

BOOK60R

Notes:

"ETA, Pellets, HFIR, EGCR, EGS Plates #1" on spine

"ETA, Pellets, HFIR, EGCR, EGS Plates" on front

-pages 253-256 are present but not attached to logbook (someone tried to glue down, but now that is too old)

Blank pages: 93, 148-150, 192, 193, 207, 208, inside back cover sheet

- big graph sheet between pages 20/21
- page 93 has 3 (8.5x11) sheets taped
- page 140 has 2 small pieces loose - will tape down
- 1 (8.5x11) sheet between pages 150/151
- 157 & 158 has 2 small pieces taped to each page
- page 238 has 4 small sheets clipped at top
- page 243 has 2 small sheets clipped at top
- page 257 has half sheet clipped at top
- pages 260/261 have small sheet between pages
- page 284 has graph taped to it
- page 292 has 4 small sheets clipped at top
- 3 sheets of paper in back of book

Scanned by:

Sheila Finch

RSICC /Oak Ridge National Lab.

August 18, 1999



Standard Blank Book

No. 38

Journals Double \$ and Cts. no Units

S. E. Ledgers " " "

D. E. Ledgers Full Page Form "

Records with Margin Line

In 150, 200 and 300 Pages

Made in U. S. A.

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

A BOORUM & PEASE PRODUCT

CLASSIFICATION CANCELLED

DATE 5-27-60

Edgar J. Murphy

CO-ORDINATING ORGANIZATION DIRECTOR

OAK RIDGE NATIONAL LABORATORY

AUTHORITY DELEGATED BY AEC 9-10-57

EM

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Etz in Sid p. 1 →

B+W Pellets p. 153 →

HFIR #2 CE p. 182 →

EECR Fuel Elements⁽¹⁴⁾ p. 194 →

U(93)-Al Alloy Plates p. 209

Neutron dose added to Mamfold

Waybill no.		kg U
16		14,113
"	17	4,170
"	18	16,244
"	19	20,346
"	20	19,475
"	21	14,015
"	22	20,184
"	23	15,124
"	24	14,931
"	25	16,684
"	26	18,701
"	27	16,497
"	28	15,442
"	29	2,342
		210,292

From Dale

Waybill			Bottle No.
12		3,044	
"		4,557	"
"	14	4,509	"
"	"	5,012	" 10
"	15	4,814	" 13
		21,966	

Eta Experiments in Sid

Rough approx. vol analysis:
 $22 \times 1.45 = .32 \text{ gmU/cm}^3$

assuming pumping rate of 50 gal/min
 $50 \times 3.78 \approx 190 \text{ l/min}$

To add 10 gmU, add 1.9 kgU/min

$$\frac{1.9}{.32} = 5.94 \text{ l/min}$$

$$= 1.57 \text{ gal/min}$$

100 kg U of vol in equiv $\approx 83 \text{ gal}$

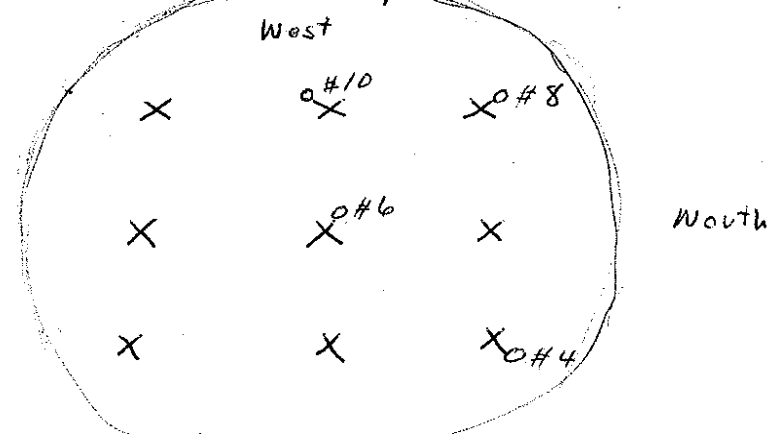
$$\text{Sid area} = \pi \times (54)^2 = 9,140 \text{ in}^2$$

$$= 39.5 \text{ gal/in}$$

$$144 \text{ l/in}$$

John manifold total area 1.65 l/in

Location of thermocouples



#10 is 35.5" above bottom

#8 " 31" " "

#6 " 35" " "

#4 " 35.5" " "

3/26/59 NOTE: Thermocouple recorder reads $\sim 0.4^\circ\text{C}$
 higher than K-3 for same temperature.

3/24/59 Horizontal traverse fission chamber

3-24-59 Zeroed soln. level so as to read directly in inches.

Horizontal traverse reads zero when at center of reactor.

Source reads zero when at top lid of tank. Limit switches at end of travel - R-2

Central control blade reads zero when down R-3

manifold soln. ht. ~~140 cm from memory~~

Check list:

1. source in
2. Instruments all checked
3. Position of horizontal traverse at least 10" from center
4. Center control Blade down
5. 4 Hairt Bladder down
6. 4 safety Bladder locked (up)
7. Check all valves on conc. soln. system.
8. Check mixer valves

START-UP CHECK LIST			
Equipment Checked by:	fox & Rudy	Checked by:	Jilly
Instrumentation:		Checked by:	Rhodes
Temperature:	min	Checked by:	Pu-Be
Time:		Checked by:	SK
Start-Up Date:	Jilly	Time:	3:50
Start-Up Operator:	fox	Date:	3-26-59

Expt. No.:	1	Time:	3:50	PM	Date:	3-26	1959
Purpose:	Test mixing of solution						
Personnel:	fox, Jilly, Rhodes, Rudy, Lewis						

- 3:58 PM Flaw rate set at .4 gal per min.
- 4:02 Stopped feeding solution.
- 4:09 ~~Flaw~~ stirrer's on.
- 4:12 Feeding solution at same rate.
- 4:13 Stopped feeding.
- 4:36 Shut down.

3/31/59

Sample taken after mixing 1 9⁰⁰ AM

Temp = 22.8°C on all thermocouples

9²⁵ AM

Horizontal traverse counter moved to 8.95 - closest position it can be without hitting vertical counter

Vertical counter IN

9³⁰ AM

Background count

Horizontal	Vertical	Normalizer	BF ₃ (x14)
0010	0130	2 ⁺⁵ (x14)	33 ⁺²
0000	0120	1 ⁺⁶ x14	32 ⁺⁸ x16 (note)

Vertical TRVERSE raised to 20.78"

10⁰² AM

Feeding solution at the rate of 0.53 gal/min

10¹² AM

Stopped feeding solution.

10¹⁷ AM

Feeding solution at the rate of 0.53 gal/min

10²⁷ AM

Stopped feeding solution.

10³⁵ AM

Solution ht in manifold now reads 76 cm.

10⁴⁰ AM

Feeding solution at the rate 0.53 gal/min.

10⁵⁰ AM

Stopped feeding - Soln ht = 65.1 cm in manifold

Horizontal chamber set at 8.95; vertical at 20.78

Horizontal	Vertical	Normalizer	BF ₃
0020	0260	1 ⁷ x14	42 ⁷ x14

~ 11²⁰

0020	0280	9 x16	43 x16
------	------	-------	--------

~ 11²⁰

Normalizing scaler is not operating properly

* These are direct readings from flow meter and must be corrected for density and full scale reading of 1.12 g/min

354,991 5.6519/l

Horiz	Vert	N [±] and of scaler	BF ₃
0010	0310	7 ⁺¹³ x16	45 ⁺¹⁴ x16
0020	0300	10 ⁺¹⁵ x16	46 ⁺¹⁴ x16
12 ⁰⁷ PM	0280	4 ⁺¹⁶ x16	45 ⁺¹⁴ x16
12 ¹²	0280	2 ⁺¹⁴ x16	43 ⁺¹⁴ x16
12 ³⁵	Mixer pump & stirrer off		
0010	0280	2 ⁺¹⁵ x16	43 ⁺¹⁴ x16
0000	0120	1⁺⁷ x16	41⁺¹⁴ x16

NOTE: Bias was changed on Horiz, Vert, and Norm scalers.

3/31/59

1²⁰ PM

Feeding solution at the rate of .53 gal/min.

1³⁰ PM

Stopped feeding solution - Soln ht. in manifold = 56 cm

1³⁶ PM

Feeding solution at the rate of .53 gal/min.

1⁴⁶ PM

Stopped feeding solution - Solution ht in manifold 47.2 cm

Colorimeter reading 8.9 gm/l

Horizontal chamber set at 8.95; vertical at 20.78

Horiz	Vert	Norm	BF ₃
0000	0210	1 ¹³ x14?	60 ¹⁵ x14
	0230	14	58 ⁵ x16

~ 2⁰⁶ PM

Sample taken; Reg. # 354992 = 9.822 g/l

2³⁴ PM

Feeding solution at the rate of .53 gal/min.

2⁴⁴ PM

Stopped feeding solution - Solution ht in manifold = 39.1

Horizontal	Vertical	Norm	BF ₃
(0000 NOT WORKING)	0280	(0000 NOT WORKING)	69 ¹⁴ x16
	0270		74 ¹³ x16

3:20 PM Feeding solution at the rate of .35* gal/min.
 3:30 PM Stopped feeding solution - ~~XXXXXXXXXX~~
 3:34 PM Feeding solution at the rate of .35* gal/min.
 3:44 PM Stopped feeding solution. (solution ht in manifold = 24.3 cm)
 Colorimeter reading 11.3 gm/l

Horizontal (out)	Vertical 0420	Normalizer (out)	BF ₃ 125 + 14 X16
	0400		128 X16

4:20 PM Colorimeter Recalibrated

Sample	Recorder
20 gm	6
13	29
12	43
5	87

4:35 PM Sample taken; Reg # 354993 11.635 gm/Liter

NOTE: Reg # 354994 was not used due to error (in manifold)

(This form is crossed out with a large X)

START-UP CHECK LIST
 Equipment Checked by RKR Personnel Check by RKR
 Instrument and Safety Checked and Recd. by SSC
 "Source In" Checked by PV-De X5' long
 Emergency Equipment in Control Room Checked by DJP
 Red Light On by RKR
 Start-Up OK'd by _____ Time _____

(This form is crossed out with a large X)

Expt. 4 Time 8:00 AM Date 4-1-59 185.9
 Purpose App to Crit.
 Personnel: F.W.H. D.F.C. Fox, Reddy.

8:15 AM Colometer Calibration

Sample	Recorder	Standard = 13 g/l
20.4 g/l	7 11	
13	52 55	
12.2	72 76	
11.6	88 89	

8:05 Solution ht in manifold = 29.5 cm.
 Solution ht in big lid = 38.564" (all blades in)
 8:50 Temp = 23.5°C
 9:30 AM All blades out.

Horizontal*	Vertical	Normalizer	BF ₃
0140	0420	out	126 + 3

9:57 AM Feeding solution at the rate .35* gal/min
 10:03 + 30 sec AM Stopped feeding solution.

* Bias changed

10⁰⁷ AM Started feeding @ ^{.28} ~~.35*~~

~~13~~
10¹³⁺³⁰ Stopped feeding - Colormeter reads 12.0 gm/liter
manifold reads 15.9 cm

10³⁰ AM All poison blades out - mixing pump & stirrers on
Horizontal traverse counter @ 8.95; vertical @ 20.78

10 ³⁵ AM	Horizontal	Normalizer	Vertical	BF ₃
	0260	out	0600	217 ⁺⁸ X16
	0240	"	0570	219 ⁺³ X16

10⁵⁵ Temp = 23.5°C

Sample taken; Reg # 354995
{¹⁴⁰ PM answer by phone 12.25 gm/l}

11¹⁴ AM Feeding solution at the rate of .28 gals/min.

11²⁰ AM Stopped feeding - Colormeter reads 11.9 gm/liter

11²⁴ AM Started feeding

11²⁹ AM Stopped feeding - colormeter reads
manifold reads 10.5 cm

11⁴⁶ AM Colormeter reads 12.1 gm/liter.

11 ⁴⁶ AM	Horizontal	Normalizer	Vertical	BF ₃
	0360	out	0760	335 ⁺¹¹ X16
11 ⁵⁸ AM	0380	"	0790	321 ⁺⁷ X16
12 ²⁰ PM	0	"	0710	329 ⁺² X16

12³⁰ PM

(sample taken; Reg # 354994) - 12.66[✓] gm/l

1¹⁹ PM

Started feeding

1²² PM

Stopped feeding

1²⁷ PM

Started feeding

1³⁰ PM

Stopped feeding

Solution in manifold = 7C.M.

1⁴⁵ PM

1 ⁴⁵ PM	Horizontal	Normalizer	Vertical	BF ₃
	0530	out	0910	471 ⁺³ X16
	0490	"	0860	462 ⁺² X16

2³⁰

Sample taken; Reg # 354997 - 12.925[✓] gm/l.

2⁴⁹

Started feeding

2⁵² PM

Stopped feeding

2⁵⁷⁺³⁰

Started feeding

3⁰⁰⁺³⁰

Stopped feeding

John manifold 3.7 cm

3¹⁷ PM

3 ¹⁷ PM	Horizontal	Normalizer	Vertical	BF ₃
	0690	out	1210	712 ⁺³ X16
	0600	"	1170	707 ⁺⁴ X16

4/1/59

3⁵³

Started feeding

3⁵⁶ PM

Stopped feeding

4⁰⁰

Started feeding.

4⁰³

Stopped feeding. - colorimeter reads ~13.4 gm/l

Solution in manifold = 0.4

4²⁰ PM

Horizontal	Normalized	Vertical	B.F. ₃
0980		1540	1113 ⁺⁸ x 16
1030		1630	1109

~4⁴⁵

Liquid level = 38.87

4/2/59

8²⁰ AM Move sol'n. put in manifold

354998 = 13.491[✓] g/L

4/2/59

8²⁰ AM Sample taken; Reg # ~~354999~~

Solu ht. in Sid = 38.74" by monometer

9⁰⁸

" " " " 38.72"

Solution ht in manifold = 102 C.M.

10⁵⁰ AM

added slight amount of solution to adjust flow rate.

10⁵⁴ AM

Started feeding

10⁵⁷

Stopped feeding

11²⁵

Horizontal	Normalized	Vertical	B.F. ₃
1480	act	2180	1282 ⁺² x 16
1340	"	2150	1301 x 16

Estimated concentration (from above sample and change on colorimeter) 13.9 gm/l

1⁰⁵ PM

Started feeding

1⁰⁸

Stopped feeding

} added .05 gm/l estimated

1¹¹

Started feeding

1¹⁴ PM

Stopped feeding

} added ~.05 gm/l est.

1¹⁸ PM

Started feeding

1²¹

Stopped feeding

} added ~.05 gm/l est.

4/2/59

1:30

Control blades removed
PM 2 voltage changed from 1200 to 940
soln ht 95.4

1:55

Started feeding

1:58

Stopped feeding

2:01+30

Started feeding

2:04+30

Stopped feeding

2:10

critical with 4 outer control blades out
and with center blade at 15.22"

2:33

Center blade at 23.02" for period
stirrers still in assembly
Temp = 24°C

3:01

Solu ht. monometer for Sid = 36.96"

" " " " " " 36.915" after

3:26

removal of 4 safety blades

3:47

Removed center control blade - all blades out
and system critical. Solu ht = ~~36.902~~ 36.879"
(blades are still in, but off.)

3:56

Feeding for pos period - solution ht at
start was 36.879"

4:00 PM Stopped feeding for pos period. solution ht = 37.472"

4:03 Draining to tail-adder tank for neg period.
solution ht at start = 37.472", drained to
36.367"

4-3-59 - Manifold reads 92.5 cm at 9:25 AM
total mass of 4 in system ~ 8.3 kg

4/3/59

8:15 AM all blades are in: mixing while pumping from
tail-adder tank: solution ht in Big lid at
start = 33.21"

8:46 after pump all solution from tail-adder, solution
ht in Big lid = 38.504". This is with all
safety blades in. "Solution temp" = 23.5°C

9:03 after mixing in Big lid for 17 min, draining back
to tail-adder for further mixing.

10:20 Safety blades out - tail-adder tank "empty" LL = 38.479"

sample Req. 593074 sample to Skutnansky

4/6/59

11 ²⁵/_{AM}

B Soln ht. = 36.56 crit. with all blades out and stirrers out

11 ³⁰/_{AM}

Soln added from tad adder. Soln ht = 36.96"
(pos. period)

11 ⁴⁰/_{AM}

Soln. drained to 36.12" for neg. period

11 ⁴⁵/_{AM}

Mixing pump turned on and left running over lunch.

3 ²⁵/_{PM}

Soln ht. = 36.48 @ critical
" " = 36.74 for pos. period
" " = 36.27 " neg. period

4 ³⁰/_{PM}

Reactor made critical @ 36.49"

Temp	# 4	25.0
	# 4	25.4
	# 8	25.3
	# 10	25.4

4/7/59

8 ⁰⁰/_{AM}

Solution level in Big Lid = 36.068" with all blades in. (Stirrers one out).

8 ⁰⁰/_{AM}

Temp = 25°C.

9 ⁰⁰/_{AM}

log N calibration checked - O.K.

9 ³⁰/_{AM}

With source out and all blades in log N shows variations with maximum reading of .003 (apparently due to temp.)

10 ⁰⁰/_{AM}

log N cable between chamber and junction box put inside 1" polyethylene tube for insulation

12 ⁰⁰/_{PM}

log N calibration checked and found O.K.

12 ⁰⁸/_{PM}

Critical Soln. ht = 36.29"

Pos. Period ht. = 36.65

12 ⁴⁵/_{PM}

Neg Period ht. = 36.04

1 ⁰⁰/_{PM}

Second Neg Period ht. = 35.70

1 ¹⁴/_{PM}

log N calibration checked (at level $\approx .002$) O.K.

1 ⁴⁵/_{PM}

Soln ht = 36.28 @ crit.

" " = 36.49 Pos. Period

" " = 36.69 2nd Pos. Period

" " = 36.06 1st neg. Period

" " = 35.73 2nd neg. Period

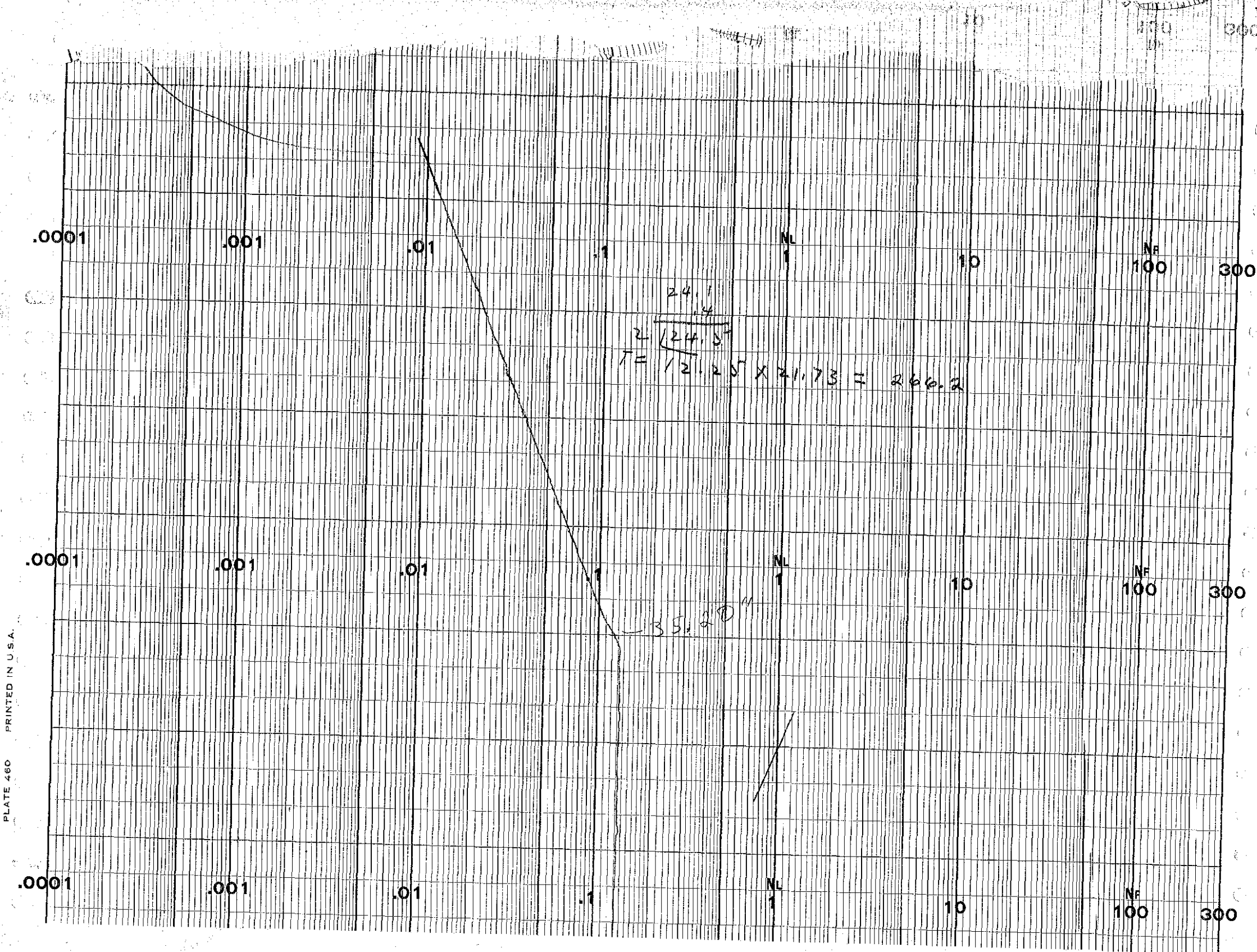
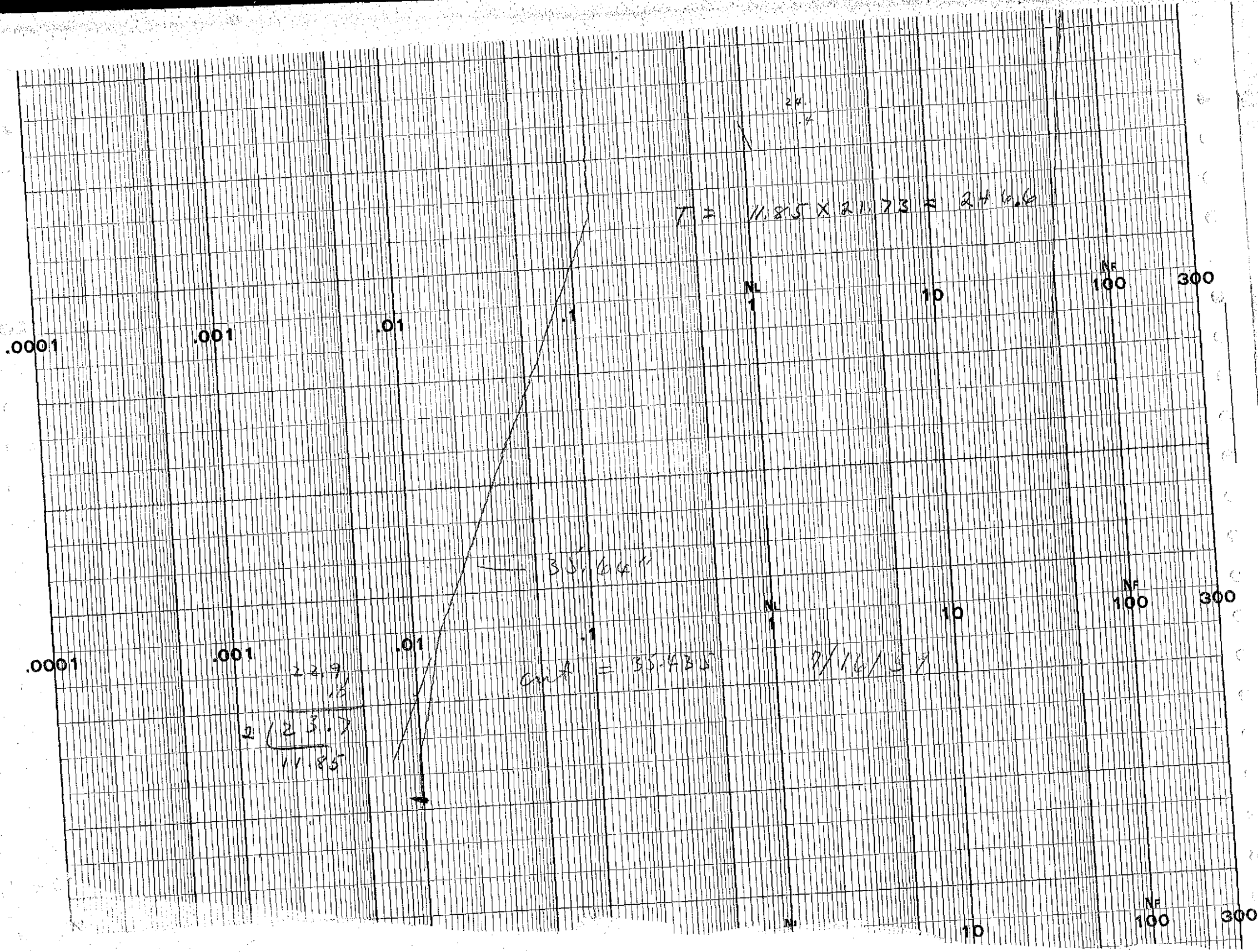


PLATE 460 PRINTED IN U.S.A.

CHART NO. 5874-N MINNEAPOLIS-HONEYWELL REG. CO., BROWN INSTRUMENTS DIVISION, PHILADELPHIA, PA.



TEG. CO., BROWN INSTRUMENTS DIVISION, PHILADELPHIA, PA.

22
4/7/59

2:45 PM

Temp. #4	24.5
#6	25
#8	25
#10	25

3:00 PM

log W calibrated (power = .1), checked O.K.

3:56 PM

Critical, solution ht = 36.27"

Pos. Period ht. = 36.41

4:20

neg. Period ht. = 35.74

4:30

all blades in soln ht = 35.80

4/8/59
8:10 AM

solution ht = 35.80" (all blades in)

8:15 AM

Temp = #4 = 24.5° #6 = ~~24.5~~, #8 = ~~24.5~~, #12 = ~~24.5~~

8:30 AM

solution ht = 35.81" (all blades in)

START-UP CHECK LIST

Equipment Checked by PKR Personnel Check by PKR
 Instrument and Safeties Checked and Initial'd by SK
 "Source In" Checked by SK Source No. _____
 Emergency Equipment in Control Room Checked by SK
 Red Light On by SK AM
 Start-Up OK'd by _____ Time _____ PM Date _____ 195

9:00 AM

solution ht = 35.726" (all blades out)
Log n = .075.

9:20 AM

first crit 36.14" = solution ht. Log n .16

9:40 AM

North stirrer put in assembly.

10:05

Soln. selsyn reads 36.16 with all blades out and one stirrer in. No solution has been added or taken out from crit. cond at 9:20 AM

10:10

crit. at 36.16

10:19

Central safety put in and north stirrer turned on.

10:30

Mixing pump also turned on.

4/8/59

11¹⁰ AM

Solu selsyn = 36.14 @ critical after mixing — no solution has been added or subtracted since 9³⁰ AM

2²³ PM

Vertical traverse selsyn = 36.07 when chamber just breaks surface

2⁴⁵

Sample taken to Cooper at X-10 [after above mixing] Ref 593076 (dup to X-12)

X-10 analysis: 13.97 ^{pm} 1.0176

4⁰⁰ P.M.

Vertical traverse counter and horizontal counter were repositioned. Vertical selsyn reads 0.00 when end of chamber is against bottom* and 36.07 when chamber just breaks surface. Horizontal chamber is at center (horizontally and vertically) when selsyn reads 0.00

* The point on the bottom which the chamber touches is actually the 1/2" flange, therefore chamber is 1/2" off "real" bottom.

Period Measurement Data

Period Measurement Data

Crit. Ht (in)	Pos. Per. Ht. (in)	Neg. Per. Ht. (in)	Period (sec)	P
			T+ T-	
36.48"	37.03	36.17	141 142.5	.0048 8.4 x 10 ⁻⁴

Date Taken	Instrument	Crit. Ht. (in.)	Pos. Per. Ht. (in)	Neg. Per. Ht. (in)	Period (sec)	P+	P-
					T+ T-		
4/3/59	LN	36.68	37.03	36.17	141 142.5	4.8 x 10 ⁻⁴	8.4 x 10⁻⁴
4/3/59	CR	"	"	"	154 141	4.45 x 10 ⁻⁴	7.7 x 10 ⁻⁴
4/3/59	CR	36.88	37.47	36.37	76 144	7.9 x 10 ⁻⁴	3.18 x 10 ⁻⁴
4/3/59	LN	"	"	"	77.6 147	7.7 x 10 ⁻⁴	8.0 x 10 ⁻⁴
4/6/59	LN	36.56	36.96	36.12	121 175	5.42 x 10 ⁻⁴	6.63 6.2
4/6/59	CR	"	"	"	116.5 172	5.6 x 10 ⁻⁴	6.95 6.38
4/6/59	CR	36.48	36.74	36.27	182	3.85 x 10 ⁻⁴	3.2 x 10 ⁻⁴
4/6/59	LN	"	"	"	192	3.7 x 10 ⁻⁴	3.1 x 10 ⁻⁴

4/8/59
4:15 PM

System crit. at 36.11" Ht of vertical chamber (selsyn reading)

Horiz	Vertical	Normalizer	
log N = 10	16.49 22.4 105380	290 ⁺⁶⁴ x 256	2 min counts
log W = 10	22.48 28.50 86830	290 ⁺⁹⁴ x 256	"
log W = 16	28.50 53080	295 ⁺³¹ x 256	"
Log W = 10	32.49 19807	283 ⁺²²⁴ x 256	"
" "	10.50 92050	275 ⁺²³⁹ x 256	"
	4.51 62210	277 ²¹³ x 256	"
Log W "	0.01 29997 29930	300 ⁺ x 256	

C₂
970^{x110}
987²¹⁴
959¹²³
949⁴⁴
943¹³²
997⁷⁴

4/7/59
8:25 AM

Temp #4 - 24°, #6 - 24.3, #8 - 24.3, #10 - 24.3

Vertical Traverse - 4-255 chamber

Horizontal chamber at 52.60" (from center)

Vert. Chamber selsyn reading	Vertical Counts	Normalizer Counts	Horizontal Counts	Log N	Time of Counts
crit. ht = 35.99" {with vertical chamber in; horizontal at 52.60; only stirrer}					

8:40	0.01	29930	309 ^{111 (.4)} x 256	4110	10	2 min
8:45 AM	1.50	42640	302 ^{90 (.4)} x 256	4010	"	"
	3.00	54610	280 ^{168 (.7)} x 256	3760	"	"
	4.50	65430	298 ^{129 (.5)} x 256	3900	"	"
9:00 AM	6.00	74870	295 ^{217 (.8)} x 256	3940	"	"
	7.50	84920	281 ^{200 (.8)} x 256	3910	"	"
	9.00	93890	284 ¹³⁴ x 256 ⁵²	3940	"	"
	10.5	98110	285 ⁷⁸ x 256 ¹³	3780	"	"
9:12 AM	12.00	103110	290 x 256	3820	"	"
	13.50	106200	288 ²⁰⁴ x 256 ⁹⁰	3780	"	"
	15.00	107160	285 ¹⁷ x 256 ¹⁴	4010	"	"
9:24 A.M.	16.50	106960	288 ⁶⁹ x 256 ²⁰	3900	"	"
	18.00	104240	288 x 256	3760	"	"
9:32	19.50	99720	288 ⁶⁵ x 256 ²⁵	3790	"	"
	21.00	97330	290 ²³² x 256 ¹⁹	3790	"	"
	22.50	91700	289 ⁵⁴ x 256 ²¹	4040	"	"
	24.00	82610	288 ¹⁴⁴ x 256 ⁵⁰	3810	"	"
	25.5	71980	305 ¹²⁰ x 256 ⁴¹	3910	"	"
	27.00	65080	290 ²¹¹ x 256 ⁸⁰	3910	"	"

4/9/59

Vert. Chamber position	Vert.	Norm.	Horz.	Log W	Time
10 ⁰⁰ AM	28.5	53560	299 ¹	3900	10 2 min
	30.00	41860	284 ^{39.15} x 256	3860	" "
	31.50	29070	286 ^{101.4} x 256	3880	
10 ⁰⁹	33.00	<hr/>			
	33.00	13440	298 ^{72.118}	3870	
	34.50	1900	292 ^{188.13} x 256	3940	
	34.50	1960	286 ^{148.58} x 256	3920	
10 ²⁵	Crit. ht = 35.94" with vertical chamber at 34.50				
	33.00	—	282 ^{191.75} x 256	3930	
	33.00	14390	286 ^{18.07} x 256	3990	
	32.75	17040	298	3850	
35 10 AM	32.00	24560	297 ^{104.14} x 256	4010	
	31.50	29850	299 ^{10.04} x 256	4000	
10 ⁴²	Temp #4 - 24.2 ; #6 - 24.2 ; #8 - 24.2 ; #10 - 24.2 (all same)				
	30.00	42170	309 ¹⁸ x 256	4200	
	28.5	55140	305 ^{95.31} x 256	4090	
	27.00	67780	294 ^{168.166} x 256	4130	
55 10 AM	25.50	77760	297 ^{209.1} x 256	3970	
	24.00	86190	287 ^{211.162} x 256	3970	
	22.50	90610	286 ¹⁰⁸ x 256	3890	
	21.00	93660	278 ¹⁰⁸ x 256	3770	
	19.5	96820	274 ¹⁰⁸	3730	

4/9/59

Vert chamber	Vert counts	Norm.	Horz.
11 ¹⁶ AM	18.00	—	275 ^{50.195} 3800
	18.00	105840	279 ^{107.141} x 256 3790
	16.50	109610	293 ^{50.195} x 256 3880
	15.00	111680	298 ^{202.79} x 256 4010
35 11 AM	13.50	107800	315 ^{134.53} x 256 4050
	12.00	105830	319 ^{34.14} x 256 3990
	10.50	100230	325 ^{25.137} x 256 3980
11 ⁴⁵	9.00	94750	324 ^{80.31} x 256 4060
	7.50	90840	306 ^{208.81} 4050
repeat →	7.50	91880	307 ^{58.22} x 256 4010
	6.00	80540	330 ^{200.178} 4240
11 ⁵⁷	Temp ave = 24.2		
	4.50	70830	326 ² x 256 —
	3.00	59230	329 ^{132.51} x 256 4090
	1.50	46730	330 ^{87.34} x 256 4160
12 ⁰⁸	0:00	32190	335 ^{153.16} x 256 4320
12 ¹¹	Soln ht = 35.97 at crit and vert chamber at 0.00		

Crit. ht 35.93" Horizontal Traverse

Horiz. Selsyn position # Horiz. Counter *Vertical N. Position 19.88" Normalizer LN

Horiz. Selsyn position	Horiz. Counter	*Vertical N. Position 19.88"	Normalizer LN
12.5 52.60	4,000	105,010	329 ⁺⁸⁹ x256
" "	4,070	103,110	329 ⁺¹⁴¹
50.00	13,140	100,890	330
10.2 47.50	20,620	101,440	330 ⁺⁷²
45.00	33,310	99,600	333
" "	28,080	100,320	339 ¹⁰⁰
" "	28,280	101,600	335 ⁺²¹⁰
" "	28,060	102,240	331 ¹²⁴
" "	28,760	102,950	341 ⁵
42.50	36,400	101,150	349 ³⁹ x256
40.00	45,120	101,510	341 ¹⁴¹ x256
37.5	55,000	107,370	344 ¹⁴⁰ x256
35.00	65,870	108,990	391 ¹²
-32.50	77,220	114,690	384 ¹⁴³ } repeat
-32.50	78,290	118,690	376 ²³⁹ }
" "	79,150	121,740	385 ¹⁴¹ }
" "	78,800	120,740	384 ⁹⁹ }
17 2 PM 30.00	88,110	121,410	379 ⁶⁵ x256
27.50	97,280	122,160	381 ²⁴ x256
25.00	104,410	121,550	375 ¹¹⁸ x256
22.50	109,550	121,226	370 ¹¹⁸ x256

* ~ 6" off center; # centered vertically

4/9/59

Horiz. Selsyn position Horiz. Counter Vert. Norm. pos. 19.88 Normalizer

20.00	116,840	119,000	380 ¹⁷⁹ x256
17.50	122,420	118,810	377 ²¹⁶ x256
15.00	127,280	119,900	373 ¹⁴⁰
12.50	130,260 132,670	120,940	366 ¹⁴⁰ x173

Normalizer counter seems to not operate properly - checked by Ellis. Horiz & Vert Norm counters not worked on r

12.50	124,700	115,900	593 ¹¹⁴ x256
" "	124,980	113,600	594 ⁶⁴ x256
15.00	122,150	116,030	596
10.00	128,940	116,800	592 ¹²³ x256
7.50	133,710	116,860	595 ²³⁷
5.00	136,220	116,650	598 ¹²⁴ x256
2.50	138,060	116,940	594 ⁸
0.00	140,690	114,460	593 ²⁰⁵

-2.01	141,660	115,300	599 ³² x256
0.00	142,230	115,140	601 ¹⁴⁵
2.50	143,630	117,310	611 ¹⁹ x256
5.00	143,050	120,210	619 ⁺²³⁴
7.50	142,590	122,610	625 ⁶⁷
10.00	138,130	122,310	627 ¹³⁰
12.50	136,230	126,020	631 ⁵⁰

4 PM

32

4/9/59

	Horz. Selsyn position	Horz. Counter	Vert. Norm.	Norm.	
	17.50	127280	125760	634	4-10
4 ²² PM	22.50	113230	124560	631	8
	27.50	98040	127810	633	
	32.50	80510	125850	625	
	37.50	61760	126030	629	4
	42.50	43820	127830	634	
4 ³⁹	47.50	25010	130180	641	
	52.5	5120	122460	619	4 ³

Solu ft. after blades in = 35.96

4/12

4-10-59

(are blades in)

8⁰⁰ AM

Solution ht = 35.995" Temp = 29.2°C
 Reading on big lid in contact = 12.742/Rev.

