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IRRADIATION PROCESSING DEPARTMENT MONTHLY RECORD REPORT JANUARY, 1960

Compiled By
IPD Personnel

February 19, 1960

RICHLAND, WASHINGTON

Work performed under Contract No. AT (45-1) - 1350 between
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IRRADIATION PROCESSING DEPARTMENT
MONTHLY RECORD REPORT
JANUARY, 1960

RESEARCH AND ENGINEERING OPERATION

Test irradiations of self-supported fuel elements continued at B and C Reactors. The test at B Reactor has reached 650 MWD/T exposure with a goal of two ruptures and the one at C Reactor has reached 250 MWD/T exposure with a variable goal.

Document HW-63280 was issued and gives current data for comparisons of the "Alternate Fission Product Confinement Systems for the New Production Reactor."

The second test capsule of graphite samples was discharged from the GEIR. Analyses showed contraction rates consistent with those of previous samples; the graphite made from needle coke contracts somewhat less than the CSF reference graphite; the graphites made with finer coke particles and exposed to higher graphitizing furnace temperatures contracted at a slightly slower rate than conventional graphites; and a significant increase in contraction rate is indicated at temperatures above approximately 1000 C.

The primary limit to all reactor power levels at month end was based on fuel element failure control.

The new IBM 709 program for accountability calculations is being normalized to give yield values equivalent to the previous program in the normal exposure range pending results from separation of several tons of specially monitored material.

MANUFACTURING OPERATION

Record reactor input production (1.7 per cent above the November, 1959 maximum) was 7.7 per cent above forecast; 1.8 per cent above at the six old reactors and 16.4 per cent above at the K Reactors. Forecast was exceeded due to high time operated efficiency at the K's and improved average power levels at all reactors.

The combined reactor instantaneous power level was increased 895 megawatts. Record levels at the individual reactors were increased 45 megawatts at B, 65 at C, 5 at D, 80 at F, 55 at H, 30 at KE, and 100 at KW.

Over-all time operated efficiency was 82.2 per cent (81 per cent forecast); 81.1 per cent at the six old reactors and 85.5 at the K Reactors.

Fifteen ruptures, fourteen I and E, and one solid regular, were removed from the reactors. Four of the I and E ruptures were at B, four at C, two at KW and one each at DR, F, H and KE. The solid rupture was at KE. Seven of these ruptures were stuck and one caused a process tube leak.

Significant items of equipment experience were:

1. One-hundred five process tubes were installed; 65 at D, 19 at H, 14 at F, 2 at B, and 1 each at C, DR, and KE.

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2. Seven process tube leaks were corrected. Five were leaks within the tube and two were Van Stone leaks.
3. An outage at D Reactor was caused when a bearing failure in a 190 Building pump allowed metal pieces to enter the process water.
4. Rear face material handling equipment, used for the first time, improved the metal charging rate at KW Reactor.
5. Non-equilibrium start-up losses were significantly reduced at KE by the use of splines.

FACILITIES ENGINEERING OPERATION

Studies being performed by Holmes and Narver regarding the seismic vulnerability of the existing reactor building structures and the associated reactor process water systems continued. Eight interim reports were received.

Scope drawings for Project CG-775 are 85 per cent complete. The scope drawing on the modifications to the river pump house was revised to show the installation of one submersible pumping unit in each of the six bays.

The over-all design for Project CGI-791 is 79 per cent complete. Scoping for Phase III is 92 per cent complete. Installation of diesel engines as alternate power drives on two electrical driven fans has been recommended for improved reliability to the K exhaust fan system. New steam turbines are also recommended for 105-B, D, DR and F to improve the reliability of the emergency exhaust systems in these areas. The testing program is 92 per cent complete.

Detail design for Project CGI-839 is 78 per cent complete. The detail design progress schedule was revised to provide additional time to prepare new drawings required to locate additional switchgear in the 1706-KER Building. The use of canned motor pumps rather than mechanical seal pumps increased the electrical demand.

Six scope drawings for Project CGI-844 are ready for Project Representatives approval. Drawings for an alternate diesel pump station for the last ditch installation have been issued for comment.

The cap remover prototype has been assembled and is on a temporary carriage in 108-D, connected to a program simulator and operated functionally.

A spline coiler, to replace the troublesome spline choppers, has been built and tested in the laboratory.

The prototype safety circuit trip identification system in DR was completed and acceptance tests performed.

Several different boring tools, including a diamond drill, are being purchased for tests on graphite over-boring at the next DR Reactor outage.

The results of the first ETR rupture test indicate that the gross gamma rupture monitoring device may be more than sensitive enough for NPR.

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The K Reactors have been equipped for improved handling of rear nozzle caps. The appropriation request for funds to provide similar cap handling equipment in other areas has been approved.

Assistance was provided in the installation of a new coal sample cutter at 284-W, the HAPO coal sampling center.

The Project CGI-791 (Reactor Confinement) Phase II construction contractor is approximately six per cent complete.

During the month considerable engineering effort was spent on budget studies for reactor modifications. This information has been issued in separate reports.

RELATIONS PRACTICES OPERATION

Ten BS/MS and two PhD candidates were interviewed with seven offers extended. Thirteen exempt employees transferred into the Department from other HAPO components. There were three transfers to other GE Departments, one to the AEC Chicago Office and one resignation to accept outside employment. Work continued on IPD's 1960 Salary Review with section guide indexes prepared on the basis of Company functional per cent of position rates. One security violation was investigated. IPD achieved the HAPO General Manager's Award at midnight January 26, 1960 with 3,800,000 injury-free hours accumulated since 3/16/59.

FINANCIAL OPERATION

Planning and organizing the FY 1962 and revision of FY 1961 budget has begun. Requests have been sent to the field for personnel estimates and other basic data.

A presentation on product cost and reactor cost problems was made to the deck officers associated with the NS Savannah.

A condensed summary of methods and procedures used by IPD in authorizing, accumulating and reporting maintenance cost was written for presentation by an employee of Facilities Engineering Operation at an off-site meeting.

An audit report of the Suggestion Plan was issued. The audit showed that the awards for CY 1959 were in accordance with the Company plan or HAPO modification.

Records relating to the HAPO General Manager's safety award which was achieved January 26, 1960 were reviewed and found to support the award.

NPR PROJECT OPERATION

Reactor plant design scope was modified to include provisions for 68 additional tubes to be installed at some future date rather than 176 as previously scoped.

Recent analyses of graphite contraction data have led to further study of potential stack distortion in excess of that used as a basis of design. In summary, it can be stated that maximum provisions are being made for channel conditioning

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to permit insertion of replacement tubes in the event of graphite contraction in excess of the design basis so that plant operability can be maintained under the worst credible conditions.

Numerous detailed contacts with the architect-engineer have been made to integrate areas of common interest in building design, piping specifications, and confiner integrity.

Construction work continued on the River Pump House. Cold weather halted work on the Administration Building and slowed up temporary construction activities.

Vendors of pilot orders for zirconium alloy process tubes continued to make substantial progress. All vendors have now completed some tubes but only one has been finally inspected and accepted.

Both vendors of top and bottom reflector graphite have started extruding material for these orders.

A large volume of design output was processed for comments and issued.

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IRRADIATION PROCESSING DEPARTMENT
MONTHLY REPORT OF INVENTIONS OR DISCOVERIES

JANUARY, 1960

All persons engaged in work that might reasonably be expected to result in inventions or discoveries advise that, to the best of their knowledge and belief, no inventions or discoveries were made in the course of their work during the period covered by this report except as listed below. Such persons further advise that, for the period therein covered by this report, notebook records, if any, kept in the course of their work have been examined for possible inventions or discoveries.

<u>Name</u>	<u>Title</u>
T. L. Deobald	Internal Diameter Optical Micrometer
J. F. Nesbitt	
D. R. Dukes*	Mechanical Conveyor

* Kirk Engineering

General Manager
Irradiation Processing Department

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RESEARCH AND ENGINEERING OPERATION

JANUARY 1960

VISITORS AND BUSINESS TRIPS

D. H. Curtiss attended a meeting with Allegheny-Ludlum and Tube Reducing Corp. at Wallington, N.J. and visited Superior Tube Co., Norristown, Pa., Chase Brass & Copper Co., Waterbury, Conn., Bridgeport Brass Co., Bridgeport, Conn., Budd Co., Philadelphia, Pa. and Harvey Aluminum, Torrence, Calif. for zirconium tube examinations, 1/3-11/60.

R. W. Benoliel visited GE-APED, San Jose, Calif., to observe graphite test irradiations, 1/4-7/60.

O. E. Adams visited the General Engineering Laboratory, Schenectady, N.Y., to discuss progress being made on the thermal stress analysis of Zircaloy 2, 1/4-7/60.

R. W. Benoliel visited Great Lakes Carbon and Speer Carbon, Niagara Falls, N.Y., and National Carbon Co., Cleveland, O., for NPR graphite discussions, 1/9-20/60.

O. H. Greager, J. H. Brown and T. W. Evans visited Nuclear Metals, Inc., Concord, Mass., to attend a meeting on fuel element problems, 1/9-13/60. Mr. Greager also attended the ASA Sectional Committee N-6 Meeting in New York, N.Y.

W. K. Alexander visited Nuclear Metals, Inc., Concord, Mass. to review the reactor fuel development program, 1/9-14/60.

W. R. Conley visited Burns & Roe, New York, N.Y., to consult on NPR design, 1/10-24/60.

C. G. Lewis, F. E. Dearing and J. E. Hanson visited Westinghouse Electric Corp., Bettis Plant, Pittsburgh, Pa., to observe and discuss KAPL-120 tests, 1/10-15/60.

D. H. Curtiss visited the Superior Tube Co., Norristown, Pa., for consultation on the fabrication of zirconium, 1/12-16/60.

F. W. Van Wormer and R. E. Baars visited the General Atomic Division of General Dynamics, San Diego, Calif., to discuss the gas loop tests, 1/17-19/60.

E. C. Bennett visited the Franklin Institute, Philadelphia, Pa., to attend a Naval Reactors Research Meeting in which he discussed gas bearing compressors, 1/19-22/60.

ORGANIZATION AND PERSONNEL

	<u>Permanent</u>		<u>Rotational</u>	
	<u>Dec.</u>	<u>Jan.</u>	<u>Dec.</u>	<u>Jan.</u>
Management & Administration	4	4	-	-
Process & Reactor Development	41	42	2	3
Process Technology	37	37	3	2
Operational Physics	17	18	5	5
Testing	68	68	5	2
	<u>167</u>	<u>169</u>	<u>15</u>	<u>12</u>

Process & Reactor Development: T. W. Ambrose, Supervisor, Reactor Fuels, transferred from HLO, 1/11/60.

Operational Physics: D. G. Montague and S. I. Stewart, Technical Graduates, assigned from the Rotational Program, 1/1/60. D. E. Goins, Engineer I, transferred to KAPL, Schenectady, 1/4/60.

Testing: W. L. Swanson, Engineer II, transferred to KE-KW Reactors, Mfg., IPD, 1/1/60. L. L. Boyd, Field Clerk, transferred from CE&UO, 1/25/60.

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PROCESS AND REACTOR DEVELOPMENT SUBSECTION

Reactor Fuels

Present Reactor Technology

Projection Fuel Testing

Irradiation of four columns of 1.47% enriched self-supported fuel columns in ribless tubes continued under PT-IP-247-A. Irradiation will continue until a factor of 20 improvement in relative rupture performance is demonstrated with 95% confidence unless terminated earlier by failure.

Pilot testing of self-supported fuel elements continued at C reactor. The test columns were lengthened to 32 pieces during the outage of mid-January and coolant flow rates met the desired test criteria. Predicted total tube flow was within 1% of the measured value, and the predicted ratio of annular flow to hole flow was within 2% of the measured value. Additional tubes will be charged as rapidly as they can be delivered and installed.

Fuel elements scheduled for charging under PT-IP-262-A, "Evaluation of Projection Fuel Elements for Use in Ribbed Process Tubes - Demonstration Loading", were rejected because of damage to the attached supports. Replacement elements are being fabricated.

Core Development

PT-IP-280-A, "Irradiation of Alloyed Dingt Uranium Fuel Elements", was charged into D reactor on January 8. The test is designed to evaluate relative dimensional stability of alloyed dingt uranium cores and ingot cores.

E-N Irradiation

Test columns from the fringe blanket loading have been discharged; final discharge of the central block loading is expected during the next outage at H reactor.

Advanced Reactor Fuels

Development Work at NMI

NMI has completed brazed closures on 20 KER outer tube test specimens. These 12" specimens are being shipped to HAPO and will be tested here to determine corrosion resistance, closure integrity, failure characteristics, and heat treatment requirements.

Work has also proceeded on a fabrication process for the Zr-Be brazing alloy used with this brazed closure. Success was also achieved in extruding arc-melted alloy to 1/8" wire, which was subsequently used in preparing the above specimens. Efforts will continue to produce a more homogeneous material with a more uniform melting temperature.

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<u>Test No.</u>	<u>Type Metal</u>	<u>Tubes</u>	<u>Reactor</u>	<u>Goal Exposure</u>	<u>Current Exposure</u>	<u>Remarks</u>
IP-56-A	Low Hydrogen Dingot U Elements	16	D	Variable		Semi-production scale testing of low hydrogen dingot uranium fuel, solid.
IP-84-A	Projection Self-supported fuel in ribless aluminum tubes	9	B	900 MWD/T		Preliminary evaluation of self-supported fuel elements. Routine charging to continue until tubes are replaced.
IP-171-A	Solid M388 & C64-F	4	B, DR, F	Variable 500 MWD/T	800 MWD/T	Provide for evaluation of alternate aluminum component vendors. Control columns are only ones carried special. Rest are lot charged. Harvey Aluminum I & E columns discharged without failure.
IP-216-A	Normal Prod. Nat. OII, KII & KIII fuel elements	73	All	Normal Variable Goal		Provides for monitoring the performance of a sample of all Natural Uranium lots to assist in development of a Quality Index for Production use. Test is continuous, first two columns were examined in December.
IP-219-A	CIIN cores SORT tested	18	DR	800 MWD/T	200 MWD/T	Provides for monitored irradiation of fuel cores categorized by the Sonic Orientation tests to evaluate its ability to isolate dimensionally unstable pieces prior to irradiation.
IP-226-A	Zr-2 Jacketed 1.6% enriched 7-rod cluster elements	1	KE	4500 MWD/T	2340 MWD/T	Charged in KER Loop 1 on August 24, 1959.
IP-227-A	Enriched Uranium samples in alu- minum capsules	2 1 test 1 control	D	1500 MWD/T	1670 MWD/T on test column	Test charged in 105-D on September 18, 1959. One tube discharged on Nov. 24 at 868 MWD/T because of reactor maintenance difficulties, and one was discharged at goal on January 5, 1959.

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Test No.	Type Metal	Tubes	Reactor	Goal Exposure	Current Exposure	Remarks
IP-247-A	1.47% Enriched I & E Self-Supported	4	B	To 2 ruptures	650 MWD/T	Provides for rupture comparison of self-supported and rib-supported fuel. Control elements were charged and failed during December.
IP-255-A	Solid Black Mint	10	H	2 years except for 3 columns scheduled for special extraction at approximately 3 Mo.	4 Mo.	Provides for long term irradiation of solid black mint for conversion ratio, and fuel performance determination. Control columns discharged.
	OII E	0	H	To be irradiated until first column reaches normal goal		Provides for E Metal support of the above described Mint. Columns to be specially extracted to monitor conversion ratio. Discharged as indicated above.
	OII N	0	H	To be discharged with above E columns.		Provides for natural uranium columns as control for above E-M material. Discharged as indicated above.
	OII & I & E Black Mint	20	H	Six columns to be irradiated to 800 MWD/T, rest till one rupture is sustained.		Provides for irradiation of the "stripped" portion of the load to determine conversion ratio data, physics parameters, and fuel performance. Monitor columns discharged.
IP-268-A	Seven Zr-2 jacketed Nat. U 7-rod cluster elements with hot headed end closures.	1	KE	2000 MWD/T	886 MWD/T	Charged in KER Loop 3 on October 29, 1959.
IP-272-A	CIVN Geometry I & E self-supported fuel	2	C	Variable	250 MWD/T	Provides for testing of CIVN geometry fuel in C Reactor ribless zirconium process tubes.

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<u>Test No.</u>	<u>Type Metal</u>	<u>Tubes</u>	<u>Reactor</u>	<u>Goal Exposure</u>	<u>Current Exposure</u>	<u>Remarks</u>
IP-292-A	Four Zr-2 jacket- ed 18-inch enriched tube-and- tube elements	1	KE	3500 MWD/T	190 MWD/T	Charged in KER Loop 2 on January 11, 1960.
IP-280-A	OIIN alloyed Dingot	12	D	800 MWD/T	50 MWD/T	Provides for evaluation of the stability and performance of cores having 100-200 ppm Si and Fe additives as grain refiners.

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KER Loop Irradiations

Four 18" enriched tube-and-tube elements, two alloyed with 2.8% Zr and two unalloyed, were charged in KER Loop 2 on January 11, under PT-IP-192-A.

Irradiation of Swelling Capsules

A second tube of uranium swelling capsules was discharged from D reactor on January 5 at an exposure of about 2000 MWD/T.

IBM Fuel Analysis Program

IBM analysis continued during the month to determine reactivity of thermal hydraulic parameters of NPR fuel candidates. Activity at the moment is directed toward the determination of the heaviest fuel element which can be tolerated in the NPR with a reasonable margin for error in calculations of control strength and transient requirements.

Reactor Physics

Present Reactor Technology

Ceramic Ball Testing

Four samples of europium and mixtures of europium-gadolinium and europium-samarium which were part of a previous order have been received. Delivery has not been made of higher concentration Sm and Gd and boron samples described last month. Further testing awaits these samples. During the next series of tests, the Hanford test pile neutron spectrum will be adjusted to approximate the anticipated NPR spectrum. This tailoring should provide more realistic comparison among various materials tested.

Black Mint Conversion Ratio

Calculations have been performed on the expected improvement in total conversion ratio (Pu and E³) by using enriched mint (38.5 w/o Li⁶) in place of natural mint in the E-N loading. Results show improvement of 0.8% to 1%. The improvement from both more efficient use of thermal neutrons and increased resonance capture in the black mint case results are documented in HW-63668, "Conversion Ratio Incentive for Using Black Mint in an E-N Load" dated January 28, 1960, by R. Nilson.

Planning continues for a full scale E-N load. Work has begun on the necessary analytical conversions from dry, cold Hanford test pile E-N length ratio measurements to the hot, wet pile.

Advanced Reactor Technology

Graphite Purity

Analysis of diH variations for core graphite of the NPR indicate that a + .15 diH spread in graphite purity will result in only + .5 mk variations in NPR reactivity. Requirement for diH variations is twice the standard variations for AGOT purity quoted by

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National Carbon Company. Consideration of the effect of the impurities in the reflector graphite indicate that the effect on the reactor multiplication factor is an order of magnitude, less for reflector impurities than for core impurities.

Neutron Slowing Down - Monte Carlo Program

At present all of the program is written and compiled with the exception of the NPR graphite configuration. Repeated efforts have been made to compile this part of the program without success. The BDF portion is ready to run.

Qualitatively the same problem has been attacked by less exact but more easily calculated methods. The conclusions reached from this analysis is that approximately twice as much damage per unit volume of graphite will occur in the NPR as in a BDF lattice for equivalent MWD/AT.

NPR Transients

Efforts continue utilizing an analog model of the NPR to determine a variety of information such as power decay during scram for various rod strengths; temperature and flow variations; power excursions during scram for various rod strengths and maximum accidental increase in reactivity; reactivity variations during start-up of a cold reactor under various startup procedures. This effort will continue.

Analysis is being made of the dynamic behavior of a reactor having general reactivity charges. The problem is simplified in that the number of delayed neutron groups is limited to two. Attempts are being made to duplicate some runs obtained on the analog computer.

Experimental Progress

Four foot exponential pile buckling measurements on tube-and-tube fuel elements have been concluded, and results are as follows:

<u>Lattice Spacing</u>	<u>Buckling (k_B)</u>	
	<u>Wet</u>	<u>Dry</u>
7 3/16"	-123	-259
8 3/8"	-64	-50
10 3/8"	-45	-76
12 3/8"	-72	-104
14 9/16"	-127	-155

Comparison of the graphite to uranium and water to uranium ratio for this element at cross over with the corresponding ratios for the NPR fuel element indicate that the NPR lattice is below the cross over point as expected.

An eight foot exponential pile is being constructed to measure tube-and-tube fuel buckling values in a 8 3/8" lattice, as a way of reducing consistent errors which may be present in the smaller four inch pile results.

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Some PCTR runs on the same tube-and-tube element have just been completed. The parameters k_{00} , p , ϵ , and f will be extracted from these experiments.

Work progresses on buckling measurements for tube-rod and I & E geometries, results will be recorded when the series is complete.

Reactor Engineering

Present Reactor Technology

Earthquake Studies

Analytical investigations were continued by Holmes and Narver to identify critical areas of seismic vulnerability of the six older reactors and the NPR. A series of preliminary topical reports have been issued by Holmes and Narver and are being utilized by Facilities Engineering Operation to evaluate plant modification requirements.

Ribless Zr-2 Production

Bridgeport Brass Company has approximately 40 smooth bore C reactor tubes in the process of final inspection. Eleven of these tubes were shipped to HAPO on January 21. In addition six C reactor ribless tubes have been processed by Harvey Aluminum Company and of these two have been completely inspected.

Reactor Decontamination

Laboratory tests continue to determine the corrosivity and cleaning efficiency of twelve different decontaminating agents. Formulation based on oxylic acid removed more than 99% on a stainless steel pigtail. This is the best result to date from any of the twelve candidate materials.

Advanced Reactor Technology

Zr-2 Process Tubes

Examination of irradiated KER tubing continued, in addition to the qualitative results reported last month. It appears that thermal recovery of cold work properties had occurred where the tube contacted hot graphite. Also of interest is the fact that no hydride platelets were found indicating that no significant pick-up of hydrogen had occurred during the hydrating of this tube.

NPR Safety Studies

Document HW-63280, "Alternate Fission Product Confinement Systems for the New Production Reactor", by G. J. Rogers was issued. Concluded in the document were the relative merits of pressure vessel containment and the confinement comparison on which NPR design is now pending. Release of particulate material and halogens to the atmosphere for the maximum credible accident are roughly comparable for these two concepts. The noble gas release is somewhat larger for the confinement approach. Assuming that the containment vessel operates as designed it appears that continuity of post-incident sphere cooling is essential to prevent excessive pressure buildup and failure of the containment vessel. In addition the very large cost and schedule requirements of a pressure

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vessel system leads to the conclusion that the present confinement concept is to be preferred.

Graphite Irradiation

The second test capsule containing samples of various graphites was discharged from the GETR on December 28. Length measurements on the graphite samples indicated length decreases of several tenths of one percent. Results from nickel flux monitors when combined with the length measurements leads to contraction rates consistent to those induced in other samples irradiated in other test conditions. Exposure levels on these samples were too low to give any evidence of saturation or slowing down of the rate of contraction. Consistent with all other test data to date the graphite made from needle coke contracts somewhat less than the CSF reference graphite. In addition there is an indication that graphites made with finer coke particles and exposed to higher temperatures in the graphitizing furnaces contracted at a slightly slower rate than more conventional graphites. Also of interest is the fact that there seems to be a significant increase in contraction rate above a temperature of very roughly 1000 C.

It is anticipated that in addition to other factors a higher degree of orientation of particles and crystallites will also contribute to lesser rates and amounts of contraction. Accordingly arrangements have been made for special extrusions at the Great Lakes Carbon Corporation in which final extrusion reduction is in only one transverse direction and in which a streamlined vane adds to the degree of orientation.

Radiological Engineering

Radiation Control Experience

The following table summarizes the 1959 radiation exposure experienced for the critical IPD classifications:

<u>Classification</u>	<u>Total Dose</u>	<u>No. of Employees</u>	<u>Average Dose/Employee</u>	<u>Maximum Dose</u>
Radiation Monitors	156455 mr	78	2006 mr	2824 mr
Processing Operators	417000 mr	253	1648 mr	2642 mr
Pipefitters	179481 mr	97	1850 mr	2884 mr
Millwrights	127113 mr	77	1651 mr	2790 mr

No IPD Employee accumulated radiation exposure in excess of 3r during 1959.

Lapse of Control

The following table summarizes the January lapses of control experienced in IPD.

