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MONTHLY REPORT
HANFORD ATOMIC PRODUCTS OPERATION
FOR
MAY 1956

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Compiled by
DEPARTMENT MANAGERS

June 21, 1956

Date 5-15-92
U.S. AEC

RICHLAND, WASHINGTON

Work performed under Contract No. W-31-109-Eng-52 between the Atomic Energy Commission and General Electric Company

[redacted]

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8 - 9	E. J. Bloch, Director, Division of Production, Washington 25, D. C.
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MONTHLY REPORT
HANFORD ATOMIC PRODUCTS OPERATION

MAY 1956

GENERAL SUMMARY

PRODUCTION OPERATIONS

The net production of acceptable finished slugs was 438 tons which was 101 percent of the forecast. The composite yield was 76 percent, an improvement of 4 percent over the previous month, and reflects a decrease in the poor bonds, bond testing and inclusion categories.

The reactor input production was 103.4 percent of the forecast with a production increase resulting from a higher than forecast time operated efficiency. The efficiency for the month was 73.7 percent which was slightly above the average of the previous two months. The gain in efficiency was attributed to fewer outages for charge-discharge and for reactor maintenance.

A total of 12 slug failures occurred during the month with 190 hours required for removal.

Major tube replacement programs were conducted at D, F and H reactors with a total of 204 tubes removed, 213 replaced and 8 problem channels cleared. A total of 412.5 hours were required for the program. At D, an average time of less than one hour per tube was achieved.

The Purex facility resumed operations on May 17, following an extended outage beginning on April 23, for replacement of process equipment, namely, the 1A column and the plutonium concentrator package. Operation was essentially continuous at a 12-ton rate for the remainder of the month, except for one outage of twelve hours required to replace a column feed valve. Achievement of stable plant operation resulted in excellent decontamination of both final products. For the first time since hot start-up, uranium fission product gamma ratios were within specifications.

ENGINEERING TECHNOLOGY

Research and Development programs and goals for the next two years were revised for the existing reactor program and developed for the improved production reactor. Consideration was given to several possible experimental reactors in support of a plutonium fuel cycle program.

Four tubes of I & E slugs and four tubes of regular metal control slugs have been charged in the C Pile for the run-to-rupture portion of the current I & E tests. Continual improvements have been made in the canning yield and in the over-all yield of dip-canned I & E slugs.

Hydrated UO_3 with high reactivity has been shipped to K-25 for pilot plant evaluation.

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Additional funds in the amount of $350,000 were authorized by HOO-AEC during the month for Project CG-654, bringing total funds authorized for this project to $500,000. The objective of this authorization is to obtain a limited scope package for a new plutonium producing reactor embodying a recirculation cooling system.

Metallurgical design development studies were continued during the month of methods of expanding canning facilities in the 300 Area to provide the additional fuel element capacity which would be required for a supplementary production reactor.

For the second consecutive month, all construction project work remained in a suspended state, except for the minor portions assigned to plant forces.

GENERAL

Richland has been awarded certificates of Achievement for "No Traffic Deaths," "Accident Records," and "Public Safety Education," by the National Safety Council in the 1955 Traffic Safety Award Program.

Nine students have now completed their work for Master's degrees and will receive diplomas at schools affiliated with our program. Also, two candidates who took course work through the school and wrote theses while working at Hanford will receive Ph.D. degrees from Oregon State College in June.

One disabling injury resulted from the sudden appearance of three deer in the plant highway causing a pickup to slide and roll over.

Computation on the IBM 702 electronic data processing machine of tube wall thickness in all standard Hanford reactors is nearing completion. Corrosion figures have been obtained for two periods, one from start-up to January 1, 1956, and the other from January 1, 1956, to May 1, 1956. The two sets of figures have been combined for all except one reactor, and this will be done in the near future. A program is now being planned which will compute tube wall thicknesses every three or four months to keep corrosion data current.

Machine tools previously arranged for delivery from Portsmouth under the upgrading program were received by the field components during the month. The plant's machine tools have been substantially upgraded during the past year from better equipment available from the closeout of AEC construction contracts.

A revised FY-1956 Financial Plan was received from HOO-AEC during May. Detailed reconciliation with the previous Financial Plan and with our mid-year budget indicates only minor changes.

Temporary measures to control the release of Co^{60} to ground water from TBP wastes were established. The growth of a retaining water mound under the 200-E Area also helps to slow down the travel of the existing contaminated water.

STAFF

Vice President and General Manager, Atomic Products Division	F. K. McCune
General Manager, Hanford Atomic Products Operation	W. E. Johnson
Counsel	E. T. Maher
Manager, Finance	D. M. Johnson
Manager, Employee and Public Relations	L. L. German
Director, Radiological Sciences	H. M. Parker
Manager, Engineering	A. B. Greninger
Manager, Manufacturing	W. K. MacCready
Operations Research and Synthesis	C. A. Bennett

AREA PERSONNEL DISTRIBUTION
May 31, 1956

	100-B Area	100-D Area	100-F Area	100-H Area	100-K Area	200-E Area	200-W Area	300 Area	700-1100 Area and Plant General	Other Areas*	Total
ENGINEERING DEPARTMENT											
Exempt	6	54	-	2	25	46	63	251	311	39	797
Other	18	30	3	12	22	17	37	239	186	71	635
Total	24	84	3	14	47	63	100	490	497	110	1 432
MANUFACTURING DEPARTMENT											
Exempt	78	62	86	91	65	97	222	114	122	-	937
Other	294	336	250	406	262	501	1 035	571	677	-	4 332
Total	372	398	336	497	327	598	1 257	685	799	-	5 269
FINANCIAL DEPARTMENT											
Exempt	-	-	-	2	-	-	5	6	123	1	137
Other	-	-	-	6	-	-	20	13	328	-	367
Total	-	-	-	8	-	-	25	19	451	1	504
EMPLOYEE AND PUBLIC RELATIONS DEPARTMENT											
Exempt	24	6	6	7	5	7	14	12	208	1	290
Other	68	45	44	43	54	42	120	108	843	53	1 420
Total	92	51	50	50	59	49	134	120	1 051	54	1 710
RADIOLOGICAL SCIENCES DEPARTMENT											
Exempt	1	1	31	-	-	2	21	76	5	-	137
Other	-	4	47	4	3	16	24	179	19	-	296
Total	1	5	78	4	3	18	45	255	24	-	433
GENERAL											
Exempt	-	-	-	-	-	-	-	-	8	-	8
Other	-	-	-	-	-	-	-	-	3	-	3
Total	-	-	-	-	-	-	-	-	11	-	11
Total Exempt	109	123	123	102	95	152	325	459	777	41	2 306
Total Other	380	415	344	471	341	576	1 236	1 110	2 056	124	7 053
GRAND TOTAL	489	538	467	573	436	728	1 561	1 569	2 833	165	9 359

* Includes White Bluffs and B-Y Exchange.

HANFORD ATOMIC PRODUCTS OPERATION
NUMBER OF EMPLOYEES
MAY 31, 1956

DEPARTMENT	EXEMPT 5-31-56	EXEMPT 4-30-56	OTHER 5-31-56	OTHER 4-30-56	TOTAL 5-31-56	TOTAL 4-30-56
GENERAL MANAGER'S GROUP	8	8	3	3	11	11
EMPLOYEE AND PUBLIC RELATIONS DEPARTMENT						
General	9	9	8	8	17	17
Salary and Wage Administration	11	11	11	11	22	22
Personnel Practices	20	19	42	40	62	59
Education and Training	6	6	51	55	57	61
Emp. Comm. and Public Rel.	11	11	45	44	56	55
Union Relations	5	5	1	1	6	6
Auxiliary Oper. and Plant Prot.	116	116	788	787	904	903
Community	65	67	301	309	366	376
Health and Safety	47	44	173	172	220	216
ENGINEERING DEPARTMENT						
Engineering Administration	29	29	89	87	118	116
Advance Engineering	7	7	1	1	8	8
Design	182	178	107	108	289	286
Project	186	187	156	159	342	346
Pile Technology	232	231	179	182	411	413
Separations Technology	161	161	103	100	264	261
MANUFACTURING DEPARTMENT						
General	24	24	8	8	32	32
Reactor	385	374	1 538	1 540	1 923	1 914
Separations	295	299	1 458	1 465	1 753	1 764
Metal Preparation	112	113	571	574	683	687
Transportation	44	44	449	446	493	490
Purchasing and Stores	62	62	233	235	295	297
Electrical Utility	15	15	75	75	90	90
FINANCIAL DEPARTMENT						
General	9	9	7	7	16	16
Budgets and Measurements	8	7	5	6	13	13
Contract Cost	24	24	102	102	126	126
General Accounting	9	9	59	61	68	70
Property Accounting	20	20	51	51	71	71
Auditing	15	15	2	2	17	17
SS Accountability	10	10	37	37	47	47
Personnel Accounting	9	9	55	55	64	64
Procedures and Computing	33	33	49	49	82	82
RADIOLOGICAL SCIENCES DEPARTMENT						
General	5	5	-	-	5	5
Records and Standards	34	35	177	180	211	215
Biophysics	57	56	70	70	127	126
Biology	29	29	44	43	73	72
Engineering	9	9	1	1	10	10
Administration and Comm.	3	3	4	4	7	7
GRAND TOTAL	2 306	2 293	7 053	7 078	9 359	9 371

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MANUFACTURING DEPARTMENT

MAY, 1956

METAL PREPARATION SECTION

The net production of acceptable finished slugs was 438 which was 101 percent of the forecast.

The composite yield was 76 percent, an improvement of 4 percent over the previous month, and reflects a decrease in rejects in the poor bonds, bond testing and inclusion categories.

A four week inventory of acceptable canned slugs was on hand at month end, and the supply of bare slugs fluctuated from four to six days during the month.

The canning, on a production test basis, of I&E and dingot slugs continued throughout the month.

There were no slug failures at autoclave testing this month.

REACTOR SECTION

The reactor input production was 103.4 percent of the forecast with a production increase resulting from a higher than forecast time operated efficiency. The efficiency for the month was 73.7 percent which was slightly above the average of the previous two months. The gain in efficiency was attributed to fewer outages for charge-discharge and for reactor maintenance.

The reactor output production, establishing a monthly record, was 110.8 percent of the forecast and resulted from discharges of low concentration material from C and H reactors that were originally scheduled for June. A total of 258 and 239 tons of low and high concentration metal respectively was discharged.

Established maximum reactor operating levels were not increased as a result of the seasonal increase in water temperature.

A total of 12 slug failures occurred during the month with 190 hours required for removal.

Thirty-five reactor scrams occurred during the month, 16 of which were due to normal panellit system variables.

Process tube leak testing programs at D, DR, F and H reactors required a total of 212.6 hours. At D, one leaking tube was removed. At DR several flange leaks and one tube leak were corrected. At F, four separate leak test programs were required in which 12 flange leaks were found and corrected. At H, 36 rear nozzles were found loose; one leaking tube and one flange leak were also found and corrected.

Major tube replacement programs were conducted at D, F and H reactors with a total of 204 tubes removed, 213 replaced and 8 problem channels cleared. A total of 412.5 hours were required for the program. At D, an average time of less than one hour per tube was achieved.

SEPARATIONS SECTION

The production of low and high ngs plutonium from the primary plants was 76 and 106 percent of the forecast respectively.

The Redox Plant, following an outage for an equipment flush, resumed operations on May 3. A shutdown was necessary on May 4 due to the improper make-up of a scrub solution which ultimately resulted in gross cross-contamination of the uranium and plutonium products. Rework of the streams was in effect until May 5 when conditions returned to normal and a rate of 10 tons was established. On May 7, a three-hour outage was necessary due to a fire on a power pole. During the shutdown a quantity of material leaked from the letdown valve of the first decontamination column, causing contamination of the plutonium stream. Rework of material, at a 5 ton rate, continued until May 12 when the plant resumed normal operation at a 10 ton rate. Operation was continuous, with rates up to 10.5 tons, until May 18 when a shutdown was made necessary by pump failures in D and F cells and by plugging of back-cycle lines. Following corrective work the plant resumed operation on May 21. On May 26, because of a sticking letdown valve, processing was reduced to a 7 ton rate. Following replacement of the valve, attempts to operate at 10 tons resulted in column flooding. On May 30 the plant shut down for an equipment flush and to perform maintenance work in the plutonium concentration building. Total outage time for the month was 190 hours.

The Purex facility resumed operations on May 17, following an extended outage beginning on April 23, for replacement of process equipment, namely, the 1A column and the plutonium concentrator package. Operation was essentially continuous at a 12 ton rate for the remainder of the month, except for one outage of twelve hours required to replace a column feed valve. Achievement of stable plant operation resulted in excellent decontamination of both final products. For the first time since hot start-up, uranium fission product gamma ratios were within specifications.

The TBP plant production exceeded the forecast by 38 percent. The second cycle, except for one hour, operated continuously throughout the month. Outages for the first cycle totaled 75 hours with the major portion of the time being used for a column replacement. A total of 62 tons of out of specification Purex UNH were processed through the second cycle.

Production of UO_3 powder was 85 percent of the forecast. The output was affected by feed shortage which was due principally to the extended outage at Purex and production interruptions at Redox.

Metal Fabrication achieved the quantities as forecast. Isolation production, affected by the extended Purex outage, was 84 percent of the forecast.

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GENERAL

Personnel

On Roll May 1, 1956	5274
Net Decrease	5
Total on Roll May 31, 1956	5269

W.K. MAC CREADY, MANAGER
MANUFACTURING DEPARTMENT

MANUFACTURING DEPARTMENT

PATENT REPORT SUMMARY
FOR
MONTH OF MAY, 1956

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.

INVENTOR	TITLE
L.E. Roberts	Tube and Rod Bending Device
K.K. Campbell	Remotely Operated Pickup Tool

W.K. MAC CREADY, MANAGER
MANUFACTURING DEPARTMENT

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METAL PREPARATION SECTION

May, 1956

I. RESPONSIBILITY

There was no change in responsibility during this period.

II. ACHIEVEMENT

A. Operating Experience

1. Statistics

	May	April	Year to Date
Total Acceptable Slugs Canned (Tons)	438	398	1,965
Composite Canning Yield (%)	76	72	76
Efficiency (%) (Canning Throughput)	89	88	89
Forecast Achievement (Current Commitment)	101	101	102
Acceptable Solid Slugs (Tons)	405	364	1,864
Slugs Returned from 100 Area (Tons)	2.35	2.06	11.18
Canning Yield (%)	76	72	76
Acceptable Cored Slugs (Tons)	33	34	101
Slugs Returned from 100 Area (Tons)	0	0.28	1.68
Canning Yield (%)	77	74	65
Autoclave Failure - Solid (No./M)	0.00	0.00	0.00
Autoclave Failure - Cored (No./M)	0.00	0.00	0.00
Acceptable C Slugs Canned (Pieces)	0	414	414
Acceptable Pb-Cd Slugs Canned (Pieces)	4,991	4,013	21,621
Average Steam Generated (M lbs/hr)	31.8	43.3	
Maximum Steam Generated (M lbs/hr)	54.0	71.0	
Total Steam Generated (M lbs)	23,674	31,156	
Coal Consumed (Tons)	1,504	1,947	
Sanitary Water from 3000 Area (M Gals)	59.3	54.7	
Average Rate (GPM)	1,328	1,266	

2. Activities

Net production was 438 tons of acceptable finished slugs of which 33 tons were cored slugs. Forecast achievement was 101 percent of the official production forecast. Production commitments were met by operating eight canning line shifts the first two days of the month and then seven canning line shifts per day on a minimum relief basis the remainder of the month.

The composite true yield for May was 76 percent, an improvement of four percent over last month reflecting a decrease in the number of poor bonds, bond test, voids, and inclusions.

METAL PREPARATION SECTION

2. Activities (Continued)

The yield for May was computed according to the true yield formula. The true yield more closely reflects the Section's performance since damaged slugs returned from the 100 Areas, good pieces used for development work, and material available for reprocessing are no longer charged against 300 Area yield totals. The net yield for May would have been 75 percent compared to the true yield of 76 percent.

An optimum four-week supply of canned slugs existed in the 100 and 300 Area storage at month's end. The inventory of bare slugs varied from a four- to a six-day supply; this inventory is expected to increase to an average six-day supply in July.

A total of 36.4 tons of uranium scrap was shipped offsite for recovery and recycle.

A new Metal Preparation Section Official Production Forecast (HW-43382-RD) extending from May 1956 through September 1957 was issued on May 23, 1956. This forecast which delays presently scheduled production increases was based on the revised Reactor Production Forecast. Developments since May 23 indicate another downward revision in production may be necessary to compensate for reduced customer demands for low concentration material.

3. Special Operations

Approximately 242 I and E slugs were canned in development tests to aid in evaluating variation of canning cycle times, vibration of the assembly during insertion of the slug and other braze porosity problems. In addition 80 enriched I and E pieces were fabricated, with a 59 percent yield through welding, for charging in the C pile.

There were 5,215 Pb-Cd poison slugs canned with a yield of 96 percent. This year to date, 22,291 poison slugs have been canned with an overall yield of 96.6 percent.

A total of 650 four-inch solid aluminum dummies were canned for Technical on MFR-433-A. These pieces are to be used for corrosion tests.

Approximately 88 tons of dingot slugs were outgassed and five tons of material were transformed in the salt bath heat treating facilities.

Fifteen thousand slugs were penetration tested using a 25 mil standard on PWR-80. The reject rate was not appreciably higher than with the 20 mil standard presently in use. These pieces will be evaluated in the piles for rupture resistance performance.

4. Schedule Variance

Acceptable canned slug production was 101 percent of forecast, based on the May commitment of 435 tons.

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METAL PREPARATION SECTION

B. Equipment Experience

1. Operating Continuity

The canning line "time-operated" efficiency was 89 percent for an increase of one percent over last month. The increased efficiency may be attributed to an improvement in canning time operational efficiencies.

2. Inspection, Maintenance and Replacement

Work was performed on all Acme-Gridley lathes in order to clean alsi-dust from the gear boxes and to correct a heating problem resulting from incorrect adjustments and wearing of the brake shoes. Additional information from the vendor and an increase in spare parts should result in improved continuity of operations.

Future production delays on the penetration and bond testers should be eliminated due to replacing the underwater bearings with nylon bushings and strengthening the slug support member.

Slug recovery operations were disrupted for approximately 100 hours during the month due to steam leaks in the heater tank.

The autoclave feed water system was revised to increase the rate of flow. The system is now capable of supplying sufficient water for immediate autoclave charging.

Two Ajax induction furnaces failed due to the development of cracks between the channel and the inductor coil. One failed during normal metal recovery and the other due to the application of high power prior to the metal reaching a satisfactory molten state. A standby furnace was satisfactorily relocated and production was not interrupted.

C. Improvement Experience

1. Production Tests

P.T. 313-47-MT "Cored Slugs from Extruded Blanks and Rolled Rods"
HW-33189

The preparation of eight-inch drilled cored slugs with pressed aluminum end plugs was continued. A total of 33 tons of finished slugs was produced with a 77 percent yield.

Beginning in July it is planned to increase the axial hole diameter of cored slugs from 3/8 inch to 1/2 inch, anticipating improved irradiation performance based on previous in-pile experience. Fernald is being requested to supply slugs with the larger hole diameter at a rate of 25 tons per month through September and increase deliveries to 80 tons per month in October. A purchase order has been issued for aluminum end plugs conforming with the revised slug counterbore dimensions.

METAL PREPARATION SECTION

1. Production Tests (Continued)

P.T. 313-56-MT "Canning of Four Tons of Dingot Uranium for Pile Evaluation" HW-37695

A program for preparing production quantities of eight-inch dingot uranium fuel elements for low goal exposure was continued as authorized by Supplyment A to this production test. Seventy-two tons of finished slugs were produced with a 69.5 percent yield. Bond test rejects continue at a rate of about 10 percent, which is twice the rate for regular ingot uranium fuel elements, even though all dingot slugs are outgassed prior to canning.

P.T. 313-58-MT "Evaluation of "C" Alloy Fuel Elements" HW-42961A

A total of 162 double length "C" slugs were fabricated by welding two regular "C" slugs end to end. It is hoped that the double length will reduce slug "chattering" in the reactor process tubes.

P.T. 105-615-A-63 MT "Evaluation of I and E Slugs Canned by the Lead-Dip Process" HW-39886A

The final yield for 450 normal uranium eight-inch I and E slugs, canned by the lead-dip process last month, was 25 percent. The low yield is largely attributed to porosity in the braze layer. An investigation of this problem has indicated the hydrogen content of the slugs was slightly higher than average production material. In addition it is evident that an abnormal amount of air was entrapped in the braze layer during the canning assembly operation. Developmental tests are currently in progress to determine the factors contributing to the high reject rate, and to revise the process as necessary to improve the yield on future production tests.

P.T. 105-629-A-73-MT "Evaluation of I and E Slugs Operating at High Specific Powers" HW-43078A

A production test design was issued and authorized for the preparation of four tubes of eight-inch enriched (1.44%) I and E slugs by the lead-dip process for irradiation at high specific tube powers. Eighty slugs were canned during this period with a 59 percent yield through welding. Further work on this test has been discontinued until the developmental tests directed toward improving yield are completed.

P.T. 105-620-A-65-MT" Irradiation of Slugs Having Truline End Contours" HW-40526A

An initial shipment of 200 truline cans was received, and 100 truline solid slugs were canned by the lead-dip process for flow laboratory tests. Delivery of the remaining 100,000 cans on order is not expected until about July 1. The preparation of truline solid slugs to replace one-half of the slugs discharged from C pile will be started as soon as cans are available in production quantities.

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METAL PREPARATION SECTION

2. Process Tests and Revisions

Since the bond test counts for dingot material outgassed in rod form were one-fourth that found on non-outgassed dingot material and approximately equal to that obtained on ingot material, it appeared as though outgassing in rod form may be an effective method of reducing the pososity of canned slugs of the solid type. The rods showed complete recrystallization when outgassed. It does not appear that this method is a complete answer to the problem since it is ineffective for I and E type pieces.

In-pile evaluation of the initial 3,000 aluminum caps from the Harvey Machine Company has been completed. These caps appear to be fully comparable to those regular caps from Alcoa. The remaining 97,000 caps are expected in June.

About 8,000 slugs were processed using a 0.025 inch standard instead of the usual 0.020 inch standard for residual can wall thickness testing. Preliminary results indicated that this thicker minimum residual can wall may be assured with no great loss in over-all slug yield.

A thulium-170 radioactive source for radiographic inspection of the inner weld on I and E slugs is being recommended to Fuel Technology for their new semi-works facility. A preliminary study indicates that this inspection method would be economically feasible for full scale production.

A new work station layout for the sleeve cleaning operation reduces the manpower requirement from two to one attendant.

3. Inventions and Discoveries

Personnel in the Metal Preparation Section engaged in work which might be expected to result in inventions or discoveries have reported that no inventions or discoveries were made during the period covered by this report.

D. Events Influencing Costs

1. Labor Variance

No appreciable change is anticipated in the unit cost of direct labor.

2. Material Variance

No appreciable change is anticipated in the unit cost of direct material.

3. I. M. E. (Other Costs)

No appreciable change is anticipated in the unit cost of I.M.E. against April actual.

METAL PREPARATION SECTION

E. Plant Development and Expansion

As a result of handling all projects through Minor Construction forces and Sub-contractors, no significant changes have been made from the previous month's report.

F. Significant Reports Issued

1. Routine

Number	Title	Author	Date
HW-40819 RD	Six Months Production Forecast and Operating Assumptions	HE Berg	5-4-56
HW-41288 RD	Metal Preparation Section, Operations, April 1956	HE Berg	5-4-56
HW-42935	Monthly Report, Process Subsection, Metal Preparation Section, April 1956	KV Stave	5-3-56
HW-42936	Monthly Report, New Fuel Element Production Program, April 1956	WA Blanton	5-3-56
HW-42952	Production Report, Metal Preparation Section, Operations, April 1956	HE Berg	5-4-56
HW-42983	General Analytical Control Program I	GB Hansen	5-14-56
HW-43047 RD	Operations Subsection, Metal Preparation Section, Monthly Report, April 1956	WW Windsheimer	5-2-56
HW-43313	Uranium Quality Control Analytical Results	GB Hansen	5-21-56
None	Monthly Report, Projects and Personnel Development, April 1956	DW Haught	5-7-56
None	Monthly Report, Contact Engineering Unit	JW Nageley	5-23-56
None	Project Status Report	JW Nageley	5-21-56

2. Non-Routine

Number	Title	Author	Date
HW-42951	Historical Measurements on Bare and Canned Slugs	GX Beard KE Carpenter	5-15-56
HW-43320	Evaluation of Rod Outgassed Dingot Material	RE Olson	5-22-56
HW-43382 RD	Official Production Forecast, Metal Preparation Section May 1956 - September 1957	HE Berg	5-23-56

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METAL PREPARATION SECTION

2. Non-Routine (Continued)

Number	Title	Author	Date
HW-43440	Request Procurement of Standard "C" Slugs	HE Berg	5-31-56
HW-43043 RD	Metal Preparation Section Production Planning	RD Ellingson	5-14-56
HW-42909	Proposed Approach to Lead Dipped Canning Mechanization	TB Correy	4-30-56
HW-43109	Proposed Investigation to Combine Preheating and Assembly to Alsi Bonded Fuel Elements in one Furnace	TB Correy	5-16-56

III. PERSONNEL

A. Organization

On May 1, 1956, H. A. Jones' position title was changed from Planner, Material Procurement to Production Planner II.

D. A. Snyder transferred from Contact Engineering to Development Engineering on May 1, 1956.

J. M. Holeman, Optical Engineer, in Power and Maintenance Subsection, transferred to General Engineering Laboratories on May 11, 1956.

B. Force Summary

	Start of Month		End of Month		Net Change	
	Ex.	Non-Ex.	Ex.	Non-Ex.	Ex.	Non-Ex.
Section General	1	1	1	1	0	0
Operations	21	167	21	165	0	-2
Process	40	66	40	66	0	0
Power and Maintenance	38	338	37	334	-1	-4
Projects and Personnel	15	5	14	5	-1	0
Total	115	577	113	571	-2	-6
		(692)		(684)		

C. Safety Experience

Heat shields were installed on each side of the canning furnaces to protect the legs of the canning operators from Alsi burns.

Chip guards were installed on all Acme-Gridley lathes to protect the operator from flying chips and to allow easy removal of chips from the machines.

METAL PREPARATION SECTION

C. Safety Experience (Continued)

Members of the Metal Preparation Section accumulated a medical treatment frequency rate of 5.19 during 113,729 exposure hours. There were no disabling injuries, no other accidents or incidents.

D. Radiation Experience

No exposures in excess of 200 mrads/week and twelve exposures in excess of 100 mrads/week were reported during the month.

E. Personnel Activities

1. Visits and Visitors

R. E. Olson and H. E. Berg visited AEC Fernald Area Office and National Lead Company of Ohio May 2 and 3 and the Mallinckrodt Chemical Works May 4 to discuss uranium quality control.

T. D. Naylor visited Pacific Oerlikon Company, Tacoma, Washington, May 3 to discuss specifications for essential material; and visited Reynolds Metals Company May 16 and the Aluminum Company of America May 18 to discuss specifications for essential materials on outstanding purchase orders.

E. W. O'Rorke visited Aluminum Company of America in Edgewater, N. J., and Mallinckrodt Chemical Works in St. Louis, Missouri to discuss uranium quality and attended the Metal Quality Advisory Committee Meeting in St. Louis from May 17 to 23, 1956.

J. W. Nickolaus visited Philadelphia, Penn., to attend the Design Engineering Show on May 14 through 17, 1956. He also visited the Ajax Engineering Corporation, Trenton, New Jersey while in the East.

2. Meetings

Members of the Section attended 18 round table discussions, 22 information meetings, 32 staff meetings, and 99 staff meetings.

Acting Manager
METAL PREPARATION SECTION

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Richland, Washington
June 8, 1956

MANUFACTURING DEPARTMENT
REACTOR SECTION
MONTHLY REPORT
MAY, 1956

I. RESPONSIBILITY

Assigned responsibilities of the Reactor Section remained unchanged during May.

II. ACHIEVEMENT

A. Operating Experience

Reactor time operated efficiency for May was 73.7 per cent, 1.5 per cent lower than April and 2.0 per cent higher than March. Major items necessitating downtime were, in descending order, 1) tube replacement, 2) charge-discharge, 3) leak testing, and 4) rupture removal.

Reactor input production (Pu) for May was 103.4 per cent of forecast as a result of a higher actual time operated efficiency than assumed in the forecast. May input production was 3.5 per cent lower than the all-time high which was achieved last month.

Reactor output production for May was 110.8 per cent of forecast. Forecast was exceeded due to the discharge of low concentration material, at C and H Reactors, which was originally scheduled for June. May output production represents an all-time high, exceeding the previous record high of February, 1956, by 5.7 per cent.

[redacted]

A. Operating Experience (Continued)

Established maximum reactor operating levels were not increased during May as a result of the seasonal increase in river water temperature. Local river water temperature is now two to three degrees higher than the average for May of the preceding nine years.

A total of 12 slug failures occurred in May as compared with 11 in April, and 19 in March. Total reactor outage time in May caused by ruptures was 305.5 hours of which 190.2 hours were required for rupture removal, the remaining time was utilized for charge-discharge and miscellaneous maintenance.

Reactors sustaining ruptures were as follows:

	B	C	D	H	KW	Total
Eight-Inch Regular		2	2	3	2	9
Eight-Inch Cored	2					2
PT-601-53-MT*			1			1
Totals	2	2	3	3	2	12

* "The Effect of Slug Heat Treatment Modifications Upon Pile Stability."

1. Statistics

Operating statistics are summarized in the table on Page 3.

2. Activities

Notification was received from the AEC on May 31 of a forthcoming reduction in the discharge of low concentration metal. It is anticipated that this reduction will eliminate the discharge of low concentration metal from D, DR, F, and H Reactors which was being utilized for rupture control and will possibly reduce the required discharges from C Reactor which is currently discharging low concentration metal only.

The discharge of rupture prone material at a modified goal exposure (400-800) has been essentially completed.

Tube replacement programs were conducted at D, F, and H Reactors with a total of 204 process tubes removed, 213 replaced, and eight problem channels cleared of partial tubes. This includes the tubes which were partially replaced at H Reactor during the April portion of the outage which started April 27, and ended May 7. Reactor outage time required for tube replacement during May was 412.5 hours. It is noteworthy that during the May 27 outage at D Reactor, an average time of less than one hour per tube was achieved which resulted in exceeding the goal removal rate of 20 tubes per day. No splitters were stuck during this outage; however, this remarkable over-all performance is attributed to improved broaches, splitter starters, adequate splitters, and the new tube wrapping machine.

