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NUCLEAR PHYSICS RESEARCH OPERATION:

MONTHLY REPORT.

AUGUST 1958

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MONTHLY REPORT,

AUGUST 1958

By Authority of CC PR-2,
DS Lewis, 12-10-98.
By Gerri Mally 1-3-94.
Verified By DK Hanson, 1-14-94

Compiled by Members of
Nuclear Physics Research
Physics and Instrument Research and Development
HANFORD LABORATORIES OPERATION

Submitted by: John E. Faulkner

September 9, 1958

HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON

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NUCLEAR PHYSICS RESEARCH OPERATION

MONTHLY REPORT

AUGUST 1958

FISSIONABLE MATERIALS - 2000 PROGRAM

METALLURGY

Nuclear Safety Considerations - N. Ketzlach

At the request of A.E.C., a "Guide to Shipment of U²³⁵ Enriched Uranium Material" compiled and edited by H. F. Henry of the Oak Ridge Gaseous Diffusion Plant was reviewed and comments submitted.

Nuclear safety of shipping three rough castings of plutonium hemispherical shells was reviewed for Plutonium Metallurgy Operation. Two castings weighed 5.2 kg each, and the third weighed 3.5 kg. The shipping of this material using standard 20 inch x 20 inch x 20 inch birdcages (one casting per birdcage) was determined to be safe.

Since there are no experimental data for the criticality of plutonium shells either bare or water reflected, an empirical method was used to estimate critical masses for shells of different diameters. Shell castings can contain more plutonium than the minimum critical mass based on water-flooded metal spheres. The results were transmitted to U.C.R.L. at Livermore for comment.

Experimental Work to Determine Nuclear Safety of Shipping 0.95 Percent Uranium in Iron Tubes - R. C. Lloyd

Exponential experiments were made with 0.95 percent enriched uranium positioned in 49 mil, Type 3S Al tubing and 49 mil Fe tubing. The fuel elements were 1.34 inches in diameter; the separation between adjacent rods in the hexagonal lattice was 2.0 inches. Previous measurements were made at rod separations of 2.1, 2.2, and 2.4 inches. The recent measurements extended the previous data and provided a better estimate of the maximum buckling. The buckling for the fuel elements in the Al tubing was 1924 μ B and in the Fe tubing, - 303 μ B. The effect of replacing the Al tubing with iron was to reduce the buckling by 2227 μ B which compares with previous reductions of 2100 - 2300 μ B for larger lattice spacings. The experimental data were used for checking theoretical calculations in reference to a study of the nuclear safety of iron encased fuel elements in shipping and storage⁽¹⁾.

(1) Ketzlach, N., "Nuclear Safety of Iron Encased Fuel Elements", HW-56423.

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REACTOR

STUDIES RELATED TO PRESENT PRODUCTION REACTORS

Thermal Neutron Flux in a Medium with a Temperature Discontinuity

A. Theory - D. A. Kottwitz, J. E. Schlosser, D. D. Matsumoto

The precise evaluation of the first 20 universal constants occurring in the analytical solution has been carried out by means of double precision arithmetic on the IBM-702. The first ten of these have been checked by an independent hand calculation, thus insuring that all of the numbers are good to at least ten significant figures.

An OMNICODE program using these constants has been written to calculate the flux directly from the analytical solution. Tests of a recursion scheme used in this program are underway.

The investigation of the effects of boundary conditions, boundary location, and mesh size on the numerical solution of the partial differential equation continues.

B. Experiment - R. A. Bennett

Irradiation experiments have been underway in the core of the P.C.T.R. for the purpose of studying neutron thermalization near a temperature discontinuity in graphite. Ten successful irradiations have been made yielding data on two high temperature discontinuities ($\Delta T = 300^\circ\text{C}$) and three low temperature discontinuities (liquid nitrogen experiments). Partial analysis of one of the high temperature experiments indicates good agreement between inferred neutron temperature changes obtained from flux traverse data and observed graphite temperature changes. Analysis of the data for the determination of the relaxation length for thermal neutron interchange and the transfer cross section have not been completed.

In connection with the analysis of the flux traverse data, an IBM-650 program for foil decay correction has been written which will reduce a portion of the data analysis effort by approximately 80 percent. This program has wide application outside this experimental investigation and is available upon request. A report describing the program is forthcoming. Additional high temperature experiments await the receipt of high power calrods.

