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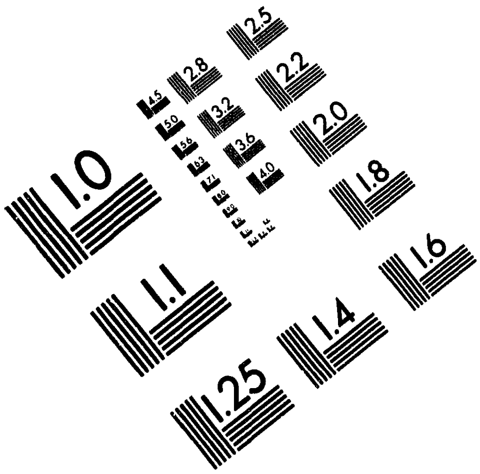

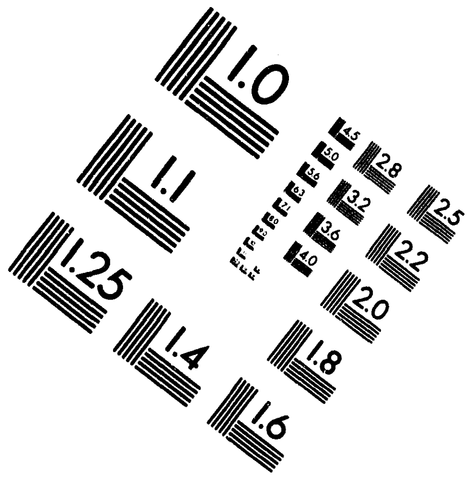

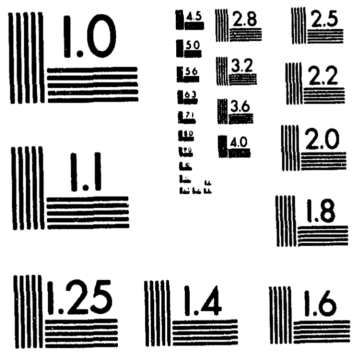

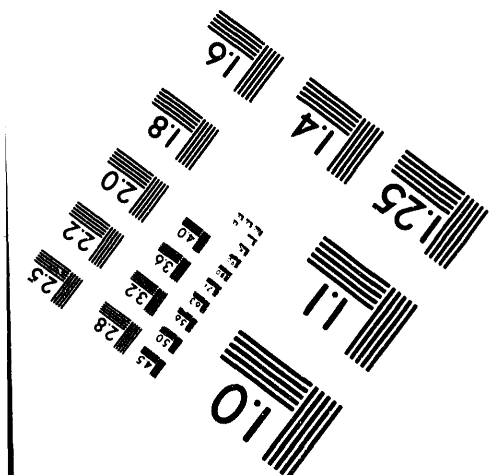

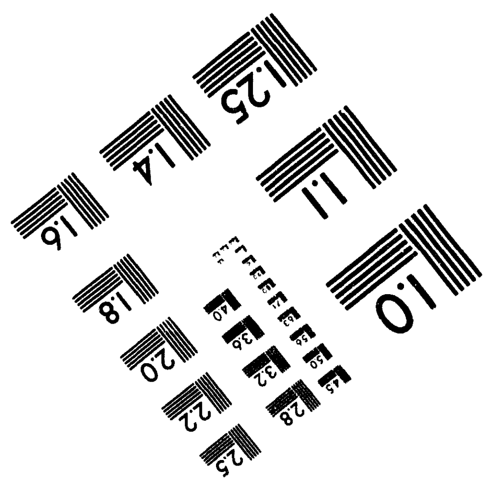

MANUFACTURED TO AIIM STANDARDS
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1 of 1

HW-15153

\# 1 - AB Greninger
\# 2 - WI Patnode
\# 3 - WK Woods
\# 4 - PF Gast
\# 5 - AA Johnson
\# 6 - AB Carson
\# 7 - HA Fowler
\# 8 - EB Montgomery
\# 9 - FE Kruesi
\#10 - 700 File
\#11 - 300 File
\#12 - Pink Copy
\#13 - Yellow Copy