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Lapse of Radiation Control
Distribution by Reactor and Component

	<u>B</u>	<u>C</u>	<u>D</u>	<u>DR</u>	<u>F</u>	<u>H</u>	<u>KE</u>	<u>KW</u>	<u>IPD Totals</u>
Processing	3	0	2	2	0	0	1	0	8
Maintenance	2	0	0	0	1	0	0	2	5
Supplemental Crews	0	0	0	0	1	0	0	0	1
Research & Engineering	0	0	0	1	0	1	0	0	2
Facilities Engineering	0	0	0	0	0	0	0	0	0
Central Maintenance	0	0	1	0	0	0	0	0	1
Reactor Areas	0	0	0	0	0	0	0	0	0
Assigned Totals	3	0	3	3	2	1	1	2	15
IPD General									0

Vertical columns do not necessarily add up to the indicated totals, because in some cases, a Lapse of Control may be chargeable to more than one component.

Average Reactor Effluent Activity Output

	<u>January 1960</u>	<u>December 1959*</u>	<u>January 1959</u>
107-B	31,000 uc/sec.	20,000 uc/sec.	23,000 uc/sec.
107-C	15,000 "	31,000 "	26,000 "
107-KW	61,000 "	43,000 "	40,000 "
107-KE	28,000 "	58,000 "	40,000 "
107-D	16,000 "	22,000 "	28,000 "
107-DR	15,000 "	19,000 "	21,000 "
107-H	22,000 "	18,000 "	28,000 "
107-F	17,000 "	29,000 "	36,000 "
Total	205,000 uc/sec.	240,000 uc/sec.	242,000 uc/sec.

*These data differ from those reported last month because of errors in computation which were not detected until after the report was issued.

Examination of the analyses of reactor effluent water for 1959 reveals that the average output of arsenic-76, phosphorus-32 and neptunium-239 were 73%, 81% and 66% of the 1958 averages, respectively. On the other hand zinc-65 average output was 123% of 1958. No doubt the reduced output of P32 and As76 can be partly explained by the unusual river water conditions in the latter part of the year. There is no explanation for the increased output of zinc-65.

Radiation Control Standards and Procedures

Revisions were made to the following Radiation Control Procedures:

- 6.2.1, Criteria for Judging Lapses of Radiation Control
- 6.2.3, Lapse of Radiation Control Severity Determination

Criteria was established for judging high dose rates to personnel as Lapses of Control.

Remote Area Monitoring

The Victoreen remote monitoring system installed in the discharge area at 105-KE continued to operate satisfactorily after two operating periods subject to the dose rates present during the discharge operations. It will require another 90 days to insure the equipment will operate in the discharge area with adequate reliability.

The logarithmic space monitoring system prototype for NPR is complete and ready for testing.

Special Studies

A pulse height analysis of reactor exhaust gases is in progress to determine what effect they may have on the operation of the exhaust air monitoring system for actuating discharge area fog sprays in association with the Reactor Confinement Project.

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PROCESS TECHNOLOGY OPERATION

REACTOR POWER LEVEL LIMITATIONS

The primary limit to all reactor power levels at the end of the report period was based on fuel element failure control at the goal exposure currently in effect.

WATER TREATMENT

Raw Water Conditions

Raw water was easy to treat in January. Close control had to be maintained on quality to prevent reactor tube filming.

Separan Approved

The Industrial Hygiene Operation at HAPO has approved the use of Separan NP10, Potable Water Grade, in concentration to 1 ppm in sanitary water treatment. This approval conforms to the U.S. Public Health Department's regulation.

PROCESS STANDARDS

HW-46000 D, Process Standards - Reactor

Seven revised Standards were issued during the month. These were:

Process Standard B-010 - "Gas Composition, Pressure and Flow"

Oxygen concentration limits were clarified. The frequency of spectrographic analysis for nitrogen content of the reactor gas atmosphere was reduced to once every 24 hours provided a decreasing N₂ content was shown by two previous samples taken at four-hour intervals.

Process Standards C-060, C-070, C-090, C-110, and C-120

The changes made to the above Standards involve conversion from inhour units of reactivity to c-mk units. (One c-mk unit, or centi-milli k, is equal to 0.001 per cent excess k.) No other changes were made.

Process Standard F-050 - "Charge-Discharge During Reactor Operation, PCCF"

To increase the flexibility of the poison column control system, the fixed limit on the margin that must be maintained between bulk outlet water temperature and the bulk limit during poison discharge was revised. The margin is now a function of the amount of poison to be discharged and thus is less restrictive when small amounts of poison are discharged for control purposes.

HW-46000 B, F, H, Process Standards - Reactor

Two revised and one new Standards were issued during the month. These were:

Process Standard B-010 - "Gas Composition, Pressure and Flow"

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Process Standard F-050 - "Charge-Discharge During Reactor Operation, PCCF"

The revisions to these Standards were identical to those issued for HW-46000 D, above.

Process Standard D-070 - "Reactor Confinement - Fog Spray System"

This new Standard requires manual operation of the new Fog Spray System under certain conditions, to confine radioactive particulate matter to the reactor discharge area.

HW-46000 K, Process Standards - Reactor

Three revised Standards were issued during the month. These were:

Process Standard C-020 - "Power Level Monitoring"

A new section was added to the Standard to specify calibration checks on power level monitoring instruments during cold startup. Rate of rise and power level are monitored initially with the neutron sensitive instrumentation until the rise in outlet water temperature is measurable. At this point, rise to power is halted and accuracy checks are made on the galvanometer and power level recorder.

Process Standard C-030 - "Flux Monitors"

A method for determining more accurate flux monitor trip settings at turnaround level was provided. The method was based on extrapolation of accurate flux monitor readings obtained at several specified power level check points during the rise to power.

Process Standard C-070 - "Horizontal Rod Withdrawal, Power Increase"

To ensure a more accurate base point for power level determination, the Standard was revised to require a somewhat larger bulk temperature rise before the first temperature map is taken. This also permits better recognition of possible flow abnormalities.

PROCESS CHANGE AUTHORIZATIONS

Six Process Change Authorizations were issued during the month to permit temporary deviation from Process Standards - Reactor, HW-46000, and two were issued to permit temporary deviation from Process Standards - Water Plant, HW-27155 Revi. These were:

PCA #9-164 - "Ball 3X Testing - KW Reactor"

A delay in testing the ball 3X system was authorized because of mechanical and parts procurement difficulties as well as manpower burnout problems.

PCA #9-165 - "Water Leak - B Reactor"

Operation of B Reactor was authorized with a water collection rate of 1.7 gallons per day over the limiting quantity. Authorization was based on man-

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power considerations. However, reactor shutdown was required in event of excessive inlet dew points or evidence of water in the moderator.

PCA #9-166 - "Vertical Bowing Traverse Delay, H-Reactor"

A delay in vertical bowing measurements was authorized due to a conflict with a Production Test associated with this tube, and in view of the fact that recent traverse data reveal no unusual changes in moderator movement.

PCA #9-168 - "Trip-Out Tests Required by Process Standards - F Reactor"

The process pump trip-out test for F Reactor was postponed to allow time for further preparations. The test is required by Standards whenever major changes are made to the process pumping system or to the reactor's flow characteristics. Present data have been made obsolete by the transition from solid to I & E fuel elements.

PCA #9-169 - "Trip-Out Tests Required by Process Standards - D-DR Reactors"

The process pump trip-out test delay was authorized for the reasons stated above for F-Reactor.

PCA #9-170 - "Critical Pressure, No. 5 Double Orifice Zone, D-Reactor"

Two equations were provided for calculating permissible low Panellit trip pressure in the No. 5 Double Orifice zone at D Reactor. This was necessary due to an orifice change in the #5 zone and the reversal of some of the secondary orifices.

PCA #9-171 - "Automatic Scram Feature of the Temperature Monitor, KE and KW Reactors"

Startup without process tube temperature trips actuating the #1 safety circuit was authorized due to the number of spurious scrams that have been experienced with this system. In its place, Design Change #258 provided low temperature annunciator trips on 50 selected tubes. Early warning of poor temperature distribution is thus provided.

PCA #9-172 - "Panellit Sensing Line Throttling, H-Reactor"

Use of the one-way Hoke valve on the Panellit gauge board to throttle gauge oscillation is not normally permitted since excessive throttling which escapes detection is possible. Throttling with the toggle valve is permitted in certain circumstances. Due to failure of the valve normally throttled, authorization was given to throttle the Hoke valve on one sensing line to dampen a 30 psi gauge oscillation. Restrictions imposed were 1/2 hour observations and not less than 6 psi oscillation of the gauge involved.

PROCESS ASSISTANCE

Auditing

One engineer audited conformance to Process Standards by making 15 inspections

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at each reactor during the report period.

Graphics

Graphics services prepared 30 charts, graphs and visual aids for various IPD and HLO components.

RUPTURE EXPERIENCE

<u>Failure Date</u>	<u>Tube Number</u>	<u>Lot Number</u>	<u>Type Metal</u>	<u>Exposure</u>	<u>Type of Failure</u>
1/3/60	2168-C	KJ-182-C	8" I&E Natural	361	Side Hot Spot
1/4/60	3075-KW	KR-100-D	8" I&E Natural	512	Side Hot Spot
1/10/60	3268-B	KL-304-D	8" I&E Natural	563	Side Hot Spot
1/10/60	1570-DR	KL-342-D	8" I&E Natural	564	Side Hot Spot
1/11/60	4345-KE	KA-245-A	8" Solid Natural	651	
1/14/60	2171-C	SJ-081-D(1)	8" I&E Natural	446	Side Hot Spot
1/20/60	2981-H	KL-339-C	8" I&E Natural	552	Side Hot Spot
1/21/60	2576-C	KJ-179-C	8" I&E Natural	462	Side Hot Spot
1/21/60	1686-B	KL-285-D	8" I&E Natural	709	Side Hot Spot
1/22/60	3866-KW	KR-113-D	8" I&E Natural	424	Side Hot Spot
1/23/60	1182-F	KL-294-D	8" I&E Natural	558	Side Other
1/24/60	2676-B	KL-352-D	8" I&E Natural	365	Side Hot Spot
1/24/60	3861-C	KJ-177-C	8" I&E Natural	545	Unknown
1/25/60	2052-KE		8" I&E Natural	537	
1/31/60	1575-B	KL-356-D	8" I&E Natural		Side Hot Spot

(1) Parent Lot KJ-153-D

Legend:

Side Hot Spot - Failure probably caused by accelerated corrosion of the external can wall in a localized region of high temperature.

Side Other - Failure probably caused by corrosion or water penetration of the external can wall or other unknown mechanism.

Unknown - Failed piece could not be located or had not been examined at the time of writing.

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OPERATIONAL PHYSICS OPERATION

PILE PHYSICS ASSISTANCE

The average flattening efficiency as measured by the total ECT was 76.5 per cent, about one per cent higher than in December but about one-half per cent lower than that attained during the smooth operation in the Fall of 1959. Shorter operating periods, with correspondingly less time to fully flatten the reactors, were primarily responsible for the older reactors being less flat than last Fall. However, through efficient cycle control, early discharge of potentially limiting high exposure tubes, and improved spline usage for flux distributional control, the average ECT's at the two K reactors reached a new high of 78.0 per cent.

With installation of subcritical monitoring equipment at D and the two K reactors, all reactors have at least one SCM channel. In addition to the D pile prototype, B, DR, and H reactors now have power rate-of-rise monitors, although temporary functional and procedural problems have limited their initial usefulness.

SUMMARY OF OPERATING DATA OF PHYSICS INTEREST
FOR THE MONTH OF JANUARY, 1960

Pile	B	C	D	DR	F	H	KE	KW
ECT in Jan. (1)	1400	1660	1460	1530	1440	1595	2510	2500
12 Mo. Avg. ECT	1435	1640	1475	1500	1445	1595	2445	2455
Equil. Scram Time (2)	13-17	24-28	14-18	25-35	14-20	14-18	18-22*	18-22*
No. of Scrams	0/0	2/1	0/0	0/0	0/0	0/0	0/0	0/0
and Recoveries (3)	0/0	4/0	0/0	0/0	0/0	2/0	0/0	0/0
No. of Non-Scram Outages (4)	4/0	4/1	2/0	3/0	3/0	3/0	2/1	2/0
Report Period - From	12/24	12/24	12/23	12/23	12/25	12/25	12/24	12/25
To	1/25	1/22	1/25	1/22	1/25	1/25	1/25	1/22

* Equilibrium scram recoveries aren't attempted at the K reactors.

- (1) Effective Central Tubes: This value is defined as pile power level divided by the average of the ten most productive tubes in the reactor.
- (2) This is defined as the maximum time available in minutes between scram and first indication of startup.
- (3) The first pair of numbers shows the number of brief outages from which secondary cold startups would be made and the number of successful startups. The second pair shows the number of brief outages from which hot startups would be made and the number of successful recoveries.
- (4) The first number shows the number of ordinary outages (including those initiated by scrams followed by unsuccessful recovery attempts), and the second shows the number of additional outages to discharge temporary poison.

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B Reactor - W. R. Smit

A lower than average flattening efficiency was due to fairly short operating periods between shutdowns, which precluded equilibrium flattening adjustments. The operating continuity was interrupted by four outages for ruptures, one of which was a control charge for run-to-rupture production test material.

Rear face steam due to cap and pigtail leaks during high level operation has lowered the resistance of the RTD's to ground, thereby reducing accuracy for the rate-of-rise meter; however, the resulting errors in indicated power rise rate are thought to be less than five per cent. Supplement A of PT-IP-188-C, Test of Startup Procedures With Subcritical Monitoring, was run preceeding a startup, and the data were being analyzed at month end.

C Reactor - R. A. Chitwood

A new high level and flattening efficiency were obtained for C Reactor during the report period. Large variations in pile enrichment to compensate for large fluctuations in residual exposure were primarily responsible for maintaining a constantly high flattening efficiency. Increased helium concentration, compensated for reactivity-wise by additional central enrichment with low-residual exposures, successfully prevented graphite temperatures from restricting power levels. Four outages were caused by ruptures. In addition there were two brief outages; one was caused by a Panellit scram shortly after startup and the other was taken for a poison push.

D Reactor - W. L. Stiede

Two successful spline startups were made; significant startup efficiency gains were realized despite minor spline removal difficulties. Lower than average flattening efficiency during one operating period resulted from the reactivity loss associated with charging several near side peripheral tubes with B metal pending their replacement. During a second operating period an unfavorable residual exposure distribution and limited use of compensating enrichment caused a below average flattening efficiency. One channel of the subcritical monitoring equipment was installed and functioned correctly except for some problems with the motor which drives the chamber in and out of the reactor. Operation was interrupted by two outages, one due to a rupture and the other scheduled.

DR Reactor - D. I. Monnie and D. G. Montague

The increased supplemental control capacity resulting from the installation of six ball valves made possible higher turnaround levels and a 50 per cent reduction in non-equilibrium losses. This additional control for startup reactivity transients permits initial levels following minimum time outages which are limited by temperatures only.

Operation was interrupted by three outages caused respectively by a rupture, a water leak, and an anomolous reactivity loss. The reactivity loss resulted from the combined effects of a water leak and the spreading within the poison column control facility tube of melted lead-cadmium poison pieces. Sufficient coolant was inadvertently lost to the charge due to a front face water leak and a subsequent valved reduction in the tube flow prior to attempting to discharge the poison.

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F Reactor - G. F. Bailey and S. L. Stewart

Sufficient reactivity was available through increased central enrichment and higher residual exposure to attain a new high level without being limited by excessive graphite temperatures. However, an unusually low residual exposure was anticipated to follow the first outage in February; an appreciable increase in central enrichment will be required. The reactor was shut down three times during the report period, twice for a rupture and once for a water leak.

H Reactor - A. R. Kosmata

Plans were completed for relocation of poison column control system tubes and addition of two more tubes to the system. These changes will improve near side control and over-all flattening flexibility. Revisions in computing cold clean reactivity corrected relatively large prediction errors which had occurred during previous months. Flux traverses indicated slight downstream flux peaking on the far side of the reactor; charging of downstream mixing elements which is planned is expected to correct this condition.

Three Panellit scrams, a rupture, a shutdown to repair a cap leak, and a shutdown to reduce the air in the pile atmosphere to within limits interrupted operation. A startup with water in the graphite caused no operating problems; the water was removed within a day and subsequent equilibrium operation was very stable. A new high power level was attained for H reactor.

KE Reactor - F. C. Franklin

The installation of the subcritical monitoring system was completed; the equipment functioned properly. The loading of the K-III-N slugs will be largely completed during the next outage. Spline usage continued to reduce the non-equilibrium losses in spite of higher equilibrium levels and was primarily responsible, along with selected discharge of potentially limiting tube charges during the transition from the K-II-N to K-III-N fuel elements, for a continued high flattening efficiency. A new high power level was also achieved.

Operating continuity was fair with three outages for ruptures and one short outage for a poison push.

KW Reactor - A. D. Vaughn

The ECT was above average and good control was maintained at equilibrium with the aid of splines in spite of a high residual exposure. The reactor achieved a record high level. There were two outages, both initiated by ruptures, during the report period.

Plans were being made to partially "de-flatten" the reactor for scheduled five-pump operations early this Spring. The fuel element corrosion limit on fringe tubes would restrict the level with the reduced flow and present flattening.

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PROCESS PHYSICS STUDIES

Safety Control Studies

Supplement A of PT-IP-188-C authorizes the repeating of basic subcritical monitoring runs at each of the reactors with the newly installed systems. The main purpose of this test is to familiarize the area physicist and the operating crews at each area with the concept of the "apparent period" due to rod withdrawal in the subcritical pile. The first run of this test was successfully completed at B reactor during January. Runs are scheduled during February at the F and C reactors.

Preparation of a document to serve for the recommendation and use of the "square pile" concept of total control evaluation is nearly complete in the rough draft form.

Pile Reactivity Studies

The new IBM 709 program for accountability calculations, derived by C. R. Richey of Process and Reactor Development, is being normalized to give yield values equivalent to the previous program in the normal exposure range. This normalization can be easily accomplished in the program by an arbitrary adjustment of the heat of fission value. Although there has been a drift of approximately two per cent between program predictions and CPD results for more than two years, it has been recommended that a renormalization not be made at this time. The discrepancy between CPD Area measurements and IPD predictions has been considerably more erratic during the past six months, and several tons of specially monitored material are now awaiting separation. These measurements are expected to be good to $\pm$ one per cent; however, latest redox programming indicates that the special separation will not be carried out until FY 1961.

A skeleton rough draft of a process improvement transition authorization for the proposed E-N loading at H pile has been circulated among the people who will be involved in preparing the final PITA. The latter document is targeted for completion by July 1.

Control Efficiency Studies

A plant order for 2,000 splines, expected to be adequate for the next six months, has now been placed. The D and KE piles used splines for startups during January. 40 and 35 splines were successfully used on startups at the respective reactors with an estimated gain of .2 effective days per startup. The KW pile is expected to use splines for startups again as soon as the removal reel is operational. C pile is expected to use splines in the near future, withdrawing them by the KE whole spline technique.

A gain of approximately .2 effective days per startup has also been made with PCCF system use at the DR and H piles - from the increased number installed at DR and from increased use at H. The above improvements are especially noteworthy in that they have taken place at higher power levels where the tendency would be toward increased losses per startup.

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The displacement column prototype system scheduled for KW pile installation is still being modified by the vendor and is tentatively expected around the end of February.

Assistance was provided Facilities Engineering Operation on FY 1962 budget studies for supplementary control and monitoring. Work is now starting on preparation of an authoritative bases document on which to base such studies in the future.

Shielding Studies

HLO results have been received on a series of preliminary masonite oxidation tests over the temperature range from 120 to 200°C. It is interesting to note that the observed doubling of burnout rate each 15 degrees in the 160 to 190 C range agrees reasonably with data taken several years ago in this temperature range with a helium atmosphere. On the other hand the burnout rate doubles in only eight degrees in the 190 to 200° range with an air atmosphere, even though kindling was not observed to occur yet.

Absolute neutron leakage data taken in the H pile far side shield test well by HLO indicate a total neutron leakage in that location equivalent to two mrem per hour dose.

Two NPR shield cases were run on the IBM 709 program during the month - a side case with 1004 tubes and an outlet face fringe case (outside the tube pattern) with a boron steel thermal shield.

Reactor Fundamentals Training

The first section of the Utility Operator program of four half days Reactor Fundamentals classes was completed by 40 UO's on January 4. A second section covering all the Utility Operators not in the first group was started in January.

Reactor Specialists classes were authorized by Manufacturing Operation during working hours and were started during the month. These classes will be held weekly to permit each specialist to attend one session per month during approximately half the months of the year.

Six hours of training time were provided on reactivity and control problems for the N.S. Savannah captains visiting Hanford for training purposes.

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TESTING OPERATIONIRRADIATION TESTINGDR Gas Loop

The DR Gas Loop was operated continuously during the report period with the exception of 119 hours during reactor outages. Test conditions of 1500 F surface temperature were maintained on the element 213 hours, bringing the total time at reference conditions to 813 hours.

The shaft couplings on all Lapp compressors were drilled and pinned to the eccentric shafts. This eliminated all mechanical knocking in the compressors. No mechanical failures were noted in the compressors during the report period. The generator shaft bearings were replaced on the No. 1 motor-generator to correct excessive noise and vibration in the set.

A gas chromatograph was installed on the loop to provide frequent chemical analysis of the loop coolant. Operator training and calibration of the instrument is still in progress.

Fission product contamination behavior in the loop deviated from previous months' experience, displaying small decreases in gamma activity levels. Also noted was a significantly lower xenon-133 (5.3-day half-life) concentration.

KAPL-120 Loop

The empty in-reactor loop was on process water cooling during this report period. The following items were accomplished in preparation for charging the fuel assemblies:

- a. The maximum water temperature that can be held on the loop with the reactor shut down was determined to be 500 F.
- b. The time required to attain the 500 F temperature was seven hours.
- c. Data were obtained to describe the flow transient simulating the loss of a loop pump, and the failure of its check valve to close.
- d. Data were obtained on the length of time a pump would operate under an overload condition.
- e. Additional pump failure flow coast-down data were obtained simulating the complete loss of power to the loop pumps.
- f. A commercial connector for joining sheathed thermocouples to thermocouple lead wire was tested. BAPL has approved the connector for use in the 120-8B test.
- g. Equipment was installed to measure the pressure drop across the individual flow tubes.
- h. Maintenance completed an instrument calibration check.

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A mutually agreeable test plan for the KAPL-120-8B experiment was established during meetings held at Bettis Plant, Westinghouse Atomic Power Division, Pittsburgh, Pennsylvania, January 12, 13 and 14. Status of the KAPL-120 Loop equipment was clarified during this visit. Both F. E. Dearing and J. E. Hanson attended these meetings.

Hanford Test Reactor measurements indicate that the neutron flux in the PWR type elements located in the KAPL-120 Loop, will decrease or remain unchanged if water is lost from the loop.

A front-to-rear neutron flux traverse, made with aluminum dummies irradiated in 2079-H, show that the unperturbed flux adjacent to the KAPL-120 Loop approximates a cosine distribution.

Rare Earth Oxide Control Rod Materials for the Hallam (Nebraska) Reactor-NAA-110

The rare earth oxide control element test assembly was installed in the 105-KW Reactor in late December and has been operating satisfactorily since that time. Maximum equilibrium temperatures of approximately 1500 F have been maintained with a pure helium atmosphere in the assembly.

Other Irradiation Experiments

The heater failed during a heater test in the thermocouple capsule (HAPO-199) in the 2A test hole of KW Reactor. The capsule, charged on November 5, 1958, is being irradiated for Physical Metallurgy Operation, Hanford Laboratories Operation, to determine to what extent the electrical output of thermocouples is affected by the gaseous atmosphere which surrounds the thermocouple bead. Heater failures also occurred in the third test assembly designed to provide controlled graphite sample temperatures in the 200 - 300 C range (HAPO-124). The test, charged into 1573-DR on December 9, 1959, is being irradiated for the Non-Metallic Materials Operation, Hanford Laboratories Operation.

Physics Studies

An aluminum sample was irradiated in the Quickie Facility at F Reactor (E Test Hole), to determine the fast neutron flux from the $Al-27(n, \alpha)Na_{24}$ reaction. The activated sodium indicated the fast neutron flux to be approximately 1.75 times greater than that measured by the $S_{32}(n, p)P_{32}$ reaction.

Calculations have been completed to determine the energy release per fission in the B, D, DR, F, and H Reactors. The "best values" and standard deviations of the values yield the following results:

$$213.7 \pm 2.6 \text{ Mev/U}^{235} \text{ fission}$$

$$202.4 \pm 3.0 \text{ Mev/fission}$$

Borescoping Activities

Borescoping assistance was provided for removal of a stuck splitter and tubing from process channels 3574-F, 0259-F, 2778-B and 2775-B.