Fuel Temperature Coefficients - R. C. Smith

A communication from P. Blomberg of the Reactor Development Division of the Swedish Aktiebolaget Atomenergi has been received. He sent a paper giving the result of theoretical calculations on the temperature coefficient of the resonance integral as a function of the fuel rod geometry and the large series of preliminary

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measurements. The measurements imply an unexpectedly large variation with temperature in the surface term of the resonance integral. The reliability of the measurements may be questioned, and, in one respect, are preliminary from the point of view of the Swedish workers. Though we do not, therefore, repeat their results here, they will be made available to anyone interested in them.

Work has continued on the formulation of our own program which would resolve these questions.

Relative Reactivities of Solid and I and E Slugs - G. W. R. Endres

The exponential pile program has been changed so that we may satisfy a special request from Process and Reactor Development Operation. The work involves the measurement of the differences in buckling between the wet and dry H-pile lattices using the old solid slug and the new I and E slug. No results are yet available, although measurements are in progress.

Computational Programs and Services - D. D. Matsumoto

Programming services supplied to other components of Nuclear Physics Research include the following:

For Critical Mass Physics, the program for solution of a 4×4 determinant was revised to provide for another set of conditions and four cases were run with the revised version. For Reactor Lattice Physics, a program for correcting for decay of foil activity was written and successfully applied to 93 cases. The program for calculating reactor reactivities from flux multiplication data has been assembled and is awaiting sample data for debugging.

STUDIES RELATED TO FUTURE PRODUCTION REACTORS

Lattice Measurements for Cluster Fuel Elements - G. W. R. Endres, E. Z. Block, and R. I. Smith

Measurements on the 6 3/16-inch lattice having 7-rod clusters of 1/2-inch-diameter uranium rods resulted in the following material buckling values:

<u>Bucklings (10^{-6} cm^{-2})</u>		<u>Volume Ratios</u>		
<u>Dry</u>	<u>MIPB</u>	<u>G/U</u>	<u>Al/U</u>	<u>Coolant/U</u>
- 102	- 62	25.24	0.711	0.864

The dry case was re-run because the previous measurement (-98×10^{-6}) used data which did not yield a satisfactory least squares fit.

The 0.926-inch fuel rods for use in the test cell of these cluster lattices are being machined in the Technical Shops, together with the other lattice components needed in the P.C.T.R. measurements.

STUDIES RELATED TO SEPARATIONS PLANTS

Criticality Studies in Support of Processing Power Reactor Fuels

A. Experiments with Heterogeneous Systems - R. C. Lloyd, E. D. Clayton, and R. B. Smith

In reference to criticality studies for support of reprocessing power reactor fuels, critical approach experiments were continued with three percent enriched, 0.925-inch-diameter uranium rods in water moderated lattices. Some delays were encountered because of the 305-B Building expansion program, which interrupted the T.T.R. operation (several of the T.T.R. safety channels are used in the critical approach experiments). Critical mass determinations have now been made for a 1.6-inch lattice and a 1.7-inch lattice at each of two different cylinder heights; in one case, the fuel rods were 24 inches in length and in the second case, 16 inches. In both cases a hexagonal pattern was used for the lattices which were water reflected; the uranium was positioned in Lucite tubes. The critical mass data for the cylinders at the different height-to-diameter ratios will be used to evaluate reflector savings. Preliminary results are listed below which show the reduction in the critical mass for the more favorable geometry (shorter cylinders). The critical mass data for the 24-inch rods were given in the previous report but are again listed here to facilitate comparison.

<u>Lattice Spacing</u>	<u>H₂O/U (by Volume)</u>	<u>Number of 24-inch Rods for Criticality</u>	<u>Quantity of Uranium</u>
1.6 inches	2.29	52	573 lbs.
1.7 inches	2.72	49	540 lbs.
		<u>Number of 16-inch Rods for Criticality</u>	
1.6 inches	2.29	64	470 lbs.
1.7 inches	2.72	58	426 lbs.

B. Experiments with Homogeneous Systems - J. A. Berberet and V. I. Neeley

Work proceeded in the analysis of the data for determining k_{eff} of three percent enriched $\text{UO}_2/\text{H}_2\text{O}$ mixtures from the P.C.T.R. measurements.

Approximately 15 pounds of nominal five mil blown tubing made of Type 9 MARLEX resin containing four percent boron carbide dispersed by Banbury Milling was received from the Plastics Sales Division of the Phillips Chemical Company of Bartelsville, Oklahoma. The boron carbide was

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supplied by Critical Mass Physics. The material was prepared at no charge for testing purposes and comments; the material is being used to poison the test cell and buffer regions in the k_{∞} measurements for the three percent enriched UO_3 in the P.C.T.R.