November 21, 1949

COPY 1 OF 1, [redacted]

This document consists of 12 pages. No. 13 of 13 copies. Series A

100 AREAS TECHNICAL ACTIVITIES REPORT - PHYSICS

OCTOBER, 1949

PILE PHYSICS GROUP - A. B. Carson

H Area Start-Up

Dry Critical: Loading to dry critical was begun 10-4-49. A pattern twenty tubes wide covering columns 63 through 82 was loaded in successive layers, symmetrically with respect to the horizontal center line of the pile. Critical was reached at 15.76 layers on 10-6-49. The neutron background was followed by means of indium foils irradiated in the "B" test hole thimble, and BF_3 chambers placed in selected process tubes. A plot was kept of the quantity (1/Buckling x neutron level) in order to anticipate the critical loading.

Dry Coefficient Test: The temperature-reactivity coefficients for the dry lattice were determined on 10-6-49. The power was raised to some undetermined low level and held constant until the central metal temperature had risen about 25°C. The metal temperature was then held constant and the central graphite temperature allowed to rise. The rate of change of reactivity during this period was compared with the rate of graphite temperature rise to give a graphite temperature-reactivity coefficient of -0.8 ih/°C. When the graphite rise reached about 14°C the power was reduced to a very low level, and critical conditions maintained while the graphite and metal were cooling to room temperature. Analysis of the reactivity transient associated with this phase of the test yielded a metal temperature-reactivity coefficient of -0.4 ih/°C. The metal temperature changes were monitored by means of special thermocouples installed in metal pieces placed in the center of selected process tubes. The observed values were corrected to correspond to central metal temperature conditions. The graphite temperature changes were monitored by means of the regular graphite thermocouples, and those readings also were corrected to correspond to central graphite conditions. The reactivity changes were obtained from the movement of "B" control rod. This rod had been calibrated prior to the test by means of reactivity periods.

Dry Augmentation Distance: Copper foils were irradiated in the "B" test hole thimble and in tube 2674 during the dry coefficient test to check the augmentation distance in the dry lattice. The foils were spaced at two inch intervals for three feet on either side of the edge of the loaded prism, and one lattice space apart further into the pile. The observed augmentation distance was 74 cm. from side to side, and 58 cm. from front to rear.

Dry Critical With One VSR: At the conclusion of the dry coefficient test, VSR #38 was inserted and the regular loading resumed. Critical was reached at 18.9 layers.

Rod Tests on the Fully Loaded Pile: From 10-7-49 to 10-13-49 the remainder of the pile was loaded dry. Tests were then performed to determine rod requirements for critical conditions with the dry pile, and later with water in the process tubes. It was found that 23 VSR's or 20 VSR's plus all the HSR's were sufficient for the dry pile, and that 12 VSR's or no VSR's plus all HSR's were sufficient for the submerged pile.

Low Level Tests: Before proceeding further the unit was loaded with about 500 lb of poison material in a seventeen tube flattening pattern. Starting with rods 2, 14, 3, 13, and 1, the unit was brought to critical on 10-20-49 with 10 1/2 HSR's still in the pile. Low level tests were run to allow Instrument Division to relocate sensitive chambers and to check equipment, and for the HI Division to conduct a radiation survey of the building. A level of 3 MW was held for about two hours, and a level of 10 MW for about ten hours.

Xenon Transient Test: A test to determine Xenon transient behavior characteristics was begun on 10-21-49. The pile was operated at 100 MW until the Xenon poison reached an equilibrium, at which time the pile was shutdown to a very low level, and the critical condition followed. The power operation was interrupted by a scram on 10-25-49, and by a short shutdown on 10-23-49 for charging additional poison, both of which delayed the approach to equilibrium. When the unit scrammed again at 0105 a.m. of 10-27-49 it was felt to be near enough to equilibrium conditions that the test was started from there. The unit was kept at a very low level critical for four days while the Xenon poison decayed to a negligible value. It is intended that analysis of this decay information should give Xenon equation constants which will be applicable to H area operation. During the decay period it was noted that some of the cooling water had been drained from the "B" test facility inadvertently, but the reactivity effect was evaluated later and found to be quite small. In addition there were some instrument difficulties encountered, but a least one good indicating instrument was available at all times, and it is felt that valid results can be obtained from the data.