4¹⁵ PM

Solution ht = 35.993". Temp = 4 = 29.5°C, 6 = 29°C
 8 = 29°C, 10 = 29°C

4²⁰ PM

Horizontal traverse chamber positioning apparatus was adjusted more accurately and total travel extended. When selsyn reads ~~4~~ 55.79 chamber is touching outside wall; when reading 993.23 chamber is "in" as far as it will go.

$$55.79 + .13 = 55.92$$

4/13/59 10⁵⁰

Horizontal selsyn zeroed so as to read 0.0 when chamber is at center.

4/13/59

8¹⁰
A.M.

Solution ht, with all blades in = 35.973"

Temp = #4 = 25.2°C, #6 = 25.1°C, #8 = 25°C, #10 = 25.1°C

11¹⁵
A.M.

Raised all blades (before stirring) and system was super crit, although no solution added or sub, since 4/9/59.

Stirrer (north) turned on after sufficient solution drained to bring system to approx. crit and Log N indicated a negative period ~100 sec. Stirrer turned off momentarily and neg. period changed somewhat - which way?

11³⁸

Temp = 25°C

11⁴⁰

Stirrer turned on to operate over lunch.

12⁴⁵

" " off

12⁵⁵

Soln ht = 35.94 for pos. period in process of getting critical

1⁰⁵
P.M.

Stirrer turned on after system made crit at soln ht. = 35.59". Log N indicated negative period but leveled after stirrer turned off.

crit
ht=35.6"

4/13/59

Crit. Ht = 35.59". Vert. normalizer chamber in south stirrer opening.

Time	Horizo Counter position	Horiz (counts) C-1	Vert. Normi C-3	Normalizer Gy	log N	2 min
1 ²⁵		991.48	120980	6680	1.81	548 ³ / _{x254} 10 2 min
		"	107710	56310	1.91	443 ¹⁴⁵ / ₂₅₄
1 ³⁴		"	106530	55020	1.94	463 ³² / _{x254} 10 "
		994.00	111000	56990	1.95	458 ²⁴⁷ / ₂₅₄ 10
		996.50	106120	55220	1.92	443 ²⁵⁰ 10 "
		998.50	106510	53930	1.97	429 ⁷⁶⁸ 10 "
1 ⁵⁰ PM		0.00	107410	54620	1.97	434.5 10 "
		2.50	108880	53370	2.04	454.25
		5.00	109590	53590	2.045	466.5 10 "
2 ⁰⁰ PM		"	109540	56710	1.93	451
		2.50	112870	55110	2.05	459 ²⁵⁰ 10
		2.50	112810	55520	2.03	460
2 ¹⁴ PM		7.25 7.25	110420	56240	1.96	463
2 ¹⁷ PM		10.00	106130	54140	1.96	453
2 ²² PM		12.50	101700	55250	1.84	440
2 ²⁵		15.00	97470	53990	1.805	444.5
		17.50	94780	53740	1.765	445.5
2 ³²		20.00	89770	56340	1.59	436.5
		22.50	84540	54670	1.49	434.
		25.00	76920	57360	1.375	436

Crit. ht=35.61

log W drifting up
very slightly
drained as tad.

	Horiz. counter position	Horiz. counts	Vert Norm.	Norm (C-4)	
2 ⁴⁵	27.50	74410	-	443	
	11	75190	58650	444	
	30.00	69170	58930	450.5	
2 ⁵⁵	32.50	62510	58120	444	
3 ²⁰	35.00	Counters show greater than statistical variation. Power level lowered from Log W ~ 10 to Log W ~ 2 to see if counters are more stable here.			
	35.00	53780	57580	453.75	10 min count
3 ³⁵	0.00	54590	28380	226.5	5 min.
	"	55360	29560	231.5	
3 ⁵⁰	998.50	56270	30130	236.5	5 min.
4 ⁰⁵ P.M.	995.00	49890	26550	207.5	5 min
4 ¹³ P.M.	997.50	49130	26060	203.	"
4 ¹⁸ P.M.	2.50	49920	26850	210.5	
	5.00	50090	27440	-	
	7.50				

Solu ht. with all blades in = 35.65"

4-14-59

8 ⁰⁰ / 1001

Solution ht with all blades in = 35.67"

Temp ⁴ = 25.5° ⁶ = 25.5° ⁸ = 25.3° ¹⁰ = 25.5°

Horiz. ctr. Position	C1 Horiz. ctr	C2 X 256 BF3	C3 Vertical Tr. ctr.	C4 X 256 Normalizer
-991.48 =	13,5040	688.2	71500	67 + 140
- 8.52"	13,3710	697.5	72340	68 + 74
"	13,1630	691.6	71360	67 + 50
- 5.00	13,2060	695.	71980	66.2
- 2.50	13,4480	711.5	73890	67.0
0.0	13,3210	682.7	71150	64.7
2.50	12,8680	675.8	69980	63.7
5.00	13,1840	693.9	71790	65.4
7.50	13,5410	700.6	73240	67.3
10.00	13,4840	715.4	73410	68.5
12.50	12,5980	697.6	72160	66.3
"	131270	714.25	75020	Adg. PPL 204.7
"	131420	714.5	75360	202.9
15.00	121260	709.	74080	201.25
17.50	115200	697.2	-	197.75
22.50	108770	713.25	74160	199.15
27.50	95520	720.8	75270	201.5
32.50	79750	728.6	76030	199.3
37.50	63350	744.0	-	201.25
42.50	46480	746.3	77580	203.2

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Position	C1	C2	C3	C4
47.50	28060	736.8	74130	200.3
51.00	15170	731.7	74200	195
54.00	13470	725.4	95390	194.2
16.00	118240	700.4	73060	188.5
14.00	120440	691.8	72120	185.8
0.0	135470	704.25	73320	190.6

Temp ~ 25.3°C Crit ht 35.43"

4/15/59

8:01 AM

Solution ht = 35.550" Temp = 9:25° 6:25° 8:25.0° 10:25°
 (all blades in except center control rack).

10:45 PM

Crit Wt. = 35,33

Horiz. Traverse

	Position	C1	C2	C3	C4	Log N	Counting time
10:50	-7.50	164540	864.0	838.80	216.25	14	2 1/2
	"	166480	864.1	84240	217.1	"	"
10:59	-5.00	165310	840.1	84340	216.3	"	"
	-2.50	167050	859.25	83460	216.25		
	0.0	164830	855.8	81760	215.5		
	2.50	161040	884.5	80850	210.4		
	5.00	155330	833.5	80520	207.6		
	7.50	155500	843.75	—	209.25		
	7.50	158790	857.0	82050	208.9		
	10.00	155500	863.0	81670	211.1		

50 PM

Crit ht = 35,30

4-16-59

8:00 AM Solution ht₁ = 35.090" with blades in. Temp = 25.2°

8:25 AM just exit, solution ht = 35.18"

Position
 Horiz. CTR. CTR. 1 CTR. 2 CTR. 4

Time	Horiz. CTR.	CTR. 1	CTR. 2	CTR. 4	Notes
9:12 AM	-8.50 984	47020 .2443	192.5	.3405 138.1	17min.
	-5.00 997	47020 .2475	190.0	.3412 137.8	
	-2.50 994	47040 .247 ⁸	190.6	.3430 134.5	
9:17	0.0 1.0	47320 .248 ³	191.2	.3485 136.6	
	2.50 1.01	47820 .247 ^{.2519}	190.2	.3485 137.2	
	5.00 997	48230 .2475	194.9	.3472 138.9	
	7.50 978	47600 .242 ⁵	196.2	.337 3 141.1	
	10.00 958	47050 .2375	198.1	.3290 143.0	
	12.50 928	46190 .230 ^{.2399}	200.9	.3230 143.0	
	15.00 887	44250 .2202	201.	.3136 141.1	
	17.50	41946 9	204.8	— 143.7	
	19.00 862	43540 .2135	203.7	.3049 142.8	
	" "	43200 .2135	202.3	.3036 142.3	
	20.00 (831)	41610 .20658	202.2	.2888 144.1	
7:77	22.50	38890 .1925	202.0	.2720 143.8	
7:38	25.00	36800 .1830	201.1	.25 8 ⁴⁷ 144.5	
6:84	27.50	34440 .169 ⁵ ₆	203.1	.2345 146.9	
6:17	30.0	31600 .15 2 ₂₉	204.7	.2156 146.6	
5:43	32.50	27930 .1345 ₄	207.8	.1910 146.2	
5:04	35.00	25500 .12 5 ₄₁	205.4	.17 8 ₄₉ 145.8	

C/N.
 428
 368
 304
 244
 187
 124
 109
 692
 055
 1080
 0813
 154
 233
 293
 386
 462
 539
 619
 669
 731
 768
 82
 80

C/N C ₂	Position	C ₁	C ₂	C ₂	C ₄	C ₄
.428	37.50	22290	.1042	209.9	.1533	145.4
.368	40.00	19010	.0911	208.7	.1284	148.1
.304	42.50	15880	.0754	210.5	.1075	147.7
.246	45.00	12690	.0606	209.5	.0857	149.2
	11	12850	.0615	208.9	.0845	148.5
.187	47.50	19310	.0464	414.5	.1044	300.0 2 min C.
.124	50.00	13100	.0313	418.6	.0444	293.8
.079	52.00	08120	.0197	412.5	.0280	290.0
.092	64.00	09370	.0226	405.5	.0329	284.6
	11	9360	.0231	405	.0329	284.9
	11	9570	.0243	392.9	.0343	279.3
	11	9400	.0245	391.4	.0341	281.2
.055	53.00	5390	.0138	390.4	.0192	281.4
	11	5380	.0137	393.3	.0189	284.4
.080	52.00	7520	.0198	381.1	.0280	270.0
.083	53.50	7520	.0202	372.7	.0285	264.8
.156	49.0	14290	.0388	368.8	.0549	260.3
.233	46.0	10400	.0577	180.3	.0802	129.7 1 min
.293	43.5	13080	.0728	180.1		
.386	39.5	17220	.0959	179.4	.1357	126.9
.462	36.00	20910	.1148	182.5	.1636	127.8
.531	33.00	23990	.1331	180.2	.1877	127.8
.619	29.00	27730	.1536	180.5	.2199	126.1
.669	26.00	29680	.1641	178.7	.2356	126.0
.737	23.00	32530	.1829	177.9	.2557	125.9 742
.768	21.00	34490	.1908	181.0	.2676	128.9 767
.824	17.00	37260	.2083	184.8	.2905	130.0 932
.844	14.00	3931	.2145	183.3	.3042	129.2

	C ₁	C ₂	C ₃	C ₄
904 110	40710	181.5	3173 5115	128.3 915
930 80	42250	183.1	3298	128.1
943 6.0	42450	181.4	3324	127.7 952
954 3.0	42870	180.8	3326	128.9
943 0.0	42780	179.	3384	124.4 972
962 -3.0	41910	175.7	3334	125.7
940 -6.0	40540	173.7	3323	122.0
934 -8.50	40270	173.3	3282	122.7
942 -6.0	40650	173.8	3291	123.5
942 -3.0	40990	175.3	3341	122.7
963 0	41810	174.8	3399	123.0
959 3.0	4210	177.0	3412	123.4
940 6.0	41020	176.0	3276	125.2
930 8.0	40700	176.3	3261	124.8
914 60	42240	174.8	3406	124.0

Chamber of d-235 counter is 14" above end of containing tube.

4-16-59

2¹⁰ PM

Vertical Traverse (C-3 counter)

counter in center - bottom of counter tube touches bottom of tank

Horizontal counter (C₁) set at 27.00"

all slides and critical

2¹⁵ PM

2⁴⁰

35.13" sol'n log N=7

d	C ₁	C ₂	C ₃	C ₄	C ₃ /C ₄	C ₂ /C ₄	C ₃ /C ₁	C ₃ /C ₂
2 ⁴⁰ 2 min PM	0	61170	576.6	31810	263.7	1207	1.43	.5200 .8447
2 ⁴⁶ "	2.51	61460	376.4	54570	265.8	2052	1.417	.8869 1.4349
2 ⁵⁰	5.00	61170	375.1	73190	262.7	2786	1.427	1.1965 1.9512
2 ⁵²	7.50	60040	368.6	86240	252.8	3414	1.458	1.4364 2.3397
2 ⁵⁹	10.00	60480	367.0	98150	253.7	3869	1.446	1.6229 2.6744
3 ⁰⁴	12.50	60570	365.8	105780	255.3	4148	1.432	1.7481 2.8917
3 ⁰⁷	15.50	61260	370.8	110820	260.5	4254	1.423	1.8090 2.9887
3 ¹²	16.50	62500	376.7	111420	264.7	4210		1.7827 2.9578
3 ¹⁴	17.50	63880	383.8	111050	265.5	4182		1.7384 2.8934
3 ¹⁷	18.50	63990	388.3	109460	266.1	4111		1.7106 2.8190
3 ²¹	19.50	64030	387.6	106120	265.6	3995		1.6573 2.7379
3 ²⁵	22.00	63870	387.7	95570	267.7	4000		1.4963 2.4651
3 ²⁹	24.50	64610	391.6	82280	271.2	3570		1.2735 2.101
3 ³²	27.00	65220	400.2	64650	273.8	3577		0.9913 1.615
3 ²⁶	29.50	62820	396.0	42630	268.0	3033		0.6786 1.077
3 ⁴¹	32.00	63080	390.9	17080	265.4	2790		0.2803 0.452
3 ⁴⁷	31.00	61260	382.8	27860	260.5	2361		0.4548 0.729
3 ⁵¹	28.00	60680	375.6	52790	259.2	2370		0.8700 1.405
3 ⁵⁴	26.00	59680	372.6	67620	258.3	2617		1.1330 1.815
3 ⁵⁸	23.00	59570	369.5	84590	258.3	2620		1.4214 2.289
4 ⁰³	21.00	59190	367.4	92780	256.4	3275	1.457	1.5675 2.525

	d	c ₁	c ₂	c ₃	c ₄	c ₃ /c ₄	c ₁ /c ₄	c ₃ /c ₁	c ₁ /c ₂
4 ⁰⁶	17.00	58340	364.1	102670	254.9	40 30 ²⁸	1.430	1.7599	2.820
4 ⁰⁸	16 ⁰⁰	57620	358.7	103030	253.3	40 20 ⁶⁸		1.788	2.871
	15 ⁰⁰	58220	361.8	104220	257.1	40 55 ⁴		1.790	2.881
4 ¹⁵	14 ⁰⁰	58730	363.5	105410	255.5	41 30 ²⁶		1.789	2.900
	13 ⁰⁰	48990	369.8	105320	259.8	40 58 ⁴		1.785	2.848
4 ²⁵	12 ⁰⁰	60360	377.9	104020	261.9	397 8 ²		1.723	2.753
	11.50	61890	380.5	105780	265.3	398 8 ⁷		1.709	2.780
	9 ⁰⁰	62220	379.8	97530	268.0	364 0 ³⁹		1.568	2.568
	6.50	63510	384.9	75360 ^{85 360}	270.8	278 2 ^{31 52 3}		1.187	1.958
	4.00	61130	376.5	65990	260.7	2530		1.079	1.757
4 ⁴⁰ PM	1.50	60190	372.2	45410	257.3	176 5 ⁸		0.754	1.220
	6.50	59780	370.0	81700	255.5	319 8 ⁸		1.367	2.208
	16.00	60210	369.5	107080	257.9	415 8 ²		1.778	2.898
	33.00	41170	373.4	5440	261.8	208		0.0889	.146
	34.00	61420 ⁶¹⁴²⁰	375.5	2030	263.0	77 0		0.0331	.054

4/17/59
8²⁰ AM Solution level = 35.209 (blades in) Temp = 25°C
194

9³⁵ Vertical traverse selsyn reading = 34.83" when tip of chamber just touches solution with all blades in.

22
10 AM Solu selsyn = 35.160 with all blades in except control blade. with all blades out 35.060
Δh = 0.10"

Normalizing chamber (C-4) is 22" from center of reactor radially.

9²⁵ PM Solution ht = 35.000" (all blades out in)
593078 Reg. sent to Y-12 for Assay: 92.83 U²³⁵
1.05 U²³⁴
0.62 U²³⁴
5.50 U²³⁸
Sample taken to be sent to Cooper

(593078) A	(593078) B	AU Anal
14.015 gmU/kg	14.025 gmU/kg	14.02
1.0207 appr	1.0206	1.02065

$$H/K = \frac{2611 \times 981.7}{13.015} = 1970$$

4/20/59
8¹⁵
AM

Solution ht = 34.961". Temp = 25°C (all blades in)
a difference in ht of .039" over the week-end.

11¹⁰

Solu manometer raised 8³/₈" , Sel syn
changed so as to read directly

Water added to reactor. Solu ht = 48.67
(with stirrers on) Solu ht = 48.72 (stirrers off)

11⁴⁵

Solu in "Tadadder" being added to reactor,
after adding solu from Tadadder ht. = 51.80"
~~estimated gm 4/l = 10.6; mass = 88.9 kg~~

1²⁵

Manifold reads 92.3 cm before feeding any solu.
Solution added to reactor from manifold
with control blades in

1⁴⁵

stopped feeding. Solu ht in manifold = 84.2 cm
Solu ht. in reactor = 51.76"

Estimated gm 4/l = 11.2

Counts taken on C-4 - no counts.

2⁴⁵

Started feeding

Stopped feeding

Estimated gm 4/l = ~~11.8~~ 11.4

3¹⁰

Sample taken on 4/17/59/ taken to Cooper

3²⁵

A second neutron source was placed outside
Sid near color meter

3²⁵

Solution ht. in manifold after last feeding = 77.2 cm

3³⁵

With all blades out Solu ht. = 51.95"

4⁰⁰4¹⁵

Fed solution from manifold for ~20 min.

Estimated gm 4/l = 12.2

Manifold reads 69.3 cm.

4/21/59

8⁰⁰
AM

Solution ht. = 52.143" Temp = ?

9¹⁶9³⁰
AM

Started feeding solution from manifold

Stopped feeding from manifold

Solu ht. in manifold = 64.6

10⁴⁰

Solu ht = 51.98"

All blades out. Mixing pump off
and stirrers off. No noticeable increase
in R as indicated by instruments.

4/21/59

10 ⁴² feeding soln from manifold
10 ⁴⁷ AM Stopped feeding
Soln ht in manifold = 63.2

10 ⁵⁵ AM Started feeding
11 ⁰⁰ AM Stopped feeding

11 ⁰⁷ AM Started feeding
11 ¹² AM Stopped feeding

11 ¹⁹ AM Started feeding
11 ²⁴ AM Stopped "
Soln ht. in manifold = 59.3 cm

11 ³⁰ AM Soln ht in reactor with control blades
in and safeties out = 52.10

Estimated mass in reactor = 98.9 kg of 4
= 92.2 kg of 4.235

1 ²⁴ PM Started feeding
1 ²⁴ PM Stopped feeding

1 ²⁹ PM Started feeding
1 ³⁹ PM Stopped feeding
Soln. ht in manifold = 56.3 cm

4/21/59

1 ⁴⁴ PM Started feeding
1 ⁵⁸ PM Stopped feeding
Stirrers and mixing pump turned
off. no noticeable increase in multiplication

2 ⁰² Started feeding
2 ¹² PM Stopped "

2 ¹⁵ PM Started feeding
2 ²⁵ PM Stopped feeding

2 ³⁰ Started "

2 ⁴⁰ Stopped "

2 ⁴⁵ Started "

2 ⁵⁵ Stopped "

3 ⁰⁰ Started "

3 ¹⁰ Stopped "

3 ¹⁵ Started "

3 ²⁵ Stopped "

3 ³⁰ Started "

3 ⁴⁰ Stopped "

4 ³⁰ PM All blades in. Soln ht. = 52.37

4/22/59

10⁴⁵

Soln ht in reactor with all blades in = 52.27"

1

Soln ht in manifold = 38.5 cm

11⁰⁵ AM

Started feeding soln.

11¹⁵ AM

Stopped feeding

11²²

Started feeding

11³² AM

Stopped feeding

Instruments are indicating some increase in activity

2

Soln ht. in manifold 34.4 cm

12⁵³ PM

Started feeding

1⁰³ PM,

Stopped feeding

1⁰⁷

Started feeding

1¹⁷

Stopped feeding

3

1²³ PM

Started feeding

1³³ PM,

Stopped feeding

3

1⁴³ P.M.

Started feeding

1⁴⁶ P.M.

Stopped feeding

4/22/59

1 ⁵⁵/_{P.M.}

Soln ht = 52.41 ~ crit with central

rod in ~~at~~ 22" on selsyn

{ here Central blade is ~6" off bottom when selsyn = 6" }

2 ⁰⁵/_{P.M.}50.52 ~ approx. crit with all blades
out and source out{ Central blade selsyn re set so as to
read zero for blade at zero - although
blade will only go within 6" of bottom. }2 ⁴¹52.02" Soln level after emptying
to ladder (Bl = 22" in?)3 ⁰⁷/_{P.M.}

Soln ht = 51.26 for gas period

3 ⁴³

Soln ht at critical = 50.02

3 ⁴⁵

Temp = 26°C [# 2, 4, 6, 8, 10]

Ngy period soln ht = 48.83"

3 ⁵⁸

Shut down + wiping

4/23/59

Soln ht. in manifold = 27.8 cm
 Soln ht in reactor = 51.49" with blades in.
 Log W Calibration checked

9¹⁵ AM.

Soln ht. = 50.54" for pos period
 Soln ht = 49.73 at crit (?) Log W = ~15

9²³ AM.

Temp #4, 6 = 25.9, #8 = 25.6, #10 = 24 °C

9³³ AM.

Soln ht = 48.63 for neg period; from log W = ~15

10⁰⁰

Soln ht = 50.74" for pos. period
 Soln ht = 48.80 for neg. period

11⁰⁵

Soln ht = 50.24" pos period
 Soln ht = 49.58" at crit log W ~ 10

11³² PM.

Soln ht = 48.55" for neg. period
 Soln ht = 49.58" at crit

Results from assay analysis (by telephone)

Sample reg. # 593076; 077; 078

	076	077	078
234	1.03	1.09	
235	92.72	93.12	
236	.60	.52	
237			
238			

1¹⁵

Bubbler for blowing moist air in Big Sid was assembled. moist air is discharged directly above solution through plastic tubes.

2¹⁵

Soln ht. = 50.43" for positive period
 Soln ht. = 49.58 at critical

2³⁰ PM

Soln ht. = 49.21 for neg. period
 Soln ht = 48.86" for 2nd neg period

2⁵² PM

Soln ht = 50.05" for pos. period
 Soln ht = 49.55 at critical

3³⁰ PM

Soln ht = 49.20 for neg. period

3⁵⁵

Soln ht = 49.76" for pos period
 Soln ht = 50.01 for 2nd pos period.
 Soln ht = 49.57 at critical

4³⁰ PM

" " = 48.48 for neg. period

4³⁵ PM

Soln ht with all blades in = 48.517

Temp ave = 25.5 °C

$T_8 = 25.2^\circ$ $T_{10} = 25.5^\circ$

9/29/59 Solution ht = 48.704", Temp #6 = 25.5° #4 = 25.5

8⁴⁵
10⁰⁰ Horizontal counter raised 7 1/4"
Soln ht. selsyn reads 48.80". Only change is that central blade has been raised.

10⁰⁰ Horizontal ~~raised~~ traverse chamber actually touches wall when selsyn reads 54.03"

10⁵⁵ AM after adjustments on sensitivity of monometer, soln ht selsyn = 48.70

11¹⁵ AM Solution ht = 49.58" for pcc period.

11⁴⁰ AM Temp ave = 25.5°C

11³⁸ Soln ht = 49.12 at critical with all blades out. Both stirrers in but not running. Horizontal counter at 25.5" (from center). Vertical counter is at 25.14" high (near center)

Sample to Cooper	4-24-59-1	4-24-59-2
	Pot. U - Coal. U	Pot. U Coal U
	13.56	13.64
	13.66	13.65
mp. NO ₃	1.0224 at 25°	1.0212 at 25°
	13.9	13.9

1⁴⁰ PM. Soln crit ht = 49.03 ^{very slightly super} with two stirrers in, horizontal chamber at 25.5, vertical counter at 25.14

1⁴⁵ Moist air bubbler turned off. adjustment made on monometer's sensitivity ^{very slightly super}
2¹⁵ PM Soln ht = 49.23 ~~at~~ with ~~conditions~~
2 stirrers in and horig. counter at 25.5, vertical counter at 25.14

2⁴⁵ PM. Soln ht. = 49.18" at crit with two stirrers in $\log W = 2$

3³⁵ PM. Soln ht = 49.08" at crit. Vertical Traverse counter has been removed (since 2⁴⁵ PM)

Soln ht. = 49.09"

~~Horizontal~~
~~position~~

Time	Horiz. Tracer position	C ₁	C ₂ BF ₃	C ₄ normalizer	Counts	Point	C ₁	C ₁ /C ₄	C ₂	C ₄	Notes
3:55 P.M.					2 min counts	-8.5	28800	103.4	236.1	278.3	1 min counts
	54.01	2.6	11.80	396.5		-6.00	28900	102.2	236.1	282.7	"
	48.00	18.74	9.050	408.0		-3.00	29060	102.6	240.3	283.	"
4:08	42.00	3.35	168.00	419.0		0.00	28770	100.4	242.4	286.2	"
	36.00	4.72	253.20	431.5		3.00	28670	99.4	245.8	288.8	"
	30.00	6.52	343.80	441.55		6.00	28070	96.2	247.6	291.9	"
	24.00	8.07	411.70	437.12		9.00	27320	92.2	248.3	296.2	"
4:17 P.M.	18.00	2.55	638.30	212.0	1 min counts	12.00	26450	88.6	253.7	298.3	"
	12.00	7.61	238.90	203.8		15.00	25910	85.6	257.3	302.8	"
	6.00	10.42	249.00	203		18.00	24900	82.2	258.8	303.	"
	0.00	10.42	253.00	203.1		21.00	22960	75.2	259.3	305.3	"
4:30 P.M.	-6.00	10.42	255.20	201.6		24.00	22040	71.8	261.3	307.0	"
4:45	Soln ht = 49.19" after all blades in										
4:27-59	49.196" 8:04 AM } all blades in										
9 AM	Stem on for 20 min LL = 49.165" }										
9:15 AM	LL 49.075 all caplets out Central Rod in										
	Mixer + stem on for 5 min										
9:20 AM	LL 49.056										
9:32 AM	LL = 49.062 Central Rod out pres. period long C ₁ = 25.50"										
9:43 AM	Cmt log N=10 LL=48.252" 25°C										
						27.00	19960	65.1	261.3	306.8	"
						29.00	18720	61.2	259.5	305.7	(counters moved only)
						33.00	33140	53.9	527.4	614.6	2 min counts
						36.00	28670	46.5	523.8	616.1	"
						39.00	24170	39.25	519.9	615.6	"
						42.00	19580	32.2	516.7	608.8	"
						45.00	15220	24.9	519.7	611.1	"
						48.00	10830	17.8	520.1	608.1	"
						51.00	6570	16.7	523.9	613.4	"
						54.00	1480	0.24	524.7	613.1	"
						9.00	28500	97.4	253.0	293.0	(1 min counts)
						6.00	28360	99.4	247.5	285.3	"
						3.00	28690	100.7	244.2	284.9	"
						0.00	28430	98.5	244.6	288.8	"

Time	Point	C1	C/C2	C2	C4	(1 min counts)
11 ²⁰	-3	29160	492	254.6	294.2	"
11 ²²	-6	30030	1003	256.5	299.2	"
11 ²⁵	-8.5	29490	988	258.0	298.8	"
11 ²⁵	Shut down $\frac{9.43}{1.155 \text{ min}}$					

48.31 soln hit after shut-down

Samples for FP analysis taken - Below at 8²⁵ AM
 Above at 12³² AM → 12³² AM

1¹⁰ P.M. Repeat of horizontal traverse

2 ¹⁵ P.M.	54.00	1290	2.14	506.25	604.0	2 ^{min} counts
2 ²⁰	51.00	6070	9.79	521.25	619.75	
2 ²⁵	48.00	10630	16.73	555.9	629.8	
2 ³⁰	45.00	14700	23.42	530.1	627.4	
2 ³²	42.00	18630	30.83 52.5	524.5 618.25	618.25	
2 ³⁵	39.00	22650	37.35	517.0	606.5	
2 ³⁸	36.00	26670	44.6	512.5	598.0	
2 ⁴⁰	33.00	31850	52.7	518.	604.3	
2 ⁴²	30.00	18100	59.1	261.2	306.6	(1 min count)
2 ⁴⁵	27.00	20300	65.7	264.6	309.0	
2 ⁴⁸	24.00	72470 (?)		263.5	309.6	
repeat after moving counter away and back	24.00	22540	73.3	263.4	307.9	
2 ⁵²	21.00	24300	78.6	263.9	309.1	
2 ⁵⁵	18.00	25860	83.78	265.0	308.6	
2 ⁵⁸	15.00	27050	89.1	260.0	303.6	
3 ⁰⁰	12.00	28040	94.2	256.9	297.9	94.2

	9.00	28270	95.6	252.6	297.3	
<u>15</u> 3 P.M.	15.00	26090	88.6	250.4	294.4	
	"	26750	87.2	250.8	295.6	
	"	25790	87.5	250.0	294.75	
<u>30</u> 3 P.M.	6.00	28460	98.7 ✓ 98.7	249.4	288.3	
	3.00	28290	98.2 ✓	245.75	288.2	
	"	27830	98.3 ✓	244.3	283.0	
	0.00	27790	98.7 ✓	240.4	281.5	
	-3.00	27260	^{98.0} 97.9	237.9	278.3	
	-3.00	27350	^{97.1} 97.9	240.2	279.3	
	-6.00	27410	97.8 ✓	241.0	280.5	
	-6.00	27300	97.5 ✓	241.4	280.0	
	-8.50	26970	97.1	237.8	277.6	
	-8.50	26440	95.7	236.1	276.2	
repeat	12.00	24230	87.7	235.6	276.3	.877
	12.00	24830	89.1	239.8	278.8	.890
	9.00	26850	94.9	242.0	283.0	
	9.00	26790	93.7		285.7	

60
4-27-59

Vertical Traverse at 6:10 PM Temp = 25.3°C

Time	Position	C ₁ ^x	C ₂	C ₃	C ₄	C _{3/4}	C _{3/1}	2 min Count	T
5:04 PM	0.0"	42400	=	-	592.6				70
5:20	"	41230	-	26250	601.5	437	637		70
	"	40800 48		26550	602.2	441	660		70
5:22	2.5"	41850	522.7	45960	601.2	765	1098		70
5:28	5.0"	42470	522.5	64960	600.25	1082	1530		70
5:33	7.5"	43060	510.2	82420	588.2	1402	1915		70
5:36	10.0"	45560	514.7	102240	593.6	1728	225		70
5:41	12.5"	48440	537.8	121420	616.2	1970	251		70
5:47	15.0"	49300	537.4	135740	620.8	219	275		70
5:51	17.5"	49100	545.1	147090	622.2	234	2995		80
5:57	20.0"	48770	543.1	150450	620.7	242	3085		80
6:05	22.5"	48980	537.3	153050	610.6	251	312		80
6:12	25.0"	49860	537.9	155090	615.4	252	311		80
6:17	25.0"	49850	538.3	150920	608.9	248	303		80
6:20	27.5"	49790	543.7	139430	607.5	2295	280		80
6:25	30.0"	47350	532.1	118560	602.8	197	250		80
6:33	32.5"	48060	545.4	105650	616.8	171.3	220 215		80
6:40	35.0"	47130	551.5	91000 79100	613.3	1483	193		80
6:46	37.5"	43940	533.1	72840	602.5	121	166		80
6:53	40.0"	44350	540.3	58580	605.6	968	132		80
6:57	42.5"	47100	555.3	41830	624.7	670	088		80
7:04	45.0"	47270	562.2	19150	637.4	300	045		80
7:09	47.5"	46910	560.5	???	632.		-		80
7:17	"	47330	554.5	2060	627.	033	044		80
7:18	"	47820	551.2	2130	620.4	034	044		80

* at 25.5"

30

4/21/59

Vertical Traverse

2 min counts 61

Time	Position	* c1	c2	c3	c4	c5	c6
7:20 PM	42.5"	773?	542.9	442 44420	616.3	721	—
7:25	"	47910	543.1	44920	622.7	722	94
7:30	37.5	47630	544.8	87600	613.6	1430	1840
7:33	32.5	46690	537.3	120640	607.7	1985	2580
7:37 PM	37.5	47070	533.8	86530	602.3	1435	1836
7:41 PM	40.0	47880	534.7	66810	603.5	1104	1395
7:47	35.0	47690	527.1	102370	598.1	1713	2150
7:51	30.0	46960	524.4	123450	588.6	210	2630
7:56	27.5	46830	524.7	128090	584.3	219	2740
8:01 PM	25.0	45960	520.4	130470	585.7	223	2840
8:06	22.5	43480	515.7	127230	581.9	2185	2925
8:10	20.0	43450	519.1	125160	579.3	216	288 241
8:15	17.5	43650	523.7	124500	585.6	213	2850
8:20	15.0	44200	524.9	121380	595.2	204	2745
8:24	12.5	43810	525.7	112090	591.9	2897	2560
8:30	10.0	44790	530.8	101450	601.25	169	2263
8:32	7.5"	44960	532.9	89210	605.1	146	1962
8:40	5.0	44940	522.7	73820	607.3	1215	1642
8:44	2.5	45490	519.4	53810	601.7	895	1183
8:49	0.0	46360	524.9	32150	604.4	532	070
8:55	20.00	47240	539.9	152860	611.8	250	3235 283
8:57	22.5	49030	549.8	159990	624.3	255	326

* 25.5"

4/28/59 Soln ht 48.230 after mixing 10 min solution ht = 48.222

10¹⁵ Counter just touches top of solution 48.13 (Via. Selwyn)
 10³⁰ Vertical counter moved to bottom then moved out above solution then back to just contact of top of solution. 48.14

1³⁰ Vertical traverse counter was realigned to travel directly over center [it was previously off center by approx 2"]. Also a guide was attached so that the chamber does not rotate about its center when being raised or lowered.

Robres discovered that C4 scaler threw in counts (possibly) on other scalars.

4¹⁹ PM just exit. solution ht = 47.87" Log n = 6

4/28/59

Time
 4¹⁰ PM
 4¹⁵
 4²⁰
 4²⁴
 4²⁹
 4³⁴
 4³⁹
 4⁴³
 4⁴⁹
 4⁵⁵
 4⁵⁹
 5⁰²
 5⁰⁹
 5¹⁴
 5¹⁸
 5²⁵
 5³²
 5³⁸
 5⁴⁴
 6¹⁰
 6⁵⁶

Lat 25.5

Position	Horiz Trav- crse.		Norm H size		Vert Trav crse		K-1
	C1	C2	C1	C2	C-3	C-2	
0.0"	107950	497.2	28930	2682	582	58.2	61.4%
0.0"	109060	498.3	29140	267	585	58.5	61.7%
2.5"	108690	492.2	50450	464	102.5	61.1%	61.1%
5.0"	107960	492.5	68160	631	138.4	60.8%	60.8%
7.5"	108220	493.6	85100	787	172.5	60.7%	60.7%
10.0"	109560	501.5	99900	911	199.2	61.4%	61.4%
12.5"	108000	495.9	111710	1034	225.2	61.4%	61.4%
15.0"	106510	488.4	119780	1124	245.2	60.7%	60.7%
17.5"	108320	493.1	127270	1175	258.9	60.9%	60.9%
20.0"	110340	505.5	133880	1214	264.5	62.2%	62.2%
22.5"	111800	513.6	137080	1226	267.0	63.8%	63.8%
25.0"	112480	515.6	135610	1205	263.8	63.8%	63.8%
27.5"	113160	517.8	130860	1156	253.9	63.9%	63.9%
30.0"	112480	514.9	121570	1082	236	63.8%	63.8%
32.5"	112910	514.7	111800	991	217	63.8%	63.8%
35.0"	110400	505.7	94870	859	187.6	62.2%	62.2%
37.5"	108940	498.2	77570	712	155.6	61.3%	61.3%
40.0"	111810	511.1	59970	536	117.4	62.5%	62.5%
42.5"	112950	515.0	39890	351	77.45	63.6%	63.6%
45.0"	112670	514.6	15010	1331	29.18	63.5%	63.5%
47.5"	112020	515.7	1850	1652	35.88	63.4%	63.4%

4/28/59

2 min counts

Time	Position	Horizontal Transverses		Vertical Transverses		c/3/c1	c/3/c2	K-1
		C-1	C-2	C-3	C-4			
6:05 PM	47.5"	110500	591.0	1920		1737		62.9%
6:18 PM	47.5"	108000	459.8	1840		1704		62.8%
6:18 ^{sup = wire}	47.5"	107740	570.0	1900		1764		63.0%
6:21	47.5"	109440	522.1	1870		1710		63.7%
6:32	47.5"	111220	529.5	1950		1754		63.9%
6:40	45.0"	111890	524.3	15710		1404		63.9%
6:48	42.5"	111270	524.4	39900		3585		63.8%
6:59	40.0"	109780	517.1	60380		550		62.8%
7:05 PM	37.5"	111430	528.1	81550		732		64.0%
7:10 PM	35.0"	112040	527.3	97780		872		64.0%
7:15	32.5"	110580	516.4	110420		997		64.0%
7:21 PM	30.0"	108160	504.7	117800		1081		62.3%
7:30 PM	27.5"	104390	490.0	121580		1165		60.1%
7:37	25.0"	107980	509.4	132690		1230		62.7%
7:45 PM	22.5"	110030	520.5	139030				64.5%
7:49 PM	20.0"	111670	528.0	140490				64.7%
7:53 PM	20.0"	112840	OUT	139060				65.0%
7:57	20.0"	113580	"N	144050				65.0%
8:01	20.0"	115020	OUT	144270				65.0%

8:05 → C-2 and C-4 scaler are out. (they were throwing counts into C-1 and C-3.)

