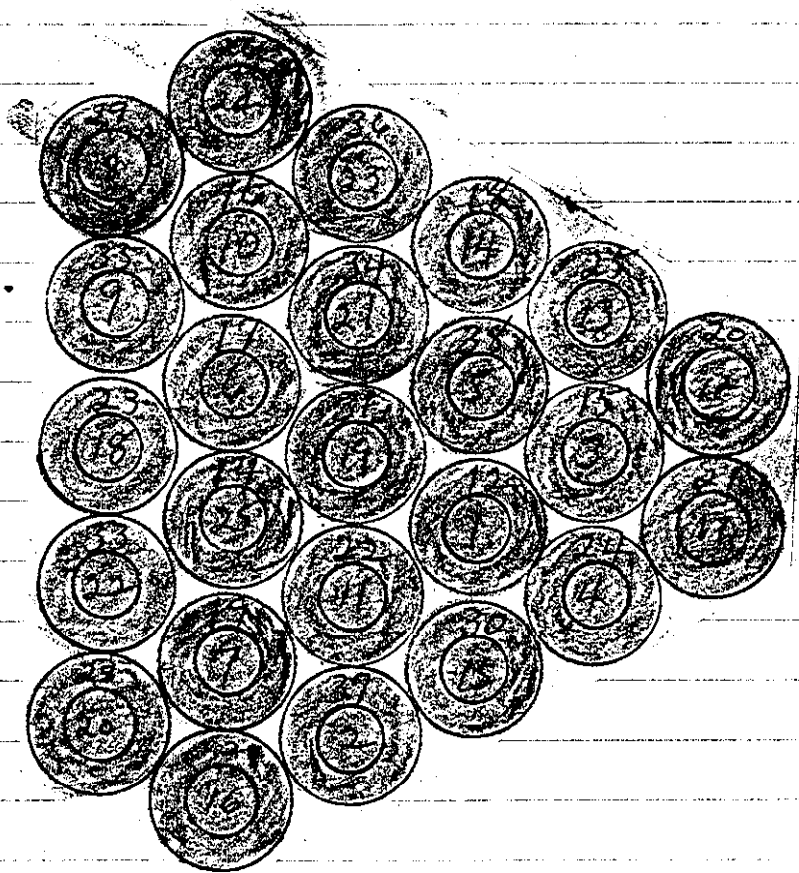
89

2.5" separation: edge-edge

Have an Triangular array. 2 full rings
plus 2 radi on every other face in third
ring. Total of 25 radi.

1306 Water ht = 91.70 cm
System sub critical
Drain.

Temp °
25.00



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 ✓	1.5"	-	"
"	"	Fast ✓	"	-	"
R-1					
R-2					
PM-1	700V	Alarm ✓	1.5"	✓	500V
PM-2	1200V	Low ✓	8.0"	✓	900V
"	"	Alarm ✓	2.0"	-	"
LOG N° CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROBE LIGHT					

START-UP CHECK-LIST

Equipment checked by I.D.C. Personnel check by I.D.C.
 Instruments and safeties checked and reset by MMV
 Source in checked by MMV Source No. M-43
 Emergency equipment in control room checked by I.D.C.
 Instruments in trip circuit: N-1 M-1-2
 Red light on by MMV Time 0815
 Start-up OK'd by I.D.C. MMV Date 4-30-69

Triangulation array.
Separation = 2, 2" edge-edge.

91

Now have an triangulation array. 2 full rings
with 2 rods on every other face in third
ring. Total of 25 rods.

Water ht = 61.00 cm $dh = .65 \text{ cm}$ Temp $^{\circ}$
27 + per 24.2

$$C = 64.10 \text{ sec} = 13.84 = 21.24/\text{cm}$$

0904 Water ht = 60.35 cm

System just critical
Drain.

Removed 2 rods. Now have 2 full rings
with 1 rod on 2 faces and 2 rods on
1 face in third ring. Total of 23 rods

28 Water ht = 63.00 cm $dh = .40 \text{ cm}$ Temp $^{\circ}$
27 per 25.2 $^{\circ}$ C

$$C = 171.67 \text{ sec} = 6.94 = 16.07/\text{cm}.$$

1025 Water ht = 62.60 cm

System just critical
Drain.

over.

Triangular array
2.2" separation edge-edge.

Removed 3 rods. Now have 2 full rings plus 1 rod on 1 fan in 3rd third ring. Total of 20 rods.

Water ht = $\frac{66.65}{66.75}$ Temp. °C
3 + Per 25.1°

N.G

added more H₂O for faster + Per.

Water ht = 67.35 $\Delta h = .60 \text{ cm}$
4 + Per

$$C = 102.13 \text{ sec} = 9.74 = 16.2 \text{ g/cm}^3$$

13.41 Water ht = 66.75 cm

(29) System just critical
Drain.

Removed 2 rods. Now have an Triangular with 18 rods. Two rings with 1 rod removed from 1 corner. Total of 18 rods.

(30) Water ht = 74.20 cm $\Delta h = 1.10 \text{ cm}$ Temp °C
5 + Per. 25.2°

$$C = 60.84 \text{ sec} = 14.34 = 13.0 \text{ g/cm}^3$$

15.04 Water ht = 73.10 cm

System just critical
Drain.

Triangular array
2.2 " separation edge - edge

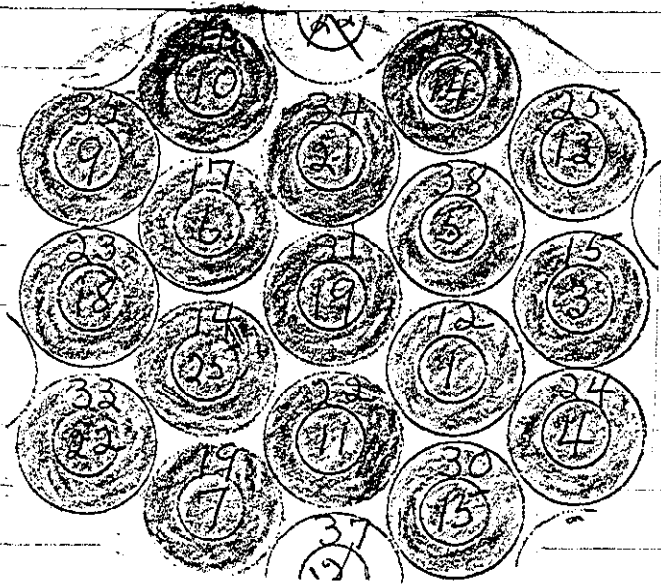
93

Removed 1 rad. Now have an triangular array with 17 rads. 2 rads removed from opposite corners in 2nd ring. Total of 17 rads.

31

Water ht = 80.90 cm $\Delta h = 1.55 \text{ cm}$ Temp $^{\circ}\text{C}$
+ Pen 25.2 $^{\circ}\text{C}$
 $\tau = 45.63 \text{ sec} = 17.4 \text{ s} = 11.2 \text{ Hsec}$

1603 Water ht = 79.35 cm
system just critical
Drain.



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3x10 ⁻¹²	Meter ✓	1"	✓	3x10 ⁻¹²
"	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	.5"	✓	500V
PM-2	1200V	Low ✓	8"	✓	900V
"	"	Alarm ✓	2"	✓	"
LOG N. CALIBRATE		OPERATE		SOURCE No. 0-80	
DUMP WELL PROBE LIGHT					

START-UP CHECK LIST

Equipment checked by ^{S.P.C.}
_{E.P.C.} Personnel check by F.H.C.

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

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

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

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

Red light on by A.H.V. Time 0840

Start-up OK'd by F.H.C. A.H.V. Date 5-1-59

Triangular array
 2.2" separation edge-edge 95

(32)

Have an Triangular array. 2 rings, with
 1 rod removed from from every other
 corner. Total of 16 ~~rod~~ rods.

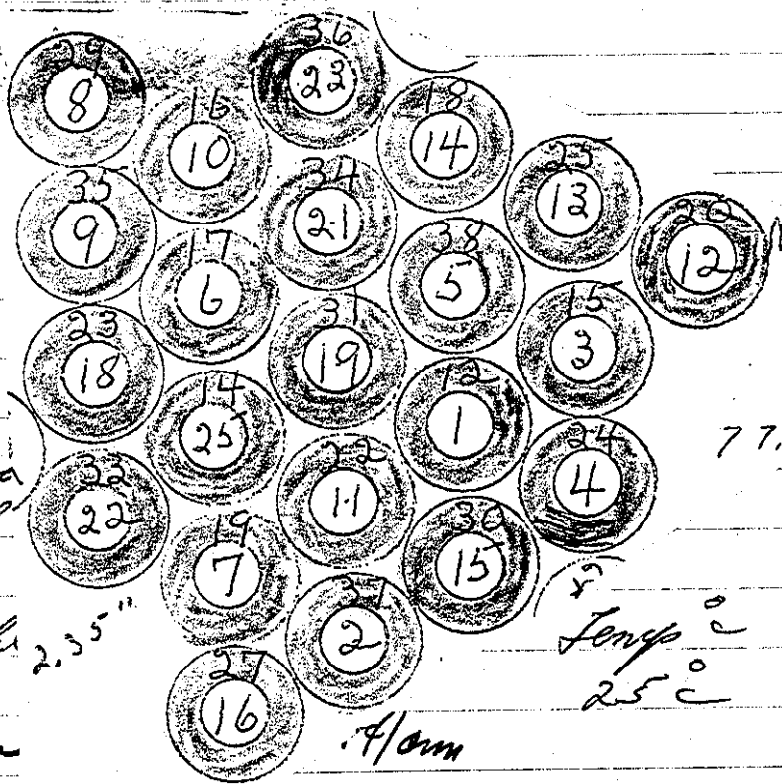
0935

Water ht = 91.70 cm

Temp °C

System sub critical
 Drain.

25.0 °C



(33)

Have an
 plus 1 rod
 Total of

Water ht 2.55"
 + Per
 $\tau = 45.63 \text{ sec}$

Temp °C
 25 °C

1504

Water ht = 77.20 cm
 System just critical
 Drain.

over

Feb

2.35" separation
Page 95

95

Have an L
1 rad near
corner.

(32)

0935 Water ht
System &
Drain.

25.0°

Triangular array:
2.35" separation edge-edge.

(33)

Have an triangular array, 2 full rings
plus 1 rad rad on 3 opposite faces.
Total of 72 rads.

Water ht = 78.20 cm $\Delta L = 1.00$
+ Per Temp °
25 °
 $\tau = 45.63 \mu s = 17.4 \mu s = 17.4 \mu s/cm$

1504 Water ht = 77.20 cm.
System just critical
Drain.

over

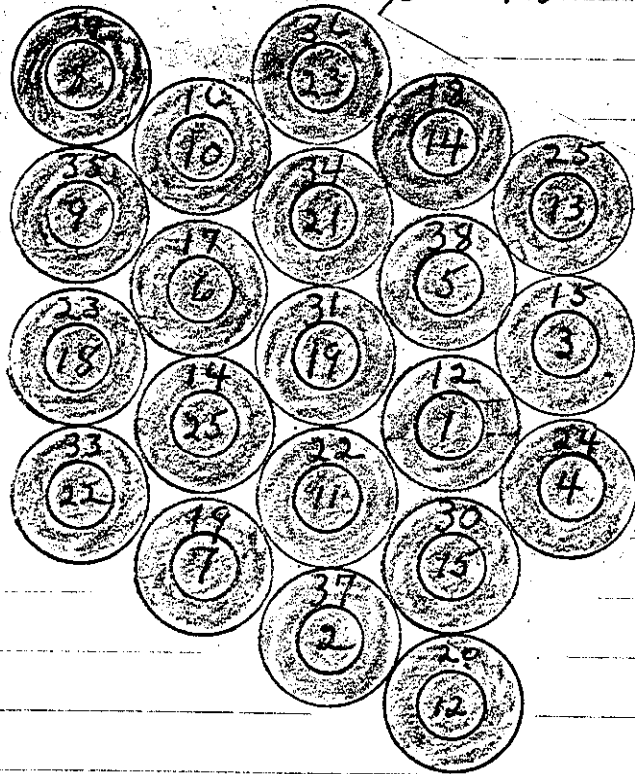
Triangular array:
2.35" separation edge - edge.

Removed 1 rod. Have 2 full rings, plus
2 rods in third ring, 1 rod on opposite
faces. Total of 21 rods.

Water ht = 78.70 cm $\Delta x = .80$ Temp $^{\circ}C$
2 + per 25 $^{\circ}C$
 $\epsilon = 80.40 \text{ cm} = 11.74 = 14.6 \text{ f/cm}$

1556 Water ht = 77.90 cm
system just critical
Drain.

Rod # 20 and insert # 12 ~~placed~~ in
wrong position. see p - 98



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 ✓	"	✓	"
	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	7000	Alarm ✓	.5"	✓	5000
PM-2	1200	Low ✓	8"	✓	900 \pm
	10	Alarm ✓	2"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. <u>B-80</u>
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by F.I.R.C. Personnel check by F.I.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.I.D.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by AKW Time 0815
 Start-up OK'd by F.I.D.C. AKW Date 5-2-69

Triangular array.
2.35" separation edge-edge.

Have 2 full rings, plus 2 rods, one each
on opposite faces. Total of 21 rods
in third ring

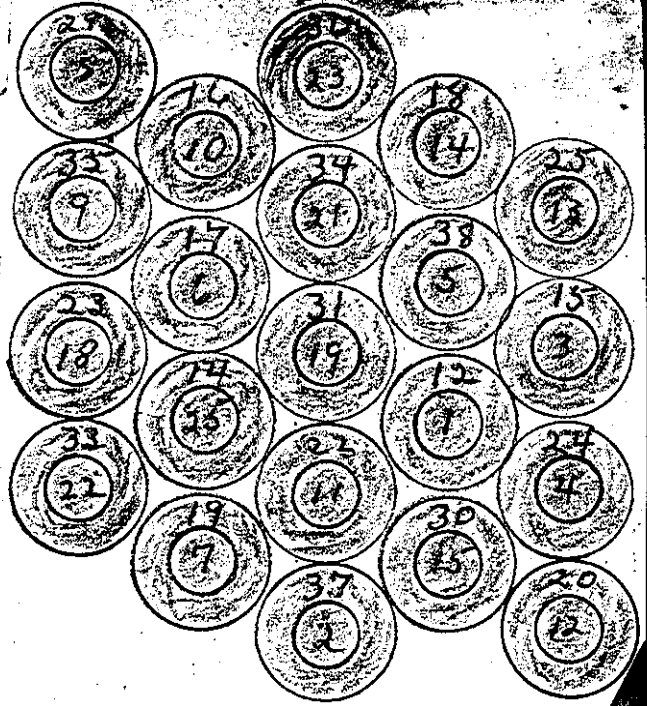
Water ht = 78.85 cm

+ per

$$C = 43.46 \text{ cm} = 17.99 \text{ ft} =$$

0900 Water ht = 77.75 cm

System just critical
Drain.



35

Removed 1 rod. Now have 2 full rings,
plus 1 on 1 face in third ring. Total of
20 rods.

0945 Water ht = 80.10 cm

$\Delta h = 1.4 \text{ cm}$

+ per

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

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

36

$$C = 39.11 \text{ cm} = 19.3 \text{ ft} = 13.9 \text{ ft/cm}$$

Water ht = 78.70 cm.

System just critical
Drain.

Triangular
2.35" sep

Have 2 full rings
on opposite faces. ∇ in
in third ring.

Water ht = 78.85 cm

2 per

$\Delta h = 1.1$ cm

Temp $^{\circ}$ C
24.6 $^{\circ}$ C

$$C = 43.46 \text{ sec} = 17.99 \text{ s} = 16.3 \text{ f/cm}$$

0900 Water ht = 77.75 cm

System just critical
Drain.

35

Removed 1 rad. Now have 2 full rings,
plus 1 on 1 face in third ring. Total of
20 rads.

0945 Water ht = 80.10 cm

2 per

$\Delta h = 1.4$ cm

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

$$C = 39.11 \text{ sec} = 19.3 \text{ s} = 13.9 \text{ f/cm}$$

Water ht = 78.70 cm.

System just critical
Drain.

36

Triangular array. 99
2.35 cm separation edge - edge.

Removed 1 rod. Now have 2 full rings.
Total of 19 rods.

Water ht = 82.55 cm $dh = 2.65$ Temp $^{\circ}C$
+ Per 25 $^{\circ}C$

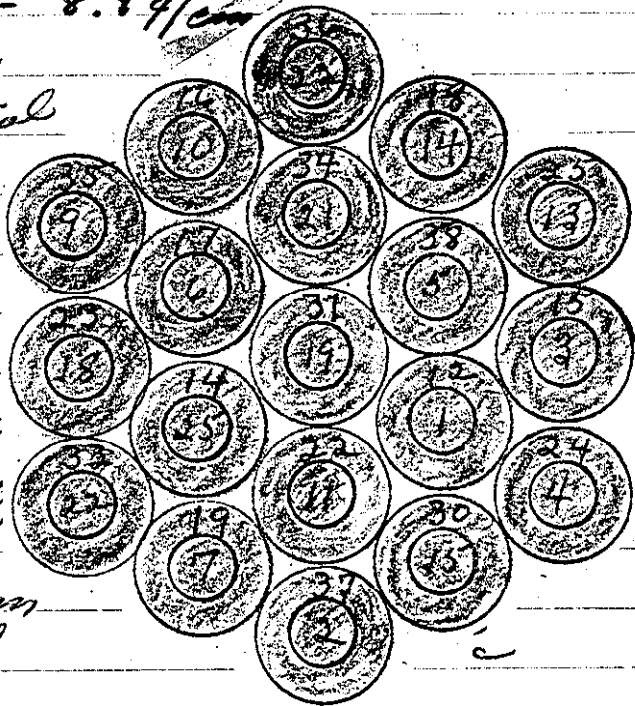
$$C = 28.25 \text{ sec} = 23.54 = 8.94 / \text{cm}$$

1035 Water ht = 79.90 cm
System just critical
Drain.

(15)

Removed 1 rod. Now
an Triangular array.

134 Water ht = 91.50 cm
System sub critical
Drain.



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter <input checked="" type="checkbox"/>	cont	<input checked="" type="checkbox"/>	3×10^{-12}
"	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2	"	Meter <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
"	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
R-1					
R-2					
PM-1	700V	Alarm <input checked="" type="checkbox"/>	1.5"	<input checked="" type="checkbox"/>	500V
PM-2	1200V	Low <input checked="" type="checkbox"/>	8"	<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 PRGBE LIGHT

START-UP CHECK LIST

Equipment checked by F.D.C. Personnel check by F.D.C.
 Instruments and safeties checked and reset by A.H.D.
 Source in checked by A.H.D. SOURCE No. M-43
 Emergency equipment in seat of room checked by F.D.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by A.H.D. Time 0840
 Start-up OK'd by F.D.C. Date 5-5-69

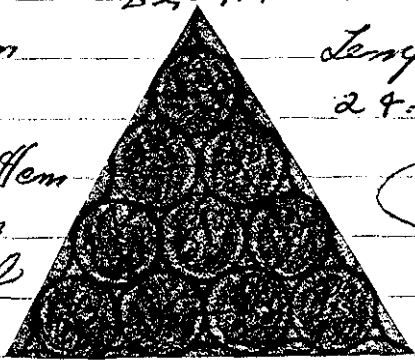
Triangular array:
 "No hearts" ~~to top half of~~
 2.35" separation edge-edge.

Have an Triangular array. 1 full ring.
 plus 1 rod on every other face in 2
 ring. total of 10 rods.

Water ht = 81.10 cm
 + Per
 $t = 69.54 \text{ sec} = 13.04 = 9.29 \text{ sec}$

Temp °C
 24.2 °C

0937 Water ht = 79.70 cm
 System just critical
 Drain.



$z_h = 1.40 \text{ cm}$

Removed 1 rod. Now have 1 full ring, plus
 2 rods one each on opposite faces in
 2nd ring. Total of 9 rods.

1043 Water ht = 94.50 cm
 System sub critical
 Drain.

Temp °C
 24.5 °C

(10)

over!

Triangular Array's.

Repeat. see p - 86-87

2.0" separation edge-edge.

7.2" rad + 2.56 rods.

Have ~~an~~ triangular array. 1 full ring, plus 1 rod on each face in 2nd ring. Total of 13 rods.

Water ht = 79.30 cm $\Delta h = .60$ Temp °C
 2 + Pr 24.6 °C

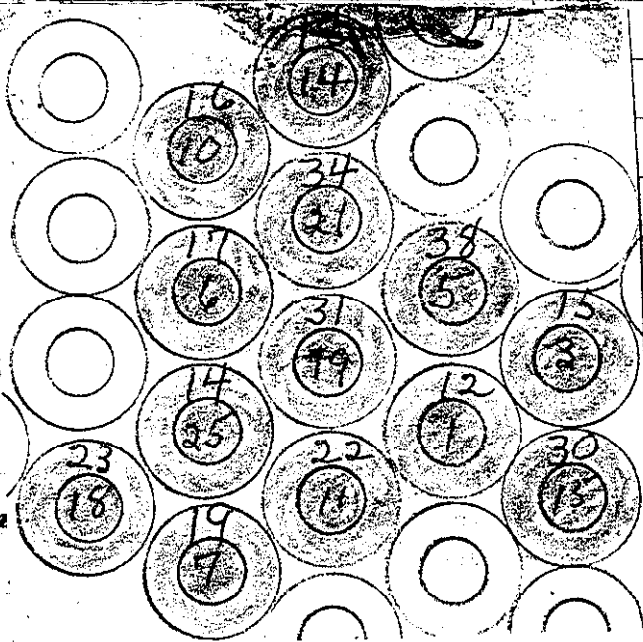
$c = 99.9 \text{ m} = 9.9 = 16.5 \text{ f/cm}$

1420 Water ht = 78.70 cm

System just critical
 Drain.

Have an Triangular plus 3 rods on 2nd ring. Total

Water ht = 92.8'
 System sub critical
 Drain.



Triangular Array's.

Repeats. see p - 86-87

2.0" sep. π s.l.m. - edge.

7.2" rad

2.0" separation

Page 102

Have ~~used~~ ^{an} Triangular
1 rad on each face.
13 rads.

Water ht = 79.30 cm

² + ps

$t = 99.9 \text{ sec} = 9.9 =$

1420 Water ht = 78.70 cm

System just critical
Drain.

Have an triangular array. 1 full ring.
plus 3 rads on every other face in
3rd ring. Total of 13 rads.

Water ht = 92.8'

System sub critical

Drain.

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

24.27.6 $^{\circ}\text{C}$

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter <input checked="" type="checkbox"/>	cont	<input checked="" type="checkbox"/>	3×10^{-12}
	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2	"	Meter <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	"
	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
R-1					
R-2					
PM-1	700V	Alarm <input checked="" type="checkbox"/>	15"	<input checked="" type="checkbox"/>	500V
PM-2	1200V	Low <input checked="" type="checkbox"/>	10"	<input checked="" type="checkbox"/>	900V
	"	Alarm <input checked="" type="checkbox"/>	8"	<input checked="" type="checkbox"/>	"

LOG N CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by I.P.C. AKR Personnel check by I.P.C.

Instruments and safeties checked and reset by AKR

Source in checked by AKR 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 AKR Time 0930

Start-up OK'd by I.P.C. AKR Date 5-6-69

Triangular array.
 2.0" separation edge - edge.
 "No freeze!"

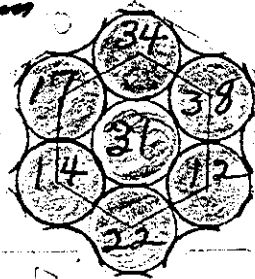
Repeat experiment. (See log book # 4 p 293.)

Reuse an triangular array. Total of 7 nodes.

Water ht = 73.60 cm $\Delta h = 1.7$ cm Temp $^{\circ}$ C
 + Per 24.5 $^{\circ}$ C

$T = 34.77$ sec = 20.7 ϕ = 12.2 ϕ /cm

1019 Water ht = 71.90 cm
 System just critical
 Drain



Triangular array.
250" separation edge - edge
7.2" + 2.56 rods.

105

93.)

Have an triangular array, 7 full rings,
total of 19 rods. Rods spaced with
plastic rings.

Water ht = 56.50 cm 2 h = 40 cm Temp °C
+ Per 29.5 °C

$t = 134.73 \text{ sec} = 7.8 \text{ f} = 19.54 / \text{cm}.$

1546 Water ht = 56.10 cm
System just critical
Drain

INSTRUMENT CHECK

INSTRUMENT	RANGE	UNIT	SOURCE	SEE	START-UP RANGE
K-1	3 X 10 ⁻¹²	μP	1"	✓	3 X 10 ⁻¹²
"	"	"	"	✓	"
K-2	"	Meter	"	✓	"
"	"	"	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm	5"	✓	500V
PM-2	1200V	Low	8"	✓	900V
"	"	Alarm	2"	✓	"

LOG N CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by I.D.C. Personnel check by J.D.L.
G.H.P.

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

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

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

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

Red light on by A.K.V. Time 0830

Start-up OK'd by I.D.C., J.D.L. Date 5-7-69
A.K.V.

Triangular array.
 .250" separation edges - edges.

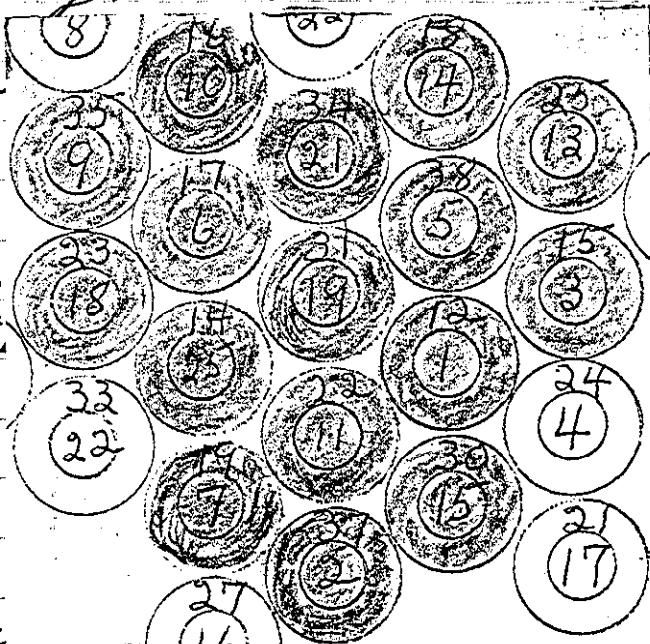
Removed 3 rods. One from every other corner. Now have an triangular array with 2 ring. Total of 16 rods.