Following the Xenon decay test, the unit was shut down for flattening loading changes which would permit operation up to 300 MW.

B Test Hole at F

Cooling water was drained from the facility during the shutdown of 10-18-49 as called for in P.T. 105-279-P. Paraffin-Cadmium shielding was built up around the gatling gun so that only a slight increase in radiation level was

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noticed on the experimental level. A gain of about 10 ih in pile reactivity which could be attributed to the removal of the cooling water was noted.

IBM Activity

Outlet Tube Temperature Recording System: The system for putting outlet tube temperatures directly on IBM cards is nearing completion. Final circuit design provides accuracy checking and interlock protection. Punching will be stopped as a result of any irregularity. With this system temperature error should be negligible, and having tube by tube exposure data available on IBM cards will make it very convenient for making special studies. Exposure of special requests will be more accurately determined. It is felt that this system will be precise enough that the errors due to tube water flow variation will now become significant, and will bear investigation.

IBM Card Tables: The following IBM card tables have been completed, accuracy checked, and differences taken for interpolation purposes;

Table	Size	Accuracy (by interpolation)
Arctangent	18,000 cards	12 decimal places
Natural logs	9,000 cards	13 decimal places
J_0 (x) to x = 10.5	1,050 cards	11 decimal places
J_1 (x) to x = 10.5	1,050 cards	11 decimal places
Y_0 (x) to x = 10.5	11,050 cards	11 decimal places for x > 0.5
Y_1 (x) to x = 1.5	1,050 cards	Same as J_0 (x)
e^{-x}, x from zero to 100 with an interval of 10^{-10}	4,800 cards	15 significant figures
Square root	900 cards	6 significant figures by simple look-up, 10 by interpolation.

Reactivity Balance

The reactivity status of each pile at the beginning and the end of this report period is summarized below.

	B Area		D Area		F Area	
	Sept. 30	Oct. 31	Sept. 27	Oct. 31	Sept. 30	Oct. 31
[illegible]	65	55	71	79	55	49
[illegible]on	475	474	499	504	45[illegible]	462
[illegible]	394	399	377	372	425	413
[illegible] Cols.	0	0	0	0	0	0
[illegible] Cols.	117	117	109	109	109	114
[illegible]sst.	0	0	20	20	0	0
[illegible]	0	0	20	3	55	32
Corr. for C_o	-200	-200	-235	-200	-235	-235
Cold, clean	851	845	861	867	870	835

D area shows a net loss of 6 ih for the month. Although the cold reactivity balance shows a gain of 26 ih at D, this is the result of altering the C_o contribution to conform to recent experience. There was actually a loss of 9 ih in hot reactivity for the month. F area shows a loss of 35 ih for the month, 9 of which are due to re-evaluation of some of the special loadings.

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EXPERIMENTAL PHYSICS GROUP - E. B. Montgomery

I. Graphite Testing

A. Non-Experimental

About a month after the finish of the regular production testing program small lots of graphite continue to show up for 305 tests. However, one or two more weeks will probably see the end of it.

B. Experimental

Two samples of graphite impregnated with boric acid were submitted to the Analytical Section for boron analysis. The results obtained from these analyses are given below.

Sample No.	Date Submitted	% Boron Added	% Boron (Analysis)
1	9-23-49	0.08000	0.24
1	9-28-49	0.08000	0.085*
2	9-23-49	0.06000	0.06

* While this result is much closer than the 0.24% first reported, the error is still greater than 6%.

II. 305 Testing - General

A. P-10 Slug Standardization

A procedure was set up for testing P-10-A slugs in the 305 pile. A series of slugs were tested individually and in pairs and compared with lead-cadmium slugs. On the basis of the results obtained from these tests, it was decided to test the slugs individually.