Critical Mass Experiments for E-Metal Dissolver - E. D. Clayton and N. Ketzlach

Dr. A. D. Callihan of the Oak Ridge Critical Mass Laboratory has begun the criticality studies with the 0.95 percent enriched I and E type (1.37-inch O.D., 0.48-inch I.D. fuel elements; the fuel elements are six inches in length. The first measurements were made with a random distribution of fuel elements in a mockup of the Hanford-type dissolver, a 52-inch-diameter water reflected tank. The first loading had a water-to-uranium volume ratio of 1.11 (556 pounds $U/ft.^3$). The vessel which contained about 12 tons of uranium (lattice height equals $3\frac{1}{4}$ inches) was subcritical with a multiplication of three. A conservative extrapolation to criticality indicated a critical mass of about 16 tons for this loading. A second loading resulted in the same water-to-uranium volume ratio. The multiplication for the second loading indicated the critical mass to be in excess of 16 tons. A third measurement was made with a hemispherical pile of fuel 16 inches deep on top a cylindrical pile 29 inches deep in the vessel; the multiplication for this arrangement was about ten percent greater than that of the first case discussed above.

The critical mass is now to be measured in a uniform array, prior to the attainment of additional uranium for further criticality studies in random arrays. The critical mass determinations in the uniform arrays will provide the necessary data for making accurate comparisons between the two types of loadings; in addition, the results can be used for checking exponential experiments.

The work of Dr. A. D. Callihan is an extension of the Hanford exponential experiments which were conducted with randomly distributed fuel elements. The fact that the 12 tons of uranium was not critical in the dissolver may be attributed to several causes; (1) the stacking density of 556 pounds $U/ft.^3$ (H_2O/U volume ratio of 1.11) is higher than expected and results in an undermoderated system, and (2) there is a reduction in the critical buckling for the fuel elements in the random distribution over that of a uniform array at the H_2O/U volume ratio of 1.11; Hanford exponential experiments also inferred this.

If 16 tons are postulated as being critical, then these data would infer a reduction in the critical buckling of about 30 percent at the H_2O/U volume ratio of 1.11. Exponential experiments with two I and E type fuel elements had previously inferred reduction ranging from about 30 to 40 percent. However, in both of the exponential experiments, the H_2O/U volume ratio was considerably higher with values of 1.48 and 1.81 for the two different cases.

The bare fuel element which gave an H_2O/U volume ratio of 1.48 was four inches in length, with a 1.66-inch O.D. and a 0.94-inch I.D. The fuel element with the H_2O/U volume ratio of 1.81 was canned, having the following dimensions, 8.6 inches in length, 1.47 inches O.D., 0.37 inches I.D.

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If we assume that 16 tons of uranium would be critical in the Hanford-type dissolver (which for the current data appears conservative), this would imply that the critical buckling is 1600 μB for the $\text{H}_2\text{O}/\text{U}$ volume ratio of 1.11 in the random array. In a uniform array at this $\text{H}_2\text{O}/\text{U}$ volume ratio, the buckling is estimated to be 2300 μB . Thus, there is a reduction of 700 μB for randomness.

If we now make use of these data and assume that the buckling will be reduced by 700 μB at higher $\text{H}_2\text{O}/\text{U}$ volume ratios as well, then we may ask how much enriched uranium may be safely processed in a Hanford dissolver?

In order to arrive at a value, two items must be considered; (1) the uranium after exposure will have an effective enrichment higher than 0.95 percent, about 0.98 percent, and (2) although the fuel elements stacked in at an $\text{H}_2\text{O}/\text{U}$ volume ratio of 1.11 (undermoderated) this will not necessarily be the case, and the $\text{H}_2\text{O}/\text{U}$ volume ratio can change during dissolution (consider water flooding at partial dissolution).

Two corrections must then be made, we must correct for an enrichment of 0.98 percent, and we must further base any proposed critical mass limit on the $\text{H}_2\text{O}/\text{U}$ volume ratio which results in the minimum critical mass, not on the $\text{H}_2\text{O}/\text{U}$ volume ratio of 1.11.