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1. Statistics

	B	C	D	DR	F	H	KE	KW	Total Or Ave.
Reactor Time Operated Efficiency (%)	83.3	74.6	55.3	79.5	57.9	63.0	92.0	84.2	73.7
Reactor Outage Time (Hrs)									
Plutonium Production	102.3	145.2	332.6	125.2	308.9	248.9	54.5	115.1	1432.7
Special Irradiations & Tests	21.8	27.6		27.1	4.0	26.1	4.7	0.5	111.8
BPA Fluctuations		16.1	0.3	0.2	0.3	0.4	0.5	2.0	19.8
Total Outage Time	124.1	188.9	332.9	152.5	313.2	275.4	59.7	117.6	1564.3
Reactor Unscheduled Outage Time (Hrs)	124.1	97.3	71.6	50.5	114.6	116.7	37.2	63.2	675.2
Metal Discharged (Tons)	25.6	131.2	34.3	71.8	22.3	73.6	29.9	103.4	493
Water Quality (ppm Turbidity)									
Raw Water - Average	33	30	30	29	27	26	29	32	
Raw Water - Maximum	63	54	57	57	47	63	59	61	
Process Water - Average	0.006	0.007	0.005	0.005	0.004	0.003	0.004	0.004	
Process Water - Maximum	0.009	0.012	0.006	0.006	0.007	0.007	0.006	0.005	
Water Pumped (MM Gals)									
Bldg. 190 to Reactor	1844	3143	1589	1969	1473	1884	5857	5500	23259
Bldg. 182 to 200 Areas	28.6		419.4						448
Bldg. 181	6020		4934		1712	2240	6169	5736	26811
Steam Generated (MM Lbs)	156		193		100	85	24	21	579
Coal Consumed (Tons)	9691		11960		7241	5041			33933
Oil Consumed (M Gals)							256	224	480

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HW-43137
DEL

A. Operating Experience

2. Activities (Continued)

Reactor	Date Started	mrad/Tube Exposure	Hours/Tube
H	4/29/56	318	2.24
D	5/12/56	180	1.72
F	5/22/56	226	1.80
D	5/28/56	114	0.96

The following table indicates activities during April associated with special irradiations other than the programs noted above:

	Tubes Charged	Tubes Discharged	Casks Shipped
Production Tests	36	20	2
Mint Flattening	20	34	
"C" Metal	1	7	
"B" Metal		2	
Rala		4	2
"Q" Metal			16
	57	67	20

B. Equipment Experience

A total of 35 reactor scrams occurred in May of which 16 were caused by normal Panellit system variables, six were caused by spurious Beckman trips, and eight were caused by fluctuations on the Bonneville Power Authority system. Causes of the other five scrams were as follows:

Reactor	Reason
KW	Manual shutdown to investigate a rupture. Indications were not confirmed.
KE	Inter-tie trip due to a Beckman scram at KW Reactor.
D	No. 1 safety circuit trip caused by lightning striking a 190-D Building transformer which resulted in temporary loss of a process water pump.
H	Manual shutdown to repair the generator for the KAPL-120 loop.
DR	Low process water pressure trip caused by a local power surge at 190-DR Building which relayed out three process water pumps.

Process tube leak testing programs were required at D, DR, F, and H Reactors due to abnormally high condensate collection rates. A

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B. Equipment Experience (Continued)

total of 212.6 hours of outage time was required for finding and correcting leaks. At D Reactor, one leaking tube was located, the tube removed and the channel blanked off. At DR Reactor, several flange leaks and one tube leak were corrected. At F Reactor, four separate leak test programs were required in which 12 rear Van Stone flange leaks were found and corrected. At H Reactor, 36 rear nozzles were found loose and were tightened, and one leaking tube and one bad Van Stone were found and corrected.

At C Reactor, two hoppers of balls were inadvertently dropped during an outage on May 1. Considerable difficulty was experienced in the ball removal when the ball elevator jammed and it was necessary to take up slack in the elevator chain. Previously the elevator chain was severely corroded and slack developed following lubrication. The elevator functioned correctly and balls were removed readily after the slack removal. Several unsuccessful attempts were made during May to remove the balls jammed in channel No. 41. During these attempts, approximately 50 balls were discharged but the obstruction has not been located nor dislodged. Further planning is in progress to develop means to clear the channel of balls.

At D Reactor, rain water standing on top of the reactor from a roof leak, caused several grounds in the Ball 3X circuitry. Extensive drying and replacement of several switches was necessary before the circuits could be returned to normal.

At H Reactor, a poison outage was extended to permit replacement of a burned out relay in the Ball 3X system and to check related circuits. The red SCR holding coils were found to be overloaded and the condition was corrected by adding two series resistors to each coil.

At B Reactor, the discharge elevator control was completely disassembled and defective parts replaced or repaired. Failures of the "D" elevator had been experienced due to unbalance of the building air system which allows hot moist air from the rear face to enter the "D" machinery room with resultant damage to electrical and mechanical equipment.

The results of Panellit gage checks made in May disclosed the following faults:

Reactor	High and Low Trips	Mercury Separation	Leaks	Misc.	Total
B	0	0	0	1	1
C	0	0	0	0	0
D	2	0	0	12	14
DR	0	0	0	6	6
F	0	0	0	65*	65
H	0	0	0	5	5
KE	17	106	0	0	123
KW	17	3	1	9	30
Totals	36	109	1	98	244

*Failure of solder joint where Bourdon tube is joined to bracket.

B. Equipment Experience (Continued)

At KE Reactor, seven spurious temperature monitor trips occurred which would have resulted in scrams if the system had not been by-passed.

A total of 31 outlet water temperature thermocouples failed and were replaced. Twelve of these were at D, seven at H, four at B, three each at C and F, and two at DR Reactors.

Investigation of the malfunction of VSR No. 22 at KE Reactor on May 31 indicated that it had been partially inserted into the Reactor since a scram on May 5. The rod was assumed to be in the up position during the interval since the upper limit indicating switch was stuck in the "up" position and since the rod had stuck in the cylinder about four feet above the lower limit switch which indicates entry of the rod. Special radiation zones were set up and the rod was removed from the reactor without incident. Plans are currently being made for replacement of the rod although examination with binoculars does not reveal serious damage. The Process Sub-Section is currently developing a method which will permit a positive determination that a VSR is latched.

The 800 horsepower motors of process pump units No. 8 at 190-H and No. 10 at 190-D Buildings failed during routine start-ups on May 12 and May 15, respectively. Reactor operation was not affected in either instance. By using spare motors on hand, the burned out drive units were replaced and pumping units returned to service on May 16 at D Area and May 18 at H Area. Work orders have been issued for repair of the burned out motors.

The No. 9 process pump unit at 190-C Building was removed from service on May 14 for inspection of the American Blower fluid drive assembly. This assembly has been in service since October 29, 1955, and was the first unit incorporating all the new design changes in the impeller including SAE 2330 steel, enlarged radii, liquid honing, seven segment dampening ring, and static and dynamic balance. The assembly was found in good condition and was returned to normal service on May 21.

C. Improvement Experience

The most significant Production and Process Tests are reported below, together with other items of improvement significance.

PT-105-14-MR (Measurement of Heat Output of KE Reactor After Shutdown)
Although this test was completed on March 7, some outage time has been resuired to restore the pig-tails and rear face nozzles to normal on 1706-KER tubes Nos. 4863 and 5063. During May, 4.7 hours were used and more time will be required in June.

PT-105-522-E (Examination of Pile Process Tubes)
A total of 15 process tubes were given to Pile Coolant Studies for corrosion attack inspection. Seven tubes were from DR, four from B, and two each from C and H Reactors.

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C. Improvement Experience (Continued)

PT-105-534-SI (Irradiation of NAA Safety Device)
The sample was "triggered" at DR Reactor just prior to the outage of May 9 with no detectable reactivity effects as monitored by existing control instrumentation. It was necessary to trigger a second sample charged during the outage as the expected temperature at equilibrium power would have exceeded requirements of the test.

PT-105-593-A (Irradiation of Cored Slugs With Aluminum End Plugs)
The remaining four tubes charged at C Reactor were discharged. These were run-to-rupture tubes but sufficient operating data have been accumulated which allowed discharge of the tubes prior to rupture. This completes irradiation authorized by this test.

PT-105-615-A-63-MT (Evaluation of Internally and Externally Cooled Slugs Canned by the Lead Dip Process)
Four tubes containing I and E slugs and four regular metal control tubes were charged at C Reactor. The eight are all run-to-rupture tubes. One additional I and E tube and one regular metal control tube were discharged at 300 concentration in accordance with the test.

DT-105-619-A (Additions to Shut Down Process Flow Tests at the KE and KW Reactors)
Due to the unscheduled outages during May, this test has been postponed until June. The object of the test is to determine flow conditions at a reactor which is operating at normal pressure when the quick-opening cross-tie valve is tripped at the opposite reactor during shutdown.

PT-105-563-E (Evaluation of Synthetic Coagulant Aid)
Feeding of Separan on the south half of the 183-DR water treatment plant was continued through the month producing good quality water and acceptable filter performance at reduced costs.

The proto-type tube wrapping machine was successfully tested during the second tube replacement outage for May at D Reactor. Approximately 55 tubes were removed with only minor difficulties. All wrapped tubes were in the burial ground within a few days, further, wrapping of the tubes for disposal as they were split enabled simultaneous work on several tubes thereby reducing the average replacement time per tube.

Five revised Process Standards - Reactor were approved and issued. The Standards changed are titled 1)"Process Piping Maintenance," 2) "Outlet Water Temperature Limits," 3) "Pressure and Flow During Reactor Shutdown," 4) "Thermal and Biological Shield Cooling Water," and 5) "Emergency Water Supply." The most significant changes

C. Improvement Experience (Continued)

accomplished in the foregoing standards are respectively 1) Valved pigtails on uranium tubes and re-use of Resistoflex pigtails subjected to cavitational flow were prohibited, and flushing requirements were established, 2) The bulk outlet temperature limit was included and the standard re-written to include all outlet temperature limits applicable during operation, 3) Directions for using water shut-off curves were simplified and several obsolescent curves were removed, 4) Flow requirements were extended to cover tube power levels higher than previously specified and action specified in event of exceeding these limits was outlined, and 5) Cross-tie flushing requirements for the K Reactors were added, and maximum permissible leak rates for emergency water check valves were specified for the other reactors.

Further, the Standards "Process Tube Outlet Water Temperature Limits - Tube Corrosion," and "Process Tube Outlet Water Temperature Limits - Slug Rupture" were deleted because these limits exceeded those specified in another standard. Also one new standard "Rate of Tube Power Increase" was added.

Three revised Standards - Reactor Cooling Water were approved and issued. The Standards changed are titled 1) "pH Control," 2) "Chemical Additives," and 3) Location of Chemical Addition Lines." The most significant changes accomplished in the foregoing Standards are, respectively, 1) Reference to chemical addition points were deleted since they are covered in another standard, 2) Liquid and amorphous alum and sulfuric acid were added as allowable chemicals for pH adjustment, and 3) Addition points relating to specific chemicals were clarified.

Personnel in the Reactor Section engaged in work which might be expected to result in inventions or discoveries have reported that no inventions nor discoveries were made during the period covered by this report.

D. Events Influencing Costs

Irradiation costs are expected to run approximately $150,000 over April. Major factors affecting this increase are 1) salaries, up $37,000 due to the 31-day month, the holiday, and increase in total personnel, 2) maintenance charges, up $61,000 from April due to a carry-over to May of some tube charges incurred in April and low costs otherwise incurred in April due to an accumulation of credits during that month, and 3) chemical costs, up $46,000 from April due to the seasonal decline of raw water quality, the 31-day month, and increased dummy decontamination.

An all-time low unit cost was established during April due to a record high input production and correspondingly low irradiation costs during April. May unit cost is expected to be about ten per cent higher than April as a result of the factors discussed above and as a result of slightly lower input production. Unit cost for June is expected to be equal to or slightly higher than May.

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E. Plant Development and Expansion

1. Project Status

The most significant Reactor Section project activity is reported below. Further details concerning projects may be found in the report "Status of Reactor Section Projects, Informal Requests and Budget Items," F. A. R. Stainken to R. S. Bell, dated May 21, 1956.

CA-512

100-K Area

Revision No. 5 to this project was forwarded to the AEC at month end. The installation of 100-K gamma monitoring equipment is scheduled to start in June; however, late delivery of the spectrometers may delay progress of the work. Installation of the pressure monitor coordinate light system at KE Reactor has been retarded due to higher priority work assigned to the instrument craftsmen. Maintenance forces are scheduled in June to start installation of acid addition facilities at the 183-K Buildings. All material for this work is now on hand except for minor items.

CG-558

Reactor Plant Modification for Increased Production

Work release addendums to Phase I and Phase II of this project were published by the Project Engineering Sub-Section. Mercoid switches will be installed in 105-F Panellit gages during a six-day scheduled outage in June, the pre-scheduled replacement being necessitated by the current high rate of gage failure. The DeLaval Company will test a first stage pump impeller under design loading at Trenton, New Jersey, during June. It is anticipated that recommendations regarding noise and cavitation problems of 190 Buildings annex pumps will be forthcoming by July.

CG-583

Moisture Monitoring System for the Detection of Leaking Process Tubes - 100-B, D, DR, F, and H Areas

Acceptance test procedures have been completed with exceptions at H and D Reactors. Leakage of gas booster pumps is a current problem. Refrigerant compressor motors, which failed at H and B Reactors, have been returned to the vendor. Six Dewcels were also found to be inoperative and were returned to the vendor. Revision No. 1 to the project proposal, requesting an extension of the physical completion date to December 31, 1956, was forwarded to the AEC but approval has not yet been received.

E. Plant Development and Expansion (Continued)

2. Plant Engineering

A number of engineering and development studies were active in the Reactor Section during May. The studies, in general, are aimed at decreasing costs and/or increasing production. Details are given in Document HW-42906. Several items of interest are reported below.

Engineering Design has agreed that the operational charge-discharge control circuits designed by Reactor Process are adequate for Project CG-642 (full pile installation) thereby reducing drafting work and expediting full pile design.

A mock-up consisting of a slug gun and simulated discharge area wall is being constructed outside the 108-B Building. The mock-up will be used to compare several methods available to prevent excessive rebound of slugs discharged during reactor operation.

Design work and procurement of materials is essentially complete to provide a proto-type installation at B Reactor for interlocking poison tube ball-valves to prevent inadvertent flushing during operation.

Samples of thermocouple wire, for replacement of the B Reactor rear face thermocouples, were tested and indicate that one spool does not meet electrical-temperature characteristics specified. Other samples of the wire have been exposed in the gamma pit at 105 C to a total irradiation of 2.3×10^7 roentgens without apparent deleterious effects.

Glass fiber material has been received for experimental insulation on the walls of the 182-B Building. The purpose of this installation is to evaluate the wall covering as a supplement to tuned baffle boxes for controlling export pump motor noise.

F. Significant Reports

1. Routine

Monthly operating reports issued for April were:

HW-42626-A	Reactor Section	R. S. Bell	5/7/56
HW-42907	Operations Sub-Section	A. R. Maguire	5/1/56
HW-42906	Process Sub-Section	O. C. Schroeder	5/1/56
HW-42905	Projects and Personnel Development	F.A.R. Stainken	5/1/56
HW-42899	Radiation Monitoring Sub-Section	P. C. Jerman	5/1/56
-	Reactor Areas Maintenance	R. T. Jessen	5/3/56
-	Project and Special Reactor Maintenance	E. E. Weyerts	5/5/56
HW-42925	Power Sub-Section	J. C. McLaughlin	5/3/56

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F. Significant Reports

1. Routine (Continued)

Other routine reports issued during May included:

HW-43402	"Monthly Progress Report - New Reactor Plants Expansion"	D. S. Lewis	5/31/56
HW-43404	"Monthly Progress Report, Reactor Section Expansion, May, 1956"	J. W. Frymier	5/3/56
-	"Informal Requests, and Budget Items"	F.A.R. Stainken	5/21/56
HW-42883	"Reactivity Balance and Associated Data, April, 1956"	A. P. Vinther	5/1/56

2. Non-Routine

HW-39942	"Michrophotometer Control of Water Treatment"	W. R. Conley	4/10/56
HW-42964	"Final Report, Production Test 105-14-MR, Measurement of Heat Output of KE Reactor After Shutdown, and Process Test MR-105-30, Determination of Minimum and Transient K Reactor Emergency Coolant Flow Rates"	R. E. Hall & P. C. Walkup	5/15/56
HW-43341	"Preliminary Evaluation of Thermocouple Replacement with Metal Shielded, Inorganic Thermocouple Wire"	C. H. Gydesen	5/29/56
Conf. Undoc.-	"K Reactor Design Improvement Study"	R. E. McGrath	5/8/56
"	"Reactivity - C Reactor"	R. E. McGrath	5/22/56
"	"Trip Report - An Evaluation of HAPO's Flux Monitoring Instrumentation Program as Compared with Several Other A.E.C. Sites"	A. P. Vinther	4/23/56
-	"Export Line Surge Suppressor Test"	R. L. Turner	5/25/56
HW-42986	"105-KE Power Level and Flow Requirement Forecast"	H. T. Wells	5/1/56

III. PERSONNEL

A. Organization

There were no appointments within the Reactor Section during May.

B. Force Summary

	Beginning Of Month	End Of Month	Net Change
Section General	2	2	0
Operations	410	413	+ 3
Proj. & Spec. Reactor Maint.	202	204	+ 2
Reactor Areas Maintenance	567	568	+ 1
Projects and Personnel	55	55	0
Power	493	494	+ 1
Process	80	84	+ 4
Radiation Monitoring	107	108	+ 1
Section Total	1916	1928	+ 12

A. Organization

B. Force Summary (Continued)

Changes during May included 42 transfers into the Section, 27 transfers out of the Section, 2 new hires, 5 terminations, 6 reactivations, and 5 deactivations.

C. Safety Experience

There were no Disabling Injuries and no Serious Accidents or Incidents within the Reactor Section during May.

J. A. Cronin, Travelers Insurance Company representative, made annual third party inspections of one boiler each at 184-B, F, and H Buildings and two boilers at 184-D Building. To date, ten of the twenty-three 100 Areas boilers have undergone annual inspection for 1956.

D. Radiation Experience

Two Radiation Incidents were formally investigated and reported during the month both of which involved localized exposure.

Radiation Incident No. 106-C occurred at H Reactor on April 27 and was caused by localized overexposure from a radioactive particle imbedded in the heel portion of a removable rubber insole worn inside an employee's left shoe. The method by which the particle became imbedded in the insole and the exact exposure time could not be determined. The particle was located following a routine hand and foot count. A dose of less than 30 rads to the affected area of the foot was estimated; official estimates will be made by the Radiological Sciences Department. The investigation of the incident is reported separately in Document HW-43424.

Radiation Incident No. 598-C occurred at C Reactor on May 7 and involved two operators who received localized dosages in excess of planned limits while sitting on contaminated rags on the charge face elevator. The localized dosages received, based on autoradiographs of the rags, were estimated at 250 mrads. Exposures received during the previous seven days plus this dose did not exceed the weekly permissible limit for either operator. This investigation is reported separately in Document HW-43316.

Thirty-six Lapses of Radiation Control were reported of which 16 involved contamination of personal clothing, 4 involved spread of contamination beyond established boundaries, and the remainder involved minor violations of established procedures.

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E. Personnel Activities

At month end, 17 employees are receiving on-the-job training for engineering or supervisory assignments in the Section; 11 of these are on assignment under the rotational training program.

L. A. Carter, Radiation Monitoring, departed on a three-month loan assignment to the Naval Radiological Defense Laboratory and will participate in Operation Redwing in the South Pacific Ocean area.

P. H. Hutton, Process Sub-Section, attended a seminar on mechanical balancing of rotating equipment presented by the Company's General Engineering Laboratory in Schenectady, New York.

C. E. Franz and C. W. Botsford, Process Sub-Section, visited the National Reactor Test Station at Arco, Idaho, to obtain general information on remote handling equipment. Mr. Botsford then continued on to the duPont managed Savannah River installation for further information on the same subject. Mr. Botsford also consulted the Garlock Company at Palmyra, New York, regarding ball valve seals.

J. E. Robb, Process Sub-Section, visited the Hansen Manufacturing Company at Cleveland, Ohio, and the Hydromotor Division of the Bonnot Company at Canton, Ohio, to discuss fabrication and application of equipment for Project CG-651 (Continuous Charge-Discharge Equipment - C Pile).

During May, ten different Education and Training Programs were attended by 66 supervisors from the Reactor Section. Courses included such subjects as Cost Control Conference Leading, Report Writing, Customer Relations, etc.

Four Power supervisors attended Step II Grievance Meetings during May. Also, within the Power Sub-Section, training classes conducted by C. M. Salina and V. R. Griffith were attended by 29 exempt and 125 non-exempt employees in May. Subject matter presented covered water plant control systems and maintenance of CG-558 equipment.

The Radiation Monitoring Sub-Section issued Radiation Hazards Topic No. 48, "The Shipment of Radioactive Materials," and assisted in the presentation of this subject material at shift-wise meetings throughout the Reactor Section. Also presented was one training lecture for new supervisors entitled, "The Supervisor's Responsibility for Radiation Protection."

A film entitled "Corrosion In Action," obtained from the International Nickle Company, was shown to 73 members of the Reactor Section by the Reactor Areas Maintenance Sub-Section.

E. Personnel Activities (Continued)

The two training classes for instrument personnel, covering water plant instrumentation under CG-558, were completed with attendance by 37 instrument craftsmen and ten engineers.

Within the Operations Sub-Section, evaluation was completed of the fourth in the series of eight sets of training questions for Pile Operators. The fifth set has been issued and evaluation of the answers is in progress. The Supplemental Crews Unit has developed a self-training program for operators based on training questions previously issued. These operators will be given informal personal contacts to review questions on which they are weak and they will again be questioned after sufficient time has elapsed to enable finding and learning the correct answers.

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SEPARATIONS SECTION

May, 1956

I RESPONSIBILITY

Responsibilities of the Separations Section were unchanged during the month of May, 1956.

II ACHIEVEMENT

A. Operating Experience

1. Statistics

a. Bismuth Phosphate Operations

	May		April	
	Normal	Acid Wash	Normal	Acid Wash
Charges completed in Conc. Bldgs.				1
Special charges - Conc. Bldgs.	3-EFN		3-MRC,	2-EF
Charges completed-Isolation Bldg.	47	0	142	4

b. Redox Operations

	May	April
Tons Uranium delivered to storage	214.2	200.6
Average Production Rate per Operating day, tons	9.4	10.0
Average Daily Operating Rate for the month, tons	6.9	6.7
Average yield, %		
Uranium	100.5	100.7
Plutonium	101.1	105.5*
Total Waste Loss, %		
Uranium	0.25	0.18
Plutonium	0.75	0.21
Average cooling time (days)	109	145
Minimum cooling time (days)	97	98
Percent down time	27	35.1

c. Purex Operations

	May	April
Tons Uranium delivered to storage	133.0	197.0

* Corrected

[redacted]

c. Purex Operations (Continued)

	May	April
Average Production Rate per Operating day, tons	9.5	11.0
Average Daily Operating Rate for the month, tons	4.3	6.6
Average yield, %		
Uranium	97.0	99.5
Plutonium	93.5	91.0
Total Waste Loss, %		
Uranium	0.52	1.36
Plutonium	3.5	2.8
Average cooling time (days)	127	105
Minimum cooling time (days)	115	95*
Percent down time	55	40

d. 231

	May	April
Batches started	56	144
Batches completed	47	144
Batches awaiting processing	29	0

e. 234-5 Operations

	May	April
Batches completed through Task I	240	281
Batches completed through Task II	242	283
Runs completed through Task III	134	175
Waste Disposal (Units)	345.5	134.0

f. UO_3 Operations

	May	April	To Date
Uranium drummed, Tons	442.41**	562.00	14,367.05
Uranium shipped, Tons	499.12	545.44	14,316.70***
Average cooling time, days	115	151	
Minimum cooling time, days	103	104	
Waste loss, %	0.02	0.02	

* 107 Dissolved

** Net - does not include 17.3 tons re-milled, and 20.69 tons re-drummed material.

*** Car #395 has been removed from "Shipped to Date" figure.

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g. TBP Operations

	May	April	To Date
Tons received from Metal Removal	151.57	151.32	7,019.16
Tons shipped to UO_3 Plant	141.87	144.79	6,768.27
Average Production Rate per Operating day, tons	4.58	4.95	
Average Daily Operating Rate for the month, tons	4.58	4.82	
Average yield, %	96.75	96.41	
Total Waste Loss, %	0.74	0.97	
Ratio Actual Waste Volume returned to Theoretical Volume	1.15	1.27	
Percent Down Time	0.17	2.50	

h. Power

	200 East	200 West
Raw water pumped, gpm	4 407	5 628
Filtered water pumped, gpm	855	1 067
Steam generated, lbs/hr	85 729	159 056
Maximum steam generated, lbs/hr	180 000	222 000
Total steam generated, M lbs.	63 783	118 338
Coal consumed, tons (est.)	4 239	7 393

i. Waste Storage

	Equivalent Tons U	
	May	April
Metal Waste reserve storage capacity-T Plant	83	83
1st Cycle reserve storage capacity-T Plant	374	385
Metal Waste reserve storage capacity-B Plant	561	685
1st Cycle reserve storage capacity-B Plant	74	74
Redox Waste reserve storage capacity	1 312	843
Purex Waste reserve storage capacity	2 769	2 923

2. Activities

a. Redox Processing

Extraction batteries were started up on May 3, but had to be shut down on May 4 when sample analyses indicated that iron had been left out of the 1BS solution. This resulted in gross cross-contamination of the uranium and plutonium products necessitating considerable rework. By May 5, conditions were returned to normal and a rate of 10 was established early on the 6th. On May 7 a three hour power outage due to a fire on a power pole necessitated a crash shutdown. Following startup, it became evident that the 1B letdown valve had leaked through during the down period causing uranium in excess of specifications to contaminate

a. Redox Processing (Continued)

the plutonium streams. Another large-scale rework effort was required during which time first cycle rates were reduced to 5. By May 12, it was possible to return to the normal 10 operating rate. During the power outage, the D-14 pump again froze and replacement was made.

By May 12, it became evident that a process leak had developed in F Cell which contributed to the already heavy rework schedule resulting from high waste losses. Inspection failed to reveal the source of the leak until May 17 when a large leak was noted in the F-1 pump. During the period May 13 - 17, rates were increased to 10.5. By May 18, the F Cell leak had developed to the point that the pump had to be replaced. In addition, the backcycle lines from D-14 became plugged. As a result, the building was shut down, the F-1 pump replaced and the backcycle lines flushed. The D-14 pump again froze and approximately 36 hours were needed to steam it out. It appears that our backcycle concentration was too high, resulting in both pump and line plugging. During this shutdown, a leak was reported in the shell of the F-2 concentrator pot. This leak has remained small (less than 200 gallons per week) and has not resulted in too great a rework problem so as to affect building operation. Startup was made on May 21. Difficulty was experienced with a sticky 1-AW letdown valve which required replacement on May 26. The 1-S column was run at 7 tons/day while 1-A was down. 1-A continued to give trouble after startup with strong flooding tendencies indicating the need of a flush. Rates were reduced to 9 tons/day until the shutdown on May 30, as a result of this. By May 30, the plutonium concentrator (L-3) leak which developed about mid-month became so bad that the building was shut down for repairs to it and for acid flushes of the columns. This work is progressing at month's end.

b. Metal Recovery

1) TBP Processing

Operation was satisfactory throughout the month, and second cycle operated continuously. Some lost time was sustained on the first extraction cycle due to a scheduled outage to replace a faulty RC(17-2) column.

2) UO_3 Processing

A combination of a feed shortage at the beginning of the month and equipment problems at end of month contributed to the lower production in May. Rework of car #395, train-wrecked enroute from HAPO, was begun.

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3) Waste Metal Removal

The primary source of slurry blends this month has been the sluicing operations in 101-T. In-farm scavenging at CR is still being held up pending development of methods to handle the aluminum and Co^{60} problems in stored and TBP wastes. Storage space is being provided for TBP wastes by transferring to other holding positions in BY farm from the normal waste receiving tanks.

c. T Plant

Activities during the month of May have been confined entirely to the decontamination and plutonium removal from the T Plant processing tanks in preparation for complete shutdown and lay-away status.

Since the start of the decontamination and plutonium removal program at T Plant, during the latter part of March, processing of six standard acid washes and twenty-five dilute nitric flushes has been completed through the Canyon and Concentration Buildings for a combined recovery of 617% of a standard run. Of this total, 407% and 210% was recovered from the Canyon and Concentration Buildings respectively.

d. Isolation and Metal Fabrication

The 231 Building processed low MWD/T plutonium from Purex which was isolated and loaded to sample cans for shipment off-site. Shutdown of the Purex Plant for a column replacement resulted in lower than normal production since no feed was received until mid month.

A small amount of material was received from the Metal Recovery operations.

e. Purex

Operation of the plant was resumed on May 17 following an extended shutdown, beginning on April 23, for replacement of critical process equipment. Operation was interrupted for twelve hours on May 18 to replace a column feed valve. For the remainder of the month production was continuous at 12 tons per day.

Achievement of stable plant operation resulted in excellent decontamination of uranium and plutonium products. For the first time since hot startup, uranium fission product gamma ratios were within specification; shipments to the Metal Conversion Facility were made without silica gel treat ment.

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3. Special Operations

In the Z Plant Hood 40 was used for the recovery of low MWD/T scrap metals, and the product was processed through Recuplex. Hood 41 was used during the month for the recovery of high MWD/T scrap metals for feed back to the RMA Line. During the month Recuplex processed slag and crucible fragments, scrap powders, Purex product solutions, and T Plant flushes. Processing in all cases was satisfactory.

4. Schedule Variance

Redox Production fell 3% below the 220 tons forecast although exceeding the commitment. Slightly higher than normal waste losses were experienced as a result of in-cell leaks and an extensive rework program.

TBP production was 134 percent of commitment and UO_3 production was 85 percent of commitment. Thirteen cars of UO_3 were shipped.

In Z Plant the goal forecast for fabrication was completed without resorting to overtime.

Purex production for the month was 133 tons as compared to a commitment of 175 tons, as a result of the extended shutdown.

B. Equipment Experience

1. Operating Continuity

In Redox a mechanical efficiency of 73% was achieved for the month. Major sources of downtime were improper separation of uranium from the plutonium necessitating rework, mechanical failures in the canyon and finally a severe leak in the plutonium concentrator (L-3) tube bundle which prevented continuing production until the goal was met.

In Metal Recovery only one hour of second cycle outage was experienced in May. Seventy-five hours of first cycle lost time was experienced through scheduled repairs.

In the Z Plant an emergency power outage occurred on May 7, 1956, but resulted in no unusual conditions, since all emergency equipment operated satisfactorily. There were no process equipment failures which seriously affected the continuity of operations.

Purex downtime this month amounted to approximately 17 days for replacement of critical process equipment.

2. Inspection, Maintenance and Replacement

a. Cell Equipment Replacement - Redox

During the latter part of April it was determined the control

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a. Cell Equipment Replacement - Redox (Continued)

valve in the 2-DF jumper was leaking. A replacement was made on April 30; however, the rotometer continuity was erratic and the flow rate appeared to be abnormally low so on May 2, 1956, a new jumper was installed.

During the column flushes the first part of the month it was found that the 1-AW letdown valve was frozen in a closed position. All efforts to open it were unsuccessful so on May 1, 1956, the jumper containing this valve was replaced. On May 22, 1956, it was again determined that the 1-AW valve was sticking in a semi-closed position which did not allow proper operating conditions. The column was shut down and the valve changed out on May 26.

During the month of April the operation of the 2-E letdown valve had been very erratic. As a result this valve was changed out on May 1, 1956.

The H-8 to H-7 transfer jumper which was reported as leaking in April was replaced with redesigned jumper.

Numerous thermohm jumpers which had failed in normal usage were replaced during the month. These include G-3 off gas thermohm, G-4 thermohm, H-1 thermohm, H-7 thermohm, and H-8 thermohm.

Prior to the column startup on May 3 a capacity check was run on the F-1 pump. It was found at that time that the capacity of the F-1 pump was not sufficient to assure operating continuity so a new pump was installed and thoroughly checked out. By May 17 it was determined that the newly installed pump was leaking badly at the top seal that another F-1 pump had to be installed.

A redesigned vent jumper for the 1-S column was installed in the silo. This will prevent recurrence of the incident which spread high level contamination of the 1st and 3rd levels AMU in April.