To obtain a correlation between 305 results and percent lithium, six slugs were pile tested then analyzed by the Analytical Section. On the basis of the results from the Analytical section the P-10-A slugs should test between 68.3% and 72.8% "black" in the pile for the % lithium in the slug to be within the limits 3.2% to 3.7%. However, the variation in results indicated a need for more control over sampling and testing.

Six more slugs were selected from the last large group of 305 tested pieces. These were retested then submitted to the Analytical Section for analysis. It was hoped that these results would make it possible to determine the lithium content of any P-10 slug from the percent blackness as determined in the 305 pile. The plot of the chemical analyses vs. the percent blackness of the slugs was very irregular and it is difficult to draw a curve through the points. The Analytical Section is rechecking the analyses but it now appears that it will be necessary to repeat the whole test. The results of these tests are given in the following table.

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305 Results		% Lithium By Analysis			
Slug No.	% Black	1st	2nd	3rd	Ave.
2-10-23-15	66.0	3.09	3.09	2.85	3.01
22-17	67.0	3.20	3.16	3.17	3.18
22-40	68.0	3.19	3.14	3.29	3.21
30-40	69.1	3.33	3.33	3.25	3.30
26-30	69.9	3.51	3.44	3.60	3.52
27-38	71.0	3.76	3.72	3.72	3.66

B. 305 Precision

A cross check of the graphite standards was made in the 305 test pile. The results are far from satisfactory. The maximum deviation from the average ih for each pair of standards should not be greater than ± .02 ih and the majority of the results should lie within ± .01 ih from the average. The values obtained for the cross check between standards are given in the following table.

COMPARISON BETWEEN GRAPHITE STANDARDS

WITH 3S3 AND 3S4 AS THE MASTER STANDARD

	△ ih (PURITY)			
Date	4S3-4S4	5S3-5S4	1F-2F	3F-4F
11/5/47	.014	+ .004	-----	----
12/3/47	- .018	- .004	-----	-----
12/17/47	- .039	- .001	-----	-----
1/27/48	.031	- .012	-----	-----
4/26/48	.026	- .003	-----	-----
8/16/48	- .012	+ .021	+ .977	+ .952
9/18/48	- .017	+ .002	+ .992	+ .957
12/4/48	- .059	- .018	+ .949	+ .946
3/14/49	- .041	- .008	+ .948	+ .945
5/19/49	- .040	- .012	+ .922	+ .890
8/9/49	- .020	+ .013	+ .990	+ .977
9/12/49	- .011	.021	+ .966	+ .939
11/2/49	- .077	- .019	+ .952	+ .915

C. Miscellaneous Special Tests

Six special work requests were completed during October.

1. Work requests No. 107 and 110 were to test the neutron absorption of various glasses for the instrument development group.

2. Work request No. 108 was to test the effectiveness of potassium borate type P. columns for the Pile Engineering Section. The results obtained are given in the following table.

[redacted]

[redacted]

Sample No.	% Potassium Borate	% Black
1	1/2	20.8
2	1.0	30.8
3	2.0	45.4
4	3.0	55.6
5	4.0	62.9
6	5.0	68.0
7	6.0	72.9
8	7.0	74.4
9	8.0	79.7
10	9.0	81.7
11	10.0	85.6

3. Work request No. 109 was to test P-10-A slugs.

4. Work request No. 111 was to measure the boron content of boron impregnated graphite. This graphite was prepared by National Carbon and was supposed to have 20 mg/gram of boron. Chemical analysis by the Laboratories Division showed 4.56 mg/gram of boron present. The 305 test pile results gave 4.85 mg/gram boron which is in good agreement with the chemical analysis.

5. Work request No. 112 was to measure the neutron absorption of a lead-tin slug containing thermocouple and heater wires.