The material buckling at the $\text{H}_2\text{O}/\text{U}$ volume ratio for minimum critical mass (about 1.85) is calculated to 3320 μB for an enrichment of 0.98 percent; 500 μB is added for the enrichment difference; the buckling enrichment difference depends also on the $\text{H}_2\text{O}/\text{U}$ volume ratio. Assuming a reduction of 700 μB for randomness, the value is 2620 μB . The critical mass in cylindrical geometry is then estimated to be 6.3 tons in the 52-inch-diameter Hanford dissolver. For the above $\text{H}_2\text{O}/\text{U}$ volume ratio and buckling, the radius of a critical hemisphere is larger than the radius of the dissolver; therefore, in this case, the hemisphere cannot be used as a credible model, although the critical mass estimate for the hemisphere is 6.4 tons.

The difference between 16 tons and 6.3 tons results from (1) the increased buckling at the 0.98 percent enrichment, and (2) the different $\text{H}_2\text{O}/\text{U}$ volume ratio. For example, with equal critical volumes the difference in the $\text{H}_2\text{O}/\text{U}$ volume ratios would account for about a 26 percent reduction in critical mass, however, for the above case the difference in buckling results in a volume reduction of about 1.87. The total reduction is thus 2.53 which gives 6.3 tons for criticality. The value of 6.3 tons results from our use of 2620 μB at the $\text{H}_2\text{O}/\text{U}$ volume ratio of 1.85 instead of 1600 μB at the $\text{H}_2\text{O}/\text{U}$ volume ratio of 1.11.

The previous limit for 0.98 percent enriched I and E fuel elements, safe for double batching, was 1.7 tons. Assuming a 700 μB reduction for randomness, the new limit would correspondingly be 2.8 tons. These numbers both assume a ten percent safety factor on the estimated critical mass.

The preceding analysis was discussed in some detail to show the interpretation which must be applied to the incomplete experimental data. Before accurate comparisons can be made, it will be necessary to obtain criticality in the

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random array, or at least provide better estimates of the critical mass, and also to determine the critical mass in the uniform array. It must also be cautioned that the Oak Ridge experiments will provide data in the random array at only one H_2O/U volume ratio, i.e., we must assume that the reduction holds for H_2O/U volume ratios at more nearly optimum conditions of moderation.

Nuclear Safety, Critical Mass Consultations - N. Ketzlach

A. Nuclear Safety in 234-5 Building Processing

1. The nuclear safety of an array of plutonium pieces (< 2 kg/piece) surrounded by depleted uranium was reviewed. Such an array can occur in the radiograph assembly. A circular array of ten pieces was determined to be safe with a center-to-center spacing of twelve inches; thus, ten pieces may be radiographed simultaneously.
2. Prints on the new Degreasing and Briquetting Hood for the RMA line were reviewed with members of C.P.D. and safe batch limits established.
3. Final drawings on a metal storage bin for room 194 were also reviewed. Since the drawings meet the criteria previously given for the design of such a storage system, the facility was determined safe. The storage facility consists of two parallel arrays three feet apart. There are 30 storage compartments within each array. The compartments are so designed that the distance between nearest pieces is 18 inches.
4. A meeting was held with members of C.P.D. to discuss nuclear safety considerations in the design of an incinerator and associated equipment to recover plutonium from rags, ice cream cartons, rubber gloves, etc. Preliminary sketches of this system have been reviewed and recommendations for revisions to insure nuclear safety have been made.

B. Purex Technology Operation

Process Specifications for Critical Mass Control - Purex Plant (Revision 2) HW-56913 have been reviewed. The nuclear safety specifications have been based on information previously submitted to members of C.P.D. The nuclear safety aspects of this document have been approved.

C. Power Fuels

Drawings of recommended shipping casks for power fuels have been received by C.P.D. from Atomics International and Commonwealth Edison. These drawings have been reviewed with members of C.P.D. Since C.P.D. prefers our recommended design for a single cask that can be adapted to fuel elements from all power reactors that are scheduled for processing at Hanford, studies will be initiated to determine safe geometries for UO_2 fuel elements of less than five percent U^{235} enrichment. Some of the restrictions on cask design based on uranium metal fuels are too restrictive to handle some of the fuel assemblies from power reactors using uranium oxide fuels.

D. Criticality for E-Metal Dissolution

A study has been made which shows that if an initial load of I and E fuel elements (1.37-inch O.D., 0.48-inch I.D.) is not critical in a dissolver, then the uranium will remain subcritical during the dissolution process. The results of this study are reported in HW-57271, "The Dissolution of I and E Fuel Elements". It was known previously that solid fuel elements would remain subcritical during dissolution.