The B-3 reactor was regenerated but since the regeneration was not effective a new reactor was placed in service.

b. 60 Ton Crane - Redox

Following the cell maintenance in the early part of the month it was necessary to replace the impact wrench sockets on both the left and right hand wrench. These sockets were lost during normal operation due apparently to a brittle pin. No further trouble has been experienced since the last replacement. On May 25 the right hand auxiliary on the crane became inoperative. The trouble was traced to an open line in the festoon and was repaired.

c. Cell Equipment - Purex

The 1A column was replaced on May 3, 1956, by a new unidiameter plant fabricated 1A column designed for improved fission product decontamination. Excellent cleanup of the old column was shown by a reading of 35 mr/hr at one foot from the storage box.

Flushing and testing of the L Cell plutonium concentration equipment revealed a major leak in the first concentrator (E-L4) tube bundle on May 5, 1956. Potential safety hazards associated with removal of E-L4 from the equipment package and installation of the spare unit resulted in replacement of the entire plutonium package. Prior to installation of the spare package on May 13, 1956, the second concentrator (E-L7) was removed, since during plant shakedown and cold runs it was found that the E-L7 was not needed.

d. Z Plant Maintenance

Primary maintenance problems on the remote mechanical line during May concerned continuity of operation in Task IV. The loss of vacuum and of heat on several occasions necessitated replacing the heating elements in Units No. 2 and No. 4 and replacing defective thermocouples and connectors to correct the vacuum leaks.

Another significant maintenance problem in the Z Plant concerned the failure of pulser bellows on the extraction columns of the Recuplex facility. The H-1 Extraction Column bellows failed three times during the month. Additional spare parts are being ordered, and redesign of the bellows for longer life is being investigated.

C. Improvement Experience

1. Process Tests and Revisions

a. Iodine Emission

1) Redox

A lower iodine retention was realized due to the higher available I^{131} in the metal processed and reactor failures. All three reactors were regenerated during the period. The B-3 reactor was replaced on May 10 since the unit continued to exhibit a low degree of efficiency despite regeneration on May 8. The C-3 reactor was regenerated for the 1st time on May 17. Due to a continued inadequate performance probably due to a poor spray pattern during the application of the silver nitrate solution, the reactor is being regenerated for the second time at month end.

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1) Redox (Continued)

The concentration of the initial acid for the first cycle was reduced from 50% to 47% on May 20 and appears to be partially responsible for a higher iodine efficiency for the A and B reactors as noted during the latter part of the month.

2) Purex

During the period, iodine emissions were detected in trace amounts. Age of cooled metal stored during the shutdown increased to 147 days.

b. Waste Scavenging

During the month it was necessary to assign 2.65 million gallons of B Plant reserve metal waste space for TBP scavenged supernatant use. This method should provide tank space for non-disposable TBP in-process scavenged supernatants until August 1, 1956. After disposal trenches are available, any scavenged supernatants in these tanks will be pumped to the trenches, thus restoring the B Plant waste space. This plan was considered necessary due to the prolonged Minor Construction strike.

The 31st tank to fill with in-process scavenged waste was not suitable for ground disposal due to trace amounts of $cobalt^{60}$ in the supernatant layer. Soil column tests indicated the absorption of the $cobalt^{60}$ was essentially nil. The 32nd tank to fill with in-process scavenged waste was suitable for ground disposal. The $cobalt^{60}$ contamination in the supernatant layer was less than 4×10^{-5} uc/cc (which is 1/10 of the MPC for $cobalt^{60}$).

Laboratory tests have indicated that ammonium ion tends to keep $cobalt^{60}$ in the supernatant layer. At month-end a plant test is being performed substituting ferrous sulfamate for ferrous ammonium sulfate. Tests in the laboratory using ferrous sulfamate have resulted in precipitating the major portion of $cobalt^{60}$ present in the original treated wastes.

2. Inventions and Discoveries

Papers have been submitted in accordance with the "Patent and Invention" procedure for two potentially patentable items submitted by L. E. Roberts, W-16688-6437 and K. K. Campbell, M-508-6437. Mr. Roberts invention concerns a device for bending tube and rods; Mr. Campbell's is a remotely operated pickup tool which can be attached to the 60 Ton crane and used for picking up odd size pieces of equipment.

D. Events Influencing Costs

Since the May Purex, UO_3, and TBP production was below the April level, the expenditures for the Separations Section are expected to be approximately one percent below the April level. This decrease in cost will reflect the reduced essential material requirements associated with the lower production level.

E. Plant Development and Expansion

1. Project Status

a. CA-513-A - Purex Facility

This project is 99.99 percent complete. Only minor work of a non-critical nature remains to be completed.

b. CA-513-E - Phase I Purex Expansion

This project is approximately 53 percent complete. The principle items remaining to be completed are iodine monitors on the dissolver system and vessel vent system, continuous samplers and absorptometer installation in L Cell, tank farm circulating facilities, replacement of the 1A column, and procurement and installation of a 40 ton remote crane and maintenance platform. A labor dispute in Minor Construction has suspended work on iodine monitors, continuous samplers, and tank farm circulating facilities.

c. CG-598 - Purex Vacuum Acid Fractionator

This project is approximately 53 percent complete. On site construction has been suspended due to labor difficulties. The delivery of two vessels being procured off-site is three weeks behind schedule.

d. CG-613 - UO_3 Expansion

The June 1, 1956 beneficial use date will not be met due to the prolonged strike which continues. All materials for construction have been obtained except one calciner and a screw conveyor. The design for the maintenance facility has been completed.

e. CG-621 - Redox Contamination Control

E Cell Ozonization: Temporary piping from the hytor compressor to the air driers has been installed. The compressor can be operated by manually controlling the pressure until the back pressure regulating valve is received about June 8, 1956.

J-6 Precondenser: Installation of nozzles and kickplates on the condenser is complete and mock-up of the jumpers is in progress.

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e. CG-621 - Redox Contamination Control (Continued)

Canyon Wash-Down Facility: No progress because of construction forces strike.

f. CG-643 - Redox Capacity Increase - Phase III

There has been no action by the Commission since the second letter detailing justification for the Phase III project was submitted. Revision 2 of the project proposal, which requests authorization to use uncommitted funds from Revision 1 to replace the D-6 condenser and 2-B column, is being prepared.

g. CG-648 - Redox Auxiliary Iodine Removal and Nitric Acid Facility

The bid package for construction of the facility is being prepared, in conjunction with the Purex facility, by the AEC and will be issued in about 10 days. Orders for process equipment with long delivery schedules have been placed. Completion date is scheduled for June 1, 1957.

h. CG-644 - Tail End Silica Gel Treatment

A design criteria for the silica gel has been completed and detailed design is being performed by Nickum and Sons of Seattle under contract AT(45-1)1111 Mod. No. 1. Design is scheduled to be completed July 1, 1956. Revision No. 1 requesting construction funds is in progress.

i. CG-647 - Iodine Removal Back-up Facilities

Revision No. 1 of project proposal has been approved for $1,150,000. A beneficial use target date is December 1956. This project is for the removal of radioactive iodine and recovery of nitric acid.

2. Plant Engineering

a. Maintenance Program

The development of measurements at the Redox Plant was continued and the last presently proposed index, labor delays, was initiated utilizing the tool work sampling.

b. Cost Reduction - 200-W Laundry

Additional information on the dryer bids was obtained and evaluated. A letter has been forwarded to Purchasing which recommends the award of bids for two steam-heated self unloading dryers.

b. Cost Reduction - 200-W Laundry (Continued)

Approvals to use the proposed system of the statistical sampling for the alpha monitoring of protective clothing were obtained. On May 14 the laundry began using this system to check the clothing from Z Plant.

c. Maintenance of Standards

The labor standards for the Purex Plant have been completed and back-up reports are being prepared. The essential material standard for Redox and the analytical service standards for the 221-U and 234-5 processes were revised. A preliminary standard for analytical requirements of the Purex process is being developed.

A study has been initiated to standardize labor standards throughout the Section. By developing a standard format for presenting data in the back-up reports, direct comparison of the labor allowed for each function will be possible between the plants. In addition, it is proposed to collect, compile, and compare standard data which has been developed during the past years. This will insure maximum use of the data in compiling future labor standards.

d. Engineering Assistance

1) Raw Water Supply During Power Failure

Tests conducted during the month have indicated a lack of reserve emergency electrical generating capacity in the 200 West Area sufficient to run pumps to furnish an adequate supply of raw water during power failure. However, the problem is being resolved by connecting only one 250 HP pump into the emergency circuit, and supplementing this with the present turbine-driven pump, equipped with an automatic starting mechanism. This will insure sufficient raw water for the 200 West Area with the exception of the filter plant which must be shut down.

In the 200 East Area tests are scheduled to determine if a 250 HP pump can be added to the emergency circuit to supplement the turbine pump equipped with an automatic starting mechanism. If not, consideration will be given to installing a second turbine to bring the pumping capacity to the necessary level.

2) Emergency Electrical Switching

Four afternoon sessions have been conducted to train shift foremen and shift electricians in proper switching procedure and system evaluation during power failures. These sessions will continue until all shifts have been covered.

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3) Design and Drafting

Progress continues on the over-all as-built drafting program. Items completed during the period include: 202-S North Gallery piping, 221-U Concentrator Mist Separator, Area Composite Maps, and 202-A and 202-S Auxiliary Hoist Hooks.

Design work completed included: 224-U Luckey Pot Continuous Unloader, Impact-Wrench Quick-Disconnect, 202-A Crane Gin Poles, and 282-W Steam-Turbine Auto-Valve installation.

F. Reports Issued

1. Routine

Number	Subject	Author
HW-43478	Separations Section Redox Plant Sub-Section Monthly Report - May 1956	C.T. Groswith
HW-43535	Separations Section Metal Recovery Sub-Section Monthly Report - May 1956	T. Prudich
HW-43473	Separations Section T Plant Sub-Section Monthly Report - May 1956	C.B. Foster
HW-43507	Separations Section Z Plant Sub-Section Monthly Report - May 1956	W.N. Mobley
HW-43491	Separations Section Radiation Monitoring Sub-Section Monthly Report - May 1956	A.R. Keene
HW-43415	Separations Section Analytical Control Sub-Section Monthly Report - May 1956	L.M. Knights
HW-43515	Separations Section Projects & Personnel Development Sub-Section Monthly Report - May 1956	O.V. Smiset
Official Use Only	Separations Section Power & Maintenance Sub-Section Monthly Report - May 1956	C.P. Cabell
HW-43461	Separations Section Purex Sub-Section Monthly Report - May 1956	V.R. Chapman
HW-43322	Purex Plant Process Control, April 1956	C.R. Anderson By: T.R.Workinger
HW-43409	Analytical Control Quality Report	A. Brunstad By: C.G.Hough
HW-42889	Essential Materials Consumption for TBP Plant, April, 1956	M.A. Thress
HW-42890	Essential Materials Consumption for Redox Plant, April, 1956	M.A. Thress
HW-42893	Essential Materials Consumption for Purex Plant, April, 1956	M.A. Thress
HW-42892	Essential Materials Area Report to Cost & Purchasing, April 1 thru April 30, 1956	M.A. Thress

1. Routine (Continued)

Number	Subject	Author
HW-42891	Essential Materials Planning - May 1 thru May 31, 1956	D.E. Peterson
HW-42993	Separations Section Waste Status Summary for April, 1956	D.E. Peterson
HW-42887 RD	TBP-UO_3 Production Schedule for May, 1956	H.F. Tew
HW-42885 RD	202-S Building Production Schedule for May, 1956	H.F. Tew
HW-42886 RD	Purex Plant Production Schedule for May, 1956	H.F. Tew
HW-42888 RD	Z Plant Production Schedule for May, 1956	H.F. Tew
HW-42973 RD	Six Month Goal Forecast, May, 1956	H.F. Tew
HW-43423 RD	Official Quarterly Forecast - May, 1956 thru First Quarter of Fiscal Year 1958	H.F. Tew
None	Status of Projects, Informal Requests, and Budget Items, May 28, 1956	V.D. Rouse
None	Separations Section Space Occupancy, May, 1956	V.D. Rouse

2. Non-Routine

HW-43006	History: Metal Recovery Waste Scavenging Program	R.B. Abrams
HW-43045	Radiation Incident, Number 597-R	W.G. Westover
HW-43414	Radiation Incident, Number 602-C	F.E. Owen
HW-43493	Radiation Incident, Number 605-C	J.J. Jech
HW-43492	Radiation Incident, Number 107-C	N.P. Nisick
HW-42896 RD	Essential Material standards for the Redox Plant	R.H. Silletto
None	Analytical Service Standard for the 221-U Building	R.H. Silletto
HW-43323 RD	Analytical Service Standard for the 234-5 Building	R.H. Silletto
HW-43138 RD	UNH Backlog Study	H.F. Tew

III PERSONNEL

A. Force Summary

	Start of Month	End of Month	Net Change
Section General	1	1	0
Redox Plant Sub-Section	226	225	-1
Metal Recovery Plant Sub-Section	262	265	+3
Z Plant Sub-Section	183	183	0
T Plant Sub-Section	69*	59	-10

* Corrected figure

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A. Force Summary (Continued)

	Start of Month	End of Month	Net Change
Purex Plant Sub-Section	272	267	-5
Power & Maintenance Sub-Section	309	311	+2
Projects & Pers. Dev. Sub-Section	56	57	+1
Analytical Control Sub-Section	223	223	0
Radiation Monitoring Sub-Section	161	164	+3
Section Total	1762*	1755	-7

B. Safety

A disabling injury occurred to a Laundry Foreman when he swerved to avoid hitting three deer who unexpectedly bounded on to the highway just north of the 300 Area. The pickup truck he was driving rolled over once resulting in a broken leg to the injured with subsequent surgical treatment and hospitalization.

C. Radiation Experience

Re-evaluation by Radiological Sciences personnel of a plutonium deposition case produced the first apparent case of plutonium deposition above the permissible limit. The involved employee, a pipefitter, received the contamination at 224-T in February, 1955, during maintenance work. The employee, who has an estimated 150-170% of permissible limit for Pu has been restricted from radiation work since the incident.

Four radiation incidents were formally investigated during May. In the Purex Plant L Cell flush material (Pu) was added to the recycle storage tank (E-3A) in excess of the amount permissible by critical mass control specifications. The E-3A tank, which is not critically safe, was removed from service for L Cell rework material which is difficult to analyze accurately (#597-R). In the Metal Recovery Plant two incidents involved: (1) the apparent failure of an assault mask during replacement of an X-3 filter bag with resulting inhalation of uranium oxide dust estimated to be less than the permissible limit (#605-C), and (2) blowback of a process sampler at the 241-WR vault causing facial contamination with the resultant localized overexposure to the skin of a radiation monitor (#107-C). Spread of plutonium contamination at 234-5 resulted from an uncontrolled chemical reaction at Task I. Respiratory protection prevented undue personnel exposure (#602-C).

Thirty curies of I^{131} were emitted during May, essentially all from the Redox Plant where all silver reactors were regenerated and one reactor was replaced.

D. Personnel Activities

* Corrected figure

1. Programs

During the month the training program activities were as follows:

Program	Attendance
For Exempt Roll:	
Accident Prevention Training	24
For Non-Exempt Roll:	
GE Selection Program	8*
Pre-Supervisor Training	38
Orientation Training (New Hires)	1
Advanced Rescue - Disaster Training Program	39

2. Reduction of Force

During May the Section forces were reduced by 7 people, with transfers to other Sections and Departments accounting for 25 people (4 Exempt, 7 Craft, 13 RM, and 1 Analytical) and removals from payroll accounting for 11 people (4 illnesses and 7 resignations). Twenty-nine people transferred into the Section (15 RM, 1 Secretary, 2 Analytical, 4 Craft, 2 New Hires, and 5 Reactivations). As of 5-31-56, the Section force totaled 1755 people.

3. Visitations

Art Brunstad of the Methods Unit went to Washington, D.C. for the AEC Spring Meeting on May 7, 8, and 9 to deliver a paper on "Coulometric Determination of Plutonium and Uranium."

Mr. R. B. Smith of the Atomic Energy Commission, Washington, D.C., visited the 234-5 Building on May 29, 1956 to evaluate fire protection needs of the building.

J. H. Warren presented a talk on "Hanford Reactors" and showed the GE film "A is for Atom" to the Weston, Oregon Chamber of Commerce on May 22nd.

* 4 Analytical, 2 Power & Maintenance, and 2 Operating personnel.

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ELECTRICAL UTILITY SECTION

May, 1956

I. RESPONSIBILITY

There were no changes in Section responsibility.

II. ACHIEVEMENT

A. Operating Experience

Power Statistics (See last page for details)

Plant Contract

Probable time of May peak.	10:30 - 11:00 a.m., May 18, 1956
Telemetered peak for May	188,400 KW
Probable billing demand for May.	194,000 KW
Probable energy consumption for May.	118,282 MWH
Actual BPA metered demand for April.	184,802 KW
Actual billing demand for April.	196,000 KW
Actual energy consumption for April.	115,037 MWH
Average monthly energy consumption-10 months of Fiscal Year '56	110,361 MWH
Cost of purchased electricity for April.	$286,533
Actual cost of purchased electricity for 10 months of Fiscal Year '56.	$2,745,942

* * * *

The telemetered maximum demand of 188,400 kw indicates an all-time peak, the previous measured high, 184,802 kw, occurred last month. As scheduled by the power contract, the billing demand is 194,000 kw, 2000 kw lower than last month.

* * * *

At 1:11 a.m., May 1, a system surge occurred and frequency dropped to 58.6 cycles when an over loaded BPA line emanating from McNary Dam tripped out all of McNary's generation. The 105-C, 105-KE, and 105-KW buildings scrammed but were able to start up. At 5:40 a.m. frequency dropped to 57.8, due to further BPA trouble, causing 105-KW to scram and again come up.

* * * *

At 11:00 p.m., May 7, the electrical dispatcher received a report of a fire on a 13.8 kv line feeding the 200-W Area from the 251 Substation. The line was switched out of service and the firemen extinguished the pole-top blaze. The fire was caused when rain penetrated a fine crack in the porcelain insulator and caused current to leak through and ignite the wooden crossarm.

* * * *

At 5:25 p.m., May 8, a relatively severe lightning storm from the White Bluffs-Hanford Area dropped power supplied from the Hanford Substation. Power was restored at 7:57 p.m. and production was not affected.

* * * *

At 11:22 a.m., May 9, one of the feeders supplying the 190-D and 105-D Buildings relayed out scramming the 105-D Building, when lightning damaged a 2,500 kva transformer bushing. The 105-D Building was able to start up after pumping load in 190-D was transferred to another transformer.

The lightning demolished one bushing and a second bushing was severely damaged by arcing. Both bushings were replaced with spares and the transformer was restored to service the next day after further examination and checks for damage.

* * * *

At 8:24 p.m., May 30, the BPA Midway breaker, terminating our No. 1 230 KV line, tripped open on a relay malfunction when lightning struck their Big Eddy line. Improper setting for reclosure time on their Big Eddy breaker resulted in back up relaying tripping the Midway bus section supplying our line. Production was not affected by the incident.

* * * *

At 9:15 p.m., May 31, oil circuit breakers on our 230 KV No. 2 line opened and were immediately reclosed at Midway and our 251 Substation, apparently from a ground fault. Subsequent investigation disclosed improper relay wiring at Midway which was corrected.

B. Equipment Experience

During the month 465 down guys and anchors on the 230 KV loop were tested by line crews. Three anchor eyes with poor welds, the same condition which caused a power outage last month, were repaired with bolt-on eyes and seven anchor rods were replaced entirely. The anchor testing program is approximately ninety per cent complete.

D. Events Influencing Costs

Overtime hours expended were approximately 1.6 per cent of the total regular hours worked.

Attendance for the month was 98.21 per cent.

E. Plant Development and Expansion

CA-586: The line contractor's forces returned to the job May 11 and are presently completing the above ground switching station structure in the 100-K Area and are also proceeding with the steel assembly at the new line tap near Gable Mountain.

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E. Plant Development and Expansion Cont'd.

CG-558: The electrical switchgear equipment for 151-H Substation addition arrived and was unloaded during the month.

III. ORGANIZATION AND PERSONNEL

A. Organization

No changes in structure or nomenclature.

B. Force Summary

	Beginning	Ending	Net
Exempt Personnel	16	16	0
Dispatchers	5	5	0
Electricians	11	11	0
Linemen	23	23	0
Substation Operators	31	31	0
Secretary	1	1	0
Stenographer	1	1	0
Clerks	2	2	0
Draftsman	1	1	0
	91	91	0

C. Safety Experience

No disabling injuries occurred during the month, one medical treatment injury was reported.

D. Radiation Experience

No incidents were reported during the month.

E. Personnel Activities

Mr. Merle Bassett, BPA Safety Engineer, presented a topic entitled "Why Electricity Kills" at the Section monthly informative meeting on May 23. His presentation was given with interesting demonstrations of how the human body tolerance to electricity changes under various commonplace conditions.

The following day he presented a second topic for linemen, line supervision and engineering personnel reporting Bonneville Power Administration's experimentation and findings in the proper rigging on steel towers such as those which we are now leasing from BPA.

* * * *

L. H. Holden completed his term in office as Chairman of the HAPO Health Activities Committee.

* * * *

POWER STATISTICS
ELECTRICAL UTILITY SECTION
FOR MONTH ENDING MAY 31, 1956

744 hours

	ENERGY - MW HRS.		MAXIMUM DEMAND-KW		LOAD FACTOR-%	
	Last Month	This Month	Last Month	This Month	Last Month	This Month
230 KV System						
A-2 Out (100-B)	27600	27520	48500	45000	79.0	82.2
A-4 Out (100-D)	16500	16010	28100	28600	81.5	75.2
A-5 Out (100-H)	8860	8630	16150	15600	76.2	74.3
A-6 Out (100-F)	5360	6810	13000	12900	57.3	71.0
A-7 Out (100-KW)	21648	22896	37000	37000	81.3	83.2
A-8 Out (200 Area)	6730	6840	11100	10950	84.2	84.0
A-9 Out (100-KE)	23424	25200	39500	40500	82.4	83.6
TOTAL OUT	110122	113906	193350*	190550*	--	--
MIDWAY IN	112530	115680	180800	182400	86.4	85.2
115 KV System (300 Area)						
BB3-S4 Out	2472	2504	4560	4400	75.3	76.5
115-66 KV System						
B7-S10 Out (W. Bluffs)	168	69	360	270	64.8	34.3
Hanford Out (7200 V.)	38	23	--	--	--	--
Hanford In	151	98	600	400	35.0	32.9
Project Total In	115153	118282	185960*	187200*	--	--

* Denotes Non-Coincidental Demand

Average Power Factor - 230 KV System 86.9

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PURCHASING AND STORES SECTION

MAY, 1956

I **Responsibility** No change

II **Achievement**

STATISTICS

	March	April	May	FY 1956 Average
Purchasing				
Emergency req'n. rec'd.	349	267	188	368
Average per day	15.9	12.7	8.5	17.4
Purchase orders placed				
Number	2,706	2,396	2,111	2,403
Value	$2,210,182	$1,853,847	$1,652,852	$2,010,055
Purchase order alts.				
Number	335	306	348	287
Value	$ 144,203	$ 115,667	$ 105,494	$ 249,171
Stores				
General Supplies				
No. of store orders	38,942	30,462	29,404	26,951
Value of issues	$ 430,427	$ 312,868	$ 328,615	$ 288,692
Spare Parts				
No. of store orders	1,677	1,382	1,501	1,493
Value of issues	$ 186,622	$ 92,851	$ 132,300	$ 115,047
Traffic				
Savings freight bill audit	$ 1,130	$ 1,414	$ 2,939	$ 1,793
No. freight bills approved	1,763	1,516	1,359	1,569
Amount	$330,572	$ 295,034	$ 269,070	$ 316,848
Carload shipments received	905	869	748	858
Tonnage report				
Tons rec'd-common carrier	60,300	56,876	49,733	55,498
Total cost	$341,512	$ 342,616	$ 304,568	$ 304,549
Average cost per ton	$ 5.663	$ 6.024	$ 6.124	$ 5.732

No. 6 Fuel Oil, carried as an Essential Material, is presenting a procurement problem. This commodity was previously purchased through GSA on annual contracts. Suppliers are unwilling to contract in advance to the government. Accordingly, means of protecting a supply source without premium payments are being explored.

II Achievement (Cont.)

Electronic tubes have been purchased for several years from commercial sources. By extensive checking through government contracts now at G.E.'s disposal, contract sources for most of these tubes have been found and the savings will be approximately 10 to 20%.

Although G. E. was delegated authority to purchase lumber from government sources, HW required procedures were conflicting and complex. G. E. now has obtained authority to purchase lumber from commercial sources in quantities up to 5 carloads. Requisitions for more than this quantity will be handled by A.E.C. This will enable lumber procurement to proceed at an efficient pace and at prices which will be competitive and double-checked by constant comparison with those of government sources.

Information of future procurement for Project CG-676 (Fuel Element Pilot Plant) was funrished to Design personnel and to the project engineer. This constituted procurement times, estimated prices, and probable sources.

Project CG-558 - Reactor Plant Modification. All equipment for 100-B Area shutdown is on plant except for venturis and these are expected from Pacific Oerlikon in Tacoma, Wash. during June. Most of the equipment for the successive shutdowns will be received by the middle of July,with the exception of De-Laval pumps which are on a scheduled delivery basis.

Project CG-621 - Redox Contamination Control Facilities. The last vessel order was placed with a long-term delivery of March, 1957, on Wyatt Company, Dallas, Texas. Progress is satisfactory on HWC-13649 (Patterson-Kelley) although plagued by corrosion failure. Progress on H6V-857 (Pacific Coast Engineering Co.) is good.

Project CG-613 - Hanford 4X Program Metal Conversion Plant. Two orders remain open. Progress is satisfactory on HWC-10928 (Consolidated Western). H6T-2214 (M-H Standard) for a screw conveyor is not satisfactory. The vendor recently submitted the second set of revised design drawings for approval. It is doubted at this time that these will be approved. This order is being followed closely by off-site Liaison.

Project CG-647 - Back-Up Radioiodine Removal Facilities, Purex. Forty-eight requisitions for equipment have been received, of which 28 have been placed on purchase orders and 20 are awaiting bids, engineering review, or AEC approval of award. The most critical orders are the absorber tower at Consolidated Western and the acid cooler at Lummus. Purchasing Liaison representatives are following all orders closely and are attempting to improve delivery dates.

Project CG-648 - Auxiliary Radioiodine Removal and Nitric Acid Recovery Facilities, Redox. Thirty-six requisitions on this project have been received, of which 23 have been placed on purchase orders and 13 are awaiting bids, engineering review, or AEC approval. The limiting order will be the absorber tower, at Consolidated Western. Liaison representatives are endeavoring to improve the delivery date by close work with the vendor and some progress is noted. It is felt that the vendor is as capable as any in the nation and the best possible performance is expected.

II Achievement (Cont.)

Project CG-651 - Continuous Charge-Discharge Equipment, C Reactor, Slug Development Facility and Demonstration Unit. The most critical order is with Rockwood Sprinkler Company for ball valves and the progress is unsatisfactory. A request for assistance from BDSA has been forwarded to AEC so that a directive or other pressure can be brought to bear on the vendor. This order is being followed closely by a Liaison Representative.

In May 1955, eight cars of Soltrol (Petroleum Naphtha) were ordered from Borger, Texas. In analysing the freight rates on this movement, it was found that the applicable rate was unreasonably high. Immediate steps were taken to have this rate reduced and on October 15, 1955 the carriers published a reduced rate. However, prior to the effective date of the new rate, the eight cars were shipped and charges assessed on the higher rate. Immediate steps were taken requesting the carriers to secure authority from the Interstate Commerce Commission to reparate G. E. for the difference. This authority was granted to the carriers and a refund in the amount of $657.88 has been received.

Contracts executed during month

RO-2 Mod. 2
Dated: September 14, 1954
Seller: Republic Coal Company
Material: Coal
Quantity: Maximum 805,000 tons
Term: 7-1-54 to 6-30-57
Price: $6,633,179.34 ($3.77 per ton f.o.b. mine)
Mod. 2 - Increases price to $6,640,543.34 ($4.05 per ton f.o.b. mine) and changes specifications.

RO-20 Sup. No. 1
Dated: August 24, 1956
Seller: Cascade Fire Equipment Company - Gas-Ice Corporation
Material: Liquid Carbon Dioxide - Max. 4,320 tons
Term: 10-1-55 to 9-30-58
Price: $228,480 ($50 per ton f.o.b. Tacoma, Washington)
Supplement No. 1 - Permits alternate method of shipment.

SA-5
Seller: Applied Research Laboratories
Service: Servicing spectrochemical equipment
Term: 2-29-56 to 2-28-57
Price: $40 per day with overtime provisions, plus expenses

SA-10
Lessor: Richland Tug and Ferry Company
Service: Boating service
Term: Approximately 4-9-56 to 4-23-56
Price $18.50 per hour and $12.00 per hour

II Achievement (Cont.)

Contracts

SA-11
Seller: O. C. Adams d/b/a/ Credit Bureau of Benton And Franklin Counties
Contract For: Collection of overdue accounts
Term: Commence May 1, 1956 and continue from month-to-month thereafter until terminated.
Price: Credit Bureau will remit to General Electric 50% to 66-2/3% or the amount collected on all accounts.

L-4
Lessee: Richland Softball Association
Lease for: Use of softball field, known as Memorial Softball Field
Term: Duration of the 1956 softball season
Price: $160.00

CA-106 - Mod. 3
Dated: May 1, 1953
Consultant: Dr. Edward James
Services: Consultant services - Radiology
Term: Mod. 3 extends term to June 30, 1956
Price: $7,080 per year plus overtime

CA-134
Consultant: Combustion Engineering, Inc.
Service: Reviewing boiler plant firing and operating practices
Term: Five weeks after notice to proceed
Price: $7.50 per hour plus overtime, travel and subsistence.

DDR No. 1
Seller: Giddings & Lewis Machine Tool Company - Davis Boring Tool Division
Service: Design of Boring Tool Unit
Term: Complete 120 days after receipt of notice to proceed
Price: $950

Although May marked the second straight month of a general reduction in Spare Parts' activity, the number of Stock Adjustment Requests increased to 237 from 66 in April 1956 and the number of items covered increased to 651 from 197. Most of the increased activity in SAR's was for Purex and Z-Plant to adjust levels or to delete material from stock.

The Spare Parts Unit processed 37 Declarations of Excess and Property Disposal Requests covering 120 items valued at $34,000.

II Achievement (Cont.)

Work sheets covering Spare Parts carried in stock for the Community Operations were prepared and forwarded to them for their analysis with a view towards effecting a transfer of the spares from Stores custody.

The annual physical inventory of Stores general supplies inventories was taken on May 16 and 17, and completed ahead of schedule.

Excess and surplus materials have been lotted and invitations to bid have been mailed for the following scheduled sealed bid sales:

Sale No.	Bids to be Opened	No. Invitations Mailed
PS-2-56	June 4, 1956	462
PS-3-56	June 4, 1956	13
PS-4-56	June 11, 1956	453

The volume of activity in Excess Warehousing and Shipping shows a substantial increase over previous months as is indicated below.

	March	April	May
Declarations of excess recv'd.	77	127	202
Items received	1194	505	2266
PDR's received	83	46	88
Shipping documents processed	107	43	279

Since the biginning of the strike against Construction contractors, March 22, 1956, 89 carloads of material and equipment have been received for Minor Construction. Of these, 49 cars have been unloaded by J. A. Jones supervisory personnel, the balance of 40 remain to be unloaded.

III Organization and Personnel

Force Summary

Component	EX.	N.Ex.	T	Ex.	N.EX.	T	Ex.	N.Ex.	T
General	2	2	4	2	2	4	-	-	-
Contract Unit	2	2	4	2	2	4	-	-	-
Traffic	3	7	10	3	7	10	-	-	-
Purchasing Sub-Sec.	43	62	105	43	62	105	-	-	-
Stores Sub-Section	12	161*	173	12	160*	172	-	(1)	(1)
	62	234	296	62	233	295	-	(1)	(1)

*Includes 5 employees from Metal Preparations on temporary basis.