1. Scaler 2 register throwing counts in own channel -
2. Scaler 4 discriminator tighten margin (LCRM level)
- 3.

2 min counts

4/28/59

8:15 PM = Dry = 25.0

Time	Position	Horizontal Transverses		c/3/c1	K-1
		C-1	C-3		
8:15 PM	0.0"	117070	31610	270	66.3%
8:18	2.5"	120960	56340	468	68.5%
8:22	5.0"	117810	76240	647	68.0%
8:26	7.5"	117110	93040	795	67.0%
8:31	10.0"	117500	108350	922	67.2%
8:36	12.5"	116480	121240	1042	67.0%
8:41	15.0"	114640	130160	1130	66.2%
8:45	17.5"	114450	136660	1194	66.0%
8:50	20.0"	115140	141740	1231	66.7%
8:55	22.5"	126340	143440	1137	66.8%
9:00 PM	22.5"	117020	146420	1250	67.0%
9:05	25.0"	118110	145150	1229	67.0%
9:09	27.5"	120000	141030	1176	67.8%
9:14	30.0"	122080	134270	1100	68.5%
9:20 PM	32.5"	117750	117970	1002	66.9%
9:25	35.0"	118240	101220	856	66.2%
9:30	37.5"	120300	85100	707	47.5%
9:35	40.0"	123030	65180	530	68.5%
9:38	42.5"	122240	42170	345	69.4%
9:43	45.0"	121180	16440	1357	69.0%
9:46	47.5"	120000	1960	1633	68.5%
9:50	45.0"	117530	15020	1278	68.2%
9:57	37.5"	114580	78470	685	66.4%
10:04	30.0"	112090	121980	1089	65.1%

over

4/28/59
Temp = 25°C

Time	Position	C-1 Horiz Traverse	C-3 Vert Traverse	4/3/41	K-1
10:12 PM	20.0"	107940	134010	1242	61.8%
10:17 PM	10.0"	107100	101200	945	61.3%
10:23 PM	0.0"	111220	30290	2722	63.0%
10:31 PM	10.0"	113090	108040	960	64.3%
10:44 PM	35.0"	114330	98120	859	65.0%

10:55 just exit, solution ht = 47.80. Log n = 5.5
 11:29 just exit. " " 47.80 Log n = 4.6

Time	Position	C-1	C-3	4/3/41	K-1
11:29 PM	0.0"	83750	21950	2628	48.0%
11:36 PM	35.0"	91900	76900	837	52.9%
	20.0"	90460	113310	1252	52.0%

The guide which prevented the traverse counter from rotating was removed just prior to the last series of counts (after 11:00 PM)

11:51 PM	15.0"	89370	104100	1165	50.5%
12:03 AM	25.0"	93310	116320	1247	53.0%

12:06 AM shut down.

New (record) monometer attached to ladder tank. Selsyn set to read dist. 17 inches above floor.

4/29/59

10:30 AM Temp = 25°C
 10:46 AM just exit = solution ht = 47.62"

Horizontal Traverses
 2 min count.

Time	Position	C-1 Horizontal	C-3 Normalizer	4/3	K-1	C
10:50 AM	-8.5"	8950	101540	880	60.0%	* C-1 bias not properly set
10:58 AM	-6.0"	147940	100410	1474	59.4%	
11:04 AM	-8.5"	143080	99310	1440	58.1%	
11:06 AM	-3.0"	146040	102110?	1430	57.8%	
11:16 AM	-3.0"	150860	104660?	1442	59.7%	
		C-3 seems high. Check LA3 output. C3 regis for disturbing base line slightly. C-3 pre-amp output connected to LA4 input. To get output pulses comparable to C-2, increased LA4 gain to 32. PDL @ 20.				
11:32 AM	-8.5"	150230	112840	1332	60.7%	
11:38 AM	-6.0"	152870	111290	1374	60.7%	
11:42 AM	-3.0"	154290	111500	1384	61.2%	
11:49 AM	0.0"	152040	110340	1379	60.1%	
11:54 AM	3.0"	149740	106680	1404		

12:05 PM System was accidentally scrambled.

Time	Position	c1 Horizontal Traverse	c-3 Normalized	c1/c3	K-1
12 ³⁵	-8.50	152430	103320	1.476	64
	-8.50	153840	105700	1.455	63
12 ⁴³	-8.50	151450	104780	1.446	62 slow drift down
12⁵¹	11	152730	107270	1.428 ³	62 drift up from 60
12 ⁵¹	11	154480	108070	1.430 ³⁸	62.1 (points to 60) drift up
				1.446 ³²¹	
1 ⁰⁰ PM	-6.00	157010	111250	1.412 ⁴¹⁰	63.0
1 ⁰⁸ PM	-3.00	160040	112100	1.428	63.6 trend up
1 ¹⁴ PM	0.00	163520	115350	1.418	64.7 trend up
1 ²⁷ PM	0.00	162270	112820	1.438	64.50 adjusted with trend
1 ³³ PM	3.00	165140	113510	1.455	66.8
1 ⁴⁷ PM	6.00	168240	116270	1.447	68
1 ⁵²	9.00	155240	110840	1.400	66
2 ⁰²	12.00	151570	112370	1.35	67
2 ⁰⁸ PM	15.00	146850	114540	1.281	68
2 ¹⁵ PM	18.00	139570	114930	1.215	67
2 ²⁰ PM	21.00	130680	115350	1.134	67
2 ²³ PM	24.00	122500	116690	1.048 ⁰⁵⁰	68
2 ²⁸	27.00	115140	118190	.974	69
2 ³⁴	30.00	103660	119460	.8675	69
2 ³⁶	33.01	91660	119290	.768	67.9

time	Point	c1	c3	c1/c3	K-1
	36.00	80290	119120	674	68.0
	39.00	67990	119200	570	68.0
	42.00	56980	120150	474	69.2 ↑
	45.00	43410	118020	348	69.5 ↓
	48.01	30280	113790	244	68.2 ↓ 67.5
	51.00	17820	109450	163	65.0 ↓
	54.00	4080	107860	038	64.5 ↑
	48.01	29390	109110	249	65.0 ↑
	42.00	53070	110690	4795	65.9 ↑
3 ²³ PM	33.00	88250	110180	8015	65.5 ↓
3 ²⁸	33.00	86310	108990	792	64.5 ↓
3 ³⁷	27.00	106730	109360	974	63.5
3 ⁴⁵	18.00	131100	109490	1198	62.9
3 ⁵²	15.00	136580	108980	1254	62.7
3 ⁵⁸ PM	15.00	136280	109550	1245	62.6
4 ⁰⁴	12.00	142500	108990	131	62.2
4 ¹⁰ PM	9.00	147060	110220	1335	63.0
4 ¹⁶	6.00	156680	112250	1396	64.0
4 ²⁵	3.00	160830	111810	1440	65.0
4 ³¹	0.0	158730	108840		64.6
4 ³⁸	-3.0	160020	107220?		64.2
4 ⁴⁵	-6.0	159210	107960 ¹⁰⁷⁹⁶⁰		64.6
4 ⁴⁹	"	157320	106890		64.2
4 ⁵⁵ PM	-8.5	155760	107880		63.5
	-6.0	157830	109070	1448	64.0
			aver.		

Results from sample for power determination

Sample results

before power run

^{99}Mo 2.30×10^8 f/ml
 ^{135}Ba 7.94×10^8 f/ml

Results of sample

after power run

4.54×10^8 f/ml
 1.02×10^9 f/ml

2.24×10^8 f/ml

2.26×10^8 f/ml

Power level = ~~8.3~~ 8.3 watts for whole reactor (Log N ~ 10)

Time = 247 sec

Time	Point	C-1	C-3	C1/C3	K-1
5 ¹⁰ PM	-3:0	159690	111570	1430	69.2
5 ¹⁸ PM	3:0	158350	112640	1405	69.1
5 ²³	9:0	155920	115500		65.5 up trend
5 ²⁷	9:0	158830	118370	1340	"
5 ³⁴	9:0	156940	116810	1341	66.5 down trend

6⁴³ shut down:

4/29/59

(Period run)

Time	Notes	Tab lit
6 ⁵⁰ PM	relation lit = 98.220 for pos period	12.962
7 ⁰⁹	" " 47.530 just crit	15.215
7 ¹²	" " 46.998 for neg period	16.993
7 ²⁸	" " 48.226 pos.	12.926
7 ⁴³	" " 47.513 just crit	15.163
7 ⁴⁷	" " 46.583 for neg period	18.112
8 ⁰⁴	" " 47.865 for pos period	14.013
8 ¹⁸	" " 48.100 for 2nd pos period	13.316
8 ²⁷	" " 47.535 supra-crit (stayed)	15.149 x
8 ³³	" " 47.537 " crit	15.180 x
8 ³⁸	" " 47.519 crit	15.222
8 ⁴⁴	" " 46.367 for neg period	18.938
9 ¹⁷	" " 48.473 for pos period	12.039
9 ³³	" " 47.500 just crit.	15.163
9 ³⁶	" " 46.755 for neg period	17.612
9 ⁵⁸	" " 48.363 for pos period.	12.513
10 ¹⁵	" " 47.529 just crit.	15.226
10 ¹⁹ AM	" " 46.719 for neg period	17.787
10 ²⁸	Shut down. reported after correction: 48.2	

4-30-59

8⁵⁰ AM

Sample sent to Cooper -

13.66 gm U/kg

sp gr. 1.0194 at 27°C

NO₃ - 13.8

$$HX = \frac{1}{.928} \sqrt{\frac{24.11}{.01344} + (2383 - 3144)}$$

$$= 2000$$

4-30-59

6⁰⁰ PM New Probe installed - Source in Inst chd -
LL = 46.421" Tsd = 19.055 Probe = ~~46.43~~ 46.43"
water temp 25°C
sol'n - rods in - Probe = 46.33" LL = 46.305

6⁴⁰ PM Pos. period Tsd = 14.371 Probe = 47.78 LL = 47.755

6⁵⁸ PM Critical log N = 15 Probe = 47.235" LL = 47.236
Tsd = 16.138

7¹⁰ Neg Period Probe 45.24" LL = 45.252 Tsd = 22.554

7⁴⁰ Pos Period - Probe 48.21" LL = 48.220 Tsd = 13.061

8⁰¹ PM Critical ht Probe 47.235" LL = 47.220 Tsd = 16.148
log N = 8

8⁵⁵ PM Neg Period 46.195" LL = 46.187 Tsd = 19.464

8²² PM Positive Period Probe 47.484 LL = 47.467 Tsd = 15.228

8³⁴ PM Positive " Probe 47.775 LL = 47.780 Tsd 14.329

8⁴⁹ PM Critical log N = 10 Probe 47.205 LL = 47.235 Tsd 16.201

9⁰⁸ PM Neg Period Probe 46.72 LL = 46.757 Tsd = 17.759

9²⁰ PM Pos Period Probe 47.518" LL = 47.530 Tsd 15.206

9⁵⁰ AM Critical Probe 47.205" LL = 47.201 Tsd 16.189 log N = 15

Neg Period Probe 46.415"

Pos Period Probe 48.20

10³⁰ PM Probe 47.205" Crit log N = 12 LL = 47.215 Tsd 16.255

10³⁵ PM Neg Period Probe 46.18" LL = 46.209 Tsd = 19.529-

10⁴⁶ Shutdown

10⁴⁷ All ht blades in (except center)
Soln ht, = 46.28"

5/1/59 Tail exposure Experiment

Crit. @ 12²⁹ PM ; log N = 2
Probe = 47.09" LL = 47.09 Tsd = 16.52

3⁰⁰ Crit. ht. = 46.92" after removal of
tail and one stirrer.

5/4/59 4⁰⁰ AM Solution ht, with all blades in (except center)
= 45.91" with probe, 45.902 with L.F.
Temp = 25°C

Horiz Travers at 26.00"

74
5/4/59
10:39
10:50 AM

13.69 { 13.71 gmV/kg, appr 10208 at 24°C
13.64 } NO3 - 13.9 ←

Pos period Probe = 46.88, LL 46.78 Tad = 17.02
Temp = 25.1°C

Sample sent to Cooper

11:06 just crit Probe = 46.36, LL 46.21 Tad = 18.69

11:17 neg period Probe 45.84 LL 45.68, Tad 20.35

1:08 Pos period probe 46.87, LL 46.65, Tad 17.02

1:45 PM Crit at probe 46.33 LL 46.14 Tad 18.73

2:15 " " 46.32(-) 46.14 " 18.78

2:17 neg per. probe 45.82, LL 45.67 Tad 20.34

2:35 Pos period Probe 46.60 LL 46.42 Tad 17.88

Crit at Probe 46.31 LL 46.12, Tad 18.78

neg. per. probe 46.04 LL 45.84 Tad 19.60

Pos. per. Probe 47.00 LL 46.82 Tad 14.58

Crit ht Probe 46.30 LL 46.14 Tad 18.82

neg. per. probe 45.59 LL 45.45 Tad 21.10

Pos. per. Probe 47.21 LL 47.05 Tad 15.95

Sample to Y-12 for Ray Neg. 593082

75

just crit probe 46.29 LL 46.11 Tad 18.84

neg. per. probe 45.32 LL 45.13 Tad 21.99

Raised the Liquid Level Manometer 37.5"

5/4/59

8:20 PM

Added water to reactor:

10:30 PM

Solution ht = 87.50" (using L.L.)

5/5/59

10:30 AM

Added water to reactor:

Solution ht = ~~87.50~~ (using L.L.) = 99.05"

Calibration of manometer:

sample	Reading
5.24 g/c	93
13.0	4
5.24	96.5
13.0	5
pipe	73

10³⁰

LL monometer raised 4.38" and selsyn
changed to read height directly.
LL ht. = 98.89" after change

10⁵⁵

Soln ht. in manifold ~ 28 cm
Started feeding solution

11¹⁰

feed rate adjusted to read ~ 40
on colorimeter

1⁰⁰ PM

110 cm of soln added to manifold

3¹⁹ PM

Started feeding soln. from
manifold. K-1 reads 10 on 10×10^{-13} .

3²⁴ PM

Stopped feeding

3³³ PM

Started feeding

3⁴⁵ PM

Stopped feeding

Soln ht in manifold = 90.6 cm

5/5/59

4¹⁵

Measurement was made of distance
between soln. level and horiz. trav.
support tube [i.e. hole in door], dist. = 12.5"
corresponding LL reading = 99.08"

Electrical junction on Horiz. trav.
counter is ~ 2 1/2" below hole in door

4²⁹ PM

Started feeding from manifold

4⁴⁶ PM

Stopped feeding " "

Soln ht. = 76.4 cm

4⁵⁷ PM

Started feeding from manifold

5¹³

Stopped feeding " "

K-1, ~ 10 on 10×10^{-13} ; colorimeter = 44 $\cong 12.3 \frac{1}{2}$

5²⁰ PM

Started feeding from manifold

5³⁵ PM

Stopped feeding " "

K-1, ~ 10 on 10×10^{-13} ; colorimeter = 59 $\cong 12.35$

Soln ht. in manifold = 53.5 cm

78

5/5/59

5⁴⁴ P.M.
5⁵⁵

Started feeding from manifold
Stopped " " "

6¹²
6²³

Add more water. Shut 99.8"
Stop @ 106.72" solution to top of distribution ring outlets.

6⁴⁰
6⁴⁵

LL reading after miping = 106.87
Started feeding - colorim = 12.8g/l post mips - from
12.25g/l before feeding -
Stopped feeding - max on color = 13.0g/l
dropped back to 12.3g/l

7⁰⁷ P.M.
7²³

Started feeding from manifold.
Stopped feeding " "
Soln ht in manifold = 26.0 cm
color meter reads 55 \approx 12.4 g/l

7³² P.M.
7⁵⁷

Started feeding
Stopped feeding
Soln ht in manifold = 0.0
Loaded 8¹¹ cc of solution into manifold - or 46 kg

9²⁰ P.M.

Draining into Tad addi -
LL Tad
Start 107.16 8.213
96.97 30.564
10.19"

79
solution ht. was not read after last addition in manifold.
since feed rate from manifold is \approx 184 cm/min then
beginning ht = 90 cm - making extrapolation from
first reading below.

9⁴¹ P.M.
9⁵¹

Started feeding soln from manifold
Stopped "

9⁵⁸ P.M.
10⁰⁸

Started feeding from manifold 73.5 cm
Stopped " " "

10¹⁶ P.M.
10²⁴ P.M.
10³⁰ P.M.
10⁴⁰ P.M.

Started feeding
Stopped "
Start
Stopped
K-1 \approx 15 ; 13.6 g/l by colorimeter

10⁴⁵ P.M.
10⁵⁵ P.M.

Started feeding
Stopped feeding 42.4 cm manifold
K-1 \approx 20 ; 13.7 g/l by colorimeter

11⁰⁰

Found air bubble in Tad - new reading = 33.365"
LL all rods in = 97.760

5/6/59

8⁰⁵ AM

Solution level in lid = 97.775" with all blades in
" " in tad = 33.364"
Solution in manifold = 72.4 cm.
Temp = 25.2°C

8²⁰

Calometer Calibration

12.2 g/c = 68 67

13.0 " = 54 46

20.45 " = 19

14.0 " = 84

pip = 86 45

8⁵⁶ AM

K-1 rods in 18 all rods out

8⁵⁷ AM

Start feeding (pump valve shut off)

9⁰⁰

" "

9¹⁰

Stop

Temp = 25.1°C (one of thermocouples)

9²⁴ AM

Started feeding

9³⁴ AM

Stopped feeding

9²¹ AM

Started feeding

9²¹ AM

Stopped "

9⁴¹

Started feeding

9⁴⁰

Stopped "

9⁵²

Started feeding

9⁵⁷

Stopped "

Soln ht. in manifold = 15.0 cm

Feeding rate 27.7cm/40 min feeding time = .685 cm/min

~10¹⁰ AM

Started feeding

10⁴⁵

Rods in + mixing -

10⁵²

Manifold 10.7cm

10⁵³

Started feeding

10⁵⁵

Stopped "

11⁰²

Started Feeding

11⁰⁴

Stopped "

11⁰⁷

Started feeding from Tad Address -

11⁴⁰ AM

Soln added to manifold; ht now = 24.5cm

1²⁰ PM

Solution ht in lid = 107.9". Tad empty.

1²² PM

Started feeding

1²⁸

Stopped for mixing

1³⁴

Started feeding

1³⁸

Stopped for mixing

1⁴⁵

Started feeding

1⁴⁷

Stopped for mixing (checked and was sub-unit)

1⁵¹^{1/2}

Started feeding

1⁵²^{1/2}

Stopped system super critical
Put central rod part way in for mixing

crit with central rod at 36.64

2:15 PM
3:22

solvent hit in manifold = 13.0 C
Raised top impellers on stirrer
after inserting poison

3:33

Started stirrer

3:52

crit with central rod at 34.00"

4:13

stopped stirrer and pump.

4:14

crit with central rod at 31.10 rod added full

Drained 1 in fuel into outside tank, since

we could not pull out all poison with
rod added full. Prepared to add water
to fill in steps

5:42

Added ~ 1 in water & mixed

5:52

accidentally hit magnet switch. Had to
recock raptures

6:22

approx. crit. rod 32.18; LL 97.44

7:21

Start pos. period L.L. 102.41 rod 15.85

Raising center rod from 99.32 on selsyn.

7:38

Bldg alarm screen on P.M. 1 no other
~~instrument~~ instruments scrambled.

8:54

Start of pos. period L.L. 102.42", rod 15.88"

9:24

Just crit. L.L. = 96.19" rod = 35.92

K-2 = 49 = 3×10^{-8}

K-1 = 33 = 10×10^{-9}

Log η = .07

9:26

Shut down to take out 1 stirrer.

Drained from fill into outside tank

starting from LL 98.54 stopped at LL 93.96"

Probe re-installed in place of N stirrer

10:45 Brought system to crit with one stirrer out

crit L.L. 95.51 rod 23.09

10:52

L η .007 K-1 3.5×10^{-10} K-2 $4.8 \times 3 \times 10^{-9}$

inserted #1 control rod alone for neg period

After shut-down L.L. 95.75; Probe 49.30

5/7/59

8:00 AM

Probe = 49.28" (all blades in)

8:45

Probe set to correspond to L.L. after
being sure L.L. in equilibrium

9:30 AM

Temp = 25.5 °C over.

5/7/59

9:45 AM

Soln fed from tab ladder to Sid for pos. period

probe = 101.65" ; LL = 101.64 pos. period

10:19 AM

Probe = 94.97" slightly pos. [leveling]

" = 94.93" " " "

10:25

" 94.89" still slightly pos.

" 94.87" " " "

94.84" " " "

10:33

Just crit. Probe = 94.81" L.L. = 94.80

Tab = 24.274"

10:40 AM

Neg. period LL = 89.97

Probe 89.99"

11:50 AM

Wiping pump and seals steven on:

12:00 PM

Sample taken: Probe = 99.95" L.L. 99.97" Tab = 10.20"

12:30

Orig. traverse chamber removed from big Sid (sol'n had penetrated wax fitting)

1:12 PM

System Critical Central Rod 38.54 log N = .0009

Pos period. LL = 99.657

Probe 99.665"

Counting with C-1

5-7-59

Sample

13.349 mU/kg
13.31

sp. gr. 1.0201
NO3 - 13.5

} Crit.
~~94.26~~

crit at 10:33 AM 94.81

2:05 PM

Critical log N = .1 Probe = 94.26"

LL = 94.265

Tab = 24.861

2:11 PM

u 4" Neg Period Probe = 90.275"

LL = ~~90.275~~

Tab = 38.20

2:35 PM

log N calibrated - OK

3:25 PM

3.5" Pos period Probe = 97.73"

LL = 97.73"

Tab = 16.375

4:00 PM

Just crit. log N = .1 Probe = 94.14"

L.L. = ~~94.136~~ 94.136"

Tab = 26.205"

4:19 PM

3.5" Neg Period. Probe = 90.57"

L.L. = 90.565"

Tab = 36.875"

5:30 PM

Pos. period, probe = 96.15"

LL = 96.15"

Tab = 20.82"

5:57 PM

Critical ht. = 93.92"

5/7/59

6⁰⁰ P.M.

neg. period Probe = 91.21"
LL = 91.20
Tad = 35.20

log N calibrated - OK

7²⁰

Pos. Period Probe 99.83
LL 99.827
Tad 96.82

7³⁰

Safetis man in -

7⁴⁰

Safetis out - no change in sol'n

8⁰²

Crit. ht = 93.775" (probe)

8¹⁴ P.M.

neg. period 89.80 = probe reading

5/8/59.

1⁰⁰ P.M.

South stirrer and wiping pump on.

1⁴⁵

Sample taken. Probe = 90.02" (all blades in.)
see next page

3²⁷

Approach to crit after adding small amt of water & mixing. Sub. crit at 98"

3⁵⁰

Adding small amts. of conc. fuel. 10 sec. at a time

4¹²

Approx crit. ht ~ 94". Hence, added too much fuel. Moral! very sensitive to small changes in fuel conc.

4²⁰ Soln ht with blades in = 94.32"

Sample to Cooper 13.349 ml/kg > p. 9r. 1.0200 @ 24°C
5-8-59 13.32 P NO3 - 13.6

5/11/59

10/11/59

8⁰⁵ A.M.

(Not sure of critical conditions)

Fuel ht = 94.23", with all blades in

8³⁵ A.M.

South stirrer and wiping pump on. (all blades in)

~ 9³⁰

Approx. 6 liters of water added

10⁵⁰ A.M.

South stirrer and wiping pump off. (all blades in)

1²⁰ P.M.

Soln level with all blades in = 94.28"

2⁰⁰ P.M.

Approx. 12 liters of H2O added to sid.

2³⁰

Foil Exposure Run

two foils (cd covered and bare) placed in center of reactor.

Temp. = 25°C by Thermocouples

Foils exposed for ~ 10 min at log W = ~.009

3⁰⁰ P.M.

~ 6 liters of H2O added to sid.

4⁰⁰ P.M.

Crit ht. = 92.11" (after mixing ~ 30 min)

4³⁵ P.M.

Crit ht. = 92.06" after mixing additional 20 min.

4⁴⁵ P.M.

Probe ht - Rods all in - 92.305 ^{except center control} Liquid level 92.286

Tad = 34.477

5/12/59

8:15 AM

Soln ht. with all blades in except center contour blade = 92.285"

8:35 AM

Soln ht. = 91.64" at critical



Approx 4" soln drained from did into outside tank

9:15 AM

Temp. = 48.25.2 °C #4 ; 25.0 °C #10

9:40 AM

pos period Probe = 94.65 ; Tad = 11.748
3.26"

10:07 AM

Crit ht. = 91.45"

10:10 AM

neg. period = 88.48" 2.97"

10:29

Shut down (Safety) to enter room

11:10

Sol'n added - 15.964" Tad-

11:14

Safety out - Sol'n Probe = 93.325 } Pos Period
Tad 15.965 } 1.95"
LL = 93.311

Water temp - 25.2°C

11:56

Critical log N = .026 Probe = 91.37"
Tad = 22.247
LL = 91.345

12:03

Neg Period Probe = 89.57

12:19

Shut down Pds in
Probe = 89.55" (all Pds in experiment)

1:20 P.M.

pos. period 96.10 = Soln ht.

1:42 P.M.

Crit ht. = 91.32"

1:51 P.M.

neg. period = 87.79 soln ht.

2:00 P.M.

5/12/59 Sample #9 taken to be sent to Cooper # Reg 1943 } Crit. 91.32
9mV/kg spgr = 1.0197 @ 25
NO3 13.7

13:32

13:32

3:02 P.M.

Soln ht = 95.08", pos. period

3:17 P.M.

Blades lowered to lower power level and then raised to obtain a second pos. period without changing soln ht.

3:40 P.M.

Crit ht. = 91.28"

3:45 P.M.

neg per. = 88.63"

4:37

Pos. Period 93.68" - probe

5:06

Crit ht. = 91.23"

5:13 P.M.

neg. period = 86.44"

5-13-59

10³⁰ AM Set syn set to zero on Vertical Traverse when Fis. ctr. touches bottom.

Fis. ctr. touches top surface of rod at 87.06" when probe reads 86.65"

10⁴⁵ 5/13/59 Sample #10 taken to be sent to Cooper

Also #10A for F.P. analysis (background) Inst. ch'd - Probe reads 86.64" (all Rods in Vertical traverse installed - Horizontal in N. Stereo position -

12³⁴ PM

1¹³ PM

1³⁸ PM

Fission Exposure (X-10 Health Physics) Log W = .0025 approx. level Probe ~~86.64~~ 90.89

2^{07.3} PM

1/2th of .028 on Log N (for HP for Egg) K-1 38 on 3x10⁻⁹

2²⁵ PM

Crit. wt = 90.90" with vertical traverse counter at 45"

5-13-59

Sample to Y-1 for assay reg 593083 #10 0.01325

5/13/59

2²⁵ PM

Vertical Traverse just exit = 90.90" Vertical Traverse counter at 45"

2²⁸ PM

C₃ position C₃ C₁ 45.00"

Log W = .024

4⁰⁷ PM

HP. samples removed

4²⁰ PM

just exit = 90.76"

4⁵⁰ PM

Sol'n Ht - all rods in = 90.98" Probe

Exposure time for F.P. analysis (in Sid) 2hr 39min shutdown time = 4⁴⁶ PM (from log N chart)

Cooper sample:

13.31 mV/hy. sp gr. 1.0201 at 24°
13.32 " " NO₃ - 13.6

Ba¹⁴⁰ + Mo⁹⁹ analysis = 4.15 x 10⁸ f/ml
note based on Ba¹⁴⁰ building up after = 370 c/min
Mo⁹⁹ after = 242 c/min
after = 344

4.15 x 10⁸ f/ml x 13.61 x 10⁶ ml = 56.5 x 10¹⁴ fissions
÷ 3.1 x 10¹⁰ f/w = .182 x 10⁶ w = 0.182 megawatt hr
÷ 9.54 x 10³ sec = 19.1 w/sec

5/14/59 8⁰⁰ Soln ht = 90.97 with all blades in
except center control blade

~~8⁴⁵~~ 9⁰⁰ ~20 liters of water added to Sid and
stirrers turned on.

10⁰⁰ AM. Two thermocouples moved vertically
(1) #4 raised ~30"
(2) #B raised ~34"

11⁰⁰ AM. Solution diluted in order to get
higher critical ht.
→ ~8" of soln fed into Sid from
outside tank. Sub. crit with
~22" in tadadder.

Added concentrated soln to get crit.
11²⁵ fed ~8 sec. from manifold

11³³ AM fed ~6 sec. " " | ~8 min. mixing
time between
additions

11⁴² " ~5 sec " "

12⁰⁹ " ~6 sec " "

12²⁶ PM. " ~5 sec. " "

manifold by-pass valve was open during above
additions.

Ventral transect

5/13/59

5-13-59

log N .024

Position	C ₁	C ₃	C ₃ /C ₁
45.00	21820	230660	1056
"	22130	231260	1045
"	22230	231840	1042
0.0	21760	26730	123
"	21820	26610	122
	21430	25870	121.9
5.00	20730	62890	307.0
	20910		
	20620	62460	306.0
	20160	62580	309.0
10.00	20790	96750	465.0
	20190	96650	479.0
	20850	96100	462
	20780	97840	472
	20760	97800	471
20.00	21150	158910	750
	21310	160060	751
	21410	161150	752
30.00	21750	205240	944
	22120	207700	948
	22300	210940	945
	22260	211610	950
35.00	22230	225700	1015
	22230	225040	1013
	22300	224800	1008
40.00	22280	232760	1044
	22300	231650	1038
	21830	231140	1041

log N = .022

part

15
3 PM

log N .024

66

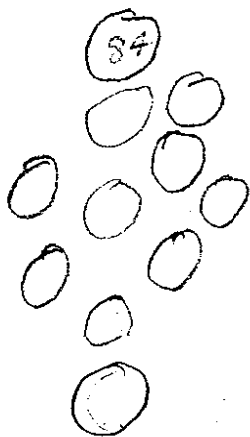
Ventral Traverse 5-13-59

Position	C ₁	C ₃	C ₃ /C ₁																																	
48.50	22080	233100	1056	log N = .024																																
	22260	231660	1039																																	
	22020	233280	1050																																	
	22430	232290	1046																																	
50.00	22710	230110	1013	log N = .024																																
	22550	231730	1026																																	
	22680	232610	1026																																	
55.00	22830	223330	979																																	
	23000	224780	977																																	
	22900	225920	985																																	
60.00	23420	209720	896	<div style="border: 1px solid black; padding: 5px;"> <p>Repeat:</p> <table border="1"> <thead> <tr> <th></th> <th>C₁</th> <th>C₃</th> <th>C₃/C₁</th> </tr> </thead> <tbody> <tr> <td>45.00</td> <td>23540</td> <td>251830</td> <td>1069</td> </tr> <tr> <td rowspan="3">slight neg period</td> <td>23180</td> <td>246870</td> <td>1060</td> </tr> <tr> <td>22590</td> <td>243040</td> <td>1076</td> </tr> <tr> <td>22410</td> <td>241140</td> <td>1076</td> </tr> <tr> <td>45.00</td> <td>22010</td> <td>232170</td> <td>1055</td> </tr> <tr> <td rowspan="3">full added almost level still very hazy much slower</td> <td>21690</td> <td>22933</td> <td>1057</td> </tr> <tr> <td>21490</td> <td>230860</td> <td>1073</td> </tr> <tr> <td>21430</td> <td>227756</td> <td>1060</td> </tr> </tbody> </table> <p>H_c = 90.76" (Probe)</p> </div>		C ₁	C ₃	C ₃ /C ₁	45.00	23540	251830	1069	slight neg period	23180	246870	1060	22590	243040	1076	22410	241140	1076	45.00	22010	232170	1055	full added almost level still very hazy much slower	21690	22933	1057	21490	230860	1073	21430	227756	1060
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	23400	211020	902																																	
	23640	211540	910																																	
	23970	216380	906																																	
	24020	217490	906																																	
70.00	24140	163950	678																																	
	24220	164180	678																																	
80.00	24860	92080	3705																																	
	24450	92480	3780																																	
	24540	92060	3750																																	
	24730	93410	3778																																	
85.00	24780	50320	203																																	
	24800	50580	204																																	
	24620	49940	203																																	
90.00	24660	2860	114																																	
	24280	2790	115																																	
	24720	2710	110																																	

N
↑

32 Clean Plate

57



(front)

(back)

00

5/13/59

manifold by-pass valve closed
 12²⁹ P.M. fed ~ 5 sec. from manifold
 12³² cut, probe 99.03"
 inserted saphire
 12⁵⁵ Adding from Tad tank mixer going
 1⁴⁷ Tad tank empty
 1⁵⁵ Draining ~ 10 in into tad tank
 1⁵⁴ Adding from Tad tank (got air out of
 pump by jogging feed switch on & off moment-
 arily)
 2⁰⁶ started ~ 10" on Tad adder - emptying -
 2³⁵ Probe ~ 106"
 3¹⁵ P.M. 96.285" Probe Critical 30.8" in Tad adder.
 3¹⁷ Stirrer On - off after ~ 8 min
 3⁴² cut 96.27
 3⁴⁴ Pumping out of Tad Tank
 4³² sol'n ht 102.39
 5-15-59
 8^{AM} Sol'n ht - 102.37" Probe
 8⁰⁵ Pumping tad tank out -
 8⁴⁵ Stirrer + Mixer pumps on -
 9⁰⁰ ~ 106" in tank
 9¹² Stirrer + Mixer pump off Sol'n ht = 106.12"

10²⁸ pos. period Probe = 99.76"
 10³⁷ K-1 on 3×10^{-9} - 38 - Keithley log N = 2.4
 Modified ORNL log N was .028 when K-1 was 38 on 3×10^{-9} (p. 90)
 a factor of 100
 11⁰⁷ 95.23" Probe } cut
 Tad 35.172 } log N = 15
 LL 95.144 } K-1 63 on 10×10^{-9}
 11¹⁷ Neg Period - ~ 3" drained into outside tank ←
 Probe - 90.24" Tad = 38.941 CL = 89.981
 4.99" not drained from cut
 11³⁰ Shut down - Rods in - started pumping from Tad -
 12³² P.M. Sol'n ht = 98.24" pos period
 12⁵⁹ P.M. Sol'n ht 95.155" } log N = 2.4
 Tad 23.052 } Critical
 LL 94.912 }
 Sol'n Temp 25.8°C
 1⁰⁵ P.M. Neg Period 92.08"
 2⁰¹ P.M. Pos Period 97.66" Probe
 Tad = 14.984, LL, 97.497"
 2²⁸ P.M. Crit 95.01" LL 94.79, Tad 23.49

2³³ Neg per. 92.52" on probe, LL 92.29, Tad 31.51

3³² Pos. period, Probe 98.57, Tad 12.03, LL 98.40

3⁵⁴
4⁰¹ P.M. Crit ht. = 94.79" probe
neg. period 91.17" probe

5⁰⁰ P.M. pos. period 97.83" probe

5²⁸ P.M. Critical - 94.75" log N 0.8
Tad 24.314
LL 94.665

5³³ Same run in which system critical -
very slight positive period - ~ 2000 sec

5³⁹ P.M. Neg Period 92.755 Tad = 30.753
LL = 92.589

5⁵⁵ Shut down
Probe 90.98
Tad ~~37.231~~ 37.231
LL 90.843 } all rods in

5/18/59

8³⁰ AM Probe = 90.89" all rods in
Tad = 37.213
LL = 90.762

9¹⁵ AM Withdrawing core from manifold for South Bay Exp -
Manifold beginning = 12.0 cm
1st bottle # 504 $\frac{4.0}{8.0 \text{ cm} \times 1.65} = 13.20 \text{ L}$
524 ~ 14-15 Liters (manifold below zero)

5/18/59

4¹⁰ out position = 102.8 on relay
of solution contained in stainless
tube.

~ 100 gm u from manifold put in
stainless tube ~ 3' long, ~ 1" dia.
and attached to vertical traverse drive.
Crit ht. = 95.96"

4²⁵ P.M. Soln. control tube lowered to relay
reading = 11.75" for pos. period
Soln control tube removed - critical
ht. is same
4³⁵ P.M.