(14)

Water ht = 80.25
 + 1.50

$C = 60.84 \mu = 14.34$

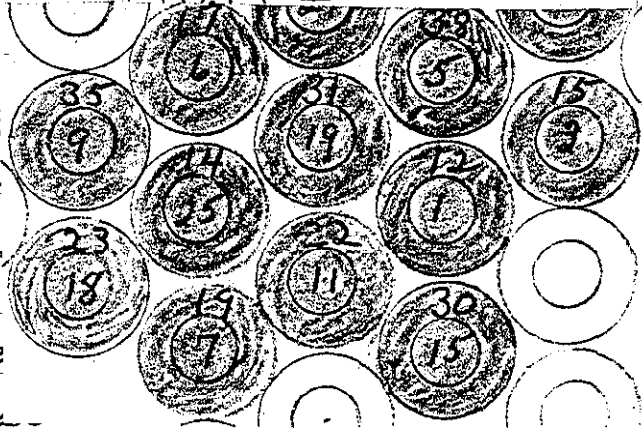
0925 Water ht = 79.30
 System just critical
 Drain.



Removed 1 rod. No array, with 1 fur in second ring. 1 corner a 1 rod. Total of 15 rods.

(15)

1105 Water ht = 91.600
 System sub critical
 Drain.



Triangular
250" sep

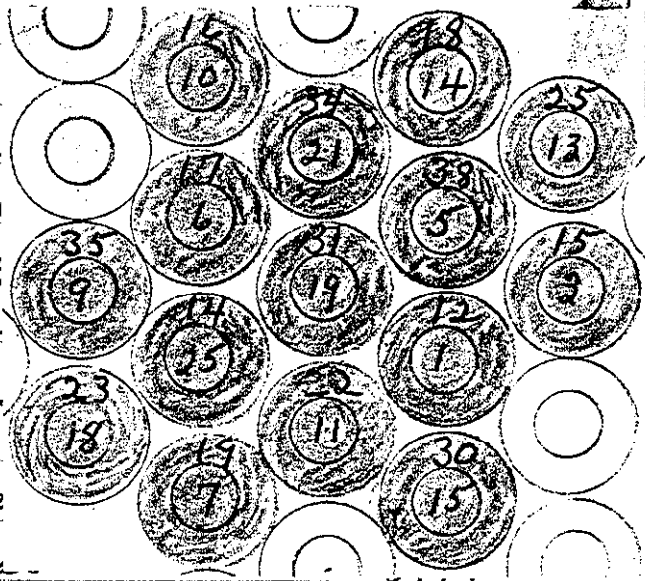
Removed 3 rods.
corner. Now has
with 2 ring. Later y.

(16) Water ht = 80.25 cm $\phi = .95$ Temp $^{\circ}C$
' + per 29.6 $^{\circ}C$
 $C = 60.84 \mu = 14.3 \mu = 15.0 \mu / \text{cm}$

0925 Water ht = 79.30 cm
System just critical
Drain.

(17) Removed 1 rod. No
array, with 1 fur
in second ring. 1
corner a 1 rod
Total of 15 rods.

1105 Water ht = 91.60 cm
System sub critical.
Drain.



Triangular
250" sep

Removed 3 rods.
corner. Now has
with 2 ring. Later

250" separation
Page 107

(16)
Water ht = 80.25 cm
+ for

$C = 60.84 \mu = 14.3 \%$

0925

Water ht = 79.30 cm
System just critical
Drain.

(17)
Removed 1 rod. Now have an triangular
array, with 1 full ring. Plus 8 rods
in second ring. Have 3 rod on 2 opposite
corners & 1 rod on 2 opposite faces.
Total of 15 rods.

1105

Water ht = 91.60 cm
System sub critical
Drain.

Temp °
29.6

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE	SET	START-UP RANGE
K-1	3X10 ⁻¹²	Meter ✓	1"	✓	3X10 ⁻¹²
	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700 ✓	Alarm ✓	5"	✓	500 ✓
PM-2	1300 ✓	Low ✓	36"	✓	900 ✓
	"	Alarm ✓	2"	✓	"
LOG-N CALIBRATE		✓	OPERATE	✓	SOURCE No. P-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by I.D.C. Personnel check by I.D.C.Instruments and safeties checked and reset by AKCSource in checked by AKC Source No. M-93Emergency equipment in control room checked by I.D.C.Instruments in trip circuit: K-1-2 PM-1-2Red light on by AKC Time 0835Start-up OK'd by I.D.C. AKC Date 5-8-69

Triangular array.

70 trunks 7.2" radi.

.250" separation edge-edge.

Have an triangular array. Total of 7 units.

Water ht = 63.10 cm

$\Delta h = .40$

Temp °

+ Res

29.5 °

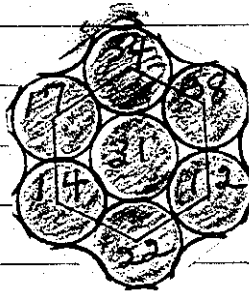
$\Gamma = 180.36 = 6.14 = 15.24/cm$

1000

Water ht = 62.70 cm

System just critical

Drain.



Removed 1 rad. Now have 6 rocks in a triangular array.

1358

Water ht = 91.70 cm

System sub critical

Drain.

(5)

Temp °

29.7 °

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 ✓	"	✓	"
	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	15"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
	"	Alarm ✓	2"	✓	"

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

DUMP WELL PROBE LIGHT _____

START-UP CHECK LIST

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

Instruments and safeties checked and reset by AMM

Source in checked by AMM 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 AMM Time 1015

Start-up OK'd by F.D.C. AMM Date 5-9-69

" 2.56" rods " (Inserts)
0(3.85)

111

Have an Triangular array, 2 full rings.
Total ~~separation~~ number of rods = 19.
average separation = 0.572" edge-edge.

Water ht = 60.60 $\Delta h = .60 \text{ cm}$ Temp $^{\circ}\text{C}$
' + Per 24.5 $^{\circ}\text{C}$

$E = 93.44 \text{ sec} = 10.9 \text{ d} = 17.3 \text{ \%/cm}$. (3)

1102 Water ht = 60.00 cm
System just critical
Drain.

Removed 2 rods, 1 each from opposite corners.
Total of 17 rods.

1435 Water ht = 91.70 cm Temp $^{\circ}\text{C}$
System sub critical. 24.5 $^{\circ}\text{C}$
Drain.

(5)

aver:

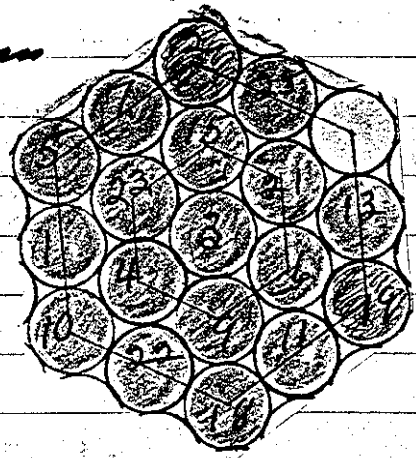
added 1 rad. Now have an triangular array. 2 rings with 1 rad removed from 1 corner. Total of 18 rods.

Water ht = 71.90 cm $d_t = 2.5$ cm Temp $^{\circ}$
 $^{\circ}$ F Per 29.6 $^{\circ}$ C

$$T = 65.19 \text{ sec} = 13.6 \text{ } \mu\text{s} = 5.4 \text{ } \mu\text{s/cm}$$

Water ht = 69.40 cm
 System just critical
 Chain.

(4)



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 ✓	"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	5"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	2"	✓	"

LOG N CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by ^{F.I.D.C.} AKK Personnel check by F.I.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.I.D.C.

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

Red light on by AKK Time 0230

Start-up OK'd by F.I.D.C. AKK Date 5-12-69

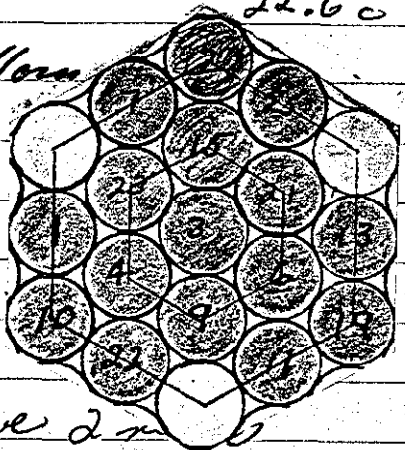
Triangular array.
 avg separation edge-edge = .713"

Have an triangular array, 2 rods with
 1 rod removed from every other corner.
 Total of 16 rods.

Water ht = 69.10 cm $\Delta h = 1.10$ cm Temp °C
 + per 22.6 °C

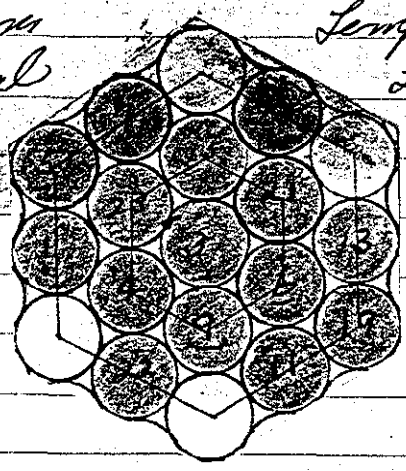
$S = 47.80$ cm = 16.9 ft = 15.4 ft/cm

1315 Water ht = 68.00 cm
 System just critical
 Drain.



Removed 1 rod. Now have 2 rods
 with 4 rods removed 2 each from
 opposite faces. Total of 15 rods.

Water ht = 91.60 cm Temp °C
 System sub critical 23.5 °C
 Drain.



(7)

Triangular array.
avg separation edge-edge = .713"

Have an triangular array. 2 rings with
1 rad removed from every
Total of 16 rads.
".713" separation
Page 114

Water ht = 69.10 cm $\Delta h =$
+ per

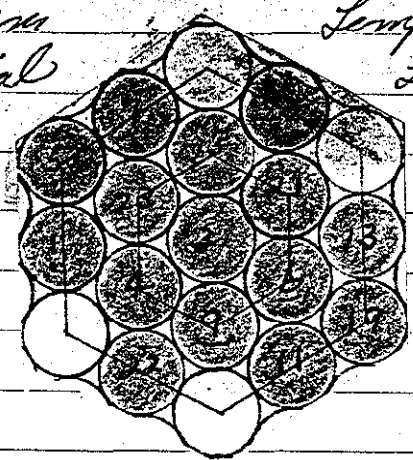
$\tau = 47.80 \text{ sec} = 16.9 \text{ f} = 15.4 \text{ f/cm}$

1315 Water ht = 68.00 cm
System just critical
Drain. (6)

Removed 1 rad. Now have 2 rings
with 4 rads removed 2 each from
opposite faces. Total of 15 rads.

Water ht = 91.60 cm
System sub critical
Drain. (7)

Temp °C
23.5°



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3X10 ⁻¹²	Meter	1"	✓	3X10 ⁻¹²
"	"	Fast	"	✓	"
K-2	—	Meter	—	✓	"
"	—	Fast	—	✓	"
R-1					
R-2					
PM-1	700V	Alarm	5"	✓	500V
PM-2	1200V	Low	10"	✓	900V
"	"	Alarm	2.0"	✓	"

LOG N CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by I.D.C. Personnel check by I.D.C.
 Instruments and safeties checked and reset by A.K.P.
 Source in checked by A.K.P. Source No. M-93
 Emergency equipment in control room checked by I.D.C.
 Instruments in trip circuit: K-1 PM-1-2
 Red light on by A.K.P. Time 0900
 Start-up OK'd by I.D.C. A.K.P. Date 5-13-69

Triangular array.
avg separation edge - edge = 1.26"

~~10.00~~ Have an triangular array. 2 rings.
with 2 rods removed. 1 each from
opposite corners. Total of 17 rods.

Water ht = 48.70 cm $\Delta h = .20$ cm Temp $^{\circ}$ C
+ Per 23.0 $^{\circ}$ C

$$\tau = 119.51 \text{ sec} = 8.6 \text{ f} = 43.0 \text{ Hcm}$$

10.00 Water ht = 48.50 cm

System just critical
Drain.

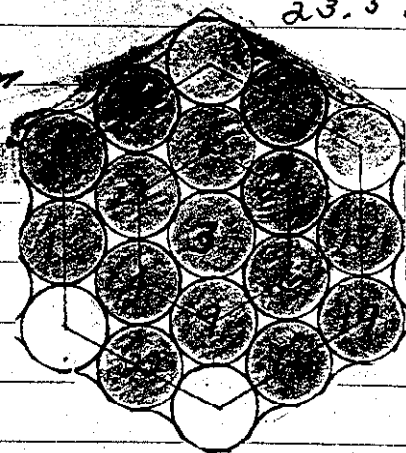
Removed 2 rods. Now have 2 rings with
4 rods removed, 2 each from opposite
faces. Total of 15 rods.

Water ht = 64.90 cm $\Delta h = .90$ cm Temp $^{\circ}$ C
+ Per 23.5 $^{\circ}$ C

$$\tau = 89.09 \text{ sec} = 10.8 \text{ f} = 13.5 \text{ Hcm}$$

11.09 Water ht = 64.10 cm

System just critical
Drain.



Triangular array.
avg separation edge-edge = 1.26"

117

Removed 1 rod. Have two rings with 5
rods removed. 1 each from five corners.
Total of 14 rods.

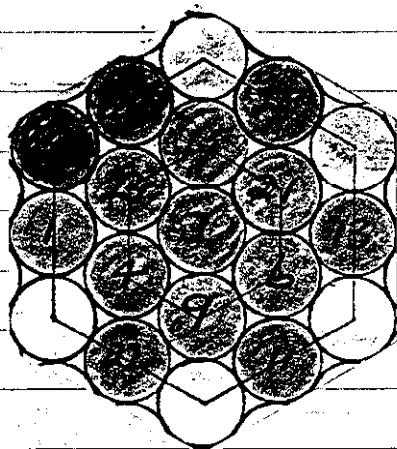
Water ht = 91.70 cm.

³ - Per

$$U = -223.82 \text{ sec} = -7.14 \text{ (10)}$$

1345

Drain:



INSTRUMENT-CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	3×10^{-12}
	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2	—	Meter	—	—	—
	—	Fast	—	—	—
R-1					
R-2					
FM-1	700V	Alarm <input checked="" type="checkbox"/>	15"		500V
PM-2	1200V	Low <input checked="" type="checkbox"/>	10"	<input checked="" type="checkbox"/>	900V
	"	Alarm <input checked="" type="checkbox"/>	2"	<input checked="" type="checkbox"/>	
LOG N CALIBRATE <input checked="" type="checkbox"/>		OPERATE <input checked="" type="checkbox"/>		SOURCE No. B-80	
DUMP WELL PROBE LIGHT <input type="checkbox"/>					

START-UP CHECK LIST

Equipment checked by ^{F.I.C.} AKR Personnel check by F.I.C.
 Instruments and safeties checked and reset by AKR
 Source in checked by AKR Source No. M-4-3
 Emergency equipment in control room checked by F.I.C.
 Instruments in trip circuit: K-1 DC-1-2
 Red light on by AKR Time 0805
 Start-up OK'd by F.I.C. AKR Date 5-14-69

Triangular array.
 avg separation edge - edge = 1.79" 119

Have an triangular array. 2 full rings
 Total of 19 rods.

0852 Water ht = 91.60 cm Temp °C
 System sub critical
 Drain:

Added 2 rods, 1 each to opposite faces
 in 3 ring. Total of 21 rods.

Water ht = 91.70 cm $\Delta h = 10.1 \text{ cm}$

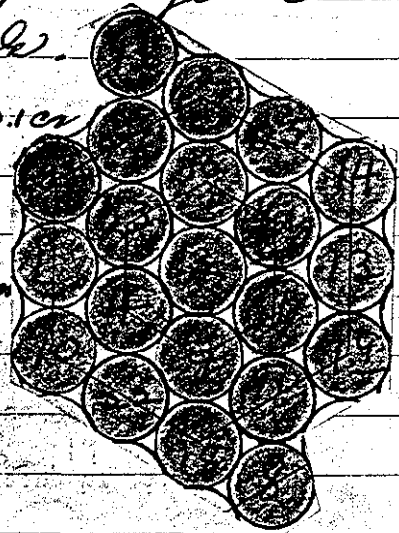
+ Per

$C = 149.94 \text{ sec} = 7.14 = .704/\text{cm}$

1019 Water ht = 81.60 cm

System just critical

Drain:



Removed 1 rod in 3 ring. Now have 2 full
 rings, plus 1 rod on 1 face in 3rd ring. 20 rods

1125 Water ht = 91.80 cm Temp °C
 System sub critical 23.5
 Drain:

Triangular Array.
avg separation edge - edge = 1.79" ¹¹⁹

Have an triangular array. 2 full rings
Total of 19 rods.

0852 Water ht = 91.60 cm Temp °C
System sub critical
Drain.

Added 2 rods, 1 each to opposite
in 3 ring. Total of 21 rods.

Water ht = 91.70 cm $b_4 = 10.10\text{ cm}$ Temp °C
' + Per 23.5 °C
 $C = 149.94 \text{ sec} = 7.14 = .70 \text{ ft/cm}$.

1014 Water ht = 81.60 cm
System just critical
Drain.

Removed 1 rod in 3 ring. Now have 2 full
rings, plus 1 rod on 1 face in 3rd ring. 20 rods.

1125 Water ht = 91.80 cm Temp °C
System sub critical 23.5
Drain.

1.79" separation
edge - edge
P-119

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

START-UP CHECK LIST

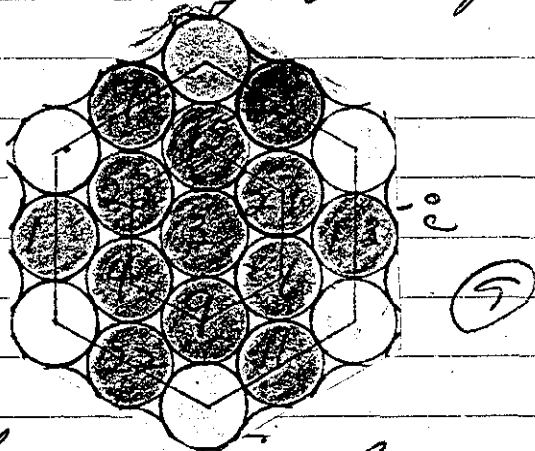
Equipment checked by I.P.C. A.H.C. Personnel check by F.O.C.
 Instruments and safeties checked and reset by A.H.C.
 Source in checked by A.H.C. Source No. M-93
 Emergency equipment in control room checked by I.P.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by A.H.C. Time 0900
 Start-up OK'd by F.O.C. A.H.C. Date 5-20-68

Triangular array.
 avg separation edge-edge = 1.00"

12

Have an Triangular array. 1 full ring, plus
 1 rad on each face in 2nd ring. Total of
 13 rods.

0950 Water ht = 91.60 cm
 System sub critical
 Drain.

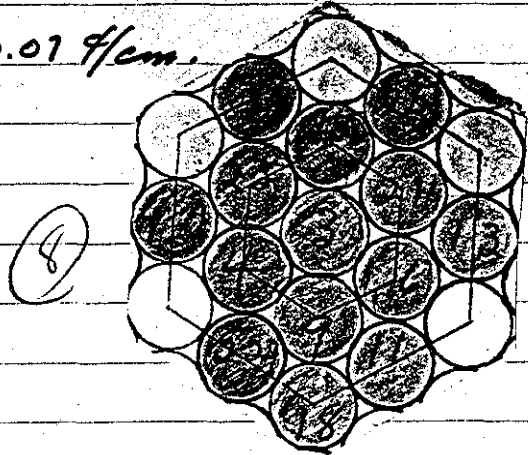


Added 1 rod. Now have an Triangular
 array, filled with 1 full ring, plus 7
 rods in second ring. Total of 14 rods.

Water ht = 74.25 cm $\Delta h = 1.35 \text{ cm}$ Temp $^{\circ}\text{C}$
 + Per 23.2 $^{\circ}\text{C}$

$U = 65.19 \text{ sec} = 13.64 = 10.07 \text{ f/cm.}$

1056 Water ht = 72.90 cm.
 System just critical
 Drain



Triangular array.
 avg separation edge-edge = 1

①
 separation = 1.00"
 edge-edge

Have an Triangular array. 1 full
 1 rad on each face in 2nd row
 13 radi.



0950 Water ht = 91.60 cm
 System sub critical
 Drain

Temp °C
 22.5 °C

⑨

Added 1 rad. Now have an Triangular array, plus with 1 full ring, plus 7 radi in second ring. Total of 14 radi.

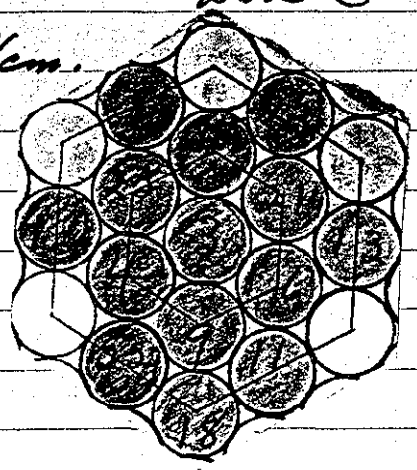
Water ht = 74.25 cm
 + Per
 $L = 65.19 \text{ sec} = 13.6 \text{ } \phi = 10.07 \text{ } \phi \text{ cm.}$

$\delta h = 1.35 \text{ cm}$

Temp °C
 23.2 °C

1056 Water ht = 72.90 cm.
 System just critical
 Drain

⑧



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	1"	✓	3×10^{-12}
"	"	Post ✓	"	✓	"
K-2	—	Meter —	—	—	"
"	—	Post —	—	—	"
R-1					
R-2					
PM-1	7000	Alarm ✓	50"	—	5000
PM-2	12000	Low —	2"	—	9000
		Alarm —	10"	—	"

LOG N CALIBRATE

OPERATE

SOURCE No.

B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

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

Instruments and safeties checked and reset by AKM

Source in checked by AKM Source No. M-93

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

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

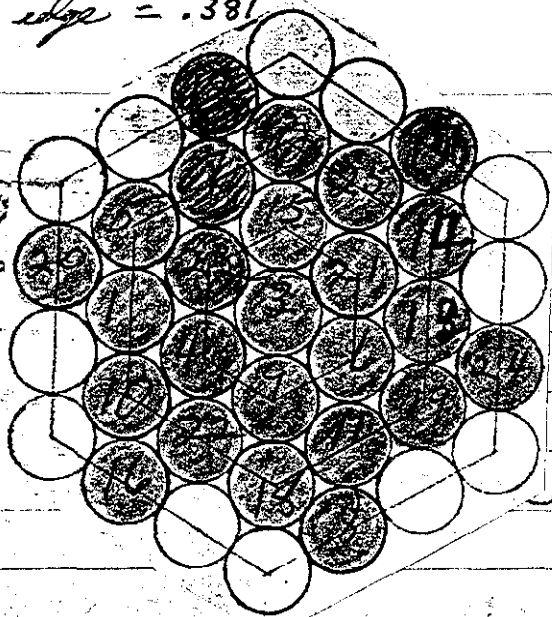
Red light on by AKM Time 0910

Start-up OK'd by F.D.C. AKM Date 5-27-69

Triangular array:
avg separation edge-edge = .381"

125

Have an triangular array
1 rod on each face in
25 rods.

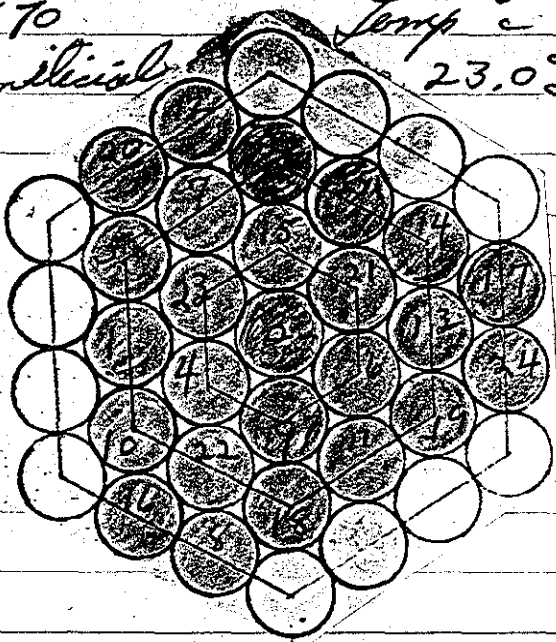


1000 Water ht = 91.70 cm
System sub critical
Drain.

Same array as above. Except now have
2 rods on every other face in 3rd row.
Total of 25 rods.

1130 Water ht = 91.70
System sub critical
Drain.

Temp °C
23.0°C



runy, separation 1381"
edge - edge 125
12

Triangular array:
avg separation edge - edge = .381"

Have an triangular array, 2 full rings, plus
1 rod on each face in 3rd ring. Total of
25 rods.

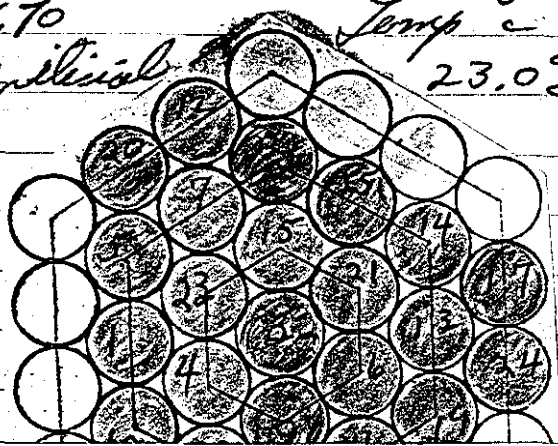
1000 Water ht = 91.70 cm
System sub critical
Drain.

Temp °
22.5°

Same array as above. Except now have
2 rods on every other face in 3rd ring.
Total of 25 rods.

1130 Water ht = 91.70
System sub critical
Drain.

Temp °
23.0°



Triangular array.
 avg separation edge-edge = 1.79"

Have an triangular array. With 3 full rings, plus 2 rods in 3rd ring, each on opposite faces. Total of 71 rods.

Water ht = 91.80 cm $\Delta h = 7.90$ cm Temp $^{\circ}$
 + Per 23.2 $^{\circ}$

$$I = 586.71 \text{ sec} = 2.17 = .267/\text{cm.}$$

1410 Water ht = 83.90 cm.

System just critical
 Drain

24 p 119

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE RANGE	SET	START-UP RANGE
K-1	3 x 10 ⁻¹²	Meter ✓	1"	✓	3 x 10 ⁻¹²
	"	Fast ✓	"	✓	"
K-2		Meter ✓		✓	
		Fast ✓		✓	
R-1					
R-2					
PM-1	700V	Alarm ✓	5"	✓	500V
PM-2	1200V	Low ✓	10"	✓	
	"	Alarm ✓	2"	✓	
LOG IN CALIBRATE ✓		OPERATE ✓		SOURCE No. B-80	
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

- Equipment checked by T.D.C. Personnel check by T.D.C.
- Instruments and safeties checked and reset by AKK
- Source-in checked by AKK Source No. M-93
- Emergency equipment in control room checked by T.D.C.
- Instruments in trip circuit: K-1 PM-1-2
- Red light on by AKK Time 1500
- Start-up OK'd by T.D.C. AKK Date 5-28-69

Same survey as described on page 126.