Safety Experience

Three medical treatment injuries were reported.

Twelve satety and security meetings were held with a total of 272 employees attending.

III Organization and Personnel (Cont.)

A manual of Job Hazard Breakdowns which affect the Stores operations has been prepared. In addition to having employees familiarize themselves with the contents of the manual, specific job hazards are discussed in regular scheduled safety meetings.

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TRANSPORTATION SECTION
MONTHLY REPORT
May 1956

Transportation Section personnel forces increased from 490 to 493 by four new hires and one transfer out.

Transportation Section gross expenditures for the first ten months of FY 1956 totaled $3,395,517 which is an increase of $34,941 or 1.04% over FY 1955. Fiscal year to date costs are under the budget by $66,769 or 1.93 %. Comparative costs by major service functions are listed below:

Function	FY 1956 1st. 10 Mos.	FY 1955 1st. 10 Mos.	% of Variance
Railroad	$ 634,139	$ 618,732	+ 3.97 %
Plant Bus	1,189,255	1,123,945	+ 5.81 %
Heavy Equipment Maintenance	511,395	477,947	+ 7.00 %
Light Equipment Maintenance	509,665	553,381	- 7.90 %
Road Maintenance	144,548	92,975	+ 55.47 %

Listed below are unit cost statistics for the first ten months compared with the performance bogeys for FY 1956 and FY 1955 actual:

		FY 1956 1st. 10 Mos.	FY 1956 Bogey	FY 1955 Actual
Railroad				
Cost per car handled -	Commercial	$ 32.18	$ 29.73	$ 31.46
	Process	242.01	232.40	241.89
	Average	54.08	52.34	52.97
Plant Bus				
Cost per mile -	Operating	.3855	.4173	.4043
	Maintenance	.1341	.1281	.1268
	Total	.5196	.5454	.5311
Light Equipment				
Cost per mile -	Maintenance	.0601	.0689	.0614
Road Maintenance				
Cost per mile - Yearly (Primary roads based on 20' roadway seal coating not included)		397.07	317.74	250.67
Seal coating - per square yard for surfaced areas		.0905	.1108	.1134
Track Maintenance				
Cost per mile - Yearly		2537.83	2577.18	2698.82

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The IME rate for the Road Maintenance Unit was decreased from 70% to 60% in May to more closely liquidate actual operating costs.

Delivery of 288 new replacement sedans and pickups is about 73% complete. The remaining units have been expedited to assure receipt by the end of FY 1956. Pre-delivery service has been considerably better on recent shipments. Representatives of the Ford Motor Company, local and Washington AEC officials, and Transportation personnel met on May 25 to discuss vehicle deficiencies, reimbursement for abnormal servicing, and an extension of the warranty period. The matter has been referred to management of the Ford Motor Company and the Washington Office of the Commission for final resolution.

Special efforts are being made to complete outstanding items in the FY 1956 Equipment Budget. No problem is anticipated inasmuch as purchase orders placed by June 30 will apply against allocated funds.

Representatives of the Financial Department and the Transportation Section met with the Commission on May 2 to discuss the FY 1957 and FY 1958 Equipment Budgets. Requirements were reduced from $1,019,005 to $591,305 in FY 1957 and from $1,427,925 to $1,282,000 in FY 1958.

Chapter 5142, Motor Vehicle Management, of the AEC Manual has been received and studied by appropriate personnel. The Commission has been informed that this document will be used as a guide in equipment management activities.

Considerable study has been given to the AEC Annual Motor Vehicle Report as to information required by Chapter 1155 of the AEC Manual. Meetings have been held with the Financial Department and the Commission regarding certain costs which have heretofore been excludable on the premise that they are peculiar to Hanford and not comparable with those of other government agencies. Full overhead costs will now be reportable thus placing HAPO at a disadvantage from a comparative standpoint since such expenditures as continuity of service, public liability accrual, area bus service, and isolation pay will be factored into the operating and maintenance cost per mile data.

Prepared a summary relative to replacement standards for government owned motor vehicles in response to the Commission's request. Information will be submitted to the Washington Office for consideration.

Recommendations on Disabling Injury No. 56-115 continued to receive attention. Installation of horns has been completed on three locomotives and the material for the remaining five units was received on May 25. The partial shipment of lights is being returned to the manufacturer for modification to provide suitability for outside mounting on locomotives. It is contemplated that a portion of the revised lights will be available by the end of June. The work of striping, lettering, and sign installation at thirty-two principal railroad crossings is approximately 75% complete. These changes are being communicated to Plant personnel through the GE News.

Conducted a civil defense practice evacuation of Kadlec Hospital on May [illegible]. Four buses were dispatched from the terminal at 1:00 P.M. and arrived at 1:0[illegible] P.M. with the drill being completed at 1:15 P.M. Movements of equipment [illegible] were executed without incident.

[redacted]

[redacted]

Completed the annual physical inventory of railroad track materials (0420-934) on May 10 and 11 as scheduled. Satisfactory results are indicated with reconciliatory work still in progress. Extensive study of line items as to probable usage has led to a significant stock reduction through excessing.

Furnished informational assistance to the Records Operations Unit for an evaluation of reports and record data generated by the Transportation Section.

The Commission has given verbal approval for the continuation of road maintenance work by Plant forces. This action followed the submission of a study wherein HAPO performance compared very favorably with the State of Washington.

Commercial rail traffic during May decreased 14.25% over April due to lower coal receipts. The following recapitulation indicates the distribution of commercial cars handled:

Cars Handled	Loads In	Empties In	Loads Out	Empties Out
General Electric Co.	782	13	16	826
U. S. Army	60	0	0	75
Morrison-Knudsen	3	0	0	0
Total	845	13	16	901

Railroad process service during May decreased 40% over April due to production difficulties.

Railroad car movements consisting of process, commercial, and special service totaled 2,092 in May compared to 2,548 in April, 2,163 in March, 2,635 in February, and 2,278 in January.

Completed the overhaul of locomotive 39-3732. Locomotive 39-3730 was removed from service for the replacement of wheels and the reconditioning of traction motors.

Maintenance of railroad trackage and associated activities required 6589 man-hours. Re-laid 2,540 lineal feet of main-line track as planned in the long range maintenance-improvement program. Documents have been prepared for the disposal of 3,578 lineal feet of abandoned spur trackage.

The Plant Bus System transported 1.18% fewer passengers in May than in April. The following recapitulation indicates the volume of service rendered:

Total Passengers	176,504
Revenue - Bus Fares	$ 8,224.36
Earnings - Transit Advertising (April)	8.97
Bus Trips	7,256
Bus Miles - Passenger Carrying	226,563
Passenger Miles	6,238,928

Established a practice of collecting bus fares at the area badge houses as an added convenience to passengers. Expanded express bus service for the 200-West and 100-H Areas.

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The Richland Bus System transported 11.41% fewer passengers in May than in April as the normal seasonal decline continued. The following recapitulation indicates the volume of service rendered:

Total Passengers - Including Transfers	9,934
Revenue - Bus Fares	$ 491.55
Earnings - Transit Advertising (April)	$ 8.97
Bus Trips	1,061
Bus Miles - Passenger Carrying	5,623
Passenger Miles	24,832

Off Plant chauffeured automobile trips (Company business and/or official visitors) totaled 172 which were rendered to the following locations:

Benton City, Washington	9
Grandview, Washington	4
Hinkle, Oregon	14
Kennewick, Washington	34
Pasco, Washington	48
Pendleton, Oregon	16
Prosser, Washington	2
Richland Wye, Washington	1
Spokane, Washington	1
Sunnyside, Washington	10
Walla Walla, Washington	4
West Richland, Washington	6
Yakima, Washington	23

The following tabulation indicates in gallons the volume of fuel distribution during May:

	Gasoline	Diesel Fuel	50 Cetane	Kerosene	White Gas
Stock at start of Month	62,338	18,625	9,150	4,060	167
Received During Month	101,386	24,400	33,393	1,240	165
Disbursed During Month	93,944	21,425	31,843	1,000	288
Stock at End of Month	69,780	21,600	10,700	4,300	44

The following tabulation indicates the volume of equipment maintenance activities during May by types of service and number of jobs:

Motor Overhauls	40
Class A Inspections and Repairs	76
Class B Inspections and Lubrications	1157
Weekly Inspections - Fuel Trucks and Off Plant Vehicles	136
Semimonthly Inspections - Buses	231
Monthly Inspections - Railroad Rolling Stock	13
Front End Alignment and Wheel Balance	151
Routine Maintenance Repairs and Service Calls	1804
Accident Repairs and Paint Jobs	47
Tire Repairs	654
Wash Jobs	397
	4706

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The following tabulation indicates the number of HO mileage vehicles in service during April and the utilization of each type:

Code	Type	No. of Units	Total Mileage
1A	Sedans	380	495,097
1B	Buses	162	224,543
1C	Pickups	463	219,923
1D	Panel, Carryall, Sta. Wagon	170	131,414
1G	Jeeps	1	710
1H	Power Wagons	50	18,946
68 Series	Trucks	207	90,755
		1433	1,181,388

Seasonal ice deliveries to all areas were begun in May.

Maintenance of Plant roads and the production of road aggregate materials required 2,031 man-hours.

The following tabulation indicates in tons the volume of asphaltic material handled during May for road maintenance.

	MC 3	MC 5
Stock at start of Month	9.39	33.39
Received During Month	0	0
Used During Month	0	0
Stock at End of Month	9.39	33.39

The following tabulation indicates the volume of mineral aggregate and pre-mix material handled in May for road maintenance:

	Pre-Mix 3/4" to 0 - Tons	Pre-Mix 1/4" to 0 - Tons	Chips 5/8" Cu.Yd.	Crushed Rock 1/4" Cu.Yd.	Crushed Rock 3/4" Cu.Yd.	Crushed Rock 2" Cu.Yd.
Stock at Start of Month	1,142	875	4,795	1,048	801	0
Made During Month	0	0	0	0	400	2,000
Used During Month	316	149	0	0	82	0
Stock at End of Month	826	726	4,795	1,048	1,119	2,000

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ENGINEERING DEPARTMENT

MAY 1956

PILE TECHNOLOGY SECTION

Rupture frequency during the month was reduced in continuation of the trend established during the last several months. Three split failures occurred in the KW Pile but this is insufficient to determine whether this will be representative of present fuel element performance under current K Pile operating conditions.

Research & Development programs and goals for the next two years were revised for the existing reactor program and developed for the improved production reactor. Consideration was given to several possible experimental reactors in support of a plutonium fuel cycle program.

Four tubes of I & E slugs and four tubes of regular metal control slugs have been charged in the C Pile for the run-to-rupture portion of the current I & E tests. Continual improvements have been made in the canning yield and in the over-all yield of dip-canned I & E slugs.

Six ribless zircaloy-2 KER process tubes were received, four of which were sufficiently long for in-pile installation. The first 500 lb. billet of zircaloy-3A has been produced from zirconium evaluation ingots at the Bureau of Mines, Albany Plant. If testing shows this billet to be satisfactory, production will continue at a rate of 1/2 ton per week to complete our 12 ton order.

Production slugs received during the month appeared to be of good quality with respect to reactivity, transformation, and gas evolution during canning. The low reactivity value of Mallinckrodt Metal in January and February has been attributed to contamination of the parent green salt with recycle depleted material. The use of carbonate or chloride salt bath outgassing of dingot rods was shown to be as effective as vacuum outgassing of slugs in reducing the void area in the Al-Si bonding layer.

SEPARATIONS TECHNOLOGY SECTION

Purex Plant processing was resumed following a thorough plant flush, replacement of the IA column which had a revised scrub section, and modification to the final plutonium concentration package to minimize plutonium buildup. Within a week after start-up, specification plutonium and uranium were being produced from the final solvent extraction cycles.

Further studies toward the development of an improved all stainless steel scrub section that would operate with the organic phase continuous were made for a Purex A-type column.

Operational and mechanical features of a Higging-type ion-exchange unit are being studied for application to the Purex plutonium product in lieu of evaporation.

Hydrated UO_3 with high reactivity has been shipped to K-25 for pilot plant evaluation.

DESIGN SECTION

Design Section effort on design development programs increased substantially during May, while effort on Design Section managed projects, process technology, and customer design orders decreased. Distribution of effort by major components for the month of May was as follows:

	Per Cent of Total Effort
Design Development Programs	34.4
Design Section Managed Projects	46.9
Advance Engineering - FY 1957 & FY 1958	0.8
Process Technology	2.4
Customer Work	15.5
	100.0

Metallurgical design development studies were continued during the month of methods of expanding canning facilities in the 300 Area to provide the additional fuel element capacity which would be required for a supplementary production reactor.

Reactor design development activity during May included studies of new reactor design technology such as optimization of operating conditions for a reactor producing electric power as a by-product, and feasibility studies for a gas-cooled plutonium producing reactor. Other reactor development included studies of the application of pressurization or recirculation to existing reactor as a means of achieving increased production capacities and possible power recovery, and studies of vertical safety rod system improvements for existing reactors.

Separations design development items included studies of building and equipment modifications for a Phase IV capacity increase in the Redox Plant, studies of the feasibility of recovering and packaging fission products from separations plant wastes, studies of the conversion of the Purex Plant to a Redox-type process, preparation of scope criteria for methods of reducing airborne contamination in the UO_3 Metal Recovery Plant, and scope studies for the provision of additional waste disposal facilities for scavenged TBP Plant wastes.

234-5 design development activity during May included development studies for the installation of continuous Task I - Task II equipment in the 234-5 Building, studies of the conversion of Recuplex to a manufacturing facility, development testing of methods for mechanical dejacketing of coated pieces, and development of an automatic autoradiography device.

Additional funds in the amount of $350,000 were authorized by HOO-AEC during the month for Project CG-654, bringing total funds authorized for this project to $500,000. The objective of this authorization is to obtain a limited scope package for a new plutonium producing reactor embodying a recirculation cooling system.

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PROJECT SECTION

At the end of the month, completion status of major construction was as follows:

Project No.	Title	Completion Scheduled	Completion Actual
CA-513-E	Purex Facilities, Part E	97%	94%
CA-546	Fuel Element Pilot Plant	100%	98%
CG-558	Reactor Plant Modifications, Phase I	59%	54%
CG-558	Reactor Plant Modifications, Phase II	13%	10%
CA-586	First Capacity Increase, 230 KV System	98%	94%
CG-598	Purex Acid Fractionator	69%	53%
CG-600	100-C Alterations	1%	0.8%
CG-613	Hanford 4X Program, Metal Conversion Plant	87%	59%
CG-621	Redox Contamination Control Facilities	50%	43%
CG-643	Redox Capacity Increase, Phase III	90%	90%

For the second consecutive month, all construction project work remained in a suspended state, except for the minor portions assigned to plant forces. Two other exceptions occurred when on May 11 the electrical contractor for the 230-KV Capacity Increase obtained permission for a foreman and crew to work in 100-K, and on May 22 the painting contractor for two high tanks at 100-C secured agreements to permit resumption of work.

Conferences and negotiations between the unions and contractors were conducted throughout the month.

A letter was written to summarize effects of the strike upon Project Section components and the Hanford portion of the J. A. Jones Construction Company. The key factors for consideration were estimated losses, liquidation of costs, handling and storage of materials, railroad demurrage, and transshipment to construction sites. Data on these factors have been maintained so that proper adjustments and backcharges may be made after the strike.

Project work was conducted under the severe limitations imposed by the strike, and engineers continued the interim work of reviewing manpower requirements, establishing work sequences, and coordinating tasks to be performed when the construction program is resumed. First priority has been assigned tentatively to CG-613, Metal Conversion Plant, with second priority for CG-558, Reactor Plant Modifications.

ORGANIZATION AND PERSONNEL

Total on Roll, April 30, 1956	1,430
Net Change	+2
Total on Roll, May 31, 1956	1,432

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ENGINEERING ADMINISTRATION SECTION

MAY 1956

The Supervisor of Classification attended a meeting at Fernald, Ohio on May 2, 3, and 4 for the purpose of drafting a classification guide to be used by the various sites which prepare fuel elements for production reactors. Hanford representation at the meeting included the HOO Classification Officer and representatives from the HAPO Metal Preparation Section, the HAPO Fuel Technology Sub-Section and the HAPO Technical Information Unit. Other sites represented were the Oak Ridge Operations Office, Savannah River Operations Office, du Pont Company and National Lead Company.

The accomplishments of the meeting include (1) a preliminary draft of a Production Reactor Fuel Element Classification Guide, within the framework of present AEC classification policy, which will permit a lower classification of information on the slug fabrication and canning process, and (2) an agreement to prepare and submit recommendations for long-term objectives which may involve modification of present AEC classification procedures. An important by-product of the meeting was learning about the approach and procedures used by other installations in classification matters.

The rough draft of the Guide agreed upon at the meeting has been received at HAPO for further review and comments. A second meeting may be required to obtain complete agreement on the final draft, discuss classification of special fabrication topics, and draft the recommendations for long-term objectives.

Time was spent during the month on the matter of appropriate legal disclaimers for HAPO-originated documents. This was important as both formal and "internal" reports now receive wide distribution under the CAProgram, and many questions of liability are raised. A locally-written disclaimer was used on all "internal" documents sent to TIS, Oak Ridge under the large-scale declassification program carried out early this year, and Oak Ridge was instructed to affix the disclaimer to HAPO reports already in TIS files. The locally-written disclaimer, together with an official AEC disclaimer, was also used on all formal reports. Recently the AEC revised its disclaimer to provide more protection for the contractor. Its new disclaimer is presently being used in all HAPO formal reports, and the H A P O attorney feels it advisable to use it on all "internal" reports as well. At the present time, an effort is being made to (1) define the type of "internal" reports requiring the disclaimer, since it is impractical to use it on all "internal" documents, (2) design a title page containing the disclaimer, for use with "internal" documents, and (3) determine if the official AEC disclaimer needs to be supplemented on "internal" reports with a HAPO "Warning - Preliminary Report" type of disclaimer.

The revisions for the HAPO Security Classification Guide were completed during May and transmitted to HOO. All sections have now been forwarded by HOO to the Declassification Branch, Oak Ridge for preliminary review. The Guide has also been submitted to members of the HOO Classification Committee for approval. Following action by this committee, the Guide will be submitted to the AEC Division of Production, Washington.

WM Harty

Manager - Engineering Administration
ENGINEERING DEPARTMENT

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PILE TECHNOLOGY SECTION

May, 1956

VISITORS

J. E. Duncan, UCRL-Livermore, Calif. visited HAPO regarding Whitney Project work, May 15-29.

E. Gaduzela, North American Phillips Co., Seattle, Wash. visited HAPO on May 2 to service electron microscope.

W. W. Gilbert, GE-Schenectady, spent May 1-3 at HAPO consulting on machinability problems.

F. Hittman and C. D. McKeoreghan of the G. L. Martin Company, Middle River, Md. visited HAPO on May 8 regarding the Pied Piper Project.

E. D. Holland and M. J. Ryan, UCRL-Livermore, Calif. consulted at HAPO, May 8-9, regarding Whitney Project work.

N. E. Houston and W. K. McCarthy, North American Aviation, Canoga Park, Calif. visited HAPO regarding NAA-109 pile experiment, May 10-12 and May 1-12, respectively.

Dr. Schiff and Dr. Stein, Westinghouse Electric, Pittsburgh, Pa. discussed material for Naval Reactor Manual, May 10-11, at HAPO.

J. C. Woodhouse, duPont, Wilmington, Del. spent May 9-12 at HAPO discussing the dingot program.

P. I. Wolf and C. J. R. Woods, North American Phillips Co., Seattle, Wash. visited HAPO, May 9-10, to service electron microscope.

TRIPS

J. M. Atwood, S. Goldsmith and N. R. Miller attended the AEC Corrosion Symposium at ORNL, Oak Ridge, Tenn., May 22-24.

J. J. Cadwell, T. K. Bierlein, P. A. Carlson, E. A. Evans, M. D. Freshley, D. E. Johnson, J. E. Minor, J. W. Riches, J. M. Tobin and W. P. Wallace attended the AEC Metallurgy Information meeting at Iowa State College, Ames, Iowa, May 2-4.

V. R. Cooper attended meeting of Metal Development Advisory Committee at Mallinckrodt Chemical, St. Louis, Mo., May 23-24.

J. M. Davidson visited MTR, Phillips Petroleum, Idaho Falls, May 21-26, for installation and startup of GEH-9 experiment.

R. L. Dillon consulted on procurement of special experimental alloys at Dow Chemical, Seattle, Wash. on May 11 and attended AEC Corrosion Symposium at ORNL, Oak Ridge, Tenn. May 23-24.

O. H. Greager visited AEC, Washington, D.C. May 21-22 to review Reactor Handbook material and discuss Hanford process development program. Mr. Greager attended meeting of Metallurgy Development Advisory Committee at Mallinckrodt Chemical, St. Louis, Mo., May 23-24.

N. D. Groves visited Carpenter Steel, Reading, Pa. on May 21 to consult on non-destructive testing techniques and attended AEC Corrosion Symposium at ORNL, Oak Ridge, Tenn., May 22-24.

R. O. Gumprecht spent May 7-9 at AEC, Washington, D.C. to present a paper to AEC Contractors Spring Meeting on Nuclear Materials Management.

D. C. Kaulitz visited Phillips Petroleum, Idaho Falls, May 16-17, regarding modifications to GEH-4 equipment installation.

J. W. Lingafelter attended American Welding Society meeting at Buffalo, N.Y. May 9-11.

J. R. Morgan and R. G. Wheeler presented papers at meeting of American Institute of Mining Engineers at Seattle, Wash., May 3-4.

O. W. Rathbun discussed security of classification of fuel elements at AEC, Feed Materials Production Center, Fernald, Ohio, May 1-8.

E. A. Smith attended AIME Regional Conference at Seattle, Wash., May 3-5.

W. R. Smith observed welding and fabrication of zirconium tubing at Trent Tube Company, E. Troy, Wis. on May 4; presented paper at American Welding Society, Buffalo, N.Y., May 7-9, and discussed material and welding problems at Research Lab.-GEL, and Materials & Process Lab., Schenectady, May 10-11.

G. W. Stuart served on thesis examination board for M. V. Davis at Oregon State College, Corvallis, on May 9.

K. G. Toyoda consulted on generator design on May 7 at General Engineering Lab., Schenectady.

W. P. Wallace visited Superior Tube, Norristown, Pa. and Allegheny-Ludlum Steel, Albany, N.Y., regarding zirconium process tube development contracts, May 21-24.

D. C. Worlton attended meeting of program committee at Argonne National Lab., Lemont, Ill. and discussed non-destructive testing devices at ORNL, Oak Ridge, Tenn. and Savannah River, Augusta, Ga., May 22-25.

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ORGANIZATION & PERSONNEL

	April 30	May 31
Administrative	2	2
Pile Engineering	101	100
Pile Materials	68	69
Fuel Technology	116	117
Physics Research	38	39
Metallurgy Research	84	82
Contact Engineering	3	4
Technical Administration	10	10
Totals	422	423

Pile Engineering: R. Neidner, Engineer II, transferred to Contact Engineering, May 1; A. H. Hegge, Engineer II, terminated, May 25; N. W. Cayey, Tech Grad, was transferred from weekly to monthly, May 1.

Pile Materials: D. R. Doman, Tech Grad, was transferred from weekly to monthly, May 1.

Metallurgy Research: L. C. Lemon, Engineer II, transferred in from Metal Preparations-Manufacturing, May 1; E. N. Kling, Engineering Assistant, was deactivated, May 7; W. B. Tolley, Engineer II, terminated, May 11.

Contact Engineering: R. Neidner, Engineer II, transferred in from Pile Engineering, May 1.

PILE ENGINEERING SUB-SECTION

PROCESS TECHNOLOGY

Power Level Limitations

Maximum power level at the B Pile has been limited by trip before instability limits between 99 C to 103 C. The C Pile has been limited by the 98 C arbitrary tube outlet limit and the DR and F Piles by the 100 C arbitrary limit. The D and H Piles have been limited by the 105 C tube outlet limit and the K Piles by tube power limits.

Process Specification Changes

None.

Pile Operation

Under the routine tube replacement program the following numbers of tubes were removed and replaced: D-37, DR-2, F-70, and H-38. In addition three tubes at B, two tubes at C, two tubes at D, eight tubes at DR, two tubes at F and two tubes at H were removed for examination by the Pile Coolant Studies Unit. Tubes were installed in these channels as well as in four channels at D, one at DR, eight at F and five at H that had been left empty from previous outages. One tube at B and one tube at KW which contained ruptures were removed and replaced. There were three tube leaks and 14 rear Van Stone leaks during the month compared to seven tube leaks and six rear Van Stone leaks last month. One tube leak occurred at each of the C, D, and H Piles. The rear Van Stone leaks were all at the F Pile. Also during the month 58 tubes were removed and replaced at the F Pile because of bad rear Van Stones. The bad rear Van Stones were found during the "O"-ring installation in February, 1955.

I and E Slugs

New thermocouple probes, to replace the ones damaged by moisture, have been installed downstream of two of the I & E columns at 105-C. Since their installation four of the eight thermocouples in the two probes have become faulty. The data from the operating thermocouples indicates that there has been no significant shift in heat distribution between the annulus and the bore. Temperatures as high as 130 C have been noted at the top of the annulus, presumably because of increasing film buildup which would increase eccentricity. Four tubes of I & E slugs and four tubes of regular metal control slugs have been charged at the C Pile for the "to rupture" portion of the current I & E test.

Ruptured Slugs

Eleven regular production ruptures occurred during the month. Lost time charged to rupture removal was 170.8 hours, amounting to 3.0 per cent lost time operated efficiency. The lost time-operated efficiency charged to rupture last month was 2.1 per cent. The single "to-rupture" test failure cost an additional 12 hours, or 0.2 per cent lost time-operated efficiency.

The month's rupture experience was characterized by:

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(1) A continued apparent declining overall rupture rate at the six older piles, due to correctives mentioned in the April report, principally goal exposure manipulation.

(2) Three ruptures at the KW Pile - all longitudinal splits. An analysis of the ruptures at KW failed to reveal an explanation for the failures. Information is insufficient to show whether these failures were representative of present fuel element performance under present K Pile operating conditions or whether they resulted from some abnormal factor. With three failures having occurred at KW, one or two failures might have been expected at KE by this time if no abnormal factors were involved. However, the fact that no failures have occurred at KE is not significant. An analysis of the in-pile loading at KW produced no evidence that canning lots of poor quality slugs were responsible for the failures. This possibility is being explored further by members of the Fuels Technology Sub-Section because of evidence that incompletely transformed material may have been processed.

Production Tests

(See following pages.)

HEAT TRANSFER

Instability Limits

Transient tests were run on the low pressure full scale mockup to study flow, temperatures, and pressures following plugging type flow reduction to a BDF process tube. The tests consisted of first reducing flow by simulated plugging and then, after a pre-set time delay, decreasing tube power comparable to a 300 to 400 ih shutdown. The most severe conditions studied were:

Case No.	Initial Tube Power kw	Initial Outlet Water Temperature °C	Per Cent Flow Reduction	Time Delay Before Power Reduction Sec.
1	500	124	80	6
2	500	138	60	6
3	500	138	80	4
4	1000	120	80	6
5	1000	138	40	6
6	1000	138	60	4
7	1000	138	80	2

In each case, a safe "shutdown" was effected. The maximum length of time delay between flow reduction and start of power decay was limited by the temperature at which the electrical insulation on the inside of the process tube breaks down. Failure of the insulation allows an arc to develop between the electrically heated tube and process tube and thus terminates testing. It is important to note that this limitation is inherent of the experimental equipment and is not necessarily one of the slug filled tube. The maximum temperature of the heater tube wall (simulated slug jacket) was about 465 C, which is well below the melting point of aluminum. Presumably, in actual pile operation, more severe conditions are

RUPTURED SLUG TABULATION

Failure Date	Tube No.	Lot No.	Type Metal	Exposure	Type Failure
4/28/56	1973-DR	K-190	8" Reg.	795	Split-transverse
4/29/56	3585-KW	K-226	8" Reg.	595	Split-longitudinal
5/5/56	1767-C	Z-110	8" Reg., Reprocessed	196	Split-longitudinal
5/5/56	1087-D	L-84	8" Reg. (53-MT)	792	Side-other
5/5/56	3777-B	D-78	8" Cored	840	Split-longitudinal
5/6/56	0986-KW	K-219	8" Reg.	668	Split-longitudinal
5/7/56	2168-C	K-228	8" Reg.	198	Side-HS
5/11/56	0990-KW	M-55	8" Reg.	753	Split-longitudinal
5/12/56	1877-H	M-78	8" Reg.	700	Cap
5/19/56	0986-B	D-15	8" Cored	604	Side-other
5/22/56	2587-H	K-289	8" Reg.	121	Side-other

Production Test Ruptures:

5/23/56	1372-D	N.A.	8" Solid (PT 601-A-53-MT)	564	N.A.

Legend:

N.A. - Information not available.
Side-RR - Failure caused by reduced rib height in the tube.
Side-HS - Failure caused by a hot spot.
Side-other - Failure probably caused by some mechanism other than RR or HS such as pin hole penetration or other unknown mechanism.
Cap - Failure caused by loss of cap.
Split-longitudinal - Lengthwise or diagonal split.
Split-transverse - Split normal to axis of slug.
Unclassified - Failure cause or mechanism unknown.

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PRODUCTION TESTS

Test No.	Type Metal	No. of Tubes	Pile	Goal Exposure	Present Exposure	Remarks
105-586-A	U-Si Ingots	1	B	900	Discharged at 1007 MWD/T	
	U-Si Ingots	4		2 ruptures		Not yet charged
	U-Si Cored	3		900		Not yet charged
	Control	4		2 ruptures		Not yet charged
105-588-A	Development Test of Extruded and Drilled Cored Slugs	2 tubes per mo.	1-C	900		Dis. 1 rupture at 797 MWD/T
			3-C	1100		Dis. at 750 MWD/T
			3-D	900	Discharged at 900	1 ruptured at 772 MWD/T 1 discharged at 788
			5-D	900	Discharged at 900	1 discharged at 807
			3-D	900		Dis. for tube replacement
			12-D	900	560-640	Charged 9/28/55. One dis. at 259 for tube replacement.
105-590-A	Extruded Cored	4	C	Ruptures	Not yet charged	Compares performance of extruded and drilled cored slugs.
105-591-A	Cored		All but C	800		Authorizes irradiation of production quantities of cored slugs.
105-593-A Supp. A	Cored-Al End Plugs	4	C	2 ruptures	1040-1125	All tubes discharged at about 1110. No failures.
	Control	4	C	2 ruptures		1 ruptured at 568 MWD/T; 1 ruptured at 786 MWD/T. Irradiation complete.
105-597-A	Mg-U Matrix	1	B or D	3000	Not yet loaded	2 Matrix slugs + 31 reg. slugs.
	4 slugs	1	B or D	6000	Not yet loaded	10 enriched matrix and 12 normal matrix slugs.
105-601-A-53-MT	Solid	12	D	6-600 6-900	550-575	Two tubes discharged at 240 MWD/T for tube replacement. One rupture at 550 MWD/T. Delay of 30, 43, 50 and 80 seconds between salt bath and water quench.