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Sample Irradiations

The following samples were irradiated or undergoing irradiation during the month:

<u>Reactor</u>	<u>Test Hole</u>	<u>Facility</u>	<u>Request Number</u>	<u>Number of Samples</u>	<u>Material - Purpose</u>
KE	2D	Magazine	ORNL-193	24	KCl-isotope production
DR-H		PCCF	HAPO-184	10	Washington Designated Program
DR		PCCF	HAPO-218	1	Natural Uranium (fission product release studies)
F	E	Quickie	HAPO-219	1	Strontium (isotope production)
F	E	Quickie	HAPO-227	1	UO ₃ (isotope production)
F	E	Quickie	HAPO-229	7	UO ₂ (Thin films for damage studies)
KW	4C	Snout	HAPO-238	1	Cobalt (isotope production)
KE	2A	General Purpose	HAPO-230	1	Zirconium burst
KW	2A	General Purpose	HAPO-199	1	In-reactor thermocouples in a gas atmosphere
KW	3A	General Purpose	HAPO-236	1	Zirconium creep
DR		Process Tube	HAPO-124	1	Graphite (damage studies)
		Inner tube			
F	E	Quickie		1	Al (fast flux studies)
F	E	Quickie		1	Zr (shielding requirements for tube examination facility)
F	E	Quickie		2	UNO ₂ (isotope production)
F	E	Quickie		2	Au (activation analysis)
KW	4B	Modified Snout	NAA-110	1	GdO ₂ , SmO ₂ (control rod material)
KE		Gamma	HAPO-171	12	Plastics, organic liquids, pH cells, etc. (radiation damage studies)
KE		Gamma	HAPO-148	3	
KE		Gamma		4	

Vertical Bowing Measurements

A summary of the results of vertical bowing measurements follows. All distances are measured from the front Van Stone.

<u>Area</u>	<u>Date</u>	<u>Tube</u>	<u>Distance</u>	<u>Results</u>
105-D	1-7-60	4674-D	36'	Up .12" at 9'4" since 9-18-59 Down .03" at 21' since 9-18-59
105-H	1-10-60	4674-H	36'	Up .01" at 7'4" since 9-22-59 Down .12" at 23' since 9-22-59
105-KE	12-28-59	2074-KE	45'6"	No previous data
105-KE	12-28-59	4569-KE	46'6"	No previous data
105-KE	12-28-59	5085-KE	40'6"	No previous data

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COOLANT TESTING

During January, 1960, activities of the Coolant Testing Operation included operation of the 1706-KE in-reactor and out-of-reactor equipment; operation of the 1706-KER in-reactor loops, and installation and revision of additional test facilities.

A summary record of activities involving each facility follows, including significant items of performance, changes, and improvements:

1706-KE Single-Pass Tubes (PT-IP-197-A)

The six central zone tubes were operated during the month under specified production test conditions as follows:

<u>Tube</u>	<u>pH</u>	<u>Water</u>	<u>Dichromate</u>
4355	7.0	Filtered	1 ppm
4456	7.0	Filtered	1 ppm
4557)Control	7.0	Process	2 ppm
4863)Tubes	7.0	Process	2 ppm
4963	6.5	Process	2 ppm
5063	6.5	Process	2 ppm

During the January 11 outage, the six tubes were discharged and recharged with K-III-N fuel elements. Coupon holders were also inserted into the downstream dummy portion of the tubes for film and corrosion studies.

Preliminary sampling was completed in preparation for a ferric chloride addition test. This test is authorized by PT-IP-197-A, Supplement A, which authorizes addition of a variety of chemicals for effluent activity studies.

1706-KE Mock-Up Tubes

The steam-heated mock-up tubes operated during the month for tests on:

- Corrosion evaluation of sample lots of nickel-plated I&E slugs corresponding to lots of slugs which have recently been charged into one of the old reactors. These tests are being run in 80 C, 120 C, and 165 C process water.
- Evaluation of sprayed silicate coating for protection of fuel elements during shipping and charging. This test is being run in the same tube as (a) above.
- Raw water corrosion of carbon steel and aluminum alloys at 140 C raw water temperature.
- Hydriding effect of 110 C process water on etched and unetched Zircaloy-2 coupons.
- Test in 170 C process water of X-8001 aluminum elements which have been deliberately defected with scratches.

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- f. NPR control rod galvanic couple test between titanium and aluminum in 80 C process water.

Out-of-Reactor Loops

1. ELMO-1 - Two descaling tests were completed during the month, the first using inhibited H_2SO_4 and the second using inhibited HCl.
2. ELMO-4 - A revised installation design was completed during the month. A new cost estimate, based on this design, is being prepared by construction forces.
3. ELMO-5 - The loop operated at 290 C and pH 10.0 for tests of:
 - a. Corrosion of samples of Zircaloy-2 and Zircaloy-4.
 - b. Corrosion of samples of carbon steel and stainless steel at 80 feet per second water velocity. This test was completed during the month.
4. ELMO-6 - The loop was operated at 300 C and pH 4.5 during the month, primarily for testing CO_2 gas addition as a method of pH control. Corrosion effects on aluminum, stainless steel, and carbon steel coupons were also studied.
5. ELMO-7 - The loop remained shut down during the month for line heater revisions, routine maintenance, revision of test manifolds, and changes in instrumentation and control.
6. ELMO-8 - The test area blast shield was completed during the month. Work continued on relocation of the control panel and other revisions necessary before the loop may be safely operated on a routine basis.
7. ELMO-10 - Loop revisions have been completed and start-up is awaiting delivery of a line heater controller.
8. CEP-1 - Predecontamination loop conditioning was completed during the month, followed by a decontamination cycle using alkaline permanganate and Turco 4518. The loop was shut down for Gismo valve repair following the decontamination cycle.
9. CEP-2 - Final shakedown runs were completed during the month. The loop was shut down for completion of piping insulation following the shakedown runs.
10. CEP-3 - This loop is being returned to the fabricator for electrical and mechanical revisions before final installation.
11. CEP-4 - One decontamination cycle, consisting of peroxide carbonate solution with alkaline permanganate followed by Wyandotte-1112 was completed during the month. After decontamination, the loop continued operation at 300 C and pH 10.0 on a conditioning run.

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12. REF - During the month, the loop was grossly contaminated with a sample of irradiated uranium and later decontaminated using alkaline permanganate followed by Wyandotte-1112.

KER Loops

1. Loop 1 - The loop operated at 232 C, pH 10.0 with LiOH during the month. The charge consists of six 1.6 per cent enriched 20 and 30 mil wall, Zircaloy-2 clad, seven-rod cluster elements and a Pu-Al Zircaloy-2 clad, seven-rod cluster element as authorized by Supplement B to PT-IP-226-A.
2. Loop 2 - The study of possible in-reactor tube hydriding from the October fuel element rupture was completed during the month, and revealed no evidence of tube damage. On January 11 the loop was charged with four 18-inch enriched tube-in-tube elements, as authorized by PT-IP-292-A. The loop continued operation at 273 C and pH 10.0 until 1630 hours on January 31, when the loop dump valve opened, causing a reactor scram and dumping of the loop directly to reactor effluent.

Although the direct cause of the dump valve malfunction has not yet been determined, it is being thoroughly investigated during the current reactor outage.

3. Loop 3 - The loop operated at 275 C, pH 10.0 with LiOH, during the month. The charge consists of seven natural uranium seven-rod cluster elements as authorized by PT-IP-288-A.
4. Loop 4 - During the month, the loop operated on in-reactor recirculation with aluminum dummies charged. The nitric acid pH control test was terminated and the loop recharged with aluminum dummies during the January 11 outage. The dichromate addition test for water quality control was begun late in the month and is authorized by PT-IP-298-A.

Coolant Testing Operation Outage Performance

A total of 11.5 hours of reactor outage time was charged to Coolant Testing Operation during the month. 7.5 hours of this time was incurred during the unscheduled outage caused by Loop 2 dump valve opening on January 31, and the remaining time was used during the January 11 outage. The following is a breakdown of outage time charged:

<u>Item</u>	<u>PT</u>	<u>Hours</u>
Recharge six single-pass tubes	IP-197-A	2.6
Charge Loop 2 fuel elements	IP-292-A	1.0
Charge new dummies in Loop 4	IP-298-A	0.4
Loop 2 scram	IP-292-A	7.5
	TOTAL	11.5

The only unscheduled outage caused by Coolant Testing Operation activities during the month was caused by the Loop 2 dump valve opening on January 31.

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COMPONENT TESTING

Irradiated Material Examination

Fuel elements from the following 23 tubes were examined at the 105-C Metal Examination Facility during the month of January:

<u>PT No.</u>	<u>Tube No.</u>	<u>PT No.</u>	<u>Tube No.</u>
85A	2084-C	216A	0467-D
168A	0973-C		2571-D
	2464-C		2572-D
	2564-C		2661-D
178A	1863-KE		2687-D
	2275-KE		2768-D
	2566-KE		1863-KW
247A	1764-B		3874-KW
	1770-B		5082-KW
	1882-B		4179-H
	1866-B	Susp. Rupt.	1271-C*
		Rupt.	3975-DR

*Tube 1271-C was discharged on December 14, 1959, as a rupture suspect. Detailed visual examination and our boiling test disclosed no evidence of a ruptured fuel element in the tube charge.

MEF Shutdowns

Basins I, II and III were shut down two days for general clean-up. At this outage the following items were accomplished: (1) general clean-up, (2) cleaned air weigher electrodes, (3) installed manipulator tray adaptor, (4) replaced the jib crane pick-up head, (5) bolted down the slit camera manipulator, (6) examined the Liqui-Steel coating sample in Basin I and found it to be brittle and discolored, (7) tested hot Wedac solutions for effectiveness in removing algae. Solutions were sprayed on under pressure and were found to be ineffective.

Process Tube Corrosion Monitoring Program

In-reactor measurements of 127 process tubes were completed during the month. Listed below are the number of tubes measured per reactor and the document number of the reports issued.

<u>Reactor</u>	<u>No. of Tubes Problogged</u>	<u>Report No.</u>	<u>HW Number</u>
F	23	54	63271
F	27	1	63409
D	56	2	63570
B	21	3	63648

Visual examination, wall thickness and rib height measurements were completed on process tubes as follows:

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Reactor	B	D	DR	F	H	KE
Number of Tubes	1	3	1	1	1	2

Tube 1489-B was removed because the Probolog indicated a remaining wall thickness of 25 mils, which was 8 mils thinner than calculated. Actual measurements verified the Probolog results.

Tubes 2290-D, 3288-D and 3583-D were removed from the reactor for further investigation of the rate of corrosion, and to verify the accuracy of the Probolog measurements on second generation tubes. Actual wall thickness of these tubes showed the Probolog interpretation to be accurate within 0-2 mils.

Tube 2481-DR, in the reactor 18 months, was removed because it was a leaker. The leak was found between 11-1/2 and 12 feet from the rear Van Stone flange. The leak was in a 1/32-inch groove that measured less than 20 mils remaining wall thickness. Adjacent to the groove the wall thickness was greater than 50 mils. This groove extended from 10 to 12-1/2 feet from the rear van stone flange located at the 1:30 position in the tube. Between 9 and 10 feet from the rear van stone flange a band between the 1:30 and 3:30 positions was found to have a wall thickness of less than 20 mils. Samples from this tube were taken to Radiometallurgy Laboratory, Hanford Laboratories Operation, for analysis of intergranular corrosion and grain size.

Tubes examined from KE Reactor were 4569 and 5085. Tube 4569 was removed because a poison spline had ruptured in the tube; tube 5085 was mechanically damaged.

A sector probe, designed to measure the wall thickness of the top half of a process tube, was tested January 4, 1960, at 105-D Reactor.

Fifty-three front face flexible connectors were examined this month and the results will be reported in the near future.

Panellit Programs

During the month, 363 gages were processed by Maintenance personnel. Component Testing Operation inspection of these gages resulted in the approval of 271 gages (74.7 per cent) as meeting inspection criteria.

In-board reliability examinations were performed on 947 gages. This number of gages exceeded our monthly quota of 817 per month and resulted from decreased emphasis on in-board Bourdon coil examination. Of this number, 110 were found to be defective and were removed from service. This is a percentage defective of 11.6 and is compared to last month's and yearly percentages as follows:

Last month	9.2%
Last year, avg./mo.	12.7%

Bourdon coil leak examination, in-board, on 875 gages resulted in detection of one leaking coil, for a leak incidence rate of 0.11 per cent.

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Response times were determined on a total of 947 gages during the month. Of this number, 119 showed slow response and received corrective action. Percentage-wise slow response was 12.5 per cent compared to 9.5 per cent for December, 1959, 12.0 per cent for November, 1959, and 6.9 per cent for October, 1959.

A total of 13 gages was submitted for failure analysis during the month.

Fifty Panellit switches were inspected this month and nine were found to be defective.

Sixty-nine gages were received from Panellit Inc. Quality of this lot was good. Only two gages had defects severe enough to require return to Panellit Inc. for repair or replacement.

Design Change No. 342, Front-of-Panel Range Change Mechanism, provides for installation of one gage in the C Reactor panel. This gage was installed during the month and performance will be monitored for an indefinite period.

Fourteen Model 2B-X2 - dual circuit - Panellit gage switches were received and installed on the test panel. These switches have modified mercury wells and are being tested non-environmentally through excessive current loading. The mercury well modification is primarily a fabrication change and does not adversely affect reliability or function ability of the switch.

INVENTIONS

All Research and Engineering Operation personnel engaged in work that might reasonably be expected to result in inventions or discoveries advise that, to the best of their knowledge and belief, no inventions or discoveries were made in the course of their work during January except as listed below. Such persons further advise that, for the period therein covered by this report, notebook records, if any, kept in the course of their work have been examined for possible inventions or discoveries.

Inventor

Title

T. L. Deobald

Internal Diameter Optical Micrometer

Manager, Research and Engineering
IRRADIATION PROCESSING DEPARTMENT

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B-C REACTOR OPERATION
January 1960

I. ORGANIZATION AND FUNCTIONS - As the result of a comprehensive IPD review of Exempt Maintenance positions, nine B-C position levels were increased one level each and five position titles were changed.

II. <u>PERSONNEL</u>	<u>December 31</u>			<u>January 31</u>			<u>Net Change</u>
	<u>E</u>	<u>NE</u>	<u>T</u>	<u>E</u>	<u>NE</u>	<u>T</u>	
B-C General	5	3	8	5	3	8	0
B Processing	16	37	53	16	37	53	0
C Processing	16	35	51	16	33	49	-2
B-C Power	14	99	113	15	98	113	0
B-C Maintenance	22	108	130	22	107	129	-1
Total	73	282	355	74	278	352	-3

The above totals include NPR Trainees.

Movement of People - Exempt: C. A. Junghans, Supervisor-100 Operations I reactivated from sick leave to B Processing 1-1-60; J. A. Finn, Specialist Reactor Operation, terminated 1-15-60 by resignation from B Processing; D. M. Hunnicutt, Assignment Supervisor, transferred into B-C Power 1-1-60 from HLO. Non-exempt: 2 terminations (1 resignation and 1 deactivation), 3 transfers out and 2 transfers in.

III. PERSONNEL ACTIVITIES - Routine.

IV. SAFETY AND SECURITY - There were 18 medical treatment injuries and no disabling injuries or security violations. B-C Area achieved twelve disabling-injury-free years, five of which were consecutive; the event was appropriately celebrated in a special meeting during which representative non-exempt personnel were honored and a duplicate "Award of Honor" plaque from the National Safety Council to IPD was presented to B-C Area.

V. NON-ROUTINE REPORTS - None.

VI. COMPONENT ACTIVITIES

General

- A. Administration - Review of N Reactor criteria, specifications and prints continued. A study was continued of the transportation, security, and radiation protection procedures for entering and leaving 100 Areas, and recommendations were made for improvements. The annual review of exempt salaries was started.
- B. Personnel Development - Eight exempt personnel completed PBM-I training. Three exempt personnel completed "Communication Training", and non-exempt personnel participated in Reactor Fundamentals, Reactor Physics, Electronics, Charge Seater, Radiation Monitoring and Emergency Rescue Training courses.

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- C. Cost - Estimates of B-C Reactor Operation's FY 1961-1962 requirements for Automotive and Heavy Mobile Equipment, Office Equipment and Specialized Equipment were submitted to General Accounting. Compilation of the Operating Expense budget for FY 1961-1962 was continued. Planned Maintenance Job No. 27, Replacement of Central Viewer - 105-C was approved by the Department General Manager.
- D. Landlord - The painting program was reviewed and plans were agreed upon for continuation of the program.
- E. Suggestions - Start of month - 33; received - 28; completed - 9; end of month - 52.

B PROCESSING

- A. Production - Input production was 101.9% of forecast. Limiting factors were tube power and graphite temperatures. TOE was 81.7%.
- B. Operating Experience - There were four (unscheduled) outages, all due to ruptured slugs. Routine outage work was accomplished during the unscheduled outages.

<u>Date</u>	<u>Outage Hours</u>	<u>Cause</u>
(1-1-60)	(5.4)	(Conclusion of December outage).
1-10-60	35.8	Rupture - tube 3268. The rupture was removed with the charging machine.
1-21-60	73.9	Rupture, tube 1686, caused a high Panellit trip. A slug lodged on the discharge slug guide during attempts to flush the down stream pieces. Removal of the slug guide was accomplished by drilling an access hole through the rear wall. The rupture was removed by means of the pushing machine with a water-cooled pushpole.
1-24-60	19.9	Rupture - tube 2676. The tube and charge were removed with a maximum force of 13,000 pounds.
1-31-60	1.1	Rupture - tube 1575 (removed with charging machine). Outage continued over month end.

- C. Equipment Experience - Two more rear pigtails (DuPont-type) failed during operation; eight leaking rear pigtails (DuPont-type) were replaced with the new J-II type pigtails. The obstruction in No. 37 VSR channel was removed. The leaking sphincter seal on No. 29 VSR was replaced. The leaking gas seals on No. 8 and No. 9 HSR's were replaced. An inspection of the rear-face neoprene seal revealed evidence of checking and cracking, and three coats of neoprene sealer were applied. The near and far side neoprene seals were inspected, cleaned and primed for future coats of sealer. The Groves valve sensing line from the far high tank froze and caused the Groves valves to trip. The far high tank fill-line froze; after thawing both tanks were being filled manually pending repairs. Two hundred reamed (.310") venturis were installed.

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- D. Improvement Experience - Project CG-791, "Reactor Confinement" - Excavation for the confinement building was started. Project CG-817, "Crossheader Pressure Differential Indicators" - Work continued on the annunciator alarm system.
- E. Radiation Monitoring Experience - A cobalt-60 source giving a dose rate of 450 mr/hr at two inches was left unattended in the transfer area, but no one was exposed. Floor contamination of 45,000 c/m was found in the maintenance storage room. Two cases of skin contamination measuring 50,000 c/m occurred following discharge area work. An electrician received a skin dose of 400 mrad from a particle which lodged on his neck while relamping underwater lights. An operator experienced 5 r/hr while installing a quickie funnel.
- F. Events Influencing Costs - 626 hours of overtime were used mostly because of rupture removal.

C PROCESSING OPERATION

- A. Production - Input production was 99.0% of forecast, and TOE was 79.9%. A new high power level was achieved, controlled by rupture limits.
- B. Operating Experience - Four (unscheduled) outages were experienced during which routine outage work was accomplished.

<u>Day</u>	<u>Hours</u>	<u>Cause</u>
3	33.7	Rupture - tube 2168 (regular I&E slug). Discharged with the charging machine.
14	40.6	Rupture - tube 2171 (regular I&E slug). Discharged with the charging machine.
21	37.4	Rupture - tube 2576 (regular I&E slug). Discharged with the charging machine.
24	38.1	Rupture - tube 3861 (regular I&E slug). Discharged with the charging machine after backseating at maximum force of 4,000 pounds.

- C. Equipment Experience - 21 faulty thermocouples required repair; seven new vertical bundles was installed. VSR Channels No. 41 and 58 have been out of service for approximately three years due to plugged Ball 3X exit lines; borescoping revealed graphite blocks obstructing both channels. Due to broken threads, 21 wire braided front connectors on Ball valve tubes were replaced.
- D. Improvement Experience - CG-666 - Zone Temperature Monitoring - 95% of the thermocouple elbows have been installed on the rear nozzles; the project is 96% complete. CG-706 - Installation of Improved Reactor Gas Instrumentation - completed, with minor exceptions. CG-791 - Reactor Confinement - Excavation work was started for the filter building. New Panellit Gauges - Installed on rows 33 and 34.

- E. Radiation Monitoring Experience - The pickup chute area was contaminated to 40,000 c/m as a result of water leaking through access holes in the discharge area wall; an operator's shoes became contaminated to 40,000 c/m and the contamination was transferred to a vehicle while driving to another area. The Metal Examination Facility basins were decontaminated at a dose rate of 1 r/hr. The rupture from tube 2171 emitted radioactive gas into the storage and discharge areas.
- F. Events Influencing Costs - Overtime required totaled 552 manhours.

POWER OPERATION

- A. Operating Experience - 100-B area continued to carry the raw water export load to the 200 areas. Filtered water quality was maintained without difficulty. The river elevations raised 4'4", with a 2' variation in a 23 hour period. The loss of No. 9B pumping unit at 181 left 21 pumps, which is the required number for operation of both reactors.
- B. Equipment Experience - Motor stator repairs and pump modifications were completed on units 5A and 8A in 190-B Annex. The No. 2 pump impeller in 190-C was replaced with an old impeller returned by Byron Jackson Company. No. 2 Pump Motor in 183-B was sent off plant for a complete overhaul; it has been returned but not installed.

The pump driveshaft on No. 9 B river pump broke, and examination showed evidence of old cracks; other shafts on this unit were sonic-tested and no other cracks were found, so the unit was returned to service. One 30-mesh process header screen in 190-C was replaced with an 8-mesh screen.

- C. Improvement Experience - New pH recorders were installed in 183-B to provide better control of pH and to improve the unit cost of process water. CG-558 - No.'s 5A and 8A impeller assemblies in 190-B Annex were replaced with the new-design impeller assemblies; only No. 6 A has not been replaced.

MAINTENANCE OPERATION

- A. Outage Experience - Of the 285.9 outage hours at B and C Reactors, 49% was devoted to maintenance. The major work accomplished was: 105-B - Two stuck ruptured fuel elements were removed; completed a vertical traverse of Tube 4574; conducted an extensive survey of the reactor gas system to determine location of unused piping and equipment. 105-C - One empty channel was retubed; seven vertical rows of thermocouples were installed; installation of zone temperature monitor rear nozzle connector elbows was 95% completed.
- B. Equipment Experience - At 183-B, an inspection revealed the need of a complete rebuilding of the No. 2 process pump motor (700HP); the rebuilding, including a dynamic balancing of the rotor assembly, was made by an electric service shop at Spokane, Washington. At 190-BA, a new impeller was installed in the No. 5 process pump as authorized by Project CG-558; the new pump assembly has a vendor modified casing head and casing, new shaft, new bearings, and new impeller. At 181-B, the No. 9B river pump was overhauled as the result of a fatigue failure of the line shaft; (broken in two places); all shaft sections were verified okay by a "sonic" testing prior to reassembly.

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- C. Improvement Experience - Seven vertical bundles of new exit-water thermocouples were installed at 105-C; the couples are an improved snap-in well type, fed by silicone rubber insulated thermocouple wire. Gas sensing lines were installed in the exhaust air ducts from the inner rod room, rear face and top of unit to aid in locating gas leaks.
- D. Maintenance Engineering - A study has been made of the B-C gas system to determine improvements needed and/or deletions recommended. The study covered the following points: 115-B Building sensing lines, 110-B Building piping, gas tunnel, reactor makeup and purge systems; a report containing the necessary design changes is being prepared. A special air motor drill with an extended 60° angle head for drilling the bellows cans has been received; testing is scheduled for February. Design Change No. 348-B, which authorizes the fusing of each individual cone valve group control circuit at 190-BA has been approved; this revision will allow maintenance of any one cone valve without endangering loss of the remaining valve groups.
- E. Productive Maintenance - Of 9,087 manhours scheduled, 93% were completed.

G. R. Maguire

Manager
B-C REACTOR OPERATION

AR Maguire:ILH:dpo

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D-DR REACTOR OPERATIONJANUARY, 1960I. ORGANIZATION AND FUNCTIONS - No change.II. PERSONNEL

A. <u>Force Summary</u>	<u>December 31, 1959</u>			<u>January 31, 1960</u>			<u>Net Change</u>
	<u>E</u>	<u>NE</u>	<u>Total</u>	<u>E</u>	<u>NE</u>	<u>Total</u>	
General	5	3	8	5	3	8	
D Processing	16	38	54	16	39	55	+1
DR Processing	14	32	46	15	33	48	+2
Power	16	102	118	16	102	118	
Maintenance	21	131	152	24	131	155	+3
Total	72	306	378	76	308	384	+6

The above includes NPR Trainees. The January 31 data includes three exempt and three nonexempt instrument craftsmen.