Water ht = 91.70 cm

Temp °C

Systems just critical

23.0 °C

1558 Drain: leg screen:

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 —	—	—	—
"	—	Fast —	—	—	—
R-1	—	—	—	—	—
R-2	—	—	—	—	—
PM-1	700V	Alarm ✓	1.5"	✓	500V
PM-2	1200V	Low ✓	1.0" 10.0"	✓	900V
"	"	Alarm ✓	2"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. <u>B-80</u>
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by I.P.C. Personnel check by F.A.C.
 Instruments and safeties checked and reset by R.M.O.
 Source in checked by R.M.O. Source No. M-43
 Emergency equipment in control room checked by F.I.C.
 Instruments in trip circuit: K-1-DM-1-2
 Red light on by A.M.P. Time 1255
 Start-up OK'd by I.A.C. R.M.O. Date 6-3-69

Same array as described on page's 126 -
128.

Water ht = 91.70 cm $\Delta h = 6.8$ cm Temp $^{\circ}$ C
+ Per 23.5 $^{\circ}$ C

$$E = 601.92 \text{ m} = 2.0 \text{ f} = .29 \text{ f/cm}$$

1403 Water ht = 84.90 cm.
System just artificial
Chain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	INSTRUMENT Meter	RANGE	INSTRUMENT CHECK		
K-1	East	TRIP			
K-2	Meter	Meter	SOURCE DISTANCE		
K-2	Fast	Fast			
R-1		Meter			
R-1	Fast	Fast			
PM-1		Alarm			
PM-1	Low	Low			
PM-2		Alarm	Alarm		
PM-2	Low	Low			
LOG N CALIBRATE		OPERATE	SOURCE No.		
DUMP WELL PROBE LIGHT		Alarm	Alarm		
DUMP WELL PROBE LIGHT		OPERATE	SOURCE No.		

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 ✓	"	-	"
"	"	Fast -	"	-	"
R-1					
R-2					
PM-1	700V	Alarm -	5"	-	500V
PM-2	1200V	Low -	10"	-	900V
"	"	Alarm ✓	1"	-	"

LOG IN CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

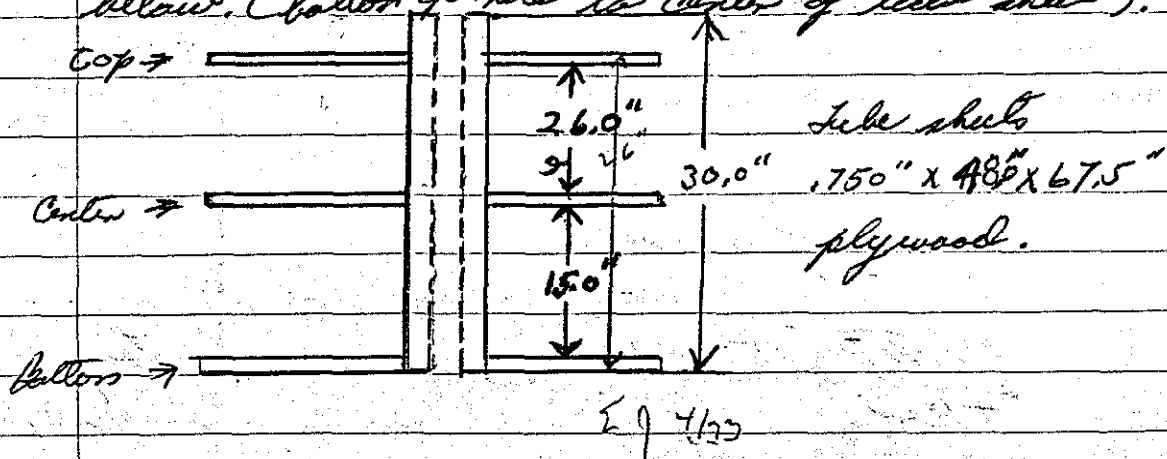
Equipment checked by ^{I.D.C.} A.K.H. Personnel check by E.D.C.
 Instruments and safeties checked and reset by A.K.H.
 Source in checked by A.K.H. Source No. M-43
 Emergency equipment in control room checked by _____
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by A.K.H. Time 0805
 Start-up OK'd by I.D.C. A.K.H. Date 10-7-69

6.2 " O.D. x 2.60 " I.D. x 30.0 " length
 0 (3.85) rods. 133

H_2O $H_2O = 76.20 \text{ cm}$
 Feed rate = 4.1 cm/min = top of rods.
 Drain = 9.1 cm/min
 Staff Pump = 9.3 cm/min.

1.250" separation edge-edge.

Have an 2 x 3 array: total of 6 rods.
 This array has 3 tube sheets, each made of
 .750" exterior plywood. sheets spaced shown
 below. (bottom of rod to center of tube sheet).



1015 Water ht = 91.70 cm Temp =
 depth sub critical 21.5°c
 Drain.

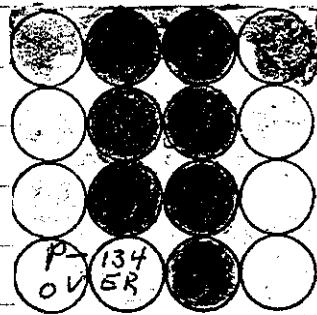
avg:

added 1 rod. Now have ~~and~~ an
2 x 4 - 1. Total of 7 rods.

Water ht = 91.50 cm $\Delta h = 6.6$ cm Temp $^{\circ}$ C
+ Per 23.0 $^{\circ}$ C

$$C = 488.92 \text{ cm} = 2.54 = .38 \text{ f/cm}$$

1327 Water ht = 84.90 cm
System just critical
Drain to 0.0 cm.



Repeat of above:

Water ht = 91.60 cm $\Delta h = 5.8$ f Temp $^{\circ}$ C
+ Per 23.0 $^{\circ}$ C

$$C = 804.01 \text{ cm} = 1.54 = .26 \text{ f/cm}$$

1440 Water ht = 85.80 cm
System just critical
Drain

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SST	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	1"	-	3×10^{-12}
"	"	Fast ✓	"	-	"
K-2	"	Meter ✓	"	-	"
"	"	Fast ✓	"	-	"
R-1					
R-2					
PM-1	700V	Alarm ✓	15"	-	500V
PM-2	1200V	Low ✓	10"	-	900V
"	"	Alarm ✓	1"	-	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. <u>B-80</u>
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by F.I.C. Personnel check by F.I.C.
 Instruments and safeties checked and reset by ATM
 Source in checked by ATM Source No. 74-23
 Emergency equipment in control room checked by F.I.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by ATM Time 0903
 Start-up OK'd by F.I.C. ATM Date 10-8-69

.250" separation edge - edge.

Repeat of last experiment, except center grid plate (see p. 133) moved to top of top grid plate.

$$\Delta h = 8.2 \text{ cm}$$

Water ht = 91.50 cm Temp. °C
 1 + Per 22.6 °C

$$T = 219.47 = 5.14 = .624/\text{cm}$$

0925 Water ht = 83.30 cm
 System just critical
 Drain.

Repeat of above.

$$\Delta h = 8.2 \text{ cm}$$

Water ht = 91.50 cm Temp. °C
 2 + Per 22.7 °C

$$T = 219.47 = 5.14 = .624/\text{cm}$$

1024 Water ht = 83.30 cm
 System just critical
 Drain.

.250" separation edge - edge 37

Removed the extra ~~top~~ ^{top} guide plate:

Water ht = 91.50 cm $\Delta h = 10.30$ cm Temp °C
3 + Per 22.7°C

$$C = 65.19 \text{ sec} = 13.64 = 1.34/\text{sec}$$

1320 Water ht = 81.20 cm Temp °C
System just critical
Drain:

Repeat of above:

Water ht = 91.50 cm $\Delta h = 10.30$ cm Temp °C
4 + Per 22.7°C

$$C = 65.19 \text{ sec} = 13.64 = 1.34/\text{sec}$$

1410 Water ht = 81.20 cm
System just critical
Drain:

INSTRUMENT CHECK

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

START-UP CHECK LIST

Equipment checked by F.P.C. M.T.L. Personnel check by F.P.C.
 Instruments and safeties checked and reset by M.T.L.
 Source in checked by M.T.L. Source No. 17-93
 Emergency equipment in control room checked by F.P.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by M.T.L. Time 0925
 Start-up OK'd by F.P.C. M.T.L. Date 10-9-69

.250" separation edge - edge.
6.2" rods + 2.56" rods.

Have an ~~3x4~~ ^{3x4} array. Total of 12 rods.

$d_h = 1.26 \text{ cm}$
 $d_r = 1.20 \text{ cm}$

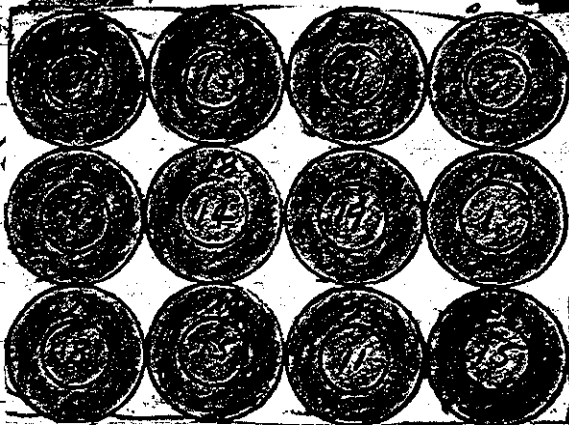
Water ht = 79.00 cm

+ Per

$C = 47.81 \text{ sec} = 16.9 \text{ ft} = 14.1 \text{ ft}$

0937 Water ht = 77.80 cm

System just critical
Drain.



Remaind 1 rod. Now have an 3x4-1 array. Total of 11 rods. (Rods 18 + 23 remaind)

1035 Water ht = 91.70 cm

System sub critical
Drain.

Temp °C

22.7 °C

.500" separation edge - edge.

6.2" rods.

Have an 2x3 array. Total of 6 rods.

$d_r = 2.60 \text{ cm}$

Water ht = 82.60 cm

+ Per

$C = 49.98 \text{ sec} = 16.4 \text{ ft} = 6.3 \text{ ft/cm}$

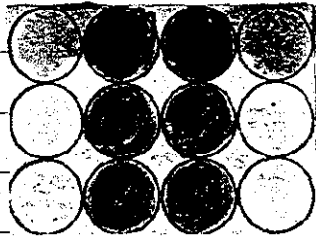
Temp °C

22.7 °C

1416 Water ht = 80.00 cm

System just critical
Drain.

(6)



avg

250" separation edge-edge
P-139

.250" spiral
6.2" rods +

Have an ^{3x4} ~~5x4~~ array.

Water ht = 79.00 cm Temp °C
+ Per 22.5 °C

$C = 47.81 \text{ sec} = 16.9 \text{ f} = 14.1 \text{ f/cm}$

0937 Water ht = 77.80 cm
System just critical
Drain.

Removed 1 rod. Now have an 3x4-1
array. Total of 11 rods. (Rods 18 & 23 removed)

1035 Water ht = 91.70 cm Temp °C
System sub critical 22.7 °C
Drain.

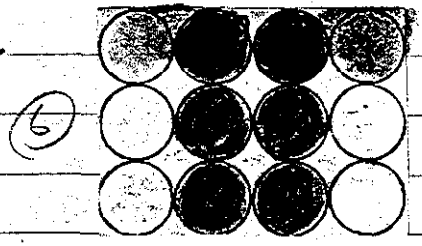
.500" separation edge-edge,
6.2" rods.

Have an 2x3 array. Total of 6 rods.
D.L. = 2.60 cm

Water ht = 82.60 cm Temp °C
+ Per 22.7 °C

$C = 49.98 \text{ sec} = 16.4 \text{ f} = 6.3 \text{ f/cm}$

14-16 Water ht = 80.00 cm
System just critical
Drain.



arr.

.500" separation edge-edge.

Removed 1-rad; Have on 2 X 3-1 array.
Total of 5 rads. (Removed rad # 14.)

Water ht = 92.00 cm
System sub critical
Drain.

Temp °
22.7 °

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	1"	-	10×10^{-12}
	"	Fast -	"	-	"
K-2	"	Meter -	"	-	3×10^{-12}
	"	Fast -	"	-	"
R-1					
R-2					
PM-1	700V ✓	Alarm -	.50"	-	500V
PM-2	1200V ✓	Low -	10"	-	900V
	"	Alarm ✓	2"	-	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by Z.P.C Personnel check by Z.P.C
 Instruments and safeties checked and reset by A.H.V
 Source in checked by A.H.V Source No. 14-93
 Emergency equipment in control room checked by F.P.C
 Instruments in trip circuit: 7-1-2 PM-1-2
 Red light on by A.H.V Time 1005
 Start-up OK'd by F.P.C A.H.V Date 10-10-68

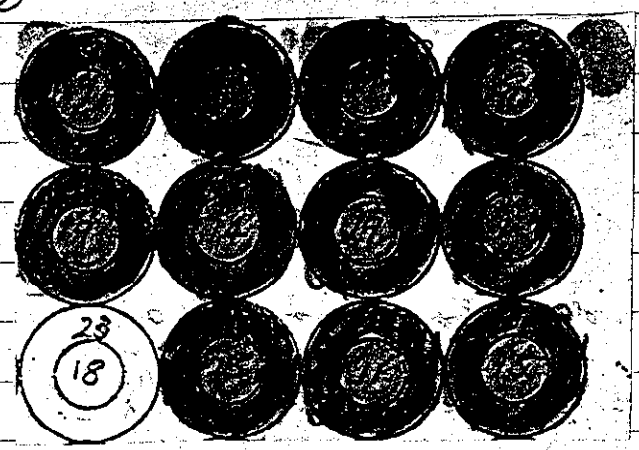
.500" separation edge-edge.
 6.2" rods + 2.56" rods.

Have on 3 X 4 - 1 array: Total of 11 rods.
 dia = .60 cm

Water ht = 67.70 cm Temp °C
 + Per 22.2 °C

$T = 115.17 \text{ sec} = 8.84 = 14.74 / \text{cm}$

11.15 Water ht = 67.10 cm
 System just critical
 Drain.



over

142

.500" separation edge-edge.
6.2" x 2.56" mesh.

Removed 1 rad (#35+9): Now have an
3x4 - 2 array: Total of 10 rads.

1319 Water ht = 91.50 cm

Temp °C

System sub-critical

22.5 °C

Drain.

10/15/69 Key No. 684581

1 gal sample of water in west hold tank
for water analysis for lead.

10/15/65

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE FUNCTION	SET	START-UP RANGE
K-1	3x10 ⁻¹²	Meter ✓ Fast ✓	1"	✓	3x10 ⁻¹²
K-2	3x10 ⁻¹²	Meter ✓ Fast ✓	1"	✓	3x10 ⁻¹²
D-1					
D-2					
PM-1	700V	Alarm ✓	12"	✓	500V
PM-2	1200V	Low ✓ Alarm ✓	10" 1"	✓	500V

LOG IN CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by IDC Personnel check by IDC
 Instruments and safeties checked and reset by EA
 Source in checked by EA 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 1455
 Start-up OK'd by IDC, EJ Date 10/15/65

144

0.75 in. Surface Separation
6.2" diam annuli

10/15/69

5 units in source pattern 2x2+1

1535

W at W @ 91.6 km. Subcritical. Temp 20.5
Durin

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3 K10 ⁻¹²	Meter ✓	1"	✓	3 K10 ⁻¹²
"	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	1.5"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	2"	✓	"

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

DUMP WELL PROBE LIGHT _____

10/14/65

START-UP CHECK LIST

Equipment checked by I.D.C. / RKR Personnel check by I.D.C.

Instruments and safeties checked and reset by RKR

Source in checked by Σ Source No. M-43

Emergency equipment in control room checked by RKR

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

Red light on by Σ Time 840

Start-up OK'd by I.D.C. Σ, RKR Date 10/14/65

6.2" rods.

0.75" separation edge-edge

Now have 2x3 lattice. Total 6 units (24 rods)

OR = 1.1 cm

0927

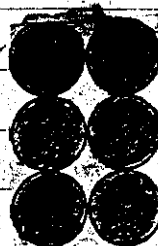
Water @ 89.7 cm. + Period #1 Temp. 21.7°C

$E = 97.78 \text{ sec} = 10.0\% = 9.14/\text{cm}$

0950

Water @ 79.1 cm. Critical

Drain



6.2" + 2.56" rods.

0.75" separation edge-edge

Now an 3x4-2 array.

Water ht = 82.90 cm:

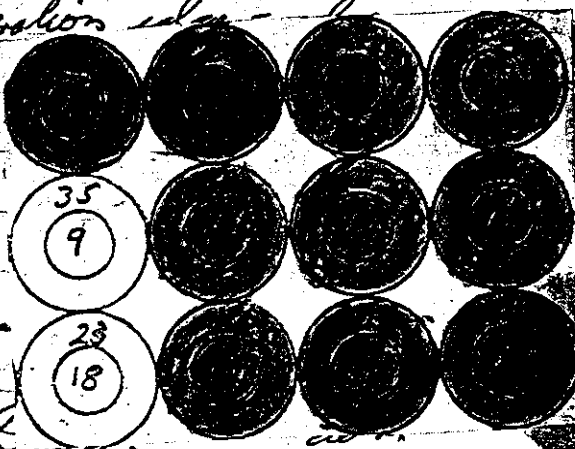
+ Per

$E = 60.84 \text{ sec} = 14.1\% = 6.34/\text{cm}$

1336

Water ht = 80.65 cm

System just critical:



START-UP CHECK LIST

Equipment checked by T.P.C Personnel check by TDC

Instruments and safeties checked and reset by RKR

Source in checked by SJ Source No. M-43

Emergency equipment in control room checked by RKR

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

Red light on by SJ Time 840

Start-up OK'd by TDC, RKR Date 10/16/65

6.2" rods.

0.75" separation edge
6.2" rods
0.75" sep.
P-145

array 2x3 lattice. Total 6 (24 rods)
BR = 1.1 cm

at W @ 89.7 cm. + Period #1 Temp. 21.7°C

7.78 rods = 10.04 = 9.14/cm

at W @ 79.1 cm. Critical

6.2" + 2.56" rods.

0.75" separation edge-edge.

array 3x4 - 2 array. Total of 10 rods.

at W @ 82.90 cm: BR = 2.25 cm Temp °C
22.0°C

8.4 rods = 14.14 = 6.34/cm

at W @ 80.65 cm

at W first critical: Drain. over

6.2" + 2.56" rods
0.75" sep. edge-edge
P-145

146

:75" separation edge-edge.
6.2" + 2.56" rods.

Removed 1 rod. Have an 3x3 array. Total of
9 rods.

1445 Water ht = 91.50 cm
System sub critical
Drain.

Temp: 22.0°

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3x10 ⁻¹²	Meter	1"		10x10 ⁻¹²
	"	Fast	"		"
K-2	"	Meter	"		2x10 ⁻¹²
	"	Fast	"		"
R-1					
R-2					
PM-1	700V	Alarm	.5"		500V
PM-2	1200V	Low	8"		9000
	"	Alarm	1"		"

LOG N. CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by ^{F.P.C.} 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 F.P.C.
 Instruments in trip circuit: K-1-2 PM 1-2
 Red light on by AKL Time 1020
 Start-up OK'd by F.P.C. AKL Date 10-17-69

1.0" separation edge - edge.
6.2" rods.

Have an 2x3 array. Total of 6 rods.

1105 Water ht = 91.50 cm, Temp °C
system sub critical 21.5 °C
Drain.

Added 1 rod. Now have an 2x4 array.
Total of 7 rods.

Water ht = 82.40 cm, Temp °C
+ pen 21.5 °C
 $\Delta h = 2.05$

$E = 82.57 \text{ cm} = 11.94 = 5.64 \text{ cm}$

1330 Water ht = 80.35 cm
system just critical
Drain



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3 x 10 ⁻¹²	Meter ✓	1"	✓	3 x 10 ⁻¹²
"	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	.5"	✓	500V
PM-2	1200V	Low ✓	6"	✓	900V
"	"	Alarm ✓	1"	✓	"

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

DUMP WELL PROBE LIGHT _____

START-UP CHECK LIST

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

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

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

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

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

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

Start-up OK'd by F.D.C. A.K.M. Date 10-28-69

150

1.0" separation edge-edge
6.2" rods + 2.56" rods.

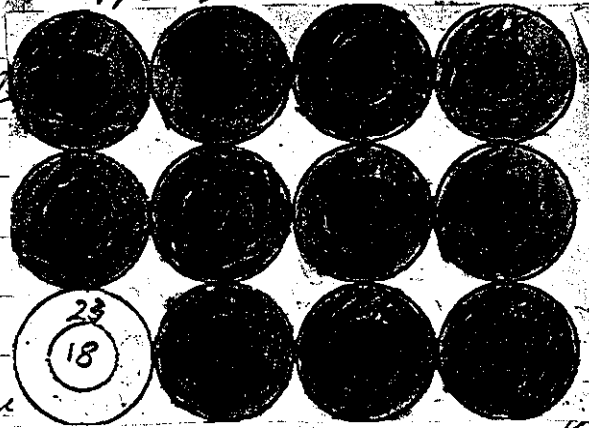
~~Have~~ Have an 3x4-1 array. Total of 11 rods.

Water ht = 73.40 cm: ^{50 cm} Temp °C
+ Per 20.5 °C

$\tau = 167.32 \text{ sec} = 6.5 \text{ ft} = 13.0 \text{ ft/cm}$.

1340 Water ht = 72.90 cm

System just critical
Drain.



Removed 1 rod. Now
Total of 10 rods.

1510 Water ht = 91.50 cm.

System sub-critical
Drain

Temp °C
20.7 °C

150

1.0" separation edge-edge

6.2" rods

6.2" rods + 2.56" inserts
separation = 1.0" edge-edge
3 x 4 array - 1. Total 11 rods
P=150

~~Have~~ Have an 3 x 4 - 1

Water ht = 73.40 cm

+ Per

$\tau = 167.32 \text{ sec} = 6.5 \text{ h} =$

1340 Water ht = 72.90 cm

System just critical
Drain

Removed 1 rod. Now have an 3 x 4 - 2 array.
Total of 10 rods.

1510 Water ht = 91.50 cm.

System sub critical
Drain

Temp °C
20.7°

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	1"	✓	3×10^{-12}
"	"	Feet ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
"	"	Feet ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	15"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	2"	✓	"
LOG N CALIBRATE _____			OPERATE _____	SOURCE No.	0-80
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

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

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

Source in checked by A.R.H. Source No. 12-43

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

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

Red light on by A.R.H. Time 1015

Start-up OK'd by F.P.C. A.R.H. Date 10-28-69

1.5" separation edge - edge.
6.2" rods.

Have an $3 \times 4 - 2$ array; Total of 10 rods.
This array has 3 tube sheets, each made
of .50" exterior plywoods. Spaced as shown
on p-133.

Water ht = 65.50 cm $p_h = .60 \text{ cm}$ Temp $^{\circ} \text{C}$
+ Per 22.1 $^{\circ} \text{C}$
 $T = 86.92 \text{ m} = 11.04 = 18.34 \text{ cm}$

1053 Water ht = 69.90 cm
System just critical
Drain

Removed 1 rod. Now have an 3×3 array. Total
of 9 rods.

Water ht = 69.00 cm $p_h = 1.45 \text{ cm}$ Temp $^{\circ} \text{C}$
+ Per 22.2 $^{\circ} \text{C}$
 $T = 41.29 \text{ m} = 19.64 = 12.94 \text{ cm}$

1313 Water ht = 67.55 cm
System just critical
Drain.

Removed 1 rod. Now have an 3x3-1 array.
Total of 8 rods.

1410 Water ht = 92.00 cm Temp °
System sub critical 22.2°
Drain.

added 1 rod. Now have an 3x3 array, with
Total of 9 rods. also moved the center
tube shut to top of top tube sheet.

Water ht = 74.30 cm $z_h = 9.5 \text{ cm}$ Temp °
3 + per 22.2°
 $\tau = 80.90 \text{ sec} = 11.7 \text{ f} = 12.3 \text{ f/cm}$

1540 Water ht = 73.35 cm.
System just critical
Drain. $\text{avg} = 12.15$

Repeat of above:

Water ht = 73.95 cm. $z_h = 1.60 \text{ cm}$ Temp °
4 + per. 22.2°

$\tau = 147.76 \text{ sec} = 7.2 \text{ f} = 12.0 \text{ f/cm}$.

1600 Water ht = 73.35 cm.
System just critical: Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3X10 ⁻¹²	Meter ✓	1"	✓	3X10 ⁻¹²
	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	5"	✓	1500V
PM-2	1200V	Low ✓	10"	✓	900V
	"	Alarm ✓	1"	✓	"

LOG IN CALIBRATE OPERATE SOURCE No. 0-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

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

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

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

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

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

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

Start-up OK'd by F.D.C. A.K.A. Date 10-30-69

1.5" separation edge-edge
6.2" radi.

155

Same array as described on p=153. 3x3 array.
Total of 9 radi. Have now removed the top
extra grid plates.

$\Delta h = 3.35 \text{ cm}$

Water ht = 73.35 cm

Temp °C

+ Per

21.5°C

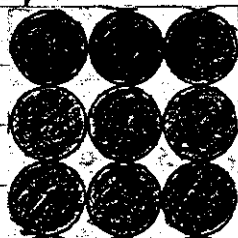
$U = 332.47 \text{ cm} = 3.54 = 10.0 \text{ ft/cm}$

0927

Water ht = 73.00 cm

System just critical

Drain.



1.5" separation edge-edge.
6.2" + 2.56" radi.

I have an 4x4 array. Total of 16 radi.

1315

Water ht = 91.50 cm

Temp °C

System sub critical

21.7°C

Drain.

over."

1.5" separation edge-edge.
6.2" + 2.56" rods.

Added 2 rods. Now have an 4x5-2 array.
Total of 18 rods.

Water ht = 91.50 cm

Temp °C

²-Per

21.70 °C

N-G.

1447 Drain:

Added 1 rod. Now have an 4x5-1 array.
Total of 19 rods.

Water ht = 77.35 cm.