E. Miscellaneous Studies

1. A rough draft of HW-56922, "Hanford Instrumentation and Procedure for Prevention, Detection, and Evaluation of Criticality Incidents," by R. L. Stevenson (C.P.D.) was reviewed and comments transmitted to the author.
2. Interest has been shown by members of H.L.O. as well as C.P.D. on criticality conditions for the handling and processing of neptunium²³⁷. In view of the lack of data on this element, conservative criteria have been established for its processing: (1) When handling solutions of Pu and Np²³⁷, nuclear safety can be based on that for plutonium solutions (consider only Pu content of solutions). (2) For Np²³⁷ in the oxide or other solid compound without moderation, the nuclear safety can be based on plutonium systems of this type. In other words, in fast systems, the Np²³⁷ should be considered as plutonium. Since these restrictions will not hamper the processing of this material, the rules are considered operable.
3. The study made last month to show the effect of moderator density on the critical parameters has been documented. It has been issued as document HW-56938, "Criticality of Highly Enriched U²³⁵ Fuels".

Neutron Age Measurements - D. G. Foster, Jr., R. A. Laing

One run was completed during the month using the large diameter source in kerosene. The only difficulty encountered in this run was the distortion of indium foils caused by a faulty thermostat which allowed the foils to overheat during the drying process.

The program of data reduction for the IBM-650 for these measurements was debugged and appears to be correct.

Mass Spectrometer for Plutonium Analyses - C. R. Lagergren, W. J. Friesen

The permanent magnet of the spectrometer was successfully magnetized to saturation. The magnetic field intensity was measured and the spatial variation of the field determined. The field strength in the gap is 8,001 gauss with a maximum variation of about 20 gauss within the gap. The field drops to 40 gauss at 13 inches from the pole face edge along the axis of the analyzer tube.

The vacuum system including the source vacuum lock sample changing system and gauges has been tested and found satisfactory. Pressures in the 10^{-7} mm Hg range have been obtained in the analyzer, source and third differential pumping stage with the traps cooled by liquid nitrogen. Further outgassing of the analyzer tube is desirable.

The high voltage and filament supply circuits have undergone tests preliminary to the installation of the special high voltage cabling. The ion counting system is ready to test when the test pulse generator is completed.

REACTOR DEVELOPMENT - 4000 PROGRAM

STUDIES RELATED TO THE PLUTONIUM RECYCLE PROGRAM

Theoretical P.C.T.R. Studies - R. H. Meichle, D. D. Matsumoto

Work has been resumed on the problem of the thermal neutron distribution from a thermal line source in the presence of a cylindrical cavity in an otherwise infinite medium. The present effort is to investigate the effect on the flux of changes in the cavity radius and the cavity - source separation. To aid in this investigation, the analytical solution derived earlier has been programmed for the IBM-650. Using this program, flux calculations have been made for a range of the parameters involved. These data are now being analyzed.

Fuel Isotope Concentrations - J. R. Worden

The program for computing isotope concentrations on the Litton computer is nearly complete. Plots of U^{235} , U^{238} , and Pu^{239} concentrations versus both flux time and local MWD/T have been successfully achieved. A Program for uranium-fueled reactors with build-up through Pu^{241} which plots isotope concentration as a function of local exposure needs only debugging to be complete. This will be accomplished at such time as the computer is again returned to operative status.

The present program requires 20 integrators; the contemplated extension of the program to include Pu^{242} build-up will require some modification in the present program for lighter isotopes, because of inherent characteristics of the machine when more than 20 integrators are used.

Lattice Parameters for UO_2 Clusters - J. R. Lilley

A series of calculations are being made in an attempt to correlate our lattice parameters for 19-rod UO_2 clusters in D_2O , with similar measurements and calculations made at other sites. The method being used is essentially that of Critoph⁽¹⁾, with use of Hellstrand's⁽²⁾ work in a portion of the p calculation.

(1) E. Critoph, CRRP-655 (1955)

(2) E. Hellstrand, J. Applied Physics, 28, 1493 (1957).

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To date, the values of the thermal utilization for 19 rods of UO_2 with and without D_2O coolant in 8- and 9-inch lattices have been computed and compared to P.C.T.R. results. The calculations of p are in progress. The values of f agree very well in the 9-inch cases and are within 9 mk for the 8-inch lattice.