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105-608-A-56-MT	Dingot Slugs	16	B	7-600 9-900	555-600 590-640	Two tubes discharged at 600 goal. Compares various mechanical and heat treatments of dingot U.
105-608-A-56-MT Supp.	Dingot Slugs Controls	4 4	C C	Ruptures Ruptures	Not yet loaded	Compares performance of dingot and ingot uranium slugs.
105-610-A-60-MT	Vertically Heat Treated Uranium	10	DR	5-600 5-900	320-330 320-330	Rod heat treated in vertical position.
105-611-A	Reg. Produc.	33	19B 14C	500,900, 1100 500,800, 900	420-575 320-530	Investigates the effects of pile variables upon slug stability Charged 2/24/56
105-613-A-54-MT	Solid	20		4-400 8-600 8-900	Not yet loaded	Delays 35, 50 and 80 seconds between salt bath transformation and water quench. Heat treated in rod form.
105-615-A-63-MT	Lead Dip Canned I & E	8	C	150,300,500 and 2 rupts.	30,400-430 one dis. at 146. One dis. 305.	Provides basic information on I & E performance and conversion ratio. Four tubes of each type loaded 3/14/56. One I & E charge discharged and replaced at about 50 MWD/T. Four additional charges of each type loaded 5/17/56.
	Control	8	C	150,300,500	30,390-420 One dis. at 140, One dis. at 340.	
105-620-A-65-MT	Tru-Line		C	Normal Goal	Approved	Provides for the quantity charging of Tru-Line slugs.
105-621-A-67-MT	Anodized	12	10-D	600,800,MWD/T	100	To determine corrosion resistance and provides for the eventual charging of anodized slugs in quantity.
DT105-623-A	Regular		DR	Normal Goal		Provides for the hand seating of charges loaded on alternate outages. Investigates effect upon failure rates.

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tolerable without serious damage to the process tube components. All of the tests were made at constant front header pressures and the results do not necessarily apply for flow reductions caused by reductions in front header pressures.

In addition to the above series of tests, exploratory runs were made to study process characteristics following momentary flow reductions and power excursions. For the momentary plugging case, initial conditions were established at a tube power of 1000 kw and 120 C outlet water temperature. Flow was suddenly reduced by 20 per cent (to 80 per cent of initial flow). At time five seconds after the mechanical flow reduction, flow instability caused a further self induced reduction in flow to 40 per cent of the initial flow. Plugging was removed at this time, and normal flow was gradually restored, without need for reduction in tube power and in spite of lacking excess header pressure.

In the case of the power excursion run, the initial tube power was approximately 760 kw and the outlet water temperature 120 C. Tube power was increased in steps. At about 950 kw (25 per cent power increase), flow instability commenced. With tube power maintained at 950 kw instability was permitted to progress and a total of 33 seconds elapsed before flow became as low as 60 per cent of initial. Flow reduction appeared to be accelerating, hence power to the tube was cut off.

Because of the number of strip charts to be analyzed, complete analysis of the test results will not be available for some time. It is possible, however, to conclude that the results are indicative of considerable conservatism in previous theoretical analysis of transient behavior following flow loss to process tubes.

Hydraulics Studies

Testing of prototype CG-558 orifices is continuing. Early data indicate that the single orifice and the primary orifice of the dual orifice assembly are properly sized; additional work is required on the secondary orifice of the dual orifice assembly.

Laboratory studies of flow rates and pressures in clean process tube and fitting assemblies at near-term operating temperatures were made for C, K, present old pile, and post CG-558 old pile geometries. In conjunction with this, data were taken from H Pile following tube replacement before and during startup and at equilibrium; these data show that laboratory data are in good agreement with data for new tubes with new slugs in the pile. However, film formation and/or corrosion do alter tube characteristics significantly.

Cooling-by-Boiling Studies

A test was run on the high pressure mockup to determine heat transfer coefficients for (1) Reynolds numbers in the regions of one million and (2) a heated surface on which a film has formed. The first part of the test was accomplished and the results are being analyzed. An equipment breakdown terminated the second part of the test and it will be completed later.

The apparatus was shutdown the rest of the month for modification and to allow operation of the low pressure facility. Equipment additions include a low range Potter flowmeter, an air operated control valve for low flows, and two temperature recorders. Insulation of approximately one-half of the piping was completed.

Two days of maintenance time were lost when heavy rains flooded the trench containing much of the equipment. The flood was caused by the inability of the sump pump to handle the roof run-off which drains into the trench.

Shutdown Water Flow Studies

On May 9 a lightening storm caused damage to the #5 transformer supplying power to two hi-lift pumps. This caused two other transformers to drop out of service, through protective relays, and 8 of 14 pumps supplying flow to the D Pile were de-energized.

An investigation of the reactor water temperature and flow recorders showed a 10 per cent reduction in flow and a rapid decrease in outlet water temperature.

There was no indication on any instrument of the expected 3 per cent increase in outlet water temperature during the scram transient. This can be explained on the basis that the #5 transformer failed 1 - 3 seconds before the other two transformers dropped out; thus, the reactor scrammed at the same time as the significant flow decrease rather than two seconds later.

Therefore, there is no reason to suspect the currently accepted HPA temperature transient is not correct. Direct measurement of this effect, however, is desirable.

Analytical Services

The effect of a poison spline on the temperature distribution of the adjacent slug has been calculated on the electrical analog computer. These calculations show that the temperature distribution within the slug is not appreciably affected for the special case where ambient water temperature and heat transfer coefficient are uniform around the slug periphery. These results are rather surprising and if correct means that slug temperature variation due to significant flux perturbations are not great. Therefore, the method of solution is to be re-examined.

Special Studies

Flow tests were run on CG-482 "DR type" pigtails in a B, D, DR and F assembly and on the proposed old pile zone temperature monitor adapter and special rear pigtail. The results of both tests indicated the flow resistance characteristics of the special pigtails to be essentially identical to the present old pile pigtails.

Calculations of flow rates, pressure drop, fuel element temperatures, and allowable fuel element dimensions were made in support of the first reactor type proposal for the GRE.

Production Test 105-615-A-63-MT

The irradiation of I & E slugs under PT 105-615-A-63-MT continued satisfactorily during the month. Tube 0878 was discharged at 300 MWD/T goal exposure. Four tubes were charged with 22 I & E slugs apiece for run to rupture in two tubes. These tubes were equipped with hole and annulus outlet temperature probes. Heat distribution between hole and annulus checks the calculated values closely. On

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the four new I & E tubes, the top center annulus temperature rise is 6 to 54 per cent greater than the rise in the between-the-ribs channels. The same effect has been noted on other I & E tubes.

PILE PHYSICS

HCR Calibrations - Transient Data Analysis

The two parts of the supplementary control rod calibration test to verify the recent unexpectedly large DR calibration are still awaiting suitable outages. A test has been written in rough draft form which would authorize a rod calibration at the 15-rod H Pile similar to the 9-rod DR test where results are applicable also to the B, D, and F Piles.

An extensive analysis of shutdown transient data from twenty F Pile outages during the past year indicates that it would have been possible to make startup predictions as accurately or more so using the new rod calibrations. These results are promising in that use of the new calibrations should help to prevent excessively fast startup periods during incremental rod withdrawals. In general, the correction to be applied to the calculated xenon change is in the same direction and of similar magnitude to the xenon transient discrepancy observed at DR. The changes in graphite coefficient with pile residual obtained from the F Pile study would agree roughly with the H Pile outage data provided that the new stronger calibrations were assumed for the applicable H Pile rod increments.

Safety System Capacity Studies

The flux matching calculation method used in analyzing the KE control system tests has been applied to the older piles for a variety of high reactivity conditions. Curves relating allowable enrichment to dry lattice natural uranium bucklings have been prepared over a range of bucklings and enrichment locations. The method is sufficiently general that a substitution of "best" values for temperature coefficients may be accomplished at a later date. These curves may then be used as the basis for preparing enrichment limits and control capacity requirements.

A second case of the variational solution was obtained from the IBM 702 computer during the month. Region of control bucklings were approximately 5 per cent different from the first case, fair agreement but somewhat disappointing. Three more cases are scheduled for computation in evaluating this method.

E-Metal Testing

Test plans for use of the imminently due 3.1 tons of 0.94 U-235% "E" metal are being coordinated with the Physics Development and the Process Technology Units. In addition to a 16-tube block for E-N conversion and heat generation data, a test is being devised for supporting fringe poison with E metal. Attempts will be made to secure some additional E metal to insure an adequate evaluation of the economics of this shield protection method and to obtain a minimum of operating experience in the substitution of E metal for U-235-Al alloy "C" slugs.

New Pile Studies

Several drawing of proposed J-pile safety system components were reviewed and appropriate comments forwarded during the month. The interspersal of 50 vertical

safety rods and 55 ball 3X units in triangular arrays appears to provide a substantial improvement over the existing K's.

A short calculation of heat generation rates in Li-Al slugs to be loaded in an Equipment Development Unit design for J-reactor rods indicated direct water cooling of the slugs to be essential.

A representative of the Pile Physics Unit participated in the Pile Engineer task group reviewing past reactor proposals and evolving short term research and development objectives.

Temperature Coefficient Measurements

Temperature weightings for the Brookhaven dry lattice graphite coefficient test have been completed, and a preliminary value of -0.7 ih/°C at 400 MWD/T exposure was obtained. However, the data indicated a very sharp reversal above 160-180 C, an illogical observation noted also by Hendrie of BNL in his analysis of the same data. An attempt is being made to resolve whether the result is real or caused by some overlooked event during the experiment.

Rapid progress is being made in obtaining flux and temperature weightings for the KE graphite coefficient measurements as a function of exposure.

Product Yield and Quality Studies

A paper was given during the month at the Washington, D.C. meeting of the A.E.C. Division of Nuclear Materials Management by R. O. Gumprecht entitled "Calculation of Discharge Concentrations in the Hanford Reactors".

Reactor Safety Studies

An outline has been prepared for a summary report of the effects of Project CG-558 on nuclear safety at Hanford. Work assignments have been discussed with other Pile Engineering Units and with Radiological Sciences, a tentative schedule has been established, and a comprehensive literature survey is under way.

Weekly observations of Lattice Test Reactor operations during the month made in carrying out assigned audit responsibilities indicated compliance with established safety procedures.

Attenuation Measurements

Water tank integrator measurements made recently in the KE inner rod room indicate that it should be feasible to reduce near side shield density or thickness in future reactor construction. Although the integrator was not sufficiently large in view of the high neutron background observed, results indicated neutron leakage rates through imperforate sections of shield to be very much less than 1 mrem per hour, whereas leakage from shield openings cause background readings near the face of the pile in the range of 10 - 100 mrem/hr; the general purpose test facility openings appear to be the chief offenders in this regard due to their relatively short shielding plugs.

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Attenuation measurements of iron-limonite concrete heated to 320 C have been completed and calculated, magnetite-limonite concrete slabs heated to 320 C are currently under irradiation for their second run of attenuation measurements, and magnetite concrete slabs are presently being heated at 100 C preparatory to attenuation traverses.

Reducing Side Shield Temperatures by Fringe Poisoning

Supplement A to PT 105-604-A aimed at bettering the economics of shield protection was issued during the month, and arrangements have been made to begin this test at the next H Pile outage. This supplement provides for centering shortened charges with natural uranium slugs in each tube in the far side fringe pattern at the H Pile in place of the present longer charges centered with aluminum pieces in alternate tubes.

Arrangements have been made to use the B test hole at the DR Pile for thermocouple installations and the D test hole for flux traverses for the proposed E Slug-Fringe Poison test discussed in a previous section of this report.

Neutron Dosimetry

A moderated counter similar to that developed by J. DePangher of Radiological Sciences has been built and calibrated at the sigma pile. The sensitivity of this particular counter is approximately 16,500 cpm per mrad/hour. Tests using different size BF_3 counter tubes indicate that the range of sensitivity might be extended from 0.1 mrem up to 60 rem per hour. The initial 1.4 inch tube has a sensitivity range from 0.1 mrem up to 200 mrem per hour. The use of this instrument will help considerably in supplementing the simulated masonite burnout test data where dose rates had to be estimated on the basis of a calculated neutron energy spectrum.

Shield Neutron Spectrum Studies

Information on the iron cross section from H. W. Newson at Duke University indicates the 25 kev dip to be worse than anticipated. The 0.2 barn anti-resonance cross section which he measured backs up previous ideas that these neutrons in the 25 kev range would predominate in leakage from "burned out" shields. A rough age theory calculation will be made on the basis of this information to approximate the leakage spectrum.

Tests on photographic fading techniques to eliminate alpha background from fission catcher emulsions have continued, and proton recoil emulsions have been exposed to neutrons and gammas to determine gamma background fog effects. Work on fast fission counter and neutron spectrometer techniques can go ahead now that the neutron dosimeter has been fabricated and calibrated.

PHYSICS DEVELOPMENT

Gamma Spectrometer Installations

The gamma spectrometer slug rupture detection systems at the five older piles detected eight ruptures during the month. The two detected at E Pile were quickly removed and scram recovery affected; the remaining six were stuck. The B Pile installation is still unsatisfactory as a result of choices in plumbing which lead to flow irregularities.

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Experiments with water cooled spectrometer heads (photomultipliers and crystal assemblies) have demonstrated that improved gain stability during pile startups can be achieved economically; as a result, water-cooled heads are being installed on the spectrometers at all areas. Experiments are being performed to evaluate the magnitude of changes in gain with age while operating the photomultiplier at a given current output level. It appears that fatigue of this type is important and is a function of specific tubes, i.e., can be rendered unimportant by selective testing of photomultipliers.

Rupture Detector Development

Some progress was made in the installation of a phototype "gamma-scan" system at C Pile to determine the effectiveness of a remotely operated system in isolating the tube containing a rupture. The electronic components have been installed as have much of the auxiliary electrical and mechanical systems. The gammascan system itself is scheduled to be installed on the rear elevator next month.

A cooperative program with Operations and Radiation Monitoring Unit to facilitate the development and utilization of more sensitive portable instruments to unambiguously identify tubes containing ruptures; over the past year about three per cent of the rupture containing tubes were not properly identified and this percentage will increase with higher power levels and more sensitive primary systems. Instruments with advanced design - the "pogo-stick" using an overvoltaged geiger-muller tube, and the bazooka II using either a geiger-muller tube or scintillating crystal in a collimating shield, have been given to the field for testing. Development of a portable system with gamma energy discrimination properties as well as directional sensitivity is being initiated.

Rupture detection systems are being developed for the fuel testing facilities being installed in the K Piles. These systems will consist of a scintillating crystal gamma spectrometer primary system and a geiger-muller tube secondary system.

Reactor Safety - Nuclear Instrumentation

The installation of the prototype sub-critical neutron multiplication detector in the A test facility at D Pile was deferred to early next month. In the meantime development activity directed toward refining the electronics has continued. An alternate logarithmic counting rate circuit based on silicon diodes was developed as was an improved preamplifier which yields improved performance with fewer components. A method of eliminating most of the electrical noise resulting from the electrical motor to position the fission chamber was also developed.

A critical review of present Hanford safety circuits and projected modifications has begun. Emphasis is being placed on the review of the selection of components for critical operations, the possibility of simplification, and the requirement for procedural interlocks.

The process tube ionization chambers for the B, D, and F Pile octant systems have been fabricated and are undergoing laboratory tests. The in-pile test of these chambers is scheduled to begin at F Pile next month.

Lattice Neutron Economy

The experimental techniques required to determine the lattice constants in lattices containing fuel clusters and/or internally-externally cooled slugs have been developed and some preliminary measurements completed. The fast effect, ε, was tentatively measured to be 1.0156 for 0.5 inch diameter uranium rods which compares with values ranging from 1.012 to 0.015 as calculated by several theoretical methods. Two independent measurements agree that ε for a five rod cluster in a 2.25 inch I.D. water filled process tube is 1.015 ± 0.0005; hence, the value of ε for the loosely packed cluster appears to be essentially that for an isolated rod. Some further calibration of detectors is required before this result can be considered firm - a theoretical analysis predicts ε should increase to 1.0175 when the five rods are irradiated in a cluster geometry.

A complete set of components for experiments in the prototype Physical Constants Test Reactor have now been fabricated. These will permit the following experiments to begin next month:

a. The determination of multiplication and lattice constants for loosely and tightly packed cluster fuel element lattices.
b. The determination of multiplication and lattice constants for internally-externally cooled slugs and cored slugs appropriate to both the 2.1 and 2.25 inch I.D. process tubes. Both the lattice spacing and fuel element dimensions can be varied in these experiments.

Measurements of the distribution of fission products in irradiated slugs have continued in an attempt to (1) isolate the theoretical model which best describes the neutron distribution in a "hot" pile, and (2) to crudely isolate an effective "thermal" neutron temperature. The data have been corrected for the effect of fast fission and the distributions agree quite well with the results of P_3 calculations performed using elevated neutron temperature cross sections. These results are:

Wafer No.	Graphite Temp.(°C)	Ave. Water Temp.(°C)	Eff. Temp. P_3 (°C)
7	308	80	375
19	360	78	400
96	468	46	375

While these data and the methods of analysis are not ideal for neutron temperature determinations they are among the first directly available on this important subject, and do give weight to the formulation of more refined methods and theoretical interpretations.

Measurements were made of the power generation rates to be expected for uranium in the K Pile fuel testing facility using a mockup of the facility in the Test Pile. Natural uranium is expected to deliver about 95 per cent of the power it would deliver in a normal process tube loading.

Analog Computer

The final specifications for the computer were submitted to the Atomic Energy Commission early this month and invitations to bid were issued. The opening of bids is scheduled for May 31. Auxiliary equipment is arriving on plant as scheduled.

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Nuclear Safety Project

Two of the three scheduled North American Aviation safety fuse tests have now been charged in DR Pile by Special Irradiations. The first did not function properly (thermocouple failure) and was discharged without gaining information. The second functioned properly but the design was in error; the relationship between temperature in the solder plug which contains the high pressure boron tri-fluoride and adjacent tube power was in error by a factor of two. Hence, the fuse was tripped at about half pile power.

The future program calls for an analysis by North American of the factors entering into the design, in particular the basis for computing the U-235 content of the fission heater surrounding the solder plug and the thermal resistance in the assembly. It is quite likely that additional tests will be required and North American is requesting funds for these from the Reactor Development Division of AEC.

Triggering of the fuse element was not observable on any of the DR Pile instrumentation.

Test Pile - Routine Tests

The testing of uranium slugs proceeded routinely. Thirty-nine Fernald billet egg lots yielded TDS values ranging from 13 to 20. Ten Mallinckrodt billet egg lots yielded TDS values ranging from 13 to 18.

MECHANICAL EQUIPMENT DEVELOPMENT

Special Studies and Reports

Advanced Reactor Concept Study was completed through its initial phases with the following objectives:

1. Summarize and critically evaluate concepts previously proposed at HAPO.
2. Make preliminary feasibility analysis of certain specific proposals.
3. To channel efforts of future studies in direction most promising with respect to future HAPO Reactors.
4. To broaden the experience and understanding of the participants in the problems of advanced reactor technology. Results have been presented to Pile Engineering supervision.

Disaster Studies - Arrangements were made with Radiological Engineering Section to undertake a cooperative program of laboratory experiments on release of F.P. from irradiated uranium. Results of these experiments will be useful in design of mockup facilities to determine rate of fission product release in the case of an un-cooled sub-critical pile catastrophe condition.

BF_3 Reactor Safety Device - Four additional tests have indicated that reactivity change is more a function of the temperature of the graphite bar rather than time of exposure. Extrapolation of these single-block tests to full scale indicates that at 1000 C graphite temperature, about 3000 additional inhours control could be obtained by injecting BF_3 gas into the reactor gas system.

New Processes, Methods and Prototype Equipment

Tritium-Producing Control Rods - Final drawings are in preparation with the following advantages apparent for this proposal:

1. Useful product from neutrons absorbed in pile control.
2. Charge-discharge of control rod during operation, 15-18 month exposure period, minimum radiation exposure to personnel.
3. Considerable inherent flexibility, as configuration can be changed to suit operating requirements, and only 35 per cent of the rods need be specifically constructed to realize the major advantages.

A Slug Can Thickness Measuring Device, which depends on the difference in penetration when an indentor point passes through the can wall into the bond and metal underneath, shows promise. Effects of penetrator geometry are now being studied.

Holding Magnet and Air Seal for Air Accelerated VSR. Material for magnet core has arrived and the magnet is being fabricated in 200-W shops.

High Pressure - High Temperature Loop. Work is to be resumed on a revised schedule because of the Minor Construction labor difficulties.

Flanging of Zircalloy Tubes. The power driven Van Stone rolling tool is now 70 per cent complete, and the broken hand-powered rolling tools for the KER tubes have been replaced. A protective envelop for the induction annealing of KER tubing is also being fabricated.

Ball 3X Components from Powdered Metal. The press has been completed and a preliminary test indicates that spherical shapes can be pressed. Various powder combinations are now being pressed into test bar coupons for further evaluation.

Sub-Critical Monitor - Mark III is ready for installation in "A" test hole in 105-D as soon as the instrument chamber is received.

Graphite Miner is ready for further testing with a new chain drive.

Flush Discharge Equipment (Design test). The new pumps are installed except for switchgear which should arrive around June 15.

Enlarged Process Tubes were proposed for 20 channels in a BDF pile for an advanced design of fuel element. A report was issued and Dwg. AT-1002 illustrates the work required.

Poison Splines have been successfully inserted and withdrawn from 105-DR at full flow and pressure, but otherwise under shutdown conditions. Panellit pressure increased 21 psi on insertion. The chopper was successful, but a larger cask will be necessary.

The second phase of the test made after turnaround included a thermocouple spline which was inserted only 1/3 of the way under the charge. No difficulties or unexpected radiation problems were encountered. Since the pile was not at equilibrium, it was impossible to observe the inhour change.

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Fuel Elements and Slug Handling

Ribbed Slugs are to be tested for flow behavior in a smooth tube in 189-D. Special modified nozzles and a new charging trough are being fabricated, and the slugs will be ready in the near future. Preliminary cost studies are being made on the basis of a pile conversion to the ribless tubes.

Automatic Slug Sorting in Basin. The scope layout and flow drawing for 105-C is complete and circulating for comments.

Slug Cocking Experiments have shown that nozzle positioning is very critical. Misaligned nozzles invariably cause cocking which persists as long as charging force is maintained. The present aligning bars do not contact the top of the tube, and therefore considerable misalignment is still possible. Design of a bar with a retractable top pad is being considered.

Pile Component Tests

Flexible Connectors. Development test is in preparation for Barco joints at 105-C for check on irradiation and chemical deterioration of gasket.

Vee-Band Nozzles. Preliminary tests indicate that under ideal conditions an adequate seal is possible up to 600 psi with only 10 lb. ft. torque on the clamp bolt.

Process Tubing Creep Tests previously planned for 1706 KER mockup will have to be rescheduled where better control over test conditions is possible. Improved strain gages and new types of cements are being investigated further.

Equipment and Techniques for Dealing with Special Maintenance Problems

The Rubber Boot for Gun Barrel Bellows Repair has encountered a little difficulty in some of the rear locations at 105-F where the graphite distortion has tipped the gunbarrel downward until it barely clears the header below it. In these cases it seems desirable to remove the can from the bellows to provide more room, and perhaps to fabricate a thinner bellows. This possibility is being followed closely.

SPECIAL IRRADIATIONS

KAPL-120 Loop

Operation of the KAPL-120 loop was normal until May 28. On that date the generator in the loop power supply system burned out a bearing; this mishap required that the loop be shut down. Five test sections in the loop scheduled for discharge the first week in June were discharged May 29th and the loop was put on process water. One test section consisting of fuel elements for KAPL remains in the loop.

A tentative schedule has been set up calling for the loop to be operated on process water all of the coming month to permit the repair of the generator. The feasibility of placing the pumps of the loop in series is being reviewed in light of this change in the operating schedule.

A major effort has been expended in making improvements and additions to the loop. The additions consist of:

1. Provisions for taking samples from the top of the surge tank.
2. Equipment for the operation of both hot and cold crud cells.
3. Piping, valves, etc., for the operation of a hydroclone.

These installations are scheduled for completion in the month of June.

Calculations to determine the specific power generation of a 19 ribbon SAR fuel element assembly at one of the KER loops has been made. For 30 inch elements and an adjacent tube power of 1000 kilowatts, the power generation was estimated to be 68 kilowatts ± 35 per cent.

In-Pile Irradiations

At the request of the Army Reactors Branch of the AEC, 305 Pile tests to determine perturbed fluxes in the proposed Army Gas Loop in one of the HAPO piles have been programmed. The Army Reactors Branch has advised that the decision on putting the gas loop at HAPO has been postponed.

Two experimental assemblies for studying the in-pile reaction between zirconium and pile gas impurities (HAPO-105) continue to operate at F Pile. Two new assemblies for additional studies are close to completion.

An additional sample of poison spline material (HAPO-155) was irradiated in the "Quickie" Facility at F Pile. The decay has been followed since shortly after discharge. Attempts are being made to study changes in the gamma spectrum by noting attenuation by various thicknesses of lead at periodic intervals.

Four additional assemblies for monitoring the temperature of the outlet water of the I & E slugs (APO-159) were charged into C Pile on May 17. Additional assemblies are being prepared for monitoring future charges of I & E slugs and for monitoring the outlet coolant temperatures of regular slugs.

Two experimental assemblies in support of the NAA safety fuse development have been charged into DR Pile. The failure of all thermocouples in the first assembly charged April 27 resulted in no information being obtained from it. In a second assembly charged May 11 it was necessary to fire the fuse at a power level much lower than planned. Preliminary interpretation of the data from this irradiation indicated that the U-235 content in the fuse was too high.

Prepost experiments charged and/or discharged during the month of May are as follows:

1. Ten samples of uranium bond tensile specimens (HAPO-165) were discharged and twelve samples of the same type were charged.
2. Two samples of effluent residue were charged in the "Quickie" Facility at F Pile to assist in determining the radioactive materials present in the process effluent water.
3. A sample of ruthenium oxide was irradiated to provide a radioactive source for the Radiological Science Department.

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The preparation of equipment in support of fuel element irradiations in the front to rear test holes of the K Piles (HAPO-174) continues. Flow studies to determine flow past the fuel elements and in the annulus around the test sections have been made. Tests have also been run to determine the proper orifice size to give a range of flows which will permit the detection of small flow reductions by distortions in the fuel elements.

Gamma Studies

Fabrication of 40 slugs obtaining cobalt for gamma facilities have been completed. These slugs will be charged into F Pile at the next outage.

One hundred-seventy samples were charged into the gamma facilities during the month of May. Samples discharged totaled 191. The majority of this work was in support of the testing of plastics and rubber materials (HAPO-171).

Improvements and refinements in the gamma ray spectrometer have been made. A manual for the operation of this equipment has been prepared.

A gamma activity traverse was made in the core tube of a purex waste tank in the 200-[illegible]ea. A maximum activity of 3×10^4 r/hr was observed at the bottom of the tank. Over a distance of 18 feet from the bottom of the tank this activity decreased in an approximately exponential manner to 6×10^3 r/hr. Above the 18 foot level, the drop off in activity was much more rapid.

Facilities

Fabrication was begun on the slug buckets and sample tubes for the large gamma facility for the Wright Air Development Center. Preparations are in progress to install this facility in the weasel pit at the 105-KE Building upon completion of the fabrication. July 1 has been set as a target date for beginning irradiations.

Efforts to achieve satisfactory operation of the heat exchangers in the test hole water systems at the K Piles have continued. Tests performed during the month showed that the valves previously thought to be oversized were appropriate for the job. It now appears that the cause of the over-controlling is excessive stem friction in the valves.

Preliminary work in support of the removal of the D test hole at F Pile has been performed. The removal is scheduled for the month of June.

Borescoping and Vertical Height Measurements

Vertical height measurements were made on three pile tubes during the month. Changes in the height of the graphite stack since April 24, 1956, on tube 4674-D taken from the front are summarized as follows:

Position (From Front Van Stone)	Change in Elevation
8'	-0.02"
10'	-0.03"
20'	-0.05"

Traverses on tube 4456 and 4492 both in DR Pile were the initial traverses in those tubes.

Tube 3882-D was borescoped to determine if the process channel contained any mandrel parts lost during the tube removal. Although no mandrel parts were found, the graphite in the channel from 16 feet to 27 feet in from the front Van Stone was badly broken and cracked.

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PILE MATERIALS SUB-SECTION

GRAPHITE AND MATERIALS DEVELOPMENT

Alternate Pile Atmosphere Study - PT 105-535-E, Supplement C

Experimental assemblies were charged into empty process tubes 0776-H and 1982-H on December 10, 1955, to determine if water-saturated nitrogen and water-saturated helium effect comparable corrosion to aluminum and iron foils and thus whether nitrogen plays an active or passive role in the corrosion mechanism. To insure realistic results, the foils were fastened to an aluminum tube through which the pile cooling water passed and which was surrounded by hollow graphite cylinders. The graphite cylinders remained at the ambient pile temperature. The gas of interest was passed through the annular space between the aluminum cooling tube and the graphite cylinders at a flow rate of about 4 cu.cm./minute or a linear rate of about one cm./min. On May 6, the assemblies were discharged after an effective exposure period of 101 operating days.

The resulting foil weight changes indicate that both nitrogen and helium acted only as chemically inert carriers for the water vapor. Maximum corrosion rates occurred in the front fringe where water vapor concentrations were a maximum. The maximum rate for an aluminum foil exposed to water-saturated nitrogen was 0.02 mil/operating year while the maximum rate for an aluminum foil exposed to water-saturated helium was 0.10 mil/operating year. Weight changes of the iron foils positioned in the front fringe were not conducive to rate calculations as a result of the flaky nature of the oxide and the fragility of the foils. In both facilities, corrosion rates decreased rapidly to insignificant values downstream from the maxima because, with increasing graphite temperatures and radiation intensity, the water vapor reacted primarily with the hot graphite to form carbon monoxide. Subsequent decomposition of the carbon monoxide resulted in the formation of carbon suboxide polymers which coated the foils and partially protected them from oxidation. In general, it can be concluded that the use of nitrogen in the pile gas atmosphere will not increase the rate of corrosion of metallic components of the pile structure even though large water leaks might exist.

Pile Disaster Poisoning System

Four graphite bars were treated with BF_3 gas in the furnace at 189-D at new operating temperatures and time periods. Purity tests were made in the 305 test pile for determining the quantity of boron retained. Four runs of two hours each at temperatures 600 C, 800 C, 1000 C, and 1150 C indicate increasing deposition of boron with temperature by factors of 2, 9, and 12 based on the 600 C run. The last two runs afford boron deposition in the desired quantity for pile disaster conditions. Four runs at 600 C for 2, 4, 6 and 10 hours indicate no increase of boron deposition after four hours.

Five virgin bars have been prepared and tested for initial purity in the 305 Pile. BF_3 runs will be made to determine saturation time at 800 C and 1000 C plus one run for determining the effect of CO_2 in the system.

Stored Energy

Twenty graphite samples representing four different cold test hole exposures were shipped to the National Bureau of Standards for heat of combustion analysis. Before shipment these samples were measured by X-ray and exposed for three hours at each of three different temperatures in a vacuum furnace. This thermal annealing represents the first precision high temperature annealing on graphite and was conducted at 800 C, 1300 C, and 1800 C. The sample exposures were 575 MD/CT, 953 MD/CT, 2023 MD/CT, and 4965 MD/CT.

Although complete interpretation of the data have not been made, annealing toward original characteristics was found in C_o, L_a and L_c. After 1800 C annealing, least improvement was noted in L_a measurement while C_o and L_c approached pre-irradiation values.

The 1800 C annealing was split into two parts, the first for 40 minutes and the second for two hours and ten minutes. After the second annealing, the samples were further from their original properties than after the first. This effect has been noticed on electrical resistivity annealing by Riley, but this is the first on X-ray properties. More work in this temperature region is planned.