$\Delta h = .65 \text{ cm}$

Temp °C

³+Per

22.0 °C

$C = 115.17 \text{ sec} = 8.84 = 13.54/\text{cm}$

1542 Water ht = 76.70 cm

System just critical
Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE - RADIANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	3×10^{-12}
"	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2	"	Meter <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
"	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
R-1					
R-2					
PM-1	700V	Alarm <input checked="" type="checkbox"/>	.5	<input checked="" type="checkbox"/>	500V
PM-2	1200V	Low <input checked="" type="checkbox"/>	8.0"	<input checked="" type="checkbox"/>	900V
"	"	Alarm <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	"
LOG N CALIBRATE <input checked="" type="checkbox"/>		OPERATE <input checked="" type="checkbox"/>		SOURCE No. <u>B-80</u>	
DUMP WELL PROBE LIGHT <input checked="" type="checkbox"/>					

START-UP CHECK LIST

Equipment checked by I.V.C. Personnel check by F.A.C.
 Instruments and safeties checked and reset by A.K.M.
 Source in checked by A.K.M. Source No. M-93
 Emergency equipment in control room checked by I.V.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by A.K.M. Time 0810
 Start-up OK'd by I.V.C. A.K.M. Date 10-31-69

15.

1.5" separation edge - edge.
6.2" + 2.56" radi.

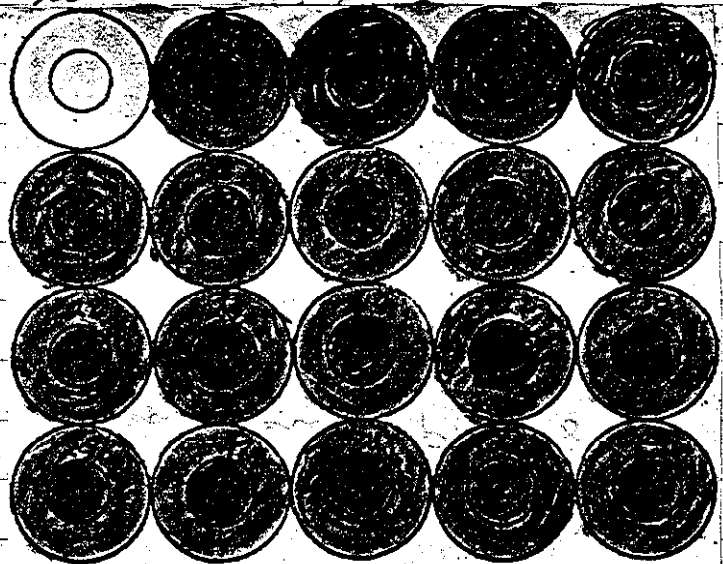
Repeat of last run. I have an 4x5-c array.
Total of 19 radi.

Water ht = 77.40 cm $d_h = 2.50$ cm Temp °C
+ Por 21.5 °C

$$E = 130.38 \text{ cm} = 8.04 = 16.04 / \text{cm}$$

Water ht = ~~76.95~~
76.90 cm

System just critical
Drain:



Rods in contact:
6.2" rod + 2.56" rods.

159

Have an 4x5-1 array: Total of 19 rods.

Water ht = 57.00 cm
2 + Rod
Temp °C
21.7 °C

$$S = 147.76 \text{ cm} = 7.2 \text{ ft} = 19.0 \text{ ft/cm}$$

1323 Water ht = 56.60 cm

System just critical
Crises.

Repeat of above: Purpose is to expose H.F.I.R
Inner annular fuel plate.

K-1 = 12.0"
K-2 = 19.5"
Log N = 18.0" } Distance from array:

Water ht = 57.50 cm
3 + Her Void
Temp °C
21.8 °C

System returned by K-2.

System reset: $Sh = .40$

Water ht = 57.00 cm

+ Rod.

$$121.69 \text{ sec} = 8.9 \text{ ft} = 20.0 \text{ ft/cm}$$

Water ht = 57.60 cm. System just critical: over.

160

1442 *Ephraem non stultus:*

1512 *Dnein:*

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3x10 ⁻¹²	Meter ✓	1"	✓	3x10 ⁻¹²
"	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	50.5"	✓	500V
PM-2	1200V	Low ✓	8"	✓	900V
"	"	Alarm ✓	1"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROBE LIGHT					

START-UP CHECK LIST

Equipment checked by ^{F.P.C.} AKU Personnel check by F.P.C.

Instruments and safeties checked and reset by AKU

Source in checked by AKU Source No. 14-43

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

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

Red light on by AKU Time 0914

Start-up OK'd by AKU, F.P.C. Date 11-3-69

Rods in contact
6.2" + 2.56" rods.

Removed 3 rods; Now have an 4x4 array.
Total of 16 rods.

Water ht = 70.70 cm $\Delta h = 1.3$ cm Temp $^{\circ}$ C
+ Per 22.2 $^{\circ}$ C

$$t = 65.19 \text{ sec} = 13.6 \text{ f} = 10.5 \text{ f/cm}$$

1001 Water ht = 69.40 cm
System just critical
Drain.

Removed 1 rod. Now have an 4x4-1 array.
Total of 15 rods.

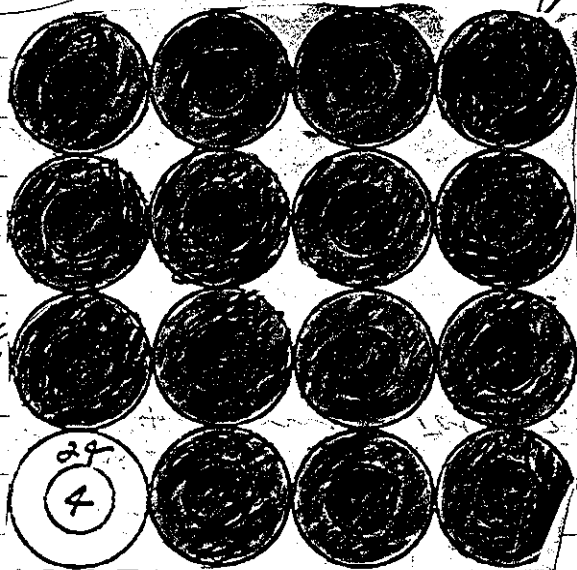
1259 Water ht = 80.10 cm.
+ Per - Void

System screamed by K.

Water ht = 79.40 cm
+ Per

$$t = 197.74 \text{ sec} = 5.6 \text{ f} = 14.0 \text{ f/cm}$$

1315 Water ht = 79.00 cm
System just critical
Drain.



Rods in contact
 6.2" + 2.56" rods.

Removed 3 rods; Now have an 4x4 array.
 Total of 16 rods.

Water ht = 70.70 cm
 + Per

$t = 65.19 \text{ sec} = 13.6 \text{ f} =$

1001 Water ht = 69.40 cm
 System just critical
 Crisis.

$\Delta h = 1.3 \text{ cm}$

6.2" rods + 2.56" inserts - Rods at Contact
 4x4 - 1 array, total 15
 P = 162.

Removed 1 rod. Now
 Total of 15 rods.

1259 Water ht = 80.10 cm.
 + Per - Void

Temp °C
 22.2 °C

System screamed by K-1. During scale change:

Water ht = 79.40 cm
 + Per

$\Delta h = 4.0 \text{ cm}$

Temp °C

$t = 197.74 \text{ sec} = 5.6 \text{ f} = 14.0 \text{ f/cm}$

1315 Water ht = 79.00 cm
 System just critical
 Crisis.

Removed 1 rod. Now have an $4 \times 4 - 2$ array.
Total of 14 rods.

1915

Water ht = 91.60 cm
system sub critical
Drain:

Temp $^{\circ}$
22.2 $^{\circ}$

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3X10 ⁻¹²	Meter ✓	1"	✓	3X10 ⁻¹²
"	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	5"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	2"	✓	"
LOG N CALIBRATE		—	OPERATE	—	SOURCE No. B-80
DUMP WELL PROBE LIGHT					

START-UP CHECK LIST

Equipment checked by F.D.C. Personnel check by F.D.C.
 Instruments and safeties checked and reset by A.K.P.
 Source in checked by A.K.P. Source No. 12-93
 Emergency equipment in control room checked by F.D.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by A.K.P. Time 0905.
 Start-up OK'd by F.D.C. A.K.P. Date 11-9-69

Rods in contact.
6.2" rods.

165

Have an 3x3 array. Total of 9 rods.

$d_s = .30 \text{ cm}$

Water ht = 47.60 cm Temp °C
+ Per --- 22.2°C

$5 = 78.23 \text{ sec} = 11.9 \text{ f} = 39.7 \text{ f}$

0847 Water ht = 47.30 cm

System just critical
Drain.

①

Removed 1 rod. Now have an 3x3-1 array.
Total of 8 rods.

$d_s = .60 \text{ cm}$

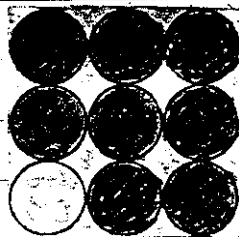
Water ht = 57.00 cm Temp °C
+ Per --- 22.2°C

$60.84 \text{ sec} = 14.3 \text{ f} = 23.83 \text{ f/cm}$

0950 Water ht = 56.90 cm

System just critical
Drain.

②



over

Rods in contact
6.2" rods.

Removed 1 rod. Now have an 3x3-2 array
Total of 7 rods.

10.58 Water ht = 91.50 cm Temp °C
System sub-critical 22.2°C
Drain.

Now have an 2x4 array. Total of 8 rods.
Rods one in contact:

Water ht = ~~72.30 cm~~ 72.30 cm $\alpha = 1.0$ Temp °C
³+Per 22.2°C

$\tau = 112.99 \mu\text{s} = 9.0 \phi = 9.0 \phi (\text{cm})$

~~Water ht =
System just critical
Drain.~~

13.43 System screened by K-2 - during scale
change. (3×10^{-8} scale)

Water ht = 71.30 cm (4)
System just critical
Drain to ~ 60.0 cm see p-167



Pool in contact
6.2" rods:

167

Repeat of last experiment (p-166)

~~rod = 1.0~~

Water ht = 72.30 cm
q + Per

Temp °C
22.2°C

$T = 112.99 \text{ sec} = 9.0 \text{ d} = 9.0 \text{ f/cm}$

1.407 Water ht = 71.30 cm

System just critical
Drain.

Removed 1 rod. Now have an 2x4-1 array.
Total of 7 rods.

Water ht = 91.50 cm.

System sub critical
Drain.

Temp °C
22.3°C

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			
		Fast			
R-1					
R-2					
PM-1	7000	Alarm -	.5"	-	5000
PM-2	12000	Low -	8"	-	9000
"	"	Alarm -	2"	-	"

LOG N CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by I.D.C. H.H.H. Personnel checked by I.D.C.

Instruments and safeties checked and reset by B.K.R.

Source in checked by B.K.R. Source No. M-93

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

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

Red light on by B.K.R. Time 1005

Start-up OK'd by I.D.C. B.K.R. Date 11-5-69

Rads in contact
6.2" Rads.

169

Have an triangular array: 1 full ring, plus
1 rad on ~~each~~ ^{at the} ~~outer~~ face. Total of 10 rads.

1053 Water ht = 91.70 cm

Temp °C

System sub-critical
Drain. (2)

21.6 °C

added 1 rad. Now have an triangular array
with 1 full ring, plus 2 rads on 2 opposite
faces. Total of 11 rads.

Water ht = 71.70 cm

$d = .60$ cm

Temp °C

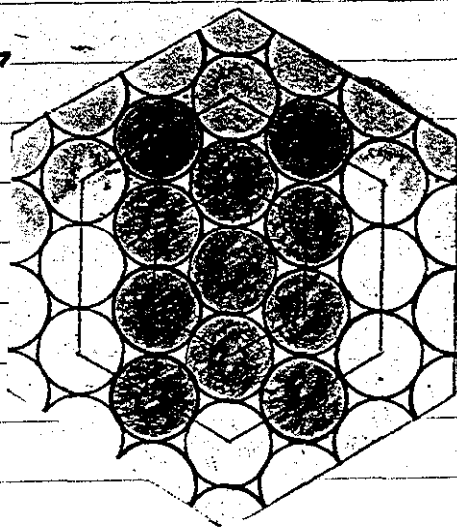
+ Pr

21.7 °C

$C = 180.36 \text{ cm} = 6.14 = 10.24/\text{cm}$

1316 Water ht = 71.10 cm

System sub-critical
Drain. (1)



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE RANGE	SET	START-UP RANGE
K-1	3X10 ⁻¹²	Meter ✓	1"	✓	3X10 ⁻¹²
"	"	✓	"	✓	"
K-2		Meter			
R-1					
R-2					
PM-1	700V	Alarm -	15"	✓	500V
PM-2	1200V	Low ✓	8"	✓	900V
"	"	High ✓	1"	✓	"
LOG IN CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

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

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

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

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

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

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

Start-up OK'd by F.D.C. A.K.C. Date 11-6-68

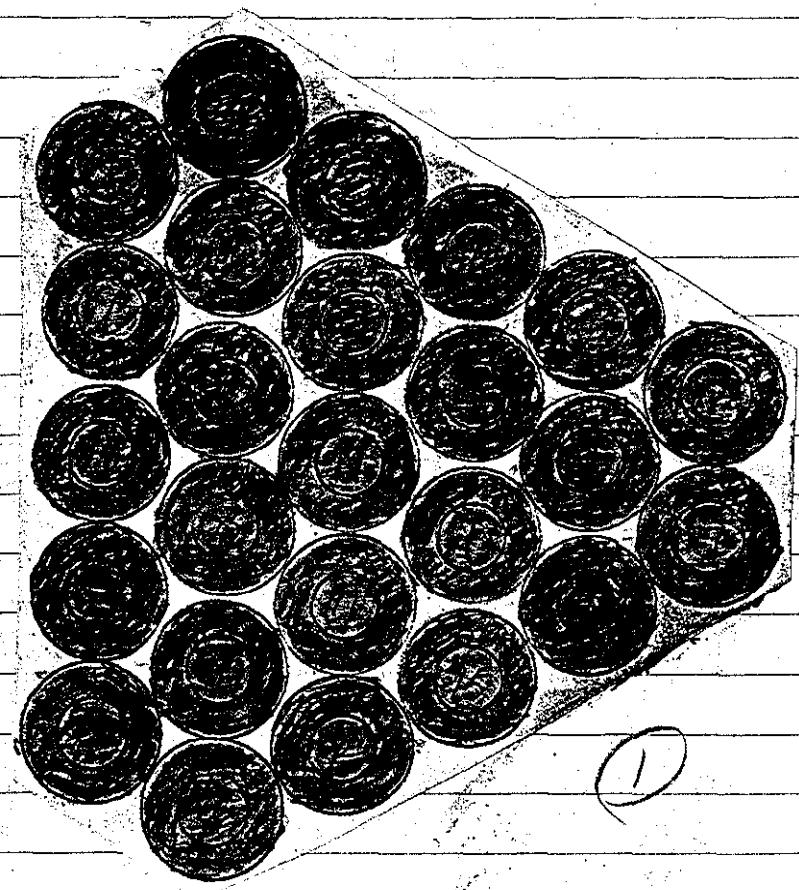
Rods in contact
6.2" + 2.56" rods,

171

Have an Triangular array, 2 full rings,
plus 2 rods on over-outer face in 3rd
ring. Total of 25 rods.

0913 Water ht = 91.50cm
system sub critical
train.

Temp °
21.7°



over

.250" separation edge-edge.
6.2" + 2.56" rods.

Have an Triangular array. 2 rings with
1 rod removed from every other corner.
Total of 16 rods.

1520 Water ht = 91.60 cm
system sub critical
Drain.

Temp °C
22.2°C

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			
		Fast			
-R-1					
R-2					
PA-1	7000 ✓	Alarm ✓	5"	✓	5000 ✓
PM-2	1200 ✓	Low ✓	8"	✓	9000 ✓
"	"	Alarm ✓	1"	✓	"
LOG N CALIBRATE	✓	OPERATE	✓	SOURCE No.	B-80
DUMP WELL PROSE LIGHT	_____				

START-UP CHECK LIST

Equipment checked by FIRC Personnel check by FIRC
 Instruments and safeties checked and reset by AKV
 Source in checked by AKV Source No. M-43
 Emergency equipment in control room checked by FIRC
 Instruments in trip circuit: K-1 MM-1-2
 Red light on by AKV Time 0815
 Start-up OK'd by FIRC AKV Date 11-7-69

.250" separation edge-edge.
 6.2" + 2.56" rods.

Added 3 rods. Now have an triangular array, two full rings. Total of 19 rods.

Water h₀ = 91.50 cm Temp °C
 System sub critical 22.0 °C
 Drain.

over:

Added 6
with 2
every 1
rad.

W.
TK
E=13

10 52 W. de.

System
Drain.



regular array,
each on
Total of 25

40°
2.0°

Removed 1 rad. Have an triangular array,
with 2 full rings, plus 2 rods on 2 faces
and 1 rod on 1 face. Total of in 3 rd ring.
Total of 29 rods.

1329 Water ht = 91.50 cm

System sub critical
Drain.

Temp °
22.20 cm

Added 6 rods. Have an triangular array, with 2 full rings, plus 2 rods each on every other face in 3rd ring. Total of 25 rods.

$\Delta h = 7.3 \text{ cm}$

Water ht = 91.60 cm Temp °C
 +hs 22.0 °C
 $\sigma = 158.63 \text{ cm} = 6.84 = .93 \text{ ft/cm}$

1052 Water ht = 89.20 cm
 System just critical
 Drain.

Removed 1 rod. Have an triangular array, with 2 full rings, plus 2 rods on 2 faces and 1 rod on 1 face. Total of in 3rd ring. Total of 24 rods.

1327 Water ht = 91.50 cm Temp °C
 System sub critical. 22.20 cm
 Drain.

250" separation edge-edge. 175
6.2" rods.

Have an Invar array: 1 full ring.
Total of 7 rods.

1545 Water ht = 91.50 cm
System sub critical
Drain.

Temp °
22.2°

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE RANGE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	3×10^{-12}
"	"	Fast <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2		Meter			
		Fast			
R-1					
R-2					
PM-1	700V	Alarm <input checked="" type="checkbox"/>	5"	<input checked="" type="checkbox"/>	500V
PM-2	1200V	Low <input checked="" type="checkbox"/>	8"	<input checked="" type="checkbox"/>	900V
"	"	Alarm <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	"

LOG N CALIBRATE OPERATE SOURCE No. B-10

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by ^{F.D.C.} AKL Personnel check by F.D.C.
 Instruments and safeties checked and reset by AKL
 Source in checked by AKL Source No. M-93
 Emergency equipment in control room checked by F.D.C.
 Instruments in trip circuit: K-1 PM-1-2
 Red light on by AKL Time 0810
 Start-up OK'd by F.D.C. AKL Date 11-10-69

.250" separation edge-edge
 6.2" nodes.

Draw on triangular array, 1 full ring,
 plus 1 node on 1 face in 2nd ring. Total
 of 9 nodes.

$r = .80 \text{ cm}$

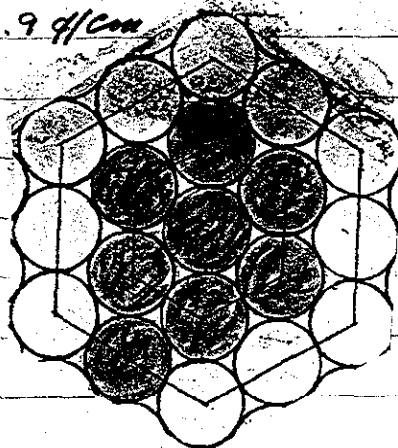
Water ht = 69.00
 + pressure

Temp °C
 27.2°C

$\Sigma = 117.84 \text{ cm} = 8.74 = 10.94 / \text{cm}$

0900

Water ht = 68.20 cm
 System just critical
 Drain.



(3) (A)

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	"	✓	"
"	"	Fast	"	✓	"
R-1					
R-2					
PM-1	7000	Alarm	15"	✓	5000
PM-2	17000	Low	8"	✓	9000
"	"	Alarm	1"	✓	"
LOG-N CALIBRATE		OPERATE	SOURCE No. B-80		
DUMP WELL PROBE LIGHT					

START-UP CHECK LIST

Equipment checked by ^{I.D.C.} AKJ Personnel check by F.D.C.

Instruments and safeties checked and reset by AKJ

Source in checked by AKJ Source No. M-43

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

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

Red light on by AKJ Time 1010

Start-up OK'd by F.D.C. AKJ Date 11-13-69

.50" separation edge - edge.
6.2" Rad.

Have an triangular array: 1 full ring. Total of 7 rods.

$D = .30 \text{ cm}$

Water ht = 48.50 cm
+ per

Temp °
22.5 °C

$E = 167.32 \text{ m} = 6.54 = 21.74 \text{ cm}$

1055 Water ht = 48.20 cm
System just critical
Drain.



Remove 2 rods: Now have 5 rods in an triangular array.

1317 Water ht = 91.50 cm
System sub-critical
Drain.

Temp °
22.5 °C

added 1 rod. Now have ~~5~~ 6 rods in a triangular array.

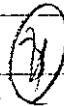
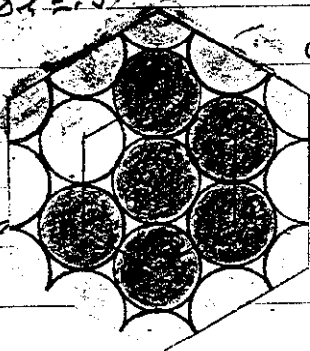
Water ht = 74.90 cm.
+ per

$D = .50$

$E = 325.95 \text{ m} = 3.64 = 7.24 \text{ cm}$

Temp °
22.7 °C

1447 Water ht = 74.40 cm
System just critical
Drain.



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter <input checked="" type="checkbox"/>	1'	<input checked="" type="checkbox"/>	3×10^{-12}
"	"	Fest <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
K-2	"	Meter <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
"	"	Fest <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
R-1					
R-2					
PM-1	700V	Alarm <input checked="" type="checkbox"/>	5"	<input checked="" type="checkbox"/>	500V
PM-2	1200V	Low <input checked="" type="checkbox"/>	8"	<input checked="" type="checkbox"/>	900V
"	"	Alarm <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	"
LOG N CALIBRATE <input checked="" type="checkbox"/>		OPERATE <input checked="" type="checkbox"/>		SOURCE No. B-80	
DUMP WELL PROBE LIGHT <input checked="" type="checkbox"/>					

START-UP CHECK LIST

Equipment checked by I.P.C. R.R.R. Personnel check by I.P.C.

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

Source in checked by R.R.R. Source No. 14-93

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

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

Red light on by R.R.R. Time 0805

Start-up OK'd by I.P.C. R.R.R. Date 11-14-69

.50" separation edge-edge
6.2" + 2.56" rods.

Have an Triangular array. 1 full ring, plus
1 rod on every other face in 2nd ring. Total
of 10 rods.

0900 Water ht = 91.50 cm Temp °C
System sub critical 22.9 °C
Drain.

added 3 rods. Now have an Triangular
array. 1 full ring, plus 1 rod on each
face in 2nd ring. Total of 13 rods.

Water ht = 59.15 cm $d_2 = .90$ cm Temp °C
' + Per 22.9 °C

$C = 43.46 \text{ cm} = 17.74 = 19.74 / \text{cm}$

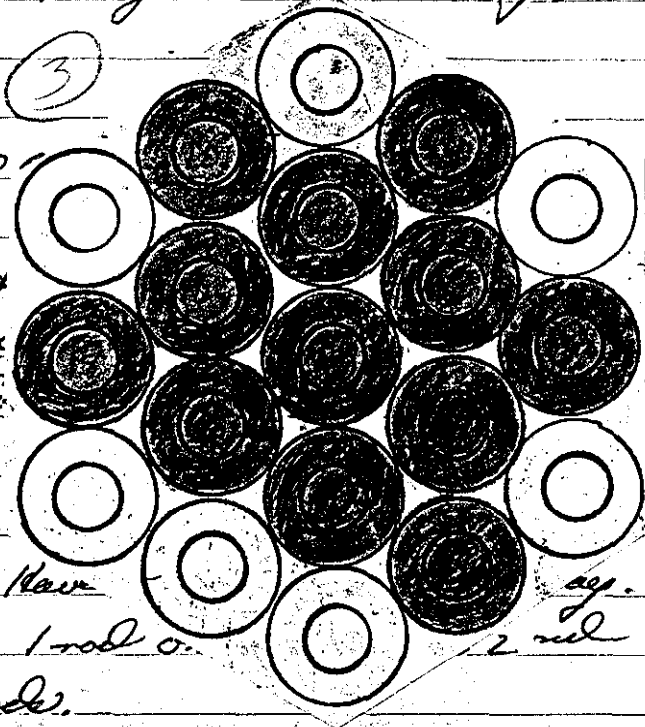
1020 Water ht = 58.25 cm
System just critical (2)
Drain.

Removed 1 rod. Have an *Triangular array*, 1 full ring, plus 1 rod on 5 faces in 2nd ring. Total of 12 rods.

Water ht = 67.00 ft
2 + Per

$$S = 63.02 \text{ sec} = 14.19$$

1108 Water ht = 66.00 ft
Systems just critical
Drain.



Removed 1 rods. Have 1 full ring, plus 1 rod on 2nd ring. Total of 11 rods.

Water ht = 91.70 cm
3 - Per

$$S = -738.87 \text{ sec} = -1.8 \text{ f}$$

1358 Drain:

Temp °C
72.5°



6-21-11
2-5
1-18
P.P.

Removed 1 rod. Have an Triangular ring, plus 1 rod on 5 faces in Total of 12 rods.

(3)

dt = 1.0 cm

Water ht = 67.00 cm
2+ Per

Temp °
22.5

$t = 63.02 \text{ sec} = 14.14 = 14.14 \text{ /cm}$

110% Water ht = 66.00 cm
Systems just critical
Drain.

Removed 1 rods. Have an Triangular array. 1 full ring, plus 1 rod on 4 faces in 2nd ring. Total of 11 rods.

(4)

Water ht = 91.70 cm
3 - Per

Temp °
22.5°

$t = -738.82 \text{ sec} = -1.84$

135% Drain:

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIPS	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	3×10^{-12}
"	"	Fast <input type="checkbox"/>	"	<input type="checkbox"/>	"
K-2	"	Meter <input checked="" type="checkbox"/>	"	<input checked="" type="checkbox"/>	"
"	"	Fast <input type="checkbox"/>	"	<input type="checkbox"/>	"
R-1					
R-2					
PM-1	700V	Alarm <input checked="" type="checkbox"/>	5"	<input checked="" type="checkbox"/>	500V
PM-2	1200V	Low <input type="checkbox"/>	8"	<input type="checkbox"/>	900V
"	"	Alarm <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	"
LOG N CALIBRATE <input checked="" type="checkbox"/>		OPERATE <input checked="" type="checkbox"/>		SOURCE No. B-80	
DUMP WELL PROBE LIGHT <input type="checkbox"/>					

START-UP CHECK LIST

Equipment checked by ^{I.P.C.} AKK Personnel check by F.P.C.
 Instruments and safeties checked and reset by AKK
 Source in checked by AKK Source No. M-43
 Emergency equipment in control room checked by F.P.C.
 Instruments in trip circuit: R-1-2 PM-1-2
 Red light on by AKK Time 1230
 Start-up OK'd by F.P.C. AKK Date 11-20-69

1.750" separation edge-edge.
6.2" rods.