B. Movement of People - Effective January 1, 1960, there were a number of changes made in Maintenance assignments as a result of recent studies relative to first line supervisory jobs. Assumption of new duties was in progress during January and completed on February 1. H. M. Armstrong and H. A. Konkle, Supervisors, Mechanical Maintenance were assigned as Supervisors, Reactor Mechanical Maintenance. R. M. Buslach, Supervisor, Shift Maintenance, and J. Fatur, Supervisor, Development Laboratory Maintenance were assigned as Analysts, Maintenance Methods. N. V. Starkebaum, Analyst, Maintenance Methods was assigned as Supervisor, General Mechanical Maintenance. D. C. Greenhalgh, Specialist, Reactor Outage was assigned as Supervisor, Maintenance Planning and Scheduling. Effective January 18, 1960, K. E. Harding and T. R. Riggins, Engineers-Construction, CE & UO were transferred to D-DR Maintenance as Supervisor, Shift Maintenance and Supervisor, Development Laboratory Maintenance respectively. Effective January 1, 1960, S. L. Hooper and R. J. Pyzel, Technical Graduates on the Rotational Training Program, were given permanent assignments in D-DR Reactor Operation as Junior Engineer in the Maintenance Operation and Assignment Engineer in the DR Processing Operation, respectively. Nonexempt personnel movement during January included five transfers in, two transfers out, one reactivation, and two terminations due to retirement.

III. PERSONNEL ACTIVITIES - Routine.

IV. SAFETY AND SECURITY - There were 18 medical treatment injuries and no security violations in January. The Specialist, Safety and Fire Prevention held a meeting with management of Equipment Development Operation, D-DR Maintenance and Thermal Hydraulics Operation (HLO) to discuss regulations on safety glasses in 189-D.

V. NON-ROUTINE REPORTS - None were issued.

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VI. COMPONENT ACTIVITIES

GENERAL

- A. Administration - Coordination was provided for completion of the annual exempt appraisal and salary review programs during January. W. A. Wright, Specialist, Administrative Programs, and R. W. Menard, Specialist, Wage and Benefits Administration, discussed the GE insurance program with Building 189-D Development Laboratory Maintenance employees. A revised roster of Emergency Disaster Rescue Personnel in D-DR Reactor Operation was submitted to the Fire Protection Operation of CE & UO.
- B. Suggestions - C. D. Chapman, Millwright Journeyman, was awarded \$665 on January 4 for a suggestion involving modification of the tuggers used at the front and rear of the reactors. Suggestion statistics for the month were: in process at beginning of month 39, submitted 11, completed 11, in process at month end 39.
- C. Personnel Development - J. Handros, HAPO Attorney, discussed problems relative to Bacon-Davis work determination at a meeting of D-DR Reactor exempt employees on January 6. Three rotation pool technical graduates completed assignments within D-DR Reactor Operation early in January. At month end no technical graduates were assigned to the Operation.
- D. Cost Control - The monthly D-DR Reactor Operation cost meeting was held on January 26. W. G. Smith, Specialist, Costs Estimates and Budgets, discussed budgeting within fifth level operations. Data concerning the following items was submitted for use in preparation of the FY-1962 Budget and revision of the FY-1961 Budget; personnel, overtime, automotive equipment, special equipment, and essential materials. A review of Planned Maintenance for FY-1961 and FY-1962 was in progress during the month.
- E. Landlord - Modification of Building 1709-D to accommodate the Electrical Equipment Development Operation was started during the month. The HLO Reactor Engineering Development facilities presently housed in this building are being moved to the south end of Building 190-D.

D PROCESSING OPERATION

- A. Production - Input production was 94.8 percent of official forecast. Operating levels were limited by a tube power rupture control limit. Time operated efficiency for January was 74.4 percent which was 90.4 percent of forecast.
- B. Operating Experience
 - 1. Operating Continuity

There were four outages during the month, one scheduled and three unscheduled. Total downtime was 190.4 hours.

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B. Operating Experience (Con't.)

<u>Date</u>	<u>Hours</u>	<u>Reason</u>
1-4-60	117.9	Scheduled tube replacement
1-4-60	1.9	Change of two venturises
1-25-60	52.3	Venturi and orifice plugging
1-31-60	<u>18.3</u>	Moderator temperature control problems
	190.4	

The second outage was to change the venturises of two columns which had been converted to I & E² during the scheduled tube outage. Pump bearing particles plugged crossheader screens, venturises and orifices causing the third outage. The shutdown of 1-31-60 was necessary when it became obvious that power level would be limited by control problems. Rapid helium purges were necessary after recalibration of the helium gas analyzer. Continuous flattening changes to control graphite temperatures dictated the decision to shut down.

2. Equipment Experience - The sixty seven tubes replaced included one in an air channel, left from a December rupture. Splines were used for turnaround control, 40 on January 8 and 22 on January 27. Equilibrium flattening required the use of 11 splines. Chopper failures during removal continued as the only major spline problem. A bearing failure in a 190-D pump allowed metal pieces to enter process water to the reactor, affecting valve pit, venturi and orifice screens. Valve pit screens were cleaned of metal scraps on January 18. Near crossheader screens and the venturises and orifices of those tubes showing increased Panellit pressure were cleaned January 25. Two crossheader screens were found with holes and all contained foreign material such as metal, rubber and welding slag. A Turco decontamination of rear face piping on January 4 reduced radiation readings 50 percent. Locking devices were installed on all channels to prevent the inadvertent connection of a blank channel to the water system. A two minute scram delay circuit of all PCCF tubes was completed.

- C. Improvement Experience - CG-706 - "Improved Gas Instrumentation" - CO₂ purge lines were installed in the 115-D dryer rooms to provide a gas supply for reducing radiation readings prior to entering the rooms. CG-707 - "Sub-Critical Flux Monitor" - The chamber was installed in "A" test hole, control room instrumentation was completed, and acceptance tests completed on the "A" hole installation. The monitor is now in service and was used during the 1-7-60 and 1-27-60 startups. CG-817 - "Crossheader Differential Alarm System" - The project was completed with completion of the acceptance tests on 1-4-60. The equipment is now in service.

- D. Radiation Monitoring Experience - There were two lapses of radiation control in January. The first the result of shoe contamination after an operator left the discharge area. The second occurred at B Reactor when a D Processing monitor overlocked a high level particle on a craftsman when surveying

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D. Radiation Monitoring Experience (Con't.)

at rear face exit. Estimated skin dose was 305 mrad/hr for the 7½ minutes until the particle was found. Significant dose rates received were 5 r/hr removing a poison slug lodged in a rear ball valve and 3 r/hr at the "A" test hole working on a sub-critical monitor assembly.

E. Events Influencing Cost - A total of 732.8 hours of overtime was used during the month.

Nonexempt Shift Overlap	15.0 hours
Shutdown Coverage	693.8
Exempt Overtime	<u>24.0</u>

Total 732.8 hours

DR PROCESSING OPERATION

A. Production - Input production was 111.1 percent of the official forecast. Time operated efficiency was 110.7 percent of forecast. Production was higher than forecast, due primarily to the significantly higher than forecasted TOE. Maximum power levels during the month were limited by a tube power rupture control limit.

B. Operating Experience

1. Operating Continuity

Operation was interrupted by four unscheduled outages during the month:

<u>Date</u>	<u>Hours</u>	<u>Reason</u>
1-10-60	37.3	Rupture 1570-DR
1-21-60	44.8	Water leak in tube 2185-DR
1-24-60	0.3	Panellit scram on tube 3379-DR, caused by sudden shifting of metal charge downstream.
1-24-60	0.2	Panellit scram on row 24. Unexplained

2. Equipment Experience - The rupture in tube 1570-DR was a hot-spot failure, discharged with the charging machine. An in-reactor water leak in poison column 2185-DR caused the January 21 outage to replace the tube. A separate report concerning the cause is forthcoming. The venturi changing program was completed with the change-out of 91 venturis, reducing the reactor to three zones with .310 venturis in the central and .283 venturis and .243 orifices in the two fringe zones. The sub-critical chamber in "E" test hole was changed out because of erratic operation.

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- C. Improvement Experience - PCCF Ball Valves - Poison column control tubes 1583 and 3283 were moved to 1482 and 3382 to permit better flattening of the reactor during reactor operation. Beckman Recorders - The Beckman miniature recorders were modified to give finer equilibrium reactor control information. At equilibrium the full range of the recorder can be set to indicate two major divisions on the Beckman meter. For non-equilibrium operation the recorder is set to operate as before.
- D. Radiation Monitoring Experience - Two lapses of radiation control were charged to DR Processing during the month. Backflow to the front face when water pressure was reduced gave dose rates of 85 mr to an operator and 115 mrad to a craftsman. The men were replacing a valve on the front face at the time. The second lapse occurred when a contaminated tugger was stored in a non-posted area of a sample room. The maximum dose rate received was 2.5 r/hr while placing a HAPO sample in a cask.
- E. Events Influencing Costs - Overtime was used as follows:

Nonexempt Shift Overlap	5.5 hours
Shutdown Coverage	151.7
Exempt Overtime	<u>8.0</u>

Total 165.2 hours

D-DR POWER OPERATION

- A. Operating Experience - The steam generating load averaged 122,389 lb/hr with an evaporation rate of 9.19. Process water quality was controlled with little difficulty in January.
- B. Equipment Experience - 183-D - About 40 tons of sand carried over from filters was found in the south clearwell when drained for inspection. Addition of 30 tons of sand to the filters was completed January 14. 184-D - The Shute-Koerting automatic steam valve on the emergency generator was replaced with a spare in order to replace a defective part. 190-D - No. 7 annex pump, placed in service after impeller replacement, was shut down soon after because of bearing temperature. Inspection revealed that the center sleeve was partially destroyed by melting and the shaft was burned, with metal missing to a depth of about 1" on the radius.
- C. Improvement Experience - Project CGI-796 - Reactor Confinement, 105-D Area - Re-routing of the 225 psi steam line south of 105-D Building to the sectionalizing valve west of the 115-D Building was started January 21.
- D. Events Influencing Costs - No unusual variance.

D-DR MAINTENANCE OPERATION

- A. Equipment Experience - Removal of the D elevator cab at 105-D has progressed to 50 percent completion without using outage elevator time. The replacement of poison tube 2185-DR presented some unique problems in moving tube, contents and rear gunbarrel together and sawing from the D elevator. The job was completed without mechanical failure or radiation incident. Two 8000 gal. stainless steel tanks for liquid alum were transported from 200-W to 183-D and 183-DR.

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- B. Maintenance Engineering - Safety Circuit Trip Identification System - Final installation and tie-in of this system was completed during the month and the system is now in beneficial use. The new system detected and identified the cause for two scrams during the last 105-DR startup. These scrams would previously have been identified as "cause unknown". Modification of Control VSR Switch Panels - Prefabrication of the new VSR switch panel for 105-D is complete. Rerouting of existing wire behind the main console panels is being done as outage time permits. Final installation of the panel will be accomplished during the next extended outage at 105-D. PECT Scram Delay Instrumentation - Installation and acceptance testing of this facility in accordance with Design Change 292 was completed at 105-D during the month. Operating experience has demonstrated the desirability of improved alarm lights. This problem is now being evaluated. Decontamination Facility 105-DR 30' Near Ready Room - This work consists of assisting maintenance personnel in the installation of rear cap decontamination equipment at 105-DR. All critical equipment including stainless steel tanks, exhaust fans, monorail, and hoist are on site. Sketches will be prepared to show the supply and drain piping arrangement. Improved Spline Disposal 105-D - Detailed drawings of the spline wrapper developed by FEO Mechanical Development "A" have been received and are now being modified for use on the 105-D "C" elevator. Discharge Chute Conveyor - Design of a hydraulic ram activated metal pusher has been completed. Fabrication and installation of this system is awaiting approval of funds by 105-D Processing. Liquid Alum Feed System - All material for this facility has been ordered and the installation is scheduled for completion by middle February. Pigtail Inspection - Pigtails were inspected at 105-D and DR during January. Eight badly cracked spiral pigtails were found at 105-D and three at 105-DR. Evidence of zone temperature pigtails (less than two years old) failing is being found.
- C. Planning and Scheduling - During the month 28 Class A, 87 Class B, and 91 Class C inspections and overhauls were made. Programmed Maintenance is essentially up to date. There was no significant change in the backlog of hours for each craft.
- D. Events Influencing Costs - Overtime usage for the month was 374 non-exempt and 246 exempt manhours.

WD Richmond

Manager
D-DR Reactor Operation

WD Richmond:JDR:jf

SECRET

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F REACTOR OPERATION
JANUARY - 1960

I. ORGANIZATION AND FUNCTIONS

No change.

II. PERSONNEL

A. Force Summary

	<u>December 31</u>			<u>January 31</u>			<u>Net Change</u>
	<u>E</u>	<u>NE</u>	<u>Total</u>	<u>E</u>	<u>NE</u>	<u>Total</u>	<u>of Total</u>
General	3	2	5	3	2	5	0
Processing	15	38	53	15	38	53	0
Power	8	51	59	8	51	59	0
Maintenance	14	71	85	14	71	85	0
Total	40	162	202	40	162	202	0

Includes employees in training for NPR.

B. Movement of People

Exempt: No changes.

Nonexempt: Three transfers in and three transfers out.

III. PERSONNEL ACTIVITIES

An information meeting was conducted on January 27 in F Area by the Section Manager for the benefit of F Area exempt personnel. Fourteen exempt employees were in attendance.

A number of F Area exempt people were interviewed as part of the follow-up program resulting from the recent Attitude Survey.

E. J. O'Black and R. M. Scott attended a talk on "Reactor Control" given by G. C. Fullmer on January 7.

R. M. Scott attended a talk on "Wages, Prices and Productivity" given by F. E. Highton on January 11.

IV. SAFETY AND SECURITY

Eight medical treatment injuries were reported. No disabling injuries or security violations were reported.

Initial steps were taken to establish a new area safety council to be known as the "F Area Accident Prevention Council." Its purpose is to stimulate worthwhile safety activities.

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A Patrol safety and housekeeping inspection tour was conducted in the area on January 5.

A review was made to determine that security bulletin boards are located in all buildings as required. Arrangements were made to have boards installed where needed.

V. NON-ROUTINE REPORTS

None.

VI. COMPONENT ACTIVITIES

GENERAL

A. Personnel Development

S. F. Ginther, Power Supervisor; J. A. Olson and K. R. Ridgway, Process Supervisors; and D. B. Ferguson, Reactor Specialist; attended a seminar on "Criticality Accidents" on January 5.

O. C. Allred, Reactor Specialist, attended the initial session of the "Reactor Processing Fundamentals" course conducted by E. H. Lockwood.

P. J. Crowder, Power Supervisor, attended a class on "Effective Communications" on January 15.

K. J. Parchen, Maintenance Supervisor, completed the PMS training course.

Four craftsmen attended the "Tube Replacement and Rupture Removal" classes conducted by the Facilities Engineering Operation at White Bluffs.

J. G. Herdan, Assignment Engineer, and E. C. Moran, Maintenance Supervisor, completed the PEM-I course.

L. C. Hatten, a Maintenance employee, attended training courses on "Shop Practices" under the current Instrument trainee training program conducted by the Facilities Engineering Operation at White Bluffs.

Two Maintenance employees attended "Rescue Crew" training during the month.

B. Costs

Budget forecasts for FY 1961-62 were submitted to the Financial Operation, including forecasts for Special Equipment, Office Equipment, Automotive Equipment and Heavy Mobile Equipment.

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C. Landlord Activities

The work of remodeling the 1713 Building to provide additional office space for Plant and Industrial Engineering people has continued throughout the month. Completion is expected within two weeks.

Remodeling of the 1707 Building was completed. Adequate facilities are now provided in this building to accommodate our change house requirements and to house new offices and a lunch room for Patrol Headquarters personnel. Patrol occupied their new quarters on January 11.

A meeting of IPD and HLO personnel (including landlord representatives and property specialists) was held on January 13 to discuss custodial responsibility for property, now located outside the new F Area perimeter fence, and to propose a new policy for maintenance of the property. It was decided that certain properties, identifiable with HLO or CE&U, should be transferred. Identification of such properties is in process.

A review of landlord expenses for building maintenance and improvement costs, resulted in an increase of monthly rental charges for space occupancy in nine F Reactor buildings, effective January 1.

Paint and new floor tile were added to the Vault, located in the north wing of the 1704 Building; work was completed on January 15.

Workmen are in the process of installing a new partition and dutch door in the new badge house building. This will provide a distinct separation of RM quarters from the portion of the building being utilized by Patrol. Space on the partition wall will accommodate a display case.

D. Suggestion Evaluation

Suggestions on hand at start of month: 26; received: 17, evaluated and returned: 20; on hand at end of month: 23.

F PROCESSING OPERATION

A. Production

Input production was 101.8 percent of forecast, with a TOE of 79.1 percent. Equilibrium operation was limited by rupture control tube power limits.

B. Operating Experience

1. Operating Continuity

<u>Outage Date</u>	<u>Hours</u>	<u>Reason</u>
1-4-60	115.2	Excessive water collection.
1-23-60	39.1	Rupture.
1-25-60	1.4	Manual trip - Insufficient control rods.
Total	155.7	

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2. Equipment Experience

- a. Process Tube Replacement - Twenty-seven tubes were probologged, 8 were replaced, and 6 air channels were retubed. Attempts to remove the tube from 0259-F resulted in a section of tube being left in the rear gunbarrel and the channel blanked.

b. Ruptured Fuel Element

<u>Tube No.</u>	<u>Date</u>	<u>Max. Removal Force</u>	<u>Tube Action</u>
1182-F	1-23-60	4500 psi	Leak tested and charged solid al.

- c. Panellit Panel - All row relays were removed for cleaning. Operational check, after cleaning, indicated malfunction of several relays. Circuit was rewired with 17 acceptable relays as per Design Change 350-F until sufficient relays can be obtained.

d. Process Tube Probing - Traverse - Borescope - Graphite Curvature

- 1) Tube 3873 passed a 14" probe, tube 4169, 4366 and 4374 passed a 12" probe, and tube 4290 passed an 8" probe.
- 2) Tube 4290 was retubed and then probed. The tube would still pass only an 8" probe.
- 3) A borescope of the rear of channel 4576-F before retubing indicated a vertical break in the first graphite block at 2 feet. The second block has a hairline crack at the 9 o'clock position running horizontally.
- +) A vertical traverse was completed on 3776-F.

- e. Leak Experience - Headers 1/2 through 25 were helium leak tested, indicating leaks on 2, 4 and 25 headers. Stinger testing of 2, 4 and 25 headers resulted in locating two tube leaks, one front Van Stone leak and ten rear gasket leaks.

- f. Rear Face - Process Water System - Sixteen process tube outlet temperature thermocouples were repaired and all outlet water connectors were inspected. Five were replaced as a result of the inspection. Forty-three "J" pigtails were installed on 21 crossheader. An inspection of the rear rear riser resulted in the necessity for repair of a crack which had developed around the gamma monitor sampling line.

- g. Gas Conservation - Four rear and three front boots were repaired. In addition, a gas leak on 27 3X hopper seal was repaired.

C. Improvement Experience

1. CGI-817 - Crossheader Differential - The mechanical portion of the system was installed and tested. Installation of the electrical portion continued during the latter portion of the month.

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2. CGI-806 - Ph. IV Power Rate of Rise - Installation is 85 percent complete.

D. Radiation Monitoring Activities

F Reactor Operation incurred two lapses of radiation control. Three employees received personal contamination with a maximum level of 40,000 c/m measured. All were readily decontaminated. A few small pieces of irradiated wire having activities up to 140 rads/hour were detected during dummy decontamination operations. Routine monitoring and remote processing prevented significant personal exposure.

There was no incidence of personal exposure to dose rates in excess of 3 r/hour.

F POWER OPERATION

A. Operating Experience

1. The Hagan Master Controller shut off and steam pressure dropped to 80 psi at 5:25 p.m. on January 4. This incident was apparently caused by foreign material in the instrument impulse line. Normal pressure was restored at 5:40 p.m.
2. On January 10 at 1:48 p.m. and 1:52 p.m., a 3 psi raise in process water pressure was observed. This was caused by a variation in BPA frequency.

B. Equipment Experience

1. The east and west alum feed lines were re-anchored inside the raw water flumes.
2. The nylon key for gear oil pump drive for No. 8A process water pump was inspected on January 6. The key was in satisfactory condition and was returned to service.
3. The governor valve and cage for No. 2 forced draft fan at 184 Building was replaced on January 20.
4. Unions were installed in the oil reservoir lines on 2A and 5A pump units.

C. Improvement Experience

Project CG-791 - Reactor Confinement Program - Phase II-A - Completed tie-in of new steam line to the main loop on January 5.

D. Events Influencing Costs

1. Overtime - The total overtime reported during the month was 59.1 hours.

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2. Other

- a. The overhaul of No. 2 boiler feed pump.
- b. The overhaul of No. 8 turbine at 190 Building.
- c. The replacement of the governor valve and cage on No. 2 forced draft fan at 184 Building.
- d. High steam load as a result of increased heating loads.

F MAINTENANCE OPERATION

A. Equipment Experience

1. Instruments - New Panellit jumpers of an improved design were installed during the January 4 reactor outage.

Three leaking pressure monitor system gages were replaced. Approximately 270 gages were adjusted during operation while approximately 600 gages were adjusted during the period the system was bypassed.

Two mass spectrometer units were disassembled and cleaned to correct trouble experienced with the reactor leak detector.

An indicator lamp was installed in the control room which will show when the reactor outlet drip-leg dump valve is open.

2. Electrical - New separators were installed in the individual cells of the two Ball 3X batteries.

Wiring for a tape recorder installation was completed between the reactor building communication cabinets located in the electrical equipment room and the Supervisor's office in the control room.

All rusted conduit and involved wiring was replaced to the car unloader conveyor at the 183 Building.

A Gamewell Fire Alarm System panel was installed at the 1707 Building, after its removal from the 1720 Building. Emergency power service was also installed in the building to eliminate the use of a gasoline-driven generator which formerly provided emergency power.

3. Mechanical - An additional 72 crossheader locking devices were installed on blank or spare crossheader connections.

The copper oil line serving 1178 ball valve, leaking due to corrosion, was repaired.

The sectionalizing valve on the 225 pound steam loop in the 182 Building pipe gallery was replaced.

An overhaul of the No. 8 emergency turbine in the 190 Building was completed on January 26.

The rear ball valve on 3685 was replaced as a result of oil leaking past the seal in the motor.

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B. Maintenance Engineering

1. Instrument Engineering

105-F Temperature Deviation Recorder - Purchase specifications were issued for bids on a new six point temperature deviation recorder.

105-F Design Change 306-F - A design change to authorize the addition of a range limiting switch to the control Beckman amplifiers has been approved and issued.

2. Electrical Engineering

105 Building Rear Face Television - Technical assistance was provided for the installation of remote television equipment.

MJA-8 - Ball 3X Revision - Technical assistance was provided for the preparation of acceptance test procedure, 189 Building mock-up testing and miscellaneous pre-installation details of the new system. The equipment is ready for installation during the February 1 outage.

184 Building Steam Export Underpressure Incident - Prepared Design Change #351-F, "184 Building Steam Export Under-Pressure Alarm." This design change will provide process annunciator alarm for underpressure condition of either of the two export lines. The formal design change is being circulated for approval signatures.

3. Mechanical Engineering

183-F Tank Car Chlorine Unloading Facilities - Drawing H-1-12275 showing arrangement and details of the proposed new facilities has been completed. An estimate was requested from the J.A. Jones Company for installation of the unloading facilities.

105-F Decontamination Tanks - Wash Pad - Two decontamination tanks, rinse as per drawing H-1-11761, and acid tank as per drawing H-1-11754, were ordered on January 8.

4. Planning and Scheduling

Approximately 24 percent of available manpower was assigned to productive maintenance efforts. This activity included the completion of 14 Class "A" overhauls and 361 Class "B" inspections.

C. Property Control

Property Disposal Request forms were prepared for the disposal of the following buildings: 1701, 1720, 1621, 1707A, 1715 and 1722-F. Final approval is pending.

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D. Events Influencing Costs

1. Overtime

In maintaining the F Reactor facilities, a total of 579.1 nonexempt overtime hours and 141 exempt overtime hours was required. Nonexempt personnel expended 192.4 overtime hours outside F Area and exempt personnel expended 12 overtime hours outside F Area.

2. Materials

A total of 66 requisitions was issued at an approximate cost of \$5827. At month's end, 63 requisitions were outstanding which represented a cost of \$17,660. Of this amount, \$7504 reflects capital expenditures. Procurement of a shipment of replacement pigtails is significant.