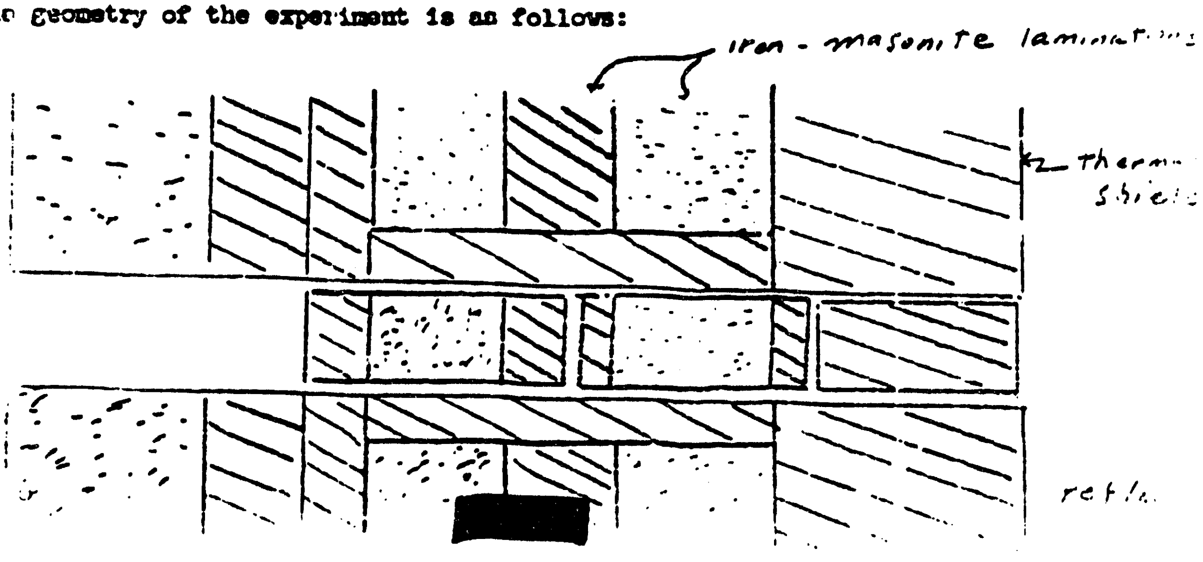
III. Shielding

A. Shielding Studies

The measurements of the attenuation in the Hanford shield have been finished. The measurements were made in the A test hole of the F pile. The conditions under which the tests were made are far from duplicating a one dimensional traverse through a solid section of shield but were the closest approach possible at the present time. With these limitations in mind the work has yielded quite valuable results.

The data have been carefully checked and appear correct as well as self-consistent on every score. Geometry considerations, however, prove difficult.

The geometry of the experiment is as follows:



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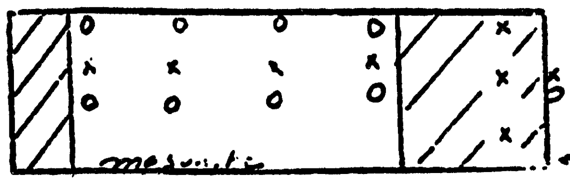
Foils are disbursed through each plug as follows:

o - Au foils
x - Mg foils



If we were to draw a curve through the entire set of points we would find a relaxation length of 8.9 cm over the first 38 inches and about 11 cm over the next 12 inches. This constitutes an over-all reduction of 2.2×10^{-6} throughout the shield. A ratio of fluxes experimentally determined yield a reduction factor of 2×10^{-6}. Therefore, it appears that the above relaxation lengths are reasonable for the geometries encountered in A test facility.

We feel that our data is sufficiently reliable to enable us to speculate upon the behavior of individual points and groups of points as well as the behavior of the entire set of points. Flux values in the immediate vicinity of the thermal shield indicate that the contribution from "streaming" in this region is small. It is reasonable then to expect that the first few points will yield a relaxation length which would approach that found in the shield proper. However, if we make the above assumption we are required to detect the region where we depart from "shield geometry" and observe "A test hole" geometry.