183

Have 5 rods in an triangular array;

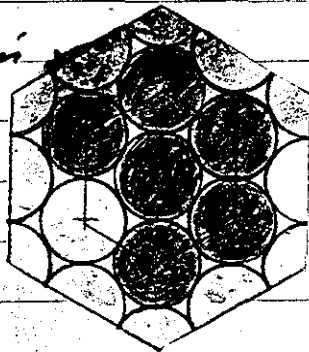
1312 Water ht = 91.70 cm Temp °C
system just critical 22.5 °C
Drain.

add 1 rod. Now have 6 rods in an
triangular array.

Water ht = 55.40 cm $d_h = .15 \text{ cm}$ Temp °C
+ Per 22.6 °C

$$\tau = 441.12 \text{ mm} = 2.7 \tau = 18.0 \text{ f/cm}$$

1428 Water ht = 55.25 cm
system just critical
Drain



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3 X 10 ⁻¹²	Meter	4"	✓	3 X 10 ⁻¹²
"	"	Fast	1"	✓	"
K-2	"	Meter	4"	✓	"
"	"	Fast	1"	✓	"
PM-1	700v	Alarm	.5"	✓	500v
PM-2	1200v	Low	6"	✓	900v
"	"	Alarm	1"	✓	"
LOG IN CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL FROST LIGHT		✓			

START-UP CHECK LIST

Equipment checked by ^{I.O.C} AKH Personnel check by F.O.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.O.C

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

Red light on by AKH Time 0906

Start-up OK'd by F.O.C AKH Date 11-21-69

.750" separation edge-edge.
6.2" + 2.50" radii.

185

Have an Triangular array. 1 full ring, plus
1 rad on 4 faces in 2nd ring. Total of 11
rads.

Water ht = 48.60 cm $D_h = 1.40$ cm
Temp °C
1 + Per 22.0 °C

$$C = 49.97 \text{ m} = 16.4 \text{ f} = 41.00 \text{ f/cm} \quad (4)$$

0905 Water ht = 48.20 cm

System just critical
Drain.

Removed 2 rads. Now have an Triangular
array with 1 full ring, plus 2 rad
on opposite faces in 2nd ring. Total of 9
rads.

Water ht = 60.60 cm $D_h = 1.0$ cm
Temp °C
2 + Per 22.0 °C

$$C = 34.77 \text{ m} = 20.7 \text{ f} = 20.7 \text{ f/cm} \quad (5)$$

1020 Water ht = 59.60 cm

System just critical
Drain.

over!

Removed 2 rods. Now have an triangular array. 1 full ring. Total of 7 rods.

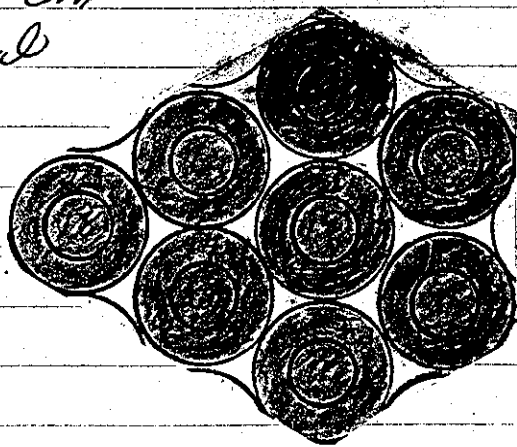
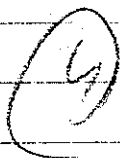
1430 Water ht = 92.10 cm Temp °C
 System sub critical 22.5 °C
 Chain.

Added 1 rod. Now have an triangular array. 1 full ring, plus 1 rod on 1 face in 2nd ring. Total of 8 rods.

Water ht = 69.10 cm $d = 2.70$ cm Temp °C
 3 + Pen 22.6 °C

$$v = 102.13 \text{ cm} = 9.74' = 13.9 \text{ f/cm.}$$

1535 Water ht = 68.90 cm
 System just critical
 Chain.



INSTRUMENT-CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3x10 ⁻¹²	Meter ✓	4"	-	3x10 ⁻¹²
"	"	Fast ✓	1"	-	"
K-2	"	Meter ✓	4"	-	"
"	"	Fast ✓	1"	-	"
R-1					
R-2					
PM-1	700V	Alarm ✓	.5"	-	500V
PM-2	1200V	Low ✓	8"	-	900V
"	"	Alarm ✓	1"	-	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROBE LIGHT					

START-UP CHECK LIST

Equipment checked by F.O.C. A.K.C. Personnel check by F.O.C.

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

Source in checked by A.K.C. Source No. 17-43

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

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

Red light on by A.K.C. Time 1015

Start-up OK'd by F.O.C. A.K.C. Date 11-29-69

1.0" separation Edge-Edge.
6.2" rods.

Have 5 rods in an triangular array:

$s = 4 = .50 \text{ cm}$

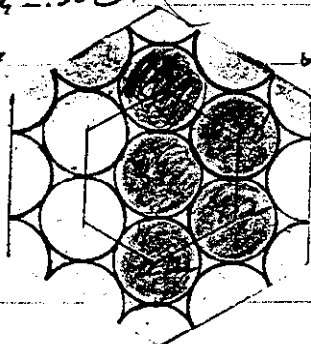
Water ht = 73.40 cm

+ Por

$E = 271.62 \text{ mm} = 4.34 = 8.68 \text{ cm}$

1114 Water ht = 72.90 cm

System just critical
Draic



Temp °C
22.5°

Removed 1 rod. Now have 4 rods in an
triangular array.

1315 Water ht = 91.60 cm

System sub critical
Draic.

Temp °C
22.6°

1.0" separation Edge-Edge.
6.2" rods + 2.56" rods.

189

Have an triangular array: 1 full ring.
Total of 7 rods.

$\Delta h = .40$

Water ht = 61.80 cm

7 rods

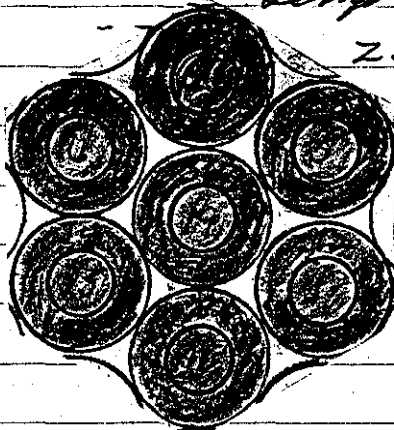
Temp °C

22.6 °C

$t = 132.55 \text{ cm} - 7.9 \text{ ft} = 19.7 \text{ ft cm}$

1443 Water ht = 61.40 cm

System just critical
Drain.



Removed 1 rod. Now have 6 rods in
an triangular array.

1530 Water ht = 91.50 cm

System sub critical
Drain.

Temp °C

22.7 °C

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3X10 ⁻¹²	Meter ✓	4"	✓	3X10 ⁻¹²
"	"	Fast ✓	1"	✓	"
K-2	"	Meter ✓	4"	✓	"
"	"	Fast ✓	1"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	5"	✓	500V
PM-2	1200V	Low ✓	8"	✓	900V
"	"	Alarm ✓	1"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROBE LIGHT					

START-UP CHECK LIST

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

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

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

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

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

Red light on by A.K.V. Time 0925

Start-up OK'd by F.I.C. M. B. G. Date 11-25-68

1.5" separation Edge-Edge.
6.2" Rods.

191

Have 6 rods in an Triangular array:

$$\Delta s = .45 \text{ cm}$$

Water ht = 61.75 cm
+ Pen

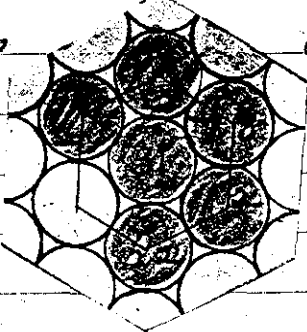
Temp °C

22.5 °C

$$D = 12 \cdot 6.03 \text{ cm} = 8.2 \text{ ft} = 18.2 \text{ ft/cm}$$

1021 Water ht = 61.30 cm

System sub critical
Drain: C9



Removed 1 rod. Now have 5 rods in an
Triangular array.

1105 Water ht = 91.70 cm

Temp °C

System sub critical
Drain:

22.7 °C

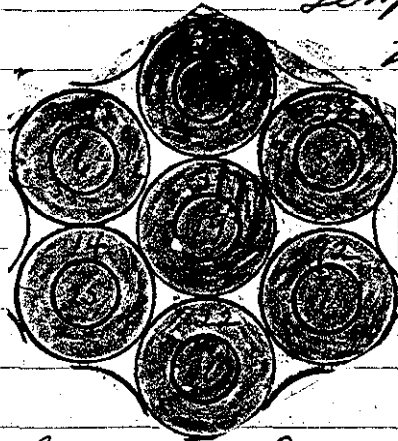
P-192

1.5" separation edge - edge.
6.2" + 2.56" Rod.

Have on triangular array. 1 full ring. Total of 7 rods.

Water ht = 74.65 cm $d_h = 1.05$ cm Temp °C
 2 + bar 22.7 °C
 $\tau = 84.75 \text{ sec} = 11.24 = 10.7 \frac{1}{\text{min}}$

1331 Water ht = 73.60 cm
 System just critical
 Chain.



Removed 1 rod. Now have 6 rods in an
 triangular array.

1430 Water ht = 91.70 cm Temp °C
 System sub critical 22.7 °C
 Chain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE RANGE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter <input checked="" type="checkbox"/>	4"	<input checked="" type="checkbox"/>	3×10^{-12}
	"	Fast <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	"
K-2	"	Meter <input checked="" type="checkbox"/>	4"	<input checked="" type="checkbox"/>	"
	"	Fast <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	"
P-1					
P-2					
PM-1	700V	Alarm <input checked="" type="checkbox"/>	5"	<input checked="" type="checkbox"/>	500V
PM-2	1200V	Alarm <input checked="" type="checkbox"/>	6"	<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

START-UP CHECK LIST

Equipment checked by F.I.C. Personnel check by F.I.C.
 Instruments and safeties checked and reset by A.K.R.
 Source in checked by A.K.R. Source No. M-43
 Emergency equipment in case of fault checked by F.I.C.
 Instruments in trip case are: K-1-2 P-1-2
 Red light on by A.K.R. Time 1245
 Start-up OK'd by F.I.C. A.K.R. Date 11-20-69

2.0" separation - edge - edge.
6.2" Rods.

Have an triangular array. 1 full ring. Total of 7 rods.

Water ht = 73.90 cm:

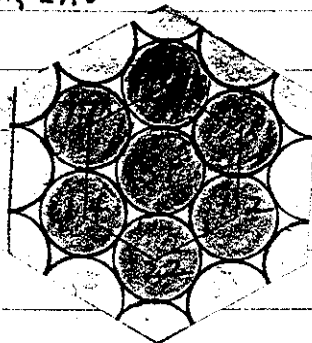
+ Per

$$E = 67.36 \text{ cm} = 13.54 = 12.74 \text{ cm}$$

1335 Water ht = 72.85 cm:

System just critical
Drain.

$d_r = 1.05 \text{ cm}$



Temp °C

22.5 °C

Removed 1 rod. Now have 6 rods in an
Triangular array.

1441 Water ht = 91.60 cm

System sub critical
Drain.

Temp °C

22.7 °C

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter	3"		3×10^{-12}
"	"	Fast	1"		"
K-2	"	Meter	3"		"
"	"	Fast	1"		"
R-1					
R-2					
PM-1	700V	Alarm	5"		5000
PM-2	1200V	Low	8"		9000
		Alarm	1"		"
LOG N CALIBRATE		OPERATE	SOURCE No. <u>B-80</u>		
DUMP WELL PROBE LIGHT					

START-UP CHECK LIST

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

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

Source in checked by A.K.W. Source No. 14-93

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

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

Red light on by A.K.W. Time 0920

Start-up OK'd by F.D.C. A.K.W. Date 12-1-69

2.0" hyperations - edge - edge.
6.2" + 2.56" Raes.

Have an triangular array, 1 full ring, plus
1 rod on 1 face in 2nd ring. Total of 8 rods.

10.12 Water ht = 91.50 cm

Temp °C

System sub critical

22.8 °C

Drain.

Added 2 rods. Now have an triangular
array, 1 full ring, plus 2 rods on every other
face in 2nd ring. Total of 10 rods.

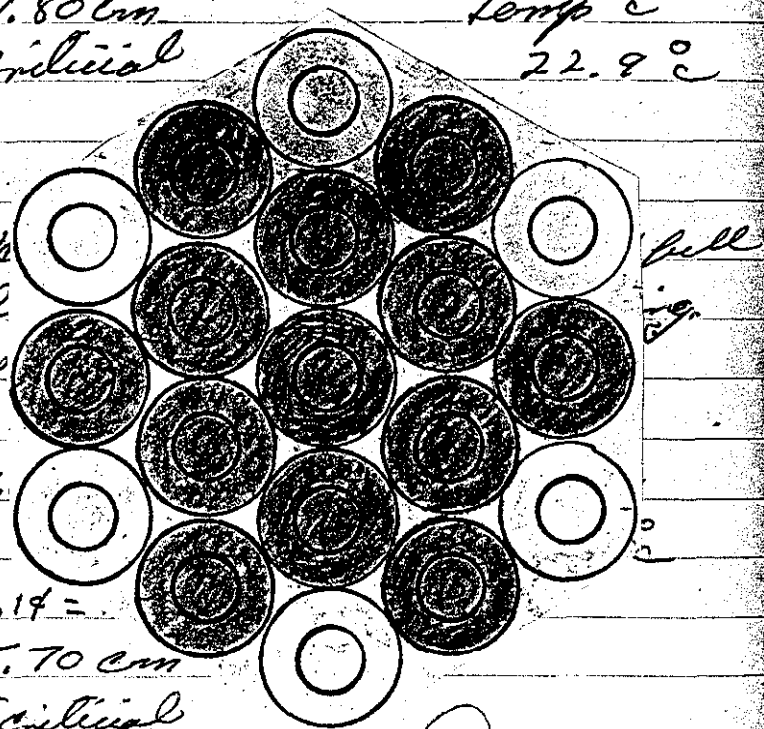
11.14 Water ht = 91.80 cm

Temp °C

System sub critical
Drain.

22.9 °C

Added 3 rods. to
ring, plus 1 rod
Total of 13 rods



Water ht = 77.

+ Per

$\sigma = 63.02 \text{ cm} = 14.14 =$

1339 Water ht = 75.70 cm

System just critical
Drain.

(2)

2.0" separation - edge - edge.
6.2" + 2.56" Raads.

Have an Triangular array, 1 full ring, plus 1 rod on 1 face in 2nd ring. Total of 8 rods.

10.12 Water ht = 91.50 cm Temp °C
System sub critical 22.8°C
Drain.

Added 2 rods. 1 2.0" separation
array, 1 full edge - edge
face in 2 6.2" Raads + 2.56" inserts
P-194
Triangular
ring - other
rods.

11.14 Water ht: °C
System sub 9°C
Drain.

added 3 rods. Have an Triangular array, 1 full
ring, plus 1 rod on each face in 2nd ring.
Total of 13 rods.

Water ht = 77.00 cm $\Delta h = 1.30$ cm Temp °C
+ Per 22.8°C

$\sigma = 63.02 \text{ cm} = 14.14 = 10.8 \text{ f/cm.}$

1339 Water ht = 75.70 cm
System just critical
Drain.

(2)

Removed 1 rad. Have an Irregular array.
 1 full ring, plus 1 rad on 5 fans in 2nd
 ring. Total of 12 rads.

1937 Water ht = 91.90 cm
 System sub critical
 Drain.

Temp °C
 23.0°C

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3 x 10 ⁻¹²	Meter ✓	3"	✓	3 x 10 ⁻¹²
	"	Fast ✓	1"	✓	"
K-2	"	Meter ✓	3"	✓	"
	"	Fast ✓	1"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	5"	✓	500V
PM-2	1200V	Low ✓	8"	✓	900V
	"	Alarm ✓	1"	✓	"
LOG IN CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by I.D.C. / B.K.V. Personnel check by I.D.C.
 Instruments and safeties checked and reset by B.K.V.
 Source in checked by B.K.V. Source No. 17-93
 Emergency equipment in control room checked by I.D.C.
 Instruments in trip circuit: K-1-2 / M-1-2
 Red light on by B.K.V. Time 1500
 Start-up OK'd by I.D.C. / B.K.V. Date 12-2-69

2.0" separation edge-edge
6.2" rods. (only)
Square array.

199

Have an 5x5 array. total of 25 rods.

Water ht = 76.10 cm. $\Delta h = 1.40$ Temp °C
+ Per --- 23.2 °C

$$\tau = 73.89 \text{ cm} = 12.9 \text{ f} = 8.9 \text{ f/cm}$$

1540 Water ht = 74.70 cm

System just critical
Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	3"	✓	3×10^{-12}
"	"	Fast ✓	1"	-	"
K-2	"	Alarm -	3"	-	"
"	"	Fast -	1"	-	"
R-1					
R-2					
PM-1	700v	Alarm ✓	.5"	-	500v
PM-2	1200v	Low ✓	8"	-	900v
"	"	Alarm ✓	1"	-	"
LOG 'N' CALIBRATE _____			OPERATE _____	SOURCE No. <u>B-80</u>	
DUMP-WELL PROBE-LIGHT _____					

START-UP CHECK LIST

Equipment checked by F.I.C. Personnel check by F.I.C.
 Instruments and safeties checked and reset by A.H.L.
 Source in checked by A.H.L. Source No. M-43
 Emergency equipment in control room checked by F.I.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by A.H.L. Time 0815
 Start-up OK'd by F.I.C. A.H.L. Date 12-3-69

2.0" separation edge-edge.
6.7" rads. (only)
square array.

201

see p-199:

Now have an 5x5-1 array: total of 24 rads.

Water ht = 79.30 cm $\Delta h = 1.6$ cm Temp °C
+ Per 22.5 °C

$C = 43.46 = 17.9 = 11.2\% / \text{cm}$

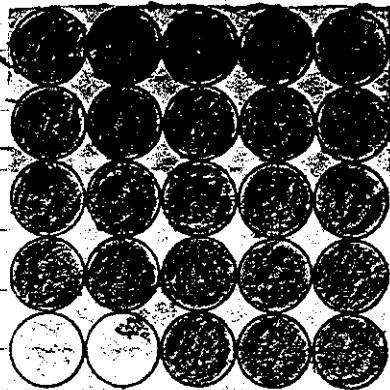
0915 Water ht = 77.70 cm
System just critical
Drain.

Removed 1 rad. Now have an 5x5-2 array.
Total of 23 rads.

Water ht = 91.80 cm $\Delta h = 6.95$ cm Temp °C
+ Per 23.0 °C

$C = 432.43 \text{ rad} = 2.84 = .40\% / \text{cm}$

1030 Water ht = ^{84.85} 84.85 cm
System just critical
Drain.



over

203

Removed 1 rod. Now have an 5 X 5-3 array.
Total of ~~23~~ rods.

1315 Water ht = 91.50 cm
System sub critical
Drain.

Temp °C
23.0 °C

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3X10 ⁻¹²	Meter ✓	3"	✓	3X10 ⁻¹²
"	"	Fast ✓	1"	✓	"
K-2	"	Meter ✓	3"	✓	"
"	"	Fast ✓	1"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	1.5"	-	500V
PM-2	1200V	Low ✓	8"	-	800V
"	"	Alarm ✓	1"	✓	"

LOG N CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

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

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

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

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

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

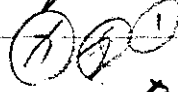
Red light on by A.K.W. Time 0840

Start-up OK'd by F.P.C. A.K.W. Date 12-4-69

2.1" separation edge - edge.

6.2" rods (only)

Have an Triangular array. 1 full ring.
 plus 4 rods on 4 faces in 2nd ring.
 Total of 11 rods.



Dh = 1.50 cm

Water ht = 59.20 cm

Temp °C

+ Per

22.0 °C

$$S = 71.71 \text{ m} = 12.74 = 25.4 \text{ H cm}$$

0915 Water ht = 57.70 cm

System just critical
 Drain.

Removed 2 rods. Have an Triangular array.
 1 full ring, plus 2 rods, one each on opposite
 faces in 2nd ring. Total of 9 rods.

Water ht = 72.10 cm

Dh = 1.50 cm

Temp °C

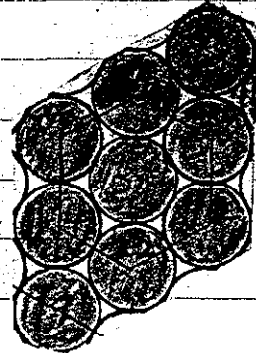
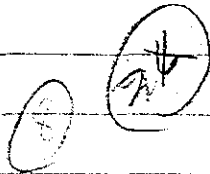
2 + Per

22.7 °C

$$S = 52.15 \text{ m} = 16.14 = 10.7$$

1070 Water ht = 70.60 cm

System just critical
 Drain.



Removed 1 rod. Have an triangular array.
 1 full ring, plus 1 rod on 1 face in 2nd
 ring. Total of 8 rods.

Water ht = 91.50 cm (3) Temp °C
 - Per. 22.5°

$$t = -423.73 \text{ mm} = -3.4 \text{ f}$$

1117 Drain:

2.1" separation edge - edge.
 6.2" + 2.56" Rods.

Have an triangular array. 2 full rings.
 Total of 19 rods. (8)

Water ht = 56.00 cm Temp °C
 + Per. 22.2°

$$t = 132.55 \text{ mm} = 7.9 \text{ f} = 39.5 \text{ f cm}$$

1508 Water ht = 55.80 cm
 System just critical
 Drain:

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-3	10^{-12}	Meter ✓	3"	-	3×10^{-12}
"	"	Fast ✓	1"	-	"
K-2	"	Meter ✓	3"	-	"
"	"	Fast ✓	1"	-	"
R-1					
R-2					
PM-1	700V	Alarm ✓	5"	-	500V
PM-2	1200V	Low ✓	6"	-	900V
"	"	Alarm ✓	1"	-	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. <u>B-80</u>
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by F.I.C. Personnel check by F.I.C.
 Instruments and safeties checked and reset by A.K.L.
 Source in checked by A.K.L. Source No. M-93
 Emergency equipment in control room checked by F.I.C.
 Instruments in trip circuits: M-1-2 M-1-1-2
 Red Light on by A.K.L. Time 0800
 Start-up OK'd by F.I.C. M.T.G. Date 12-5-69

2.1 "Separation edge - edge.

207

6.2" + 2.56" Rads.

Have an triangular array. 1 full ring, will
3 rads removed from 3 corners in 2nd
ring. Total of 16 rads.

Water ht = 74.10 cm.

$v_h = .90$

Temp °C

22.0 °C

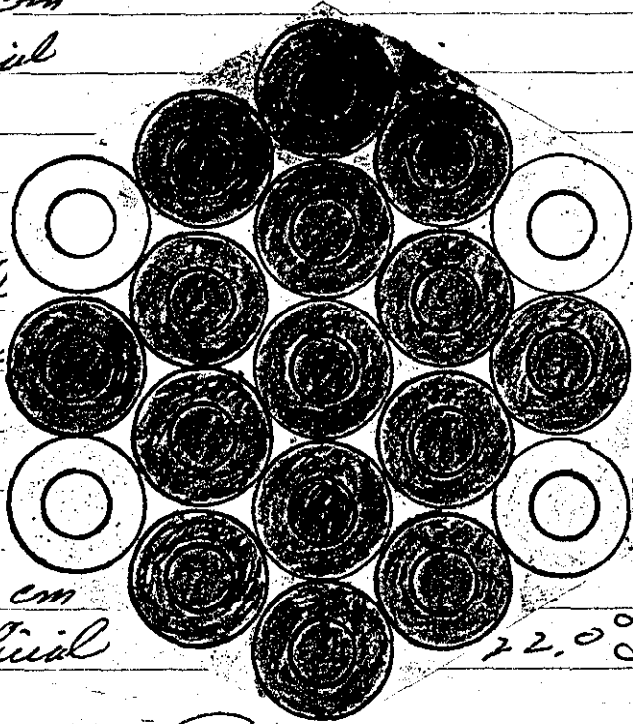
+ Per

$C = 91.27 = 10.54 = 11.74/cm$

0859 Water ht = 73.20 cm

System just critical
Drain

Removed 1 rad
array. 1 full ring
from 4 corners
rads.



Water ht = 91.50 cm
System just critical
Drain

10

over!

2.1" separation edge - edge.

207

6.2" + 2.56" Rads.

Have an triangular array. 1 full ring, with 3 rads removed from 3 corners in 2nd ring. Total of 16 rads.

$2h = 1.9$

Water ht = 74.10 cm.

+ Per

$C = 91.27 = 10.5f = 11.74/c$

0859 Water ht = 73.20 cm

System just critical
Drain.

2.1" sep edge - edge
6.2" rads + 2.56" rads
P - 207

~~Removed~~ Removed 1 rad. Have an triangular array. 1 full ring. With 4 rads removed from 4 corners in 2 ring. Total of 15 rads.

Water ht = 91.50 cm

System just critical
Drain

Temp °C

22.0 °C

(17)

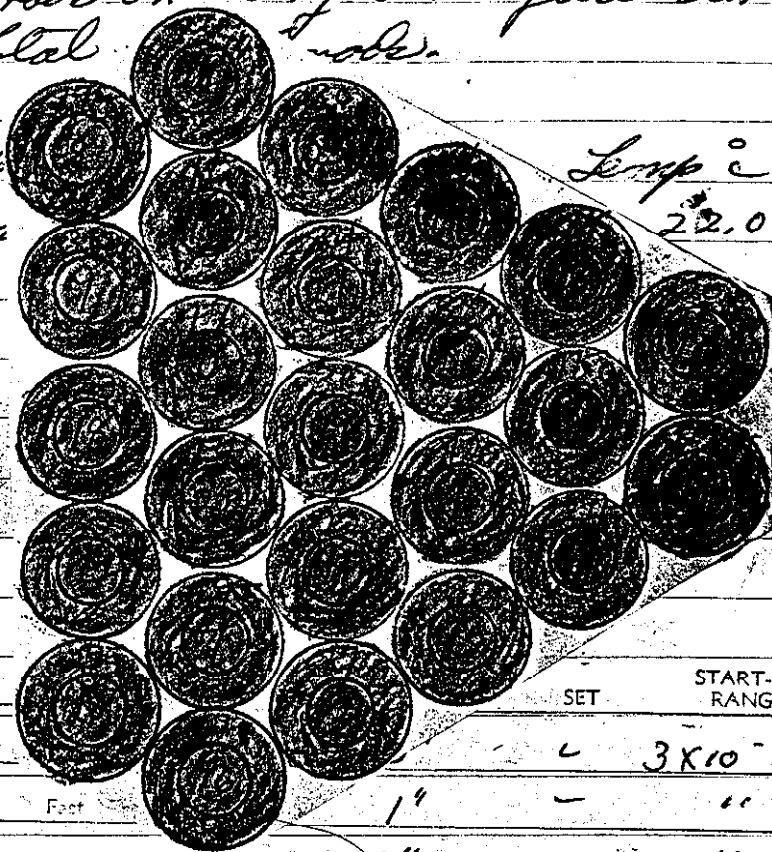
over!