5/19/59

9³⁰

all solution fed from todadder into
Sid and stirred ~ 10 min

9⁴⁹
AM

Crit. ht. = 95.13" $\log W(\text{Keithley}) = .05$

9⁵⁵
AM

Soln. control tube lowered to 18.00" relsyn
reading [Center of fuel in tube ~ 47" from bottom
of Sid] for pos. period

10¹⁰
AM

Fuel control tube removed - system
~~fast~~ critical [very slight drift up -
same as at lower power level]

10⁴³

Crit. ht. = 95.13" $\log W(\text{Keithley}) = .03$

Soln tube inserted for pos period.

11⁰²

Soln tube removed

12⁰⁰

Stopped feeding from todadder

Temp. of soln 25.10 C

12¹⁸

Refuel out for pos. period

Probe 100.04"

Forgot to get crit. pt.

12⁴³

Stopped draining. Fuel rod in to keep power up.

1⁰³

90.00" for neg period. start fuel rod
out

2¹⁵

Soln added from todadder "

2²³

Pos. period probe 98.71

2⁴³

crit. probe ~~94.97~~ " 94.93

4²⁰
PM

Crit. ht. = 94.86"

5/20/59

Soln added to Sid from todadder
and mixed.

8⁵⁶
AM

Stirrer and mixing pump turned off.

9²⁷

99.94 pos. period

9⁵⁶
AM

Crit. ht. = 94.54"

10⁰⁷

Soln ht = 89.98" for neg period

(by removing control soln. tube)

10¹⁷

soln. control tube removed.

10²²

Temp = 25.2 C

11⁴⁹

Pos Period ht = 98.96

5/20/59

12³⁷ PM

Crit. ht = 94.50"

12⁴⁵ PM

Soln drained into todadder and soln control tube inserted

12⁵³

Soln ht = 91.48" for neg period

1⁵⁶2⁰⁴

Soln added to Sid from todadder pos. period 98.00" = soln ht. (Single control blade removed)

2³⁶

Crit. ht. = 94.44"

2⁴⁶ PM

Soln drained into todadder for neg. period. System held critical with soln tube. Soln ht. = 90.54"

2⁵⁶ PM

Soln control tube removed

4⁰⁰ PM

Soln ht = 96.92 Pos period

4³¹

Crit ht = 94.44"

4⁴⁰ PMNeg ~~91.99~~ 91.99" soln ht - by removing fuel rod -5⁰⁸ PM

Log N (Reithley) checked - OK.

5/21/59

9⁵⁵94.19" critical log N = .04 (without fuel tube)
Fuel tube touches surface at 74.89" on slygon wheel when soln 92.21"10²⁵10³⁰Fuel tube at 14.77" [center assumed to be 15" (tube 30" long)]
pos. period: Soln ht = 94.19 + fuel tube11⁰⁰

~ 1" of solution drained into outside storage tank.

~~Soln ht = 88.73 88.70" ; crit. with soln tube at 14.77" (center)~~11³² AM

Soln ht. = 88.67" ; crit with soln tube at 12.02" (center)

11³⁴ AM

Soln tube removed for neg. period

1⁴⁵ PM

Fuel ht = 90.91"

1⁵⁵ PM

Pos Period. Fuel ht = 90.91" Fuel tube = 13.15"

2¹⁹

Crit. Fuel tube at 34.20 on slygon.

5/21/59 4⁰⁰ P.M. Sample # 11 taken after mixing ~ 30 min
 pot. Cond. NO₃ Density
 13.30 13.33 13.5 1.020 at 24°C

5/22/59

8²⁰ AM Fuel added from tank - added to acid; fourth stirrer and mixing pump on.

9⁴⁵ AM Pos Period: Fuel ht = 98.87"

10¹⁹ AM just Crit: Fuel ht = 93.90

10³⁵ AM Neg Period: Fuel ht = 88.85"

11⁰⁰ AM Temp #4 = 25.8°C #6 = 25.8° #8 = 25.8° #10 = 25.2°C

1⁰⁹ PM Pos Period: Fuel ht = 94.92"
 1⁰⁷ PM Levelled with safety rods to check Log #11's.
 1³² PM Pos Period: Fuel ht = 94.92"

2¹⁸ PM Critical HT Log N = 2.5 93.685"

2²⁴ PM Neg Period - Fuel ht = 92.61"

3⁰² PM Crit ht = 93.685" Log 2

3¹³ PM Pos Period, Fuel ht = ~~94.68~~ = 94.68"

3⁵² PM just Crit - ht = ~~93.67~~ = 93.67" Log 2 = 1

3⁵⁴ PM Neg Period - Fuel ht = 92.64"

4²⁵ PM Probe HT = 92.87" (all Rods in)
 12⁰⁴ PM 5/25/59 Probe = 92.83" (all Rods in)

Sample #12 taken after mixing 15 min
 Sol'n set at 93.51" (approx Crit)

12⁰⁹ Rods out - not Crit -
 12²⁵ Crit - ~~91.85~~ 91.85" Log N (Keithley non-operable)
 Shut down

1³² Starting up again -
 ()

5-25-59

142

C₁

C₂

K₁

K₂

ORNL

Keithly

R₁

R₂

PM2

27x10x10⁻¹¹

5x10x10⁻¹³

0.00065

3x Range 100mV

0.3 10mV

0

540V

HT = 91.83" Carb

2 min count

2720

11020

1⁵⁰ PM

Pool Period by running in fuel tube

2⁰⁰ PM

Log rat 0.1

K₁

K₂

R₂

2³⁰ PM

Log N at 142

20 on 10x10⁻⁸

37 5x10⁻¹²

100%

out

3 on 10mV range 4

PM-2 8 on 540V fuel Rod out

2¹¹ PM

C-1

C-2

195 4230

409 1490 a 2 min count.

K-1 20 on 10x10⁻⁴

Log n ^{ORNL} at 142

PM-2 30 on 600V

Using γ source on K₂

R₂ + Log N

(similar chambers to K-1, R-1 + ~~Keithly~~ ^{ORNL Log})

20 mV/hr 20% on 5x10⁻¹¹

25% 10mV PC

3.8x10⁻¹² avg

PM-1 R-1, K-1 + ORNL chambers in Rm 101,

PM-2 R₂ - K₂ + Keithly in Rm 202

Fuel adjusted to 91.80"

2⁴⁹ PM

C₁ 965880/min

C₂ 2020670/min

1931760

4041340

3⁵⁷ PM

Sol'n HT = 91.80"

4⁰⁰ PM

Shut down

4⁰⁵ PM

Stirrers on

Sample taken for F.P analysis #12A

Ba₁₄₀ 6.5 x 10⁹ f/ml

Ba₁₅₀ 3.1 x 10⁹ (analyt (Richard) says results on Ba₃₀ ^{not} reliable)

5/26/59

3:27

Began removing pipe rolls

4:01 P.M.

Slightly super.
fact cut at 91.02

5/27/59

9:00 AM

Horizontal Travers installed;
out position make = 53.72"
In " " = -8.05

10:03 AM

Horz. Travers at

fact crit. fuel ht = 90.22" Log n = 6
-8.05" at fuel crit = 90.22"
Horz. Travers.

Time	Position	C-1	Normalized	C-3	C/E3
10:05 AM	-8.05"	590150		1089170	.5418
10:16 AM	-6.05"	294440		540040	.5452
10:22 AM	-4.05"	296540		537700	.5515
10:23 "	"	298750		540460	.5525
10:25 "	"	294840		537640	.5485
10:34 AM	-2.05"	291470		527770	.5523
10:42 AM	0.00"	280840		506770	.5542

Time	Position	C-1	C-3	C/E3
10:47 AM	2.00"	273520	495690	.5518
10:50 AM	4.00"	267870	489140	.5477
10:53 AM	6.00"	260490	481130	.5414
10:56 AM	8.00"	252760	474530	.5327
11:00 AM	11.00"	241820	464320	.5208
11:04 AM	14.00"	229620	458700	.5005
11:08 AM	17.00"	214380	451590	.4748
11:13 AM	20.00"	204510	451190	.4532
11:17 AM	23.00"	189180	449690	.4207
11:21 AM	26.00"	175080	449460	.3895
11:25 AM	29.00"	160290	452090 452090	.3544
11:29 AM	32.00"	143580	455020	.3154
11:33 AM	35.00"	128720	463050	.2780
11:37 AM	38.00"	111580	471890	.2365
11:41 AM	41.00"	93680	479070	.1955
11:45 AM	44.00"	75280	487320	.1545
11:49 AM	47.00"	55720	496120	.1123
11:55 AM	50.00"	36320	508850	.07137
12:00 PM	53.72"	7530	508660	.01480
check points				
12:06 PM	47.00"	57830	511200	.1131
12:11 PM	41.00"	100170	515660	.1942
12:17 PM	35.00"	143980	517320	.2785
12:23 PM	29.00"	182150	514520	.354
12:27 PM	23.00"	214800	No count	
12:28 PM	"	214750	510480	.421

Time	Position	C-1	C-3	C-3
12 ³⁶ PM 1min	17.00"	242400	507060	476
12 ⁴⁰ PM 1min	11.00"	260470	503620	517
12 ⁴⁴ PM 1min	8.00"	268870	499640	529
12 ⁴⁸ PM 1min	6.00"	268400	496730	5403
12 ⁵² PM 1min	4.00"	270540	494180	5474
12 ⁵⁶ PM "	2.00"	271140	492370	5507
1 ⁰⁰ PM "	0.00"	270680	488630	5540
1 ⁰⁴ PM "	-2.00"	269110	487340	5522
1 ⁰⁸ PM "	-4.00"	268520	486260	5521
1 ¹² PM "	-6.00"	268000	490200	5467
1 ¹⁶ PM "	-8.01"	271640	499530	5437
1 ¹⁸ PM "	-8.01 (repeat)	273470	503370	5433

5/27/59

4⁰⁰ PM Sample taken to be sent to Cooper
 Sample # 13
 Pot. 13.32, Cond. 13.32 $\mu\text{mV}/\text{kg}$, NO_3^- 13.4, SPGR 1.0197

5/28/59 10³⁸ AM Crit ht = 89.505" $\log W = .14$
 $K-1 = 46 \times 10^{-11}$

10³⁹ AM began feeding water into well to determine effect of reflector on sid critical ht.

11⁰⁹ Instruments indicate system slightly sub. critical with water in well = 160 cm. Water dumped from well ~~without~~ without changing soln ht. in Sid. System is very slightly sub. critical after draining water from well indicating system was slightly sub at 10³⁸ AM above.

11⁴⁰ AM Crit ht = 89.525"
 Since addition of H_2O to well was not sufficient increase in reactivity to make Sid critical, then effect was less than 0.02" at soln in Sid.

6/2/59

A plastic strip was "C" clamped to side of Sid (inside) so that bottom of strip is just ~~below~~ in contact with solution when solution level probe selsyn reads 89.18".
Strip moved by accident before height was measured

3 ⁰⁸ PM

Sid made critical and put on slow positive period for purpose of checking saturation of C-1 and C-2 with changes made in scalars. Critical ht. not accurately determined but was ~ 97".

Solen ht. for pos. period = 99.83"
max. power level ~~Log N~~; Log N = 90
PM-1 voltage = 750; PM-2 voltage = .5

2 ³⁴ PM

6/8/59

Preliminary Crit Expt. to determine crit ht. before traverse
3 ⁵⁰ out probe 91.69", 91.33 monometer

4 ⁰⁰ PM

Horizontal traverse chamber measured to be 8.25" from east wall when selsyn = 100.00" (re-adjusted)

6-9-59

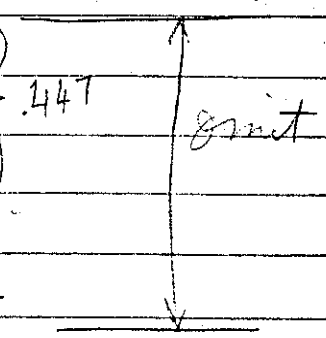
7 ¹⁵ AM

Counter placed ~ 46" ~~below~~ below surface of soln
When horizontal traverse reads 100.60" the chamber is 8.0" from east wall.
When horizontal traverse reads 8.02" the chamber is 8.0" from west wall of Sid.
Critical log N = 1 (K-1 = 18 x 3 x 10⁻⁹) 90.92"

10 ³⁰ AM

Counting	Pos.	C ₁	C ₂	C ₃	C ₄
2 min	100.60 ✓	27240	.1125	242160	
"	95.0	40590	.1083	241070	} 2 min wait after moving counter 1 min between counts
"	11/ov. 107	40240	.147	241320	
"	"	40180	.147	239960	
1 min	90 ✓	27160	.228	119230	2 min waiting
"	85 ✓	33710		117000	.288
"	80 ✓	39710		116560	.341
"	75 ✓	45670		117870	.387 = 358
"	70 ✓	50530		119020	.425
"	67 ✓	53520		119930	.444
"	65 ✓	55320		122160	.453

Country	Pos	C ₁	C ₃	C ₁ /C ₃
Zmin	63 ✓	57290	124010	.4620
"	61 ✓	59390	125830	.4720
"	59 ✓	60910	127380	.4780
"	57 ✓	62310	129460	.4815.482
"	55 ✓	61400	127840	.480 8
"	53 ✓	60880	128050	.4755.474
"	51 ✓	60660	126390	.4795.480
"	49 ✓	59950	125130	.479 8
"	47 ✓	58540	125330	.467 8
"	45 ✓	57610	125630	.4610
"	43 ✓	56500	124490	.4540
"	41 ✓	55080	124480	.4425.443
"	38 ✓	53230	125690	.4235.424
"	33 ✓	49250	126110	.396
"	28 ✓	42310	125700	.3365.337
"	23 ✓	35820	123310	.296
"	18 ✓	27360	122750	.223
"	13 ✓	20830	122440	¹⁷⁰⁰ .474
"	" ✓	20710	122570	.485.169
Zmin	8 ✓	27600	243880	.113 8
"	43	53800	120080	.448
"	43	53480	118710	.451
"	43	52890	117840	.448
"	45	52510	115910	.453
"	45	52260	115870	.452



	<u>Pos</u>	<u>C₁</u>	<u>C₅</u>	
1 min	47	52860	114810	.460 ^u unit
"	47	53800	116340	.463 full added
"	49 ✓	56460	119290	.474 .473
"	51 ✓	58960	1219870	.484
"	49 ✓	59040	125120	.482 .472
"	53 ✓	61160	127700	.479
2 min	55 ✓	125080	260640	.480
1 min	57 ✓	62590	131000	.478 - mean
"	"	61760	128050	.482
"	"	61520	128480	.479 } 480
"	"	61230	127280	.481
"	"	60810	126740	.480
"	54	60630	125910	.482
"	54 ^{av.}	60020	125630	.478 * (-) moved ctr.
"	"	59590	124290	.479 ^u (+) " "
"	"	59500	122790	.485 (-)
"	52 ✓	58830	121720	.483
4 min	100.6 ✓	13850	124680	.111
"	" ✓	14080	124030	.1135
"	95 ✓	20940	125460	.147
"	90 ✓	28410	125040	.227
"	85 ✓	35770	126330	.283 .283
"	80 ✓	41980	125070	.334
"	75 ✓	48270	125360	.385
"	70 ✓	52970	125230	.423

* (-) means moved ctr down to in 51" and back

	Pos.	C1	C3	
	65 ✓	56860	125250	.454
	40 ✓	59650	125840	.474
	55 ✓	60560	124530	.479
	50 ✓	60800	127610	.476
	45 ✓	59080	129780	.455
	40 ✓	57520	132330	.435
	35 ✓	53140	131020	.404
	30 ✓	94070	139160	
	"	44500		
	11 ✓	46680	127850	.345
	25 ✓	39710	127120	.312
2 min	20 ✓	64720	253000	.255 .254
	15" ✓	49400	252400	.195 .196
	10 ✓	34220	251620	.136
³⁰ 3 PM	30 ✓	44370	125990	.352
This point is out of line	40 ✓	⁵ 3840 (?)	124790	.351 .431
	50 ✓	58710	123260	.4763
	55 ✓	58980	122300	.482
	60 ✓	57490	120990	.475
	70 ✓	51680	119980	.4310
	80 ✓	40370	119600	.337 .338
2 min	90 ✓	56400	23850 238820	.236
²⁰ 4 PM	100 ✓	14110	117640	.120
4 ²⁰	Shut down			

6

6-10-59

Period run to check print-out counter

Solution added from Tad tank & mixed

10¹⁷ AM 93.58" solution - (Tad = 24.062") Pos. Period -

Critical Lt = 90.09"

6/11/59 Plastic marker placed on east side of Sid so that bottom touches soln when probe selsyn = 89.77*

LL = 89.501

9⁰⁰ AM Lt - all Rods out = 89.54" super crit -9¹⁷ Probably Critical 89.00"1²⁵ PM Counters removed from tank & rinsed off -
16 liters of waste added to Sid -Check on travel of Horizontal traverse drive: selsyn reading increment 91.98"
corresponding steel tape measure of rack travel = 91¹⁵/₁₆ - 91.94

6/15/59. 144.7891 gms from sample #11. (5-21-59) sent to Copper. (It is also numbered sample #11 by Copper.)

* After draining and washing tank the meas. distance from bottom of plastic strip to tank bottom is ~~90.4~~ → 90.25". This is the bottom at edge wall - amt. of "dish" effect must be added. see page 117

6-22-59

A leak was found in the outside water pump ~~to~~ seal cooling loop. Also one of the flanges was loose enough to leak slowly. Since the outside tank had coln. in it, coln. leaked out on the floor and some went down the drain. Since the leak was only at a drip rate and since it was not leaking on Friday June 19, it is felt that no large amt. is lost. That that was still on the floor was sponged up with ~~some~~ Cleanex.

The leaks were fixed and the coln. in the outside tank (except for about 1 in. in bottom) was pumped back up into sid. Then the hand valve above the pump was closed.

It is difficult to estimate the amount of coln. lost. A reasonable guess is five liters. This may be far too low.

See notes page 120

6-24-59

Sid sampled while filling trucks

#14 Rq. 593 089 } for mass
 Gross = 93.5g } imp
 Tare 20.0 } away
 Net 73.5g

.03219 g/gm
 Sp Gr = 1.0181

Resamples -

#10 (R) Rq 595088

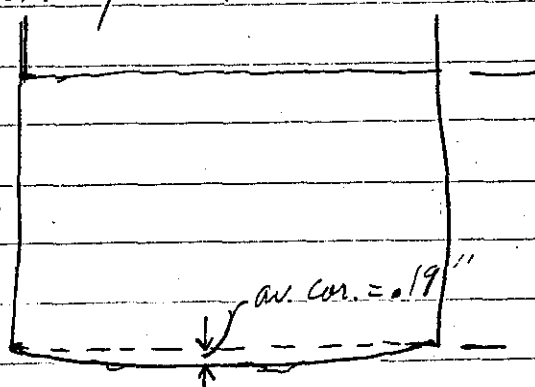
#9 (R) 593 087

G = 76.2 .012990
 T = 20
 N = 56.2 Sp Gr = 1.0174

G = 70.0 .015076 g/gm
 T = 20.0
 N = 50.0 gm Sp Gr = 1.0165

Corrections to probe readings:

A. 90.25" meas. salm ht. up wall
 Probe R. 89.79"
 correction .48"



B. Correction for Dished Effect;

measurements are from
 plane level with bottom edges to
 actual bottom.

(measured East-west)		measured North-South	
Amount of Dish	Dist. from Center	Amount of Dish	Dist. from Cent
3/8"	6"	3/8"	6"
5/16"	12"	1/2"	18" south side
5/16"	24"		
1/4"	36"	7/16"	24"
1/8"	48"	1/4"	36"

next page for Dis. measurement →

6/26/59 4⁰⁰pm

Sample taken of ~~water~~ water which was drained from drainage line which had been plugged (out side fence on west end). ~10 gal of H₂O drained. ~1 gal sent for sample
Reg. # 593090

9/9/59 Measurement of Sid Dia

4 1/2 ft. above floor. Figures indicate variation from nominal 7' dia

- 1/4" } 4 measurements in 4 directions
- 1/4" }
- 1/4" }
- 0" }

~ 1" from floor
- 3/4" E-W
- 1/4" N-S

9 ft. from floor
- 1/2"
- 1"

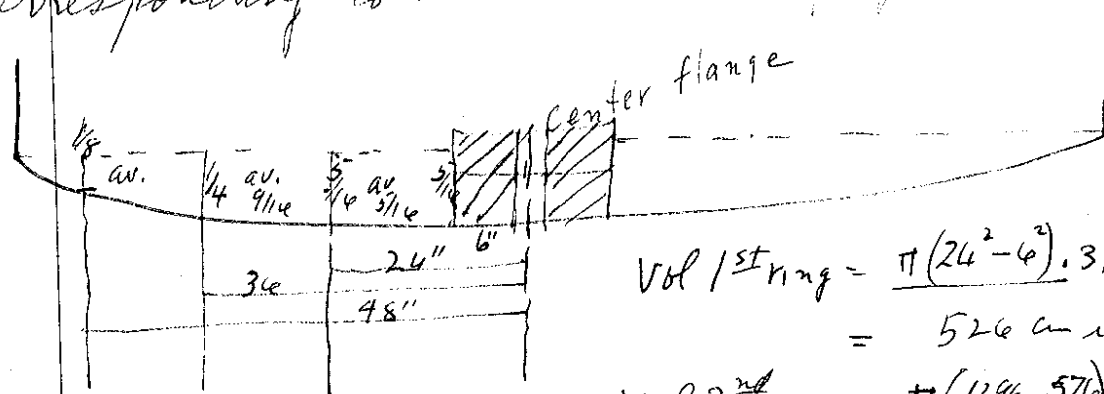
Rough approx. is that Rad. is 54" - 0.15"
R = ~53.85"

7/7/59

Sample taken from bottle ~~11~~
11 ; Reg # 593096
Gross 43.0125
Tare 19.8470
23.1655

Measurement of Height Corrected - due to dished bottom:

An approximation was made by calc. the vol. of 3 concentric rings with depths corresponding to measurements on page 117



$$\text{Vol 1st ring} = \pi(24^2 - 6^2) \cdot 31$$

$$= 526 \text{ cu in.}$$

$$\text{Vol 2nd ring} = \pi(12^2 - 3^2) \cdot 28$$

$$= 634$$

$$\text{Vol 3rd ring} = \pi(48^2 - 36^2) \cdot 187$$

$$= 597$$

$$\text{Total vol} = 1757 \text{ cu in.}$$

Equivalent av. ht. :

$$\text{Vol} = \pi \cdot 54^2 \cdot h$$

$$1757 = \pi \cdot 2912 \cdot h$$

$$h = .19 \text{ in.}$$

Cont. on page 120

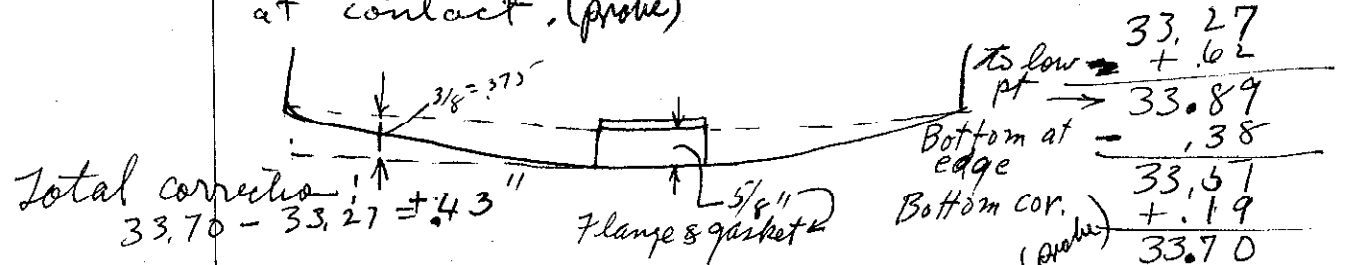
7/8/59

The uranium which ran down the pump house drain from the pump by-pass leak (6-22-59) was recovered by removing ~ 2/3 of pump house floor and then ~~the~~ 8 pieces of drain tile beginning at ~~the~~ south edge of pump house and including the "T" and one section of tile from drain line at north-west corner of building, and salvaging all dirt and gravels which indicated activity. After salvaging operation the tile was replaced and a solid (no drain) floor was poured in pump house.

Total correction to meas. hts for 48" & 90" hts:
 Probe cor. .48
 Bottom cor. .19
 .67 in

7/9/59

^{10:30 PM}
 Solution height in Sid was measured from top of flange on the bottom ~~top~~.
 Sol'n. ht = 33.25". The probe relay was then set to read 33.27" at contact. (probe)



Total correction
 33.70 - 33.27 = .43"

7/10/59
 10¹⁵ AM
 Solution ht in sid = 41.52", Sid - address empty. All blades in (except center.)

Soln hts in tank # 8 of manifold ~ 35 cm
 (soln is in tanks # 7 and 8 only)

3¹⁵ P.M.

Began feeding concentrate in Sid from manifold. Sid for ~ 5 min. at slow rate while adjusting flow rate to read 11 (on meter scale)
 Feeding
 Stopped feeding

3²⁰ P.M.

3²⁴

3³⁰

3⁴⁵

Started feeding
 Stopped feeding Flow meter read ~ 7 at this time
 Soln ht. in manifold 26.5 cm

7/10/59

3⁵³
4⁰⁸ PM
4¹²

Started feeding. flow rate ^{from manifold} not changed
Stopped feeding.

There has been a small increase in reactivity as indicated by instruments after these additions.

4²⁰ Solu ht. in manifold still reads 26.5 cm. There may be air in pump since pump (fuel) was warm after last attempt to feed.

7/13/59 8:51:30 Started feeding after adjusting flow rate to ≈ 12 on flowmeter mixing pump and one stirrer on
K-1 reads ≈ 35

9^{01:30} Stopped feeding.
K-1 reads 37 with pump and stirrer off
Manifold reads 20.2

9¹¹
9¹⁷ AM Started feeding
Stopped feeding
K-1 reads 39 (on the scale) with pump off and stirrer off

9²⁴
9³⁴ AM Started feeding
Stopped feeding
K-1 reads 42 (on the scale) with pump off and stirrer off.

9⁴²
9⁵⁰ Started feeding
Stopped feeding
K-1 reads 43 with pump off, stirrer off

10⁰⁰
10¹⁰ AM Started feeding
Stopped feeding
K-1 reads 44 pump off, stirrer off

7/13/59

Manifold reads 18.8 after last addition

10¹⁹ AM
10²⁸

Started feeding
Stopped feeding

10³⁰

Fed for 2 or 3 min while adjusting flow rates
manifold reads 16.5
K-1 reads 51

10:39:30
10:49:30

Started feeding
Stopped feeding
Manifold reads 15.4

K-1 reads ~ 57 pump off, stirrer off (10x10⁻¹²)

10⁵⁵ AM
11⁰⁰ AM

Started feeding.
Stopped feeding
Manifold reads 14.7

K-1 reads ~ 69 pump off, stirrer off.

11¹⁰ AM
11¹⁵ AM

Started feeding.
Stopped feeding
Manifold reads 13.7

K-1 reads ~ 24 on 3x10⁻¹¹

7/13/59

11²³ AM
11²⁷

Started feeding
Stopped feeding
manifold reads 13.1

K-1 reads ~ 28 on 3x10⁻¹¹

Source removal indicates system sub. crit.

12⁵⁶ PM
1⁰¹

Started feeding feed rate ~ 18 on meter
Stopped feeding

manifold reads ~~13.1~~ ^{11.3} immediately after stopping
" " 12.0 after ~ 5 min
K-1 = 35 on 3x10⁻¹¹

1⁰⁷ PM
1¹²

Started feeding
Stopped feeding

K-1 = 54 pump off stirrer off

1¹⁷ PM
1²³

Started feeding
Stopped feeding

K-1 ~ 75 pump off stirrer off

1²⁹ PM
1³⁴

Started feeding
Stopped feeding

K-1 = 45 on 10x10⁻¹¹

manifold reads ~ 8.3

7/13/59

1 ⁴³/_{PM}

Solu ht. in Sid ≈ 41.4 "

1 ⁴⁴/_{PM}

Started feeding

1 ⁴⁹

Stopped feeding

manifold reads 7.4

1 ⁵⁷

feeding

feed rate ≈ 11

1 ⁵⁹/_{PM}

stopped feeding

2 ⁰⁵/_{PM}

Started feeding

2 ⁰⁵

stopped feeding

2:15:30

Started

2:16

stopped

2 ²⁵

Slightly super with all blades out

2 ²⁷

fed for ≈ 5 sec

{crit height ≈ 41 "

2 ³⁶/_{PM}

fed for ≈ 5 sec

Concentrate to be added to get crit. at ≈ 36 "

2 ⁴¹

fed for ≈ 10 sec

2 ⁴⁷

fed for ≈ 10 sec.

7/13/59

3 ⁴⁸/_{PM}

fed for ≈ 10 sec.

3 ⁵²/_{PM}

fed for ≈ 10 sec.

3 ⁵⁵

" " "

3 ⁵⁷

fed for 15 sec

3 ⁵⁹

" " " "

4 ⁰⁰

" " " "

4 ⁰⁵

" " " "

4 ⁰⁷/_{PM}

fed for 30 sec.

4 ¹¹/_{PM}

started feeding

4 ¹⁵

stopped feeding

4 ³⁰/_{PM}

Solu ht = 38.99 in Sid with all blades in

7/14/59

8²⁰ AM

Solu ht in Sid before any solu added = 38.88
with all blades out - no evaporation

8²⁴ AM

Started feeding from manifold

8³⁶ AM

Stopped feeding

8⁴⁵

drained to about 38.5" in Sid

8^{49:30}

Started feeding

8⁵⁵

Stopped feeding

9⁰³ AM

Started

9⁰⁸

Stopped

9^{12:30}

Started feeding

9^{22:30}

Stopped feeding

9²⁸

Started feeding

9⁵⁵

Stopped feeding

9⁵⁸ AM

Started

9^{10⁰⁰}

Stopped

10²⁰

drained more into tadadder
Solu ht. in Sid ~ 36.9"

7/14/59

10²⁰

Started feeding

11⁰⁵

Crit. ht. ~ 35.62

11⁰⁵

Started feeding

11⁰⁴

Stopped feeding

11¹⁵

Sid is slightly super at 35.35" with
all blades out. Solu in tadadder is
at slightly lower concentration
Solu ht in tadadder ~ 16.7"

11²⁰

Feeding from tadadder into Sid
after lowering 4 control blades

1⁰⁸

Essential all of solution from tadadder
pumped into Sid. Mixing pump on,
one stirrer on.

1¹³ PM

drained into tadadder < 8" (~ 6")

1²¹ PM

feeding from tadadder (for mixing,
all blades in).

1³³

Solution fed from tadadder to Sid, mixing

1⁴³ PM

Stopped mixing

7/14/59

Stirrer removed to obtain "clean"
critical

3⁰⁷

Crit. ht. = 35.63", by probe

$K_1 = 40 \text{ on } 3 \times 10^{-10}$

3¹⁰

Slightly super at 35.65". The
instruments indicate a definite trend upward.
This gives a "feel" for the accuracy of the
critical ht. as determined from instruments.

3³⁰

3 P.M.

Stirrer put back in. Solution being
pumped from top adds to side with all
blades in. mixing pump on

4²⁰

Stirrer removed again.

Soln ht. = 35.54 slightly sub. *

" " = 35.73 super *

Soln ht = 35.42 slightly super *

3¹

4 P.M.

* The above inconsistencies are
apparently due to a faulty probe

7/15/59

10⁰⁵

Probe wire found to be shorted due
to soln in tube.

Probe zero rechecked after reassembling
probe and relay changed to read
height from top of flange directly.

1⁰⁰

Probe still not reading consistently
apparently oil on surface of soln.
causing resistance at contact of
probe.

Tube placed around probe point
to shield probe from oil on surface
of liquid.

7/16/58 8⁰⁰ Probe checked for consistency.
Seems to be good (less than .005")

Solu ht.

9¹⁹
AM

35.485" super

35.47 "

35.455 slightly super

35.445

35.44

9⁵⁰
AM

35.435" crit all blades out
stirrer out

9⁵⁵
AM

35.54" Pos. Period - too slow

9⁵⁸
AM

35.64" Pos. Period

10¹⁵

35.435" Crit log N 0.15

10¹⁹

35.20 Neg Period

7/16/59

2²⁰

Counters (normalizer and horizontal traverse) put in position.

Horizontal traverse chamber is $8 \frac{5}{8}$ " from wall when selyer reads 100.6

3²⁰

Crit ht. = 35.415"

	Horiz trav. position	C ₁	C ₃	C ₁ /C ₃ CT
3 ³⁸ P.M.	90.00	63070	249460	.253 2 min
	"	59770	245160	.244 2 min
3 ⁴⁵	80	43710	121690	.359 1 min
	"	43290	121060	.3575 "
	70	53310	119570	.4459 1 min
	60	57540	116380	.4944 1 min
	50	57680	116440	.4954 "
	40	53670	117870	.4553
	50	58940	119230	.4943
	60	60130	120830	.4974
	70	55380	123370	.4489
	80	46070	126230	.3649
4 ²⁰ P.M.	90	33120	130000	.2548

Sole ht. with all blades in = $\left(\begin{array}{l} \text{blades out} \\ 35.51" \\ \text{Center blades out} \end{array} \right)$

7/17/59

^{8:00}_{8:00 AM} Soln ht. in Sid with all blades in, stirrer out 35.49"

8:08 AM

Mixing pump turned on

8:30

Mixing pump turned off.

Sample taken

15

7/21/59 Sample sent to cooper

Gross 107.4 Answer: Pot 14.00 gm O/kg

Tare 21.0

Cont. 13.99

Net 86.5 gms soln sp gr. 1.0194

NO₃ 14.2

PM-1 setting M, 55 at Log W .03 - trip
Voltage = 1550

9:10 AM

Soln ht

35.355

.43

just cut.

Cor.

35.79

See page 121

7/17/59

9:16 AM

9

9

9

9

9

9

9

9

9

9

9

9

9

9

9

9

Horizontal Traverse
 crit. ht. = 35.355*

7/17/59 Salu temp. by thermocouples 19.6 °C [see note on correction, page 3]

Counter Position	C ₁	C ₂	C ₃	C ₄ /C ₃	
9 ¹⁶ AM	100.60	8.63"	26260	213980	.1227 2 min count
"	"	"	26370	215940	.1221 "
9 ²² AM	95.00	14.23	40050	219020	.1829 "
"	90.00	19.23	54610	221600	.2464 "
9 ²⁴	85.00	24.23	68630	223210	.3075 "
9 ⁴⁰ AM	80.00	29.23	81520	(^{2-assumed} 224680) ?	.363 "
9 ⁴⁵	75.00	34.23	46340	112700	.4112 1 min
9 ⁴⁷	70.00	39.23	50130	111320	.4503 1 min
9 ⁵⁰	65.00	44.23	52770	110740	.4765 "
9 ⁵⁵	80.00 (repeat)	29.23	82140	220960	.3717 "
10 ⁰⁰	60.00	49.23	54550	109880	.4965 "
"	"	49.23	54740	109980	.4977 "
10 ⁰⁵	70.00 (repeat)	39.23	49960	108610	.440 "
"	"	39.23	49350	108560	.4546 "
10 ¹⁴	55.00	54.23	55060	109260	.5039 "
10 ¹⁷ AM	50.00	59.23	54020	107860	.5008 "
10 ²⁰	45.00	64.23	52030	107180	.4854 "
10 ²⁴ AM	40.00	69.23	49180	107150	.4590 "
10 ²⁷	35.00	74.23	45080	107030	.4212 "
10 ³¹	30.00	79.23	41130	109010	.3773 "
10 ³⁵	25.00	84.23	35660	110810	.3218 "

* Measured from flange on bottom of big sid

7/17/59

	C_1	C_3	C_1/C_3		
10 ³⁹ AM	20.0089.2329740	113320	.2624	1 min	
10 ⁴³ AM	16.0094.2347410	232470 239010	.2008 .1984	2 min	
10 ⁵⁰ AM	10.0099.2333340	248380	.1342	"	
10 ⁵⁴ AM	8.0210.25"29640	259010	.1144	"	
10 ⁵⁸ AM	10.00	33490	267460	.1252	
11 ⁰⁶ AM	30.00	52920	143410	.3690	1 min
11 ¹¹ AM	50.00	71610	104 144130	.4968	
11 ¹⁵ AM	60.00	92110	144400	.4994	
11 ²⁰ AM	70.00	67120	146760	.4573	
11 ²³ AM	90.00	78100	303870	.2570	

11 ³⁰ Soln ht = 35.355 but system is now very slightly super with counters in same place.

11 ³³ solution ht = 35.345" just exit.

4 ²⁵ Soln ht with all blades in and stirrer out = 35.43"

7/1
all
13'
13'
14'
14'
15'
15'
15'

7/20/59 Vertical traverse counter installed.

2³⁰

~~Soln selsyn reads~~

all blades in

Soln ht = 35.42 when ~~probe~~ vertical traverse chamber just touches top of soln. Vert. traverse selsyn set to read 35.40" at same time.

2⁴² PM

Soln ht.