Ambient Pile Temperature Irradiation Facility

The fourth graphite sample boat was discharged from the Y-test hole at 105-C. Greater high temperature exposure, 913 MD/AT, of the Battelle Texas-coke, varied-temperature-of-graphitization series confirms the data from the previous 648 MD/AT exposure. Maximum stability of physical distortion occurred with a graphitization temperature of 2500 C. Contraction increased with decreasing graphitization temperature below 2500 C to -0.46 per cent for the 1370 C material. A slight expansion, 0.01 per cent to 0.02 per cent continued for the materials with graphitization 2500 C to 2700 C. Some expansion has been observed up to 1600 MD/AT prior to contraction for CSF graphite irradiated under the same conditions. Irradiation of this series will continue in order to determine longer exposure effects.

Highly-Impregnated Graphites

Physical distortion and crystallite structure measurements were made on the Brookhaven highly-impregnated graphite samples after 2130 MD/AT at 470 C. No significant change occurred in physical size or A_o and only minor changes were noted in C_o and L_c. Weight loss was greater than expected and L_a appeared erratic. Detailed information is presented in HW-43010.

Strength of Materials

Compression testing of an H-Pile type graphite trunnion block positioned between two tube block sections has shown that fracturing occurs both around the outside of the trunnion block lip and through the lip to the tube bore. No fractures were observed in the tube block sections.

Before compression 20 mil gaps existed between the end surfaces of the tube blocks and the trunnion block shoulders causing the initial load to be born only by the trunnion block lip. In a plot of deformation versus load, the curve flattens considerably after 1200 pounds indicating that above this point the load was born by both the end of the lip and the shoulder of the trunnion block. It is felt that

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in the case of graphites "stiffened" by irradiation, where rupture occurs with less deformation, the lip would fracture before the 20 mil gaps were closed.

The trunnion ruptured under a load of 56,400 pounds or 5860 psi on an area including the end of the lip and the shoulder of the trunnion block. If a stress of 5860 psi were applied to the area on the end of the lip alone it is calculated that rupture would occur under a load of 19,280 pounds.

SR-4 strain gauges placed inside the trunnion block lip indicated a maximum compression of 0.019 in/in. parallel to the axis of the tube bore and 0.0015 in./in. around its circumference or a reduction of the tube bore diameter from 1.750 in. to 1.747 in. Minimum tube bore diameter after completion of the test was 1.740 in. at the point where rupture occurred.

Physical Properties Studies

Routine X-ray parameter measurements were made on ninety-six graphite samples which included TSGBF graphite being prepared for irradiation in the GEH-9 experiment, high density impregnated graphite irradiated in a hot test hole for Brookhaven National Laboratories, a high temperature annealing series, and samples from a graphite piston used in a separations pulse column. Thermal conductivity measurements were also taken for the Brookhaven samples using the Mark II apparatus with a recirculating cooling system recently installed to eliminate flow fluctuations due to entrapped air.

Radiation Damage to Plastic Materials

Samples of about forty different plastics and elastomers are being evaluated for reactor use by: (1) immersion in boiling water, (2) immersion in 145 C water at 60 psi, (3) heat aging in 145 C air, (4) irradiation in the 105-F gamma pits at 15 C. About half of these tests will be completed in June. Equipment for high temperature gamma irradiations will be installed and operated during June. A report has been issued covering the preliminary evaluation of these material.

Five materials have been irradiated in the cobalt-60 source in 325 Building. Results will be compared with similar data from the 105-F gamma pit to determine the effect on elastomer properties of varying the incident gamma intensity.

PILE GRAPHITE STUDIES

Pile Distortion

Recent vertical height traverses taken at the old piles have continued to show a contraction of the enter zone graphite and some indication of expansion in the fringe. The first twelve feet of a number of process tubes at F Pile were probed by Reactor Operations Engineering Unit on shutdown of May 21. Most tubes would pass a probe one to two inches shorter than in October, 1955. One tube, 4091-F, passed an eleven inch probe before replacement and a fourteen inch probe after replacement. This would indicate that tube replacement may provide a temporary relief from restrictive tube curvature. Additional measurements are planned for the next outage. In view of the restrictive trends in tube curvature, Process Standards now detail the charging pattern for restrictive regions of the pile. In brief, if a tube will pass a ten inch probe the charge will be 32 eight inch

slugs; for 9-10 inch probe, the charge is 30 eight inch slugs downstream and four inch slugs upstream; for 8-9 inch probe, the charge is 64 four inch slugs.

PT 105-566-E, Graphite Oxidation in CO_2 - Helium Mixtures

This production test, now being circulated for approval, authorizes exposure of graphite samples in channel 2773-C and the "follower furnace" to determine oxidation rates with high helium content in the pile gas. The pile would be operated under Process Specifications at about 500 C and 50 to 80 per cent helium. Twelve tubes surrounding channel 2773-C would be loaded with J-N or J-Q columns to raise temperature in that channel to 580 to 600 C. Duration of the test is expected to be approximately one year.

Irradiation of Sheathed Thermocouples in Channel 2182-D

A special half-length thermocouple stringer was charged in channel 2182-D on May 24, replacing an unused experimental stringer. The new stringer contains five 25 gage chromel-alumel couples with stainless steel sheath and magnesium oxide insulation, five 20 gage chromel-alumel couples with asbestos insulation, and five 20 gage iron-constantan couples with asbestos insulation. These are located in five positions, each position having one couple of each type spaced about one inch apart. All couples are recorded continuously. Operation for the first three days indicates no significant difference in readings or transient response time among the couples.

The test of a modified Beckman oxygen analyzer has been completed and the results indicate that this type of instrument is satisfactory for continuous indication of oxygen concentration in the pile gas. The instrument was thoroughly tested with tank carbon dioxide and helium for two months in the laboratory followed by four months of operation at 105-DR and 105-C. The instrument has two ranges 0-0.2 per cent and 0-1 per cent with the results continually recorded as per cent oxygen on a Brown strip-chart recorder. An oxygen analyzer working on the principle of a Galvanic cell has been described in HW-40418 and operated concurrently with the Beckman model at 105-C. Although laboratory tests indicated that the cell had the necessary sensitivity and range, the calibration continually changed during the pile test, making the instrument unsatisfactory for pile use. Further development of the cell analyzer could possibly result in an instrument suitable for pile use. The initial cost of a Galvanic cell analyzer would be less than the Beckman analyzers, but maintenance and calibration costs of the cell appear to be considerably more. The results and details of this work are being collected and a report will be issued in the near future.

PILE COOLANT STUDIES

Production Tests

The Zircaloy-2 process tube being exposed under PT 105-555-E in channel 3586-D operated satisfactorily during the month. The weighed regular metal in this tube is the second charge to be exposed under this Production Test. The first charge is scheduled to be examined and weighed in June.

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Operation was satisfactory under PT 105-554-E, the half pile test of pH 7.0 process water at F Reactor. Visual examination of two unweighed charges of slugs which had been exposed to pH 7.0 water revealed no evidence of localized corrosion attack. Three weighed and numbered charges are awaiting weighing and correlation of the data. The effluent activity on the far side of F Reactor (pH 7.0) has been higher than the near side (pH 7.65) by a factor of 1.2 to 1.4 since January. The rare earth, arsenic, and zirconium activities have been higher, but there has been very little difference in the manganese activity.

The half pile test of Separan 2610, a synthetic coagulation aid, at DR Reactor authorized by PT 105-563-E, has been running very smoothly. The alum concentration has been the same for both halves of the water plant. Separan concentration on the far side has been 0.03 ppm. while activated silica concentration has been 4 ppm. on the near side. One settling basin and one filter have been taken out of service on the Separan side to give settling time and filter rates comparable to post CG-558 conditions. A serious in-pile film buildup which almost scrammed the reactor was experienced on the near side which was furnished water treated with activated silica. During this period the Separan side of the pile had no film buildup.

Process Specification Change

Reactor Cooling Water Treatment Specification 4.00 (pH adjustment) was relaxed for an additional period of one month at 100-H, 100-B, and 100-C Areas to permit adjustment of the process water pH in the range 6.9 to 7.2. The purpose of these relaxations is to reduce the rate of uniform corrosion attack on aluminum process tubes to help extend the operating life of tubes.

Process Specification 4.00 was relaxed at 100-KE and 100-KW Areas for a 30 day period to permit adjustment of the process water pH in the range of 7.1 to 7.4. This relaxation was granted at the request of Reactor Section because the seasonal low pH (8.1) of the Columbia River water coupled with a current need for high chlorine dosages was resulting in a process water pH just below the minimum of 7.2.

Pile Process Tubes

Thirty-four process tubes were examined during the month. No unusual type of attack was observed. The leaks found in the three leaking tubes examined, one from B Reactor and two from F Reactor, were located in areas of external tube corrosion adjacent to the rear gunbarrel.

A production test, PT 105-564-E, authorizing the in-pile exposure of charges including three water-mixing-slugs per charge has been issued. The first water-mixing-slugs will be charged under this test early in June at D Reactor.

The IBM-702 study of process tube corrosion has been completed for the six old reactors. This study has produced a method of calculating a corrosion parameter which is a number related to both the tube wall thickness and the probability for any given tube to leak. These corrosion parameters indicate, with much greater accuracy than previous calculations, which tubes to remove from the reactors to prevent leaks.

Zirconium Process Tubes

Ribless, BDF type process tubes received from Allegheny-Ludlum during the month have been visually examined, inside and outside, and the tubes have been checked with the Probolog to determine variations in wall thickness and to pinpoint small flaws in the tube walls. These examinations have shown that four sound tubes were received, three tubes greater than 48 feet long and one tube approximately 43 feet long. A number of sound short pieces ranging in length from 5 to 34 feet long were also received. The average tube dimensions were 1.738 inch O.D. x .062 inch wall.

The outside surfaces of the tubes were smooth. Inside surfaces were generally smooth with slightly roughened areas noted at approximately thirteen feet from one end of the longer tubes. It is postulated that this roughened surface results when the tube reducing operation was interrupted to insert a new tube blank behind the blank being reduced.

Fractures observed on this tubing were identical to fractures observed on ribbed zirconium tubing. The breaks occurred as long cracks at 45° to the radial and axial directions. It is felt these were caused by excessive cold work in the metal. Some of the tubes were cold reduced as much as 70 per cent.

Work is proceeding at the Bureau of Mines Albany, Oregon, plant on the melting and alloying of Zircaloy-3 metal to be used on forthcoming development orders. The first 500 pound billet was cast during the month and chemical analyses are being made to determine billet homogeneity. If the chemical analyses are satisfactory production of Zircaloy-3 billets will be started immediately at a rate of 1000 lb. per week.

Laboratory Corrosion Studies

A test of 2-S and M-388 aluminum jacketed slugs in pH 6.0 process water was started in the mockup at 115 C. In connection with this test a minitube is being run with the same water at 115, 135, 155 and 175 C using 2-S aluminum minislugs in zirconium minitubes.

The final results of the test to determine the effect of Separan 2610 on aluminum corrosion rate show a corrosion rate of 0.5 to 1.0 mil/mo. (95 per cent confidence limits) for 2-S aluminum in 125 C, pH 7.3 process water and 0.4 to 1.0 mil/mo. under the same conditions with the addition of 0.3 ppm. Separan to the process water.

In-pile tube 4557-KE is now being used for effluent water activity studies. Dilute solutions of various chemical elements are injected into the process water stream feeding 4557-KE. Tube 4863-KE receives identical water without the chemical addition and is used as a control tube. To date sulfur, arsenic, potassium, uranium, and phosphorus have been added to the water. The results of the effluent water analyses have not been completed.

A test was initated during the month to determine the effect of high water flows on the stability of projection slugs in ribless tubes. A tube in the 50 tube mock-up containing five projection slugs is being supplied cold process water at a flow of 46 gpm. The test will be run for approximately one month at which time the tube and slugs will be examined for chattering indications and/or damage.

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RECIRCULATION TECHNOLOGY

H-Loop Recirculation Studies

Run No. 14, for the purposes of evaluating M-388 slug jackets in high purity, pH 5, 200 C water and studying the effect of increased specific power with enriched slugs, was concluded after 13 days operation. The pieces have been transferred to Fuel Examination personnel for weighing. Run No. 15, operating at the same conditions, was started but the motor bearings in the main loop pump began to fail after three days of operation. The vibration from the faulty pump induced a partial failure of a weld downstream from the pump and necessitated a transfer to process water. The transfer was accomplished by Operations reducing reactor power level prior to lowering the H-Loop inlet pressure. Following repair of the motor bearings and weld leak, the tube was recharged during a reactor outage. The present charge is operating at the same conditions as Run No. 14 with the exception of a reduced dissolved oxygen content.

At 6:56 A.M., May 22, a sudden drop in the loop flow shutdown the reactor. The flow drop was apparently caused by a temporary plugging in the portion of the loop between the rear nozzle and back pressure valve. The flow immediately returned to normal. The rear portion of the loop will be thoroughly examined during the next outage.

Data which have been obtained from aluminum coupons exposed in the H Loop Facility have shown that the corrosion rate of coupons exposed to the maximum flux (4.5×10^{13}nv) is 0 to 20 per cent greater than that of the out-of-pile pieces. The data have also indicated that the corrosion rate of coupons in the out-of-pile section did not decrease during the first 25 days of exposure; any rate reduction which might occur would have been expected during this period. The reason for the seemingly high aluminum corrosion rates in the H Loop Facility remains unresolved.

ELMO Loop Development Activities

ELMO-4 - Two fuel element configurations, designed to minimize flow blockage in the event of a jacket penetration, were ruptured in 220 C water. The first, or "tell tale" piece consisted of a uranium core, a 10 mil aluminum sleeve, a 15 mil uranium "warning layer", and a standard aluminum jacket. After 14 hours operation, the diameter had uniformly increased 70 to 80 mils with six bumps approximately 20 mils high and located about the point of the defect. The second piece was a segmented cluster with I & E cooling. Each of the six clusters contained seven uranium pieces (0.84 inch long and 0.375 inch diameter) separated by 1/8 inch aluminum wafers. After 12 hours operation, the rupture had been confined to the defected segment. In both cases, appreciable coolant channel space remained at the conclusion of the test.

ELMO-9 - Aluminum corrosion tests were continued at 200 C. The first test was for a period of 11 days. The test was conducted using neutral pH water with approximately 7 ppm. of oxygen and preventing a significant build-up of hydrogen through frequent bleeding of the system and addition of fresh water. Aluminum corrosion rates were between 1.0 and 1.4 mils/month. While the rates obtained after 11 days of testing cannot be considered quantitative, it is important to note that these

rates more closely approximate those from H Loop experience with coupons and dummy slugs (2.5 mils/month) than the ANL autoclave data (0.15 mil/month). The ELMO-9 water simulated H Loop water closely in regard to hydrogen and oxygen content.

In the second ELMO-9 test, water with high oxygen content was used, but the hydrogen was allowed to build up in the loop. The corrosion rates were the same as those of the first test. At this time, however, the hydrogen concentration values are not available. It is possible, therefore, that the hydrogen concentration did not build up sufficiently to show an effect.

The current test is with water having a low oxygen content and with the hydrogen concentration allowed to build up in the system.

ELMO-2 - ELMO-2 has been operated at 150 C, neutral pH, high purity water. After 25 days, the aluminum corrosion rate appears to be approximately 0.5 mil/month. This rate is close to that which would have been predicted from the H Loop experience with coupons, dummy slugs and metal slugs (the latter corrected for heat transfer effects). The ELMO-2 water contained low dissolved oxygen. The dissolved hydrogen content is unknown (a sampling system for hydrogen determination has been recently installed in the system). The ELMO-2 data indicate that high oxygen content is not the reason for the high aluminum corrosion rates (compared to off-site values).

A carbon steel corrosion test is in progress in ELMO-2 using high purity, low oxygen, neutral pH water. After approximately 100 hours, the rate has become linear at 1 mil/year. This rate is satisfactory from the structural viewpoint, but will require analysis as to the effect of crud release.

ELMO-5 - The loop has not operated during the month due to required repairs on the main pump. These repairs have included the replacing of wearing rings, straightening the pump shaft, installing new motor bearings, and the installation of a new mechanical seal. The pump has been reassembled for performance testing. If the unit operates satisfactorily, a test will be initiated with aluminum and carbon steel coupons at a temperature of 200 C, neutral pH, and specimen velocities of 7 and 20 ft./sec.

ELMO-6 - The first corrosion test with this loop is in progress. The operating conditions are 250 C, neutral pH, and specimen (aluminum and carbon steel) velocities of 20 ft./sec.

Boiling Development Program

The "Single Pass Laboratory Boiling Experiment" is being modified to permit steam qualities approximating 100 per cent. Following the completion of the modifications, data will be obtained under both boiling and condensing conditions.

KER Activities

A short section of KER ribless Zircaloy-2 tubing has been successfully tested at a hydrostatic pressure of 4000 psi. The four full-length process tubes will be hydrostatically tested, borescoped, and probologed. Metallographic examination of the tubes has revealed that the outside surfaces are covered with pits, or fissures, reaching a maximum depth of 30 mils.

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Hydrostatic testing at 4000 psi of compression-type fittings (as an alternative to Van Stone flanges) for the KER tubes has shown that this approach holds promise. Further testing of this method of tube sealing is planned.

Charge-discharge tests are in progress with KER cluster fuel elements and with standard diameter fuel elements having stud-welded projections to center them in a ribless KER tube. The initial results have led to minor modifications of the front and rear nozzle assemblies to insure satisfactory charging operations.

Coolant mixing tests have been conducted with cluster fuel elements in a Lucite tube. The use of dye and air bubbles to determine the flow line patterns have not been satisfactory. It is planned to use a suspension of bentonite particles with polarized light in an attempt to obtain a better definition of the flow lines.

KE-KER SEMIWORKS

The KE-KER Semiworks Unit was organized May 1, 1956. During the month personnel activities were primarily confined to the operation of the 1706-KE Building and development work preparatory to the startup of the KER Facility.

1706-KE Operations

The 1706-KE in-pile tubes were discharged May 3, 1956, completing the second run.

Sporadic film build up necessitated variation in pH, however, no significant difficulties were experienced. In the future diatomaceous earth purges will be used to control tube inlet pressures. The Columbia River spring runoff and the associated high turbidity was responsible for the film build up. It should be noted that significant film sluffing was experienced due to temperature cycling of the KER reactor.

The Separan addition test to tube 4557 was completed on May 1, 1956. A series of tests was initiated to determine the effect of specific elements on the effluent activity of the process water by injecting chemicals containing uranium, sodium, and sulphur in the process supply to tube 4557.

Out-of-Pile Tests

The current filter evaluation test was completed on May 16, 1956. A new test was initiated to evaluate backwash cycles of 12, 16, 20 and 24 hours.

The Single Pass Boiling Prototype operated intermittently throughout the month. It was necessary to replace the process tube due to external corrosion and penetration resulting from the action of steam in the jacket.

The pressure vessels in the 1706-KE Building were inspected by the "third party inspector" during the month. The inspector recommended the addition of the ASME code stamp to several pieces of equipment and a reduction in operating pressure for the "Illco-Way" mixed bed units.

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DEPARTMENT MANAGERS

June 21, 1956

Date 5-15-93
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A scheme has been devised, in cooperation with Electrical Design, to allow the functional testing of KER equipment prior to the permanent electrical tie-in. Testing of the individual components prior to the permanent tie-in can save from one to two weeks in the KER completion schedule.

Completion of the KER facility remains at 80 per cent, as the Minor Construction strike continued during the month.

Specifications for the installation of: Dowtherm Unit, Control room enclosure and replacement compressors for the 1706-KE Building under CG-512, revision 5 were approved. Present plans call for inviting package bids by "lump sum" contractors.

Development work has been initiated on the following items:

1. The use of Amberlite IR-120 and Nalco HCR resins for cation exchange at elevated temperatures.
2. The use of Callender Dutch Weave Cloth for "crud" studies.
3. A preliminary study of feasibility of modification and restartup of the H Loop.

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FUEL TECHNOLOGY SUB-SECTION

PROCESS TECHNOLOGY

Hydrogen

A strong relationship between quick hydrogen values and per cent void areas was shown in data obtained during canning, sonobond testing for braze voids, and autoradiographing seventy five dingot slugs (each from a pair of slugs from salt bath outgassed dingot rods - the adjacent piece being used for quick hydrogen determination). The per cent void areas were determined by comparing the autoradiographs of the test slugs with standards in which the areas were previously measured. No significant relationship between sonobond count and quick hydrogen value was found in this test.

Two methods being investigated as a means of limiting the hydrogen concentration of the Al-Si canning bath are: (1) The surface of the metal bath is blanketed with dry air to mitigate hydrogen pick-up from water vapor in air supplied by the building ventilation system, and (2) dry nitrogen gas is sparged continuously through the melt in an effort to remove hydrogen already contained in the metal.

Measurement and analyses of the gas content of aluminum cans from the three new vendors as well as from Alcoa were completed using two sample cans from each vendor. The hydrogen contents ranged from .09 to .40 ppm. With the hydrogen content of the canning bath Al-Si in the range of .27 to 1.35 ppm, it appears possible that the hydrogen in the aluminum components can contribute to braze porosity.

Reactivity of Production Uranium

The T. D. S. values for both MCW metal and Fernald metal are now within the normal ranges. The low reactivity values exhibited by MCW metal in January and February have been attributed to contamination of the parent green salt with recycled depleted material. Closer control over the green salt in the reduction plant at MCW should prevent recurrence.

Slug Closure Zone Impurities

Radiographic studies of the slug closure zone have revealed that the braze layer of slugs occasionally becomes contaminated with dense material. The dense material has been identified as part of the compound layer formed in the duplex bath of the lead dip process. A more extensive study has been planned to determine of any correlation exists between contamination of the braze layer and welding difficulties.

The Reaction Between Lead and Uranium

Preliminary information indicates that uranium metal reacts with molten lead at 600° C with a rate of approximately 0.00025"/minute to form UPb_3 and/or UPb. Further information on the rate and mechanism of lead and uranium reaction will be developed to obtain reproducibility in the canning process and to ascertain the effect of irradiation upon the properties of the bonding layer produced in lead dip canned slugs.

Grain Size Measurements

The 20X method for estimating grain diameter in transformed uranium was applied to dingot and ingot uranium. The data, based upon multiple observations of 30 samples, five in each category, confirm the previous conclusions that the grain size of dingot uranium is slightly larger than that of ingot uranium.

Recrystallization of Dingot Uranium

The grain size after recrystallization of uranium quenched from the beta phase is dependent upon the hydrogen content prior to recrystallization. Uranium containing 1 ppm hydrogen exhibited a recrystallized grain size of 0.4 mm while uranium containing 5 ppm hydrogen exhibited a recrystallized grain size of 0.2 mm.

Copper and Iron Inclusions in Aluminum

Using a procedure developed by duPont at Savannah River, surface inclusions were found in a random sample of Alcoa cans from lot number 42-C-8. Of 132 as-received cans tested, 14 gave a positive reaction for copper and 131 gave a positive reaction for iron. It is not known that this test is specific for copper, and spectrographic confirmation has not been secured; however, most of the inclusions appeared to be brass under the microscope. The average diameter of the imbedded particles was 1.7 mils (range .9 to 3.0 mils).

Wafers containing two of the inclusions were tested in high temperature bombs for 16 hours at 425 C. No preferential attack was noted at the inclusion on these samples, but the edges of the wafers did show intergranular attack. Of 700 lot 42-C-8 cans examined after production autoclaving, 14 were rejected for inclusions. One of the 14 inclusions had the appearance of the intergranular pit associated with copper inclusions.

Evaluation of Aluminum Components

Three tubes of slugs bearing Harvey end-caps were examined after 500-550 MWD/T exposure. Corrosion resistance of this material was reported to be comparable to that of caps supplied by Alcoa. A flow laboratory corrosion test in 115 C water, on twenty Harvey cans revealed no accelerated corrosion at the site of copper inclusions in the cans. The overall corrosion of the Harvey cans was not significantly different from that of Alcoa pieces. Six tube charges of slugs with Hunter-Douglas caps, alternated with standard slugs, are at an exposure level of 230 MWD/T at 105 F as of 5-31-56. Similar charges of Hunter-Douglas cans, alternated with standard slugs, are at an exposure level of 100 MWD/T at 105 DR as of the same date.

Al-Si Clad Caps

About 15,000 Al-Si clad slug caps were successfully used for production canning. A small reduction in the poor bond rejection was noted. The caps were impact extruded from Al-Si clad aluminum sheet.

Process Sampling

A 25 slug per week sampling plan was placed in effect to supplement normal quality control information. This sampling plan will provide corrosion and

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metallographic data in addition to monitoring the effectiveness of the ultrasonic bond test.

Tru-Line Slugs

Two hundred Tru-line cans were received from Alcoa. These cans were slightly oversize in diameter, but will be satisfactory for making slugs for charging studies. Delivery of cans for production test use is expected in early June.

Double Length "C" Slugs

A revised production test (PT 313-58MT, HW-42961 A) is being issued to authorize fabrication of 150 double length C-process canned "C" fuel elements for in-pile evaluation.

The original test authorized the fabrication of 1500 double length "C" slugs. Unanticipated welding difficulties had delayed fabrication for almost a year. Because of the impending program for substitution of Ike ("E") metal for "C" metal, the reduced "C" slug rupture rate, and welding difficulties involved in the fabrication of double length fuel elements, the original test was canceled.

PROCESS DEVELOPMENT

Induction Preheat for Canning Sleeves

It has been proposed to preheat the can-sleeve assembly by induction prior to submerging in the canning bath. This would increase production through the Al-Si canning furnaces by reducing the preheat time on the can-sleeve assemblies. Initial development work will be performed on the 200 KW, 3000 CPS induction heating unit in the 314 Building. This unit has ample power to preheat two can-sleeve assemblies simultaneously. The initial tests will establish permissible heating rates, can and sleeve temperature gradients, and the scope of mechanical design required for a production installation. Modification of a work station at the 200 KW Tocco unit in the 314 Building is underway.

Evaluation of Sylvania Hot-Pressed Slugs

The non-destructive phase of this evaluation has been essentially completed, and several destructive tests have been conducted. Results to date indicate general inferiority of the SEP closures. No adequate test has yet been found for determining bond quality. The frost test and ultrasonic bond test give uninterpretable results. Mechanical and chemical stripping show excellent bonding on the few samples thus far examined, but reveal no discernable difference from HAPO hot-pressed slugs in this respect. This may be significant, since the nickel layer on the SEP slugs is only about half as thick as on the HAPO slugs and results in negligible reactivity loss as compared to the Hanford hot-pressed product. To map slugs with respect to nickel thickness, a recording magnetic device was developed, which rapidly and non-destructively traces upon a paper wrapped around the canned slug, a map of the light and heavy nickel layer.

Bond Stability-Baking Tests

Ultrasonic tests indicate that bonding created by the lead-dip, triple-dip,

single-dip, and hot press canning methods is destroyed by baking at 400° C for 100 hours.

Vacuum Canning

The vacuum canning equipment is being modified to obtain more consistent canning results by achieving accurate temperature control of the cap, core, jacket, and Al-Si.

Irradiation Effects on Hot Press Bonds

A study of the effects of irradiation on the physical and metallurgical properties of hot-press bonds is continuing so that a more complete evaluation of the hot-press product may be made. Tensile specimens with U-Ni-Al bonds and with U-Ni-Fe-Al bonds are currently being irradiated in HAPO reactors. As was reported last month the data collected to date show a trend toward lower strengths after irradiation.

DEVELOPMENT OF NEW FUEL ELEMENTS

Internally and Externally Cooled Fuel Elements - Enriched

Preliminary dimensions for I & E slugs for use in the old piles have been calculated, using the methods developed by Tippets. (1) Post CG-558 flow conditions were assumed together with 115 C maximum outlet temperature leading to a maximum tube power of 1130 kw. Standard old pile process tubes were assumed to be used leading to a calculated pressure drop of 270 psi across a 32 slug active zone. The usual assumptions of smooth tubes and good alignment were also made. Based on these assumptions the resulting dimensions are:

Uranium dimensions: 1.356" O.D.; 0.414" I. D.
Can Slug dimensions: 1.460" O.D.; 0.310" I. D.

The hole size was chosen on the basis of the current philosophy of designing the hole to run slightly cold with respect to the annulus. The criterion used was that the hole temperature rise should be about 0.9 of the bulk tube temperature rise. (2) The O. D. represents a compromise between the opposing factors of high uranium content versus low pressure drop and small eccentricity in tubes of standard rib height.

A production test (PT 105-629-A-73MT) using 1.44 % U-235 enriched material has been designed to evaluate rupture resistance and dimensional stability at post CG-558 slug powers. The fuel elements for this test are now being fabricated.

(1) HW-33434 "Heat Transfer Analysis of Internally-Externally Cooled Cylindrical Fuel Elements for Nuclear Reactors." F. E. Tippets, 10-15-54.

(2) Private communication. K. J. Bell

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Lead Dip Canned I & E Slugs

Four tubes (22 slugs each) of lead dip canned I & E fuel elements having two piece components were charged at "C" pile together with four tubes of solid standard slugs for the "run to rupture" portion of PT 105-615-A-63MT. Thermocouples were installed in all I & E tubes to monitor temperatures of the water eminating from the hole and through the annulus at the downstream end of the slug columns. Measured water temperature at the top of the slugs are averaging 15 C higher than water temperature of the internal and between the ribs flow.

The I & E slugs examined to date have shown no unusual dimensional behavior. Warping of the I & E slugs discharged at 150 MWD/T was similar to the solid control slugs and at 300 MWD/T was less.

Two tubes of I & E slugs and two tubes of solid slugs, the balance of the non-rupture portion of PT 105-615-A, will be discharged next month at a nominal exposure of 500 MWD/T.

Hot Press Canned I & E Slugs

Twenty anodized, hot-pressed, hollow, I & E fuel elements, selected as the C-pile partial tube load for in-pile outlet water temperature tests (Production Test 625-A-70-MT) remain ready for pile charging when final approval of the test is received. Five reject I & E pieces were metallographically examined to determine the actual minimum thickness of the electroplated nickel layer which serves as the metallurgical core-jacket bonding medium. The pieces are considered satisfactory in this regard since the smallest value obtained was 0.0006 inches. A minimum of 0.0005 inches of nickel plate is required in hot press pieces to produce proper core-jacket diffusion bonding and to prevent U-Al diffusion.

Wafer Fuel Elements

During May NLO began to supply small numbers of uranium washers of suitable dimensions for MTR and HAPO irradiation tests. These wafers were machined from I & E slugs which met all Hanford requirements except those for surface finish and dimensions.

Two I & E wafer fuel elements were fabricated for irradiation in the GEH-4 facility of the Materials Testing Reactor to obtain information to supplement the GEH-4-5 test.(1) The irradiation is scheduled to begin June 11. The elements were 4.82" and 8.95" in length. Both were assembled by the lead-dip process, rather than the single-dip process used previously. Both elements were jacketed in M-388, 1% Ni-Al alloy. There were no Al spacers, as previously used, although a layer of Al-Si 3-7 mils thick bonds the uranium wafers, or washers, to each other. The uranium washers were 3/16" thick. Those in the 4-inch fuel element were fabricated from rolled sheet at Fernald by stamping; those in the 8" element were machined from uranium rod.

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(1) HW-38817 T. W. Evans, GEH-4-5, Irradiation of Wafer Fuel Elements, Secret, 8-29-55.

Self-Supporting Fuel Elements

A second group of dummy fuel elements with ribs attached by the Sonoweld process was examined by various methods to investigate the quality of the welds and to check dimensional specifications. All dimensional specifications were satisfactory, and a slight deformation of the jacket around the ribs was not considered detrimental. However, a slight gap was still noticeable at the ends of several ribs, and the undersurfaces of the ribs at the sides were not bonded. Strength tests indicated that the bonds were considerably weaker than those of the first shipment. A group of 14 uranium pieces has been shipped to HAPO by the vendor for evaluation. The vendor states that the welding behavior of the dip canned uranium pieces was markedly different from that of the dip canned steel dummies.