2.5" separation edge-edge,
6.2" + 2.56" Rods.

Have an Triangular array. 2 full rings,
plus 2 rods on every other face in 3rd
ring. Total 18 rods.

1520 Water &
System &
Drain.

Temp @
22.0°C



INSTRUMENT	RANGE	SET	START-UP RANGE
K-1	3×10^{-12}		3×10^{-12}
"	Feet	1"	"
K-2	Meter	3"	"
"	Feet	1"	"
R-1			
R-2			
PM-1	700V	Alarm	5"
PM-2	1200V	Low	8"
"		Alarm	1"

LOG IN CALIBRATE OPERATE SOURCE No. B-80

DISP. LIGHT

2.5" separation edge-edge.
 6.2" + 2.56" Rods.

Have an Triangular array. 2 full rings,
 plus 2 rods on every other face in 3rd
 ring. Total of 25 rods.

1520 Water hts = 91.60 cm.
 System sub critical
 Drain.

Temp \approx
 22.0°C

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter <input checked="" type="checkbox"/>	3"	<input checked="" type="checkbox"/>	3×10^{-12}
"	"	Feet <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	"
K-2	"	Meter <input checked="" type="checkbox"/>	3"	<input checked="" type="checkbox"/>	"
"	"	Feet <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	"
R-1					
R-2					
PM-1	700V	Alarm <input checked="" type="checkbox"/>	.5"	<input checked="" type="checkbox"/>	500V
PM-2	1200V	Alarm <input checked="" type="checkbox"/>	8"	<input checked="" type="checkbox"/>	900V
"	"	Alarm <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	"
LOG IN CALIBRATE <input checked="" type="checkbox"/>		OPERATE <input checked="" type="checkbox"/>		SOURCE No. B-80	
DIMMER DIMMER LIGHT <input type="checkbox"/>					

START-UP CHECK LIST

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

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

Source in checked by B.K.H. Source No. 14-23

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

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

Red light on by B.K.H. Time 12:25

Start-up OK'd by F.L.C. B.K.H. Date 12-8-69

2.5" Separation edge-edge.

~~6.2" + 2.55" (total)~~

6.2" Rods Only.

Have an "Inverted" ring of full rings plus 2 rods on every other full in 3rd ring. Total of 25 rods.

Water ht = 54.60 cm Δt = 50 cm Temp °C

+ per

23.0 °C

$t = 91.27 \text{ sec} = 10.6 \text{ s} = 21.20 \text{ ft/cm}$

1304 Water ht = 54.10 cm

System just critical
Drain.

(10)

7-200

Removed 6 rods. Now have an triangular array. 2 full rings. Total of 19 rods.

Water ht = 60.10 cm $d_s = .50$ Temp $^{\circ}C$
 2 + Per $\textcircled{7}$ 22.8 $^{\circ}C$

$$t = 99.96 \text{ sec} = 9.94 \text{ f} = 19.8 \text{ f/cm}$$

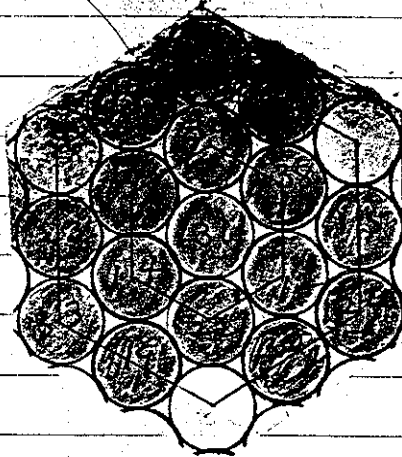
1428 Water ht = 59.60 cm
 System just critical
 Drain!

Removed 3 rods. 1 from every other corner in 2nd ring. Total now of 16 rods.

Water ht = 77.30 cm $d_s = .90 \text{ cm}$ Temp $^{\circ}C$
 3 + Per 23.0 $^{\circ}C$

$$t = 71.71 \text{ sec} = 12.7 \text{ f} = 15.9 \text{ f/cm}$$

1540 Water ht = 76.50 cm
 System just critical
 Drain!



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	3"	✓	3×10^{-12}
"	"	F-st ✓	1"	✓	"
K-2	"	Meter ✓	3"	✓	"
"	"	F-st ✓	1"	✓	"
R-1					
R-2					
PM-1	700V	-Alarm ✓	5"	✓	500V
PM-2	1200V	Low ✓	8"	✓	900V
"	"	Alarm ✓	1"	✓	"
LOG N CALIBRATE ✓		OPERATE ✓		SOURCE No. <u>B-80</u>	
DUMP WELL PROBE LIGHT ✓					

START-UP CHECK LIST

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

Instruments and safeties checked and reset by ATK

Source in checked by ATK Source No. M-03

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

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

Red light on by ATK Time 0803

Start-up OK'd by F.D.C. ATK Date 12-9-69

2.5" separation edge-edge.
6.2" Rods (only)

Have an triangular array. 1 full ring. plus
1 rod removed from 4 corners in 2nd
ring. Total of 15 rods.

Water ht = 91.90 cm

Temp °C

1 Per

22.5°

N. G

0848

Drain.

2.6" separation edge-edge
6.2" Rods (only)

Have an triangular array. 2 full rings.
Total of 19 rods.

Water ht = 81.50 cm

$\Delta h = 1.5$ cm

Temp °C

2 Per

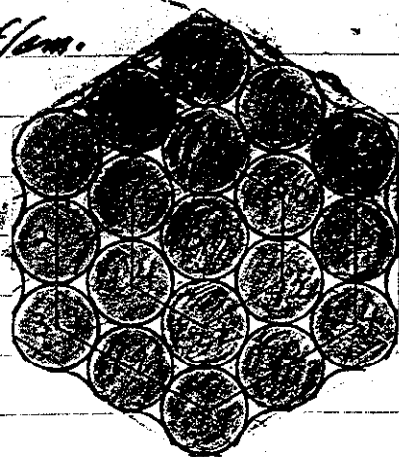
22.5

$\bar{v} = 71.71 \text{ cm} = 12.7 \text{ f} = 8.5 \text{ f/cm.}$

1440

Water ht = 90.00 cm

System just critical
Drain.



p - 213

Removed 1 rod. Have an triangular array.
1 full ring, plus 1 rod removed from 1
corner in 2nd ring. Total of 18
rods.

1530 Water ht = 91.70 cm
System sub critical
Drain.

Temp °C
22.5 °C

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	3"	✓	3×10^{-12}
"	"	Fast ✓	1"	✓	"
K-2	"	Meter ✓	3"	✓	"
"	"	Fast ✓	1"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	1.5"	✓	500V
PM-2	1200V	Low ✓	8"	✓	900V
"	"	Alarm ✓	1"	✓	"

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

START-UP CHECK LIST

Equipment checked by F.I.C. A.K.B. Personnel check by F.I.C.
 Instruments and safeties checked and reset by A.K.B.
 Source in checked by A.K.B. Source No. 14-93
 Emergency equipment in control room checked by F.I.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by A.K.B. Time 0940
 Start-up OK'd by F.I.C. A.K.B. Date 12-10-69

2.35" separation edge - edge. 215
6.2" + 2.56" Rods.

Have an triangular array. 2 full rings.
Total of 19 rods.

1029 Water ht = 91.80cm Temp °C
System sub critical --- 22.5°C
Drain.

added 3 rods. Have an triangular array.
2 full rings, plus 1 rod on every other
gap in 3rd ring. Total of 22 rods

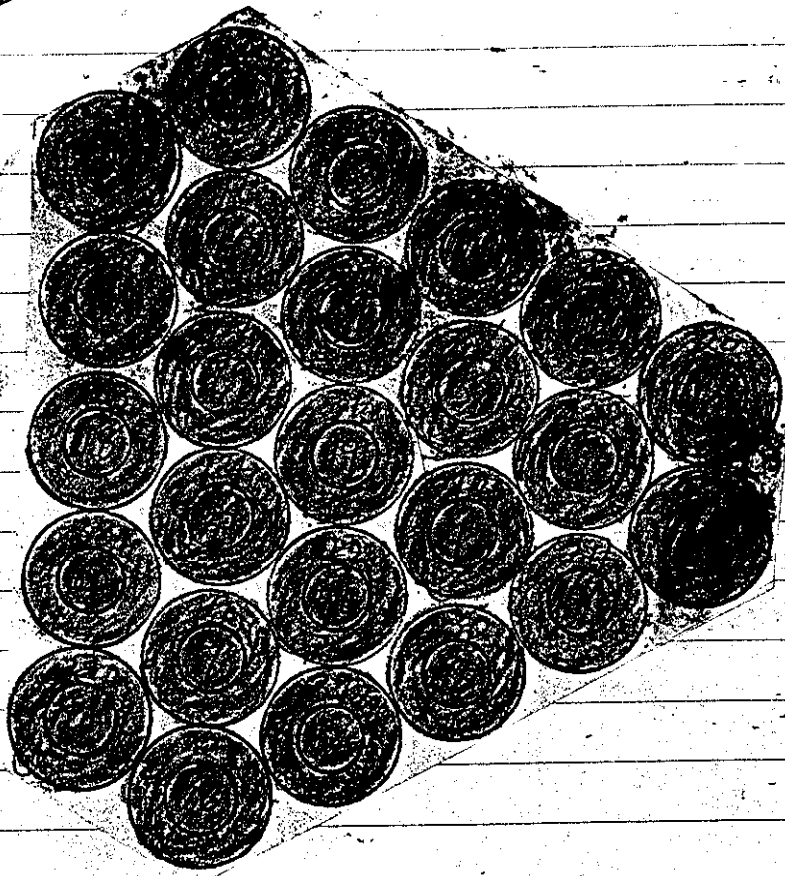
1300 Water ht = 91.50cm Temp °C
System sub critical 22.7°C
Drain.

p 2/6

added 3 rods. Have an triangular array
 2 full rings, plus 2 rods on every other
 face in 3 ring. Total of 25 rods.

1412 Water ht = 91.50 cm
 System just critical
 Drain.

Temp °
 23.0 °



Hand
 3/10/77

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3X10 ⁻¹²	Meter ✓	3"		
"		Fast ✓	1"		
K-2	"	Meter ✓	3"		
"		Fast ✓	1"		
R-1					
R-2					
PM-1	700.5	Alarm ✓	5"		
PM-2	1200.5	Low ✓	10"		
"		Alarm ✓	1"		
LOG N CALIBRATE		OPERATE	SOURCE No. <u>D-80</u>		
DUMP WELL PROBE LIGHT					

START-UP CHECK LIST

Equipment checked by ATD Personnel check by F.O.C

Instruments and safeties checked and reset by ATD

Source in checked by ATD Source No. M-93

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

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

Red light on by ATD Time 0810

Start-up OK'd by F.O.C Date 3-5-70

5.2" Rods.

12.50" separation edge - edge.

5.2" Rods only.

Feed rate = 3.4 cm/min

3" Pump rate = 8.6 cm/min

3" Drain rate = 8.55 cm/min.

 $H_2O = 76.50 \text{ cm} = \text{Top of fuel.}$ 0905 Have an $3 \times 3 - 1$ array. Total of 8 rods.

Water ht = 50.60 cm

System just critical

Drain.

Temp °C

21.2 °C

Removed 1 rod. Now have an $3 \times 3 - 2$ array.
Total of 7 rods.

Water ht = 92.40 cm

S.S. = 7.6 cm

Temp °C

+ Per

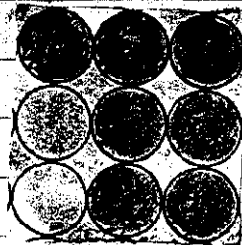
21.5 °C

 $C = 804.01 \text{ cm} = 1.54 = .2 \text{ cm}$

1037 Water ht = 84.80 cm

System just critical

Drain.



Removed 1 rod. Now have an 2×3 array.
Total of 6 rods.

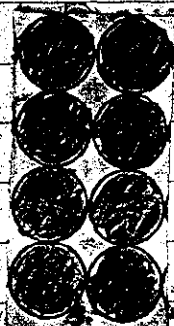
1100 Water ht = 92.50 cm Temp °
System sub-critical 21.5 °
Drain.

added 1 rod. Now have an $2 \times 4 - 1$ array.
Total of 7 rods.

1350 Water ht = 91.70 cm Temp °
System sub-critical 21.5 °
Drain.

added 1 rod. Now have an 2×9 array. Total
of 8 rods.

1510 Water ht = 60.95 cm Temp °
System just critical 21.5 °
Drain.



INSTRUMENT CHECK

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

START-UP CHECK LIST

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

Instruments and safeties checked and reset by AKK

Source in checked by AKK Source No. M-83

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

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

Red light on by AKK Time 0930

Start-up OK'd by I.D.C. AKK Date 3-6-70

2.50" separation edge-edge.

5.2" Raods + 2.56" raods.

22

Have an 3x4 array. Total of 12 raods.

1025 Water ht = 91.70 cm

Temp °C

System sub critical
Drain.

21.5°C

added 1 raod. Now have an 4x4 - 3 array.
Total of 13 raods.

Water ht = 91.90 cm
' + Per

$\Delta h = 5.1 \text{ cm}$

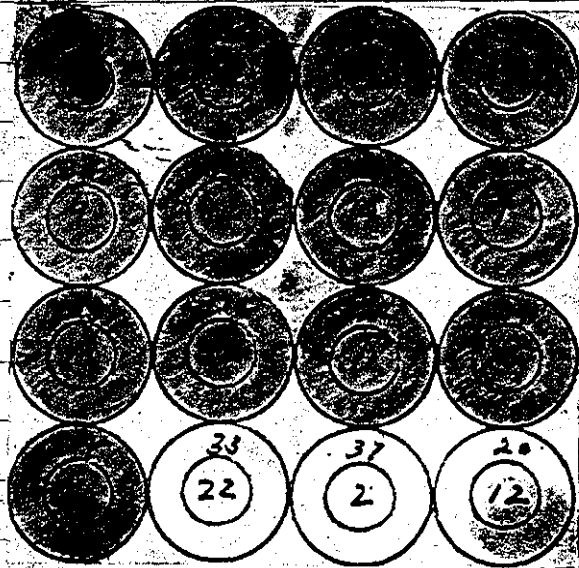
Temp °C

22.2°C

$t = 1216.84 \text{ sec} \approx 1.0 \text{ f} = .2 \text{ ft/cm}$

1340 Water ht = 86.80 cm

System just critical
Drain.



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	4"	✓	3×10^{-12}
"	"	Fast -	1"	✓	"
K-2	"	Meter -	4"	✓	"
"	"	Fast ✓	1"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	150"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	1"	✓	"

LOG IN CALIBRATE OPERATE SOURCE No. 17-80

DUMP-WELL-PROBE-LIGHT

START-UP CHECK LIST

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

Instruments and safeties checked and reset by AKM

Source in checked by AKM Source No. 19-23

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

Instruments in trip circuit: K-1-2 19-1-2

Red light on by AKM Time 0845

Start-up OK'd by F.P.C. AKM Date 7-9-70

Rods in contact
5.2" rods only.

223

Have an 3x3 array. Total of 9 rods.

0935 Water ht = 48.90 cm
system just critical
Drain.

Temp °C
23.5°

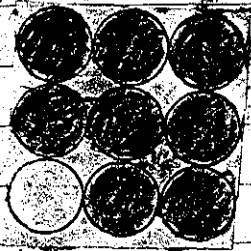
Removed 1 rod. Have an 3x3-1 array. Total
of 8 rods.

Water ht = 59.50 cm $\Delta h = .35$ cm
+ Per

Temp °C
23.5°

$\bar{v} = 132.55 \text{ sec} = 7.94 = 22.6 \text{ ft/cm}$

1317 Water ht = 59.15 cm.
system just critical
Drain.



Removed 1 rod. Have an 3x3-2 array. Total
of 7 rods.

1425 Water ht = 91.80 cm
system sub critical
Drain.

Temp °C
73.7°

aver:

224

Rods in contact
5.2" Rods only.

Now have an 2x4 array: Total of 8 rods.

Water ht = 84.10 cm $\Delta L = 3.2$ cm
+ Pr

Temp °C
23.7

$T = 78.23 \text{ mm} = 11.9 \phi = 3.7 \text{ ft/cm}$

1536 Water ht = 80.90 cm

System just critical
Drain.



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	4"	✓	3×10^{-12}
"	"	Fast ✓	1"	✓	"
K-2	"	Meter ✓	4"	✓	"
"	"	Fast ✓	1"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	.5"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	1"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by F.D.C. Personnel check by F.D.C.
 Instruments and safeties checked and reset by A.K.W.
 Source in checked by A.K.W. Source No. M-43
 Emergency equipment in control room checked by F.D.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by A.K.W. Time 0830
 Start-up OK'd by F.D.C. A.K.W. Date 3-10-70

226

"Rods in contact.
"5.2" rods only."

Now have an 2x4-1 array. Total of 7 rods.

0933 Water ht = 91.90 cm
System sub-critical
Drain.

Temp °C
23.5 °C

Rods in contact:
5.2" + 2.56" rods.

Now have an 4x4-1 array. Total of 15 rods.

1350 Water ht = 91.80 cm
System sub-critical
Drain.

Temp °C
23.5 °C

Added 1 rod. Now have an 4x4 array.
Total of 16 rods.

1530 Water ht = 92.10 cm
System sub-critical
Drain.

Temp °C
23.5 °C

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3 X 10 ⁻¹²	Meter ✓	4"	✓	3 X 10 ⁻¹²
"	"	Fast ✓	1"	✓	"
K-2	"	Meter ✓	3"	✓	"
"	"	Fast ✓	1"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	.5"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	1"	✓	"
LOG N CALIBRATE _____ OPERATE _____			SOURCE No. <u>A-80</u>		
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by F.I.C. BKM Personnel check by F.I.C.
 Instruments and safety checked and reset by BKM
 Source in checked by BKM 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 BKM Time 0840
 Start-up OK'd by F.I.C. BKM Date 3-11-70

220

Rods in contact.
5.2" rod + 2.56" rods.

Have an 4x5-3 array. Total of 17 rods

0925 Water ht = 91.90 cm
system sub critical
Drain.

Temp °C
23.2°C

added 1 rod. Now have an 4x5-2
array. Total of 18 rods.

Water ht = 79.80 cm
+ Per

$\Delta h = .50 \text{ cm}$

Temp °C
23.5°C

$U = 149.94 \text{ sec} = 7.1 \phi = 14.2 \phi / \text{cm}$

1055 Water ht = 79.30 cm
system just critical
Drain.



Rods in contact.

229

5.2" rods.

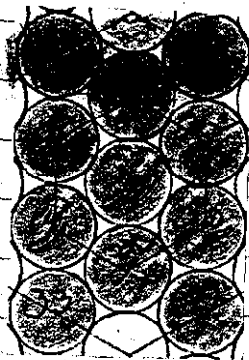
Triangular array:

1 core an Triangular array with 1 full ring, plus 2 rods on 2 opposite faces in 2nd ring. Total of 11 rods.

Water ht = 68.80 cm ^{sh = 13.5 cm} Temp °C
2 + per 23.5°C

$C = 241.20 \text{ au} = 8.74 = 13.9 \text{ cm}$

1535 Water ht = 68.95 cm
system just critical
Drain.



230

3/12/70

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE	SET	START-UP RANGE	
K-1	3 x 10 ⁻¹²	Meter	✓	4"	✓	3 x 10 ⁻¹²
		Fest	✓	1"	✓	
K-2	3 x 10 ⁻¹²	Meter	4 ✓	4"	✓	3 x 10 ⁻¹²
		Fest	✓	1"	✓	
R-1	—					
R-2	—					
PM-1	700V	Alarm	✓	1/2"	✓	500V
PM-2	1200V	Low	✓	10"	✓	
		Alarm	✓	2"	✓	500V

LOG N CALIBRATE OPERATE

SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by RKR Personnel check by RKR

Instruments and safeties checked and reset by EJ

Source in checked by RKR Source No. 14-43

Emergency equipment in control room checked by

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

Red light on by EJ Time 0920

Start-up OK'd by EJ, RKR Date 3/12/70

Rods in contact
5.2" rods only.

231

Triangular array:

Repeat of last experiment p 229.

Water ht = 68.90 cm $\Delta h = .35$ cm Temp °C
+ Per 23.0 °C

$E = 346.16 \text{ cm} = 3.5 \text{ f} = 10.0 \text{ f/cm}$

1022 Water ht = 68.55 cm

System just critical
Drain

Removed 1 rod. Now have an triangular array with 1 full ring, plus 3 rods 1 each on every other face in 2nd ring. Total of 10 rods.

1357 Water ht = 93.10 cm Temp °C
System just critical 23.2 °C
Drain

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SPT	START-UP RANGE
K-1	3 X 10 ⁻¹²	Meter ✓	4"	✓	3 X 10 ⁻¹²
"	"	Fast ✓	1"	✓	"
K-2	"	Meter ✓	4"	✓	"
"	"	Fast ✓	1"	✓	"
PM-1	700V	Alarm	5"	✓	500V
PM-2	1200V	Low	10"	✓	900V
"	"	Alarm	1"	✓	"
LOG-N-CALIBRATE		OPERATE	SOURCE No. <u>0-80</u>		
DUMP WELL PROBE LIGHT					

START-UP CHECK LIST

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

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

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

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

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

Red light on by A.K.N. Time 0910

Start-up OK'd by I.P.C., A.K.N. Date 3-16-70

.50" separation edge-edge.
5.2" Rods only.
Square array's.

232

Have an 2x3 array. Total of 6 rods.

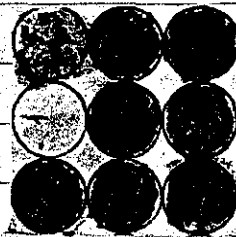
1007 Water ht = 91.60 cm Temp °C
System sub critical --- 23.0 °C
Drain:

added 1 rod. Now have an 3x3 array.
Total of 7 rods.

Water ht = 67.70 cm $d = .65$ cm Temp °C
+ Per --- 23.0 °C

$L = 102.13$ cm = $9.74 = 14.92$ H cm

1101 Water ht = 67.05 cm
System just critical
Drain:



over:

231

.50" separation edge-edge.
5.2" radii only.
Square array's

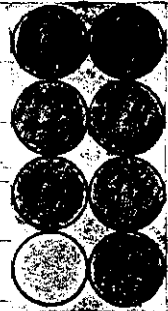
Now have an 2 x 4-1 array. Total of 7 tracks

Water ht = 72.60 cm $\Delta h = 2.35$ cm Temp °
+ Per 23 °

$t = 56.50$ sec = 15.04 = 6.84 cm

1318 Water ht = 70.25 cm

System just critical
Drain.



INSTRUMENT CHECK

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

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

START-UP CHECK LIST

Equipment checked by F.D.C. Personnel check by F.D.C.Instruments and safeties checked and reset by A.H.V.Source in checked by A.H.V. Source No. M-43Emergency equipment in control room checked by F.D.C.Instruments in tray checked by A-1-2 PM-1-2Red light on by A.H.V. Time 0805Start-up OK'd by F.D.C. A.H.V. Date 3-17-70

.50" separation edge - edge
 5.2" + 2.56" rods.
 Square array.

Have an 3x4 array. Total of 12 rods.

Water ht = 57.50 cm $\phi h = .50$ cm Temp $^{\circ}$ C
 + Rx 23.5 $^{\circ}$ C

$$C = 86.92 \text{ m} = 11.0 \text{ ft} = 22.0 \text{ g/cm}$$

0857 Water ht = 57.00 cm

System just critical
 Drain.

Removed 2 rods. Now have an 3x4-2 array
 Total of 10 rods.

1058 Water ht = ~~77~~ 91.60 cm

System sub critical
 Drain.

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

added 1 rad. Now have an 3x4-1 array. Total of 11 rods.

Water ht = 67.35 cm $\Delta h = .75 \text{ cm}$ Temp $^{\circ}\text{C}$
2 + Per 23.7 $^{\circ}\text{C}$

$C = 93.44 \text{ au} = 10.44 = 13.94 / \text{cm}$

1139 Water ht = 66.60 cm
System just critical
Point.



P-238

+250" separation edge - edge.
5.2" Rods only.
Triangular array.

Have an Triangular array: 1 full ring. Total of 7 rods.

1423

Water ht = 91.70 cm
System sub-critical
Drain.

Temp °C
29.0 °C

Added 1 rod. Have an Triangular array.
1 full ring, plus 1 rod on one face in
2nd ring. Total of 8 rods.

Water ht = 79.10 cm
3 + per

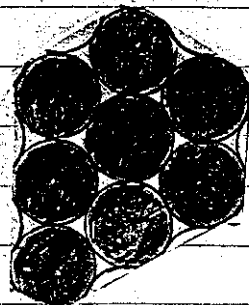
$\Delta L = 1.60 \text{ cm}$

Temp °C
29.0 °C

$$v = 254.29 \text{ cm} = 4.54 = 7.54/\text{cm}.$$

1543

Water ht = 73.50 cm
System just critical
Drain.