35.24"

super

35.225"

critical

Vert. traverse ctr. reads zero when touching bottom

7/21/59

Sample #15 sent to Cooper cut at 35.25"

	Poz	C1	C3	C/L	
130 PM	0.00	96480	104010	.1075	1076
"	"	95920	103810	.1083	1082
134	2.00	94470	144640	.1530	1531
"	"	95450	145420	.1524	1524
141	4.00	95330	199370	.2090	2091
144	6.00	95310	235130	.2470	2467
147	8.00	94210	267420	.2840	2838
151	10.00	92910	291240	.3130	3134
154	12.00	93450	311050	.333	3329
157	14.00	93610	325560	.348	3477

Time	Poz.	C ₁	C ₃	C ₃ /C ₁
	16.00	94650	327030	.3460 3455
2.05	18.00	97270	329570	.3390 3388
	20.00	96980	316440	.3265 3263
2.10	22.00	97480	292120	.300 2997
	24.00	98010	265720	.271 2711
2.14	26.00	98800	229010	.232 2318
	28.00	99460	186770	.188 1878
	30.00	100660	137810	.137 1370
2.22	32.00	100750	77860	.077 772
	34.00	99450	7580	.0076 762
	32.00	98370	74310	.0754 7543
	30.00	97120	127510	.131 1313
	28.00	95540	175250	.183 1834
	26.00	94160	220270	.234 2339
	24.00	95000	256450	.270 2699
	22.00	94130	284150	.302 3019
	20.00	93860	304250	.324 3242
	18.00	93830	318920	.340 3399
	16.00	94610	326980	.346 3456
	14.00	94780	323410	.342 3414
	12.00	94910	315650	.333 3326
	10.00	96540	301230	.312 3120
	8.00	96790	276450	.286 2856
	6.00	98350	245420	.250 2495
	4.00	98940	205080	.207 2072

	C ₁	C ₂	C ₃ /C ₁
2.00	99800	155120	.155 1554
0.0	100960	108670	.108 1076
14.00	101180	347720	.344 3436
15.00	100200	347350	.347 3467

7/24/59 Sample 15-B taken from batch 15
 Reg # 593099 for spec and assay

G 126.3081
 T 19.6862 Assay:
 W 106.6219 gm

5
8
3
7
1
18
78
70
728
02
543
513
334
39
99
519
42
399
56
14
26
20
56
95
72

140

7-27-59
7:00 PM

1st period run

Temp. 25.0°C

Crit ht. 35.44"

ctr #1 & #3 connected to Autometer

Print-out circuits

1 st Pos. Per.	35.66"	Period #	1
	Crit at 35.43	at LN =	.3
	Neg period	35.22	Period # 2
2 nd Pos. Period	35.815"	"	3
	Crit 35.44	LN	.6
8:55 PM	Neg period	35.08	" 4
9:08 3 rd	Pos. period	35.56	" 5
	Crit 35.44		
	Neg period	34.94	" 6

2	7852620
2	7852620
1	7852620
2	7852620
1	8689360
002	11133230
1	9696650
2	12413370
1	10758170
2	13779250
1	11879490
02	14728840

7/28/59 η Period Measurement9³⁰Mifing pump turned on \sim 5 min.10⁰⁰

Probe not reproducible. Removed and cleaned ~~corrosion~~ corrosion from point. Small amount of oil also removed from inside of plastic tube. Probe now reproducible to $\pm .005''$

10⁴⁸
PM

Run A

Pos. period

(ORNL)
Low level $\log N = .001$; H.L. = .1

Soln ht = 35.785''

11¹⁵
AM

Crit ht = 35.41

Run B neg. period

11¹⁷
AM

Soln ht = 34.985''

Crit ht = 35.41''

f

11⁴¹
AM

Run C pos period

Soln ht. = 35.53

12²⁰
PM

Crit ht. = 35.41

142

7/28/59

Run D neg. period
Soln ht. = 35.205"
Crit ht. = 35.41

47
12 PM

Run E pos period
Soln ht. = 35.625
Crit. ht. = 35.41

Print-out counters failed to operate properly - data not good

18

Temp. = 24.8°C by thermocouple

Run F neg. period
Soln ht. = 35.08
Crit ht = 35.41

Print-out counters failed to operate properly -
~~exp~~ data not good

10
2 PM

Run G pos. period
Soln ht. 35.63
Crit ht = 35.41

Run H neg. period
Soln ht. = 35.06"
Crit ht. = 35.41

24
2
231

Temp. = 24.8°C
Shut down

Soln ht. = 35.15 with all blades in.

7/28/59 ^{4³⁰} Sample # 16 taken. Crit ht 35.41

7/30/59 2nd Vertical Traverse

Inserted gold wire for irradiation ~ 8½" from center
 * Had false scram on R-1 & R-2
 Crit. ht. 35.35"

Time	Position	CA	CS	C ₃ /C ₁
3 31 3 ³¹ / _{PM}	0.0	369130	144380	292
3 ³⁴ / _{PM}	2.0"	271420	202830	777 9,546
3 ³⁷ / _{PM}	4.0"	371230	270210	728
3 ³⁹ / _{PM}	4.0"	365480	266370	730
3 ⁴³ / _{PM}	4.0"	358560	261300	730
3 ⁴⁶ / _{PM}	6.0"	360880	320210	887
3 ⁵⁰ / _{PM}	8.0"	365320	370490	1,014
3 ⁵³ / _{PM}	10.0"	369150	412360	1,116
3 ⁵⁶ / _{PM}	12.0"	373510	445140	1,192
3 ⁵⁹ / _{PM}	14.0"	278310 ^{??}	466630	1,234
4 ⁰² / _{PM}	14.0" 16.0"	384270	475870	1,240
4 ⁰⁵ / _{PM}	16.0"	388250	483180	1,245
4 ⁰⁸ / _{PM}	18.0"	391010	477170	1,220
4 ¹¹ / _{PM}	20.0"	391640	457170	1,168
4 ¹⁴ / _{PM}	22.0"	397880	432930	1,088

144
7/30/59

Time	Position	c/1	c/3	c/3/c/1
4:17	24.0"	398110	389950	.980
4:19	26.0"	399820	334470	.836
4:22	28.0"	395950	267150	.675
	30.0"	396480	193 X 930	.489
4:29	32.0"	394620	113440	.288
4:31	34.0"	393740	19120	.0485
4:34	28.0	391170	259010	.662
4:37	22.0	377950	406580	1.095
4:40	18.0	362980	445910	1.226
4:43	16.0	356870	447290	1.258
4:47	13.0	351910	431430	1.164 1.223
4:50	11.0	346810	406290	1.172 } <i>anything</i>
4:52	7.0	341650	334090	.977 }
5:00	4.0	345210	261240	.757
5:03	4.0	337170	255260	.757
5:06	4.0	326770	238580	.731
5:12	11.0	Shift in 299780	338540	x1.1284
5:17	11.0	Sensitivity 300150	338990	1.13
5:20	11.0	300750	340630	1.132
5:24	15.0	301760	364160	1.207
5:27	15.0	306230	372280	1.217
5:30	15.0	310440	377240	1.217
5:36	28.0	333490	210790	.631
5:39	28.0	343250	218630	.625
5:47	4.0	352870	258720	.733
5:46	4.0	354290	259460	

7/30/59

145

	Position	%	g/s	g/s/g/l	
	5.50	4.0	352000	259210	
	5:56	15.0	356190	435020	1.222
	5:59	15.0	353620	433720	1.227
	6:01	23.0	366120	366000	1.0
	6:04	23.0	361050	362300	
	6:07	8.0	344890	350900	1.017
	6:12	8.0	335340	339430	1.012
	8.0	33534			
	3.0 Pos. Pull	213590	196370	(not level)	
	3.0 "	316400	197090	.623	
	6:22	5.0 "	314960	250640	.795
tripping	7.0 "	314760	294390	.936	
	6:28	9.02 "	310290	326050	1.052
	6:32	11.05 "	306490	349840	1.145
		13.09 "	306830	369110	1.204
	⁴⁶ 6:PM	15.00 "	308810	378300	1.226
		17.00 "	307180	376500	1.226
		19.00 "	315350	373010	1.183
		21.00	318540	357810	1.123
		23.00	332140	340810	1.026
		25.00	339590	307090	.905
		27.04	352090	265140	.755
		31.18	365520	137920	.378
		31.18	358950	134650	.375
	¹² 7 PM	shut down			

7-30-59
8:35 PM

~~Periods~~ Periods

Temp 25°C

A	Crit ht	35.32
B	neg period	34.995
C	positive	35.665
D	Crit ht	35.33
E	neg.	35.065
F	Pos.	35.565
G	Crit	35.33
H	neg	34.925
I	Pos.	35.725
J	Crit ht	35.335
K	neg	35.10
L	pos. per	35.56
M	Crit ht.	35.335
N	neg	34.825

7-31-59 -

gold activation started 3:12 PM (n⁺)
gold " shutdown 7:12 PM

4 hrs

ORNL log N

average reading was 0.12

CR @ 15 or 16 varied from ~~364~~ 600 to 483000 cpm

8/17/59

Sample taken from batch 15-2

Reg. # 593050

G	109.6
T	21.0
N	88.6

Sent to y-12
for analysis (g/g)

$g \frac{4}{g} = .013832$
 $Sp. g^N = 1.0172$

8/20/59

Sample taken from bottle #15
to get Uranium isotopic analysis (y-12)

Reg. # 593052

G	106.9
T	20.0
N	86.9

$g \frac{4}{g} = .1280 \text{ est.}$

U ²³⁴	1.07
U ²³⁵	92.77
U ²³⁶	0.65
U ²³⁸	5.51

$$\begin{array}{r}
 38 \\
 38 \\
 \hline
 304 \\
 114 \\
 \hline
 1944 \\
 1156 \\
 \hline
 288
 \end{array}$$

$$\begin{array}{r}
 40 \\
 40 \\
 \hline
 1600 \\
 1444 \\
 \hline
 156
 \end{array}$$

$$\begin{array}{r}
 1.189 \\
 1600 \\
 \hline
 713400 \\
 1189 \\
 \hline
 11802900
 \end{array}$$

⊙

H.C. + Per = ~~15.8~~
~~14.8~~
 1.8
 15.6

Temp °C 23.7 °C

$$\begin{array}{r}
 1600 \\
 1444 \\
 \hline
 156
 \end{array}$$

$$\begin{array}{r}
 1600 \\
 20 \\
 \hline
 1580
 \end{array}$$

+ Per = 16.555
 + = 16.30 cm

39 x 39 + 19

$$\begin{array}{r}
 39 \\
 39 \\
 \hline
 351 \\
 117 \\
 \hline
 1521 \\
 19 \\
 \hline
 1540 \\
 112 \\
 \hline
 3080 \\
 1540 \\
 \hline
 15950
 \end{array}$$

53.70¢
52.70¢
106,408

900,000
.05
45,000.00

WB-84-73-109

17.70
16.30
1.40

18.10
17.05
1.05

17.65
14.00
3.65

16.30
15.80
.50

39
38
317
117
1482

39
38
312
117
1482

~~39~~
39
351
117
1521

9-21-59

Pellet Expts B. & W pellets

16l. Polyethylene Bottles filled with Pellets.

0

Expt. #	7	Time	9-21-1959
Purpose	1 Cyl - no water inside		
Personnel	R.K.R., J.K.F.		

no detectable m⁻¹ fully reflected

00

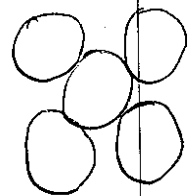
Expt. #	2	Time	11:10 AM 9-22-1959
Purpose	2 Bottles no water inside		
Personnel	R.K.R., J.K.F.		

no detectable m⁻¹ fully reflected

000

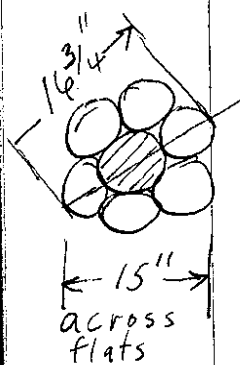
Expt. #	3	Time	9-22-1959
Purpose	3 Bottles - no water inside		
Personnel	R.K.R., J.K.F.		

no appreciable m⁻¹ flooded



Expt 4 Time 3:20 AM Date 9-22-1959
 Purpose 5 Bottles in cluster as shown
 Personnel: RKR, JKF

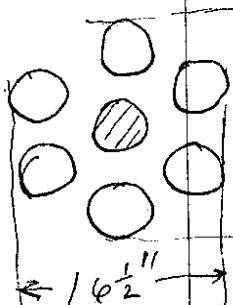
NO appreciable M^{-1} flooded
 K-1 reads $27 - 10^{-12}$



Expt 5 Time 8:55 PM Date 9-23-1959
 Purpose 7 Bottles with center bottle filled with water
 Personnel: LWC, RKR, JKF

Bottles in B.C. hex in contact

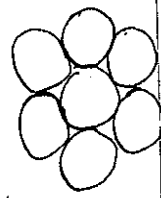
6 outer bottles dry & inside
 No appreciable M^{-1} flooded
 K-1 reads $35 - 10^{-12}$



Expt 6 Time 10:10 AM Date 9-23-1959
 Purpose Same as #5 except Bottles spaced 3/4" edge to edge
 Personnel: LWC, RKR, JKF

Bottles held to hex with 3/4" spacing by plexiglas spacing blocks at top & bottom.

K-1 reads $45 - 10^{-12}$ flooded

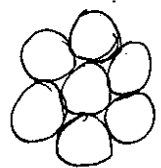


Hex. in contact

Expt 7 Time 3:20 PM Date 9-23-1959
 Purpose Central bottle full of water; 3 l in each of other six.
 Personnel: LWC, RKR, JKF

approx. water ht in six outer cylinders is $\sim 20"$ ($18" - 23.5"$ var)
 Added pellets to Bottle #5 that had been removed & washed in chips (practically all material removed is now back in #5.)

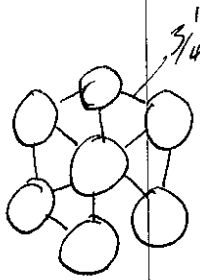
K-1 reads $\sim 80 \times 10^{-12}$ when bottom flooded $\sim 4"$ above top of fuel.



Expt 8 Time 8:40 AM Date 9-24-1959
 Purpose 7 Bottles in hex. close-packed each full of water
 Personnel: RKR, JKF

Flooded K-1 reads 35×10^{-10} - this was an appreciable M^{-1} . However system was quite source dependent.

Sample for assay 593054



Expt. # 9 Time 10:45 AM Date 9-24-1959
 Purpose Same as #8 except
 Bottles spaced 3/4" edge to edge
 Personnel: L.W.G., R.K.R., J.K.F.

K-T 10-11
 Flooded K-1 = 10" x 24"
 Log $\alpha = .15$
 Sub Crit. - less m' than contact case

Expt. 10 Time 12:45 PM Date 9-24-59
 Purpose Same as above except
 edge to edge = 1/4"
 Personnel: R.K.R., J.K.F.

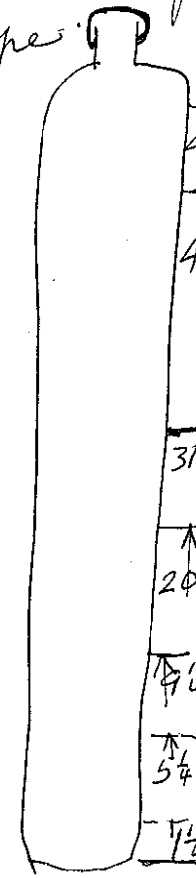
143.2 slightly sub.
 144.3 " super
 143.8 just cut ~ 8 cm top refl
 Sight glass reads 31 cm when water level at top of plastic table
 Top of fuel above table varies from 42 to 44.5" - av ~ 43" ~ 109 cm
 Sight glass reads ~ 140 at av. top of fuel.

Expt. 11 Time 2:05 PM Date 9-24-1959
 Purpose Same as Expt. 10 except
 Spacing now 3/8"
 Personnel: R.K.R., L.W.G., J.K.F.

135.7 cm slightly super crit
 135.0 " " just cut "
 134.8 " " just cut "

16 liter polyethylene bottles - blown types. av variation There were used as pellet containers

These data
 due from
 McDuffee
 Aug 17, 1959



45" up .143 (.12-.18)
 42" up .147 (.135-.155)
 31" up .184 (.175-.20)
 24" up .24 (.23-.25)
 19" up .356 (.32-.40)
 14" up .445 (.42-.47)
 5 1/2" up .504 (.31 to .77)

These figures weigh bottom heavy

.143
.147
.184
.24
.356
.445
.504
7 2.019
.29
~ .25"

Pellets in 15" S.S. cylinder

approx. ht. of pellets inside: 20.75"

Expt. 12	Time 2:08 AM	Date 9-28 1959
Purpose: 4 Bottles of pellets poured into 15" dia. S.S. cylinder		
Personnel: LWG, RKR, JKF		

Inside water brought to 26.6" -
No appreciable activity
No appreciable " fully reflected

approx. height of pellets: 37.0"

Expt. 13	Time 3:52 AM	Date 9-28 1959
Purpose: 7 Bottles of pellets poured into 15" S.S. Reactor		
Personnel: LWG, RKR, JKF		

Water inside raised to 43"
Sub crit.

Expt. 13 Repeat	Time 2:15 AM	Date 10-14 1959
Purpose: Repeat for counting		
Personnel: LWG, R.K.R., R.R., JKF		

approx. ht. of pellets 37.0"

Raised water inside cyl. to 43"
Water ht outside = 133.0 cm.

Sub Crit.

2 minute counts
13 repeat 10/14/59

C-2 → 1	1995.00
C-3 → 2	624.50
1	2010.20
1	626.00
1	2400.70
2	614.60
1	1995.10
2	619.10
1	2004.00
2	264.0

pellet level

26" down from top

fuel thickness = 42"

Expt. 14	Time 3:30 AM	
Purpose: Added bottle #01 as total of 8 bottles of fuel to cell.		
Personnel: L.W.G., R.K.F., R.R.		

Expt. #14 10/16/59

7.002" = inside water monometer

7.340 1.34" = monometer reading after monometer moved

1	1859.60
2	673.70
1	1869.50
2	671.10
1	1861.30
2	671.50

156

Pellets in 15" S.S. cylinder

approx. ht. of pellets inside: 20.75"

Expt. 12	Time 2:05 AM	Date 9-28 1959
Purpose: 4 Bottles of pellets poured into 15" dia. S.S. cylinder		
Personnel: LWG, RKR, JKF		

Inside water brought to 26.6"
No appreciable activity
No appreciable " fully refilled

approx. height of pellets: 37.0"

Expt. 13	Time 3:50 AM	Date 9-28 1959
Purpose: 7 Bottles of pellets poured into 15" S.S. Reactor		
Personnel: LWG, RKR, JKF		

Water inside raised to 43"
Sub crit.

approx. ht. of pellets 37.0"

Expt. 13 Repeat	Time 2:15 AM	Date 10-16 1959
Purpose: Repeat for count		
Personnel: LWG, R.K.R., R.R., JKF		

Raised water inside of water ht outside = 133.0 cm.
- Crit.

Expt. 14	Time 3:30 AM	Date 10-16 1959
Purpose: Added bottle #012. Now have a total of 8 bottles of pellets approach to crit.		
Personnel: L.W.G. J.K.F. R.K.R.		

7.002" = inside water height before monometer was moved
7.540 1.34" = monometer reading after monometer moved

Sub crit



pellets to be
down for
Fuel

Exp #15

Time 8:30 AM Pat Date 10/19/1969
Dial no 8 and 9
1/2 full
L.W.G. R.K.R.

1	132810
2	74240
1	134980
2	73670
1	134010
2	73770

reactor to top of fuel = 18.5"
reactor to floor = 7.5"
= 55.5"
= 63.0"

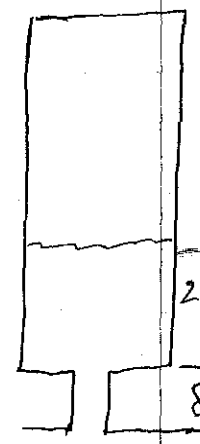
Time 8:30 AM Pat Date 10/19/1969
Dial no 10 and 11
cells are in
L.W.G. R.K.R.

Exp 16

1	133970
2	77100
1	133550
2	79370
1	135810
2	79370
1	137630
2	77210

7.75" down from top after
two bottles of pellets
thickness = 60.25"
atw = 66.25"
atw = 71.6"
nil, A = 1747
 $= \frac{(17.5)^2}{4} \pi \times 60.25 = 10,450 \text{ cu cm.}$
wt. of pellets: 905.6 kg
" " U ~~235~~ ; 5.94% x 11 = 53.8 kg
" " U ~~235~~ ; 1.932 x 538 = 50.1 kg

Expr. 17 Time 8:32 AM Pat Date 10-20-69
Purpose Put in 17 1/2" Dia. cyl.
Pellet bed depth ~ 23"
Personnel: L.W.G., R.K.R., R.P., J.K.F.



Ref. inside cyl at ~6" above fuel
crit. with outside H₂O at 76 cm from
floor, top of fuel ~ 78.7 cm from
floor.
8 sight glass selsyn reads 17.67" at top
of fuel. ~~add 1.66" to reach~~ ~~5.66~~ cor. not true
because of R.
These pellets were poured from top half of
15" R. Hence, they represent the last shipment

Expr. 18 Time 8:32 AM Pat Date 10-20-69
Purpose Removed pellets; bed depth
now 20.25"
Personnel: L.W.G., R.K.R., J.K.F.

selsyn reads 15.04" at top of fuel
not crit flooded

Area 17.5" cyl: $\frac{(17.5)^2}{4} \pi = 240.4$
measured and found dia. ≈ 17.4 "
~~vol = 240.4 x 20.25 = 4865.8~~
Area $\frac{(17.4)^2}{4} \pi = 237.5 \text{ in}^2$

pellets level 18.5"
down from top

Fuel thickness

= 49.5"

From top of reactor to top of fuel = 18.5"

" bottom of reactor to floor = 7.5"

inside water = 55.5"

out side water = 63.0"

Sub Crit

15	Time 8 ³⁰ AM	Date 10/19/ 1957
add'd bottle's no 8 and 9 (Bottle no 8 about 1/2 full.)		
Personnel: J.K.F. J.W.B. R.K.R.		

Exp 12/16

	Time 10 ³⁰ AM	Date 10/19 1957
add'd bottle no 10 and 11 pellets over in		
P.K.E. J.W.B. R.K.R.		

7.75" down from top after

two bottles of pellets

thickness = 60.25"

atw = 66.25"

water = 71.6"

nil, A = 1747

$$= \frac{(1.5)^2}{4} \pi \times 60.25 = 10,450 \text{ cu in.}$$

wt. of pellets: 905.6 kg

" " " U²³⁵ : 5.94% x 11 = 53.8 kg

" " " U²³⁵ : 9.32 x 538 = 50.1 kg

1	133970
2	77100
1	133550
2	79370
1	135810
2	79370
1	137630
2	77210

Time 8³⁰ AM Date 10/19/ 1959
 added bottle's no 8 and 9.
 (about 1/2 full.)
 K.F. J.W.S. RKR.

of reactor to top of fuel = 18.5"
 of reactor to floor = 7.5"
 water = 55.5"
 water = 63.0"
 pit

Expt. No. Time 10³⁰ AM Date 10/19 1959
 Purpose added bottle no 10 and 11
 all pellets are in
 Personnel: K.F. J.W.S. RKR.

fuel is 7.75" down from top after
 adding two bottles of pellets
 fuel thickness = 60.25"
 inside water = 66.25"
 outside water = ~~72.0~~ 71.6"
 Sub Crit, A=1747

Bed Vol: = $\frac{(12)^2}{4} \pi \times 60.25 = 10,450 \text{ cu in.}$
 Total wt. of pellets: 905.6 kg
 " " " U²³⁵ ; 5.94% x 11 = 53.8 kg
 " " " U²³⁸ ; 1.932 x 538 = 50.1 kg

160

Selwyn
reads 16.4"
at top of bed

Expt.	19	12 ⁵⁰ PM	10-20-1959
Purpose	Added pellets: bed depth now 21.5"		
Personnel:	LWG, RKR, JKF		

Not critical flooded inside & outside

Expt.	20	143	10-20-1959
Purpose	Added pellets to bed depth 22.35"		
Personnel:	LWG, RKR, JKF		

Not crit flooded inside and outside

Expt.	21	Time 2 ²³ PM	10-20-1959
Purpose	Bed depth 22.6" = 574		
Personnel:	LWG, RKR, JKF		

17.161
 Bh = .00200
 Br = .00727
 .00927

Only slightly sub. critical flooded inside and outside.

20"
 Br = .00927
 .00587
 .00340

Vol = 5510 m³

Expt.	22	3 ⁰⁰	10-20-1959
Purpose	Bed depth 22.9"		
Personnel:	LWG, RKR, RR, JKF		

When flooded inside and outside L n gave very slight drift down on removing source.

162

Selsyn reads
96.430 at
zero in 20" cyl

Expt.	23	Time	2:45 AM	Date	10-21-1959
Purpose	C.C. for pellets in 20" Dia. Al. Ann. Type Cylinder				
Personnel	LWG RKR JKF				

$$\begin{array}{r} 100.00 \\ 96.43 \\ \hline 3.57 \end{array}$$
 Selsyn reading at top of bed 13.44"
 Bed depth \rightarrow $\frac{13.44}{3.57} = 17.01$ "

Area 20" cyl = 314.0"

Surf. crit at 81.5 cm from floor outside & 6" top refl. inside
 These pellets poured into 20" cyl. from 15" cyl and represent the first shipment

Expt.	24	Time	3:32 PM	Date	10-21-1959
Purpose	Added from 13.44 to 14.18 direct reading on selsyn				
Personnel	LWG RKR R.R. JKF				

$$\begin{array}{r} 14.18 \\ 3.57 \\ \hline 17.75 \end{array}$$
 Bed depth 17.75" slightly sub critical

20" cyl (Al)

Expt.	25	Time	8:45 AM	Date	10/22/1959
Purpose	Added from 14.18 to 14.42 direct reading on selsyn				
Personnel	Reedy, Rohrer, Gilley				

bed depth = $\frac{17.99}{4.32} = 17.99$ "
 Flooded inside
 crit at 71 cm from floor to bot. of R - $\frac{24}{4.70} = 4.70$
 $\frac{4.70}{4.37} = 4.37$
 $\frac{4.37}{1.3} = 4.37$ cm above fuel outside

163

Selsyn zeroed to bottom of 17.5" Dia. R.

Expt.	26	Time	12:5 AM	Date	10-23-1959
Purpose	17.4" Dia. Cyl. Using the pellets that were poured from the 20" cyl used in previous Expt.				
Personnel	LWG RKR JKF				

Fuel ht. in cyl. 23.81"
 Surf. crit flooded inside & outside
 Before the 17.4" R. was reinstalled pellets were poured out into 15" R. Then the 17.4" R. was loaded by pouring all the pellets out of the 20" R.*

Expt.	27	Time	2:23 AM	Date	10-23-1959
Purpose	Added pellets to 24.34" bed depth				
Personnel	LWG RKR JKF				

Not crit flooded inside & outside

* A check on the bed depths vs area of the 17.4" vs 20" R's checks exactly. This shows that the pellets pack about the same on re-loading

Expt. 28	312	10-23 1959
Purpose	Added pellets. Bed depth 25.10"	
Personnel:	LWG, RKR, JKF	

not critical flooded inside & outside

Expt. 29	830	10-24 1959
Purpose	Added pellets. Bed depth 26.04"	
Personnel:	LWG, RKR	

Water above bed 6"
out with water outside at 80.5' cm from floor.

Expt. 30	Time 11:15 AM	Date 10-26 1959
Purpose	Added - Remainder of pellet inventory to 17.4" dia. P. to check Bare	
Personnel:	LWG, PKR, JKF	

Height of pellet bed ~ 44.56"

Very little increase in reactivity with water up to top of pellet bed but no water outside.

With inside water at top of bed, added refl. water to 74.5 cm from floor crit.

Expt. 1	Time 8:20 AM	Date 10-26 1959
Purpose	Exposed. Dg fail.	
Personnel:	L.W.G., R.K.R.	

Fuel ht = 44.56"
 water inside = 44.59" just crit
 water outside = 74.525 cm
 water ht = 78.0 cm for pos period.

4²⁵

Shut down

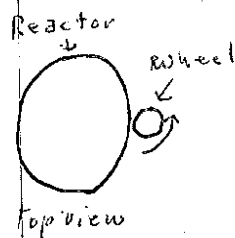
Expt. 2	Time	AM	Date 10/27	1959
Purpose: Expose two Dy foils (wire)				
Personnel: Reedy, Gilley				

#13 & #14 Dy wire foils exposed. Foils were placed outside 17.4" cyl containing ThO_2-UO_2 pellets. #13 foil was placed 8.5 cm above water level with wire placed in the direction of the radius vector. #14 was similarly placed 4.5 cm below the water level.

Moderator Height	Outside Water
44.40	73.4 (from floor)

just crit.
Log W ~ 3 ; pm 2 trip voltage = 1.08 KV

Expt. 3	Time 1:00	AM	Date 10/27	1959
Purpose: Exposure of 12 Dy wire foils				
Personnel: Reedy, Gilley				



Center of foils are 69.5 cm above floor. Wire foils are parallel to center line of reactor. Foils are ~ 1" away from wall of reactor at nearest point

moderator water ht. Reflector Water
44.56"

Expt. 4	Time 3:45	AM	Date 10/28	1959
Purpose: Fuel (pellets) ht. lowered for reactor for cd. ref. completely ref.				
Personnel: Reedy, Fox, Gilley				

Fuel thickness = 26.75" { by yardstick }
" " = 27.14 by menometer
Outside water = 74.8 ~ crit.

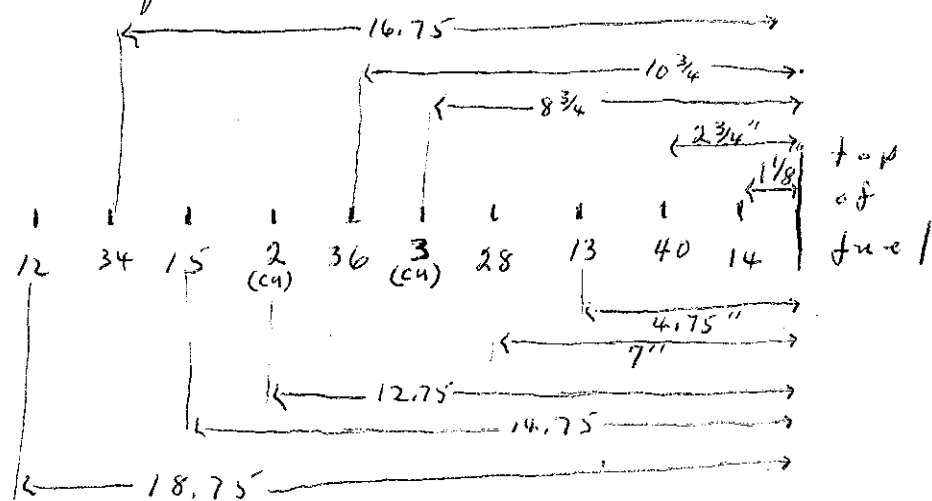
Expt. 5	Time 2:00	AM	Date 10-29	1959
Purpose: Same as above. One cd. channel by foil 1.2" down from top of fuel cell.				
Personnel: J.W.S. J.R.T. R.K.R.				

Fuel thickness = 27.14
water inside = 33.28
water outside = 79.1 Pos. Period.

Expt. 6	Time	AM	Date 10/29	1959
Purpose Base In foils placed on center line vertically				
Personnel: Reedy, Gilley				

Fuel thickness = 25.33"

In and out foils were placed along center line (in slotted al. tube) in the 17.5" dia al. cyl. containing $\text{ThO}_2\text{-UO}_2$ pellets. The vertical positions and numbers of the foils are given (below) relative to the top of the fuel.



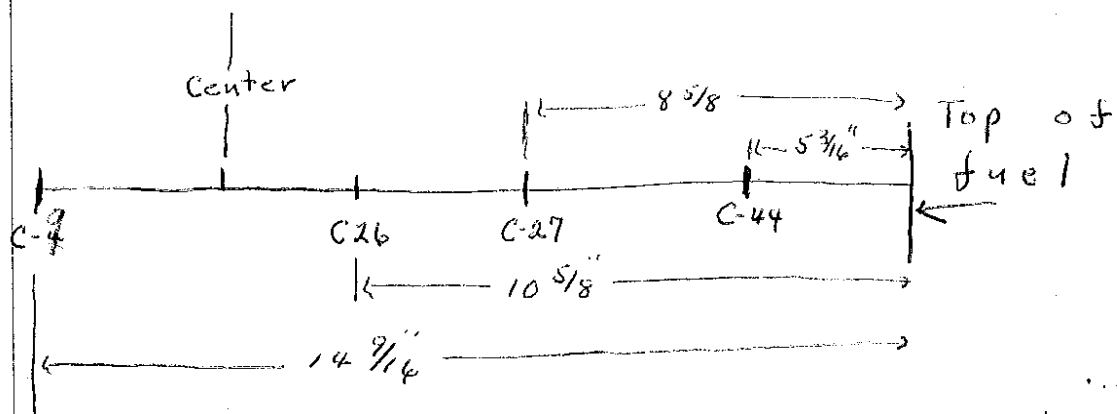
4/3⁴⁵ ~ 2 liters of pellets added - thickness = 25.58"

Expt. 7	Time 8 ⁰⁰	AM	Date 10-30	1959
Purpose Foil exposure run (see exp 6) on to position				
Personnel: L. W. B. RKR				

Fuel thickness = 25.58"
 Inside water = 31.58"
 Outside water = 41.5 cm Pos Per.
 fuel crit (outside water = 87.2 cm
 $K_{eff} = 35 (3 \times 10^{-8})$
 $\log N = -18$
 $LCRM = 10^3 \times 750$

9²⁶ shut down

Expt. <i>7</i>	Time	AM PM	Date <i>11/2</i>	196 <i>9</i>
Purpose <i>Cd covered fu tails</i>				
<i>5/4" dia, 5 mil</i>				
Personnel: <i>Reedy, Gilley</i>				



10³⁵ AM

Fuel thickness = 25.76"
just crit. flooded inside and out
i.c inside water = 31.76, outside = 100 cur

11³⁰

Small amount of fuel added to give excess R.
~~*Fuel thickness = 25.79"*~~ *(monometer in error)*
Fuel thickness = 26.00"
not crit flooded

1²⁵ PM

Repeat of preceding - doubt results.
Fuel thickness = 26.00"

inside water = 32.07

Outside water = 88 slightly super.

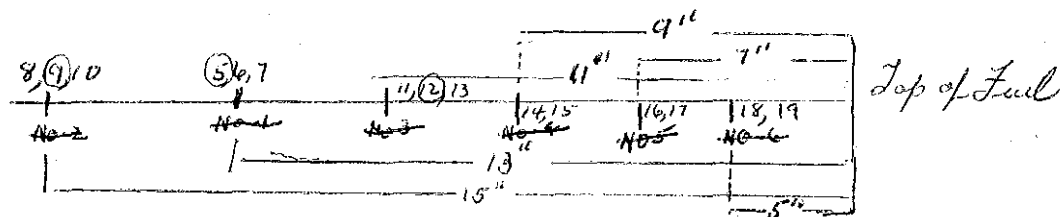
Outside " = 91 for pos period

Power level = 18 on log W

~ 35 on 3x10⁻² on K-2

Exposure time 20 min

Expt. 9	Time 10 ³⁰ AM	Date 11-3	1967
Purpose: Cu fuel, 1/2" dia. 5' h.			
Personnel: L.W.S. RKR ERR			



Fuel thickness = 26.00"
 Inside water = 32.099"
 Outside water = 96.9 cm Poop Per. $T = 70.2$ sec; $P = 13$ cents

11¹⁵ AM During a steady period the reactivity of the system began increasing as indicated by instruments for no obvious reason [compare two runs in exp. 8]
 $T = 142.7$; $P = 7.44$ before added reactivity; $T = 70.2$; $P = 13$ cents after added reactivity
 ~ Crit inside water 32.00"
 outside water 89.00 cm $\log W = 2.5$

11³⁰ AM Reflector and inside water drained out. Inside water brought back in to a height of 34.855 by monometer and allowed to sit through lunch period.

1⁰⁰ PM Inside water ht. = 34.845 by monometer

11/3/59 Reeb, Gilley
 1³⁰ PM

Outside water = 90.7 cm just crit.
 water drained out and jumped back in

2⁰⁰ PM Inside water = 32.025"
 Outside water = 90.7 cm just crit.
 $\log W = .03$

2⁴² Outside water = 101 cm ~ just crit.
 $\log W = .25$

3³⁰ PM Drained water out. Added ~ table spoon of tide (wetting agent) to inside water storage tank and stirred. Began to refill reactor.

4⁰⁰ PM Outside reflector = 89.3 cm $\log W = .05$
 ~ crit.

4⁰⁷ PM Source inserted to raise power level
 $\log W = .7$, ^{source removed} instruments indicate slight negative period.

4¹² PM water level raised to get critical again
 $\log W = .5$, outside water = 90.0 cm

Expt. 10	Time 4 ³⁰ AM	Date 11/24/ 1968
Purpose: Cu Foils, 1/2" dia, 5 mil.		
See Expt. No. 9.		
Personnel: J.W. & RKR, ERR		

Fuel thickness = 26.00"

8⁵⁵

Outside water 84.3 cm just crit
 Inside water 31.7 cm log W = .2

8⁵⁷

Adding outside reflector for pos period.
 Outside ht. = 86.1 cm

~ 9⁰⁰

System on steady period at log W ~ 3 when reactivity suddenly increased by a small amount (~ 5 cents) as indicated by log W. ^{outside} Water drained to (outside) 85.1 cm. System remained on smaller positive period

~ 9²⁵

All instruments indicates a decrease (gradual) of reactivity [log N ~ 100] K-1 10x10⁻¹⁰ drops during pos. period. No changes made in system

9³⁵

Power leveled at log W = 170, K-1 48 on 10x10⁻¹⁰
 Outside water = 85.2 ~ crit, K-2 20.5 3x10⁻⁹

9⁵⁰
 10⁰⁰ AM

lowered power level from ~170 to ~1.5

10¹³

Reflector water dumped

10²⁰ AM

Radiation level against outside of reactor near center = 2 r [2000 mr].