MANAGER
F REACTOR OPERATION

CN Gross:CFK:det

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H REACTOR OPERATION
JANUARY, 1960

I. ORGANIZATION AND FUNCTION

No change.

II. PERSONNEL

A. Force Summary

	<u>December 31, 1959</u>			<u>January 31, 1960</u>			<u>Net Change</u>
	<u>E</u>	<u>NE</u>	<u>Total</u>	<u>E</u>	<u>NE</u>	<u>Total</u>	<u>Of Total</u>
General	3	2	5	3	2	5	0
Processing	17	35	52	16	35	51	-1
Power	9	52	61	9	53	62	+1
Maintenance	13	61	74	14	61	75	+1
Central Maintenance	<u>18</u>	<u>113</u>	<u>131</u>	<u>18</u>	<u>114</u>	<u>132</u>	<u>+1</u>
Total	60	263	323	60	265	325	+2

B. Movement of People

Exempt - C. D. Shadinger, Supervisor I, H Processing Operation to Fabrication Shop Engineer, NPR Project Operation; K. G. Dyekman, Technical Graduate, Hanford Laboratories Operation, to Assignment Engineer, H Maintenance Operation; H. L. McDonald, Reports Analyst, Project Engineering Operation, to Maintenance Engineer II, H Maintenance Operation; G. H. Nickles, Analyst - Maintenance Methods, H Maintenance Operation, to Analyst - Reports, Project Engineering Operation.

Non-Exempt - Five transfers in and three transfers out.

III. PERSONNEL ACTIVITIES

Sixteen people attended the Section Manager's Information Meeting. First-line supervisor attitude surveys were started during the month.

IV. SAFETY AND SECURITY

There were 14 medical treatment injuries reported. There were no lost-time injuries or security violations. Reorganization of the H Safety Program Council was started with the re-writing of the safety charter for the area. Function of the council will be to develop health, accident prevention, and security topics and programs for area-wide use.

V. NON-ROUTINE REPORTS

None.

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I. COMPONENT ACTIVITIES

General

A. Administration

Special equipment budgets were submitted for the next two fiscal years. Reviews were conducted on job descriptions for clerical and non-secretarial jobs. Salary data was compiled for the 1960 exempt salary review.

B. Personnel Development

Enrolled personnel continued to attend PBM. Training activities ranging from classes on tube replacement and rupture removal to secretarial proficiency were attended by interested personnel.

C. Cost Control Activities

Control activities were routine during the month.

D. Landlord Activities

All activities were routine.

E. Suggestion Evaluation

On hand at beginning of month	26
Received	5
Processed	8
On hand at end of month	23

Processing Operation

A. Production

Input production was 2.7 percent above forecast. Equilibrium power levels reached 1825 MW which represented a new high for H Reactor. The tube power operating limit was increased from 1090 to 1140 KW which represented a 50 percent increase in Operational Severity Index with some additional gain from decreased river temperature.

B. Operating Experience

Operating Continuity

<u>Date</u>	<u>Hours</u>	<u>Reason</u>
1-9-60	32.7	Shutdown to rotate front cap 2272 which was not fully engaged.
1-20-60	52.7	I & E natural rupture, 2981.
1-23-60	3.7	Excessive O ₂ in reactor atmosphere.

Operating Continuity (Continued)

<u>Date</u>	<u>Hours</u>	<u>Reason</u>
1-23-60	0.8	Panellit trip, 0265.
1-26-60	40.5	Tube leak, 1960.
1-28-60	0.6	Panellit trip, 3457.

Equipment Experience

A total of 19 process tubes were replaced. Sixteen were thin-walled tubes, one was for special examination, one was a leaker, and the other was damaged by a stuck rupture. It was found during regular tube replacement that the rear Van Stone on one of the thin-walled tubes had become separated or completely sheared. This plus a leak in another tube attributed to the excess water collection from the reactor gas system.

Two stuck ruptures from the same lot were removed. The second occurred when a group of tubes of this lot were being discharged at 70 percent of goal exposure because the material had been classed as rupture-prone.

In addition to the stuck ruptures, there were two other stuck charges which were easily removed after a high water pressure flush. The charges were freed at maximum forces of 1,500 pounds.

Twenty-seven additional Panellit gauges were converted to the 10-90 range. The board contained 49.6 percent 10-90 gauges at month end.

An additional 73 J-2 type rear face pigtails were installed. A total of 48 serious pigtail or connector leaks were corrected.

C. Improvement Experience

Charging a mixer slug as the seventh downstream piece in the I & E natural columns was started. The purpose is to reduce abnormal tube corrosion.

The crossheader differential (CG-817)ATP was completed. The equipment is now ready for service.

D. Radiation Experience

A spread of contamination and uncontrolled radiation was created in the non-radiation zone section of X-1 level when contaminated water backed up into a new differential pressure gauge system for the KAPL Loop. Smearable contamination up to 150 mrad/hr leaked from the system. Personnel contamination to 10,000 c/m on coveralls and 4,000 on hands while working on the system was encountered. Dose rates in the order of one r/hr were found on the equipment. The employee exposed to these rates received an estimated 40 mr body equivalent dose.

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Because of a rupture leak in the reactor in December, tube splitting equipment became highly contaminated to greater than 25 rad/hr on splitters and 15 rad/hr on the tugger cable. Contamination on horizontal rods has increased to 20 rad/hr at one foot.

E. Events Influencing Costs

Overtime for the month was 329.5 hours.

Power Operation

A. Operating Experience

The average steam generating rate was 63,587 pounds per hour. An evaporation rate of 9.03 pounds of steam per pound of coal was attained.

The extra orifice (4-7/8 inch) was removed from the raw water system in 105-H valve pit, and a 5.110 inch orifice was installed in the proper location. It is believed that the desired flow characteristics will be achieved with the modification; however, this will be confirmed by a flow test in the near future.

Standard quality water was produced throughout the month with an average alum feed of 4.6 ppm.

B. Equipment Experience

Difficulties were experienced with the plug valves on the sulphuric acid storage tanks in the 183-H Building during freezing weather due to moisture entering the packing glands. Repairs were completed and the glands were treated with waterproofing.

In the 184-H Building, "A" inspections of No. 1 boiler and the coal crushers continued throughout the month. No. 3 boiler was removed from service for a short period on January 22, to repair a leaking drum flange gasket.

In the 190-H Building, modification of No. 2 annex pump unit was completed on January 11, and modifications to No. 7 unit were 95 percent complete at end of month. Straightening vanes were installed in the suction lines to annex pump units No. 5 and 7, completing 5 of the 8 units. Excessive air was experienced in the lubricating oil system on No. 8 annex pump unit on January 24, due to a leak in the main oil pump prime line. The line was resoldered during a subsequent outage. The No. 1 annex pump unit inboard seal has been losing an excessive amount of carbon and will be inspected during an outage scheduled for early February.

Maintenance Operation

A. Field Maintenance

A trip on a low-sensitivity annunciator, which cleared itself immediately, was checked but the cause was not found. During a later startup, the No. 2 low-sensitivity seismoscope pendulum was found to be loose from its suspension point and inoperative -- repairs were made.

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Horizontal control rod hose reels nos. 6 and 7 were Class "A" inspected and repaired. The reel hoses were inspected. Replacement will be necessary within a ten-month period. New hoses purchased from Spare Parts do not meet specification for 105-H. Replacement hoses are being procured.

Replacement of three horizontal control rod CO₂ pressurized seals will complete installation of 15 pressurized type seals. The control system is complete, except for tubing in the Inner Rod Room where work has been halted due to radiation levels.

The pipe fabrication for the helium and CO₂ system modification is approximately 60 percent complete. Progress is slower than expected due to isolation of the gas vessels to maintain system operability. Also, the scope of work was increased to correct a non-code compliance of the original installation.

The No. 20 vertical safety rod failed to withdraw from the unit during a startup because the cable had failed on a limit switch, caused by malfunction of the hydraulic brake. This was corrected and all other VSR brakes were checked and adjusted as necessary.

The waterproofing of the "D" elevator electrical system (including installation of new elevator push-button station and associated conduit and wiring) was completed. Additional waterproofing will be necessary after installation of the elevator geared limit switches.

Charging machine relay by-pass switches were installed in the Control Room in accordance with Design Change 286-H.

D. Maintenance Engineering

Difficulty is being experienced with the CO₂ and helium make-up valves at the low operating pressures of the gas system. The problem is being studied in an effort to determine cause of the trouble. Immediate plans call for minor instrument relocations in addition to upgrading the gas make-up system equipment.

The reducing valve of the CO₂ make-up system in the 110 Building will have a new controlling mechanism installed. This will provide the required fail-safe operating action.

The instrument panel for the downcomer has been completed and is being piped. When the work is complete, the assembly will be mounted in the "D" Machinery Room and placed in service.

The thermocouple stringer in temperature monitor thermal loop tube No. 70 failed and was removed from service. It will be repaired and returned to service along with flow-meters monitoring thermal loop tubes 71, bottom, and 72, top.

The CO₂ analyzers for flue gas monitoring will be selected for use with operating boilers at 184-H. These instruments will be used to gain additional efficiency of operation.

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Using scintillation equipment furnished by Equipment Development Operation, it was possible to gain a suitable high radiation level alarm at the 105-H Technical Viewing Pit. Should the piece of transistorized equipment prove successful in this application, it will be considered for other radiation monitoring applications.

The flush console design for the flush discharge facility will be modified from a portable unit to a fixed installation to be mounted on "C" elevator. The rear pad tray design was completed.

During the report period, the Instrument Service Manual Writer prepared diagrams and instructions for calibration of gas-oil seal tank manometers. In addition, the shop blueprint index was revised and drawings were brought up to date. He assisted with work on leak detectors, power calculator, and timekeeping console. Scope sketches were prepared for two alternate Instrument Shop enlargement schemes.

Central Maintenance Operation

A. Engineering and Planning

A set of rules for Central Maintenance trainees was formulated. A classified Reactor Tube Tool Manual was submitted to Classified Files for their distribution and control.

Facilities Engineering Operation was assisted on cutter design for overboring equipment. The present method of recording labor hours and material charges was revised.

B. Shops

Hot shop work included repairs to rear face caps, venturis, splitters, broaches, trimmers, spline caps, tongs, and revision of four front face nozzles to rear face nozzles.

Project fabrication work included work for projects MJA-8, CG-707, and CG-817.

The special 100-channel gamma equipment was completed. Decontamination tanks for C Area were fabricated. A pump impeller was repaired and casks fabricated for K Area. Covers on Panellit lines were fabricated and installed on "C" elevator at F Area. Six sections of "B" river pump shafts and casing head bearing were straightened and metallized. A spline inserter for Equipment Development was completed. Four bell ring seal assemblies and three zircaloy P-tube fittings for NPR were finished.

C. Project and Special Services

Project activity includes:

CG-666, C Area; CG-716 - C and D Areas; CG-707 - C, D, KE-KW Areas; CG-806 - C and F Areas; CG-817 - B, D, F, H, and KW Areas.

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Preparatory and field mockup for MJA-8 for installation at F Area was performed. Work on charge-discharge equipment, as well as other miscellaneous equipment, for Facilities Engineering Operation was continued. Installation work in connection with modifications to Elmo 7 was started. Motor drip pans at B Area were installed. Routine fire alarm system checks were made. KW charging machine trays were repaired and revisions to DT-1050 at F Area were completed. Painting this month was primarily at B, F, and H Areas. Special work included the gas seal at B Area.

E. J. Filip
 E. J. Filip
 Manager
 H REACTOR OPERATION

EJF:JGM:ore

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KE-KW REACTOR OPERATION
MONTHLY REPORT
JANUARY, 1960

I. ORGANIZATION AND FUNCTIONS

No change.

II. PERSONNELA. Force Summary

	<u>December 31</u>			<u>January 31</u>			<u>Net Change</u>
	<u>E</u>	<u>NE</u>	<u>Total</u>	<u>E</u>	<u>NE</u>	<u>Total</u>	<u>of</u>
							<u>Total</u>
General	3	2	5	3	2	5	0
KE Processing Oper.	15	42	57	16	43	59	+ 2
KW Processing Oper.	15	38	53	16	38	54	+ 1
Power Oper.	13	73	86	12	72	84	- 2
Maintenance Oper.	23	125	148	24	125	149	+ 1
Supp. Crews Oper.	10	56	66	10	59	69	+ 3
TOTALS	79	336	415	81	339	420	+ 5

Above totals include personnel assigned to NPR training.

B. Movement of People

Within the Reactor Operation, F. L. Hughes, Analyst, Maintenance Methods, assumed the duties of Supervisor, Shift Maintenance, and J. K. Grady, Supervisor, Shift Maintenance, assumed the duties of Analyst, Maintenance Methods. V. V. Johnson, Assignment Engineer, K Power, was transferred to KW Processing and assumed the duties of Assignment Supervisor.

J. G. Parsons was transferred from the Technical Graduate Rotational Program to K Maintenance Operation and assumed the duties of Assignment Engineer. W. L. Swanson, Engineer, Coolant Testing Operation, R & E, was transferred to KE Processing and assumed the duties of Assignment Supervisor.

Changes for the month included twelve transfers in, six transfers out and one retirement.

III. PERSONNEL ACTIVITIES

Six Deck Officers in training for service on the N. S. Savannah arrived on January 11 to observe operational and maintenance techniques.

A visitor tour was conducted for officers of the Defense Atomic Support Agency on January 5.

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IV. SAFETY AND SECURITY

Fourteen medical treatment injuries were experienced. There were no disabling injuries or security violations.

V. NON-ROUTINE REPORTS

Second Progress Report on Filter Development Test IP-282-E, J. C. McLaughlin to R. S. Bell, January 27, 1960.

VI. COMPONENT ACTIVITIES

GENERAL

A. Administration

Suggestion Plan Statistics for the month were as follows:

Suggestions at start of month --	66
Received for evaluation -----	13
Replies submitted -----	14
On hand at end of month -----	65

The second series of meetings to study the "American Economic System" was completed. L. P. Reinig was course leader.

Assistance was given the Fire Protection Operation in up-dating rescue team rosters and scheduling of training sessions.

The Reactor Operation conducted indoctrination and discussion sessions, tours and lectures during the month to further the training of six representatives of the States Marine Corporation.

Information was submitted for use in publishing the forthcoming revision of the HAPO telephone directory.

B. Cost Activities

The reactor area requirements for FY-61 and FY-62 were submitted to the Financial Operation for the following budgets:

- Office Equipment
- Automotive and Mobile Equipment
- Special Equipment

At the Monthly Cost Meeting, Planned Maintenance jobs for fiscal years 60, 61 and 62 were reviewed to up-date the area requirements. The status of approved FY-60 Equipment items was reviewed.

C. Landlord Activities

Individual building rental rates were compared to liquidations for the first half of FY-60 and anticipated future expenditures. Appropriate rate adjustments were submitted.

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KE PROCESSING OPERATION

A. Production

Input production was 119.7 per cent of forecast. Power level was limited by the rupture control tube power for the KII charges in the central zone. The maximum level was 30 units above the previous high.

F. Operating Experience

1. Operating Continuity

Reactor outage time totaled 109.5 hours. Operating continuity was affected by the following events:

<u>Day</u>	<u>Hours</u>	<u>Remarks</u>
11	50.9	Rupture in tube 4345. Following removal, outage time was used for processing 550 tubes.
25	50.2	Rupture in tube 2052. Following removal, outage time was used for precessing 607 tubes.
27	0.9	Beckman scram during reactor start-up.
31	7.5	Scram caused by KER Loop Number 2 due to dump valve operation.

2. Equipment Experience

- a. Instrument and Circuitry - All Panellit gage electrical jumpers were replaced with silver soldered jumpers. Other Panellit gage statistics are as follows:

Gages connected for slow response	- 23
Gages replaced due to Bourdon tube leaks	- 2
Row relays replaced	- 6
Gages replaced due to sticking dials	- 8

- b. Ruptures - Two ruptures occurred (tubes 4345 and 2052) in metal of KA-245-A and K002-C types. All tubes containing metal from lot K-002-C and all central zone tubes containing KII-N with mixer charges were discharged to reduce the rupture potential. A new tube was installed in rupture channel 4345.

- c. KER Facilities - A failure of the dump valve diaphragm on the KER Loop Number 2 resulted in a scram and a minimum outage. The loop was not discharged and plans were made for its operation on single pass flow until the dump valve is repaired.

C. Improvement Experience

1. Poison Splines

The average non-equilibrium loss for the month's start-ups using splines was 1958 MWD compared to 2752 for January, 1959, and 2741 for the six

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C. Improvement Experience (Cont'd)

months period ending June 30, 1959. This represents an average non-equilibrium loss reduction of 783 units or 28.6 per cent. Maximum levels have increased 16.6 per cent since the first month of last year.

2. Sub Critical Monitoring, CG-707

The installation of the system was completed and it was used on all reactor start-ups since that date. Operation was satisfactory.

D. Radiation Occurrences1. Radiation Control

One Lapse of Radiation Control occurred involving the failure to prepare a Special Work Procedure for work not covered by a Routine Work procedure and was assigned a severity level of five.

2. External Exposure

Dose rates to personnel of 1 r/hr or greater were required on six occasions. The maximum whole body penetrating dose rate taken was 2 r/hr and the maximum hand dose rate was 3 r/hr.

3. Contamination

Floor contamination of 10 mrads/hr resulted from the charge and discharge of the coupons at the REP facility of KER. The affected area was readily cleaned to a level of 4,000 c/m.

KW PROCESSING OPERATIONA. Production

Input production was 113.2 per cent of forecast. The maximum power level was 100 units above the previous high. The increases followed the planned power increase program.

B. Operating Experience1. Operating Continuity

Reactor outages totaled 106.4 hours. Operating continuity was affected by the following events:

<u>Day</u>	<u>Hours</u>	<u>Remarks</u>
4	41.9	Reactor scram due to ruptured slug in tube 3075. Remaining outage time was used for metal processing and miscellaneous maintenance.
22	64.5	Reactor shut down to discharge ruptured slug in tube 3866. Remaining outage time was used for metal processing, maintenance and project work.

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2. Equipment Experience

- a. Ruptures - The two ruptures slug columns were discharged using forces of 2500 psi applied with the charging machines.
- b. Instruments and Circuitry - Six high trips on the temperature monitor system were due to control box malfunction and one was due to the failure of the thermocouple element.

Panellit experience was as follows:

Gage suppressors installed	- 10
Gages replaced (25-75 trip range for 10-90)	- 66
Tested for inboard reliability	- 38
Gages replaced for leaks	- 1

- c. Ball 3X System - Modifications to the distribution piping were made and 16 hoppers of balls were dropped and recovered during the second outage. Modifications were successful in overcoming ball jamming in the recovery system. The hopper gate plungers were also modified to prevent locking bar tightening screws from slipping off the plunger during installation or removal.
- d. Traverse Work - Horizontal traverses of Z-2, 3, and 4 holes and the Y-2 were completed as part of the graphite movement monitoring program.

C. Improvement Experience

1. Poison Splines

A heat cycle was suppressed by use of the splines thereby averting a reactor outage.

2. Rear Face Material Handling System

Use of the carts, trays and a conveyor for the first time during metal processing operations contributed to improved rates for setting up and capping of tubes.

D. Radiation Experience

1. Radiation Occurrences

One Lapse of Radiation Control occurred involving release of radioactive gas for an assigned severity of six.

2. External Exposure Control

Rupture removal was accomplished at a maximum dose rate of 600 mr/hr. Metal buildup in the discharge chutes caused dose rates to 750 mr/hr in the discharge area. Dose rates to 2 r/hr were experienced during X-level, spline removal and inner rod room work. The ruptured slug from tube 3075 gave off radioactive gas in the storage area until it

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D. Radiation Experience (Cont'd)

was canned. An orifice change in the 4-B test facility contributed to neutron dose rates to 185 m rem/hr at six feet. The levels were reduced to normal after installation of the original orifice.

3. Contamination Control

Contamination to 20 rads/hr on the rear well of the rear face resulted from the discharge of the ruptured slug from tube 3075. Decontamination efforts lowered the levels to 3 rads/hr.

KE-KW POWER OPERATION

A. Operating Experience

1. Electrical Peak Control

The control point was raised by two points to 325 megawatts on January 13 and again by three points to 328 megawatts when the additional load made generation unprofitable. The load was controlled at this point for the remainder of the month.

2. Number 4 Low Lift Pump, KW

While raising process water pressure on January 5, the Number 4 low lift motor failed to start. The difficulty was traced to a faulty 4160 volt circuit breaker. Replacement of this component returned the unit to normal service without delay of reactor startup.

3. 440 Volt Power Failure, Number 2 Boiler, KE

Three relays burned out in the Number 2 Motor Control Center, thereby losing the 480 volt power to the boiler. The steam-driven auxiliaries functioned properly and no major equipment was affected. This incident was covered in a separate report.

B. Equipment Experience

1. Number 5 River Pump at 181-KE

On January 14 the cooling water line to the Kingsbury thrust bearing on Number 5 pump at 181-KE froze and the pump was removed from service for thirty-five minutes due to failure of the electrical heating element of the line.

2. Number 1 High Lift Flywheel Cooling, KE

On January 6 the cooling coil for Number 1 High Lift flywheel, 190-KE was found to be leaking and was replaced.

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B. Equipment Experience (Cont'd)

3. Number 2 Glycol Pump, KE

The Number 2 winter glycol pump, previously used only as a spare because of excessive vibration, was placed in service after making changes in the discharge piping supports and re-aligning the motor with the pump.

4. Forced Draft Fan Turbine, Number 2 Boiler, KE

During a routine scheduled test of auxiliary equipment, this fan turbine would not drive the fan. Subsequent investigation showed a failure of the governor drive gear. The gear was replaced and the turbine was satisfactorily tested.

C. Improvement Experience

1. CG-775 K Water Plant Expansion

Filter flow test results IP-282-E on Number 8 filter at 183-KE continued to be satisfactory and were reported in detail in a separate report.

KE-KW MAINTENANCE OPERATION

A. Equipment Experience

1. Instruments

- a. Remote Monitoring - 105-KE - This rear face system was placed in operation and functioned satisfactorily.
- b. Octant Monitor System - 105-KW - All chambers were returned to normal service following repairs to Number R-2.
- c. Temperature Deviation Recorder - 105-KE - The dual selector switch was modified by installing a worm gear type switch mechanism and a more rigid bracket to aid in keeping the equipment in synchronization.

2. Electrical

- a. Design Changes - The following changes were completed in 105-KW:
 - Number 281 - Horizontal Control Rod Wiring Modifications.
 - Number 313 - Panellit Photo-Recording System Addition of Vertical. Column Light Seal-In.
 - Number 316 - Removal of Beckman No. 5 and Temperature Monitor From Safety Circuit.

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A. Equipment Experience (Cont'd)

- b. Annunciator System - 105-KW - The storage area float switch was connected to the control room annunciator to indicate high and low water levels.

3. Mechanical

- a. Process Tube Hardware - Ninety-three spline caps were reworked in 105-KE. Reaming was completed on 235 nozzles in 105-KW.
- b. Charge Seating Equipment - The new ram type machines were installed on "C" elevators of the 105 buildings.
- c. 1706-KE-KER - All rear face and boiling point suppression thermocouples were checked for resistance and proper grounds.

B. Engineering

- 1. Zone Temperature Distribution System - The wire borrowed from 100-C Area has been cut and bundled for 105-KE and readied for shipment off-plant for installation of molded strap-on thermocouples. Specifications, a drawing, and a purchase requisition were completed for the procurement of the strap-on thermocouples.
- 2. Graphite Stringers - As a result of difficulties encountered while attempting replacement of stringer Number RS-7 in 105-KE, a machining specification change to reduce the outside diameter of graphite stringer blocks by .005 inch and gradually taper the ends was made.
- 3. Horizontal Control Rods - The cooling water supply hose to Number 19 rod in 105-KE was inspected, and a recommendation was made on the basis of the hose surface condition that all these hoses be replaced within one year.
- 4. Electrical Procedures

The following FM procedures and check sheets were completed:

Electrical Panel Board Wiring and Terminal Inspection Procedure.
Electrical Inspection of the 5000 KVA Turbine Driven Generator.
Electrical Inspection of the Hi-Lift Pump Unit Pressure Lubrication System.
Electrical Inspection of 10,000 HP Hi-Lift Pump Drive Motor.
Electrical Inspection of the Motor Operated Field Rheostat Used on 5000 KVA Generator Regulation System.

C. Planning and Scheduling

- 1. Class "A" overhauls were completed on 164 items of equipment, Class "B" on 277 items and lubrication or inspection on 48 items.

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SUPPLEMENTAL CREWS OPERATION

A. Improvement Experience

A procedure, Pre-Insertion of Downstream Dummies, was received from Industrial Engineering and approved for use. Distribution was made to the Processing Managers.