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter <input checked="" type="checkbox"/>	9"	<input checked="" type="checkbox"/>	3×10^{-12}
"	"	Fast <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	"
K-2	11	Meter <input checked="" type="checkbox"/>	9"	<input checked="" type="checkbox"/>	"
"	"	Fast <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	"
R-1					
R-2					
PM-1	700V	Alarm <input checked="" type="checkbox"/>	1.5"	<input checked="" type="checkbox"/>	500V
PM-2	1200V	Low <input checked="" type="checkbox"/>	10"	<input checked="" type="checkbox"/>	900V
"	"	Alarm <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	"
LOG N. CALIBRATE <input checked="" type="checkbox"/>		OPERATE <input checked="" type="checkbox"/>		SOURCE No. <u>B-80</u>	
DUMP WELL PROBE LIGHT <input checked="" type="checkbox"/>					

START-UP CHECK LIST

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

Instruments and safeties checked and reset by AKK

Source in checked by B. Kelly 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 AKK Time 1230

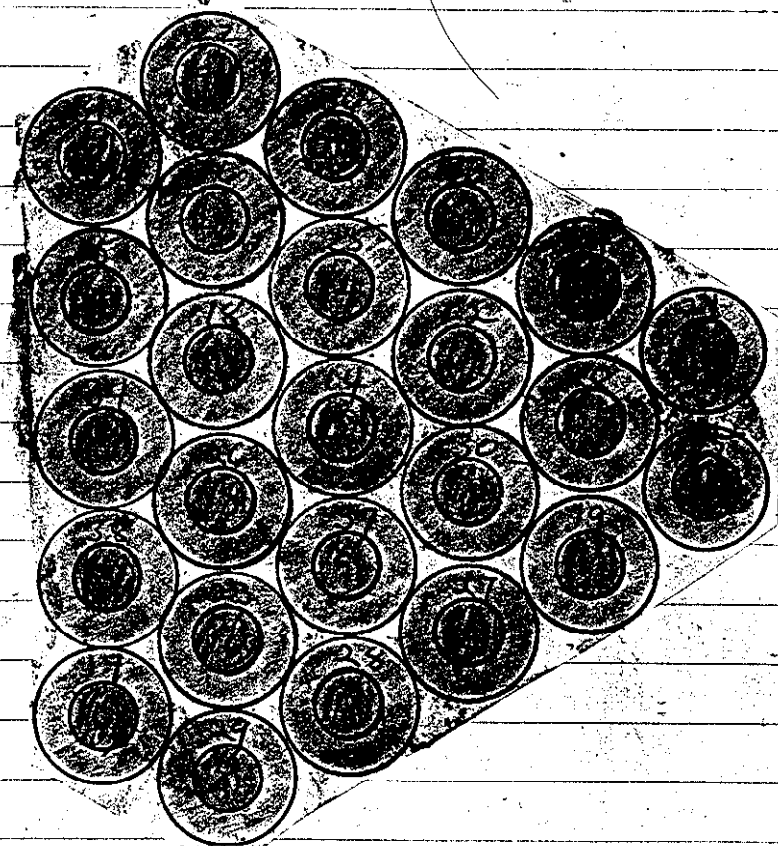
Start-up OK'd by F.I.C. AKK Date 7-18-70

.250" separation edge - edge.
 5.2" + 2.56" rods.
 Triangular array.

I have an triangular array. 2 full rings,
 plus 2 rods on every other face in 3rd
 ring. Total of 25 rods.

Water ht = 91.90 cm
 System sub critical
 Drain.

Temp °C
 29.5 °C



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	7"	-	3×10^{-12}
"	"	Fast ✓	1"	-	"
K-2	"	Meter ✓	3"	-	"
"	"	Fast ✓	1"	-	"
R-1					
R-2					
PM-1	700V	Alarm ✓	5"	-	500V
PM-2	1200V	Low ✓	10"	-	900V
"	"	Alarm ✓	7"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. <u>B-80</u>
DUMP WELL PROBE LIGHT					

START-UP CHECK LIST

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

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

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

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

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

Red light on by A.T.M. Time 0930

Start-up OK'd by F.I.D.C. A.T.M. Date 3-19-70

242

.50" separation edge-edge.
 5.2" Rads only.
 Triangular array.

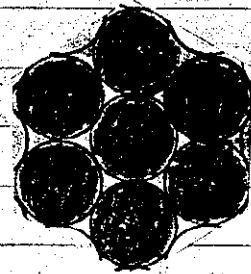
Have six rads in an triangular array.

10 37 Water ht = 91.80 cm Temp °C
 System sub critical 25.0 °C
 Drain.

added 1 rad. Now have an triangular
 array. 1 full ring. Total of 7 rads.

Water ht = 53.70 cm $\Delta L = 0.45$ cm Temp °C
 + Per 25.0 °C
 $E = 73.88 \text{ in} = 12.9 \text{ ft} = 27.54 \text{ cm}$

1306 Water ht = 53.25 cm
 System just critical
 Drain.



.50" separation edge - edge.

5.2" + 2.56" rods.

Triangular array.

Have on Triangular array. 1 full ring, plus 2 rods on 2 opposite faces in 2nd ring. Total of 11 rods.

Water ht = 91.70 cm
System sub critical
Drain.

Temp °C
25 °C

Added 2 rods. Now have on Triangular array. 1 full ring, plus 1 rod on each face in 2nd ring. Total of 13 rods.

Water ht = 91.90
27 per

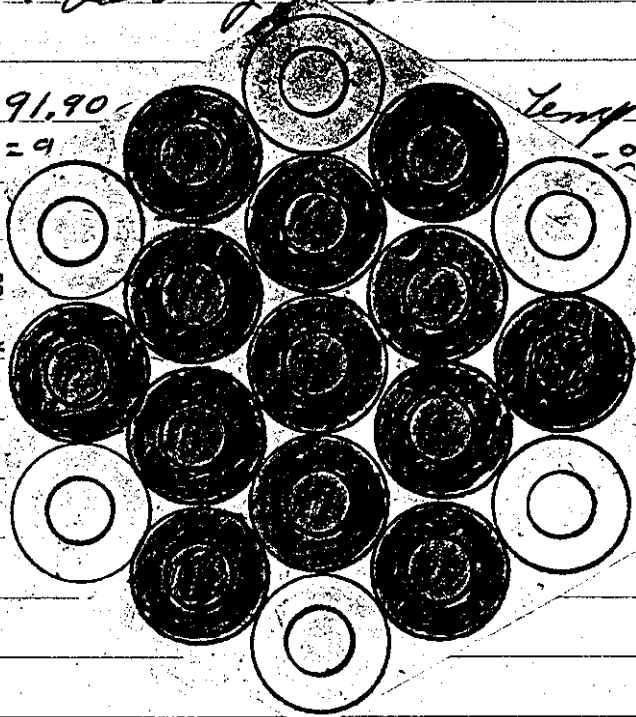
sl = 9

U = 99.96 m/s

Water ht = 8

System just
Drain.

Temp °C
25 °C



.50" separation edge - edge,
 5.2" + 2.56" rods,
 Triangular array's.

Have an Triangular array, 1 full ring, plus
 2 rods on 2 opposite faces in 2nd ring, Total of
 11 rods.

Water ht = 91.70 cm
 System sub critical
 Drain.

Added 2 rods. Now have
 array, 1 full ring, plus 1
 in 2nd ring. Total of 13

Water ht = 91.90 cm
 27 per $\Delta h = 9.35$

$C = 99.96 \text{ cm} = 9.9 \text{ ft} = 1.1 \text{ ft/cm}$

Water ht = 82.55 cm
 System just critical
 Drain.



2
 5.2
 5.56
 5.0
 2.56

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE	
K-1	3 x 10 ⁻¹²	Meter	3"		3 x 10 ⁻¹²	
"	"	Fast	1"		"	
K-2	"	Meter	3"		"	
"	"	Fast	1"		"	
R-1						
R-2						
PM-1	700 V	Alarm	1.5"		5000	
PM-2	1200 V	Low	10"		9000	
"	"	Alarm	1"		"	
LOG N CALIBRATE		<input checked="" type="checkbox"/>	OPERATE		<input checked="" type="checkbox"/>	SOURCE No. B-80
DUMP WELL PROBE LIGHT <input type="checkbox"/>						

START-UP CHECK LIST

Equipment checked by I.P.C. Personnel check by F.O.C.
 Instruments and safeties checked and reset by A.K.H.
 Source in checked by A.K.H. Source No. M-93
 Emergency equipment in control room checked by I.P.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by A.K.H. Time 0845
 Start-up OK'd by I.P.C. A.K.H. Date 3-20-70

150° separation edge - edge.

5.7" + 2.56" radii.

Triangular array?

245

Have an Triangular array (full ring) plus
1 rad on each of 5 faces in 2nd ring.
Total of 17 radii. (see p. 243)

0926 Water hts = 92.20 cm

System sub-critical

Drain.

Temp °C

24.2 °C

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	STARTUP RANGE
K-1	3 X 10 ⁻¹²	Alarm ✓	3"	✓	3 X 10 ⁻¹²
"	"	Fast ✓	1"	✓	"
K-2	"	Alarm ✓	3"	✓	"
"	"	Fast ✓	1"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	15"	✓	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 F.P.C. Personnel check by F.P.C.
 Instruments and safeties checked and reset by A.K.D.
 Source in checked by A.K.D. Source No. 19-93
 Emergency equipment in control room checked by F.P.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by A.K.D. Time 0935
 Start-up OK'd by F.P.C. A.K.D. Date 3-23-70

.75" separation edge-edge.
5.2" rods only.
Square array.

247

Have an 2×3 array. Total of 6 rods.

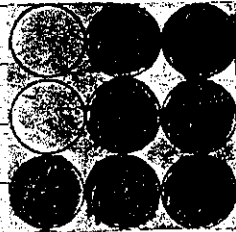
10:30 Water ht = 91.70 cm Temp °C
System sub-critical 23.0°C
Drain

Added 1-rod. Now have an $3 \times 3 - 2$
array. Total of 7 rods.

Water ht = 68.80 cm $\Delta h = .90$ cm Temp °C
+ Per 23.1°C

$$E = 69.59 \text{ cm} = 13.04 = 14.9 \text{ f/cm}$$

11:15 Water ht = 67.90 cm
System just critical
Drain

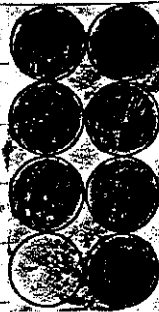


Now have an $2 \times 4 - 1$ array. Total of 7 rods.

Water ht = 72.70 cm $\Delta h = 1.10$ cm Temp °C
+ Per 23.1°C

$$E = 84.75 \text{ cm} = 11.29 = 11.2 \text{ f/cm}$$

13:27 Water ht = 71.70 cm
System just critical
Drain



over!

.750" separation edge-edge,
5.2" + 7.50" rods,
Square array's

Have an 3 x 4 - 2 array. Total of 10 rods.

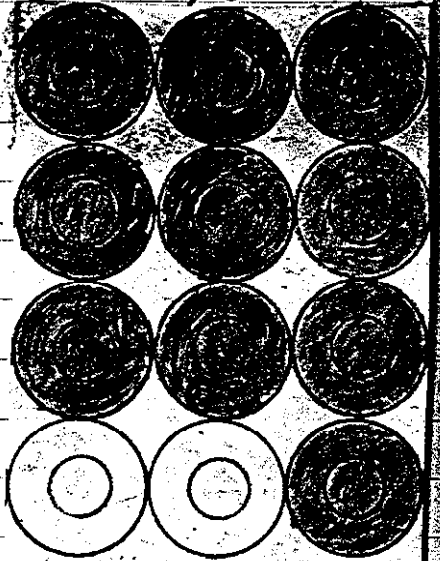
Water ht = 80.45 cm $\phi = .70$ cm Temp $^{\circ}$ C

3 + Per

$$U = 173.94 \text{ sec} = 6.34 = 9.0 \text{ g/cm}$$

1455 Water ht = 79.75 cm

System just critical
Drain.



Removed 1 rods. Now have
Total of 9 rods.

1547 Water ht = 91.80 cm

System sub critical
Drain.

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

248

.750" separation edge
5.2" + 2.56" rods.
Square array.

.750" sep. edge-edge
5.2" + 2.56" rods

Have an 3 x 4 - 2 array. Total
Water ht = 80.45 cm $\phi = 1 =$

3 + Per

$$C = 173.94 \text{ cm} = 6.34 = 9.0 \text{ g/cm}$$

1455 Water ht = 79.75 cm

System just critical
Drain.



Removed 1 rod. Now have an 3 x 3 array.
Total of 9 rods.

1547 Water ht = 91.80 cm
System sub critical
Drain.

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

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3X10 ⁻¹²	Meter ✓	9"	✓	3 X 10 ⁻¹²
"	"	Fast ✓	1"	✓	"
K-2	"	Meter ✓	9"	✓	"
"	"	Fast ✓	1"	✓	"
R-1					
R-2					
PAI-1	700V	Alarm ✓		✓	500V
PAI-2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	1"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. <u>B-80</u>
DUMP WELL PROBE LIGHT		_____			

START-UP CHECK LIST

Equipment checked by I.D.C. Personnel check by F.D.C.
 Instruments and safeties checked and reset by M.K.H.
 Source in checked by A.H.H. Source No. M-43
 Emergency equipment in control room checked by I.D.C.
 Instruments in trip circuit: K-1-2 PAI-1-2
 Red light on by A.H.H. Time 0915
 Start-up OK'd by I.D.C. A.H.H. Date 3-29-70

1.0" separation edge - edge.
 5.2" rods only.
 Square array's.

Have an 3x3-1 array. Total of 8 rods.

Water ht = 51.45 cm $dk = .45$ cm Temp °C
 1 + Per 23.2 °C

$$E = 93.44 \text{ cm} = 10.44 = 23.14 / \text{cm}$$

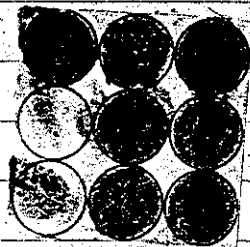
1000 Water ht = 51.00 cm
 System just critical
 Drain.

Removed 1 rod. Now have an 3x3-2 array.
 Total of 7 rods.

Water ht = 80.50 cm $dk = 1.2$ cm Temp °C
 2 + Per 23.2 °C

$$E = 108.65 \text{ cm} = 9.34 = 7.74 / \text{cm}$$

1101 Water ht = 79.30 cm
 System just critical
 Drain.



$\beta = 25.1$

Now have an 2x4-1 array. Total of 7 nodes.

Water ht = 91.80 cm
3-per
C = -254.29 mm = -6.1 ft

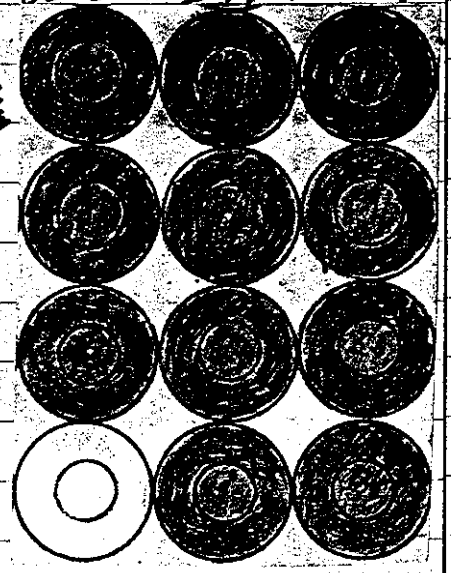


Temp °
23.5 °

1.0" separation edge-edge.
5.2" + 2.50" nodes.
Square array.

Now have an 3x4-1 array. Total of 11 nodes.

Water ht = 66.10 cm. ^{p-251}
4-per
C = 99.96 mm = 9.9 ft = 16.5 ft/cm.



1500 Water ht = 65.50 cm
system just critical
Drain.

Now have an 2x4-1 array. Total of 7 nodes.

Water ht = 91.80 cm
 3-per

$$C = -254.29 \text{ mm} = -6.1 \text{ ft}$$



Temp °C
 23.5 °C

P-251

1.0" separation edge
 5.2" + 2.50" node
 square array

Now have an 3x4-1 array.

Water ht = 66.10 cm. ^{pl. 60}
 4-per

$$C = 99.96 \text{ mm} = 9.9 \text{ ft} = 16.5 \text{ ft cm.}$$

1500 Water ht = 65.50 cm
 system just critical
 Elmer.

p-252

Removed 1 rod. Now have an 3x4-2 array.
 Total of 10 rods.

1550 Water ht = 92.70 cm
 system sub critical
 Drain.

Temp °C
 23.5 °C

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3x10 ⁻¹²	Meter ✓	3"	✓	3x10 ⁻¹²
"	"	Fast ✓	1"	✓	"
K-2	"	Meter ✓	3"	✓	"
"	"	Fast ✓	1"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	5"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	1"	✓	"
LOG IN CALIBRATE		✓	OPERATE		✓
			SOURCE No.		B-80
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

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

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

Source in checked by H.K.H. Source No. 14-83

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

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

Red light on by H.K.H. Time 0915

Start-up OK'd by I.P.C. H.K.H. Date 3-25-70

1.9375" separation edge-edge.
5.2" rad only.
Square array?

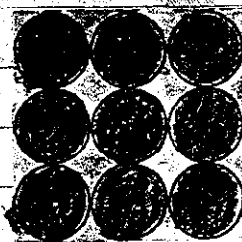
Have an 3x3 array. Total of 9 rods.

Water ht = 66.10 cm $z_{L} = .90 \text{ cm}$ Temp °C
Then " " " " 73.2 °C

$G = 63.02 \text{ cm} = 13.94 = 15.44 \text{ cm}$

0957 Water ht = 65.20 cm

System just critical
Drain.



aver:

Remained 1 rad. Now have an $3 \times 3 - 1$
array. Total of 8 rads.

Water ht = 92.00 cm $\Delta h = 3.25 \text{ m}$ Temp $^{\circ}\text{C}$
~~system just critical~~ 23.5 $^{\circ}\text{C}$
 Drain.

1.4375" separation edge - edge.
 5.2" + 2.56" rads.
 square array's.

Now have an 4×5 array. Total of 20
 rads.

Water ht = 57.45 cm $\Delta h = 1.30 \text{ m}$ Temp $^{\circ}\text{C}$
 $^2 + \text{Per}$ 23.5 $^{\circ}\text{C}$

$$C = 256.11 \text{ sec} = 4.5 \phi = 15.0 \phi / \text{cm}$$

1453 Water ht = 57.15 cm
 system just critical
 Drain.

Remaind 2 rods. Now have on $4 \times 4 + 2$
rods on 1 fan. Total of 18 rods.

Water ht = 65.25 cm ^{at 1.70 cm} Temp $^{\circ}\text{C}$
3 + Per --- 23.5 $^{\circ}\text{C}$

$t = 63.02 \text{ m} = 13.9 \text{ f} = 15.4 \text{ ft}$
1545 Water ht = 64.35 cm
System just critical
Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-3A10	-12	Meter ✓	3"	✓	3 K10-42
"	"	Fst ✓	1"	✓	"
K-2	"	Meter ✓	3"	✓	"
"	"	Fst ✓	1"	✓	"
PM-1	700V	Alarm ✓	5"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
		Alarm ✓	1"	✓	"
LOG IN CALIBRATE ✓		OPERATE ✓		SOURCE No. B-80	
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

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

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

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

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

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

Red light on by A.K.M. Time 0920

Start-up OK'd by F.I.C. A.K.M. Date 3-26-70

1.4375" separation edge-edge. 257
5.2" + 2.56" rods.
Square array

See p 255. Removed 1 rod. Now have
an $4 \times 4 + 1$ array. Total of 17 rods.

Water ht = 70.60 cm $d_s = 1.6$ cm Temp $^{\circ}$ C
+ Per 23.0 $^{\circ}$ C

$$C = 97.78 \text{ cm} = 10.0\% = 6.27/\text{cm}$$

1020 Water ht = 69.00 cm =
System just critical
Drain.

Removed 1 rod. Now have an 4×4
array. Total of 16 rods.

Water ht = 72.70 cm $d_s = 1.3$ cm Temp $^{\circ}$ C
+ Per 23.2 $^{\circ}$ C

$$C = 39.11 \text{ cm} = 19.3\% = 14.9/\text{cm}$$

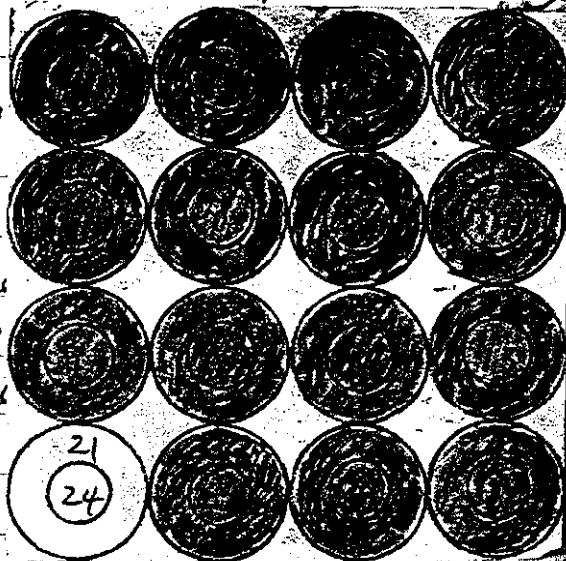
1107 Water ht = 71.40 cm
System just critical
Drain.

see p 258

Removed 1 rad. Now have an 4x4-1 array
Total of 15 rads.

$\sigma_4 = 1.15$
Water ht = 90.00 cm
3 + per

1335 $\sigma = 76.05 \text{ cm} = 12.2 \text{ ft} = 10.1$
Water ht = 78.85 cm
System just critical
Drain.



Removed 1 rad. Now have an 4x4-2
array. Total of 14 rads.

1433 Water ht = 92.40 cm
System sub critical
Drain.

Temp °C
23.3 °C

Removed 1 rad. Now
Total of 15 rads.

Water ht = 90.00 cm

³ + per

$\epsilon = 76.05 \text{ cm} = 12.2 f = 10.6 H \text{ cm}$

1335 Water ht = 78.85 cm

System just critical
Drain.

$0.5 = 1.15$

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

Removed 1 rad. Now have an 9x9-2
array. Total of 18 rads.

1433 Water ht = 92.90 cm

System sub critical

Drain.

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

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3x10 ⁻²	Meter ✓	3"	✓	3x10 ⁻²
"	"	Fast ✓	1"	✓	"
K-2	"	Meter ✓	3"	✓	"
"	"	Fast ✓	1"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	5"	✓	500V
PM-2	1200V	Alarm ✓	10"	✓	900V
"	"	Alarm ✓	1"	✓	"

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

START-UP CHECK LIST

Equipment checked by F.D.C. Personnel check by A.T.M.
 Instruments and safeties checked and reset by A.T.M.
 Source in checked by A.T.M. Source No. M-43
 Emergency equipment in control room checked by F.D.C.
 Instruments in trip circuit: K-1-2, PM-1-2
 Red light on by A.T.M. Time 1230
 Start-up OK'd by F.D.C. A.T.M. Date 3-30-70

2.0" separation edge - edge.
 5.2" rods only.
 square array.

1313 Have an 4x4-2 array. Total of 14 rods.
 Water ht = 91.90 cm Temp °C
 System sub critical 22.5 °C
 Drain.

added 1 rod. Now have an 4x4-1 array.
 Total of 15 rods.

1400 Water ht = 91.80 cm Temp °C
 System sub critical 23.0 °C
 Drain.

added 3 rods. Now have an 4x5-2 array.
 Total of 18 rods.

1458 Water ht = 91.80 cm Temp °C
 System sub critical 23.0 °C
 Drain.

added 2 rads. Now have an 4x5 array.
 Total of 20 rads.

Water ht = 91.80 cm
~~System kept exhibited~~ --- Temp °C
 1 - Pen 23.0°C
 N.G

1555 Drain:

4
6
2
2

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE RANGE	SET	START-UP RANGE
K-1	3 X 10 ⁻¹²	Meter ✓	3"	✓	3 X 10 ⁻¹²
"	"	Fast ✓	1"	✓	"
K-2	"	Meter ✓	3"	✓	"
"	"	Fast ✓	1"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	5"	✓	500V
PM-2	200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	1"	✓	"

LOG N CALIBRATE OPERATE SOURCE No. B-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by I.D.C. Personnel check by I.D.C.
 Instruments and safeties checked and reset by A.K.V.
 Source in checked by A.K.V. Source No. 19-43
 Emergency equipment in control room checked by Fila
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by A.K.V. Time 0815
 Start-up OK'd by I.D.C. A.K.V. Date 3-31-70

2.0" separation edge - edge. 263
5.2" Rods only.
Square array's.

Now have an 5x5 array. Total of 21 rods.

Water ht = 92.10 cm

Temp °

' - Per

22.5 °

N.G.

0900 Drain!

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3K10 ⁻¹²	Meter ✓	3"	✓	3K10 ⁻¹²
"	"	Fast ✓	1"	✓	"
K-2	"	Meter ✓	3"	✓	"
"	"	Fast ✓	1"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	5"	✓	600V
PM-2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	1"	✓	"

LOG N CALIBRATE _____ OPERATE _____ SOURCE No. _____

DUMP WELL PROBE LIGHT _____

START-UP CHECK LIST

Equipment checked by I.D.C. Personnel check by R.K.H.L.

Instruments and cables checked and reset by R.K.H.L.

Source in checked by R.K.H.L. Source No. M-93

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

Instruments in trip checked: K-1-2 M-1-2

Red light on by R.K.H.L. Time 14:20

Start-up OK'd by I.D.C. R.K.H.L. Date 4-2-70

Repeat of last experiment (see p - 263)

Water ht = 91.90 cm

Temp °C

~~91.90 cm~~

22.5°C

- per

N.G

1509

Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	STARTUP RANGE
K1	3X10 ⁻¹²	Meter ✓	3"	✓	3X10 ⁻¹²
"	"	Fst ✓	1"	✓	"
K2	"	Meter ✓	3"	✓	"
"	"	Fst ✓	1"	✓	"
P11	700V	Alarm ✓	5"	✓	500V
P12	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	1"	✓	"
LOS IN CALIBRATE ✓		OPERATE ✓		SOURCE No. B-80	
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by ^{F.P.C.} AKAL Personnel check by F.P.C.
 Instruments and safeties checked and reset by AKAL
 Source in checked by AKAL 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 AKAL Time 10 10
 Start-up OK'd by F.P.C. AKAL Date 9-3-70

2.0" separation edge-edge.
 5.2" Rod only.
 Square array's.

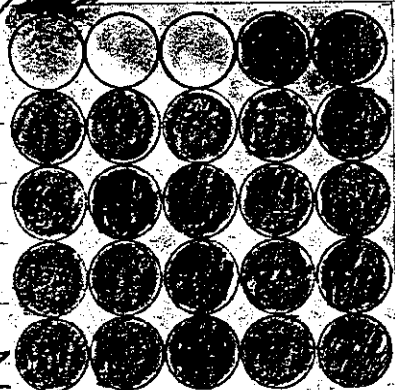
267

Now have an 5x5-3 array. Total of 22 rods.

Water ht = 82.10 cm $\Delta h = 1.9$ cm Temp $^{\circ}$ C
 + Per --- 22.8 $^{\circ}$ C

$\tau = 78.23 \text{ new} = 11.94 = 6.3 \text{ f/cm}$

1046 Water ht = 80.20 cm
 System just critical
 Drain.



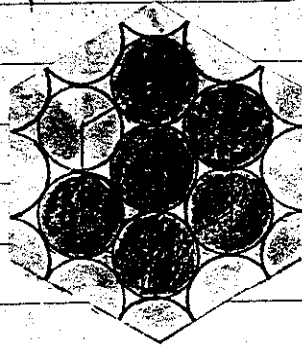
Triangular as
 750" separation edge-edge.
 5.2" rods only.