This region is detected at a distance of 3-12 inches from the thermal shield. At this point we note a discontinuity in attenuation which is evidenced by a shift of the curve about 4 inches and a 40% increase in flux the behavior suggests a neutron source in this region which is reasonable to expect from geometry and streaming considerations. On this basis we obtain relaxation lengths which we believe approach those actually found in an over-all shield although it is difficult at this point to prove because we are unable to evaluate accurately the effective neutron streaming without defining the region of discontinuity more closely with more data. Based on the data we have our estimates of relaxation lengths in Hanford shield are

6.35 cm over first 21"
~ 8.9 cm over next 15"
~11 cm over rest of shield

These values are self-consistent with flux data using the best values obtainable for the "source strength" and based on a flux of 300 $_0n^1/cm^2/sec$ at "A" hole exterior. However, these values neglect the effect of the aluminum thimble on streaming as well as the various mechanical clearances beyond the region of the discontinuity in flux. In comparison with the larger effects mentioned this may not be serious.

Values of flux determined by Au foil activities at points of interest are

Inside thermal shield		2.6×10^{11}	$_0n^1/cm^2/sec$
Outside thermal shield		4.5×10^{8}	$_0n^1/cm^2/sec$
Outside biological shield	about	1.5	$_0n^1/cm^2/sec$

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These values are interesting in that the attenuation of thermal shield is about a factor of 600 and biological shield is about 3×10^8 or the factors of transmission will be 1.6×10^{-3} (thermal shield), 3.3×10^{-9} (biological shield) and 5.4×10^{-12} for over-all Hanford shield.

Actually there is some question as to the meaning of these factors because they do not represent the decrease in thermal neutrons alone but represent the decrease in thermal neutrons impinging upon the thermal shield plus decrease in fast neutrons moderated between monitoring points as well. In the absence of data describing fast neutron flux it is impossible to make the indicated corrections. However, the thermal shield attenuation can be accounted for purely on the basis of primary thermal neutron attenuation using a cross-section of 2.5 barns for neutron capture. Once the masonite is reached it becomes evident that fast neutron moderation plays a major role. About 1/2 the shield has been traversed. In view of this fact the 4-8 ev. Au^{198} resonance probably contributes more at some points in the shield than others. Therefore, we believe a measurement made in cadmium would be required for two reasons: (1) to determine relaxation length for 4-8 ev. neutrons and (2) to enable us to make a real evaluation of thermal neutron behavior by subtracting the resonance flux from the previously determined thermal + resonance values.

As previously reported the flux in iron is consistently lower than flux in the masonite. As would be expected this anomaly becomes larger at lower fluxes because only the "harder" components remain in this region and iron is a particularly ineffective moderator with respect to these components. The decrease is striking - approaching a factor of three 45 inches from the thermal shield.

Gamma Relaxation Lengths

The state of gamma relaxation length in the Hanford shield is in some doubt in the region of the thermal shield. Nine cm appears to be a good value over most of the shield with a thirteen value noted over the outside 6 or 7 inches.

The limit of the nine cm value is probably about 15 inches from the thermal shield. In this region we note an obvious gamma source as well as behavior similar to a gamma sink. After completing the data and noting the strange behavior in the immediate thermal shield region I believe that high intensity calibrations are in order to enable us to separate the wheat from the chaff and make our knowledge of the attenuation curve more positive.

B. Gamma Source For γ, n Reaction

Mr. Miles Libby, of the Reactor Development Division of the A.E.C. visited here and discussed our shielding study program. One item of considerable interest discussed was the use of solutions, circulating through the pile, to provide nearly monochromatic gamma sources. This method, originated by J. M. West has never been used and yet it offers many possibilities for both shielding studies and accelerated gamma effect studies. This gamma source can produce neutrons from a γ, n reaction on Be in the neighborhood of 10^6 to 10^8 n/sec.

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Several requests frequently have been made by other divisions regarding the effects of gamma and neutron irradiations on many types of materials. The above mentioned gamma source could serve excellently for accelerated testing of materials which are to be used around but not in the piles.

Exponential Pile Studies

The exponential project has been approved and is awaiting a Field Release by Project Engineering. Pile plans and shop and laboratory facility plans are being arranged at present. Procurement lists are awaiting the final release. Instrument development is progressing satisfactorily toward the immediate goals of standardization of Geiger counters and the fabrication of a proportional counter amplifier.