CROSS SECTION PROGRAM

Subthreshold Fission - Np^{237} and Am^{241} - E. J. Seppi, B. R. Leonard, Jr., S. J. Friesenhahn

A high resolution run (0.5 $\mu\text{sec/m}$) was completed on the 1.25 ev resonance in Am^{241} . About ten points were taken over the resonance with a total counting time per point of about 24 hours. The total fission counts per point were less than 100 counts at the peak of the resonance. Despite the poor statistical precision of the data the information obtained is of considerable value in demonstrating resolution effects. The operating efficiency during August was only about 40 percent because of reactor outages and high radiation levels which prohibited entry into the spectrometer facilities (105-DR).

The lower resonances of Am^{241} and Np^{237} are now being investigated.

Fission Cross Section - Pu^{241}

A special sample containing 96 percent Pu^{241} was allocated to Hanford for improved fission cross section measurements. Fission foils are being prepared of the approximately 10 mg of material.

Three Crystal Spectrometer - E. J. Seppi, J. H. McCrary, S. J. Friesenhahn

Installation and preliminary tests have been completed of the control units and data recording system for the spectrometer. The system has operated satisfactorily except for the third axis milling machine dividing head which is the rotation axis for the analyzing crystal. The torque requirements for driving this dividing head are much more severe than for the other dividing heads and the motion is erratic. A mechanical investigation of the head has been started.

A theoretical analysis has been performed on the incoherent scattering from vanadium. The analysis indicates that a valid calibration of the analyzing crystal and detector can be made by observing the intensity of elastically scattered neutrons from vanadium as a function of incident neutron energy. The analysis also indicates that it is desirable to determine the vibrational spectrum of vanadium by measuring the inelastic scattering. These data can be compared with the results of other experiments obtained using lower energy incident neutrons. The spectrometer has been programmed to study the vanadium scattering.

Time-of-Flight - J. T. Russell

The Van de Graaff accelerator was shut down for modification and no operating time was available. The design of a new mount and positioning system for the Van de Graaff was completed.

OFF-SITE PROGRAMMass Spectrometer - C. R. Lagergren, W. J. Friesen

The instrument system for the mass spectrometer for this program is in the same status as the 2000 program mass spectrometer. The permanent magnet for this spectrometer has been energized and the magnetic field intensity and its spatial variation have been determined. The vacuum system for the spectrometer has been cleaned and is being installed.

EXPERIMENTAL REACTOR OPERATIONSP.C.T.R. - H. L. Henry, H. A. Fowler

Operation of the P.C.T.R. continued routinely during the month on a one-shift basis. There were no unscheduled shutdowns. A series of neutron thermalization experiments was begun and partially completed.

Construction of the addition to the building continued. The roof reinforcing beam was installed and the doorway and stairway from the T.T.R. Assembly Room were essentially completed. This work had prevented T.T.R. operations. The floor was cast, and delivery of concrete blocks is expected during the first week in September.

Plans for the relocation of the 305-B and 314 Building fence have been completed and turned over to the Commission. Bids are expected during September. After the change, these buildings will no longer be in the 303 Exclusion Area.

T.T.R. - H. L. Henry and W. P. Stinson

Critical mass approach experiments continued during the month.

Construction work prevented reactor operation; however, at month end work nearly completed on reactivating the control and counting instruments.

DECLASSIFIED

HW-57394

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INFORMAL REPORTS ISSUED

HW-56938 "Criticality of Highly Enriched U-235 Fuels," N. Ketzlach
July 29, 1958 (Unclassified)

HW-57143 "Criticality of Oralloid and Plutonium Shells," N. Ketzlach
August 12, 1958 (Secret)

HW-57271 "The Dissolution of I and E Fuel Elements," N. Ketzlach
August 25, 1958 (Unclassified)

HW-57127 "Nuclear Physics Research Monthly Report for July," J. E. Faulkner
August 11, 1958 (Secret)

FORMAL REPORTS ISSUED

HW-54687 "Correlation of Theoretical and Experimental Values of the
Ratio of Fast to Thermal Fissions," M. T. Lee, June 19, 1958
(Unclassified)

PAPERS SUBMITTED FOR PUBLICATION

H. W. Lefevre "Vernier Chronotron" - Submitted for publication in Review of
J. T. Russell Scientific Instruments.

B. R. Leonard, Jr. "The Width of the 1.0 EV Resonance in Pu^{240} " - Revised
E. J. Seppi manuscript submitted for publication in Nuclear Science
W. J. Friesen and Engineering.

PAPERS ACCEPTED FOR PUBLICATION

R. C. Lloyd "Variation of Graphite Diffusion Length with Temperature," - For
C. R. Richey publication in Nuclear Science and Engineering.
E. D. Clayton

DATE

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