Fabrication of self-supporting slugs for use in ribless tubes now appears to be most economically and advantageously accomplished by attaching projections of suitable dimensions to the surface of canned and inspected slugs by stud-welding techniques. The stud-welding machine used for this purpose is basically designed to accomodate only round studs up to 1/4" diameter. However, objections to this size of stud, on the ground that the small bearing surface leads to rapid erosion-corrosion of the process tube at the area of contact, led to the development of a new type of projection to be attached by the same welding machine. This new projection is a narrow rib about an inch long, which is held by a modified holding collet in the welding machine during attachment to the slug. Experiments show the fabrication of this new type of slug to be operationally feasible, with fabrication at the same rate as with use of the round studs. Functional testing of the product remains to be completed.

Fuel Elements with Thin End Caps

A production test (PT 105-631-A-64 MT) has been designed to determine if the incorporation of a thinner end cap would increase the probability of fuel element failure. A satisfactory welding technique for welding fuel elements with thin, 125 mil caps, was developed. Welding yields were only about 60%, due to the normal amounts of braze layer porosity encountered near the base of the caps in the present production slugs. However, it will be feasible to provide enough satisfactory slugs for pile testing.

MATERIALS DEVELOPMENT

Aluminum Process Tubes

Contract SO-8 with Alcoa for 10 tubes of M-388 (1% Ni) alloy is still incomplete, with June now the target for completion. Fabrication of APMP process tubes on Contract SO-7 does not look promising. Work will be resumed on SO-7 after the completion of SO-8, but not much hope is held for the successful fabrication of tubes from APMP, as preliminary results were quite discouraging.

A report on process tube creep, HW-42707, and another report, presenting a modified process tube design, HW-43013, were issued during the month.

Zirconium Process Tubes

Two KER-size Zircaloy-2 process tubes, approximately 33 and 25 feet long, were received from the Bridgeport Brass Company. Six billets were successfully

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extruded to provide blanks for tube reducing to H-pile size Zircaloy-2 process tubes.

H-Loop Corrosion

The corrosion of slugs in H-Loop was evaluated by use of the equation

$$\log C = a + bT' + cP + d \log t$$

where C is total corrosion in mils; T' is the reciprocal of the absolute temperature expressed at 1000/K°; P is power as KW/8" slug and t is time of exposure in days. The parameters for the above corrosion are shown below. These parameters for all data are significant; however, it has been suggested (1) that the data below 100 C are not pertinent to the corrosion pattern.

PARAMETERS FOR H-LOOP DATA

	Overall Fit	Above 100 C	Below 100 C
a	1.69 ± 0.54*	2.11 ± 0.86	0.95 ± 2.40
b	-1.14 ± 0.14	-1.48 ± 0.33	-0.620 ± 0.736
c	0.0225 ± 0.0049	0.0269 ± 0.0059	0.0228 ± 0.0130
d	0.508 ± 0.251	0.714 ± 0.279	0.031 ± 0.565

*95% confidence limits

For temperatures under 100 C the parameters of time and temperature do not differ significantly from zero, and the power parameter is barely significant. Therefore, the corrosion is a function of some variable not associated with exposure period; i.e., with the reactor. Variables such as cleaning assume more importance when the total corrosion is small.

Since the corrosion below 100 C could be as well expressed by a constant as by the equation, the parameter determined for temperatures above 100 C give a better fit than the overall spread.

The temperature coeffecient (b, -1.48), is much less than that computed for in-pile data in present pile water (-2.4). The power coeffecient (c, 0.0269) agrees within its own precision with that obtained from present pile water (0.033). The time coeffecient (d, 0.714) states that the corrosion in H-Loop increases as the 0.714 power of the time; that is, the corrosion is rapid at first and slower later. This agrees with the value found for the Flow Cup Laboratory Data, where d = 0.65.

A corresponding analysis of the in-pile data has been submitted for IBM calculations. This work is being programmed.

Galvanic Corrosion of Aluminum

Tests are under way to determine the importance of galvanic effects upon the corrosion of aluminum in water at temperatures from 100 to 200 C. Thus far,

(1) Jaech, J. L., Corrosion in 0961 H, HW-42101 RD, (Secret), 3-21-56.

samples of 1045 aluminum have been exposed to flowing 15,000 ohm-cm water at 125 C for a period of 3 days. A 1.5 volt battery was connected across two of the samples giving a current flow of 8 to 10 milliamperes per square decimeter. A third sample was not connected to the battery and served as a control piece. The corrosion rate of the electrically connected samples was not appreciably different from that of the control sample. This lack of appreciable galvanic corrosion is consistent with the observations made at lower temperatures.(1)

Water Quality Studies

Studies of the corrosion of aluminum in 92 C distilled water with various ions added have been continued under low flow conditions. Samples were exposed to solutions containing (1) 10 and 100 ppm H_2O_2, (2) 10 and 100 ppm H_2O_2 plus 10 and 100 ppm HCO_3^-, (3) 10 and 100 ppm H_2O_2 plus 5 and 100 ppm Cl-, (4) 10 ppm H_2O_2, 5 ppm Cl^-, plus 10 and 100 ppm HCO_3^-. The HCO_3^- and Cl^- were added as $NaHCO_3$ and NaCl. In previous studies samples were exposed to solutions containing Cl^-, HCO_3^- and Cl^- plus HCO_3^-.

Of all the ions and combinations of ions studied, only bicarbonate has any effect upon the corrosion rate of the aluminum. That is, the corrosion rate in 50 ppm HCO_3^- is double that for distilled water, and in 100 ppm HCO_3^- is triple that for distilled water regardless of the presence of sodium chloride or hydrogen peroxide.

Corrosion of Magnesium and Uranium in High Temperature Water

A method has been devised to determine the corrosion rates of reactive materials in high temperature water. The problem is to bring the reactants, water and metal, to temperature before the reaction has proceeded to an appreciable extent. By use of a 10 KW induction generator, a 100 ml 10,000 psi pressure vessel can be brought to temperature at the rate of 100° C/min.

Corrosion rates of magnesium and uranium have been investigated in the range of 150-350 C in solutions of sodium hydroxide and sodium carbonate. These data were obtained to determine if corrosion of magnesium and uranium might be inhibited by increasing the pH of the solution.(2) On uranium no difference was observed in NaOH. In Na_2CO_3, the corrosion rate was reduced by a factor of 4 to 5.

The corrosion curve for magnesium in water was extended from above 100 C to 350 C. The rate increases rapidly with temperature up to about 200 C. The rate then increases slowly to about 260 C, after which it drops slightly as the temperature rises to 350 C. Some slight inhibition in NaOH solutions was observed up to 250 C. Above 250 C, the rate is greater in the caustic solution than in water. In 1N Na_2CO_3 the rate was less by a factor of 8-10 than in water over the entire range of 140-350 C.

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(1) Groot, C., The Galvanic Corrosion of Aluminum, HW-33881, (Unclassified), 1-6-55.

(2) Eschbach, E. A., Possibility of Employing Magnesium Jacketing and/or Basic Coolants in Metallic Uranium Fueled Reactors, HW-41032, (Secret), 1-24-56.

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Corrosion of Aluminum in High Temperature Water

Corrosion rates for 16 new Alcoa alloys have been determined in 350 C after 60 days exposure. The rates are similar for all alloys except for one (EB-Alcoa 173170) which failed. No consistent difference in rates between annealed samples in the as-received conditions was noted.

TESTING METHODS AND EQUIPMENT

Bare Slug Test Equipment

More than 380 tons of uranium have been processed through the Uranium Quality Test. This represents over a third of the total tonnage planned for this test. With a two-shift operation of the equipment now in progress, it is expected that the 300 Area portion of the test will be complete in September. The mechanical switches were replaced with photoelectric devices to limit the tested area to within 3/4" from either end of the slug. This limitation is necessary to avoid the spurious response which occurs as the end of the uranium slug approaches the coil.

Drawings of the mechanical handling device for use with the Sonic Orientation Test have been completed.

Finishing Line Test Equipment

The automatic conveyor, modified for use with an I & E testing probe, has been reassembled. One probe, incorporating Penetration Test coils, has been built for service testing on I & E pieces.

Three hundred twenty six I & E slugs were tested for bond and penetration on the internal tube. Destructive tests on these slugs revealed a fair correlation with the pieces previously tested by the Ultrasonic Bond Tester; however, the correlation with the Al-Si Penetration Test was poor in that wrinkling of the internal tube, not Al-Si penetration, was apparently causing most of the rejects.

Internal Friction

High temperature internal friction equipment was placed in operation, and data on internal friction versus temperature obtained up through the beta transition. Unfortunately, the inter-action between the electronic induction heater and the thermocouple resulted in the temperature measurements being in error. Operation in the beta phase was conclusively shown, however, by existence of a thermal arrest. The internal friction data showed a peak at somewhere between 200-300° C, but on allowing the slug to soak at this temperature, it appeared that this peak was due to the familiar Koster effect (after a change in temperature the internal friction decreases with time). The rate of change with time is clearly a function of temperature because at higher temperature no Koster effect appears. With the exception of a towering peak which appears at the alpha to beta transition, the internal friction is much lower in the beta phase than in the high alpha phase. This is in close agreement with Maringer's results obtained at much lower frequencies with the torsion pendulum.

Nickel Plating

Three non-destructive methods for examining the plate have been tested. They include (1) a magnegage, (2) an electronic eddy-current thickness gage, and (3) autoradiographic techniques. These three will be discussed separately below.

(1) Magnegage - The magnegage consists of a magnet suspended on a pivoted lever with a helical spring attached to the lever. The magnet is placed in contact with the nickel plate and the spring is wound in the direction tending to raise the magnet. The spring tension at the time of release is an indication of ferromagnetic material within the sphere of the magnet. The chief disadvantages of this instrument are: (1) the care with which the readings must be made to prevent premature release because of vibrations, and (2) the magnetostrictive characteristic of the nickel. The magnetic characteristics of a magnetostrictive material vary as the compressive and/or tensile stresses on that material change. Since nickel and uranium do not have the same coeffecient of thermal expansion, the stresses and therefore magnetic properties of the nickel plate vary with temperature.

(2) Nickel Depth Meter - This electronic eddy-current thickness tester was assembled by members of Testing Methods Unit. The instrument is sensitive and will indicate the thickness as rapidly as the probe can be placed on the piece. It is expected that the same problems which are present due to the magnetostrictive characteristics of nickel will affect the readings obtained from this instrument, but the rapidity with which readings can be taken will minimize this problem.

(3) Autoradiograph - The natural radiations from uranium will expose a photographic plate. Pictures made by this technique are termed autoradiographs. Exposures made by members of the Product Inspection group of Separations Technology indicate that the nickel plate will attenuate this natural radiation enough to give sufficient variations in film exposure. The degree of exposure is an indication of the nickel thickness. This work has been done using a comparatively fast film, Kodak NoScreen Safety Film in direct contact with the plated piece for 2-3/4 to 3 hours. Further evaluation of this technique will be made in the near future.

IRRADIATION BEHAVIOR

Cored Slug Evaluation

Slugs under PT 593-A, a run-to rupture test of four tubes of solid slugs and four tubes of cored eight inch slugs with aluminum end plugs were irradiated in C-pile. The four tubes of cored slugs were discharged in May at about 1100 MWD/T without incurring rupture where it was shown with 95% probability that the cored slugs had a greater resistance to rupture than the solid. Solid slug failures occurred at 568 and 786 MWD/T.

Based on experience in 105-B, D, and F with slugs charged June 1, 1955 and later and irradiated through February, 1956, failure rates for drilled-cored and regular production solid slugs were about the same. The failure rate for extruded cored slugs was 1.5 to 2-fold higher.

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	Total No. Tubes	No. Tubes to 550 MWD/T	No. Tubes to 700 MWD/T	Number of Failures
Cored-Drilled	1941	408	132	5
Cored-Extruded	576	138	70	4
Total-Cored	2517	546	202	9
Total-Solid	1871	280	134	4

In addition a survey is underway to determine the comparative frequencies of stuck charges for cored and solid slugs.

FACILITIES AND EQUIPMENT DEVELOPMENT

Corrosion Testing Facilities

Four of the six autoclaves in 3732 Building have been started on corrosion tests of M-388 aluminum and can stock quality aluminum. Samples are being exposed to deionized water at temperatures of 120 C, 135 C, 155 C and 170 C. The flow rate is about 800 cc/hour.

The No. 1 medium pressure autoclave in 326 Building has been modified so that electrical leads can be inserted through the lid. Tests of galvanic corrosion in water of moderate quality and at temperatures between 100 and 170 C are now in progress.

The installation of the three new high pressure autoclaves in the east end of 314 Building is about 80% complete. It is anticipated that static tests can be started in these autoclaves about July 1, 1956. The autoclaves will initially be operated at a temperature of 250 C, 300 C, or 350 C.

The flowing water autoclave in 189-D has been shut down and will be scrapped as soon as the new autoclave is installed in 1706-KE. Installation of the new autoclave in 1706-KE is being delayed, but should be completed sometime during the next month.

Plating Rack Design

The plating rack, which was designed to permit plating the I & E fuel element in a near-vertical position, is being redesigned. The plate on the outside cylindrical surface was examined with the Magnegage and found to be very uneven. The rack member was apparently too close to the work and acted as a shield preventing normal distribution.

Autoclave Liners and Baskets

Drawings have been completed for aluminum liners and baskets for the standard production autoclaves. The purpose of this liner and basket is to permit sealing anodized films in production autoclaves without having the sealing solutions in contact with the steel of the autoclave. The load area of the new baskets are approximately 85% as large as the standard basket. Capacity could be as high

as with the regular equipment if the canned pieces are close packed without the sections of process tube presently used as spacers.

Automatic Welder

Preparation of the bid package for the automatic fuel element welder is being completed with the inclusion of isometrics of the welder components. There is a possibility that the "rotor-arc" welding method, which appears to permit simplification of the welding process with increased capacity per welder, will be ready for production use prior to amortization of a 313 installation of automatic welders. Tests to date show that the mechanical portion of the proposed automatic welder could not be used with the "rotor-arc" welder, since the latter must weld in a vertical position rather than the horizontal position of the automatic welder. Prior to awarding a contract to the successful bidder, this situation will be reviewed.

105-C Metal Examination Facility

The 105-B MEF operated at half capacity during the month since four of the operating personnel assisted with the operation of the 105-C MEF. Mechanical difficulties using the weigher were being corrected at month end.

The Basin IV equipment was tested under operating conditions. The test results indicated that further minor revisions will be necessary for satisfactory operation of the equipment.

Projects

All work on Project CG-676 - Pilot Plant Semi-Works was estimated to be 20% complete at the end of May. Preparation of the Project Proposal requesting authorization of the construction funds was started May 14, 1956 with July 1, 1956 as a schedule date for obtaining authorization. Total authorized funds for this Project are $120,000.00.

The AEC directive for Project CG-664 - 350° C Flow Loop was received on May 9, 1956. Detailed design has been scheduled to start about June 1, 1956. The Project Work Authority was issued May 22. Total funds are $120,000.00 on this Project.

The AEC directive for Project CG-620 - Vacuum Melting and Alloying Furnace was received April 13, 1956 and the Project Work Authority was issued May 1, 1956. Detailed design was started May 1, 1956. A detailed specification for the equipment is in rough draft form, and is scheduled for approval by June 1, 1956. Total funds are $143,000.00.

General Electric approval for the work in 314 Building - Corrosion Testing Facilities has been obtained and the Project proposal is now being reviewed by the local AEC office. Total funds are $140,000.00 on this project.

All work on Project CA-546 - Fuel Element Pilot Plant has been stopped by the continued labor dispute. Remaining items after work is resumed will require about two months for completion. Total funds on this Project are $1,600,000.

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PHYSICS RESEARCH SUB-SECTION

REACTOR LATTICE PHYSICS

Measurements with hollow enriched uranium slugs (1.37" O.D., 0.48" I.D.) were completed in May. The uranium was 1.44% by weight U-235. The measurements were undertaken to obtain information upon which to base a nuclear safety specification concerning the safe handling and storage of these fuel elements. In the series of measurements the distance between adjacent rod centers was varied from 2.0 inches to 2.6 inches; the water-to-uranium volume ratio varied from 1.31 to 3.36. The measured bucklings, which complete the series, are given in the following table.

Lattice Spacing (hexagonal geometry)	H_2O/U (by volume)	Reflector Savings* (assumed)	Buckling x 10^6 cm^2
			slug core dry
2.1"	1.59	7.37 cm.	5656
2.6"	3.16	6.66 cm.	3797
			water in core
2.6"	3.36	6.63 cm	3696

*The reflector savings were estimated from Brookhaven data.

Previously measured values are tabulated in the Pile Technology Section Monthly Report for April, 1956.

Measurements involving the use of enriched uranium (1.007% by weight U-235) in small ($\sim$ 4' x 4') graphite exponential piles were continued during May. When completed, the series of measurements with enriched 0.925" diameter slugs will encompass the following lattices spacings: 4-3.16", 5-3/16", 6-3/16", 7", 7-1/2", and 8-3/8". Four different water annulus sizes are being used at each lattice spacing. These measurements will furnish data on enrichment and coolant size needed for developing and checking the lattice theory. Measurements have now been completed in the 6-3/16" and 7-1/2" lattices with the four different water annulus sizes. The results are given below, where the previously measured bucklings are also listed for comparative purposes.

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Lattice Spacing	Dry Lattice Al/U	Dry Lattice C/U	Dry Lattice Buckling (10^{-6} cm^{-2})	Wet Lattice H_2O/U	Wet Lattice Buckling (10^{-6} cm^{-2})
6-3/16"	0.69	100.4	356	0.174	349
	0.54	98.7	360	0.304	356
	0.80	98.7	335	0.786	270*
	0.97	97.1	307*	1.316	160*
7-1/2"	0.69	148.2	313	0.174	297
	0.54	146.6	331	0.304	278
	0.80	146.6	310	0.786	192*
	0.97	145.0	292*	1.316	67*

*The six values indicated by an asterisk were measured during May.

The ratios listed in the table are the atom ratios for the cell. The dry buckling values are seen to vary as the aluminum content in the cell. Since the 7-1/2" lattice is more overmoderated than the 6-3/16" lattice, the wet-dry buckling difference is larger in this lattice; the difference becoming proportionally greater as the water annulus is increased.

The 7" and 8-3/8" lattices have been built and measurements are underway in these lattices.

The wet buckling for a five-rod cluster in a 10-3/8" lattice (five 0.925" slugs in a 3" tube) has been measured to be -12 x 10^{-6} cm^{-2}. (The dry value was 63 x 10^{-6} cm^{-2}.) The atom ratios for the above assembly are: C/U = 52.0; Al/U = 0.52; and H_2O/U = 0.704. The negative wet buckling is the result of the high H_2O/U ratio (about 4 times that of the normal Hanford lattice). A six- and seven-rod cluster will be measured next and these will have a more favorable H_2O/U ratio at this lattice spacing.

The material buckling values have been determined for a range of lattice spacings having 1.36" natural uranium fuel elements with the following coolants: 1) light water (H_2O), 2) heavy water, and 3) air. The volume of the coolant material per centimeter length of fuel element in the 0.076" thick cooling channel was 2.33 cc. The calculations were done for lattice spacings ranging from 6-3/16" to 8-3/8" and the density of the graphite moderator was 1.65 g/cc. The results of the calculations are given in Tables I and II.

It is seen that higher values of reactivity are obtainable for lattices having heavy water as the coolant. The reactivity values are greater for the heavy water cooled lattices than for the air cooled lattices over the lattices investigated because the moderating contribution of heavy water, which increases resonance escape probability, is greater than the small poison effect on thermal utilization (see Table I). Due to the smaller "slowing-down power" of heavy water as compared to that for light water, which decreases the resonance escape probability, "the conversion ratios" of the heavy water cooled lattices are larger than those having light water as the coolant.

TABLE I

LATTICE PARAMETERS FOR VARIOUS COOLANTS

Lattice Spacing	Thermal Utilization			Resonance Escape Probability			Conversion Ratio		
	H_2O	D_2O	Air	H_2O	D_2O	Air	H_2O	D_2O	Air
6-3/16"	0.9102	0.9331	0.9354	0.8269	0.8024	0.7950	0.946	1.006	1.013
7"	0.8960	--	0.9227	0.8592	--	0.8380	0.877	--	0.920
7-1/2"	0.8860	0.9101	0.9131	0.8754	0.8643	0.8602	0.842	0.870	0.875
8"	0.8753	--	0.9037	0.8893	--	0.8762	0.812	--	0.838
8-3/8"	0.8666	0.8951	0.8986	0.8986	0.8897	0.8866	0.792	0.815	0.814

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TABLE II

BUCKLING VALUES FOR VARIOUS COOLANTS

Lattice Spacing	Buckling x 10^6 cm^2		
	H_2O	D_2O	Air
6-3/16"	32.2	20.5	1.7
7"	72.6	--	76.7
7-1/2"	82.7	106.2	100.7
8"	84.7	--	112.7
8-3/8"	82.7	118.5	116.8

In conclusion, the calculations indicate that it is possible to construct a heavy water cooled reactor that is "fail safe" over a wide range of lattices, and the available reactivity and plutonium production are greater than in the light water cooled reactors.

EXPERIMENTAL NUCLEAR PHYSICS

Measurements were made on the gamma rays emitted when slow neutrons are captured in sulfur, lanthanum, silicon, lead, and depleted uranium. These measurements were made on the X-2 level of DR Pile using diffracted neutrons from the neutron spectrometer as a source of slow neutrons. The neutron capture gamma rays were detected by a scintillation counter mounted in a boron and lead shield. The energy spectrum of the gamma rays was obtained using a twenty channel pulse height analyzer. These preliminary measurements gave good results on silicon and sulfur whose gamma rays have a large spread in energy. Some structure was discernible in the lanthanum spectrum. No structure could be seen in the case of uranium. These spectra covered the gamma ray energy range 1 Mev to 7.5 Mev.

EXPERIMENTAL REACTORS

The Lattice Testing Reactor operation proceeded routinely during the month. Experiments included measurements of k_∞ for wet and dry lattices with solid and I and E slugs. Data are still being processed.

Seven unscheduled shutdowns occurred. Six were instrument failures and one was caused by improper by-passing of power level trip circuits. One additional by-pass switch caused trouble but all of those modified last month continued operating successfully. The causes of the instrument failures have been tentatively identified and action taken.

The core oven for the temperature coefficient measurement was successfully operated out of the pile. Temperatures up to 350°C and vacuum down to 10 microns were obtained. Additional testing is planned to determine the required heating and cooling cycle times.

A compressed air line was run to the reactor room to allow more accurate barometric correction measurement. Heater facilities were provided for determination of the temperature coefficient of pile reactivity. Period data taking was simplified by installing a switching device that simultaneously starts one counter as it stops a second one.

The electrical and mechanical components of the TTR have been installed and tested. Installation of the annunciator, aural monitor, and spare cable panels completed the control room instrumentation except for the galvanometers and remote meters. The source drive mechanism was installed in the reactor. Reactor room instrumentation is now the major item to be completed. The barometer and water lines to the reactor room were completed. Placing of bricks in the thermal column hole through the shielding wall was about half completed and the step plug was moved into place.

NUCLEAR SAFETY PROBLEMS

Experimental results on hollow slugs made of enriched uranium (1.44%) have been used to set up process specifications for handling these slugs. These specifications have been prepared jointly with the Fuel Technology Sub-Section.

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METALLURGY RESEARCH SUB-SECTION

Fundamental Studies

Studies of the diffusion of noble gases through silver are continuing. Emphasis has shifted from krypton to xenon. Experiments have shown that xenon gas can be introduced into silver in a Schüler discharge tube if a lower voltage (about 410 volts) is used than used for krypton gas. After the inert gas was charged into the metal, the silver was cut into six pieces. The pieces were fused separately, and the gas evolved from the silver was analyzed by irradiation and counting. The xenon was distributed uniformly over the length of the cathode except near the bottom, where very little xenon was found in the metal.

A study of the fracture-surfaces of various reactor materials, including uranium, is being conducted in order to establish the effect of various fabrication, heat treatment, stress, and irradiation histories on the mode and type of fracture which occur under particular test conditions. Two replication techniques, plastic embedding and aluminum pressing, are being evaluated. Thin replica films from both the Faxfilm and aluminum pressing replicas of fractures have been prepared for electron microscopy and the results are encouraging. A particular specimen of uranium, vacuum annealed in the beta phase and slow cooled, revealed extensive precipitation at grain boundaries, presumably due to oxides. The fractured surface of this specimen revealed a large number of spherical mounds, less than 0.0005 mm in diameter; these mounds are similar in shape and size to those present at grain boundaries and observed in polished and etched specimens. Since so many of these mounds were present at the fracture interface, it is reasonable to conclude that considerable intercrystalline cleavage has occurred, although transgranular parting of the grain is very common. In order to provide a norm for the interpretation of the microstructure of uranium of various histories, extensive optical and electron micrography is being conducted on the metallographic surfaces and fracture surfaces with the aid of replicas. Correlation of both optical and electron micrographs is now in progress.

Laboratory investigation of the ex-pile diffusion of uranium into AlSi and zirconium are continuing in order to provide a basis for in-pile studies currently in progress. The extent of diffusion of AlSi and zirconium into uranium is also being recorded. A U/AlSi couple which was annealed 28 days at 255 C (491 F) was cross sectioned and metallographically examined in six planes perpendicular to the diffusion interface. The indicated maximum diffusion of uranium into the AlSi was 0.0052 inch, and the maximum diffusion of AlSi into the uranium was 0.0026 inch. However, the actual penetration of uranium into the AlSi was probably 0.001 inch less than indicated since the couple was forced apart slightly during mounting. The results agree very well with data obtained previously when this correction is applied. Two U/AlSi couples have been annealed at 200 C (392 F), and two have been annealed at 300 C (572 F) for 29 days. All of these couples adhered and are now being analyzed. A U/Zr couple which had been annealed 30 days at 450 C (842 F) under a pressure of 17,500 psi was cross sectioned three times to provide planes perpendicular to the diffusion interface. Extensive metallographic examination failed to reveal any diffusion zone. Autoradiography was employed using Kodak type NTA nuclear track plates in an attempt to detect any diffusion product which might have had the same

appearance as the surrounding metal. The alpha tracks, however, were too long to give the required definition. Interpretation of the observation on this couple may be easier after results are obtained from future U/Zr couples annealed at slightly higher temperatures. Two U/Zr couples are now being annealed at 500 C (932 F) under a pressure of 10,000 psi. No further results of the in-pile studies are available at this time.

Three specimens each of irradiated zirconium and molybdenum have been examined by x-ray diffraction film methods. A symmetrical back-reflection focusing camera was used for a determination of possible changes in lattice constants. Unfortunately, the grain size of the zirconium has resulted in spotty films that are extremely difficult to read. The exact line positions in some cases are impossible to determine because of the small segment of the diffracted cone that is intercepted by the film in this type of camera, and the intermittent recording of the diffracted x-rays. A rotating film, back-reflection, non-focusing type of camera must be used to overcome this difficulty even though a loss in precision will occur. The use of a diffractometer utilizing a scintillation detector and a pulse height analyzer for discrimination against radioactive backgrounds is another alternate method of approach. Such a unit is being installed at the present time. The refined grain size of molybdenum results in very good diffraction lines with the focusing camera. Specimens exposed to 6.5×10^{16}, 3.9×10^{18}, and 6.0×10^{19} nvt fast flux have received cursory examinations. An expansion of the lattice is observed in all cases. Additional x-ray exposures will be necessary before the exact amount of distortion can be determined.

Preferred orientation measurements have been obtained from three additional specimens of uranium irradiated to 150 MWD/T (0.017 burnup). This is a total of 23 samples from this material that have been examined. Pre-irradiation data are available for comparison purposes. Changes in orientation have been found that are of the same type as found in previous studies. Fuel elements that had increased in length during irradiation exhibit a small but definite increase in the number of (010) poles parallel to the cylindrical axis. For fuel elements that decreased in length during irradiation, a marked decrease in the number of (100) poles, and a marked increase in the number of (110) poles parallel to the axis is apparent. These general trends have been found consistently in the material of this test. These results would indicate that uranium with crystalline properties conducive to growth during irradiation should elongate at a rate increasing with exposure time. For material with characteristics that predict contraction during irradiation, the rate of contraction should decrease with exposure time. These conjectures are based upon the rotation of the crystallites observed in the relatively low burnup material. It is very possible, however, that the deformation rates could be affected by induced irradiation damage, especially at higher burnups.

Mechanical and Physical Properties of Fissionable Materials

Additional beta heat-treated uranium tensile specimens irradiated under Production Test 105-3NA to approximately 300 and 600 MWD/T (0.035 and 0.07% total burnup) were tested in tension at room and elevated temperatures. The irradiation temperatures of these specimens was approximately 150 C at the gage length. The irradiated uranium tensile data are presented in Table I with comparable values at the same temperature for unirradiated beta heat-treated uranium.

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TABLE I

Experiment or Sample No.	Exposure, nvt	Testing Temp. °C	Ult. Tensile Strength, psi	Yield Strength 0.2% offset, psi	Elongation in 1", %
B-12	0.9×10^{20}	25	92,200	76,800	0.87
L series	0	25	97,100(avg)	37,800(avg)	19 (avg)
N-8	1.8×10^{20}	25	87,500	82,600	0.55
N-9	1.8×10^{20}	25	88,500	75,000	0.53
HW-26426	0	300	41,000	24,000	33
P-2	1.8×10^{20}	300	61,400	57,000	0.95
HW-26426	0	450	20,500	15,000	34
P-5	1.8×10^{20}	450	26,000	21,500	0.53
HW-26426	0	800	400	400	36.5
P-6	1.8×10^{20}	800	--	--	11
P-4	1.8×10^{20}	800	900	900	7

The data continue to show the extreme brittleness of uranium even at an exposure of only 300 MWD/T (0.9×10^{20} nvt). The test at 800 C shows a recovery of ductility and indicates that either the microcracks, if present, are able to partially heal at this temperature or that the face-centered-cubic lattice can more easily accommodate the fission impurity atoms. These tests are an indication that gamma phase irradiation temperatures will best permit the material to remain at least reasonably ductile under the stated exposure conditions.

Preliminary work on the production test to evaluate the properties of irradiated thorium has been completed. The entire amount of BMI thorium has been machined into samples in preparation for irradiation. In addition to the BMI thorium, some of the HAPO reject slugs have been rolled down to 3/4-inch diameter and finished to 0.600 by cold swaging for the fabrication of tensile, thermal expansion, and metallography specimens. Results of the tensile data on the BMI and HAPO material are as follows:

Spec.	Treatment	Ultimate Strength psi	0.2% Y. Strength psi	Elongation in 1" %	Reduction of Area %
1	HAPO, vacuum annealed	24,900	15,900	36.5	70.5
2	" " "	28,600	20,700	39.0	66.9
3	" swaged	37,200	35,400	10.0	21.7*
4	" "	39,300	37,900	16.0	62.2
5	BMI	36,700	35,800	10.0	65.0

*Internal defect

From the above data it appears that the BMI material is also cold worked, even though BMI thought that it would not be. Further evaluation is in progress, for the thermal expansion data, the stress relaxation, the metallography, and hardness of both the HAPO and BMI material. Also, from the values of the HAPO material, it has been decided to extend the machining of the HAPO material to include some more tensile, Izod impact, and thermal expansion specimens.