CRITICAL MASS PROJECT - F. E. Kruesi

General

Authorization was received on October 12, 1949, for expenditures of $198,000 to proceed with work as requested in Part II of the Project Proposal. Part II funds will provide for the fabrication, instrumentation, and for auxillary components of the #1 Test Unit. In addition, provisions were made for the design of the #2 Test Unit, if a second unit is found necessary. The combined appropriation for Parts I and II is not to exceed $328,000.

Site Preparation Progress

Work has been progressing slowly on the preparation of the P-11 site area. The following items were completed during this report period: security fence, underground piping, disposal crib, septic tank, and the installation of the site water pump. The guard and pump houses have been completed excepting for electrical installations and the installations of the water storage tank and hypochlorinator.

The erection of the Stran Steel experimental building is in progress, work having been started on the steel frame towards the end of the month. A considerable amount of work remains to be done on this building.

Design and Fabrication of the #1 Test Unit

The design of the #1 Test Unit is virtually completed. Minor changes in a few components will be necessary as fabrication proceeds.

The fabrication of the cylindrical reactors is nearing completion. The manufacturer has been successful in meeting the required tolerances. Work has not yet commenced on the #1 Test Unit with the exception of the solution chambers. A visit was made to the Puget Sound Naval Station on October 5, 1949 concerning the manufacturing schedule for the test unit. It was estimated that two months would be required to complete this work. Authorization and materials have now been supplied the Puget Sound Naval Station and work will start immediately.

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ment Development Division is making good progress in all phases of instrument work. It is estimated that this work will be completed er, well in advance of the test unit excepting for wiring and ad- requiring work on the test unit. U^{235} foils were received from s and are currently being fabricated into a fission counter.

ources have been ordered and will be available by December 15, 1949. es were required, one, a mock fission source of 10^7 n/sec., and the egular source of 10^6 n/sec. strength. Both sources are Po-Be. source container was received from the fabricator and found to be ory.

tion of the Hazards Involved in an Uncontrolled Supercritical P-11 Reacti

l study of the radiation and explosion hazards involved, should rolled divergent reaction take place in P-11 experimental work, has . Calculations of the maximum radiation dosages to personnel and the of the "worst case" situation were studied with the following results.

reactor is made supercritical the energy production rates are such enough active solution will be ejected to stop the reaction before sive rates can be reached. The margin of safety is substantial in ense that the rates involved are smaller than explosive rates by al orders of magnitude. (This situation presumably might arise were ion added at the maximum rate to a reactor vessel which had already made critical.)

solution, possibly in the form of mist, may be blown out into the room, thus seriously contaminating this area.

amma dosages received by personnel in the control room would reach a m of about 10 roentgens.

bility of the occurrence of an uncontrolled reaction is extremely Personnel involved in the design and operation of the P-11 equipment the benefit of similar experiments using U^{235} at Oak Ridge, in safety controls have been provided to protect against an inadvertent at might lead to an accident.

l report of the work summarized here is in preparation.

T WORK - [illegible] Duvall

Pile

configuration frequently used in sigma and exponential piles consists inally equal sources placed at $x = \pm a/4$, $y = 0$ in the base of a r pile in which x and y axes are parallel to the sides of the pile, is at the center of the base and the dimension of the pile in the

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x-direction is a. The treatment for the case where one source is slightly displaced from its symmetrical position was described in the monthly report for September. Another case of importance is that where the strength of one source is slightly greater than that of the other. As before the neutron density is given by

$$n = \sum_{\substack{m,n \\ \neq 0}} \Big\{ A_{mn} (-1)^{(m-1)/2} \sin m\pi/2 \; \cos m\pi x/a + b_{mn} (-1)^{m/2} \cos m\pi/2 \cdot \sin m\pi x/a \Big\} (-1)^{(n-1)/2} \sin n\pi/2 \; \cos n\pi y/b \; \exp(-z/B_{mn}) \cdot \Big\{ 1 - \exp\left[-2(Z-z)/B_{mn}\right] \Big\} \qquad (1)$$