For above copper exposure:

average log W ~ 130

Exposure time ~ 48 min

Count rates of the cu foils ~ 2 hrs after shut down

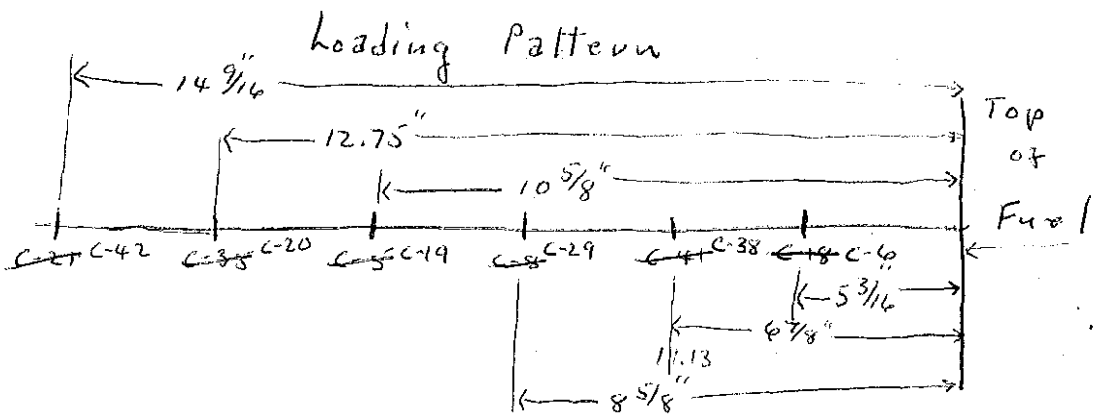
A ~ 12,000 c/12 min

B ~ 16,000 c/12 min

Foils were placed as shown, p 172
 i.e. 3-5mil foils together at 3 positions and
 2-5mil foils together at 3 positions

Run # 11
 Time 9⁰⁰ AM Date 11/5 1959
 Purpose Repeat of Bare In foil run
 5/16" foils, 5 mil thick
 Personnel: Reedy, Gilley
 Fuel thickness 24.00"

Foil # Factor
~~C-21~~ .9482
~~C-35~~ .9429
~~C-18~~ .9483
~~C-5~~
~~C-8~~
~~C-44~~
~~C-42~~



9⁰⁰ Inside water = 37
 Outside water = 85.2 cm just airt log W = .06

9⁰⁵ Outside water added for pos period = 86.8

~ 9⁰⁸ Discovered that normalizer foil not in place. Shut down and removed the above foils and put in 6 new ones [see changed foil #'s above].

Foil #	Factor
C-6	.9605
C-38	.9408
C-29	.9342
C-19	.9310
C-20	.9372
C-42	.9424

Note: Normalizing foil calibrates to within 1% of previous normalizing foil according to Cronin.

11/5/59
 10³⁰
 10³⁸ AM

Outside water = 87.1 slightly sub.

Pos. period at outside H₂O ht. = 90.6. This period is larger than previous one at 86.8 cm.

Exp. 12	Time 10 ⁵⁵ AM	Date 11/6 1959
Purpose Bare U^{235} chamber traverse		
Vertically along center line of		
17.5" dia cyl of pellets		
Personnel: Reedy, Rehner, Gilley		

Same fuel loading as last exp. (26.00")

The traversing selsyn has been set so that selsyn zero reading corresponds to center of fission chamber ^{when at the bottom of reactor.} (although chamber cannot be lowered to that point.)

U^{235} normalizing chamber placed ~ 1/4" outside reactor near the vertical center.

~11 System slightly super with when completely reflected and with U^{235} chamber at 12.03.

1⁰⁰ PM System slightly sub critical completely reflected with U^{235} chamber at 25"

11/6/59

~1³⁰

Inside water drained out and then refilled. System slightly sub. crit. with U^{235} chamber at 12.03 and completely reflected.

2¹⁵ PM

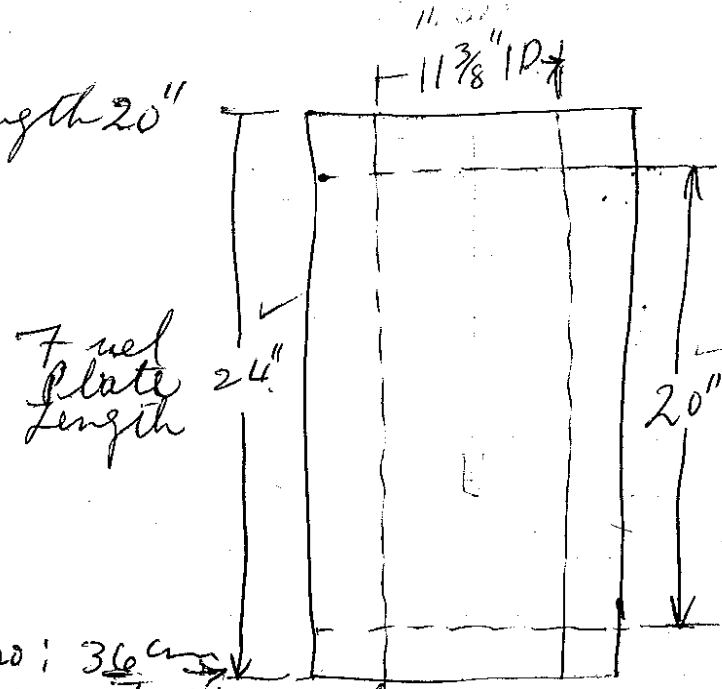
System drained to level of fuel. U^{235} chamber raised above fuel and al. tubes in center filled with pellets. This exp. is same as # 11 as far as fuel loading etc. are concerned (except for 6 bare U^{235} foils).

3-13-61
Reedy
Crown
Fox

Expt. # 1

Criticality Test on HFIR
Outer Annulus of fuel plates
Water in inside of 11" I.D. of
Annulus

Active Fuel length 20"



Platigro: 36 cm
on outside scale

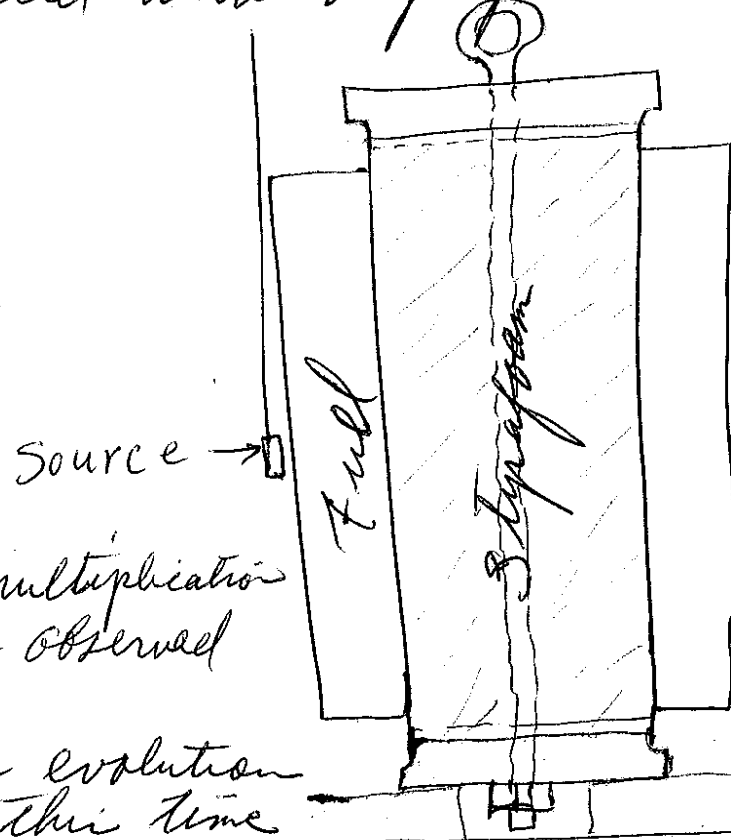
No appreciable multiplication when flooded. Observed small bubbles rising out of plates after flooding.

76
34
112

3-13-61
Reedy
Crown
Fox

Expt. 2

Criticality Test on HFIR Outer
Fuel Annulus with Central Trap
Region filled with styrafoam!



When flooded: multiplication of about 2 was observed on counter.

Very little gas evolution was observed this time when flooded.

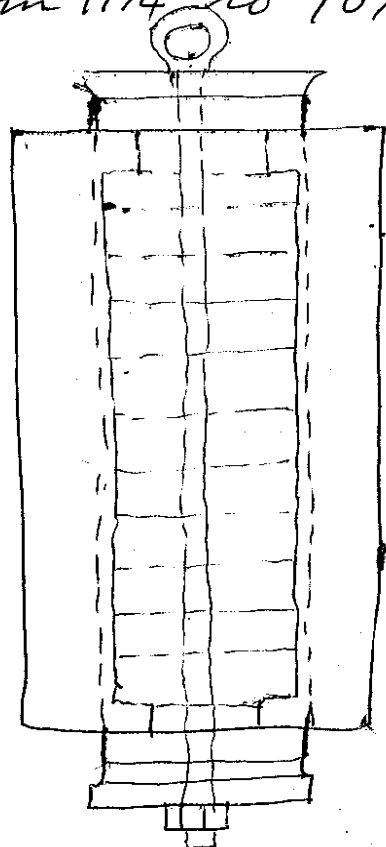
Moved counter lower to near tank floor

Expt. 3

3-14-61
Reedy
Fox

Same as expt 2 except cut
styrafoam dia. from $11\frac{1}{4}$ " to $10\frac{1}{2}$ "

End styrafoam plates cut
smaller to allow water
free passage



Multiplication of about 2
when flooded.

Exp. 4

3-14-61
11⁰⁰ AM
Reedy
Fox
Brown

Similar to #'s 2+3 - Inner disc of styrafoam
now average $9\frac{1}{16}$ " diam.

Multiplication of about 1.5 when
flooded

Styrafoam - C_8H_8
 $\rho = 0.024$

184
 3-28-61
 Reedy
 Cronin
 Fox

Expt 5 HIFR Core Including Inner Annular Fuel Ring

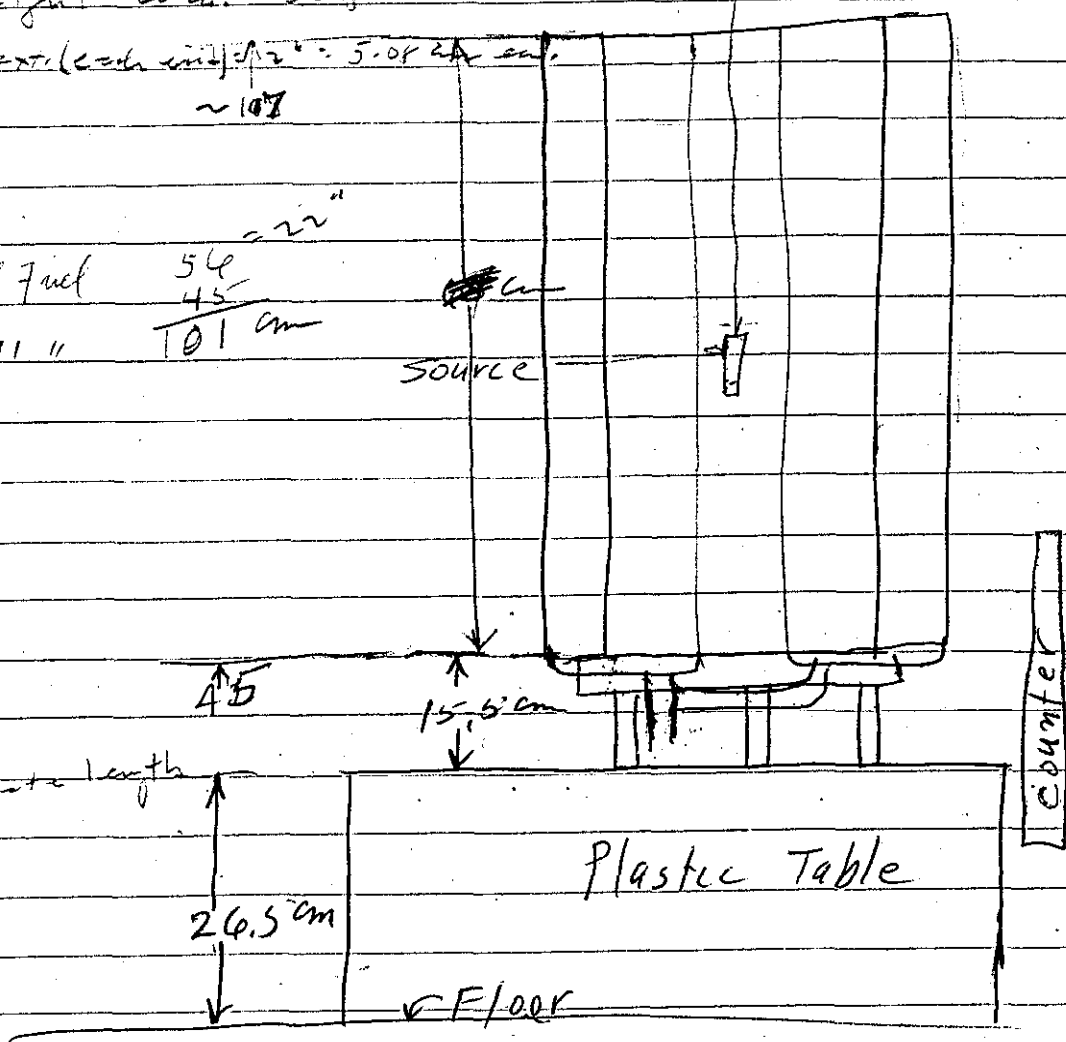
Fuel height = 22 in. = 55.8 cm

plate ext. (each end) of 2" = 5.08 cm
 ~ 10%

Top of Fuel 56 = 22"
 45
 11" 101 cm

Source

15.5
 26.5
 41.0 fuel plate length
 103.0
 18
 121



2

3

3/2

2 min counts

Water ht	C ₁ (1")	C ₂ (1 1/2")
2 ³⁷ / _{PHU} 119.5	88168	90598
"	(34588)	92,969
"	(34741)	(92,513)
93.5	7661	20,075
"	7585	9705
"	7745	19,697
85.0	4497	11,035
"	4527	11,148
78.5	3034	7,367
	3057	7400

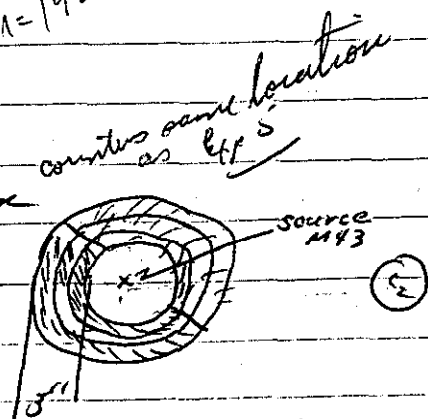
3/29/61 HIFR Core removed: water ht = 9.7 cm. Background count.

C ₁	C ₂	2 min counts
303 = M ₁	481	
316 105	512 M=192	
334	482	

3/29/61 water at 113 cm source & Al shells as shown

Al shells are air filled + 3" ^{between} thick

874	1094	M=
778 42=M	1079	86
845	1079	
312097	1085	
832		



186
3-29-61

Expt. Cc

Reedy
Oronin
Fox

Filled Central 5" Flux Trap with
Styrofoam in Completed HFIR Core

Out. at 103.0 cm

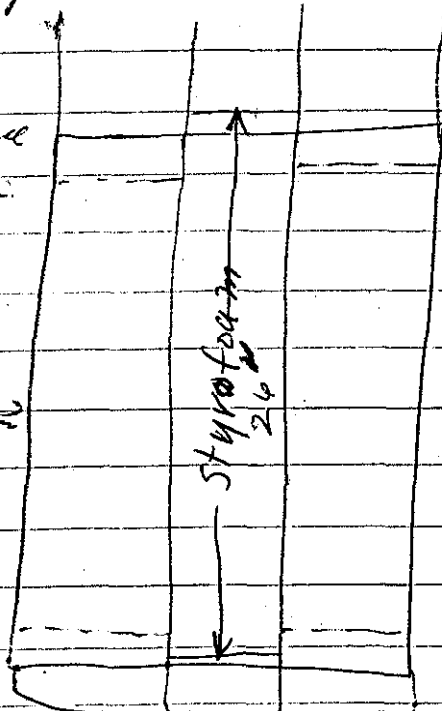
+ 2 cm above fuel
= 0.788 in.

Top of fuel = 101 cm

This piece of styrofoam had a
volume of $\frac{7}{4} (5)^2 (26) (16.4) = 8.37 \times 10^3$
cm³

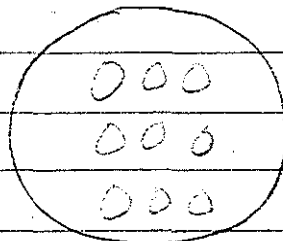
ρ of styrofoam = 0.028 g/cm³ (p. 187) i.e. this
measurement corresponds to

"full void" in target region
= 45%



Styrofoam Discs with holes

10	Without holes	187.5 gm.
10	with	152.0
		<u>35.5</u>



$\frac{35.5}{187.5} = 18.9\%$

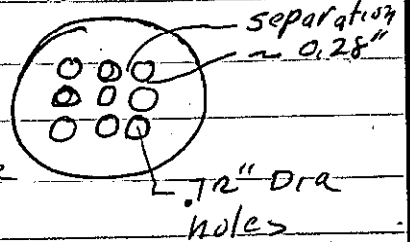
Vol. fract = 18.05% from areas using
0.72" Dia. holes

3-30-61
Reedy
Cronin
tot

Expt. No. 7

Similar to Expt #6 Except styrofoam has 9 holes as shown, each 0.72" in Dia. ~~void~~ ^{Water} fraction = 18.9%

Length of Styrofoam in trap is ~ 20" corresponding to Active fuel length.



just cut $\frac{101}{1.7 \text{ cm}} = 59.3 (83.0)$

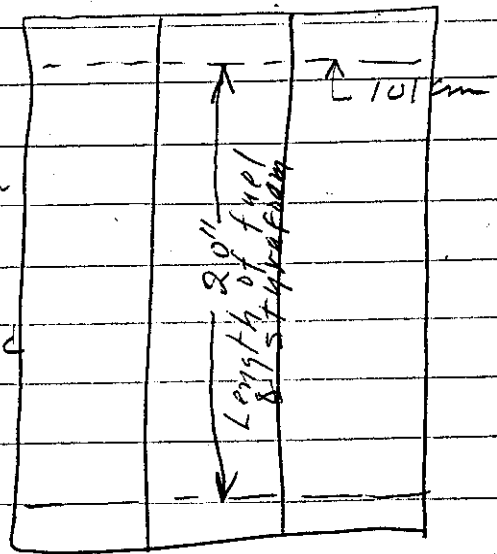
Positive period 83.4 cm

$T = 81 \text{ sec}$

$\Delta h = .42 \text{ cm}$

$\rho = 7.43 \times 10^{-4} \approx 11.62 \text{ g/cm}^3$

$\frac{\Delta p}{\Delta h} = \frac{1.89 \times 10^{-3}}{.42} = 29.4 / \text{cm}$



Holes $\frac{\pi}{4} (.72)^2 = .407 \text{ in}^2 \times 9 = 3.66 \text{ in}^2$

$\frac{\pi}{4} (.5065)^2 = 20.16 \text{ in}^2$ total trap area

Styrofoam in: $\rho = .028 \times 738\% = 2.05\%$ as much H₂O as in H₂O:

$\frac{20.16}{3.66} = 5.50$ styrofoam A.
 $\frac{20.16}{16.14} = 1.25$ void A

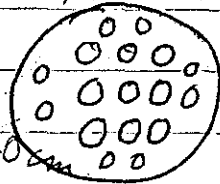
$\frac{16.14}{20.16} = 80.2\%$ void

188-30-41

Ruddy
Crem
70X

Expt. # 8

Same as Expt. 7 except that total number of holes now $9+8=17$, Total Water ~~fact~~ = 35.7%
Each hole ~ 0.72" in dia.



Just crit 98.9 ()
Pos. period 99.33, $\Delta h = .40$

$$T = 81 \text{ sec.}$$
$$P = 7.43 \times 10^{-4}$$

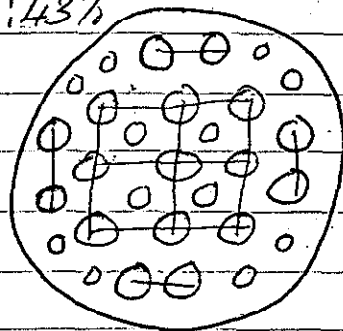
$$\frac{\Delta P}{\Delta h} = \frac{1.84 \times 10^{-3}}{.294 / \text{cm}}$$

$$\begin{array}{r} 409 \times 17 \\ 2016 \\ \hline 692 \\ 1324 \times 2005 = 27 \\ \hline 1297 \\ 2016 \end{array}$$

$$\frac{1297}{2016} = 64.4$$

Expt # 9

Same as Expt. 8 except 12 holes were added each 0.44" in dia.
Calc. Total area of holes based on area in 44.5%. Based on wt. change: 43%



Just crit. 99.6 cm

$$\frac{314}{4} \times (44)^2 = .152 \times 12 = \frac{1.824}{6.92} = 8.744$$

$$\begin{array}{r} 2014 \\ 874 \\ \hline 1142 \\ .23 \\ \hline 1119 \end{array}$$

$$\begin{array}{r} 57.3 \\ - 1.4 \\ \hline 55.9 \end{array}$$

wt equiv of Styrofoam

$$\frac{1119}{2014} = 55.5$$

In view of wt. change use void ≈ 56

3-30-61
Reedy
Crown
77X

Expt. 10

Similar to Expt. #6 except dia. of Styrafoam 4.5" leaving a 1/4" annular ring of H₂O in 5" trap region. Length of Styrafoam column is 20.5" (centered).

$$\frac{\pi(4.5)^2}{4} = 15.905$$

$$15.57 +$$

just out at 99.5
por. perc 99.7

$$\frac{19.1}{17.9} = 1.067$$

$$\frac{15.57}{20.14} = 77$$

$\Delta h = 0.2$ — suspected of being in error

$$T = 89.05$$

$$P = 6.9 \approx 10.784$$

$$\frac{\Delta P}{\Delta h} = \frac{3.45 \times 10^{-3}}{0.2} = 17.25 \text{ cm}$$

4-3-61
Reedy
Crown
77X

Expt. # 11

Reduced dia. of Styrafoam to 4.0" in 5" trap region of HFIR

36.0%

just out at 99.0

Styrafoam area

$$\frac{\pi(4)^2}{4} = 12.57$$

$$12.31$$

por. period 99.5
 $\Delta h = 0.5$

$$\frac{12.31}{20.14} = 61$$

$$T = 76.0$$

$$P = 7.9110^{-4} = 12.34 \text{ C}$$

$$\frac{\Delta P}{\Delta h} = \frac{1.52 \times 10^{-3}}{0.5} = 24.74 \text{ cm}$$

190
 7-3-61
 Reedy
 Cron
 Fox

Expt # 12
 Reduced dia. of styra foam

to 3.5"

Water annulus = 51%

25.00
 12.25
 12.75

100 on back
 scale ≈ 83.8

just cut at 99.9
 por. period 100.3 $T = 110.6 \approx 5.85 \times 10^{-4}$

Styrofoam A
 $= 9.41 \times 10^{205}$
 $\frac{9.41}{20.14} = 46.7$
 ≈ 47

just cut at ~~99.9~~ 99.85
 $\Delta h = 0.45$

$\frac{\Delta \rho}{\Delta h} = 1.3 \times 10^{-3}$

Expt. # 13

cut out some of the webs between
 holes of styrafoam pieces used in
 Expt 9

wt. of 10 original discs 187.5 gm

wt of 10 discs now 89.1

47.5×0.205
 $\frac{9.7}{46.53}$
 ≈ 47

Water fraction; 52.5% 98.4



por. period 85.2 on back scale cut out
 $84.4 +$
 just cut at 100.0 $\Delta h = .80$

$T = 54.4 \mu$

$\rho \approx 10.4 \times 10^{-4} \approx 10.25 \text{ g/cm}^3$

$\frac{\Delta \rho}{\Delta h} = \frac{1.3 \times 10^{-3}}{.80} = 204 \text{ g/cm}^3$

Expt 14

Reduced dia of strafeam used in Expt#12 to 3.0"

Water fraction = 64.0%

changed scale position

$$\begin{array}{r} 7.07 \\ .13 \\ \hline 6.92 \end{array}$$

Posttime removed ~~81.0~~
just cut 101.8 x 0.317 in.

$$\begin{array}{r} 81.0 \\ 80.45 \\ \hline 0.55 = \Delta h \end{array}$$

$$\frac{692}{20.18} = 34.3 \approx 34$$

cut

EECR Fuel Elements

1/16/62

These elements are described by Samuels in NSE 14:1 (Sept. 62). 16 elements are available for determining safety of proposed shipping container.

Elements ~~not~~ set within unistrut frame which is mounted on plastic table in N-ell. Water system checked, inst. moved.

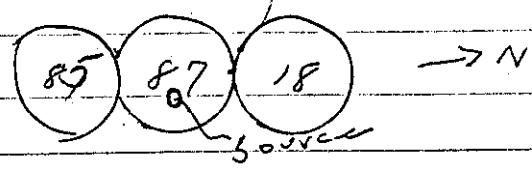
Int. trip:
K-1, K-2, PM-1
PM-2

STARTUP CHECK LIST	
Equipment Checked by <u>RKR</u>	Checked by <u>IDE</u>
Instrument: <u>one set of 2" counter and 1" counter</u>	<u>EHR, RKR</u>
Source in <u>1" counter</u> by <u>AI</u>	
Emergency <u>stop</u> button <u>OK</u>	<u>IDE</u>
Red Light on by <u>RKR</u>	
Start Up OK'd by <u>RKR, ES</u>	1300 on 1/16 1962

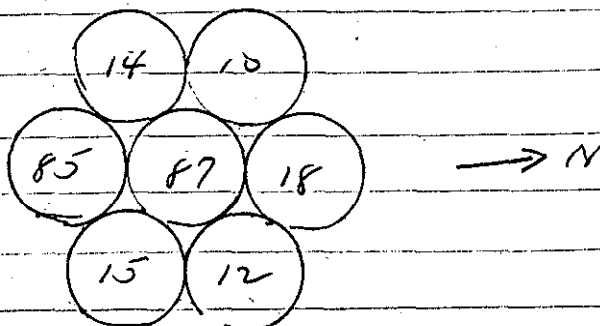
a) 3 elements in line on central of table. Small source inside central element. Counter ^(2 in) in ~~west~~ north thimble. K-1 on north outside of tank, K-2 & Log N in tubes in tank. 1" counter on top of Log N. 2" counter = C-1, 1" counter = C-2.

107.7 cm H₂O at top of fuel / side seal
123.8 cm H₂O at top of unistrut.

C-1	C-2	Time	Notes
1470	659	14 min	With H ₂ O
16900	3108	10 min	No H ₂ O
2 cm = 32 cm - fish scale			



b) Added 3 elements to each site as below



c-1	c-2	Time	Hand
949	1.05	700	143
		10 min	yes
			NO

Box		Time
c-1	c-2	
3100	9322	1742
		574
		70 min

- 1) Gas (air) bubbles rise from both sides of graphite sleeve, apparently steadily with time.
- 2) Elements will not stay in perfect contact. Reason not fully understood.

11/7/62

Expt. 1 C
ECCR Fuel

START-UP CHECK LIST	
Equipment Checked by	RKR Person to Check by FDC
Instrument and indices Checked and Reset	EJ
Source In? Checked by	RKR No. PN-563
Emergency Equipment in Control Room Checked by	
Red Light On by	EJ AM
Start Up OK'd by	RKR 1230 PM Date 11/7 1962

Added elements ~~to~~ ²¹ and 19 to array.
(sup. 197)

C-1		C-2	
13720	.365	857	.584 5 min
13662		864	5 min
<u>27388</u>	.360	1921	.582

Remove elements ²¹ ~~to~~ 19

27038 .370 1536 .451 10 min

Installed shorts around C-2

7
13541 .370 11559 .431 5 min
13745 11670 5 min

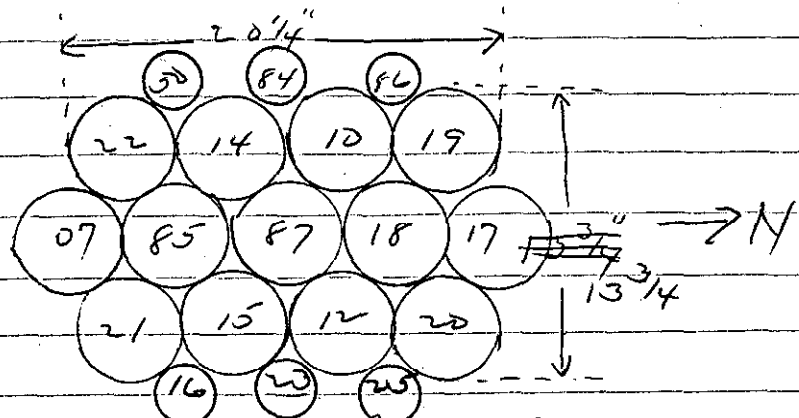
Replace ²¹ 19

6
13669 .366 11528 .437 5 min
13587 11698 5 min
27256 .367 25256 .430

Added 22 and 20 (sup. 197)

13902 .360 11411 .438 5 min
13594 11345

11/7/62



1330 Saw Trip: K-1, K-2, PM-1, PM-2

H₂O to 124 cm (side scale)

	C-1	C-2	Time
11	1202 832	585 171	10 min
	1107 882	562 178	10 min
	<u>156</u>	<u>174</u>	

Add 17 and 7

	C-1	C-2	Time
13	13766 363	8515 587	5 min (L ₂ H ₂ O)
	13668	8459	5 min
	<u>27434 365</u>	<u>16974 589</u>	

Add 16, 23, 25 as shown above

	C-1	C-2	Time
14	16331 006	10010 5	5 min (L ₂ H ₂ O)
	16259	10028	5 min
	<u>32590 007</u>	<u>20038 5</u>	

1450 Adding H₂O to 124 cm

16	1468 661	754 132	10 min
	1512 662	793 124	
	<u>2980</u>	<u>1547</u>	

11/8/62

START-UP CHECK LIST	
Equipment Checked by	RKR
Inspector	RKR
Source No.	211063
Emergency Equipment	RKR
Red Light On by	RKR
Start Up OK'd by	RKR
Time	0845 PM
Date	11/8 1962

away on end of 11/7/62. (16 elements)
 PM-1 required 750 J to trip.
 PM-2 " 1300 J to trip.

C-1	C-2	Time
15879	9900	5 min
15688	9932	5 min
31567	19832	

(16)

H₂O I₂ ≈ 124 cm

1430	807	10 min
2857	1528	20 min total

Added elements 80, 84, 86 to next row
 (see p. 157) norm: C-1 x 1.045; C-2 x 1.011 (C.R.)

(19)

C-1	C-2	Time
19089	11564	5 min
19164	11778	5 min
38253	23342	

H₂O I₂ ≈ 124 cm (side scale)
 norm C-1 x 1.044, C-2 x 1.014 (C.R.)

1476	598	59864	116	10 min
3246	616	1757	114	20 min total

11/8/62

Q)

7 units are on p.155 spaced ≈ 0.77 in side-to-side.

Bore count:

C-1	C-2	Time
27315 346	20509 488	10 min
13397	10154	5 min

H₂O To ≈ 124 cm

C-1	C-2	Time
9.41 1.06	431 232	10 min
1008	434	10 min
1949 <u>1.026</u>	865 <u>.231</u>	
1.044	1.014 = 0.228	

0.983

R)

200

EXPT. 2 B
EER Fuel

11/9/62

START OF CHECK LIST	
Equipment Checked by	RKR
Inspected by	RKR
Emergency	RKR
Start Date	11/9/62
Start Time	1230
Checked by	JDE
Checked by	EJ
Checked by	RKR

15 elements arranged as shown p. 197,
Spaced as indicated below.

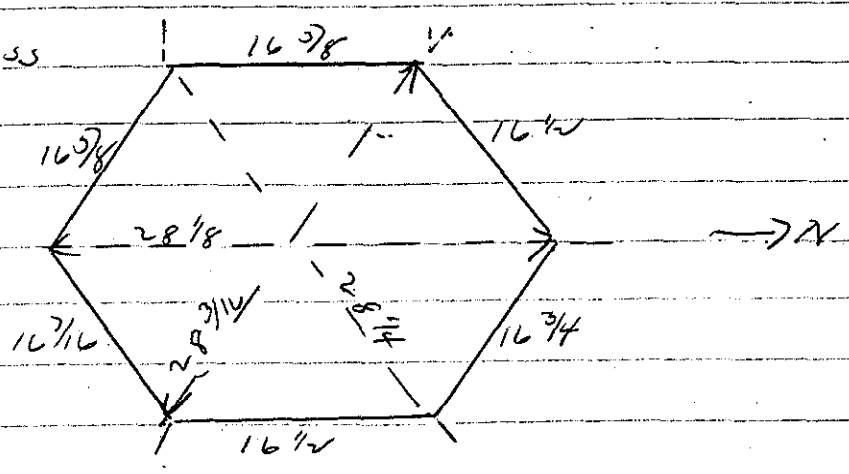
c-1	c-2
16938 .296	10949 .4575 min
17053 .293	11082 .4515 min

Add H₂O to = 124 cm

c-1	c-2
1159 .834	659 .15 10 min
1203 .832	676 .1455 10 min
1402 .833	1355 .0.150 = 0.148
1.044	1.014

All measurements across
dia of elements

Average all
measurements: 0.792"
side-to-side



11/9/62

EGCR Fuel

19 elements in hex array, side-to-side spacing 0.5", maintained by vertical plastic strips. Same arrangement shown on p. 197.

1245

H₂O to ≈ 124 cm

C-1

C-2

1297 771 782 128 10 min

2584 774 1611 124 20 min total

11/9/62

EXPT. 4

19 elements in plastic bags, done packed hexagon. Purpose of bag: To exclude water from the inner annulus of the fuel tube, and ∴ from around the fuel tubes.

1445

H₂O to ≈ 124 cm (side scale)

C-1

C-2

1952 512 762 131 10 min

3974 504 1506 133 20 min total

Drain H₂O

C-1

C-2

27215 184 12152 4125 min

26182 12098 5 min

3357 187 24250 413

H₂O got inside all bags; some seeped on fuel tube head cut bags.

Expt. 4 B

11/12/62

Repeat of 4

START-UP CHECK LIST	
Equipment Checked by	RICK
Instrument used	KKA
Source in use	EDC
Emergency stop	
Red Light On by	E. J. RRA
Start-Up OK'd by	E. J. RRA
Checked by	EDC
Run Date	11/12/1962

4-in. dia corrugated cardboard discs tapered over bottom taper of graphite sleeves. Elements put in new trays, 19 in hex ang, close-packed.

PM-1 red light would not come on; water went below trip point.

1130

H₂O to ≈ 124 cm (side scale)

C-1

C-2

1953

832

10 min

3954 506 1612 124 20 min total

1150

Drain

19 elements in close-packed hex. tray

C-1

C-2

Times

17201 290 11305 442 5 min

34562

22663

10 min total

now C-1 x 1.152, C-2 x 1.042 to p. 198 (now)

C-1

250

C-2

424

Expt. 5

11/12/67

Added 5 elements, 2 to east, 1 to NE, 2 to NW faces.

C-1	C-2	Time
16180.247	12917.372	5 min
32432	25883	10 min total

Added 4 more elements, alternating 2+1 per ^{remaining} face. Total lower 28.

C-1	C-2	Time
17297.250	12672.379	5 min
34409	25094	10 min total

11/13/62

START-UP CHECK LIST	
Equipment Checked by	RKR Personnel Check by FDC
Instrument and Safeties Checked and Reset by	EJ
"Source In" Checked by	RKR Source No. PN-523
Emergency Equipment in Control Room Checked by	FDC
Red Light On by	EJ AM
Start-Up OK'd by	EJ, RKR 845 PM Date 11/13 1962

on trip
K-1, K-2, P14-1,
P14-2

28 units in top array:

Bands.

C-1	C-2	5 min:
17592	12129	
17362	12124	
17591	11957	
<u>52545</u> .286	<u>36210</u> .414	

H₂O to ≈ 124 cm

~~Ref~~ Refl.

C-1	C-2	10 MIN.
2408 .416	1675 .597	
4774 .418	3426 .585	20 min Total

Removed 3 elements, one from each face which had 2 elements. Total now 25.

C-1	C-2	5 min
19247	11868	
38264 .261	20799 .420	10 min

H₂O to ≈ 124 cm (side scale)

C-1	C-2	10 min
1803 .555	1468 .381	
3577 .500	2927 .384	20 min total

11/13/62

Slings 1 element from each face. Total count 19
in perfect exp. made picture.

	C-1	C-2	
	18408	11989	5 min
19	36851	23940	10 min total

H₂O to = 124 cm.