Now have 6 rods in an
 array.

Water ht = 65.40 cm $\Delta h = 1.05$ cm Temp $^{\circ}$ C
 + Per --- 23.2 $^{\circ}$ C

$\tau = 49.98 \text{ new} = 16.44 = 15.6 \text{ f/cm}$

1555 Water ht = 64.35 cm
 System just critical
 Drain.



2.0" separation edge-edge.
5.2" Rod only.
Square array's.

267

Now have an 5x5-3 array. Total of 22 rods.

Water ht = 82.10 cm $\sigma h = 1$
+ Per

Pass 267

$$U = 78.23 \text{ sec} = 11.94 = 6.37$$

1046 Water ht = 80.20 cm

System just critical
Drain.

Triangular array.

.750" separation edge-edge.

5.2" rods only.

Now have 6 rods in an triangular
array.

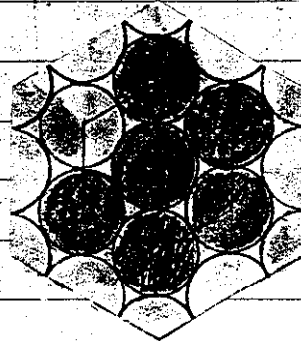
Water ht = 65.40 cm $\sigma h = 105 \text{ cm}$
+ Per

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

$$U = 49.98 \text{ sec} = 16.44 = 15.64 \text{ cm}$$

1555 Water ht = 64.35 cm

System just critical
Drain.



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K1	3×10^{-12}	Meter ✓	3"	✓	3×10^{-12}
"	"	Fast ✓	1"	✓	"
K2	"	Meter ✓	3"	✓	"
"	"	Fast ✓	1"	✓	"
P-1					
P-2					
PA	700V	Alarm ✓	5"	✓	500V
PA	1200V	Low ✓	10"	✓	900V
		Alarm ✓	1"	✓	"
LOG N CALIBRATE		✓	OPERATE		✓
WELL PROBE LIGHT		✓	SOURCE No.		B-80

START-UP CHECK LIST

Equipment checked by ^{I.D.C.} A.K.V. Personnel check by F.R.S.
 Instruments and safeties checked and reset by A.K.V.
 Source in checked by A.K.V. Source No. M-03
 Emergency equipment in control room checked by F.D.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by A.K.V. Time 0835
 Start-up OK'd by F.R.C. A.K.V. Date 4-6-70

.750" separation edge-edge. 269
5.2" rods only.
Triangular array.

Must have 5 rods in an triangular array.

0926 Water ht = 91.90 cm Temp °C
system sub critical 23.5 °C
Drain.

.750" separation edge-edge.
5.2" + 2.50" rods.
Triangular array?

Have an triangular array. 1 full ring,
plus 4 rods on 4 pairs in 2nd ring.
Total of 11 rods.

Water ht = 55.60 cm $\Delta h = .55 \text{ cm}$ Temp °C
'ther 23.5 °C

$t = 65.19 \text{ cm} = 13.6 \text{ f} = 24.7 \text{ Hcm}$

1043 Water ht = 55.05 cm
system just critical
Drain.

Removed 1 rod. Now have an triangular array
1 full ring, plus 1 rod on every other face
in 2nd ring. Total of 10 rods.

Water ht = 66.60 cm $dh = 1.3$ cm Temp $^{\circ}$ C
2 + Per 23.5 $^{\circ}$ C

$$C = 32.59 \text{ sec} = 21.6 \text{ f} = 76.6 \text{ f/cm}$$

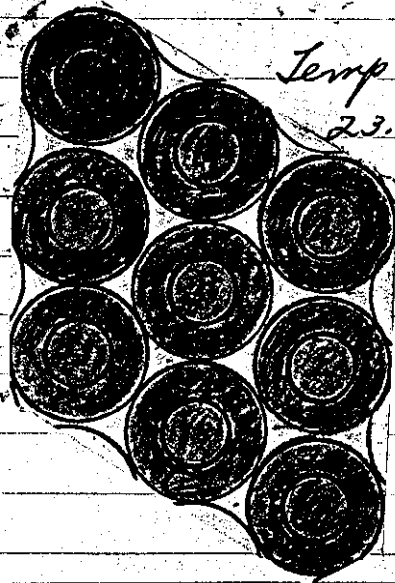
1305 Water ht = 65.30 cm
System just critical
Drain.

Removed 1 rod. Now have an triangular
array. 1 full ring, plus 2 rods 1 each on
opposite faces in 2nd ring. Total of 9
rods.

Water ht = 92.30 cm Temp $^{\circ}$ C
3 + Per $dh = 8.5$ 23.6 $^{\circ}$ C

$$C = 265.11 \text{ sec} = 4.3 \text{ f} = 5 \text{ f/cm}$$

1420 Water ht = 83.80 cm
System just critical
Drain.



Repeat:

Water ht = 92.00 cm

4 Per

Temp °C

23.6 °C

$$E = 265.11 \text{ sec} = 4.3 \text{ s}$$

1530 Water ht = 83.80 cm

system just critical

Drain

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-13	3 X 10 ⁻¹²	Meter ✓	3"	✓	3 X 10 ⁻¹²
"	"	Fast ✓	1"	✓	"
K-2	"	Meter ✓	3"	✓	"
"	"	Fast ✓	1"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	5"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	1"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROBE LIGHT					

START-UP CHECK LIST

Equipment checked by F.P.C. Personnel check by F.P.C.
 Instruments and safeties checked and reset by A.K.A.
 Source in checked by A.K.A. Source No. 12-43
 Emergency equipment in control room checked by F.P.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by A.K.A. Time 0800
 Start-up OK'd by F.P.C. A.K.A. Date 4-7-70

1.750" separation edge-edge.
5.2" + 2.56" rods.

273

Triangular array.

see p 270. Removed 1 rod. Now have an
Triangular array. 1 full ~~filling~~ ring, plus 1
rod on 1 face. Total of 8 rods.

0832 Water ht = 92.00 cm

Temp °C

System sub critical

23.5 °C

Drain:

1.0" separation edge-edge.

5.2" rods only.

Triangular array.

Now 5 rods in an triangular array.

0950 Water ht = 91.70 cm

Temp °C

System sub critical

23.5 °C

Drain:

added 1 rod. Now have 6 rods in an
Triangular array. $dh = .70$

Water ht = 58.75 cm

Temp °C

+ Per

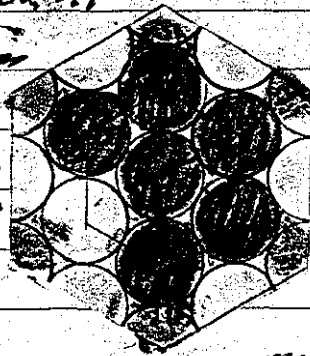
23.5 °C

$S = 52.15 \text{ cm} = 15.84 = 22.64\%$

1106 Water ht = 58.05 cm

System just critical

Drain:



cross:

27-

1.0" separation edge - edge.
5.2" + 2.56" rods.
Triangular array's.

Have an Triangular array. 1 full ring. plus
1 rod on 1 face in 2nd ring. total of 8 rods.

Water ht = 65.10 cm
2 + Per

$\rho = .5$

Temp °
23.5°

$E = 102.13 \text{ sec} = 9.74 = 19.44/\text{cm}$
13.26 Water ht = 64.60 cm
System just critical
Drain.



Removed 1 rod. Now have 1 full ring.
Total of 7 rods.

1410 Water ht = 92.20 cm
System sub critical
Drain.

Temp °
23.6°

INSTRUMENT CHECK

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

START-UP CHECK LIST

Equipment checked by F.D.C. Personnel check by F.D.C.
 Instruments and safeties checked and reset by ATM
 Source in checked by ATM 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 ATM Time 0805
 Start-up OK'd by F.D.C. ATM Date 9-8-70

1,4375" separation edge - edge.
5.2" rods only.
Triangular array?

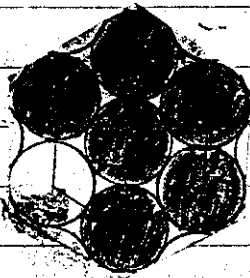
Have 6 rods in an triangular array.

78.15 cm
Water ht = 78.15 cm $D_h = 1.3$ Temp °
+ Per 23.6 °

$$L = 65.19 \text{ cm} = 13.6 f = 10.54 \text{ cm}$$

0937 Water ht = 76.85 cm

System just critical
Drain.



Removed 1 rod. Now have 5 rods
in an triangular array.

0926 Water ht = 91.70 cm

System sub critical
Drain.

Temp °
23.70 cm

1.4375" separation edge-edge. 277
5.2" + 2.56" radii.
Triangular array.

Have an ~~Triangular~~ array. 1 full ring.
Total of 7 rods.

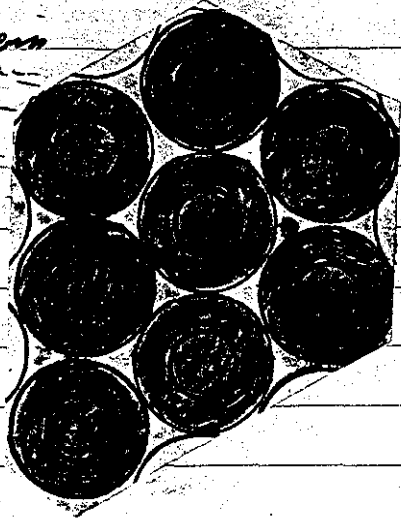
1258 Water ht = 92.20 cm Temp °C
System sub critical = 23.70 cm
Drain

added 1 rod. Have now an ~~Triangular~~
array. 1 full ring, plus 1 rod on 1 face
in 2nd ring. Total of 8 rods.

Water ht = 78.10 cm Temp °C
2 + Per D.H. = .70 cm = 23.7 °C

$$G = 108.65 \text{ sec} = 9.3 \phi = 13.3 \phi \text{ cm}$$

1350 Water ht = 77.40 cm
System just critical
Drain.



$\phi = 2.78$

1.9375" separation edge-edge.
 5.2" rods only.
 Triangular array.

Have one triangular array. 1 full ring,
 plus 1 rod on 1 face in 2nd ring. Total
 of 8 rods.

Water ht = 77.60 cm $\Delta t = 1.0$

³+Per

$\bar{v} = 73.88 \text{ cm} = 12.54 = 12.5 \text{ ft/cm}$

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

1530 Water ht = 76.60 cm

System just critical
 Drain



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3×10^{-12}	Meter ✓	3"	✓	3×10^{-12}
"	"	Fast ✓	1"	✓	"
K-2	"	Meter ✓	3"	✓	"
"	"	Fast ✓	1"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	10"	✓	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 E.A.C. Personnel check by R.T.H.
 Instruments and safeties checked and reset by R.T.H.
 Source in checked by R.T.H. 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 R.T.H. Time 0805
 Start-up OK'd by F.I.C. R.T.H. Date 4-9-70

1.9375" separation edge - edge.
5.2" Raab only.
Triangular array.

(See p 278.) Removed 1 rad. from base
1 full ring. Total of 7 rads.

0845 Water ht = 92.00 cm
System sub critical
Drain.

Temp °C
23.8°

1.9375" separation edge - edge.
5.2" + 2.56" Raab.
Triangular array.

Have an Triangular array. 1 full ring, plus
1 rad on each face in 2nd ring. Total
of 13 rads.

1033 Water ht = 92.00 cm
System sub critical
Drain.

Temp °C
24.0°

added 1 rod. Now have 1 full ring, plus
7 rods in 2nd ring. Total of 14 rods.

Water ht = 76.90 cm

1 + Per

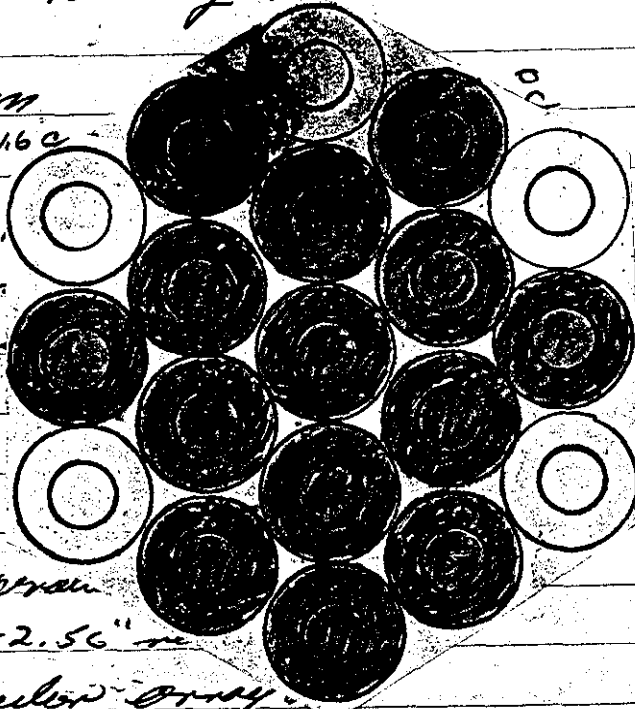
$$d_1 = 160$$

$$C = 45.63 \text{ sec} = 17.9 = 10.9$$

1115 Water ht = 75.30 cm

System just critical

Drain.



.30" apron

$$5.2" + 2.56" =$$

Triangular array

NO

Have an triangular array, 2 full rings,
plus 2 rods on every other row in 3rd
ring. Total of 25 rods.

Water ht = 57.70 cm

2 + Per

$$C = 108.65 \text{ sec} = 9.3 \text{ s}$$

1590 Water ht = 57.75 cm

System just critical

Drain.

Page 281

added 1 rad.
7 rads in 2.

Water ht =
1 + Per

$$C = 45.63 \text{ sec} = 17.9 = 10.$$

11.15 Water ht = 75.30 cm
System just critical.
Drain.

1.30" separation edge-edge
5.2" + 2.56" rads.

Triangular array.

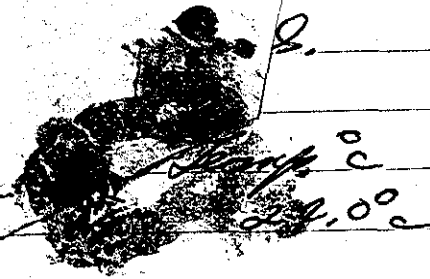
Have an triangular array of full rings,
plus 2 rads on every other face in 3rd
ring. Total of 25 rads.

Water ht = 57.70 cm
2 + Per

$$C = 108.65 \text{ sec} = 9.34$$

1590 Water ht = 57.75 cm
System just critical
Drain.

blue
2.



Temp °C
24.00

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE CLEARANCE	SET	START-UP RANGE
K-1	3X10 ⁻¹²	Alarm ✓	3"	✓	3X10 ⁻¹²
"	"	" ✓	1"	✓	"
K-2	"	Alarm ✓	3"	✓	"
"	"	Alarm ✓	1"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	15"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	1"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. B-80
DUMP WELL PROSE LIGHT		_____			

START-UP CHECK LIST

Equipment checked by EJC Personnel check by F.D.C.
 Instruments and safeties checked and reset by A.M.V.
 Source-in checked by A.M.V. Source No. M-93
 Emergency equipment in control room checked by F.D.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by A.M.V. Time 0900
 Start-up OK'd by F.D.C. A.M.V. Date 9-10-70

130" repeated edge-edge. 283
5.2" + 2.56" rods.
Triangular array.

(See p 281.) Removed 3 rods. Now have
2 full rings, plus 1 rod on every other
face in 3 ring. Total of 22 rods.

Water ht = 65.90 cm

Temp °C

+ Per

23.9°C

$$C = 341.16 \text{ cm} = 3.54$$

0955 Water ht = 65.60 cm

System just critical
Drain.

Removed 2 rods. Now have 2 full rings,
plus 1 rod on 1 face in 3rd ring.
Total of 20 rods.

Water ht = 77.80 cm

Temp °C

23.7°C

+ Per

$$C = 52.15 \text{ cm} = 15.9 \phi$$

1101 Water ht = 76.70 cm

System just critical
Drain.

arr.

Removed 1 rad. Now have a Triangular array, 2 full rings. Total of 19 rads.

Water ht = 81.50 cm

3 + per

$$E = 76.05 \text{ cm} = 12.13 \text{ ft} =$$

1310 Water ht = 80.3

system just on
Drain.



Removed 1 rad. Have an array, with 1 rad remaining from 1 corner in 2nd ring. Total of 18 rads.

1515 Water ht = 92.10 cm

Temp °

system just sub critical
Drain.

23.7°

Page 284

34

Removed 1 rad. Now have
array, 2 full rings. Total

Water ht = 81.50 cm

3 + per

$E = 76.05 \text{ cm} - 12.34 = 10.24 \text{ cm}$

1310 Water ht = 80.30 cm

system just critical
Drain.

Removed 1 rad. Now have an irregular
array, with 1 rad removed from 1 corner
in 2nd ring. Total of 18 rads.

1515 Water ht = 92.10 cm

system ~~just~~ sub critical
Drain.

Temp °
23.7°

ERLINE

K-1

K-2

R-1

R-2

PM-1

PM-2

LC

DUM

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3X10 ⁻¹²	Meter <input checked="" type="checkbox"/>	3"	<input checked="" type="checkbox"/>	3X10 ⁻¹²
"	"	Fast <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	"
K-2	"	Meter <input checked="" type="checkbox"/>	3"	<input checked="" type="checkbox"/>	"
"	"	Fast <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	"
R-1					
R-2					
PM-1	7000	Alarm <input checked="" type="checkbox"/>	15"	<input checked="" type="checkbox"/>	5000
PM-2	12000	Low <input checked="" type="checkbox"/>	10"	<input checked="" type="checkbox"/>	9000
"	"	Alarm <input checked="" type="checkbox"/>	1"	<input checked="" type="checkbox"/>	"
LOG 'N CALIBRATE <input checked="" type="checkbox"/>		OPERATE <input checked="" type="checkbox"/>		SOURCE No. B-80	
DUMP WELL PROBE LIGHT <input checked="" type="checkbox"/>					

START-UP CHECK LIST

Equipment checked by F.I.D.C. Personnel check by F.I.D.C.
 Instruments and safeties checked and reset by P.K.H.
 Source in checked by P.K.H. Source No. M-93
 Emergency equipment in control room checked by F.I.D.C.
 Instruments in trip circuit: K-1-2 PM-1-2
 Red light on by P.K.H. Time 1440
 Start-up OK'd by F.I.D.C. P.K.H. Date 9-15-70

286

1.6" separation edge - edge.
5.2" + 2.56" radii.
square array's.

Have an 4x5 array. Total of 20 rods.

1512 Water ht = 92.10 cm Temp °C
System sub critical 23.4°C
Drain.

Added 1 rod. Now have an 5x5 - 4
array. Total of 21 rods.

1556 Water ht = 92.00 cm Temp °C
System sub critical 23.5°C
Drain.

INSTRUMENT CHECK

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

LOG N CALIBRATE _____ OPERATE _____ SOURCE No. B-50

BUMP WELL PROSE LIGHT

START-UP CHECK LIST

- Equipment checked by F.P.C. Personnel check by F.P.C.
- Instruments and safeties checked and reset by ARKV
- Source in checked by ARKV Source No. M-43
- Emergency equipment in control room checked by F.P.C.
- Instruments in trip circuit: Z-1-2 DM-1-2
- Red light on by ARKV Time 0820
- Start-up OK'd by F.P.C. ARKV Date 4-16-70

1.6" separation edge - edge.
 5.2" + 2.56" rad.
 Square array.

(see p - 286) added 1 rad. Now have an
 5 x 5 - 3 array. Total of 22 rad.

Water ht = 92.00 cm
 - Per
 N.G.

Temp °C
 23.0°C

0914 Drain

added 1 rad. Now have an 5 x 5 - 2 array
 Total of ²³22 rad.

Water ht = 78.20
 + Per

$T = 5.215 \text{ per} = 15.94 = 19.9$

1019 Water ht = 77.10
 system just over
 Drain.



1.6" separation edge - edge.
 5.2" + 2.56" rods.
 Square array.

(See p - 286) added 1 rod. Now have an
 5 x 5 - 3 array. o

page 288

Water ht = 92.00

- Per

N.G.

0914 Drain

added 1 rod. No
²³
 Total of 22 rods.

0.1 = 11 cm

Water ht = 78.20 cm

² + Per

Temp °C

23.1 °C

$T = 52.15 \text{ sec} = 15.9 \text{ f} = 14.9 \text{ ft/cm}$

1019 Water ht = 77.10 cm
 system just critical
 Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	3x10 ⁻¹²	Meter ✓	3"	✓	3x10 ⁻¹²
"	"	Fast ✓	1"	✓	"
K-2	"	Meter ✓	3"	✓	"
"	"	Fast ✓	1"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	5"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	1"	✓	"

LOG N CALIBRATE

OPERATE

SOURCE No. 17-80

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

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

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

Source-in checked by A.K.V. Source No. 14-93

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

Instruments in trip circuit: 2-1-2 014-1-2

Red light on by A.K.V. Time 0840

Start-up OK'd by F.I.C. A.K.V. Date 4-17-70

2.3" separation edge - edge.
5.2" Rods only.
Triangular array.

Have seen triangular array. 1 full ring,
plus 1 rod on each face in 2nd ring.
Total of 13 rods.

Water ht = 92.00 cm

Temp °C

- Per

23.0 °C

N. 6

0925 Drain.

added 1 rod. Now have 1 full ring,
plus 7 rods in second ring. Total of
14 rods.

$s = 1.6$ cm

Water ht = 73.70

Temp °C

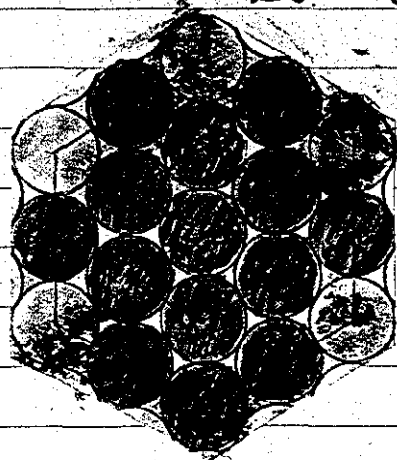
+ Per.

23.2 °C

$t = 56.50$ sec = 15.1 ft = 9.49/cm

1149 Water ht = 72.10 cm

System just critical
Drain



INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE RANGE	SET	START-UP RANGE
R-1	3X10 ⁻¹²	✓	3"	✓	3X10 ⁻¹²
"	"	✓	1"	✓	"
R-2	"	✓	3"	✓	"
"	"	✓	1"	✓	"
R-1					
R-2					
PM-1	700V	✓	5"	✓	5000
PM-2	1200V	✓	10"	✓	9000
"	"	✓	1"	✓	"

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

START-UP CHECK LIST

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

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

Source in checked by ATR Source No. M-93

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

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

Red light on by ATR Time 1235

Start-up OK'd by F.D.C. ATR Date 9-20-70

2.05 separation edge - edge.
 5.2" + 2.56" rad.
 Triangular array.

Have an triangular array. 2 full rings.
 Total of 19 rods.

Water ht = 55.40 cm
 + Per

ph = 40 cm

Temp °C
 22.2 °C

$$t = 89.09 \text{ sec} = 10.84$$

1310 Water ht = 55.00 cm
 system just critical
 Drain.

Removed 2 rods. 1 each from opposite point
 Total of 17 rods.

Water ht = 64.90 cm
 + Per

Temp °C
 22.7 °C

$$t = 132.55 \text{ sec} = 7.94$$

1408 Water ht = 64.30 cm
 system just critical
 Drain.

Removed 2 rods. Now have on Irregular
 core, 1 full ring, plus 4 rods removed
 from 2nd ring. Total of 15 rods.

Water ht = 9230 cm

Temp $^{\circ}$

3 - Per

23.0 $^{\circ}$

$C = -673.63 \text{ sec} = -2.0 \text{ f}$

1509 Drain.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	TRIP RANGE	SET	START-UP RANGE
K-1	3 X 10 ⁻¹²	None ✓	3"	✓	3 X 10 ⁻¹²
"	"	✓	1"	✓	"
K-2	"	Alarm ✓	3"	✓	"
"	"	Test ✓	1"	✓	"
R-1					
R-2					
PM-1	700V	Alarm ✓	5"	✓	500V
PM-2	1200V	Low ✓	10"	✓	900V
"	"	Alarm ✓	1"	✓	"
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. 0-80
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

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

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

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

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

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

Red light on by A.K.V. Time 0805

Start-up OK'd by F.I.C. A.K.V. Date 9-21-70

2.05" separation edge - edge 295
5.2" + 2.56" Rods.

Triangular array.

See p 293. added 1 rod. Now have
1 full ring, plus 1 rod removed from
every other corner in second ring.
Total of 16 rods.

Water ht = 75.20 cm

$\Delta h = 1.3$ cm

Temp °C

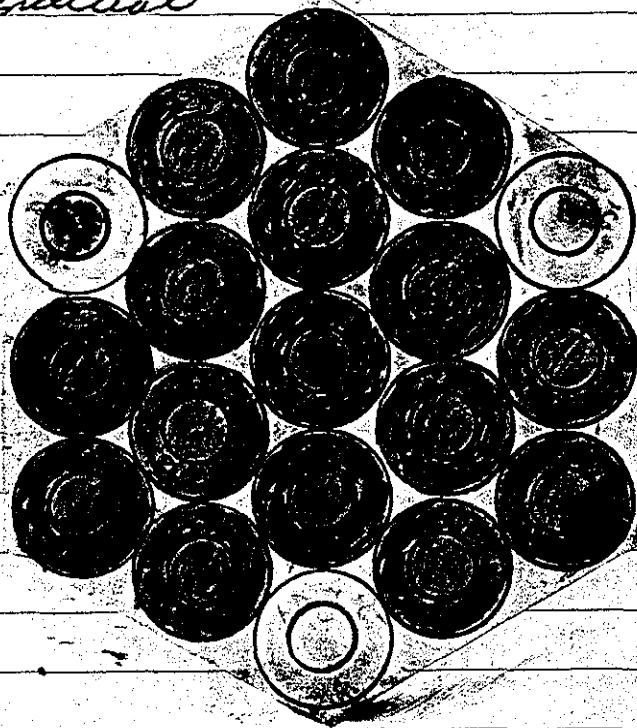
22.7

+ Per

$C = 54.32 \text{ sec} = 15.5 \text{ s}$

0896 Water ht = 73.90 cm

System just critical
flow.



298

Styrene
4/28/70

4-28-70

Sample taken from Big Kiel reflector
tank.

Reg # 684593

only for

g/g = .00000031