B. Events Influencing Costs

1. Overtime Usage

There were 589 hours of non-exempt overtime and 24 hours of exempt overtime worked by Supplemental Crews personnel.

2. Supplemental Crews Time Distribution

The non-exempt time distribution from January 4 through January 31 was as follows:

<u>Area</u>	<u>Percent</u>	<u>Hours</u>	<u>Area</u>	<u>Percent</u>	<u>Hours</u>
100-B	10.7	897	100-F	11.7	983
100-C	13.3	1117	100-H	11.4	960
100-D	19.5	1634	100-KE	18.4	1541
100-DR	4.4	370	100-KW	10.6	891

Manager
KE-KW REACTOR OPERATION

RS Bell:GE Greger:ld

PRODUCTION OPERATION
DECEMBER, 1960

I. ORGANIZATION & FUNCTIONS

No change.

II. PERSONNEL

A. Force Summary

	<u>December 31</u>			<u>January 31</u>			<u>Net Change</u>
	<u>Ex.</u>	<u>N.E.</u>	<u>Total</u>	<u>Ex.</u>	<u>N.E.</u>	<u>Total</u>	
General	4	1	5	4	2	6	+1
Prod'n. Rpts. & Statistics	1	2	3	1	2	3	0
Prod'n. Planning & Sched'g.	5	4	9	5	4	9	0
Prod'n. Computing	3	3	6	3	3	6	0
Essential Materials	<u>1</u>	<u>1</u>	<u>2</u>	<u>1</u>	<u>1</u>	<u>2</u>	<u>0</u>
	14	11	25	14	12	26	+1

One secretary, formerly in C.E.&U. returned from a leave of absence and was assigned to Production Operation.

III. SAFETY & SECURITY

There were no injuries or security violations. Safety and Security Meetings were attended as scheduled.

IV. NON-ROUTINE REPORTS

None.

V. FUNCTIONAL ACTIVITIES

A. Production Planning and Scheduling Operation

1. Planning

An official production forecast, Doc. No. HW-63468 RD, was issued for the period beginning January 1, 1960, through June 30, 1965.

2. Production Scheduling

a. Discharge Concentrations

There were two discharge goal exposure adjustments effected during January:

- 1) KIIN slugs at KE Reactor - reduced from 700 MWD/T to 600 MWD/T because the remaining KIIN tubes had lost flow to the KIIIN tubes and had become limiting to reactor power.

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- 2) CIIN slugs at C Reactor - a series of slug ruptures prompted an exposure reduction from 675 MWD/T to 600 MWD/T. This action was considered a stop-gap measure with future discharges to be scheduled on a 640 MWD/T basis.

A complete resume of the goal exposure plan in effect is given in the following table. The variable goal discharge plan is described by the equation:

$G = I - Mf$, where
 G = Discharge goal exposure in MWD/Ton
 I = Constant (Variable Goal intercept - see table)
 M = Constant (Variable Goal slope - see table)
 f = Tube Factor (Relative Tube Power).

Variable Goal Discharge Plan

<u>Material</u>	<u>Reactor(s)</u>	<u>I</u>	<u>M</u>	<u>*Gmax</u>	<u>** Usual Dischg. Exposure</u>
Solid Reg.	B,D,DR,F,H,KE,KW	1000	440		725
Solid Reg.	C	1000	550		650
I & E Reg.	B	1400	570	900	725
I & E Reg.	C	1400	690	900	640
I & E Reg.	D	1400	570	900	725
I & E Reg.	DR	1400	580	900	725
I & E Reg.	F	1400	630	900	650
I & E Reg.	H	1400	640	900	680
I & E Reg. KII	KE	1500	800	900	600
I & E Reg. KIII	KE	700	700	900	700
I & E Reg.	KW	1500	740	900	650
Solid Enriched	B,DR,H	1800	1160	1000	950
I & E Enriched	B	2100	1030	1600	900
I & E Enriched	C	1900	1050	1600	700
I & E Enriched	D	2100	1030	1600	825
I & E Enriched	DR	2100	1050	1600	950
I & E Enriched	F	2100	1100	1600	825
I & E Enriched	H	2100	1150	1600	925
I & E Enriched	KW	1900	970	1600	700
I & E Enriched	KW	1900	1000	1600	650

*Where low tube factors would result in discharging well above the economic upper limit, a maximum goal has been specified.

**The exposure of individual batches can vary widely from those listed because of the timing of the outage and the powers of the tube discharged.

Note: M values may change with inlet water temperature, tube flow rate and reactor power level.

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Considerable below exposure goal discharging was necessary during January. Significant items are listed below:

Below Goal Discharging - January 1960

<u>Reactor</u>	<u>Tons Discharged</u>	<u>Tons Excess Usage</u>	<u>Material Type</u>	<u>Reason</u>
C	0.4	0.3	Enriched	To adjust enrichment.
	4.2	1.3	Regular	Low corrosion tubes considered rupture-prone due to the location of the mixer slug.
	22.0	4.2	Regular	Exposure reduction to lower rupture potential.
D	2.4	0.7	Regular	Process tube replacement.
	2.9	1.7	Regular	Suspected tube plugging resulting from pump failure.
H	0.8	0.4	Enriched	Production Test IP-255-A.
	0.5	0.3	Regular	Process tube replacement.
	10.0	3.1	Regular	Discharge of rupture-prone 105 KL-339-C.
KE	5.9	1.1	Regular	Discharge of high power solid charges.
	1.8	1.1	Regular	Temporary poison.
	11.3	5.0	Regular	Exposure reduction on remaining central zone KIIN charges which were limiting power level.
KW.	1.1	0.5	Enriched	To adjust enrichment.
	0.6	0.4	Regular	To adjust enrichment.
	4.7	1.4	Regular	Tubes equipped with spline caps and, therefore, considered rupture prone.
	<u>2.9</u>	<u>1.4</u>	Regular	Temporary poison
	2.3	1.2	Totals for Enriched	
	69.2	21.7	Totals for Regular	

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A comparison of January discharge exposures for each metal type with similar data from previous months is as follows:

Comparison of January Discharge Exposure (MWD/T)

	Regular U		Enriched U	
	<u>Solid</u>	<u>I & E</u>	<u>Solid</u>	<u>I & E</u>
November	732	704	935	790
December	716	696	902	786
January	677	659	959	739

b. Process Tube Replacement

A total of 105 process tubes was replaced during January and was divided among reactors as follows:

B	-	2
C	-	1
D	-	67
DR	-	1
F	-	14
H	-	19
KE	-	1

3. Operations Analysis

Work continued on special studies and analyses for IPD Management.

Production data for use in the Plant Improvement Program were reviewed and revised to reflect changes in programming. This work will continue as more information is developed by groups assigned to expansion studies.

Tube corrosion analysis continued and data compiled in preparation for issuance of a revised tube replacement forecast. A study of zirconium tube replacement for C Reactor was begun.

B. Production Computing Operation

Tube-by-tube source data were processed to establish the current production and corrosion status for each tube in all reactors. Routine and emergency reports were issued to implement the scheduling, forecasting, and accountability functions of the Production Operation. Charge-discharge and tube replacement information for each reactor operation was provided in accordance with production schedules. Production data were supplied to each Pile Physicist for reactivity evaluations, and to Process Technology for EDPM processing.

Individual tube source data were supplied to the SS Accountability Operation for calculating weights of SS material in discharges and month-end in-reactor inventories.

To help the Electronic Data Processing Operation, C&AO, meet their year's-end commitments, Production Computing incurred thirty man-hours of overtime on Saturday, January 2.

C. Production Reports & Statistics

Routine processing of the Daily Production and Daily Operations Reports and the monthly Manufacturing Section Record Report was continued. Data involving reactor operation and associated equipment were collected and tabulated in historical record books. Chart Books were maintained for the HAPO and IPD General Managers and Manufacturing Section Manager. A large volume of both routine and non-routine data were supplied to IPD personnel. Some routine data were also supplied to the FPD, CPD and HLO.

D. Essential Materials

Rail and truck shipments received in January were as follows:

Carload shipments for IPD	206
Carload shipments for other Depts.	185
Truck shipments for IPD	<u>122</u>
Total	513

Helium consumption during the month of January in all reactors was as follows:

100-B	505,300
100-C	757,900
100-D	231,700
100-DR	294,100
100-F	375,600
100-H	106,000
100-KE	254,500
100-KW	<u>361,900</u>
Total	2,887,000

In addition to the routine duties involved in the procurement and delivery of essential materials, the following items were included in the group's activities during January:

1. Increased coal shipments by two cars per day from the Northern Pacific Coal Co. for the last two weeks of the month. The 200 Areas were experiencing some trouble in reclaiming coal from their stockpile due to heavy snow and freezing weather.
2. Prepared a letter to Purchasing outlining HAPO's requirements of coal for Fiscal Year 1961. New contracts will be negotiated for this material.

E. Miscellaneous Activities

Security classification matters continued to be handled for the department. New guidance from the AEC-HOO and the Hanford Laboratories Operation was given appropriate distribution and interpretation within IPD.

Planning for the "Fundamentals of Manufacturing" training course continued. The lesson outline for the pilot first class was firmed and preliminary agreements were reached regarding (1) the first-line supervisors and equivalent specialists who will be eligible to volunteer for this course, and (2) the class schedule which will enable shift personnel to participate. Other integrative work on training continued in connection with union relations, radiation protection, and reactor fundamentals.

Liaison was established with CPD regarding IPD participation in a G.E. Manufacturing Services presentation at HAPO in mid-February on the subject "Work Simplification for Managers".

C. A. Priode, Manager
Production Operation

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MONTH January 1960		REACTOR OPERATIONS STATISTICS - PROCESSING																	
		B		C		D		DR		F		H		KE		KW		TOTAL	
		NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.
INPUT PROD.-PU (% OF FORECAST)		101.9		99.0		94.8		111.1		101.8		102.7		119.7		113.2		107.7	
TIME OPER. EFF. (% OVERALL)		81.7		79.9		74.4		88.9		79.1		82.4		85.3		85.7		82.2	
NO. OF REACTOR OUTAGES & HOURS																			
SCHEDULED		0	59.8	0	79.7	1	170.2	0	37.8	0	103.1	0	81.4	-	44.9	0	67.1	1	644.0
UNSCHEDULED - SCRAMS		-		-		-		2	0.5	1	1.4	2	1.4	2	8.4	-	-	7	11.7
- OTHER		4	76.3	4	70.1	3	20.2	2	44.3	2	51.2	4	48.2	2	56.2	2	39.3	23	405.8
TOTAL		4	136.1	4	149.8	4	190.4	4	82.6	3	155.7	6	131.0	4	109.5	2	106.4	31	1061.5
BREAKD'N OF REACTOR OTGE HRS.																			
PLANNED																			
CHARGE-DISCHARGE		28.3		19.8		36.3		9.7		17.7		30.9		32.9		43.1		218.7	3.7
TUBE REPLACEMENT		0.7				84.4				25.4		21.2						131.7	2.2
PROJECT WORK				12.5		0.3				32.2		0.7				11.5		57.2	0.9
PRODUCTION TEST		4.4		1.9		2.1		1.0				4.7		8.9				23.0	0.4
MAINTENANCE		23.8		45.5		47.1		27.1		27.8		23.9		2.0		10.1		207.3	3.5
MISCELLANEOUS		2.6												1.1		2.4		6.1	0.1
SUB - TOTAL		59.8		79.7		170.2		37.8		103.1		81.4		44.9		67.1		644.0	10.8
UNPLANNED																			
CHARGE - DISCHARGE		6.0				1.0		1.3		1.3		2.9				3.7		16.2	0.3
PRODUCTION TEST						7.7								7.5				15.2	0.3
RUPTURE REMOVAL		66.8		68.1				13.1		10.8		12.6		45.0		30.6		247.0	4.1
WATER LEAK								26.2		31.6		16.6						74.4	1.3
MAINTENANCE		3.5		2.0		11.5		3.7		7.5		12.4		11.2		2.0		53.8	0.9
INSTRUMENTATION														0.9				0.9	0
PANELLIT								0.5				1.4						1.9	0
MISCELLANEOUS										1.4		3.7				3.0		8.1	0.1
SUB - TOTAL		76.3		70.1		20.2		44.8		52.6		49.6		64.6		39.3		417.5	7.0
TOTAL		136.1		149.8		190.4		82.6		155.7		131.0		109.5		106.4		1061.5	17.8
NO. SLUG RUPT. (ALL TYPES)		4		4		0		1		1		1		2		2		15	
NO. NEW TUBES INSTALLED		2		1		67		1		14		19		1		0		105	
TYPE OF WATER LEAK - TUBE		1		0		0		1		2		1		0		0		5	
VAN STONE		0		0		0		0		1		1		0		0		2	
REMARKS:																			

SECRET
Ch 1

REACTOR OPERATION STATISTICS - SLUG RUPTURES

REACTOR OPERATION STATISTICS - SLUG RUPTURES											
MATERIAL	TUBE NO.	TYPE RUPTURE	REMOV HRS.	CHARGE DATE	RUPTURE DATE	ACT. CONC.	LOT NO.	REMOVAL METHOD			REMARKS
								QUIC.	CHG. MACH.	HYD. JACK	
I&E Reg.	2168-C	Hot Spot	16.5	11-7-59	1-3-60	361	KJ-182-C		X		
I&E Reg.	3075-KW	Hot Spot	10.1	10-30-59	1-4-60	512	KR-100-D		X		
I&E Reg.	3268-B	Hot Spot	7.3	10-20-59	1-10-60	563	KL-304-D		X		
I&E Reg.	1570-DH	Hot Spot	13.1	10-12-59	1-10-60	564	KL-342-D		X		
Solid Reg.	4345-KE	Not Available	26.2	8-24-59	1-11-60	651	KA 245-A			X	
I&E Reg.	2171-C	Hot Spot	14.5	11-17-59	1-14-60	446	SJ-081-D		X		Ball Valve
I&E Reg.	2981-H	Hot Spot	11.3	11-4-59	1-20-60	552	KL-339-C			X	
I&E Reg.	1686-B	Hot Spot	42.5	10-4-59	1-21-60	709	KL-285-D			X	
I&E Reg.	2576-C	Hot Spot	18.1	11-7-59	1-21-60	498	KJ-179-C		X		
I&E Reg.	3866-KW	Hot Spot	20.5	11-29-59	1-22-60	424	KR-173-D		X		
I&E Reg.	1182-F	Side Other	10.8	10-23-59	1-23-60	558	KL-294-D			X	
I&E Reg.	2676-B	Hot Spot	15.9	11-27-59	1-24-60	365	KL-352-D			X	Leaker
I&E Reg.	3861-C	Unknown	19.0	11-7-59	1-24-60	545	KJ-177-C			X	
I&E Reg.	2052-KE	Hot Spot	18.8	11-16-59	1-25-60	537	K-002-C			X	
I&E Reg.	1575-B	Hot Spot	9.8	11-27-59	1-31-60	417	KL-356-D		X		
					</						

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MONTH
January, 1960

REACTOR OPERATIONS STATISTICS - POWER

SHEET 1

	100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW	TOTAL
RIVER WATER (BLDG. 181)									
TO RESERVOIR (BLDG. 182)	11763		4312		1968	2690			20733
TO FILTER PLANT (BLDG. 183)	63680		81877		70355	74400	166800	167500	624612
TO FILTER PLANT (C&DR)	94564		60083						154647
TO R & E (KER) & FEO			203				488		691
TOTAL	170007		146475		72323	77090	167288	167500	800683
TOTAL	7589.1		6538.6		3628.5	3441.3	7467.7	7477.2	35742.9
RESERVOIR WATER (BLDG. 182)									
TO POWER HOUSE (BLDG. 184)	26		68		442	35			571
TO COND. SYSTEM (BLDG. 190)			1544		44	2655			4243
TO COND. SYSTEM (190DR & 183F)			2700		1410				4180
TO EXPORT SYSTEM	11737								11737
TOTAL	525.1		192.4		37.8	120.1			925.4
FILTER WATER (BLDG. 183)									
TO POWER HOUSE (BLDG. 184)	217		239		165	164			785
TO PROCESS (BLDG. 190)	70652	78064	68312	70395	68247	70900	161164	162106	749840
TO 108	2500	4500	400		1101	1240			9741
TO 108DR			400						400
TO FILTER PLANT (BLDG. 183DR) & F		10749	11018						(21767)
TO F & S SYSTEM	161		225		150	127			663
TO R & E (KER) & FEO			153						153
BACKWASH	899	1251	1130	706	692	1969	5636	5394	17677
TOTAL	3802.3	3741.5	3655.0	3173.9	3140.6	3321.2	7446.0	7477.2	35757.7
PROCESS WATER (BLDG. 190)									
TO REACTOR	70252	77664	67912	69995	67847	70400	158100	158400	740570
TO REACTOR	80400	94500	79000	79900	82200	81700	177600	178900	854200
POWER HOUSE (K AREA)							43	13	56
108 (KE - KW)							2389	3293	5682
TO R & E (KER)							232		232
BUILDING USAGE	400	400	400	400	400	500	400	400	3300
TOTAL	3153.9	3484.7	3049.4	3142.4	3046.5	3165.0	7194.4	7236.4	33472.9
RIVER DATA									
ELEVATION (MSL. FT.)	390.6		381.8		369.0	374.2		384.2	
	387.8		379.0		365.1	371.8		380.0	
	389.0		380.7		367.0	373.0		382.8	
TEMPERATURE	38.6		40.0		41.4	40.6		38.4	

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REACTOR OPERATIONS STATISTICS — POWER											SHEET 2
MONTH	100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW	TOTAL		
January 1960											
WATER TREATMENT DATA											
AT BLDG. 182											
MM GALS	2842.6	4221.3	3655.0	2682.1	88 3140.6	3321.2	7446.0	7477.2	88 34786.1		
BLDG. 183											
CHEMICAL CONSUMPTION											
CHLORINE (BLDG. 182)											
LBS	8913	19272	16250	11390	14087	15360	28500	24800	138572		
BLDG. 183											
LBS	.4	.5	.5	.5	.5	.5	.5	.4	.5		
AVG PPM											
Alumina											
LBS	* 313								313		
ALUM											
LBS	98640	121948	151000	110680	122883	127905	292100	246400	1271556		
AVG PPM	* 4.2	3.5	5.0	5.0	4.7	4.6	4.7	4.0	4.4		
SEPARAN											
LBS											
AVG PPM											
SULPHURIC ACID											
(AS 100%)	177320	265980	286448	198362	282363	241880	623200	617100	2692653		
AVG PPM	7.5	7.6	9.4	8.9	10.8	8.7	10.0	9.9	9.3		
DICHROMATE	46000	51824	40500	43000	45697	47939	106100	106300	487360		
PURGE MATERIAL CONSUMPTION											
LBS											
SOLIDS		300							300		

* Alumina and alum combined for avg. PPM in alum column.

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MONTH

January 1960

REACTOR OPERATIONS STATISTICS - POWER

SHEET 3

ANALYTICAL DATA

RAW WATER

PH
TURBIDITY

FINISHED WATER

PH AVG
TURBIDITY
CL₂ RESIDUAL
DICHROMATE

STEAM DATA

GENERATED (MAX)
(NOR)
(AVG)

TOTAL

TO PLANT

COAL RECEIVED

CONSUMED

IN STORAGE

GEN. STEAM/LB. OF COAL

OIL RECEIVED

CONSUMED

IN STORAGE

GEN. STEAM/GAL. OF OIL

ELECTRICAL DATA

TOTAL GENERATED KW HRS.

	100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW
PH AVG	8.1	7.6	8.2	8.2	8.2	8.1	7.6	7.6
PPM AVG	3	3	5	4	5	5	12	10
PH AVG	7.1	7.1	7.1	7.1	7.0	7.1	7.1	7.0
PPM AVG	.004	.004	.006	.005	.007	.006	.006	.005
PPM AVG	.05	.05	.09	.09	.05	.05	.05	.06
PPM AVG	1.76	1.79	1.80	1.80	1.80	1.85	1.80	1.80
100-B	132000	187000	101000	76000	496000	76000	68000	144000
LBS/HR	104700	100000	70000	64400	339100	41177	34274	75451
LBS/HR	105100	122389	79338	63587	370414	30636	25500	56136
LBS/HR	78217	91058	59026	47309	275610			
M LBS	66328	77217	51943	40118	235606			
M LBS	3389	3649	2590	2202	11830			
TONS	4526	4950	3392	2619	15487			
TONS	26334	29442	18353	19433	93562			
TONS	8.64	9.19	8.70	9.03	8.90			
GEN. STEAM/LB. OF COAL								
OIL RECEIVED						400572	0	400572
CONSUMED						284442	231000	515442
IN STORAGE						951636	634662	1586298
GEN. STEAM/GAL. OF OIL						107.7	110.3	108.9

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FACILITIES ENGINEERING OPERATION
MONTHLY RECORD REPORT

JANUARY, 1960

I. RESPONSIBILITY

There were no changes of assigned responsibilities during the month.

II. ORGANIZATION AND PERSONNEL

A. Force Summary

Employees on Permanent Roll	179
Technical Graduates (Rotational)	5
Technical Trainees	3

B. Personnel Activities

G. H. Nickles, Jr., Reports Analyst, transferred from H Reactor, Maintenance to Project Engineering on January 1, 1960.

M. L. McDonald, Engineer, transferred from Project Engineering to H Reactor, Maintenance on January 1, 1960.

H. H. Hubble, Supervisor, Project Engineering, transferred to KAPL on January 4, 1960.

C. Safety

Three medical treatment injuries were reported.

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III. ACHIEVEMENT

A. Reactor Modification Design

1. Research and Development

Work, which is being performed by Holmes and Narver, is continuing on the seismic vulnerability studies of the existing reactor building structures and the associated reactor process water systems. The following interim reports were received during the month.

Piping in Reservoir Building - 182-B
Power House Building - 184-B
Building 105-B Structure Above Reactor
Overhead Steam Lines in Area B
Building 183-B Pump House
Critical Buried Water Lines in Areas B and C
200' Chimney Building 116-B
300' Chimney Building 184-B

Completion of five assigned budget studies consumed thirty two percent of the available engineering manpower. Documents have been issued reporting the results of the study of each problem listed below:

Replacement of Rear Face Hardware and Piping
105-B, C, D, DR, F, and H
Coolant Backup, Old Reactors and 1706-KER
Earthquake Protection, All Reactors
Modification of HCRs for By-product Production
Modification of Gunbarrels to Allow Process Tube
Expansion, 105-F

2. Design Projects

a. CG-775 100-K Area Water Plant Expansion

Scope drawings for the total project are 85 percent complete. Work continues on the remaining drawings.

Approval was received for extending the completion date for the project to June 30, 1960 to permit installation and testing of a revised design high lift pump impeller. This impeller is scheduled to be shipped by the manufacturer on February 3, 1960 and to be installed in 190-KE during the next available scheduled outage.

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b. CGI-791 Reactor Confinement

Overall design for the project is 79 percent complete. A revised Title II design schedule has been completed showing design completion of Phase III by April 1, 1960 and clean up of all design work not affected by final tie-in by September 1, 1960. Ventilation flow balance diagrams have been prepared for all 105 Buildings. Five drawings detailing the rear face instrumentation duct moisture protection shields were issued for comment. The shields were redesigned to simplify fabrication and installation.

Phase III scope is 92 percent complete. Thirty two drawings have been approved by Project Representatives. These drawings included modifications of the ventilation system, electrical fan control, and 105 Building modifications for ventilation control. The scope study on ventilation supply modifications has been completed. Purchase requisitions have been issued for procurement of new exhaust fans, electrical motors, switchgear and dampers as required for modifications. Alternate power drives for the K Area exhaust fans have been recommended for improved reliability. This recommendation has been approved by Project Representatives and submitted for Design Council approval. Diesel engines will be installed on two electrical driven fans by means of an overriding clutch.

Steam turbines driving the 105 Building exhaust fans were inspected to establish the reliability of this equipment for automatic operation. One turbine of the eight inspected in 105-B, D, DR, and F was found to be in satisfactory condition externally. New turbines are recommended.

The overall completion of the test program is approximately 92 percent complete. The progress on individual test items not previously completed is as follows:

1. ORNL has completed the Irradiated Uranium Burning Tests. A final report is to be issued in February.
2. The air filter tests in the 105-B and F exhaust tunnels have been in progress approximately three months. Pressure buildup on the high efficiency filter is a maximum of 0.1 inch water gauge and a minimum of 0.05 inch water gauge. No noticeable difference has been indicated for the pressure buildup of the roughing filter and halogen collectors.