	C-1	C-2	
	1406	971	10 min
	2818	2007	20 min total

Total of units in exp. array:

Base

	C-1	C-2	
	13753	11034	5 min count
	27148	22558	5 min
	54296	45116	10 min

H₂O to = 124 cm

Ref.

	C-1	C-2	
	920	474	10 MIN.
	1874	941	10 min
			20 min total

8/12/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10x10 ⁻¹²	Meter ✓ Fast ✓	Contact	✓	10x10 ⁻¹²
K-2	10x10 ⁻¹²	Meter ✓ Fast ✓	Contact	✓	10x10 ⁻¹²
R-1					
R-2					
PM-1	700	Alarm	Contact		500
PM-2	1220	Low Alarm	18 in. 4 in.		800

LOG N CALIBRATE OPERATE SOURCE No. R-7
 DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by EJ, RKR Personnel check by RKR

Instruments and safeties checked and reset by RKR

Source in checked by RKR Source No. PM-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 RKR Time 10:20

Start-up CR'd by RKR, EJ Date 8/12/63

30 elements of 8 plates each spaced with 138
 unit^{al} spacers. Single row of spacers down

11/13/62	Total of 1 unit	Bare	
	C-1	C-2	§
	8941	8981	5 min
	17986 .556	17827 .561	10 min total

H ₂ O to ~ 124 Cm.	Refl Refl.
C-1	C-2
859	376
1678 1.19	770 2.60
	10 min
	20 min total

8/14/63

center. Mass. over center top space 5.820 in.

1348 fence cut, + period @ 20.73 in.

1351 sub crit. @ 20.48 in. (W25 still + at 20.53)

Exp. 1 B

Replaced two top + bottom fuel plates
in outer elements with Al.

Feed rate = 3.6 in./min.

1402 fence cut. 21.33 in + period

Subcritical @ 20.97 in. Fuel @ 21.11 in.

Expt. 1 C

Outer elements now consist of 4 Al plates
at bottom, 1 fuel plate, followed by
3 Al plates.1538 subcritical @ 20.54 in. (This is top of
plates)

+ period @ 24.07 in. (fence cut)

fuel @ 20.85 in.

slightly less @ 20.97 in.

1545 Done

NB

{ zero = 959.975 in.

{ head at top of plates 20.52 in.

Exp. 1 D

8/13/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10X10 ⁻¹²	Meter ✓ Fast ✓	3"	✓	10X10 ⁻¹²
K-2	10X10 ⁻¹²	Meter ✓ Fast ✓	8"	✓	10X10 ⁻¹²
R-1	—	—	—	—	—
R-2	—	—	—	—	—
PM-1	600	Alarm ✓	Contact	✓	500
PM-2	1200	Low ✓ Alarm ✓	18" 4"	✓	900

LOG IN CALIBRATE _____ OPERATE _____ SOURCE No. 228
 DUMP WELL PROBE LIGHT _____

START-UP CHECK LIST

Equipment checked by RKR Personnel check by IOC

Instruments and safeties checked and reset by RKR

Source in checked by RKR Source No. PN-43

Emergency equipment in control room checked by IOC

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

Red-light on by EQ Time 0845

Start-up OK'd by RKR, EQ Date: 8/13/63

Outer elements now are stacked (from the bottom) 2 Al, 1 fuel, 2 Al, 1 fuel, 2 Al.
 Avg width at center space 5.820 in.

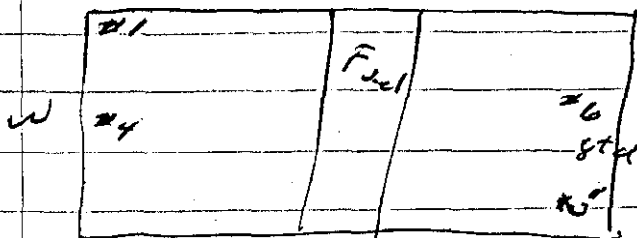
212

8/13/63

0920 Fuel @ 23.32 in. All channels show signs of something resembling noise. Maybe ripples in the surface.

0925 Dump.

Put deflector on air duct east of Tanks. Installed thermocouples as follows:



1: ~ 2" from bottom

2: Hold + work

4: ~ 2"

5: ~ 2" from bottom

6: ~ 2"

9: air

10:40 + Reint @ 23.40 in.

Lead @ 23.28 in: still "unstable"

Turned air conditioner off for 5 min.

led improvement and led change in air temp ($^{\circ}\text{F}$). T.C. #1, 4, 5, 6 read 22.5°C
 $^{\circ}\text{F} = 24^{\circ}\text{C}$.

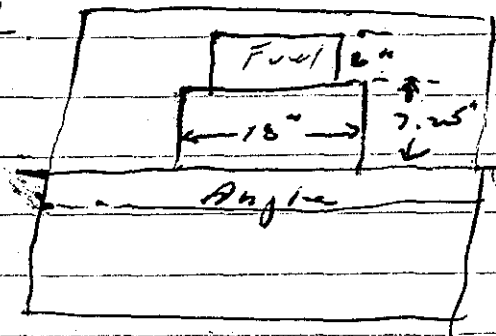
Drained leads to 12.2 in. for visual inspection of manometer line + plates. No air in line, small air bubbles on plates.

8/13/63

Reproducibility Check:

1319 Same cont. + point ≈ 3.42 in."Level" @ ≈ 23.25 in. (Ly No. 1) (Right +)Round next level to ≈ 1.0 on Ly No. + slightly
@ ≈ 23.225 in. Less "grass" on all channels.H₂O for + point of 133.5 rev was ≈ 23.49 in.1400 $p = 7.8\%$. Essentially level @ ≈ 23.23 in. (Right -)A_{lv} = 0.26 in. $\therefore 0.14$ in $\approx 30\%$ in.Drain to ≈ 1613 in. Fewer bubbles than
earlier, and primarily on edges of plates.1400 + Point ≈ 0.52 in. $T = 163.0$ $p = 9.7\%$ Slightly low @ ≈ 23.21 in.; slightly + @ ≈ 23.22 in.

Drain

Added a 1-in. thickness of steel to south
edge of tank

T.C.	
21	≈ 22.5
2	≈ 21.5
4	≈ 23.0
5	≈ 23.0
6	≈ 23.0
9	≈ 24.5

1550 + Point ≈ 23.51 in. $T = 166.1$ rev1610 Level @ ≈ 23.15 in. $p = 6.5\%$

Drain

214

8/14/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10 X 10 ⁻¹²	Meter ✓ Fast ✓	6"	✓	10 X 10 ⁻¹²
K-2	10 X 10 ⁻¹²	Meter ✓ Fast ✓	8"	✓	10 X 10 ⁻¹²
R-1	—				
R-2	—				
PM-1	600	Alarm ✓	Contact	✓	500
PM-2	1200	Low ✓ Alarm ✓	18" 4"	✓	500

LOG IN CALIBRATE OPERATE SOURCE No. Ra-228
 DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by RKR Personnel check by IDC
 Instruments and safeties checked and reset by RKR
 Source in checked by RKR Source No. PN-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 RKR Time 0830
 Start-up OK'd by RKR, EA Date 8/14/63

0905

+ Period, H₂O @ 23.39 in. @ T=241.8; P=4.744
 Subcritical slightly @ 23.17 in.

8/14/63

T.C.

6918	Slightly + @ 23.19 in. $T=47.2$ $p=2.54$	1	22.5
0920	+ Paint @ 23.28 in. (for Rhoebe)	2	22
0934	Slightly + @ 23.18 in. (Lg. N ≈ 4.0)	4	22.5
0947	Just level @ 23.17 in.	5	22.5
		6	22.5
		9	23.5

moved steel 1" away from outside of tank

1055	H ₂ O @ 23.46 in. for + period. $T=112.3$ $p=9.0$
1110	Level @ 23.16 in.

1124	Dropped level, brought back to critical. H ₂ O @ 23.22 in. for just critical.
------	---

Drained back, came up to Rhoebe range
with H₂O @ 23.31 in. for + period. $T=316.2$ $p=3.2$

1146	Slight + @ 23.20 in.
1150	Slight - @ 23.19 in.
	Drain completely.

T.C.

1335	H ₂ O @ 23.43 in. for + period. $T=127.1$ $p=8.1$	1	22.5
1350	Slightly - @ 23.17 in.	2	22.0
1354	" + @ 23.19 in.	4	23.0
	Drain completely.	5	22.7
		6	23.0
		9	24.5

216

9/16/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE	SET	START-UP RANGE
K-1	12 X 15 ⁻¹²	Alarm ✓	6"	✓	12 X 15 ⁻¹²
		Low ✓	6"	✓	
K-2	12 X 15 ⁺¹²	Alarm ✓	8"	✓	12 X 15 ⁻¹²
		Low ✓	8"	✓	
P-1	—				
P-2	—				
PM-1	600	Alarm ✓	Contact	✓	600
PM-2	1200	Low ✓	18"	✓	900
		Alarm ✓	3"	✓	

LOG IN CALIBRATE _____ OPERATE SOURCE No. Ray

DUMP WELL PROBE LIGHT _____

START-UP CHECK LIST

Equipment checked by RKR Personnel check by IOCInstruments and safeties checked and reset by RKRSource in checked by RKR Source No. PN-43Emergency equipment in control room checked by IOCInstruments in trip circuit: K-1, K-2, PM-1, PM-2Red light on by RKR Time 1450Start-up OK'd by RKR, EA Date 9/16/63

Changes since 9/14:

- 1) Shims removed from legs of tank, steel from sides.
- 2) Installed manometer & mirror scale in control

8/16/63

room. Level (H₂O) with plates just submerged
(no H₂O over top edge); Selsyn = 23.49 in., manometer
= 57.60 cm

3) Spacers are now installed with centers = 8" from
each side of gasket plates, so that plates
are spaced at 2 positions rather than only
at the center.

4) 29 complete elements (8 plates each)

5) Attachments - what? etc

1512

+ Period. Selsyn = 23.82", M = 58.45 cm

T = 101.2 P = 9.84

#1	22.5	22.5
#2	22.5	22.5
4	23.0	22.7
5	22.5	22.5
6	22.5	22.7
9	24.8 ⁰	24.0

These were since
constant thro 5 & 22
@ 16.10.

at 1520 (Period) at 1534 (Level)

1534

Slightly + @ 23.67 in. + 58.10 cm

1540

Apparently level @ 23.65 in @ 58.10 cm

Drained 4.27 m, back to approx level.

1553

Slightly + @ 23.68 in. + 58.10 cm

1559

" - @ 23.67 in @ 58.05 cm

1600

Drained to 22 in, returned to previous level

1613

Slightly - @ 23.67 in. 58.10 cm

1620

" + @ 23.68 in. 58.10 cm

Drain.

8/15/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	12x15 ⁻¹²	Meter ✓ Fast ✓	6"	✓	12x15 ⁻¹²
K-2	12x15 ⁻¹²	Meter ✓ Fast ✓	6"	✓	12x15 ⁻¹²
R-1	—				
R-2	—				
PM-1	600	Alarm ✓	Contact	✓	500
PM-2	1200	Low ✓ Alarm ✓	18" 3"	✓	900
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. <u>Ra-2</u>
DUMP WELL PROBE LIGHT		—			

START-UP CHECK LIST

Equipment checked by EJ Personnel check by IDCInstruments and safeties checked and reset by EJSource in checked by EJ Source No. PM-43Emergency equipment in control room checked by IDCInstruments in trip circuit: K-1, K-2, PM-1, PM-2Red light on by EJ Time 0540Start-up OK'd by EJ-IDC Date 8/15/63

Center bag on K-2 lead H₂O. removed bag & put chamber on floor under east side of tank.
 otherwise same as 8/14/63

8/19/63

When H_2O was $\approx 12"$, the sediment at the lower end of section (102) dump well drained out.

Removed.

1129 + Period. H_2O @ 23.79 in, 58.35 cm

T = 142.3 mm, p = 7.4

1145 Slightly -; H_2O @ 23.67 in, 58.05 cm

1155 Drain completely

1324 + Period H_2O @ 23.74 in, 58.25 cm

T = 201.8 mm, p = 5.5

1350 Slightly +, H_2O @ 23.68 in, 58.10 cm

Drained to ≈ 12.5 in.

1410 + Period H_2O @ 23.77 in, 58.30 cm

T = 152.2 mm, p = 7.0

1430 Slightly +, H_2O @ 23.67 in, 58.05 cm

(+5%)
Amplitude in fluctuation changed.

1440 " - , H_2O @ 23.67 in, 58.05 cm

1445 Drained to $\approx 16"$.

1453 + Period H_2O @ 23.79 in, 58.35 cm

T = 103.0 mm, p = 9.4

1513 Apparently level @ 23.67 in, 58.05 cm

Drain completely.

Conclusions from above + 8/14/63: That the change in water level required to reverse a slightly + or - period is less than can be read on either the original or the re-arranged. And that "great critical" levels can be repeated within the above limitation.

8/19/63 H₂O Temp.

Couple	Time	11:30	11:42	11:48	12:34	13:46
1		22.0	22.0	22.0	22.5	22.5
2		22.2	22.2	22.5	22.5	22.5
4		22.2	22.5	22.5	22.5	22.5
5		22.0	22.0	22.0	22.5	22.5
6		22.2	22.5	22.5	22.5	22.5
9		24.0	24.0	24.0	24.0	24.0

	13:55	14:22	15:12
1	22.5	—	22.5
2	22.5	22.5	22.5
4	22.5	22.5	22.5
5	22.5	22.5	22.5
6	22.5	22.5	22.5
9	24.0	24.2	24.2

8/20/63

INSTRUMENT-CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10x10 ⁻¹²	Meter ✓ " " ✓	8"	✓	10x10 ⁻¹²
K-2	10x10 ⁻¹²	Meter ✓ " " ✓	Contact	✓	10x10 ⁻¹²
R-1	—				
R-2	—				
PM-1	600	Alarm ✓	Contact	✓	500
PM-2	1200	Low ✓ Alarm ✓	18" 3"	✓	900
LOG N CALIBRATE ✓		OPERATE		SOURCE No. <u>PN-42</u>	
DUMP WELL PROBE-LIGHT					

START-UP CHECK LIST

Equipment checked by RKR Personnel check by IDCInstruments and safeties checked and reset by RKRSource in checked by IDC Source No. PN-42Emergency equipment in control room checked by IDCInstruments in trip circuit: K-1, K-2, PM-1, PM-2Red light on by RKR Time 1430Start-up OK'd by RKR, EJ Date 8/20/63

Two 2-in. counters (C-1 + C-2) located on floor under tank, 1-in. counter (C-3) on angle brace on south side of tank.

Apr/63

$T = 93.5 \text{ mm}$, $P = 17.3 \text{ \#}$
 1500 + Print. H_2O @ 23.82 in., 58.40ⁱⁿ cur. Rhoe the side of
 1509 - Print @ 23.67 in., 58.05ⁱⁿ cur. (Definite wj.)
 + " @ 20.69 in.
 - " @ 23.67 in. (just slightly -)
 + " @ 23.67 in. (slightly +) (58.05ⁱⁿ cur.)

8/21/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10×10^{-12}	Meter ✓	6"	✓	10×10^{-12}
		Fast ✓	"		
K-2	10×10^{-12}	Meter ✓	7"	✓	10×10^{-12}
		Fast ✓	"		
R-1	—				
R-2	—				
PM-1	600	Alarm ✓	Cont'	✓	500
PM-2	1200	Low ✓	18"	✓	900
		Alarm ✓	3"	✓	

LOG N CALIBRATE OPERATE

SOURCE No.

Dra-8

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by RKR Personnel check by F.D.C.Instruments and safeties checked and reset by RKRSource in checked by F.D.C. Source No. Pn-43Emergency equipment in control room checked by F.D.C.Instruments in trip circuit: RKRRed light on by RKR Time 8:20 AMStart-up OK'd by RKR F.D.C. Date 8/21/630830 + Period. H₂O @ 23.75 in, 58.41 cm.Slight - H₂O @ 23.66 in, 58.05 cm" + H₂O @ 23.68 in, 58.05 cm- H₂O @ 23.67 in, 58.05 cm

0930 - Drain. completely

① T-107.11 cm
p-917

7/11/62

Feed rate now 2.61 in/min. - as of beginning of day.

Removed center element and associated spacers, installed 342-mil spacers. Slab 5.650 in.

Added thermocouples to monitor room (control) air.
 1205 + Revised H_2O @ 24.01 in. 58.85 cm. $T = 96$ mm
 slightly + @ 23.84 in + 58.45 cm
 " - @ 23.83 in. + 58.42 cm.

1325 Drizin completely

$T = 96$ mm $p = 11.8$ F
 1350 + Revised H_2O @ 24.02 in. 58.90 cm.
 slightly + @ 23.82 in + 58.45 cm
 " - @ 23.81 in + 58.40 cm

In air completely.
 3 ²⁰ PM + Per $H_2O = 23.92$ + 58.72 cm $T = 104.0$ $p = 6.6$ F
 Level = 23.82 58.50 10.48 cm
 Scope

$T = 152$ mm
 #5 Poo Per $p = 7.1$ F

Liquid L.	Worn	Scope
+ Per 23.94"	58.75 cm	10.50 cm
avg X 23.82"	58.50 cm	—
∅ 23.83	58.50 cm	10.27 cm

INSTRUMENT CHECK

225

9-22-63

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10X10-12	Meter ✓	8"	✓	10X10-12
	"	Fast ✓	"	✓	"
K-2	"	Meter ✓	8"	✓	"
	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	600V	Alarm ✓	cont	✓	500V
PM-2	1200V	Low ✓	18"	✓	900V
		Alarm ✓	3"	✓	"
LOG N CALIBRATE ✓		OPERATE ✓	SOURCE No. <u>Ac 1</u>		
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

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

Instruments and safeties checked and reset by AKA

Source in checked by AKA Source No. PM-43

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

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

Red light on by AKA Time 2:15 PM

Start-up OK'd by AKA, F.P.C Date 8-22-63

1430

Purpose: Attempt to repeat data p. 224
 + Period ^① _{p. 209} 23.90 in 58.70 cm 12.61 cm
 Slight+ 23.83 in. 58.50 cm 12.41 cm
 Slight- 23.82 in. 58.45 cm 12.38 cm
 Drain partially

8/22/63

① 1" 57.3
Selsyn

Manometer

Scope

	+ Period	24.01 in.	58.85 cm	12.80 cm
1530	Day light +	23.81 in.	58.45 "	12.39 cm
	Slight -	23.81	58.45 "	12.37 "

1540 Drain partially

	+ Period	② 1" 11.4 23.97 in.	58.80 cm	12.72 cm
	Slight + (seed)	23.84	58.50	12.46
	Very slight +	23.82	58.45	12.38

8/26/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10x15 ⁻¹² ✓	Meter ✓ Fast ✓	6"	✓	10x15 ⁻¹²
K-2	10x15 ⁻¹²	Meter ✓ Fast ✓	6" "	✓	10x15 ⁻¹²
R-1	—				
R-2	—				
PM-1	600	Alarm ✓	Cont.	✓	500
PM-2	1200	Low ✓ Alarm ✓	18" 3"	✓ ✓	900

LOG IN CALIBRATE _____ OPERATE _____ SOURCE No. R-4
 DUMP WELL PROBE LIGHT —

START-UP CHECK LIST

Equipment checked by EJ-Wet Personnel check by IDC
 Instruments and safeties checked and reset by EJ
 Source in checked by IDC Source No. PN-43
 Emergency equipment in control room checked by IDC
 Instruments in trip circuit: K-1, K-2, PM-1, PM-2
 Red light on by EJ Time 1020
 Start-up OK'd by EJ Date 8/26/63

Added 1 fuel plate to the 4th plate from the bottom in the 30th element position, ent.
 1100 + Periodic Selong = ? ~~57.4 cm~~, 54.150 cm.
 1115 Dump on K-2 on scale change.

1318 + Period ≈ 23.63 in., 57.50 cm, 54.570 cm
 Slight + period ≈ 23.33 in., 57.15 cm 53.800 cm.

1515 In 30th element, ^(last) now 20th, starting at
 bottom, 2 Al, 1 fuel, 2 Al, 1 fuel, 2 Al.

1531 + Period ≈ 23.23 in., 56.85 cm, 53.485 cm
 Slight + ≈ 22.98 in., 56.13 cm, 52.800 cm

Drain In ≈ 17 in.

+ Period	≈ 23.365 in.,	57.22 cm	53.875	
Slight +	≈ 23.04 in.	56.35 cm	53.915	cm
			53.210	
			52.950	cm

Drain

9/27/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10x15 ⁱⁿ	Meter ✓ Fast ✓	8"	✓	10x15 ⁱⁿ
K-2	10x15 ⁱⁿ	Meter ✓ Fast ✓	8"	✓	10x15 ⁱⁿ
R-1	—				
R-2	—				
PM-1	600	Alarm ✓	Contact		500
PM-2	1200	Low ✓ Alarm ✓	18" 3"		900

LOG N CALIBRATE _____ OPERATE _____ SOURCE No. R-1

DUMP WELL PROBE LIGHT _____

START-UP CHECK LIST

Equipment checked by EQ Personnel check by IDC
 Instruments and safeties checked and reset by EQ
 Source in checked by IDC Source No. PM-43
 Emergency equipment in control room checked by IDC
 Instruments in trip circuit: K-1, K-2, PM-1, PM-2
 Red light on by EQ Time 1345
 Start-up OK'd by EQ Date 9/27/63

Brought line for flow meter directly from 3' line thru well. Moved meter and collector meter. Now have no signal.

230

9/27/63

1435	+ Period ^①	6.15 am	52.525 am	
	slight to Period	5.38	51.715 E9	(Scope level changed)
		5.40	51.705 E5	

Drain to top of blade on glass scale.

1510 + Period 6.00 am

1535 slight+ 5.54 am

1540 Drain

Found that crosshairs in cathetometer are best in center of field and. Therefore, it is possible to obtain readings of the same level which differ by as much as 5 mm.

9/27/63 There ~~is~~ is now a scale line on the hand containing the crosshairs and a filed notch on the body of the telescope. The whole thing is level in the range where it will be used.

9/28/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE RANGE	SET	START-UP RANGE
K-1	10X15 ^{IV}	Meter ✓	8"	✓	10X15 ^{IV}
K-2	10X15 ^{IV}	Meter ✓	8"	✓	10X15 ^{IV}
R-1					
R-2					
PM-1	600	Alarm	Contact	✓	500
PM-2	9/200	Low	15"	✓	500
		Alarm	3"		

LOG N-CALIBRATE OPERATE SOURCE No. R-1
 DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by EA Personnel check by IDC

Instruments and safeties checked and reset by EA

Source in checked by IDC Source No. PN-43

Emergency equipment in control room checked by IDC

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

Red light on by EA Time 1000

Start-up OK'd by EA / IDC Date 9/28/63

1045 + Period ^① 7.24 cur ~~53.215~~ cur 54.100
 slight- 6.38, 6.40 cur ~~53.215~~ cur
 Replaced entire line from 3" to manometer.

9/28/63

with T. J. ... T = 358.3 ...
lg N. ... P = 3.854

PM

+ Period

7.52
7.02 am

53.900

53.905 / am

Right +

6.60 / am
6.61 am

53.480

53.495 / am
53.485

1620

Orzin.

INSTRUMENT CHECK

8/29/63

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10x15 ^{IN}	Master ✓ Set ✓	8'	✓	10x15 ^{IN} ✓
K-2	10x15 ^{IN}	Master ✓ Set ✓	10'	✓	10x15 ^{IN} ✓
R-1					
R-2					
PM-1	600	Alarm ✓	Contact	✓	500
PM-2	900	Low ✓ Alarm ✓	18" 3"	✓	900
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. <u>PA-8</u>
DUMP WELL FROSE LIGHT					

START-UP CHECK-LIST

Equipment checked by EJ Personnel check by IOC

Instruments and safeties checked and reset by EJ

Source in checked by IOC Source No. PN-43

Emergency equipment in control room checked by IOC

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

Red light on by EJ Time 0820

Start-up OK'd by EJ IOC Date 8/29/63

No known changes since end of 8/28/63

0945 + Period 7.39 am 54.230 am (twice)

Blip - 6.40 am 53.600 am

" + 6.50 " 53.365 am

Drain same

8/29/63

1015 + Period \odot 7.22 cm $\begin{array}{r} 54.115 \\ 54.115 \\ 54.115 \\ \hline 54.113 \end{array}$ cm

Drain

1033 + Period \odot 7.42 cm 54.300 cm

Drain

1045 + Period \odot 7.61 cm $\begin{array}{r} 54.490 \\ 54.490 \\ \hline \end{array}$ cm

Drain

1110 + Period \odot 7.70 cm $\begin{array}{r} 54.595 \\ 54.600 \\ 54.595 \\ \hline 54.597 \end{array}$ cm

Drain

1125 + Period \odot 7.12 cm $\begin{array}{r} 54.015 \\ 54.020 \\ \hline 54.0175 \end{array}$ $\begin{array}{r} 54.025 \\ 54.015 \\ \hline \end{array}$ $\begin{array}{r} 54.010 \\ 54.020 \\ \hline \end{array}$

Drain

1145 + Period \odot 7.30 cm $\begin{array}{r} 54.190 \\ 54.195 \\ \hline 54.195 \end{array}$ $\begin{array}{r} 54.195 \\ 54.185 \\ \hline \end{array}$ $\begin{array}{r} 54.185 \\ \hline \end{array}$

Drain

1025 + Period \odot 7.11 cm $\begin{array}{r} 53.995 \\ 53.995 \\ \hline \end{array}$ $\begin{array}{r} 53.995 \\ \hline \end{array}$ cm

Drain

8/30/63

INSTRUMENT-CHECK

INSTRUMENT	RANGE	TRIP	SOURCE RANGE	SET	START-UP RANGE
K-1	10x10 ⁻¹²	Meter ✓ Fast ✓	8"	✓	10x10 ⁻¹²
K-2	10x10 ⁻¹²	Meter ✓ Fast ✓	8"	✓	10x10 ⁻¹²
R-1					
R-2					
PM-1	600	Alarm ✓	Constant	✓	900
PM-2	1200	Low ✓ Alarm ✓	18" 3"	✓	900

LOG N CALIBRATE OPERATE SOURCE No. R-1
 DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by DC-EJ Personnel check by IDC

Instruments and safeties checked and reset by EJ

Source in checked by IDC Source No. PN-43

Emergency equipment in control room checked by IDC

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

Red light on by EJ Time 1040

Start-up OK'd by EJ-IDC Date 8/30/63

Now have 29 full plates (replaced center)
 + the partial 30th plate (fuel in 3 & 4).

1125 + Period ^D 6.90 cm 53.717 cm avg.
 slight - 6.8 cm 53.555 cm

9/30/43

flight + 6.8 cm 53.635 cm | 53.615 cm
 possible critical

1245 + Permal 7.30 cm 54.100 54.205 cm
 54.105 54.110 54.510

1320 + Permal 7.62 cm 54.445 54.450 cm
 54.445 54.450

1335 + Permal (5) 7.41 cm 54.220 54.230 54.219
 54.215 54.218

1350 + Permal (5) 7.12 cm 53.935 53.930 53.920
 53.940

1420 + Permal (5) 7.48 cm 54.355 54.430 54.418
 54.340 54.420 54.425

+ Permal (2) 7.13 cm 53.990 53.990 53.980
 53.990

9/3/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10x15" ^N	Meter ✓ Fet ✓	8'	✓	10x15" ^N
K-2	10x15" ^N	Meter ✓ Fet ✓	10"	✓	10x15" ^N
R-1	—				
R-2	—				
PM-1	600	Alarm ✓	Contact	✓	500
PM-2	1200	Low ✓	18'	✓	500
		Alarm ✓	6'	✓	

LOG N CALIBRATE OPERATE SOURCE No. R-8

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by RKR Personnel check by IDC

Instruments and safeties checked and reset by EF

Source in checked by IDC Source No. PN-43

Emergency equipment for cont. al. reason checked by IDC

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

Red light on by EF Time 1310

Start-up OK'd by EF, RKR Date 9/3/63

1) Replaced oxygen line thru wall with straight stainless tubing. 4 installed dial gauges from instrument mounted on I along to each

9/3/63

end of tank (east and west) (3) installed
3 pieces of Cd (clad) in array of plates.
Purpose: to identify source of difficulties.

PM

Installed U-shaped probe from same level
arm that supports dial faces. Set H₂O level
in probe. Scope initially 59.845 cm.

Drain, return to probe: 59.795 cm. Again, 59.805.

Filling to previous initial scope reading resulted in
flooding probe.

Manometer line is apparently much easier to
debubble.

Drain: change in height, east end of tank,
18.8 mils. ~ 2 mils first 2 fuel plates.

9/4/63

1) Took excess length out of tubing in measured
line.

2) Moved bypass line (dump tank) so that it
extends essentially to the bottom of the
tank on the side opposite the feed line.

0900

Filled to probe, 59.830 cm, 13.05 cm

Drain, fill again ^{to probe} ~ 1.2 mils on east dial

~ 1030

59.845 cm, 13.05 cm.

Adjust + set telescope. ¹³³⁰ 59.915 @ 11:20
59.835 cm, 13.00 cm

~ 1400

Drain to 50.755, refill to probe, 59.885 cm (3 times)
13.03 cm.

#1- 59.895 - without 11
 out ~ $\frac{3}{32}$ " 59.865
 out $\frac{3}{32}$ " 59.850 (slightly loose)
 in from #1 ~ $\frac{1}{16}$ " 59.935
 without 11- 59.925
 slight 11 59.925
 $\frac{850}{50}$
 w/o 11 59.915 11:20

1st 59.835 27 1330
 59.835 RKR
 2nd
 59.860
 59.850
 59.860
 59.855
 59.850
 59.855

0.52
 250.
 B.T. 59.915 LBS
 59.910 WCT
 59.905 RKR
 59.880 LBS
 11:20-11:40
 20392
 20392 *

59.880 WCT
 59.880 LBJ 1330
 59.860 RKR
 59.860 DWM

59.775
.885

022

* w/ powder
860
835

025

59.935

59.865

out 59.825
035

59.895 * 59.895

9/4/63

1445

Drain completely, fill to probe, 55.865, 55.870, ^{13.02}

Added a little water.

55.915, 55.910, 55.905, 55.905 cm.

≈ 1600

Drain to install dial gauge in bottom of tank.

9/5/63

On filling to probe, dial gauge on bottom of tank showed << 1 mil change.

At probe, Hyd Q 55.870, 55.875, 55.870 cm

13.82 on scale.

Removed Cd from between plates.

240

9/27/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE D STANCE	SET	START-UP RANGE
K-1	10 X 15 ⁻¹²	Meter ✓ Fast ✓	7"	✓	10 X 15 ⁻¹²
K-2	10 X 15 ⁻¹²	Meter ✓ Fast ✓	9"	✓	10 X 15 ⁻¹²
R-1	—	—	—	—	—
R-2	—	—	—	—	—
PM-1	600	Alarm ✓	Contact	—	500
PM-2	1200	Low ✓ Alarm ✓	18" 3"	—	900
LOG N CALIBRATE ✓		OPERATE ✓		SOURCE No. <u>R-1</u>	
DUMP WELL PROBE LIGHT					

START-UP CHECK LIST

Equipment checked by RKR Personnel check by IDC

Instruments and safeties checked and reset by RKR

Source in checked by RKR Source No. PN-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 RKR Time 0630

Start-up OK'd by RKR, CJ Date 9/27/63

		Time (min)	Seep (cm)
9/5763			
0955	+ Permal (1)	1st 7.35	1st 54.185
		2nd 7.35	2nd 54.190
			avg = 54.1875
1045	+ Permal (2)	7.60	54.425
		7.60	54.420
			54.425
21055	K-1 Trip - system seram:		avg = 54.423
1125	+ Permal (3)	7.17	53.995
		7.18	54.000
			53.995
			54.000
			54.000
			avg = 53.998
1 ³⁰ / _{PM}	+ Per (4)	7.51	54.335
		7.51	54.320
			54.335
			54.335
1410	+ Per (5)	7.03	53.880
		7.03	53.870
		7.04	53.875
			53.875
			53.875
			avg 53.875

242

1510 + Per (6)

Mean

7.75

Seape.

59.580

7.76

59.585

7.755

59.585

avg = 59.583

1550 + Per (7)

7.42

59.255

59.260

59.255

59.255

avg = 59.256

Man
1.99 - RKR
2.99, E-J.

T&T.

54.790 E-J.

54.790

54.790 -

water at top of
plates

hope	Man
54.890	8.09
54.885	
54.890	Just above plates
<hr/>	8.09
54.8875	7.99
54.790	.100
<hr/>	
.0975	

INSTRUMENT CHECK

243

9/6/63

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10X10 ⁻¹²	Meter ✓ Fast ✓	7"	✓	10X10 ⁻¹²
K-2	10X10 ⁻¹²	Meter ✓ Fast ✓	9"	✓	10X10 ⁻¹²
R-1	—				
R-2	—				
PM-1	600	Alarm ✓	Contact	✓	500
PM-2	1200	Low ✓ Alarm ✓	18" 2"	✓ ✓	900

LOG N CALIBRATE OPERATE SOURCE No. R-1

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by RKR Personnel check by IOC

Instruments and safeties checked and reset by RKR

Source in checked by IOC Source No. PN-43

Emergency equipment in control room checked by IOC

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

Red light on by RKR Time 0830

Start-up OK'd by RKR Date 9/6/63

	Mass (cm)	Depth (cm)
10.00 + Per (1) [⊕]	7.41	54.220
	7.41	54.215
		54.215
		54.220
		avg = 54.2175

244

1025 + Per (2)



7 Mon (cm)

7.09

7.09

leaf (cm)

53.895

53.900

53.905

53.905

53.900

53.895

avg = 53.900

9/9/63

INSTRUMENT CHECK

245

(pm)

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10 X 10 ⁻¹²	Meter ✓	7"		10 X 10 ⁻¹²
	11	Feet ✓			
K-2	10 X 10 ⁻¹²	Meter ✓	10"		10 X 10 ⁻¹²
		Feet ✓			

R-1

R-2

PM-1	600 v	Alarm ✓	Contact	500
PM-2	1200 v	Low ✓	18"	500
		Alarm ✓	4"	

LOG IN CALIBRATE OPERATE SOURCE No. Ray

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by RRR Personnel check by IDC

Instruments and safeties checked and reset by RRR

Source in checked by IDC Source No. PN-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 RRR Time 0945

Start-up OK'd by RRR, ? Date 9/9/63

Removed element #30 containing 2 fuel plates.
 Replaced jacks with new ones.
 Now have 29 full elements.

all

246

1035

+ Pen (1)

the (cm)

leaf (cm)

9.21

56.005

56.015

56.010

56.015

56.015

avg 56.012

1110

+ Pen (2)

8.86

55.695

8.88

55.690

8.87

55.695

55.695

avg 55.69375

1155

+ Pen (3)

9.13

55.955

55.955

55.965

55.960

55.960

avg = 55.959

1215

+ Pen (4)

8.98

55.790

55.785

55.790

avg = 55.788

	Mean	Leaf
1297 + Per (5)	9.52	56.635
		56.335
		56.360
		56.360
		56.355
		avg = 56.353

Removed central element. Now have a total of 28 elements, 14 on each side of the central slot.

	Mean	Leaf
1515 + Per (1)	9.43	56.265
		56.260
		56.265
		56.260

1535 + Per (2)	8.99	55.790
		55.795
		55.795

1553 + Per (3)	9.69	56.495
		56.500
		56.500
		56.500

1603 + Per (4)		56.115
		56.110

over

248

+ Per (4)

Wam (cm)

Leage (cm)

9.30

56.110

56.115

16¹⁸ + Per (5)

9/14/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10X15"	Meter ✓	7"	✓	10X15"
K-2	10X15"	Meter ✓	10"	✓	10X15"
PM-1	600	Alarm ✓	Contact	✓	500
PM-2	1200	Low ✓	18"	✓	500
		Alarm ✓	4"	✓	

LOG IN CALIBRATE OPERATE SOURCE No. Ra-γ
 DUMP WELL FROSE LIGHT

START-UP CHECK LIST

Equipment checked by RKR Personnel check by FDZ
 Instruments and safeties checked and reset by EA
 Source in checked by IDC Source No. PN-43
 Emergency equipment in control room checked by IDC
 Instruments in trip circuit: K-1, K-2, PM-1, PM-2
 Red light on by EA Time 0800
 Start-up OK'd by EA Date 9/14/63

905 + Per (1) Man (cm) 9.45 scope (cm) 56.280
 56.275
 56.280

	Man (cm)	leaf (cm)
9 ³³	9.18	55.995 55.990 55.995 55.995
9 ⁵⁵	Just Crit:	8.91
		55.740 55.735 55.735
10 ²⁵	No change in water ht: system ^{now} slightly sub crit	8.91
		55.730 55.730
10 ²⁸	added ^a tad: system ^{now} slightly super crit.	8.93
		55.765 55.765
10 ⁴⁰	Shut down:	
	Measured array: (29 element core) (center out)	
	Top of plates: 54.715 cm. on cathetometer	
	Average across top: 5.649 in. (5 measurements)	(5.630 → 5.660)
	Measured height in tank: 23 ¹⁹ / ₃₂ in = 23.594 in.	
	Average temperature of H ₂ O: 22.5°C	
	Top reflected at critical: 29 full elements = 0.835 cm	
	" " " : 28 full elements (center out) = 1.035 cm	

9/17/63

Replaced center element. Modified 1st element so that it contains fuel only in positions 4+5 (the rest al) and added 2nd element with fuel also only in nos. 4+5.

