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- 1 -

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- #3 Area Engineer
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This Document
Pages 10
19

August 16, 1946

author W E Jordan

100 AREAS

August 6 through August 12
(For Technical Progress Letter No. 110)

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S-47

Physics

D Pile

The D Pile operated at rated level during this period except for a routine shutdown of about 22 hours on August 6 and a slight drop in level following the start-up for the purpose of maintaining tube temperatures within the required limits. No regular push was scheduled for this time. Special Request samples 9-2 and 25-2 were discharged from Tube 3674. This tube was recharged with load dummies. Special Request 25-1 was discharged from Tube 2878 and the tube recharged with regular heavy metal slugs. These sample discharges are expected to cause a gain in reactivity of 7 nominal inhours.

Special Requests 13-2 and 15-3 were charged into poison Tubes 3169 and 2082, respectively. Tube 3169, which formerly absorbed 34 nominal inhours is expected to absorb 21 inhours. Tube No. 2082 is expected to change from 46 to 41 nominal inhours.

The total change in reactivity of all sample changes is a gain of 24 nominal inhours or 18 inhours effective.

During the shutdown both high tanks were tested; the near high tank through D riser, the far tank through B riser. All of the remaining graphite samples in the B Test Hole were removed with the exception of one loaded casing which could not be removed. After this shutdown no attempt will be made to cool the B Test Hole.

F Pile

The F Pile was shut down for about 16-1/2 hours on August 7 for the purpose of discharging irradiated metal. The pile operated at 50 MW below rated level throughout the remainder of this report period.

Three tubes were charged with Special Request material. These charges are summarized in the following table.

Tube No.	S.R.No.	Material	Nominal ih	Nominal ih of Column Displaced
1569	15-3	LiF	41	30
2666	13-2	B ₂ N ₂	20	27
2271	20	TiNO ₃	7	0
Total Nominal			68	57

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The above table indicates a change of 11 inhours in the nominal poison value. This corresponds to an expected change of about 8 inhours in the effective poison.

Reactivity changes in connection with the shutdown are listed below.

In rods at shutdown	70 inhours
Loss due to 6.4% discharge	-5 inhours
Long term gains in 4 days	4 inhours
Loss due to change in metal quality	-2 inhours
Expected excess for no poison change	67 inhours
Observed excess	59 inhours
Effect of poison change	8 inhours

This comparison shows agreement between expected and observed reactivity changes.

The charges in three over-age corrosion tubes, No's. 0674, 1286, and 2491, were moved slightly to demonstrate that they are not bound. These pieces have been in the unit since the beginning of operation.

It has previously been reported that the average apparent thermal conductivity of the graphite around the six central thermocouples in the D Pile was somewhat greater than indicated by laboratory measurements on cooled test hole samples of comparable exposure. This comparison was based on the assumption that the graphite in the vicinity of the thermocouples received an exposure equivalent to that received by central graphite. Since four of the six thermocouples are over seven feet upstream or downstream from the center of the pile, and the neutron density follows a cosine distribution in the direction of the tubes, the average exposure of adjacent graphite is not the same as that of central graphite. Allowance for this difference in exposure brings the two sets of measurements into good agreement.

General

Apparatus to replace the B Test Hole facility is under design. A number of improvements are being incorporated to simplify construction, maintenance, and operation.

Water, Corrosion and Engineering

Process Water Control and Pressure Drop Studies

The iron content in the process water averaged 0.026, 0.007 and 0.012 ppm at B, D and F, respectively.

The frequency of pressure drop monitoring has been reduced to once per week at D and F. The rate of pressure drop increase for F was 0.39 lbs./sq.in.(day). No rate has been determined for D following the purge on August 6.

Purging

The D Pile was purged with about 100 ppm Super Gel for one hour and twenty minutes on August 6. The pressure drop above base in the 0.240 inch orifice zone, based on Sample Room B data, was reduced from 9.1 lbs./sq.in. to 2.1 lbs./sq.in.

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- 3 -

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Corrosion

Tube 2163, loaded with cast material, was discharged at D on August 8. Three of these slugs were slightly blistered. Gravimetric data, based on six weighed slugs uniformly distributed along the length of the tube, are summarized below:

Corrosion Data for Cast Slugs

Exposure, Days	Accumulated Power MWD	Penetration Rate, in./mo.	
		Average	Maximum
119	18	0.00004	0.00005

Present indications, based on the examination of three tubes of cast material, are that cast slugs are at least as susceptible to blistering as are extruded slugs.

Graphite Expansion

It was determined on August 6 that the top central tube at D would pass a 1.480 inch diameter steel slug but would not pass a 1.490 inch diameter slug. The test was confined to the inlet end of Tube 4674, and the large slug stuck at a point 6 ft., 9-1/2 inches in from the inlet Van Stone joint. This is the same result that was previously obtained for Tube 4574 at B, although the D Pile has about 30% more accumulated exposure.

Tube 4674 at D was traversed for vertical bowing and Tubes 2451 and 2496 were traversed for horizontal bowing on August 6. The bowing of Tube 4674 is now 2.16 inches. The bowing of this tube was increased at a steady rate of only 0.064 inches/month for the past 2-1/2 months, a rate which is appreciably smaller than had been previously observed and in the first important indication that the rate of graphite expansion may be decreasing.

Tube 2496 has increased in outward bow 0.10 inches while Tube 2451 has increased in outward bow only 0.01 inches since May 28. It is concluded that the horizontal expansion of the D Pile toward the near side has substantially ceased and hence that it may not be necessary to replace the neoprene seal on the near side. The overall sidewise expansion has been only 0.048 inches/month, in confirmation of the relatively low rate of graphite expansion reported above.

Gun Barrel Clearance - Further push-pull tests with the 1500 lb. pneumatic jack at 100D Area were made on August 6. The results, which are listed below, are in reasonable agreement with previous measurements of gun barrel sum-clearance at B:

Jacking Tests at D

Tube No.	0274	0688	0859	4574
Gun Barrel Sum-Clearance, in.	31/32	23/32	26/32	--
Force required for full and reproducible movement	800	800	600	>1000
Binding	No	No	No	Yes

When a force of 1000 lbs. was applied to the front gun barrel of Tube 4574, the rear gun barrel did not move but the front gun barrel could be moved about 3/32 inch. This could be explained by the rear gun barrel being bound while the front gun barrel was free to move in and out. The aluminum tube would then stretch or compress under the applied forces.

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- 4 -

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Previous tests have shown that the front gun barrel of Tube 3671 at B binds as it is moved in and out. In order to obtain information on the cause and location of this binding, it was suggested that Baldwin electrical resistance strain gauges be mounted at intervals inside this gun barrel and a force be applied to the flange. The binding action could then be located as occurring between the gauges which showed strain and those that did not. This has been tried on a gun barrel mounted in a mock-up so that it could be clamped with a vise at various points along the gun barrel. It was found that if gauges were mounted in pairs on opposite sides of the gun barrel and the average reading taken for each pair of gauges, the position of the vise was defined, with the exception that if the vise were clamped directly over a gauge it caused erratic readings.

W. E. Jordan
W. E. JORDAN, CHIEF SUPERVISOR
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