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The Arthur D. Little Company has completed the halogen collector test program. Preliminary reports of the iodine loading tests indicate a 1000 cfm activated charcoal filter with one half inch effective bed depth will hold greater than 1500 grams of iodine without break through or drop in removal efficiency. Air flow was continued for an additional 45 hours to determine the desorption rate. An estimated 6.85 grams were desorbed or 0.5 percent of the total iodine absorbed.

c. CGI-839 Modification of Fuel Element Test Facilities
1706-KER

Detail design is 78 percent complete. The detail design progress schedule has been revised to extend the design completion date to May 1, 1960. Additional time is required to prepare new electrical and mechanical drawings to locate additional switchgear in the 1706-KER Building. Previously the electrical scope was developed on the basis of obtaining mechanical seal type pumps with motors of 200 horsepower or less for cells No. 3 and No. 4. The loop pump bid which was received was based on a canned motor pump with a 275 horsepower motor. The increased load will require a larger class switchgear. To provide the required clearance for the new switchgear, one section of movable office partition will require relocation. No provision is being made for additional office space.

The bids for the loop pumps were opened January 12, 1960. Two vendors, Hayward Tyler and Company, Ltd., and The Byron Jackson Pump Company submitted bids from a total of seven manufacturers who were solicited. The bid from Hayward Tyler and Company, Ltd., was non-conforming since it proposed the use of a wet motor design which is not acceptable for Hanford in-pile test loops. The Byron Jackson Pump Company bid proposing the use of a canned motor pump was accepted. An order for the loop heat exchangers has been placed with the Whitlock Manufacturing Company.

Prototype nozzle assemblies are being machined and fabricated at the 1717-H shop. Radiographs of the nozzle to barrel weld show that the welds will require re-work.

Comments on the drawings for the addition to the 1706-KER Building have been transmitted to the architect-engineer who is doing the building addition designs. The comments were extensive and the drawings will require considerable supplementation to cover the degree of detail considered necessary for industrial building construction.

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d. CGI-844 100-K Coolant System

Progress during the month was slowed due to the unavailability of draftsmen. Six scope drawings have been prepared and are ready for Project Representative approval. Drawings for an alternate diesel pump station for the last ditch installation have been issued for comment. Drawings which remain to be issued are for an additional alternate station using gas turbines driving vertical turbine pumps similar to the diesel installation.

3. Visitors

Mr. J. R. Eliason of the General Electric Company, Apparatus Sales Division, Seattle Office visited HAPO on January 12 to discuss work on the design review of electrical modifications for Project CG-775 being performed by that office.

4. Trips

E. L. Etheridge visited Cambridge, Massachusetts on January 14 to review progress on the halogen collector test program being conducted by the Arthur D. Little Company.

5. Significant Reports Issued

HW-63350 - FY-1962 PA&C Budget, Replacement of Rear Face Hardware at B, D, DR, F, and H Reactors and Riser Support Modifications at C Reactor, F. J. Kempf, January 25, 1960, **SECRET**

HW-63428 - FY-1962 PA&C Budget - Modification of HCRs for By-product Production, N. F. Fifer, January 22, 1960 **SECRET**

HW-63429 - FY-1962 PA&C Budget - Modification of Gunbarrels to allow Process Tube Expansion - 105-F, N. F. Fifer, January 27, 1960, **SECRET**

HW-63526 - FY-1962 PA&C Budget - Coolant Backup, Old Reactors, and KER, W. J. Tupper and D. F. Watson, January 15, 1960, **SECRET**

HW-63527 - FY-1962 PA&C Budget - Earthquake Protection - All Reactors, W. J. Tupper and D. F. Watson, January 18, 1960, **SECRET**

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B. Equipment Development

1. Existing Reactor Work

The cap remover prototype has been assembled and is on a temporary carriage in 108-D, connected to a program simulator and operated functionally. Work is continuing to remove minor bugs, but the assembly now performs the intended function of removing the cap and replacing it.

A spline coiler, to replace the troublesome spline choppers, has been built and tested in the laboratory. The device, once connected to the spline, withdraws it from the process tube and coils it up on a small reel inside a shielded container, then drops reel and all into a disposal chute. This device is expected to complete development work on the spline system of supplemental control.

The laboratory check-out of the prototype analog-to-digital converter is complete after minor modifications were made in our laboratory by the vendor's project engineer. The unit was moved to D-Reactor temporarily for further functional tests prior to its permanent installation in the B-Reactor.

Considerable effort has been devoted to checking and establishing procedures for rehabilitating faulty panellit row relays. In a number of instances relays which failed unsafe, or trip-out more slowly than desirable, have been found. Equipment Development is cooperating with other plant organizations in correcting this situation.

The prototype safety circuit trip identification system in DR was completed and acceptance tests performed. One side effect was that two unsafe conditions were detected by the equipment and promptly corrected.

Design and layout of the 100 channel gross gamma monitor has been completed. All the necessary components and hardware for the above system were purchased and received and given to Central Maintenance for assembly. Schedule for completion of the above system is as follows: Two pilot units by January 15, 1960. All units by January 31, 1960. Operating system on site (105-C) by February 15, 1960.

Work on operational charge/discharge was limited to preparation of specifications for a second procurement of rear face ball valves and continuation of work on HAPO designs, both for equipment similar to the C equipment and for early test models of simple concepts to be checked out.

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A number of tool vendors, a graphite manufacturer, and a tool consultant in Manufacturing Services, were contacted for assistance in obtaining an appropriate cutting tool for the graphite overboring. Several different tools are being purchased, including a diamond drill, for test at the next DR-Reactor outage when a second attempt to bore through the channel will be made.

2. New Reactor Work

It is reported that the fuel element which was ruptured in the first ETR rupture test discharged only about 100 milligrams of uranium into the loop. This rupture was detected with the small gross gamma monitor like those being installed at 105-C for test, and the results indicate that this rupture monitoring device may be more than sensitive enough for NPR.

Development work to select a contact protector for NPR relays was completed and a final report issued.

Design test work on the NPR horizontal control rod drive is completed and a development program started to correct deficiencies found in the test. Initial success was obtained in increasing the speed of scram insertion.

Increased effort is being applied to the fuel handling problem in an effort to develop a satisfactory system for receiving and gently stopping dropped NPR fuel elements in the discharge chute without producing excessive damage to the fuel element or any damage to the device receiving the impact. No really effective method has yet been found to do this.

3. Security Experience

None

4. Visitors

E. Vynne, Jr. of Cascade Distributors, Seattle, visited Ezra Hollister December 29, 30, 1959, to demonstrate the Winchester prototype Van Stone flanging explosive tool. Demonstration tests were conducted in 108-D Building and the tool was kept by Mr. Vynne for return to the factory and completion of approximately fifteen items of required modification.

Ivan Jacobs of GE-APED visited R. R. Cone, M. R. Wood, and J. W. Green on January 14, 1960, to discuss the nuclear instrument requirements at HAPO and the line offered by APED.

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K. S. Dhanjal, Project Engineer from Epsco-West, visited HAP0 January 9 through 12, 1960, to improve performance of ADC Replacement System, R-63501.

5. Trips

R. M. Smithers attended a joint US AEC-AECL Nuclear Engineering seminar in Toronto and Peterborough, Ontario to obtain information on automatic charge/discharge (while operating) techniques and equipment proposed or developed for CANDU and NPD-2 reactors. Other meeting subjects included zirconium and stainless steel joints in high temperature, high pressure systems and heat exchanger design and development problems. The meetings covered the period January 20 through 22, 1960 and the development laboratory and shops of Canadian General Electric were visited for viewing the prototype NPD-2 fueling machine and reactor calandria being assembled there in Peterborough.

On December 30 and 31, R. B. Willson visited Western Gear Company, Lynnwood, California for engineering and technical liaison regarding the design of outlet ball valve prototypes for OCD. He also visited (December 28 and 29) the plant of the Aeroquip Company in Burbank, California, for liaison regarding procurement of special hydraulic system jumper hoses and connectors for use on rear face reactor systems.

Ezra Hollister visited Pacific Steel Products Company, Seattle, Washington, on December 29 and 30 to observe vendor shop tests of the tube disposer (roller tube chopper) final prototype being fabricated there.

C. W. Botsford visited the following companies on January 4 through 13, 1960, for consultation on graphite overboring and procurement of overboring tool: GE Manufacturing Services, in Schenectady, New York; Great Lakes Carbon in Niagara Falls, New York; Anton Smit and Company in New York City; and, Niagara Cutter Company in North Tonawanda, New York.

From January 19 through 22, 1960, R. K. Smith visited the following companies: Wolverine Tube Company, Detroit, Michigan; Metallurgical Products, Detroit, Michigan; and A. O. Smith Corporation, Milwaukee, Wisconsin. The purposes of the trip were to witness the drawing of a special 430 stainless boron steel for prototype control rod, for consultation concerning splines, and discussion of a special welding problem, respectively.

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6. Significant Reports Issued

Undocumented - "Flow Tests Using Poison Splines in
"C" Process Tubes," F. E. Haun, 10-12-59.

Undocumented - "Tube Removal and Replacement Integra-
tion Study," E. A. Wegener, 11-16-59.
(Interim Report)

Undocumented - "Status Report - NPR Fitting Develop-
ment Activity," J. H. Fastabend, 1-11-60.

HW-62409 - "Development-Traveling Wire Flux Monitor,"
P. B. McCarthy, 10-15-59. (Unclassified)

HW-63278 - "Interim Report No. 5 - Design Test 1024 -
NPR Fuel Handling Discharge Chute Mattress
Pads," G. F. Howden, 1-4-60. (Unclassified)

HW-63300 - "Interim Report No. 1 - Design Test 1064 -
Test of G. W. Dahl Company Flow Monitor
Valve," G. F. Howden, 1-4-60. (Unclassified)

HW-63343 - "Expansion Study - Header to Header Fittings,"
P. B. McCarthy, 1-5-60. (Unclassified)

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C. Plant and Industrial Engineering

1. Drafting Operation

Summary of Drafting Operation services provided is:

New, revised, as-built drawings	135
Sketches, layouts and charts	102
Microfilm drawings added or retired	1939
Film prints produced	181
Check prints produced	658
Catalogs added	40
Customers serviced, print files	206
Customers serviced, catalog files	95

2. Industrial Engineering

Rear Face Improvements, 105-KE-KW

Improved material handling system for rear face nozzle caps incorporates use of a gravity roll conveyor, nozzle cap trucks and cap trays used in conjunction with an engineered system of removing, servicing, and replacing nozzle caps for charge-discharge activities. All equipment has been received from vendors and has been installed in the reactors. Engineered methods and time standards for the setup and buttonup tasks have been forwarded to Supplemental Crews Operation for review and approval. Full beneficial use of the improved engineered system is scheduled for the February outages.

Rear Face Improvements, 105 (old reactors)

To improve charge-discharge in the older reactors, rear face nozzle cap material handling equipment similar to that described for the K reactors has been programed for the remaining reactors.

Revisions to gravity conveyor, nozzle cap truck and cap tray drawings have been completed. Request for Appropriation No. 60-IP-29, amounting to \$17,000 for rear face material handling equipment has been approved for expenditure of funds.

Metal Handling, 300-100

As a part of the three-phase program for charge-discharge improvement which has been formulated by IEO, the matter of fuel element shipment from FPD to IPD is being studied.

Test of a cascade delivery type of fuel element magazine has revealed some design deficiencies. One further test has been scheduled to evaluate a design change. There have been no additional transport tests of the rack type magazine.

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Simplification of Maintenance Administrative Control System

Development has been requested of means for providing management with better and more timely administrative control data measures.

Working in cooperation with the customer organization, efforts have been directed toward simplification of the control procedures used internally by H Maintenance Operation.

As a result a proposed procedure, employing new forms and methods, has been formulated by this cooperative effort and is under management review.

Preinsertion of Downstream Dummies in K Reactors

This analysis has been completed. A report has been issued suggesting a mode of operation and presenting the outage time savings available from this operation. The savings from manual preinsertion amount to 0.11 minutes per tube over machine charging of the downstream dummies.

Program of Charge-Discharge Improvement

International Sales Corporation completed the order for 10,400 front face marking tags. Approximately 2,500 front and rear face tags will be carried in Spare Parts to replace lost or worn tags.

Several different methods and procedures have been developed for charging operations when using the pole-type charge seaters. These methods point out difficulties which arise from using this type of charge seater.

A two-dimensional model has been prepared to simulate these operations so that these problems can be resolved and the best method selected for use.

Prepare Training Films

A 400-foot roll of film was prepared on rear face setup and button up methods for use by Supplemental Crews Operation in training supervisors and operators in these methods.

At the request of the Manager, B/C Maintenance Operation, rear bellows repair is being studied. Film of the rear bellows repair was shown and discussed with B/C Maintenance personnel.

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IPD Decontamination Practices Report

The purpose of this assignment is to provide information to the US-AEC on the procedures used and savings achieved by decontamination work within IPD. Work is being performed in conjunction with Mr. J. R. Young of the Production Operation. Information submitted has been transmitted to the AEC as a section of an overall HAPO report being compiled by CPD.

3. Reactor, Plant EngineeringGamma Monitor Improvements for Six Older Reactors

The comment issue of the scope report for this work was distributed on January 6, 1960. It was requested that comments be submitted by January 15, 1960. Most of the comments have been received and are now under consideration in preparing the final draft for approval.

Noise Abatement

A Maintenance Job Authorization for noise abatement work in 190-C and K, 165-K has been prepared and submitted to Project Engineering for determination of estimated cost and expenditure pattern.

Rear Face Riser Failure - 105-F

Assistance was given to 100-F Maintenance Engineering in the repair of cracked walls in the 105-F Near Side, rear face riser. The 36-inch O.D. riser was cracked adjacent to a sparger sample line tap. The damaged area was removed, the remaining length of sparger was cut out and a patch welded over the hole in the 3/16 inch stainless steel plate.

Critical Mass Monitoring Instrumentation - IPD

A scope report was provided for installing a criticality instrument in all places in IPD in which fissionable material is handled or stored. The final draft of the project proposal has been completed and approved. Two additional instruments are being provided which were not specified in the scope report. Tests have been completed using a prototype instrument at 105-D building, to determine appropriate trip settings.

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4. Standards Engineering

Spare Parts

Stores Stock Requests Processed	2
Stock Adjustment Requests Processed	21
Maximum Authorized Dollar Value of New Items Added by SARs	\$2,990
Maximum Authorized Dollar Value of Spare Equipment Requested by letter to Project Engineering	0
Maximum Authorized Dollar Value of Spare Parts Requested for Projects by SARs	0
Number of Engineered Spare Parts Items Reviewed	36
Number of Drawings Ordered Revised	0
Maximum Authorized Dollar Value of Items Deleted From Spare Parts Stock	0

Craft Training and Manual Writing

The first class on Tube Replacement and Rupture Removal was held on January 19, 1960; classes are scheduled for Tuesday and Wednesday each week through June 15, 1960. Duration of the class is eight hours and to date 34 craftsmen and supervisors have attended.

The mock-ups in White Bluffs are presently being used for training Processing Operators in the use of the new charge seating equipment. Assistance has been rendered as necessary.

Instructive classes for Instrument Trainees, covering the use of Hand Tools and Approved Shop Practice, started on January 5, 1960. Six training sessions with an average attendance of five (5) trainees per session have been completed to date. Manuals covering this subject were distributed to the participating trainees. In addition, a film entitled "Atomic Physics" was shown to the trainees to provide needed background in our industry.

5. Water Plant and Utilities Engineering

Coal Standardization

Assistance to Production Purchasing Operation was provided in the installation of an improved coal sample cutter and screening facilities which will reduce the labor to processing a sample seventy-five per cent. Training the sampler in the use of this equipment is being continued. Tests are being run to determine the confidence level that can be placed in the results obtained in this sampling process.

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Coal Standardization (continued)

Examination of results of screen analysis have disclosed an objectionable characteristic of the coal from one vendor that is due to the method of preparation. This information has been provided to those involved in purchasing coal.

Assistance was given to Production Operation in estimating the quantity of coal required for Fiscal Year 1961 and modifying the coal specifications.

Improved Safety of Steam Backup

A plan for obtaining data pertinent to the performance of the 184-F boilers and 190-F pumps during a complete electrical trip-out has been firmed up. Instrumentation for obtaining this data is being provided.

Tabulation, interpretation and analysis of the data obtained in 100-H Area electrical trip out test has been completed. A report of the results of this test is being prepared.

Rough drafts of power procedures for 100-F trip out test and D/DR trip out were prepared and reviewed with power personnel.

Expansion Study

Study estimates for the water plant facilities modifications have been prepared for all areas. The work required in the 181 and 183 buildings is relatively straight forward consisting of adding pumps, new outside lines, and filters and making modifications to the 183 inlet piping and distribution flumes according to the flow desired. The amount of expenditure in the 190 building is dependent upon the flow desired and the top of riser pressure required. Work is continuing.

100-D/DR & 100-F Flow Decay Tests-Electrical & Measurements

These tests involve recording pressure (flow) decay at each reactor during a simulated BPA outage. Accurate data and timing of flywheel decay to steam pumping and to high tanks and raw water are necessary to assure reactor safety. Planning meetings were held to outline procedures for Flow Decay Tests as requested by Reactor Engineering and Process Technology Operations. Electrical procedures and instructions were issued for temporary wiring for instrumentation and communications for the tests. A test film was made at 184-F to assure the readability of data to be recorded on film during the boiler pick-up test.

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6. Trips

E. W. Baker attended the Executive Study Groups, Maintenance Conference in Philadelphia, Pennsylvania. He also visited General Electric and duPont plants in Camden, South Carolina and Louisville, Kentucky to discuss maintenance problems.

7. Significant Reports Issued

HW-63355, "Full Reactor Installation of Zircalloy-II Process Tubes, 105-C", dated January 8, 1960, J. H. Hoage.

HW-63546, "Material Handling Improvements, IPD", dated January 29, 1960, H. D. Lenkersdorfer.

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D. Project Engineering

1. Projects

CG-558 - Reactor Plant Modifications for Increased Production

182-FA Pump Test Stand Facility, 100-F Area

The purpose of this facility is to test performance of process pumps for 190 B, C, D, DR, F and H buildings. Present schedule for completion of the test stand facility is being co-ordinated with the proper need for this facility during April 1960. A pump being manufactured by Ingersol-Rand will replace 190 DR-1. The DR-1 pump which has not been altered in any way will be placed on the test stand and tested to establish a basis for comparison with the 190 pumps which have received modification.

At the present time final design and specifications are being completed and a lump sum contract will be obtained to provide additional piping, instrumentation, and miscellaneous wiring necessary to complete the installation.

Revision No. 6

The present stage of this Rev. 6 has to do with process pump modification and cost negotiation with the pumping vendor. During this period process pump D-7 was shut down after failure of the center bushing and shaft after 1½ hours of operation. Repairs to the pump case have been completed and the pump is being re-assembled in place at 190-D. This incident occurred on January 15, 1960.

CGI-791 - Reactor Confinement

Phase I - Fog Spray

Modifications to the sampling system are underway. A partial shipment of the new sodium iodide crystals has been received.

Phase II-A - Site Preparation

All site preparation work is complete except the rerouting of the 225 pound steam line at 105-D.

Phase II-B - Filter Buildings

The R. B. Miles Company is approximately six percent complete with their contract. The base concrete pours have been completed in 100-F and H Areas. Form work for the first wall pour at 100-F is progressing. Ground has been broken at 100-B and the excavation at 100-C is expected to be complete by February 5, 1960.

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Phase III - Ventilation Modifications and Tie-ins

Requisitions have been issued for motors, fans and dampers for the ventilation system modifications. Preparation of the Phase III proposal and estimate has been started.

CG-666 - Zone Temperature Monitoring - 100-B, C, D, DR, F & H

Previously reported work has been finished in all required areas except 105-C. During this period work was started at C by Central Maintenance forces.

CG-707 - Improvements to Reactor Nuclear Instrumentation - All Reactors

Purpose of this project is to design, procure, and install dual channel electronic systems for low level flux monitoring and automatic pile period meters. The installation was completed at 105-KW on January 23, 1960. The equipment requires final checking prior to its use for reactor start-up. Work remaining on this project includes the installation of one controller each at 105-H and D.

CGI-817 - Crossheader Pressure Differential Indicators - Hanford Reactors

Acceptance tests were conducted at 105-H on January 26, 1960. Two reactors, 105-KE and 105-D, were previously reported as complete and work remains in varying stages at 105-B, C, F and KW.

CGI-865 - Continuous Air Monitoring - All Reactors

All materials are either available or on order and physical work has begun. The continuous air monitoring units are expected to be shipped from the vendor's plant on February 5, 1960.

2. Project Proposals

Projects Awaiting AEC Approval

CGI-844	Coolant Backup, 100-K Area (Interim authorization of \$30,000 received July 20, 1959.)
CGI-869	Operational Charge-Discharge, C Reactor
CGI-883	Increased Process Water Flow - 100-K Area

Requests Received for Project Preparation

CGI-839 Rev. 2	Modification of Fuel Element Test Facilities, 1706-KER
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R-20929 Ventilation Improvements, 1704-K

CGI-791 Reactor Confinement
Rev. 4

3. CPFF Service Contract - Designated IPD Representative

We have issued nine new work orders and supplemented four work orders for a total of \$38,628 to J. A. Jones in the month of January. Of the nine new orders, they were classified as follows: Five Davis-Bacon; three Maintenance; one Development. The four non-Davis-Bacon jobs amounted to \$2,595 and were sent to Jones because they had the only facility available.

Since the change-over of the J. A. Jones management October 1, 1959, the following amount of work was assigned to them: Work Orders - \$173,512; Projects - \$179,460; a total of \$352,972.

4. Plant Forces Work Review

The HOO-AEC Labor Standards Board approved two jobs for assignment to plant forces which are estimated to cost \$175,300. Since taking over this assignment October 1, 1959, LSB approval was assigned twenty IPD jobs representing a total cost of \$643,050.

5. Safety Experience

Exempt personnel attended the monthly safety meeting and all nonexempt personnel attended the quarterly information meeting held for them.

6. Trips

D. M. Diediker and G. L. Swezea were in San Jose, California January 6, 7 and 8, 1960 witnessing the final testing of the neutron monitoring equipment being finished for CGI-839 by GE-APED, San Jose.

W. P. Nicklason spent January 7, 1960 in Seattle conferring with McCray Marine Construction Company in regard to underwater repair work which will be required on the K Area Out-fall pipe lines.

DECLASSIFIED**E. Principal Engineers and General****1. Activities**

The Manager, Facilities Engineering participated in the Department General Manager's Information Meetings for employees which were held January 19-20.

2. Visitors

Paul N. Higgins, Field Engineer, Peerless Pump Division of the Food Machinery Company visited the Principal Mechanical Engineer to discuss space, installation, and operating requirements of their pumps.

3. Trips

The Specialist, Engineering Administration participated in the 10th Annual Meeting of the Western College Placement Association, held in San Francisco, January 21-22.

As a member, the Principal Mechanical Engineer attended a meeting of the Materials Task Force of the American Standards Association B-31 Advisory Committee on Nuclear Piping. This meeting was held at the Argonne National Laboratories, Lemont, Illinois.

IV. INVENTIONS

All persons engaged in work that might reasonably be expected to result in inventions or discoveries advise that, to the best of their knowledge and belief, no inventions or discoveries were made in the course of their work during the period covered by this report except as listed below. Such persons further advise that, for the period therein covered by this report, notebook records, if any, kept in the course of their work have been examined for possible inventions or discoveries.

NONE

MANAGER
FACILITIES ENGINEERING

RT Jessen:msw

RELATIONS PRACTICES OPERATION
JANUARY, 1960

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PERSONNEL PLACEMENT

Of the ten experienced BS/MS candidates interviewed, offers were made to seven. Five offers were open at month end. Two PhD candidates were interviewed with no offers extended. One offer was open at month end. Thirteen men transferred into the Department from other HAPO components and three transferred to other GE Departments. There was one resignation to the AEC Chicago Office and one termination to an outside company.

OFFICE SERVICE

A precision paper cutter was installed in the 100-K duplicating facility. Acoustic tile was installed in the 1719-D duplicating office to improve its lighting, insulation and noise control.

EDUCATION AND TRAINING

B.O.C.E. course materials have been ordered and March 14 has been selected as the target date for starting two classes running simultaneously for 30 IPD participants. Thirteen clerical-secretarial employees completed three sessions of "Secretarial Proficiency".

COMMUNICATION

Mass communication activities included the publication of eight Management News Bulletins, one Round Table Guide, two IPD Employee Headliners, and three priority messages. Two IPD-OPGs and thirteen HAPO-OPGs were issued during January. GE NEWS coverage included 16 items about IPD activities totaling 331 column inches. One Management Information Meeting was held during the month.

SALARY ADMINISTRATION

Work continued on the Department's 1960 Salary Review. Section guide indexes were prepared on the basis of Company functional percent of position rates.

WAGE AND BENEFITS

One IPD employee died during January.