1625	+ Period ^①	10.41 cm	57.235	57.240
			57.240	57.238

	+ Period ^②	10.89	57.700	
--	-----------------------	-------	--------	--

	+ Period ^③	10.50	57.325	57.325
			57.330	57.327

	+ Period ^④	10.68	57.480	57.485
			57.480	57.482

	Slightly -	9.89 cm	56.655 cm	
	" +	5.59	56.800 cm	

Dimensions:

Average across top: 5.852 in. (Range 5.842 → 5.865)

Temp., height as of 1.250.

Thickness of top reflected at critical 2.0052

252

9/11/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE	SET	START-UP RANGE
K-1	10x15 ⁻¹²	Meter ✓ Fast ✓	8"	✓	10x15 ⁻¹²
K-2	10x15 ⁻¹²	Meter ✓ Fast ✓	10"	✓	10x15 ⁻¹²
R-1	—				
R-2	—				
PM-1	600	Alarm ✓	Contact	✓	500
PM-2	1200	Low ✓ Alarm ✓	18" 3"	✓ ✓	900
LOG IN CALIBRATE ✓		OPERATE ✓		SOURCE No. <u>Ra-5</u>	
DUMP WELL PROBE LIGHT <u> </u>					

START-UP CHECK LIST

Equipment checked by RKR Personnel check by IDCInstruments and safeties checked and reset by RKRSource in checked by IDC Source No. PN-43Emergency equipment in control room checked by IDCInstruments in trip circuit: K-1, K-2, PM-1, PM-2Red light on by EQ Time 1245Start-up OK'd by RKR, EQ Date 9/11/63

Loading now 28 full elements with partial
(4/8) elements in pos. 1 + 30. Pos. 1 contains fuel
in pos. 2, 4, 6, 8; Pos. 30 has fuel in 1, 3, 5, 7.

13¹⁵ + Per (1) Man 8.43 Seeps. 55.260
 + Per (1) Log 71 only; Coaster trouble. C-2.

14²⁵ + Per (2) 8.40 55.215
 55.215
 55.215
 avg = 55.215

14³⁵ + Per (3) 8.24 55.060
 At least 1 plate on SE side lost 55.075
 submerged. 55.070
 55.075
 avg = 55.070

14⁴⁰ + Per (4) 8.50 55.320
 55.330
 55.320
 avg = 55.323

14⁵⁰ + Per (5) 8.40 55.220
 55.215
 55.215
 avg = 55.217

15⁵⁰ + Per (6) 8.46 55.285
 55.280
 55.280
 avg = 55.282

254

		Mon (cm)	Depth (cm)
1402	+ Per 7	8.13	54.980
			54.980
			54.975
			avg = 54.979
1420	+ Per 8	8.30	55.115
			55.110
			55.110
			avg = 55.112
1435	+ Per 9	8.34	55.185
			55.180
			55.180
1440	Down		avg = 55.182

9-12-63 avg thickness of array across top = 5.873" taken from 5 measurements.

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10x10 ⁻¹²	Meter ✓	8"	✓	10x10 ⁻¹²
	"	Fest ✓	8"	✓	"
K-2	10x10 ⁻¹²	Meter ✓	10"	-	"
		Fest ✓	10"	✓	"
R-1					
R-2					
PM-1	600v	Alarm ✓	cont	-	500v
PM-2	1200v	Low ✓	18	✓	900v
		Alarm ✓	3	✓	

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

START-UP CHECK LIST

Equipment checked by AKR Personnel check by F.D.C
 Instruments and safeties checked and reset by AKR
 Source in checked by AKR Source No. PM-93
 Emergency equipment in control room checked by F.D.C
 Instruments in trip circuit: K-1 K-2 PM-1 PM-2
 Red light on by AKR Time 0920
 Start-up OK'd by AKR, EJ Date 9-12-63

0930 Removed one fuel plate from 1st row (west end.) Third plate down from top. (pos 3)

1000 + Per (1) Man Keefe
 55.990

256

		Mass (cm)	Shape (cm)
		9.18	55.990
			55.990
			avg 55.990
1012	+Per (2)	9.95	56.290
			56.290
			56.295
			56.292
1025	+Per (3)	8.97	55.790
			55.785
			55.780
			55.790
			55.786
1052	System slightly Pos	8.85	55.670
			55.675
			55.670
			55.672
1100	System slightly Neg	8.82	55.650
			55.655
			55.645
			55.650
			55.650
			avg = 55.661
1112	+Per (4)	9.75	56.565
			56.570
			56.570
			56.566

(p. 257)

Sauell = 5.8600

S. spore = 5.8750

contc = 5.8350

π spore = 5.8300

Hart = 5.8599

avg = 5.8520

1123 + Per (5)

Man (em)

People (em)

9.51

56.330

56.³³⁵~~335~~56.³³⁵~~350~~

56.333

1134 + Per (6)

9.28

56.105

56.110

56.105

56.105

56.106

1147 + Per (7)

9.61

56.450

56.455

56.450

56.452

1155 Shut down:

In Row 1, replaced 3rd fuel plate from Top,
removed 1st (top) fuel plate.

1503 + Per (8)

9.39

56.195

9.39

56.195

56.195

56.195

1520 + Per (9)

8.91

55.730

55.730

55.730

55.730

258

1530 + Per (10)

Man (cm)

heaps. (cm)

8.68

55.500

55.500

55.500

avg = 55.500

1546 System slightly ^{Pos} ~~neg~~

8.45

55.270

~~8.41~~

~~55.245~~

55.270

1552 System slightly neg

8.42

55.250

55.240

55.245

avg = 55.245

avg = 55.257

1604 + Per (11)

8.76

55.590

55.585

55.585

55.587

1615 + Per (12)

9.09

55.895

55.900

55.905

avg = 55.900

1620 shut down:

INSTRUMENT CHECK

9/13/63

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10x15 ^{-12V}	Meter ✓	6"	✓	10x15 ^{-12V}
		Fast ✓		✓	
K-2	10x15 ^{-12V}	Meter ✓	10"	✓	10x15 ^{-12V}
		Fast ✓		✓	
R-1					
R-2					
PM-1	600	Alarm ✓	Contact	✓	500
PM-2	1200	Low ✓	18"	✓	900
		Alarm ✓	3"	✓	
LOG N CALIBRATE		✓	OPERATE	✓	SOURCE No. Ray
DUMP WELL PROBE LIGHT					

START-UP CHECK LIST

Equipment checked by RRR Personnel check by IDE
 Instruments and safeties checked and reset by RRR
 Source in checked by IDE Source No. PN-43
 Emergency equipment in control room checked by IDE
 Instruments in trip circuit: K-1, K-2, PM-1, PM-2
 Red light on by RRR Time 1245
 Start-up OK'd by RRR, RA Date 9/13/63

No change since end of 9/12/63, p. 258.

13¹² + Per (1)

man

Leape
~~55.575~~
 55.580
 55.585
 55.585

avg.

	Man	heap
	8.76	55.585 avg = 55.584
13 ³⁵ + Per (2)	9.20	56.010 56.015 56.010 56.012
14 ⁰² + Per (3)	9.37	56.185 56.180 56.180 56.182
14 ¹⁵ + Per (4)	8.94 8.95	55.770 55.770 55.770 55.770
14 ³⁰ system slightly neg	8.41	55.220 55.220 55.220
14 ³⁵ system slightly neg	8.42	55.240 55.240 55.240
14 ⁴⁰ system slightly Pos	8.47	55.265 55.270 55.270 55.268
	55.254 avg put in it	

Mon

heap.

1500

+ Per (5)

9.07

55.890

55.890

55.890

55.890

9-16-63
0900

avg thickness of array across top = 5.8582 (in)
taken from 5 measurements:

South = 5.8600

S-Open = 5.8900

Center = 5.8650

N-Open = 5.8600

North = 5.8500

$$\text{avg} = \frac{5.8650}{5}$$

262

9/16/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START UP RANGE
K-1	10 x 10 ⁻¹²	Meter	8"		10 x 10 ⁻¹²
"	"	Foot	8"		"
"	10 x 10 ⁻¹²	Meter	10"		"
"	"	Foot	10"		"

PM-1	600V	Alarm	cont	500V	400V
PM-2	1200V	Low	18"	900V	
		Alarm	3"	"	

LOG IN CALIBRATE OPERATE SOURCE No. 5mg R²³⁸

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

Equipment checked by AKR Personnel check by AKR
 Instruments and safeties checked and reset by AKR
 Source in checked by AKR Source No. PM-43
 Emergency equipment in control room checked by F.P.C.
 Instruments in trip circuit: K-1 K-2 PM-1 PM-2
 Red light on by EBT Time 1120
 Start-up OK'd by EBT AKR Date 9-16-63

Checked H₂O level for wt. of

9/16/63

Added fuel plate in pos. 1. Set 1 to repeat
 the curve for this configuration, 28 full
 elements \rightarrow $[\frac{4}{8} + \frac{4}{8}$ in slots 1+30], same as of 9/16/63
 Added wetting agent to build head & circulation,
 added 3 blower to check for air bubbles.

		Mass	Temp
1246	+ Pos (1)	8.69	55.490
			55.495
			55.495
			avg = 55.493
1310	+ Pos (2)	8.61	55.455
			55.450
			55.450
			avg 55.452
1320	System very very slightly Pos. 8.11		54.925
			54.920
			54.925
1328	System very slightly but 8.10		54.900
			54.900
			54.900
1343	+ Pos (3)	8.42	55.240
			55.245
			55.245
			avg 55.243
		aver.	

		Mass (cm)	Leapt. (cm)
1359	lepton slightly + Po	8.11	54.925
			54.930
			54.930
			AVG 54.928
1402	lepton slightly - Aug	8.09	54.865
			54.870
			54.865
			AVG 54.867
1500	avg thickness of array		AVG 54.898
	= 5.8650" (in) taken from Sarcophagus		

9/17/63

INSTRUMENT CHECK

265

(cont)

INSTRUMENT	GE	TRIP	SOURCE RANGE	SET	START-UP RANGE
K-1	10 X 10 ⁻¹²	N	6"	✓	10 X 10 ⁻¹²
"	"	"	6"	✓	"
K-2	10 X 10 ⁻¹²	Auto	10"	✓	"
"	"	"	10"	✓	"
R-1					
R-2					
PM-1	600 V	Alarm	cont	✓	500 V
PM-2	1200 V	Low	18	✓	900 V
		Alarm	3	✓	"

LOG N CALIBRATE OPERATE SOURCE No. Gen Rad 1

DUMP WELL PROSE LIGHT

START-UP CHECK LIST

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

Instruments and safeties checked and reset by RKR

Source in checked by RKR Source No. PM-23

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

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

Red light on by RKR Time 0820

Start-up OK'd by RKR E.P.C Date 9-17-63

Repeat of 9-16-63.

0845 + Pen (1)

Man 8.71

Leop.
~~55,435~~
 55,435
 55,530
 55,530
 avg = 55,532

cont.

266

		Mass (cm)	Leads (cm)
0903	+ Per (2)	8.50	55.340
			55.335
			55.335
			AVG 55.337

0920	System very-very slightly + Pos	8.11	54.945
			54.940
			54.940
			AVG 54.942

	System slightly sub - Neg	8.10	54.930
			54.925
			54.930
			AVG 54.928
		ent	AVG 54.935

0945 Backed off on top two screws on west-end of cone; removed top fuel plate, then replaced same ~~as~~ as before:

10.00	+ Per (3)	8.45	55.295
			55.295
			55.295

1025 + Per (4) Man (cm)
8.55 shape. (cm)
55.395
55.390
55.395
av 55.393

1043 ^{= reg} Supter very slightly + Per 8.10 54.925
54.925
54.920
AVG 54.923

Supter slightly + Per 8.10 54.940
54.940
AVG 54.940
cut 54.932

1205 avg thickness of array = 5.8794 (in) taken
from five measurement across top of array.
Second measurement was made of array; avg
thickness = 5.8680 (in); avg of the two
measurement = $\frac{5.8737}{2}$ (in) = 5.8821 (in).

1300 Picked one fuel plate at random, and replaced
it with the top plate on the secret end of
array; avg thickness across top of array
now = 5.8690 (in)

array 1

268

	man (cm)	feet (cm)
133		
1330 + Per (5)	8.43	55.270
		55.270
		55.275
		avg 55.272
1415 + Per (6)	9.00	55.835
		55.835
		55.835
		avg 55.835
1430 + Per (7)	8.60	55.425
		55.430
		55.425
		AVG 55.427
1440 Repten slightly + Per	8.15	55.005
		55.000
		AVG 55.003
1440 Repten slightly - neg	8.13	54.985
		54.985
		54.980
		AVG 54.983
		cut, 54.993

(em) 3:25 Loosen all screw jacks + straighten
alum. spacers as best as possible.
Screw jacks replaced and array
now measures 5.8524" in. (no plates were
removed.)

	Man (em)	Height (em)
1540 + Per (8)	8.51	55.345
		55.345
		55.350
		AVG 55.347

1548	System slightly + Per	8.08	54.910
			54.901
			54.910
			54.905
			AVG 54.908

	System slightly - Neg	8.06	54.895
			54.890
			54.895
			AVG 54.893
			CRIT. 54.901

1601	+ Per (9)	8.63	55.480
			55.480
			55.480

1612 Shut down

avg 55.480

270

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SPT	START-UP RANGE
K-1	10x10 ⁻¹²	Meter ✓	6"	✓	10x10 ⁻¹²
"	"	Fast ✓	"	✓	"
K-2	10x10 ⁻¹²	Meter ✓	10"	✓	"
"	"	Fast ✓	"	✓	"
R-1					
R-2					
PM-1	600v	Alarm ✓	cont	✓	500v
PM-2	1200v	low ✓	18"	✓	900v
		Alarm ✓	3"	✓	"
LOG N CALIBRATE ✓		OPERATE ✓		SOURCE No. <u>509 Bst</u>	
DUMP WELL PROBE LIGHT _____ /					

START-UP CHECK LIST

Equipment checked by RKR Personnel check by I.D.C.Instruments and safeties checked and reset by RKRSource in checked by RKR Source No. PM-93Emergency equipment in control room checked by I.D.C.Instruments in trip circuit: K-1 K-2 PM-1 PM-2Red light on by RKR Time 0935Start-up OK'd by RKR Date 9-18-63

9/18

Loosened jacks and "retightened" only until the plastic strips were against outside plates; the jacks will not support themselves, but are tapered to the Al jacks between groove plates. Average across top is 5.9762 mm.

9/18/63

T-UP
AGE

12

5

5

5

5

1009	Res Per + (1)	4.44	51.270
			51.265
			51.265
			AVG 51.267

1018	System slightly + box	3.87	50.700
			50.700
			AVG 50.700

	system slightly - tray	3.82	50.675
			50.675
			AVG 50.675
			50.688

1130	+ Res (2)	8.56	55.420
			55.405
			55.400
			55.405
			AVG 55.403

til
later;
nt
msj

3:36 + per (6) man (cm) 8.39 scope
 55.200
 55.200
 55.200
 Avg 55.200

3:55 System very slightly + pos. 8.08 ~~54.890~~
 54.890
 54.890
 54.890
 + Pos. value closer to just crit. Avg 54.890

4:00 System sub. crit. 8.05 54.880
 54.875
 54.875
 Avg. 54.877
 CRIT 54.884

274

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP
K-1	10 X 10 ⁻¹²	Meter ✓	6"	✓	10 X 10 ⁻¹²
	"	" ✓	"	✓	"
K-2	10 X 10 ⁻¹²	Meter ✓	7"	✓	"
	"	Fest ✓	7"	✓	"
R-1					
R-2					
PM-1	6000	Alarm ✓	Carat	✓	5000
PM-2	12000	Low ✓	18"	✓	9000
		Alarm ✓	3"	✓	"
LOG N CALIBRATE ✓		OPERATE ✓		SOURCE No. <u>5m East</u>	
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by L.B.D. Personnel check by AKK

Instruments and safeties checked and reset by L.B.D.

Source in-checked by L.B.D. Source No. PM-43

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

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

Red light on by 29 Time 0900

Start-up OK'd by RKR 29 Date 9/19/63

No change since end of 9/18/63

9/19/63

275

	Man (cm)	Leads (cm)
0917 + Pos (1)	8.52	55.375 55.375 55.380 avg 55.377
0935 + Pos (2)	—	55.600 55.600 55.595 avg 55.598
0955 + Pos (3)	8.52	55.390 55.395 55.390 AVG 55.392
1007	8.08	54.905 54.900
Lenses slightly Pos + (Would usually be called level)		
		54.875 54.880
Lenses Neg -		

1115 In taking auto-center elements, found one plate missing. The error dates back to 9-10-63: + RMD/h

1315 "Now have 8 plates in center (15th) element: ^{from unit}
 avg thickness of array = 5.8420" this is
 .0104" smaller than last array:

		Wom	Reps.
1339	+ Per (1A)	9.08	55.910 55.905 avg 55.907
1355	Reps ^{just} slightly sub - Neg. 8.75		55.575 55.580 55.580
1402	Reps very very slightly + Per 8.75		55.575 55.575
1423	+ Per (2A)	<u>9.92</u> 9.72	56.735 56.740 56.737
1442	+ Per (3A)	9.15	55.995 56.000 56.000 55.998

1459 + Pen (4A)

Wan (cm)

9.30

277

Depth (cm)

56.130

56.135

56.135

56.133

9/20/63

	(Mon)	Depth (cm)
0925 + Per (1)	8.9 9.23	56.075 55.815
	9.21	56.065 55.810
		56.070 55.810
		avg = 56.070

0947	Depth very very slightly + Per 8.91	55.735
		55.740
		55.740
		55.738

1025	+ Per (2)	9.45	56.275
			56.280
			56.275
			56.277

1045	+ Per (3)	9.33	56.170
			56.175
			56.165
			56.170

1115	+ Per (4)	9.20	56.025
			56.030
			56.025
		avg.	56.027

280

		Wom (cm)	Legs (cm)
1132	System slightly - Neg	8.87	55.690 55.695 55.695 AVG 55.693
1139	System slightly + Pos.	8.88	55.705 55.705 AVG 55.705 CRIT, 55.699
	Removed plastic + chamber, now have two 15-1		
1225	+ Per (5.)	9.20	56.020 56.020 56.025 AVG 56.022
1241	System ^{very} slightly - neg.	8.91	55.720 55.720 AVG 55.720
12:45	System ^{very, very} slightly + Pos.	8.91	55.725 55.720 AVG 55.723 CRIT, 55.722

9/20/63

Check of feed, drain, and dump rates:

1) Feed control valve completely open, bypass valve completely open (present operating condition)

Feed: 3 plates (8.85 in.) in 2 min 40 sec; 0.05534 in./sec
 $= 3.3 \text{ in./min.}$ Dump: 3 plates / 19 sec = $0.465 \text{ in./sec} = 28 \text{ in./min.}$

Drain: essentially same as feed.

2) Maximum feed rate: Bypass valve closed, feed control valve completely open:

Feed: 3 plates / 1 min 38 sec = 5.4 in./min.

Dump: 3 plates / 19 sec

Removed element #15, replaced. Average

thickness = 5.8419 in.

	(Max)	Leaps
1540 + Pen (6)	9.05	55.890
		55.890
		55.885
1558 + Pen (7)	8.72	55.555
		55.555
		55.550

		Men	Keopl
1620	Keopl slightly + pos	8.32	55.145 55.145

1623	Keopl slightly - Neg	8.32	55.135 55.135
------	----------------------	------	------------------

9/23/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10x10⁻¹²	Meter ✓	—	—	—
		Fast —			
K-2	10x10 ⁻¹²	Meter ✓	10"	✓	10x10 ⁻¹²
		Fast ✓			
R-1	—				
R-2	—				
PM-1	600	Alarm ✓	Contact	✓	500
PM-2	1200	Low ✓	18'	✓	900
		Alarm ✓	2"	✓	

LOG N CALIBRATE ✓ OPERATE ✓ SOURCE No. K-2

DUMP WELL PROBE LIGHT
Bidman Dy - OK

START-UP CHECK LIST

Equipment checked by EJ Personnel check by EDC

Instruments and safeties checked and reset by EJ

Source in checked by EDC Source No. PM-43

Emergency equipment in control room checked by EDC

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

Red light on by EJ Time 1245

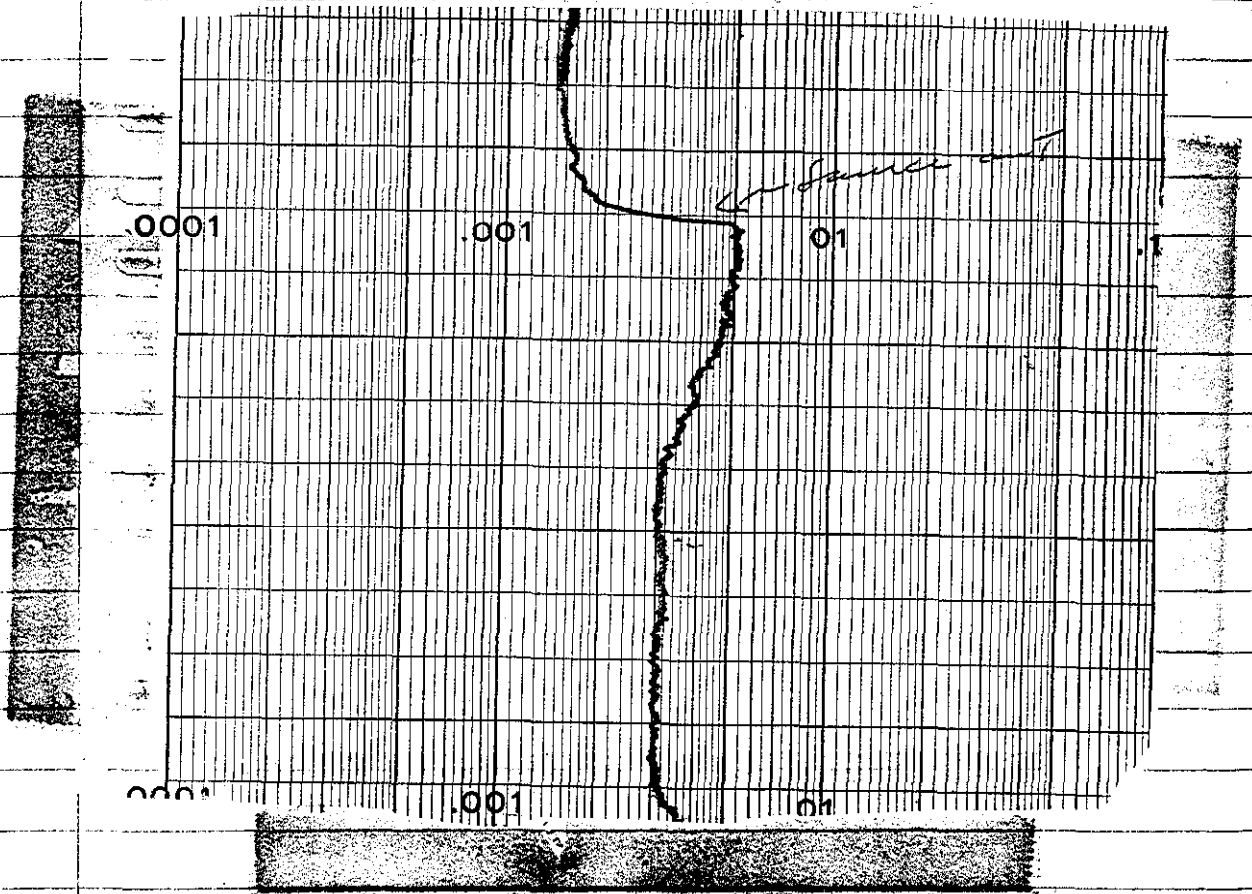
Start-up OK'd by EJ EDC Date 9/23/63

no change since end of 9/20/63.

1325 + Res (1)	(man)(em) 8.71	Reserve (em) 55.540 55.550 55.550 55.550
----------------	-------------------	---

	Worn (cm)	Height (cm)
1340	height very slightly + loss .33	55.165
		55.165

Added Styrofoam on 1 ft x 1" holes to the east end of the array. Because of the jacket a column of water = 2" wide remained on the ends. H₂O to 16.55 am (almost over the top of the tank. Essentially led to multiplicity quite subcritical.



Plastic Spacers

9/30/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START UP RANGE
K-1	10x15 ^{IV}	Motor ✓	6"	✓	10x15 ^{IV}
K-2	10x15 ^{IV}	Motor ✓	15"		10x15 ^{IV}
R-1	—				
R-2	—				
PM-1	600 V	Alarm ✓	Contact		500
PM-2	1200 V	Low ✓	18"		900
		Alarm ✓	3"		

LOG N CALIBRATE OPERATE SOURCE No. R-2

DUMP WELL PROBE LIGHT

START-UP CHECK LIST

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

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

Source in circuit by AKR Source No. PM-2

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

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

Red light on by R.K.R. Time 1045

Start-up OK'd by L.B.J. R.K.R. Date 9-30-63

Loading still 28 full + 4/8 in slots 1 & 30.
 Replaced A1 spacers with Plexiglas = 1" wide x
 141 mils thick, spaced 2" & 6" (centred) from E;
 total 4 rows of spacers. Added jacks as
 needed.

286

avg core thickness = 5.8449 (in)

	Man	Scope	
1110	Hyten super crit	0.1	96.900

Removed all plates from slots 1 + 3.
 Now leave 28 fuel elements, vid particles.
 → (The plates which were removed are numbered in the upper right hand corner as viewed looking ^{toward} east across the tank. Plate #1 is at top of element, #8 at bottom)

Average core thickness = 5.4478 in. (7 positions)

	Man (cm)	Scope (cm)	
1312	Hyten slightly + Por	5.42	52.310

Removed 4 fuel plates (1 → 4) from element in West, ^(slot #2) replaced with Al. Av. thickness 5.4544

	Man (cm)	Scope (cm)	
1402	+ Por (1)	9.60	56.465
			56.465
			56.470
1424	Hyten slightly - Neg	9.30	56.165
			56.160
			56.165

	Mon (cm)	Leaf (cm)
1430	Sept very very slightly 9.31 + Por	56.175 56.175
	Cr. initial 56.170 cm	56.175

1445	f Por (2) 10.0	56.895 56.900 56.895
------	----------------	----------------------------

1450 shut down!

Across Top of core

AM

13.00

family	5.8495	5.4455
S. space	5.8280	5.4415
S center	5.8380	5.4490
Center	5.8465	5.4515
N center	5.8527	5.4405
N space	5.8505	5.4580
North	5.8495	5.4485
	<u>5.8449</u>	<u>5.4478</u>

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10/1/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE	SET	START-UP RANGE
K-1	10 X 10 ⁻¹²	✓ 6"		✓	10 X 10 ⁻¹²
	"	✓ "		✓	"
K-2	10 X 10 ⁻¹²	Meter ✓ 9"		✓	"
	"	Fast ✓ "			
R-1					
R-2					
FM-1	600 v	Alarm ✓ cont		✓	500 v
FM-2	1200 v	Low ✓ 18"		✓	900 v
		Alarm ✓ 3"		✓	"
LOG IN CALIBRATE ✓		OPERATE ✓	SOURCE No. <u>5mg R₁</u>		
DUMP WELL PROBE LIGHT _____					

START-UP CHECK LIST

Equipment checked by AKR/j Personnel check by E.D.CInstruments and safeties checked and reset by AKR/jSource in checked by AKR/j Source No. PM-43Emergency equipment in control room checked by E.D.CInstruments in trip circuit: K-1 K-2 PM-1 PM-2Red light on by AKR/j Time 0920Start-up OK'd by L.P.J. AKR/j Date 10-1-30

Removed element in Slot #15 & replaced.
 (Also removed plates 1 & 2 from slot 14, unplanned,
 & replaced.)

avg cone thickness = 5.4486" (in)

	Mass (gm)	Depth (cm)
0995 + Per (1)	10.22	57.100
		57.100
		57.100

1001	Depth very very slightly 9.52 - 1.1g.	56.405 56.3 56.405 56.400
------	--	---

Removed element in lot 15 & replaced.

Average avg thickness = 5.4486 in. accuracy.

1395	+ Per (2)	10.95	57.350
			57.340
			57.340
			57.350
			57.340

1358	Depth very very slightly + Per	9.42	56.300
			56.305
			56.305

1.
2. *labeled*

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Uniform Loading

10/2/63

INSTRUMENT CHECK

INSTRUMENT	RANGE	TRIP	SOURCE DISTANCE	SET	START-UP RANGE
K-1	10x10 ⁻¹²	✓	0"	✓	10x10 ⁻¹²
		Reset ✓		✓	
K-2	10x10 ⁻¹²	Alarm ✓	10"	✓	10x10 ⁻¹²
		Reset ✓		✓	
K-3					
K-4					
PM-1	600	Alarm ✓	Contact	✓	500
PM-2	1200	Low ✓	20"	✓	900
		Alarm ✓	3"	✓	
LOG IN CALIBRATE		✓	OPERATE		✓
			SOURCE No.		R-43
DUMP WELL PROBE LIGHT					

START-UP CHECK LIST

Equipment checked by RRR Personnel check by RRRInstruments and safeties checked and reset by EJSource in checked by RRR Source No. PM-43

Emergency equipment in control room checked by _____

Instruments in trip circuit: K-1, K-2, PM-1, PM-2Red light on by RRR Time: _____Start-up OK'd by RRR, EJ Date 10/2/63

27 full element loading in slots beginning with #3.
 1/2" Plexiglas end reflectors over full faces, held
 with the previous 4 jacks/pins. 140 mil
 spacing throughout; the 8 spacers between

10/2/63

the fuel in slots ¹³⁺¹⁴ 12+13 and ¹⁷⁺¹⁸ 16+17 consist of 2 strips
 of 30 mil CH₂ plus 2 strips of 30 mil CH₂ covered
 on ~~both~~ sides with 5 mil "Celene" Tapes. Elements
 #1 & 2 not in core.

Average width across top (including Beagles
 reflected) = 6.2450 in. (see p. 252 for detail)

	Man (cm)	Scope (cm)
1540 + Per (1)	10.91	57.795
		57.795
		57.790

1550	System very slightly + low.	56.855
		56.860
		56.855

	System very slightly - neg	56.835
		56.830

1604	+ Per (2)	57.620
		57.625
		57.620

1615 shut down.

Uniform Loading

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Details of core measurements:

across top: (Calipers) - including Plexiglas:

South	6.2351 in	North	Center space 6.2500
South space	6.2300	North space	6.2650
S Center	6.2314	North	6.2900
Center	6.2423	Average	= 6.2492 in.

With micrometer from Plexiglas ref to end of tail

View of east Plexiglas ref from east:

				E_1 :	17.8300, 17.8298	
				E_2 :	17.8269, 17.8259	
				E_3 :	17.7500, 17.7500	
S	E_4	E_5	E_6	N	E_4 :	17.8218, 17.8218
					E_5 :	17.8140, 17.8110
	E_7	E_8	E_9		E_6 :	17.7695, 17.7690
					E_7 :	17.8050, 17.8050
					E_8 :	17.8474, 17.8449
					E_9 :	17.7665, 17.7650

Similarly, west side of west Plexiglas viewed from west:

W_1	16.1752	16.1735
W_2	16.1455	16.1455
W_3	16.0284	16.0305
W_4	16.0490	16.0470
W_5	16.0328	16.0322
W_6	15.9890	15.9900
W_7	15.9806	15.9800
W_8	15.9472	15.9486
W_9	15.9060	15.9060

2pc Ply. $\frac{1}{2} \times 24 \times 24$

Cut 86 ml.

Remove $\frac{1}{2}$ element
(minus 27 element case)

16 spans 40 mils. 1" wide
30 sheet
2 layers top

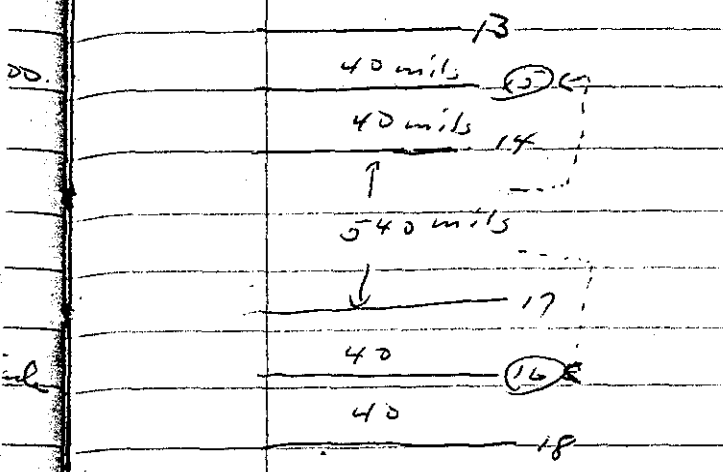
16 spans 30 mils - 1" wide

140		✓	
140		✓	13
140	2 - 30		14
140	2 - 40		15
140	2 - 30		16
140	2 - 40		17
140		✓	18
140		✓	

✓ 140		13
40	1pc (30+40)	13
40	1pc	14
540	3-140x 4-30	14, 15, 16
40	1pc	17
40	1pc	18
✓ 140		
60		
80		
140		

540	
140 3	14 x
420	560
3 x 140 = 420	
4 x 30 = 120	
	540
2 x 140 = 280	
2 x 30 = 60	
	340

2 Displaced Elements



East	West (comp. 29)
$E_1 = 17.8265$	$W_3 = 16.0300$
$E_4 = 17.8213$	$W_5 = 16.0392$
$E_6 = 17.8020$	$W_7 = 16.0025$
$E_9 = 17.7492$	$W_8 = 15.9865$
	$W_9 = 15.8885$
Center Temp = 6.2419	

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INSTRUMENT CHECK

INSTRUMENT	RANGE	TYPE	SOURCE	SET	STARTUP
K-1	10x15 ^{12V}	✓	5"	✓	10x15 ^{12V}
		✓	"	✓	
K-2	10x15 ^{12V}	Motor ✓	12"	✓	10x15 ^{12V}
		Fit ✓		✓	
R-1					
R-2					
PM-1	600	Alarm ✓	Contact ✓	✓	500
PM-2	1200	Low ✓	24" ✓	✓	500
		Alarm ✓	3" ✓	✓	

LOG IN CALIBRATE _____ OPERATE _____ SOURCE No. R-1

START-UP CHECK LIST

Equipment checked by RRR Personnel check by RRR

Instruments and safeties checked and reset by EP

Source in checked by RRR Source No. PM-40

Emergency equipment in control room checked by _____

Instruments in trip circuit: PM-4, PM-2

Red light on by DC Time 1345

Start-up OK'd by RRR, EP Date 10/3/63

		Mass (cm)	Scope (cm)
1410	System ab init:	16.5	63.430 (free tank!)
	Cradled plate 2-6 to element ppv. $W_1 = 15.9650$ $W_5 = 15.8270$ in. Top center of cone = 6.2500 in.		
1504	+ Per (1)	13.83	60.720 cm
	80.4 sec } μN	13.83 cm	60.715
	11.7 d } μN		60.720
			<u>60.718</u>
1515	System slightly + Per Best value:		58.940
			58.935
	Control 58.93 cm		<u>58.935</u>
			58.937
1517	System slightly - Neg		58.865
			<u>58.865</u>
			58.865
1525	+ Per (2)	15.42	62.325
	50.8 sec } μN		62.230
	16.2 d } μN		62.330
			62.330
			<u>62.328 cm</u>

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10/4 Measurements across top of Cover as left 10/3
 27 fuel elements plus one fuel plate in
 Element #21; 0.540" water gap between elements
 14 & 17, formed by putting element 15 between
 13 & 14 and 16 between 17 & 18.

South 6.4300

South spacer 6.4315

S Center spacer 6.4500

Center 6.4550

Across top

N Center spacer 6.4620

North spacer 6.4850

North 6.5100

ANALYTICAL DATA REPORT
(RCA)

SERIES NO.

CONTROL NO.

40630

FROM

DATE

E. B. JOHNSON

E. I. Wyatt

9-30-63

Sample Code

Chlorine, micrograms/ml.

TRITON

13.9 ± 0.7

SAMPLES SENT TO WASTE RETURNED TO SENDER

γ COUNTED THROUGH AL Pb ABSORBER

α COUNTED AT _____ % GEOMETRY

β COUNTED AT _____ % GEOMETRY

SUPERVISOR

E. I. Wyatt

= 50,2947 kg H₂O

avg of bottles = 2.80 kg avg % of H₂O = 2.16%

# 1	82.3	-	2.9
2	80.1	-	
3	79.65	-	
4	80.15	-	
5	80.25	-	
6	80.0	-	
7	81.25	-	

avg 80.5285 kg per bottle

9.7914

avg 4.7914 kg of V per bottle

33.5398 kg of V = total

@ 5.95%

avg 4.7833 - 33.4931 kg of V

@ 5.94%

# 8	23.7	-	
9	79.8	-	
10	79.9	-	
11	80.05	-	
12	79.8	-	

avg 68.655

33.5398

20.4295

53.9643 = kg of V - total of 12 bottles @ 5.95% of V

avg 4.0849 kg of V per bottle

4.0849

20.4245 kg of V = total

@ 5.95

avg 4.0771 kg of V per bottle

@ 5.94

John has V = 5.94% = 53.8 kg
U2302 = 932 = 50.1 kg

check on H₂O: 5.80 - 2.8 = 3.00 kg H₂O