where a, b, and Z are the length width, and height of the pile and

$$1/B^2_{mn} = 1/L^2 + \pi^2 (m^2/a^2 + n^2/b^2),$$

L being the diffusion length in the pile. If the two sources at -a/4 and a/4 have strengths 1 + ε and 1 respectively, they are represented by a Fourier series

$$F(x,y) = (2/b) \sum_{m \text{ odd}} \sum_{p=1}^{\infty} (g_p \sin p\pi x/a + f_p \cos p\pi x/a) \cos m\pi y/b \qquad (2)$$

where

$$g_p = \begin{cases} 0, & p = 1, 3, 4, 5, 7, 8, 9, \ldots \\ -(2\epsilon/a) \sin p\pi/4, & p = 2, 6, 10, \ldots \end{cases} \qquad (3)$$

$$f_p = \begin{cases} 0, & p = 2, 4, 6, \ldots \\ (2/a)(2+\epsilon) \cos p\pi/4, & p = 1, 3, 5, \ldots \end{cases} \qquad (4)$$

The coefficients in (1) are obtained by requiring that the flow of neutrons into the pile be equal to the strength of the sources. The result is

$$A_{mn} = \frac{4\epsilon B_{mn} \sin m\pi/4}{D\,a\,b\,\{1 + \exp[-2(Z-z)/B_{mn}]\}}, \quad m = 2, 6, 10, \ldots \qquad (5)$$

$$b_{mn} = \frac{2(2+\epsilon) B_{mn} \cos m\pi/4}{D\,a\,b\,\{1 + \exp[-2(Z-z)/B_{mn}]\}}, \quad m = 1, 3, 5, \ldots \qquad (6)$$

where D is the diffusion coefficient in the pile.

An estimate of the effect of the source inequality on the neutron distribution is obtained by taking the ratio of the second harmonic to the fundamental in (1) at x = y = 0. The result is

$$\frac{\epsilon B_{21}}{(2+\epsilon) B_{11}} \exp\left[-z(1/B_{21} - 1/B_{11})\right] \cong 0.39\,\epsilon \exp(-.0077z), \qquad (7)$$

[redacted]

where z is the height above the base at which the neutron density is observed. It is seen from (7) that an inequality of 10% in the sources produces a (2, 1) harmonic that is only 2.6% of the fundamental on the axis at z = 50 cm. Since 10% is the greatest inequality that would normally be expected in the sources, the "harmonic distortion" should be no worse than 3%.

2. Xenon

The least squares analysis of the first B - shutdown has been delayed for lack of IBM time, but should go ahead shortly.

The xenon test at H has been completed and the data await analysis. It was originally hoped that the H-test would provide information about the effect of control rods on neutron flux. These hopes have become faint since it was discovered that the proportional counter on which pile periods were measured wasn't operating properly during the first day and a half of the test.

It may be worthwhile to partially summarize the status of the xenon problem at this time. Prior to the H-test there have been two extended pile shutdowns during which reactivity was followed, the reactivity as a function of time was fitted in each case by a sum of exponentials with decay contants assumed to be known. The second B-shutdown showed that the coefficients of the exponentials necessary to fit the observations varied with time elapsed after shutdown. From the preliminary analysis of the first B-shutdown described in the monthly report for September it appears that coefficients show similar behavior in that case. In looking for possible explanations three alternatives appear. (i) The test starts with no control rods in the pile and ends with almost all in; the time variation of coefficients may simply reflect the progressive flux distortion produced by the insertion of control rods. (ii) The decay constants of the exponentials used to fit the data may be in error by at least 1% and perhaps more. As shown in the previous monthly report, small variations in decay constants may produce rather large changes in coefficients. (iii) There may be other time varying poisons that haven't yet been discovered.

It was hoped that the test at H would enable us to evaluate (i) above. (See memo to U. M. Staebler, 10/20/49.) If that fails there are still some isolated observations which may be helpful, and a theory has been constructed which may be of use. The data from the first B-shutdown will be analyzed for coefficients in ten hour intervals, so their time variation can be observed in some detail. It is expected that this analysis will shed some light on the effects of (ii) and (iii) above.

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