Three employees retired. During January IPD paid a total of \$1445 in suggestion awards to 28 suggesters for a total of 27 suggestions. The highest award was \$1200 divided equally between two suggesters.

HEALTH & SAFETY

One security violation was reported during the month in Facilities Engineering Operation. No disabling injuries were reported during January and 79 medical treatment injury cases were treated. The HAPO General Manager's Safety Award

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HEALTH & SAFETY - cont'd

was attained at midnight January 26 making a total of 3,800,000 injury-free hours accumulated since our last disabling injury 3-16-59. Selection of award gifts have been completed and purchase requisitions placed 2-6-60.

W. M. Shanks

FINANCIAL OPERATION
MONTHLY RECORD REPORT
JANUARY, 1960

General Accounting

During January two IPD employees participated in professional society meetings. Expenses incurred for this purpose totaled \$297. Societies represented were Washington Society of Professional Engineers and the American Society of Mechanical Engineers. There were no charges incurred during January for attendance at offsite courses and seminars.

The quarterly expenditure pattern for Equipment Not Included in Construction Projects was transmitted to Contract Accounting on January 26, 1960. Estimated expenditures for FY 1960 are \$1,611,000 and estimated commitments at June 30, 1960 are \$1,914,000.

FY 1961 and FY 1962 budget call letters for office and special equipment were distributed to IPD section and sub-section managers January 13 and 20, 1960, respectively. Consolidated IPD FY 1961 and FY 1962 Automotive Equipment forecast and General Manager transmittal letter was reviewed with Manufacturing and Financial Operation Managers and forwarded to the General Manager January 29, 1960.

PA&C budget summary as of January 29, 1960 was prepared and forwarded to the Manager-Finance January 29, 1960.

Five appropriation requests in the amount of \$35,760 were received during January, 1960. Of the five audited, three were forwarded to C. & AO approved by G.E. management and distributed, one was cancelled and returned to the Plant Manager on his instruction and one was retained for additional audit.

The depreciation allocation for the 2nd Half, FY 1960 was made. Property Accounting (C&A) subsequently issued the report.

Product Cost and Budgets

Planning and organizing the presentation of the FY 1962 and Revision of FY 1961 budget has begun. Schedules of due dates and planned maintenance expenditures have been submitted to sub-section managers. Requests have been made for personal and essential material requirements.

At the request of operating personnel a presentation was made to SS Savannah training personnel to cover product cost and reactor cost problems in general.

The method of accumulating customer overtime hours on time cards was revised. The new method should reduce the manual effort involved and may also enable us to get the information through IBM.

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A condensed summary of methods and procedures used by IPD in authorizing, accumulating and reporting maintenance cost was written for E. W. Baker, FEO, for presentation at an offsite meeting.

Personnel Accounting

Mr. S. H. Small replaced D. R. MacNaughton as Manager-Finance this month. Mr. Small was transferred from the Auditing Department at Schenectady, New York.

Total overtime hours worked by IPD personnel in January were 10,403; 2,766 by exempt and 7,637 by nonexempt. Total personnel in the Department at January 31, 1960 was 2,193, an increase of 6 from December 31, 1959.

Auditing

A report covering an audit of the Suggestion Plan for the twelve month period ended December 31, 1959 was issued. The audit showed that the awards for CY 1959 were made in accordance with the Company plan or HAPO modifications.

Records relative to the HAPO General Manager's safety award which was achieved January 26, 1960 were reviewed and found to support the award.

Revisions to four AEC Manual Chapters were reviewed to determine their effect on IPD operations.

General

No inventions or discoveries were made during the month by Financial personnel.

SHS Small

Manager-Finance
IRRADIATION PROCESSING DEPARTMENT

SH Small:kd

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NPR PROJECT OPERATION
MONTHLY RECORD REPORT
JANUARY, 1960

I. RESPONSIBILITY

There has been no change in responsibility since last month's report.

II. ORGANIZATION AND PERSONNEL

A. Forces

	<u>12-31-59</u>	<u>1-31-60</u>	<u>Net Change</u>
Employees on Permanent Roll	80	81	+1
Technical Graduates	3	2	-1
Technical Trainees	0	0	0

	<u>NPR</u>	<u>Tech Grads</u> (Rotational)
Transfers Into Operation	1	1
Transfers Out of Operation	0	0
Payroll Removals	0	0

Field and Operation Engineering: C. D. Shadinger transferred from H Reactor Operation into Special Materials NPR group.

Process Design: Tech Grads A. R. Gottschalk and K. D. Coughren left and J. R. Sheff transferred in on rotational assignments.

B. Safety and Security

No disabling injuries reported during the month.

A safety and housekeeping inspection of 762 Building and the offices occupied by NPR personnel in the 712 Building was conducted.

No security violations were reported during the month.

C. Personnel Activities

Appraisals of 1959 performance of exempt personnel were completed during the month.

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III. ACHIEVEMENT**DECLASSIFIED**A. Process Design1. Research and Development

The IBM-709 code for two-phase flow calculations has been completed and preliminary comparisons made with flow and pressure drop data obtained from the critical flow tests performed at 189-D. In general, the agreement is good over a wide range of upstream pressures. Consideration is being given to expanding the code to handle a variety of steady state two-phase flow problems.

A method of increasing the convergence and thus decreasing the computing time for the IBM-709 heat transfer program has been found. The program is now being rewritten for use with the improved Monitor System of data processing recently installed by the Data Processing Operation.

During the month, the IPD Lattice Physics Survey Code was converted for use with the Monitor System and also was altered so that it will iterate to a desired input K_{eff} .

2. Project CAI-816

On reactor plant design, the decision was made to provide for future installation of 68 additional process tubes rather than the 176 which had been the objective previously. These extra tube locations will be on the top and bottom of the initial pattern. Need for cooled shield plugs and provisions for an additional header on each side of the reactor were eliminated. Basic process block dimensions as well as rod and ball system patterns will remain the same. Studies are now being made of possible shortening of the control rod stroke and best utilization of the previously reserved additional header space.

In light of most recent re-evaluations of graphite contraction data, long range stack distortion problems are receiving further study. To provide additional latitude for accommodating potentially severe deflections, the process tube entry block is being redesigned and the tube bearing block notches are being made shallower. In addition, consideration is being given to reducing the length of the tube bearing blocks and to designing cleavage planes into the block to ease the problem of accumulated lateral distortion.

Extended discussions were held here during the month with A-E representatives on the proposed primary cooling loop piping specification, which will cover both 190 and 105 Building portions of the system, and on process building

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2. Project CAI-816 (Continued)

structural design, where a common approach to aseismic design and to confiner integrity is essential. Agreements were also reached on the design of the common wall between the 105 and 190 buildings.

In regard to the primary piping design package, further delays were experienced in obtaining the services of a qualified engineering group to check calculated pipe stresses and support requirements. It appears probable that completion of the piping system design package will have to be held up pending completion of these critical analyses.

Reactor plant Title I and II design progress stands at about 45 percent. Scope action has been limited mainly to processing of cost reduction program items. A readjustment in detail design progress resulted from a change in the basis of calculating percentages from 1900 to 2000 drawings and from changes in graphite design after drawings were already approved. Preparation of specifications and acceptance test procedures still lags behind schedule somewhat. Progress on development and design testing, on which significant gains had been made recently, slipped somewhat this past month to about 7 percent behind target schedule.

The latest heat dissipation system design progress schedule received from the A-E, dated January 23, 1960, reports Title II work as being 35.5 percent complete, compared to 37 percent scheduled. Over-all scope progress is calculated to be 72 percent complete. Scope drawings on the circulating water system and the fuel oil system flow diagram were processed during the month. On detail design, three specifications and thirteen construction drawings were accepted during the month.

Preliminary discussions were held with representatives of the Engineering Section, APED, concerning a proposed engineering audit of the NFR design to be performed by that organization. Program background was discussed as well as particular areas of interest and responsibility so that a proposal could be prepared and presented for consideration in the near future.

3. Visitors

Charles Pon, Structural Engineer of Burns and Roe, Inc., visited Reactor Plant Design the week of January 11, 1960, to discuss problems common to the 105-N and 190-N building design.

Paul DeRienzo and T. A. Russell of Burns and Roe, Inc., visited Reactor Plant Design on January 20-22, 1960, for discussion and revision of Piping Specifications.

DECLASSIFIED**4. Trips**

M. H. Russ visited Burns and Roe, Inc., in Hempstead, New York on January 11-22, 1960, to expedite design progress.

M. C. Fraser visited the following on January 30 through February 6, 1960:

1. Discussion with Dr. C. E. Toensing of Firth-Stirling Co., and Dr. J. Hino of Bettis in Pittsburgh, Pennsylvania.
2. Discussion with Dr. Howard Green of the G. E. Lamp Metals Components in Cleveland, Ohio.
3. Attended the AWS Conference in Chicago, Illinois.

5. Significant Reports Issued

HW-53439 REV - "K-Reactor Water Plant Expansion Analysis," January 25, 1960, W. A. Massena.

HW-57030 REV1 RD - "105-N Design Criteria - Moderator Cooling System," January 25, 1960, W. J. Morris and G. E. Wade.

HW-57046 - "105-N Design Criteria - Fission Product Confinement System," January 25, 1960, G. E. Wade.

HW-62881 ADD1 - "Addenda to Design Evaluation of Provisions For Extra Process Tubes - NPR," January 11, 1960, N. O. Strand.

HW-63011 - "Summary Engineering Report - New Production Reactor," January 15, 1960, E. R. Astley and Staff of Reactor Design Analysis.

HW-63172 - "Three Group NPR Core Flux Levels," January 5, 1960, D. E. Simpson.

HW-63395 - "Leak Test Requirement for NPR Confinement Zone I," January 7, 1960, D. D. Stepnewski.

HW-63416 - "Shutdown Pressure and Injection Control on the NPR," January 14, 1960, D. L. Condotta.

HW-63421 - "Demineralized Water Plant Capacity and Primary Heat Exchanger Tube Material," January 8, 1960, M. C. Fraser.

HW-63433 - "Engineering Factors Related to NPR Spare Process Tubes - Summary of Meeting of January 7, 1960," January 11, 1960, D. E. Simpson.

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5. Significant Reports Issued (Continued)

- HW-63450 - "Monthly Design Test Status Report for December,"
January, 1960, W. J. Morris.
- HW-63593 - "NPR Production Losses vs. Graphite Purity,"
January 21, 1960, C. A. Mansius.
- HW-63608 - "A Note on the Materials of Construction for the
NPR Connector Venturis," January 25, 1960, M. C. Fraser.
- HW-63627 - "Pitting Corrosion of Carbon Steel, Stress Corrosion
of Stainless Steel and Primary Heat Exchanger Tube Material,"
January 26, 1960, M. C. Fraser.
- HW-63656 - "Power Calculator Response Characteristics,"
January 27, 1960, D. L. Condotta.
- HW-63647 - "Derivation of Expansion Coefficient for Vaporiza-
tion of Coolant in Heated Tubes," January 26, 1960,
D. L. Condotta.
- HW-63704 - "Conversion of CG-558 Pump Test Stand for Testing
NPR Pumps," February 1, 1960, W. J. Mundt.
- HW-63275 - "NPR Process Design Monthly Report - December, 1959,"
January 11, 1960, A. B. Carson.
- HW-63426 - "R. W. Beck Presentation - Reactor Plant Description -
January 5, 1960," January 12, 1960, A. B. Carson.

B. Development and Testing

Listed below are significant developments for the New Production Reactor primarily reported by the Equipment Development Operation of Facilities Engineering.

Purchase requisitions and specifications for inlet butterfly valves and exit diversion valves were forwarded to Kaiser Engineers on 1-11-60. These requisitions and specifications are the first to be forwarded to Kaiser Engineers which invoke the prototype demonstration technique. Suggested procedures for this procurement, as agreed in previous meetings with Kaiser Engineers, were documented in a letter from JR Carrell to GL Roberts dated 1-4-60. Progress of these orders will be watched closely since this technique could be used for other critical equipment components. Magnitude of this procurement is evidenced by engineer's estimates ranging upward to \$1,200,000 for exit diversion valves with up to \$75,000 of prototypic activity, and up to \$800,000 for inlet butterfly valves with up to \$75,000 of prototypic activity. Sequence of procurement activities includes: (1) requests for engineering proposals (without costs) and statements of prior experience, production facilities, test facilities, etc., (2) pre-bid conference at

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Richland, (3) elimination of unsuitable engineering proposals and companies with inadequate experience and facilities, (4) cost and schedule information solicited for prototypes, (5) selection of up to four vendors for prototype fabrication and testing, (6) evaluation of prototypes, and (7) award of production order to vendor of desired prototype following price negotiation. In meetings with Kaiser Engineers and the Atomic Energy Commission, General Electric has stressed the desirability of presenting a common story to all vendors and the need for early agreement on the procurement procedures which would continue unchanged through placement of the production order. During the early stages of this procurement, Equipment Development was requested to suspend development activities on their totally-enclosed hydraulic cylinder concepts, permitting personnel to work on more critical developments.

The Component Test Loop was used during the month to test various types of joints and fittings. Test conditions included thermal-cycling from 600°F to 480°F at 1,800 psi with simultaneous application of bending and torsion moments of 13,000 inch-pounds each. Two Grayloc couplings completed 1,000 cycles without leaking; leakage in a third Grayloc coupling was traced to damage with a file during assembly. Two redesigned Marman Conoseals completed 400 cycles without leakage but disassembly revealed seal buckling opposite the point of torque application during assembly.

In hydrostatic tests at 600°F, a Marman Conoseal began leaking at 11,500 psi and a flash-welded section of a simulated carbon-steel connector ruptured axially at 13,400 psi with a 3-inch brittle fracture in the parent tubing and not at the flash weld.

Prototypic rupture detection equipment operated satisfactorily during the second rupture test in the Engineering Test Reactor at Arco, Idaho, on 1-25-60. The GM tube detector indicated the rupture first and this was subsequently confirmed by the characteristic fission product spectrum of a multichannel analyzer. At this point, serious doubt existed among the operating personnel as to whether the rupture had occurred. Subsequently, the rupture was confirmed by visual observation with magnification.

Debottlenecking modifications to the hydraulic supply system to the prototypic horizontal control rod drive were successful and rod speed was increased above 26 feet per second. Sticking operation at low speeds and effects of acceleration and deceleration are being studied.

Development work to evaluate contact protectors for NPR electrical relays was completed and a final report issued.

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C. FIELD AND OPERATIONS ENGINEERING

1. Activities

Construction

There has been very little construction activity during this period on the 1704-N Building and on the TC facilities due to weather conditions. Work has proceeded on the excavation for the 181-N river pump house building.

Work has been started on preparation of as-built drawings for the 13.8 kv power line from 100-D to 100-N.

Arrangements have been made to transfer two 35,000 gallon tanks and four 107,000 gallon tanks from existing plants to 100-N to be incorporated into the permanent facility for oil storage service.

Procurement of precise optical controls and inspection equipment, and preliminary planning for procedures to be followed by Kaiser in pile erection continued.

Approved a preliminary plan for a 20 tube mock-up of front and rear face nozzle assemblies and obtained the concurrence of Kaiser Engineers to the plans for its use in construction planning and training and subsequent operations and maintenance training.

Graphite

Work was started by the graphite fabricators on the orders for the reflector grade material. National Carbon Company started extruding green bars January 19 and Great Lakes Carbon Company January 26.

Bids for moderator block notching machinery were received by Kaiser Engineers during the month and on the basis of their evaluation, they are proceeding with the purchase of a machine from the Arrowsmith Company of Los Angeles which will simultaneously machine all notches in either drilled or solid bars at an estimated rate of 50 bars per hour. A total of only three bids were received on this inquiry, the other two being proposals for an automatic indexing device which would be used with our existing milling machinery. The basic proposal from Arrowsmith did not provide for sufficient flexibility of machining capabilities; however, the vendor has since advised that additional features can easily be incorporated into the basic design which will provide the necessary flexibility.

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Bids were received during the month for 2101 Building modifications. Notice to proceed has been given to the successful bidder and actual work is scheduled to start during the first week of February.

Actual renovation of the moderator fabrication shops and supporting facilities was started on January 4. Kaiser Engineers is presently utilizing about 12 craftsmen for this work.

Preparation of drawings is underway for the inspection stations required in pre-shop for the gaging of approximately 12,000 4" x 4" filler blocks. Since the filler blocks have approximately the same finished cross sectional dimensions as those processed for "K", existing equipment may be used with a minor amount of modification.

Preliminary layouts have been started for the inspection stations required for the gaging of graphite blocks of various sizes after the notching operation has been completed. Three vendors of precision gaging equipment have been contacted to investigate the possible use of pneumatic and electronic components in gaging and averaging the cross sectional dimensions of notched blocks.

Zirconium

Progress on the pilot tube orders is as follows:

Chase Brass and Copper Company

Fourteen tubes have been drawn to final size. One of the tubes has been cleaned, and was examined by a HLO representative and appears to be in excellent condition except for a few localized spots. The other tubes have not been given the final cleaning, conditioning, and inspection steps. Chase expects to draw nine additional tubes within the next two weeks. Price redetermination for the pilot order is scheduled for February 10, 11, and 12. Chase should have 23 tubes completed for the first lot.

Allegheny-Ludlum Steel Corporation

Ten tubes have been tube reduced to final size at Tube Reducing Corporation. Eleven additional tubes have been welded or are in the process of being welded. The first tube was reduced in the presence of a representative from HLO and the process was performed without difficulty. An examination of the tube prior to cleaning showed that it should be in excellent condition. Price redetermination is scheduled at Allegheny February 15, 16, and 17. Allegheny should have 21 tubes completed by March 1.

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DECLASSIFIEDHarvey Aluminum, Incorporated

Thirteen additional tubes have completed the first two cold draw operations. The finish drawing should be performed this week. Price redetermination is scheduled at Harvey February 24 and 25. Fourteen tubes should be completed by this time.

The inquiry for the production order of tubing has been formalized with Purchasing and the AEC, and was sent to the vendors January 28. Bid opening is scheduled as March 14 with placement of order by April 15, 1960. The inquiry requests a firm price for either a total or half quantity of tubing. The order will be awarded to one or two suppliers, based on the lowest total price. As agreed with the Commission, nondestructive testing will be performed by the fabricator with final acceptance of tubing being made at the fabricator's plant.

General Electric design of fixtures for inspection devices for the tube preparation shop is proceeding. Drawings completed to date include changes to immerscope, holding mandrel for immerscope standards and zirconium standards. General Electric technical shops are fabricating standards and mandrel for ultrasonic test calibration. Drawings for the immerscope changes have been released to Kaiser Engineers for procurement and assembly.

Negotiations are in progress with other Irradiation Processing Department components for the loan of a boroscope and vidigage to supplement the existing equipment during NPR tube testing work.

Agreements have been reached with Kaiser Engineers, The Atomic Energy Commission, and Hanford Laboratories Operation on responsibility assignments and details of operation of the tube shop during NPR tube testing.

Kaiser Engineers are preparing the bid package for the mechanical modifications to the tube shop and the installation of autoclaves. The contract for the building modifications has been awarded with a notice to proceed February 1, 1960.

Procurement

Field and Operations Engineering representatives participated January 21 and 22, 1960, with Kaiser Engineers and Process Design in the conducting of pre-bid conferences for the 105-N hydraulic elevators, developing an addendum which from the standpoint of the potential bidders makes the package more attractive.

The following is the present status of Material Control:

General Electric Originated Orders:

15 Open Orders

2 Complete Orders

13 Requisitions

Total Estimated Cost \$15,101,305.49

Burns and Roe Originated Orders:

3 Open Orders

16 Requisitions

Total Estimated Cost \$18,984,387.00

TOTAL: \$34,085,692.49

Administration

The following material was issued by Drawing and Specification Control during the month:

Drawings	620
Criteria	19
Specifications	103
Requisitions	34
A.T.P.'s	1
Other	<u>78</u>
TOTAL:	855

This is 157% of the number processed during the previous month.

Design Review and Consultation

Reviews were completed and formal comments were offered as follows on engineering material during the month:

On Detail Drawings	581
On Specifications	37
On Scope Drawings	6
On Criteria	<u>2</u>
TOTAL:	626

This is 235% of the number of comments offered during the previous month.

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DECLASSIFIEDOperations Planning

A list of NPR Project Section personnel interested in transfer to Manufacturing on completion of their NPR assignments, along with their production experience, present salary level, suggested Manufacturing assignment, and expected availability date was sent to Manufacturing for use in their manpower planning activities.

Further consultation has been held with A. C. Wiggins of Hanford Laboratories Operations Analysis on the N-Plant reliability study. He is still working with the basic data provided previously and has a few items which are requiring more effort to program than was initially apparent. Arrangements have been made for him to attend discussions on the Goodyear and the GEL simulation studies when the Burns and Roe instrument representatives visit Hanford.

2. Visitors

Mr. Leiser, representative of the Wheelabrator Corporation, visited the plant January 21, 1960 to discuss present equipment and methods of vapor blasting zirconium tubes.

3. Trips

E. W. Wilson spent the period from January 11 through January 22 at Burns and Roe, Inc., in Hempstead, New York as Heat Dissipation Plant Representative resolving NPR scope and design problems.

E. W. Wilson visited the Eddystone and Schuylkill Power Stations of the Philadelphia Electric Company on January 18 to observe and discuss demineralized water installations and operation.

C. E. Love visited the Budd Company, Philadelphia, Pennsylvania; Chase Brass and Copper Company, Waterbury, Connecticut; Tube Reducing Corporation, Wallington, New Jersey; Harvey Aluminum, Incorporated, Los Angeles, California, during the period January 4 to 9, 1960, to review progress on fabrication of NPR process tubes.

R. C. Walker and N. W. McKay visited the following plants January 11, 12, 13, 14 and 15, 1960 to discuss gaging requirements connected with the inspection of the NPR moderator blocks: The Sheffield Corporation, Dayton, Ohio; Pratt and Whitney Company, West Hartford, Connecticut, and Federal Products Company, Providence, Rhode Island. During the same trip the Great Lakes Carbon Company, Niagara Falls, New York, was visited to discuss graphite machining.

W. W. McIntosh, with J. C. Hamilton of Construction Engineering and Utilities, B. J. Loftus of the Commission and V. L. Frankson and George Leonard of Kaiser Engineers visited General Electric vendor

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inspection personnel and Kaiser Engineers expeditors at Chicago, New York and Pittsburgh and Combustion Engineering Corporation and Burns and Roe offices in New York and Hempstead, New York during the period of January 24 through January 28, 1960, to discuss inspection and expediting of NPR orders.

D. Consulting Engineers

1. Activities

A draft copy of the Burns and Roe portion of the Federal Power Commission study was received and commented on, and on January 29, 1960, the final copy of this report, HAN-74343, "Conversion of Hanford New Production Reactor to Export Electric Generation", was received.

A final draft copy of the FPC report, HAN-74417, "New Production Reactor Power Plant - Economic Feasibility Study", was received and commented on.

E. Program Evaluation

1. Activities

Costs and Estimates

The December 14, 1959 estimate as reported in last month's report is still the current estimate. Starting on January 26, 1960, a new estimate is being prepared and will be issued early in February.

Schedules

On January 20, 1960, Kaiser Engineers issued a new working schedule.

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Design StatusWt'd
TotalCertified
Schedule Actual
 % CompleteReactor Plant as of 1-31-60Title I

Scope

100

99.3

Title II

Drawings

70

38

40.9

Specifications

8

42

28.4

Requisitions

8

6

1.5

ATP's

4

3

0.0

Development and Testing

10

59

55.0

Total

100

37

36.5

Heat Dissipation Plant as of 1-31-60Title I

Scope Criteria

100

81

Title II as of 1-23-60

Detail Design

37

35.5

No.
Req'dNo. Issued to 12-26-59
Scheduled Actual

Criteria

26

14

14

Preliminary Drawings (bid)

603

157

130

Detail Drawings (for const.)

670

56

52

Specifications

165

52

40

Requisitions

150

54

42

ATP's (no. being developed)

-

0

0

Composite Design Completion
(Reactor and Heat Dissipation Combined)Certified
Schedule Actual
 % Complete

Total

45.1

43.1

IV. INVENTIONS OR DISCOVERIES

All persons engaged in work that might reasonably be expected to result in inventions or discoveries advise that, to the best of their knowledge and belief, no inventions or discoveries were made in the course of their work during the period covered by this report except as listed below. Such persons further advise that, for the period therein covered by this report, notebook records, if any, kept in the course of their work have been examined for possible inventions or discoveries.

Mechanical Conveyor dated December 8, 1959 by J. F. Nesbitt and D. R. Dukes of Kirk Engineering.

MANAGER
NPR PROJECT

JS McMahon:mf

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END

**DATE
FILMED**

9 / 18 / 92