The flow stress recovery of dingot uranium sheet, cold-rolled to approximately 50 percent reduction, is being studied for samples prepared longitudinal and transverse to the rolling direction. Data were obtained for samples annealed in dynamic vacuum at 350 C for 1000 minutes; at 400 C for 10, 100, 450, and 1250 minutes; and 500 C for 10, 100, and 1065 minutes. Previous test specimens here and at Los Alamos were definitely embrittled after cold working and annealing in static vacuum. The dynamic vacuum did not embrittle whereas material annealed in evacuated quartz capsules at 600 C became embrittled, primarily in the longitudinal samples. Gas analyses for hydrogen, oxygen, and nitrogen and spectrographic analysis were made. These results indicated that hydrogen was responsible for the embrittlement and that great care must be taken in the heat treatment operation.

Reactor Structural Materials

The study of the increase in zirconium oxidation rate observed after an oxidized specimen has been vacuum annealed has continued, to evaluate the apparent discrepancy when specimens are vacuum annealed in different furnaces. A comparison of two vacuum heat-treating furnaces has shown that anomalies observed in the oxidation rates of zirconium specimens after treatment in the furnaces resulted from a small leak in one furnace. This has been repaired, and heat treatment of slightly oxidized specimens in either furnace now produces substantially the same increase in the reaction rate during subsequent heating in air. Study of this effect is continuing.

Process tube, mechanical (bend) test and weight gain specimens of zirconium and Zircaloy-2, were discharged from the 100-H X-test hole after 508 days in the reactor at an average full-power-temperature of 410 C. The weight gain of these pieces that were exposed to the pile atmosphere was compared with the extrapolated weight gain of similar pieces exposed to air ex-pile at the same temperature and for the same length of time. It appears that the in-pile rate of reaction of zirconium and Zircaloy-2 with the pile atmosphere is essentially the same as the ex-pile reaction rate of the material with air.

Under certain conditions the system zirconium-uranium-water will react to cause a rapid pickup of hydrogen by the zirconium. Experiments directed toward defining the conditions necessary for rapid pickup of hydrogen by zirconium, Zircaloy-2, and Zircaloy-3 are under way. The initial results are tabulated below:

Run No.	Apparatus	Time, Hours	Temp., °C	Results
1	Autoclave	6	280	Uranium decomposed. No significant hydrogen pickup in Zr.
2	Autoclave	7	350	Same as above.
3	Tube furnace filled with dry steam at atmospheric pressure	2-1/2	450	" " "
4	" "	4	706	Slight increase in hydride 200 ppm.
5	" " *	1	600	Severe hydrogen pickup.
6	" " **	18	600	Metallography incomplete. Zr appears to be unaffected.

*Uranium rod was surrounded by zirconium, and the assembly was sealed in an aluminum tube.

**Zirconium and aluminum, but no uranium present.

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An examination of Runs 4 and 5 have definitely proven that the conditions observed in the H-pile recirculating loop can be duplicated ex-pile, and that there can be an extensive pickup of hydrogen in zirconium alloys due to a uranium-water (steam) reaction.

Fuel Materials

Installation of the ceramics laboratory for fabrication of UO_2 fuel materials continued slowly. The rubber mill for blending ceramic materials and plasticizer prior to extrusion was received. The saturable reactors for the hydrogen sintering furnaces were on site. The balance of the laboratory equipment is expected in June.

Two hundred and fifty pounds of normal uranium shot has been received from Fernald (NLO). The shot is clean and each of four particle size fractions tap-pack with a density of about 63-64% of uranium metal. The shot varies in size from 0.012" diameter to 0.080" diameter. A tap-pack density of 68% of uranium metal was obtained by mixing the smallest size particles with the largest size. Theoretical densities for the close packing of single size spheres alone and of mixed sphere sizes such as to permit interstitial packing are about 10% and 12% more, respectively, than the densities cited above. It is not possible to attain the theoretical densities with the shot because they are not uniformly sized and are not truly spherical.

Fuel Element Evaluation

Placing a lead foil layer between the capsule and the steel swaging jacket (monthly report, April 1956), greatly facilitated removal of the capsule and resulted in its having an excellent surface finish. However, a peculiar "necking" condition exists at the oxide, end plug, interfaces. The cause of this "necking" is being investigated. New dies are being made which will allow for all future oxide swaging experiments to be made on the small swaging machine in Building 326 instead of the large swage in the 306 Building. This change will save time and money as well as provide better control of the swaging operation.

An analysis of the numerical results from time dependent thermal stress calculations for solid uranium fuel elements operating between 100-350 C and 350-600 C is being made. Based on the results of these and supplementary calculations, the following general observations were made:

1. Elastic calculations predict thermal stress values for realistic temperature drops in massive uranium fuel elements which are several times too large.

2. For fuel elements which operate in an intermediate temperature range -- 100 C to 400 C -- the initial thermal stresses and strains can be approximated with the theory of plastic deformations. Further relaxation of the thermal stresses may reduce these initial values up to 25%.

3. For high temperature operation of fuel elements -- over 400 C -- stress relaxation must be considered during power increases. For these cases, rate of power increase affects the stress distribution. Thermal stresses can be completely relaxed during steady-state reactor operation.

4. During steady state reactor operation the effects of stress induced strain can be neglected in determining the stress relaxation rates.

Eleven KER fuel element clusters were completed and shipped to 1706-K. Nine of these have spiral spacers. Two have support fins on each of four fuel rods. A plastic flow tube was set up at 1706-K. Spirally wound fuel elements charge easily over the pigtail holes and circumferential groove of the present KER nozzle. Three fuel elements were run with dye injection. Mixing of the dye is so complete that it will be necessary to use a fluid polariscope to determine flow streamlines. Testing of four rod clusters with external support and no spiral winding will begin next month. Compression testing of spiral wound fuel elements showed that about 900 lbs is necessary to collapse the spiral tubing 0.030 inch. A fuel element of this type could then be expected to withstand 0.030 inch of radial rupture distortion before discharge forces became excessive. Uranium machining for 75 fuel elements has been completed. This metal can be used for the ring supported fuel element. Flow and mechanical testing should determine which type is most feasible by July. Production for the October charging schedule in KER can then begin. Two irradiated cluster fuel elements from H Reactor have Radiometallurgy priority and should be examined during the next month.

Examination of a UO_2 slug which ruptured in the MTR in September has been completed. Release of fission products from the slug occurred through a hairline crack in the weld closure. This weld failure probably occurred before irradiation when positioning lugs were welded to the can wall after the closure weld had been completed and autoclaved. The UO_2 fuel material was cracked in a number of places. A tubular crack around the center of the piece indicated that further sintering and shrinkage had probably occurred at the center. The power at which the piece operated was estimated from burnup analysis on the uranium, and temperatures calculated from this power indicated that central temperatures were in the range 2200-2300 C. A final report on the experiment is in process.

Present practice at other sites in the preparation of UO_2 fuel elements requires the fabrication of UO_2 to very close tolerances. As a result, the fabrication costs are high. An experiment has been initiated to determine whether these tolerances can be relaxed without harm to fuel element performance. An analytical treatment has been developed concerning the temperature distribution in UO_2 rods enclosed in Zircaloy capsules having varying annular clearances between the UO_2 and the inner wall of the capsule. These calculations are being published as HW-42996. The calculations will be tested by the irradiation of two sintered UO_2 pieces (MTR irradiation GEH-3-19) canned in Zircaloy capsules and having annular clearances between oxide and jacket varying from 0.001" to 0.011". It is expected that certain portions of the UO_2 may reach the melting point, but this should not give rise to difficulty in the irradiation.

Radiometallurgy Examination

The examination of the slug that was downstream from the H-loop rupture has been completed. Intergranular corrosion, diametrically opposite the rib marks, and a 0.061" double-throw warp were the only observed abnormalities. A report

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on the complete investigation is in progress and shows that intergranular corrosion of the aluminum jacket caused the ruptures to occur.

Six assemblies containing preformed tensile specimens of nickel or nickel-iron diffusion bonds were received after irradiation of 300, 600, and 1000 MWD/T according to Production Test 105-537. Both bonds in the two nickel bonded samples and one bond in a NiFe bonded sample irradiated at 50 C to 1000 MWD/T were observed to be broken when the assemblies were opened. Bonding between the uranium portion of the samples and the aluminum inserts may have been responsible for these breaks in the tensile sample. Tensile tests of the bonds in the assemblies irradiated at 200 C to 1000 MWD/T showed a decrease in the ultimate tensile strength of approximately 15% after an exposure of 300 MWD/T. Above the exposure of 300 MWD/T, a decrease of 4-5% of the original ultimate tensile strength was observed for each 300 MWD/T increment up to an exposure of 1000 MWD/T.

The radiometallurgical investigation of the cap failure problem which was requested by Fuel Technology continued. A report (HW-42940) on the examination of one cap failure and three incipient cap failures is being issued. The examination of six additional unruptured slugs to determine the relation between core distortion and bonding in normal slugs and incipient cap failures was started. Two of these slugs, one normal and one exhibiting a slightly necked down region just below the cap, have been examined. These slugs were discharged from tube 4154-H after an exposure of 659 MWD/T. Three very pronounced circumferential grooves were observed in the jacket of the incipient failure in addition to the necked area below the cap. One of these grooves was located at the center of the slug, and the other two were 1-3/4 inches on either side of the center. The uranium core was found to be broken in two at the center and is presumed to be broken at the other two necked areas. Both slugs were sectioned longitudinally at the cap and base ends, and the length and dish of the uranium core were measured. These measurements are summarized in the following table.

	Length and Dish Measurements				Average Length Change - mils	
	Dish- mils		Length - inches			
Slug	Cap	Base	Axial	Peripheral	L_A	L_p
Incipient Failure	10	20	8.305	8.335	-20	+10
Normal	20	17	8.252	8.289	-73	-36

The cap of the incipient failure was unbonded while the bond at the base end appeared intact. A large number of macro-cracks were observed in the central area of the cap section, and a large transverse crack which extended completely through the uranium was found approximately one inch from the base end. This crack was approximately 1/16 inch wide at the center and decreased to hairline dimensions at the ends. The cap of the normal slug was unbonded as was the jacket for a short distance from the cap end of the uranium on one side. The base and the jacket at the base end were also unbonded. Several small macro-cracks were observed in the uranium of both sections.

Separations Plant Structural Materials

In order to determine the corrosive damage incurred in the use of a 12 w/o nitric-3 w/o hydrofluoric acid mixture as a cleaning or pickling solution, samples of type 304L stainless steel were exposed to this solution for times ranging from one-half to 24 hours at temperatures ranging from 25 C to the boiling point of the solution. Very high corrosion rates were obtained at all temperatures, in the range of 0.100 to 1.00 inch penetration per month. The corrosion rate appears to decrease with time; however, this may be due to fluoride depletion.

Samples of various potential bearing materials were Huey tested to determine their suitability for service in nitric acid. Included in this group were Heavy Metal, Elgiloy, Carboloy 608, Carboloy 907, aluminum oxide, Alsimag 614, Everlub, Stupakoff 1542, and ADL 210; glazed and unglazed. Of this group, only the following appear to offer much promise as bearing materials in high concentrations of nitric acid: Stupakoff 1542, Carboloy 907, aluminum oxide, Alsimag 614, and possibly glazed ADL 210. Samples of mild steel coated with Kel-F dispersion were also tested. Three samples were selected at random from the 12 supplied and placed in boiling 65 w/o nitric acid. All three samples exhibited pin holes in the coating.

Data have been produced which show the relationship between the surface temperature, bulk metal temperature, and solution boiling temperature of heat exchangers for conditions where the steam temperatures lies between 100 and 200 C and where the solution boiling point lies between 100 and 120 C. This relationship has been applied to existing heat transfer corrosion data and the results compared with existing factorial autoclave corrosion test (F.A.C.T.) data to evaluate the possible correlation. The results show that the corrosion rates obtained by the two separate techniques can be correlated and that the corrosion rate is dependent upon the surface temperature of the metal.

The L-4 heat exchanger tube bundle in the Purex product concentrator failed this month. Although this tube bundle was an original equipment installation in Purex plant, it experienced only about 90 days' actual service time, 60 days concentrating product and 30 days on cold runs and cleanouts. The short service life of this tube bundle coupled with the failure of a similar tube bundle in the Redox product concentrator, after two months' service, points out the serious corrosion problems existing in this phase of separations plant operation.

Welding Development

Taking advantage of the suggested use of water-cooled copper electrodes, the Roto-Arc welding head has been completely redesigned. Its size has been reduced approximately 60%, yet the cooling has been increased and magnetic field strengthened. A provision for establishing a fixed arc length has also been made.

Plutonium Metallurgy

Five large experimental plutonium castings were made during May: three of the castings were satisfactory, and the remaining two were unsatisfactory because of failure to completely fill the mold cavity. Two of the castings were cooled on a loose-fitting aluminum plug and had approximately 37 mils eccentricity due to non-uniform cooling. One of the castings cooled on a tight-fitting aluminum plug had an eccentricity of only seven mils. Since machining stock amounts to

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only 50 mils or less on large castings, it is extremely important to avoid eccentricity. These castings were produced from buttons having a density less than 19.3. Considerable purification was achieved in the molten charge by evaporation of impurities under one micron pressure at about 800-850 C. The boiling of impurities from the melt was so active that between 250-300 grams of metal was lost from each charge as small beads of plutonium were thrown out of the melting crucible. The density of the final castings ranged from 19.5-19.55 and represents some of the highest densities achieved in large castings of alpha plutonium.

Alpha plutonium turnings were briquetted at 150 C under pressure of 2700 psi. The briquettes were solid and easily remelted. About 70% of the metal in the briquette was recovered as useable material. Briquetting of alpha plutonium at room temperature is completely unsuccessful. The hot briquetting of alpha plutonium will permit the recovery of a substantial proportion of machining wastes directly as opposed to more time consuming chemical recovery methods.

Additional experience in machining plutonium on the 20" Monarch air gage tracer lathe has demonstrated that roughing cuts can be safely made at a feed of 0.012" per revolution with a 0.030" depth of cut. A satisfactory cutting speed for plutonium is 100 surface feet per minute with or without coolant. The surface roughness produced by 1/32" radius tool at a feed of 0.004" per revolution is 40-60 micro inches rms. Cast iron grade of sintered carbide has been found to be satisfactory for machining plutonium. One of the serious problems in machining large plutonium castings is the temperature gradient existing from place to place in the plutonium. A temperature gradient of 8 C was measured in one of the castings recently machined. This is equivalent to 0.4 mil thermal expansion per inch. Thermal expansions of this magnitude are greater than the permissible dimensional tolerances of some parts. The temperature gradient can be minimized by proper distribution of coolant to the piece being machined. Contributing to the difficulty of controlling the temperature is the heat generated in machining and the heat of incandescent hood lights. Some difficulty was experienced from tool chatter in machining. These difficulties were minimized through use of a heavier tool holder and by dampening the piece being machined by attaching a heavy rubber piece to it.

Twelve electroformed copper cans were made during May, some of them using the improved formula, Unichrome C10XB electrolyte. The maximum wall thickness variation found was 1.2 mils while the minimum was 0.4 mil. Seven of the 12 cans passed the helium leak test.

A uranium slug placed in an anodized aluminum can was heated to 400 C for 4-1/2 hours and subsequently heated to 450 C for 28-1/2 hours with no evidence of reaction between the uranium and aluminum. The anodized coating is a nominal 0.001" thick but in places is only half that thickness. Examination of the coating after the test showed some crazing, but the coating remained adherent and in good condition. Anodized aluminum cans will be used for all PCTR fuel slugs.

The vacuum induction furnace melting pot has been modified to permit melting uranium as well as plutonium. With a uranium charge, the initial power input was only four kw, but when modified by providing a greater gap between

the coil and the graphite crucible, a power input of 27 kw was achieved. With this power input, a 31-pound charge of uranium can be melted and poured in eight minutes, or a total cycle of 50 minutes between charges. It is planned to complete fabrication of PCTR slugs in the induction furnace to take advantage of larger charges and shorter time cycles.

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CONTACT ENGINEERING UNIT

PROJECT ACTIVITIES

Project CA-512

Construction work on Revisions 3 and 4 has been at a standstill during the month because of the craft strike.

Prlject CA-548

Detailed design is proceeding by the Architect-Engineer, but is not yet complete. Revised estimates, based on detail drawings, indicated that costs would be greater than the budgeted $125,000. It is expected that minor modifications to the scope will bring costs back within the available funds.

Project CG-588

All construction work has been stopped during the month by the strike. The performance of the new high head pumps is still under study. The vendor is making full-flow tests at the factory to evaluate further the cavitation which was experienced during the initial flow tests here.

Project CG-642

As reported last month, scoping of this project is complete and detail design is under way.

Project CG-654

A program for issuance and approval of design criteria has been instituted by Reactor Design and Development Unit. The criteria for vertical safety rods have been approved and transmitted to the Design Council. Criteria for other components of the reactor are currently under consideration.

ETR Liaison and Project CG-681

A project proposal (CG-681) has been approved by G.E. Management and forwarded to the local Commission to secure $80,000 for detailed design of the facilities HAPO plans to install in the Engineering Test Reactor at ARCO. Floor space, for equipment to service the two test facilities, has been allotted to HAPO and preliminary scoping is in progress.

MTR Liaison

The liaison work schedule in May was directed primarily toward completing the modification to the GEH-4 fuel testing loop at the MTR, and in preparation and installation of a thermocouple slug test, GEH-4-11, to determine the power output in the modified loop.

Test samples of GEH-3-14, 15, and 16 were also returned from the MTR to HAPO.

Sample one of GEH-3-12 was discharged from the MTR at an exposure of about 6×10^{20} nvt. This sample along with two samples of GEH-3-10 will be returned to HAPO along with the first GEH-4 samples, GEH-4-11, about the middle of June.

Sufficient priority had been established to complete the modifications on the GEH-4 loop and install the next fuel test (GEH-4-11) for irradiation during the earliest possible cycle. Originally, June 11 had been the target date for starting the fuel test program again; however, by stepping up some shipping dates and obtaining extra manpower for installation purposes, this target date was stepped up to May 21. The fulfillment of this May 21 dead line was completed, the GEH-4-11 experiment was charged and, as of now, the new loop is operating satisfactorily.

Preparations are now under way to irradiate I & E type fuel elements during the next reactor cycle. These slugs will be made of uranium washers and will be Al-Si canned in aluminum cans. Fuel-Technology will sponsor this test.

SPECIAL STUDIES

An economic analysis of tritium production from the irradiation of slightly enriched uranium and lithium aluminum shows that the unit product cost is approximately that of natural uranium. The unit cost of tritium obtained from this method of irradiation is less than the unit cost for tritium obtained by using U-235 alloy fuels. This is primarily due to two factors:

1. Improved neutron economy for slightly enriched fuels from fast fission effects, decreased shield losses, and reduced parasitic captures.

2. Improved use of existing manufacturing facilities (slightly enriched uranium can be separated in Purex or Redox plants).

It was concluded that only under exceptional circumstances could an alloy fuel compete with a slightly enriched uranium fuel.

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PILE TECHNOLOGY SECTION

INVENTIONS

All Pile Technology Section 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 May, 1956, 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.

Inventors	Title
N O N E	

Acting Manager - Pile Technology

PH Reinker:cvf

[redacted]

VISITORS AND BUSINESS TRIPS

R. J. Hale, and W. J. Motell, of the duPont Company, Savannah River Operations, Aiken, So. Carolina visited Hanford on 5-14 thru 5-16-56 to discuss plutonium laboratory equipment, hoods, cubicles and high level radiation.

Fred Hittman and C. D. McKereghan of the G. L. Martin Co., Baltimore, Maryland visited Hanford on 5-8-56 to discuss "Project Pied Piper".

Larry J. Haight of the Johnson Pump Company, Pasadena, California visited Hanford on 5-15-56 for equipment consultations (primarily pumps and agitators).

Richard Rowe of the General Machinery Company, Spokane, Washington visited Hanford on 5-15-56 for equipment consultations (primarily pumps and agitators).

George Watt, University of Texas, Austin, Texas visited Hanford on 5-21 thru 5-25-56 as a Consultant on general problems in separations.

Professor Thomas of the Massachusetts Institute of Technology, Boston, Mass., visited Hanford on 5-23-56 to discuss waste scavenging program.

L. W. Niedrach, of Knolls Atomic Power Lab., Schenectady, N. Y. visited Hanford on 5-4 to discuss electrowinning of uranium.

J. A. Seneker of General Electric, Anaheim, California visited Hanford on 5-22 and 5-23-56 to attend the safety forum on painting and coating problems.

R. L. Moore of Hanford visited the Oak Ridge National Laboratory, Oak Ridge, Tenn. on 5-7 thru 5-11-56 for consultations on fission product utilization and process chemistry.

M. C. Lambert of Hanford visited the Univ. of Chicago, Chicago, Ill. on 5-4 to discuss properties of UO_3 and research program, and visited Washington, D. C. on 5-7 thru 5-9-56 to attend annual AEC spring meeting and visited Oak Ridge National Lab., Oak Ridge, Tenn. on 5-10 and 5-11-56 to discuss the UO_3 program.

B. M. Johnson of Hanford visited the Argonne National Laboratory, Lemont, Ill. on 5-7-56, the Oak Ridge National Laboratory, Oak Ridge, Tenn. on 5-9 thru 5-11-56 and University of Wisconsin, Madison, Wisconsin on 5-12-56 to discuss uranium oxide problems and uranium conversion processes.

R. J. Brouns of Hanford visited the duPont Company, Aiken, So. Carolina on 5-21 and 5-22-56 and the Knolls Atomic Power Laboratory, Schenectady, N. Y. on 5-23-56 and the General Engineering Laboratory, Schenectady, N. Y. on 5-25-56 and the Argonne National Laboratory, Lemont, Illinois on 5-28-56 and ANP, Cincinnati, Ohio on 5-29-56 to discuss analytical chemistry and separations chemical research . On 5-24-56 also attended the analytical conference in Schenectady and on 5-30 and 5-31 attended the ASTM Committee Meeting in Cincinnati, Ohio.

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H. C. Rathvon and W. H. Swift of Hanford visited the Oak Ridge National Laboratory, Oak Ridge, Tenn. on 4-30 thru 5-2-56 and duPont, Savannah River Operations, Aiken, So. Carolina on 5-3 and 5-4-56 to discuss ion exchange metallex, and purex processing; on 5-6 thru 5-9-56 attended the American Institute of Chemical Engineers, New Orleans, La.

H. H. Hopkins, Jr. of Hanford visited the Oak Ridge National Laboratory, Oak Ridge, Tenn.on 5-1 and 5-2-56 and the duPont Company, Savannah River Plant, Aiken, So. Carolina on 5-3- and 5-4-56 to discuss process technology and Purex processing.

A. E. Smith of Hanford visited the Savannah River Operations, Aiken, So. Carolina on 5-21 and 5-23-56 and the Knolls Atomic Power Laboratory, Schenectady, N. Y. on 5-23 thru 5-25-56 to discuss in-line instrumentation and other equipment development.

D. O. Darby of Hanford visited the Oak Ridge National Laboratory, Oak Ridge, Tenn.on 5-7 thru 5-11-56 to discuss Purex and metal recovery plant problems.

K. M. Harmon of Hanford visited the Los Alamos Scientific Laboratory, Los Alamos, New Mexico on 5-7 and 5-8-56 and the Dow Chemical Company, Rocky Flats Plant, Boulder, Colorado on 5-9-56 to discuss chemistry and metallurgy of plutonium.

ORGANIZATION AND PERSONNEL

	April	May
Separations Technology General	2	2
Plant Processes Sub-Section	64	65
Chemical Development Sub-Section	75	75
Chemical Research Sub-Section	57	57
Contact Engineering Unit	2	2
Analytical Laboratory Unit	35	36
Technical Shops Unit	28	28
	263	265

Chemical Research Sub-Section: F. M. Smith, Engineer I hired into the Sub-Section on 5/4/56. F. J. Leitz transferred to AEPD, Detroit, Michigan on 5/25/56.

Analytical Laboratory Unit: Billie W. Adler, Lab. Asst. "C" transferred to the Unit on 5-14-56. Mildred L. Irwin, Lab. Asst. "A", transferred to the unit on 5-7-56. Kathleen T. Hannan, Lab. Asst. "C" transferred from the Unit to the Hospital on 5-14-56.

PLANT PROCESSES SUB-SECTION,

REDOX PROCESS TECHNOLOGY

Summary

Numerous rework solutions from process leaks, vessel overflows, and flushes required reprocessing for about one week after start-up on May 3. Approximately five days' uranium production at 120 per cent of Phase II instantaneous rate contained excessive gamma activity due to rework materials, necessary crash shutdowns, and poor intercycle acidity control, and were processed through silica gel during the first week of operation.

After the first week of operation, decontamination of both products improved rapidly to over-all logarithmic decontamination factors of about 7.0 for uranium and 8.2 for plutonium, despite numerous operation difficulties. In general, solvent extraction losses have been about 0.09 and 0.15 per cent for uranium and plutonium, respectively, although over-all losses (due to a number of process leaks, sump solutions, temporary extraction system upsets, etc.) were considerably higher.

Exposure of the material processed averaged 779 MWD/T (525 to 1029) with an average age of 110 days (97 to 181) since pile discharge. The plutonium concentration in the product solution averaged 104 grams per liter, with an average acidity of five molar.

Feed Preparation

Dissolving resulted in iodine-131 emissions to the stack of approximately one curie per day average for the month. The higher than normal emissions were due, in part, to decreased reactor efficiency because of length of operation between regenerations. Because of these emissions, all three reactors were regenerated during the month. However, two of the regenerations were not successful, and one of the reactors was replaced. The concentration of the nitric acid for the first dissolving cut was reduced from 50 per cent to 47 per cent on May 22 in an attempt to reduce iodine emissions. Early data indicate a small reduction.

Feed treatment was begun on May 3 (and continued for approximately one week), with feed consisting of miscellaneous sump and rework solutions combined with virgin metal solution. One such feed batch after treatment contained gamma activity approximately two fold higher than normal. This batch was retreated and scavenged, with no significant improvement. Between May 11 and May 17, each feed batch contained approximately 600 grams of plutonium from uranium contaminated PR solution. Permanganate concentrations were increased as necessary to compensate for the possible increase in reducing potential of these rework solutions.

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Decontamination

Over-all fission product decontamination was relatively poor during the first part of May (logarithmic 6.4 and 7.0 for uranium and plutonium, respectively), but was excellent during the latter part (logarithmic 7.0 and 7.5 to 8.2). The uranium product from the first few days of operation contained gamma activity exceeding specifications by as much as a factor of three and was processed through silica gel and blended with low activity uranium product. During the same period, the plutonium contained activity up to three fold greater than the shipping specification. Approximately two-thirds of this product solution was successfully reworked through the plant (because of uranium contamination, however, and not fission product activity). The remainder was successfully processed in the 234-5 Building. Most of the contamination was zirconium-niobium immediately after start-up, and ruthenium after two or three days. The early high activity was caused by contamination with the HS (IS)* Column flush solution, the large amount of rework, and several start-ups and shutdowns. The later high activity was primarily due to poor acidity control of the intercycle streams, and the improved performance during the latter part of the month reflects subsequently improved acidity control.

Solvent Extraction

The solvent extraction battery was started up on May 3, with the same flowsheet as that in effect prior to the April shutdown, including the permanganate feed treatment, precycle flowsheet, and two stage salt waste backcycle. Operational difficulties have prevented complete adoption of the partition and plutonium cycle flowsheet suggested in HW-42180 for improved critical mass safety.

A batch of IBX solution with negligible ferrous ion concentration was used on May 4 for 17 hours before the situation was discovered. During this period, greater than 90 per cent of the plutonium in the IBF stream followed the uranium into the 2DF (3DF) stream, resulting in a maximum plutonium concentration in the latter stream equal to that in the HAF (IAF) stream. The resultant plutonium concentration in the uranium product was reduced to a maximum of only 14 parts per billion parts of uranium in the 2D (3D) Column. The temporary use of 0.01 molar ferrous ion in the 2DS (3DA) stream resulted in no apparent improvement of plutonium removal and no increase in ion contamination of the uranium product.

During the above incident, the backcycled plutonium losses from the IAW (2DW) stream were approximately 1.5 per cent of the plutonium returned from the 2D (3D) Column. This fact illustrates the excellent oxidation of plutonium from the three to the six valence in the IAFS (2DFS) Concentrator.

* Since the Redox HW No. 5 Flowsheet (HW-38684) nomenclature and the plant equipment nomenclature are not necessarily the same, the HW No. 5 nomenclature is used in this report, followed parenthetically, where different, with the plant equipment nomenclature.

Due to a leaking IBP valve after a crash shutdown on May 8, a large amount (14 PR cans) of plutonium was contaminated with uranium to a maximum of about 20 to 25 per cent. This was returned to the feed preparation step and successfully reprocessed through the solvent extraction battery. The partition and plutonium cycle flowsheets were adjusted slightly during this rework to compensate for the increased plutonium content of the feed solution.

A plug developed in the HAIS (IABS) line on May 17, temporarily interrupting that part of the second stage of backcycle at that time. After the plugged line was replaced, the HSIS (ISBS) line developed a partial plug on May 21, again restricting backcycle waste flow, a condition which still exists at report time.

The HAIS (IABS) waste backcycle pump "froze" several times during the month, once during operation and at least three times during shutdown.

The causes of the line and pump troubles are unknown, but are currently under study in collaboration with members of the Process Chemistry Unit. In the meantime, the $Al(NO_3)_3$ concentration in the HAIS (IABS) stream has been reduced from ca. 2.3 to 2.2 molar since May 21.

Waste Losses

The extraction losses from the first cycle (the only salt waste stream not backcycled) averaged 0.09 and 0.15 per cent for uranium and plutonium, respectively, except for the last week when they averaged 0.1 and 0.3 per cent. The higher losses are not yet explained, but are probably due to the combination of extraction column flooding, excessive return of plutonium from the final concentrator, and several other related factors and unusual conditions arising this month.

The over-all recoveries for the month were 99.77 and 99.28 per cent for uranium and plutonium, respectively. These are lower than normal, primarily due to several in-cell process equipment leaks, equipment flushes, and waste backcycle difficulty, coupled with exceptionally high plutonium content in the plutonium concentrator condensates.

Waste Storage

The pH adjustment (from approximately three to between seven and nine) of the cribbed condensates from the Redox Plant was started on May 4. This was done to minimize leaching of activity from the soil upon recommendation by the Radiological Engineering Section.

The second test of addition of calcium chloride to one of the Redox Plant utility outlet header cribs was concluded on May 23 since no beneficial effect on crib drainage rate has resulted.

The waste storage production tests, HW-41408 - Part II, was formally approved, and filling of the 107 SX tank is continuing as planned.

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Between May 11 and report time, seven pressure surges occurred in the 101-SX tank. These are the first such occurrences in that tank since December, 1955. Four of the pressure surges resulted in peak condensate rates of about 40 gallons per minute or more, with a maximum total heat evolution from one incident of approximately 31 million BTU. The pressure developed in the tank reached a peak of 50 inches w.g. on one occasion. It is believed that the auger agitator is no longer connected to the motor shaft, thus leaving the tank contents unagitated. Preparations are now being made to reactivate the air recirculator in the tank.

On May 22, approximately 113,000 gallons of condensate in the 106-SX tank were transferred to the 104-SX tank to raise the liquid level in the latter tank above the top of the air operated recirculator to permit better agitation in the tank.

Plutonium Concentration

Failure of the third tube bundle in the L-3 plutonium concentrator occurred about May 12, after approximately two months of operation. The failure was indicated by a gradual increase in plutonium losses to the 233-S Building condensate (backcycled to the D-14 backcycle concentrator) from less than 0.1 to greater than three per cent at report time. Preparations are currently under way to replace the tube bundle with another stainless steel unit.

Plutonium product from the 233-S Building during the month averaged 104 grams per liter plutonium, 5.0 molar nitric acid, and 35,000 ppm iron (plutonium basis).

Tail-End Treatment

The top alundum grate in the SG-1 silica gel bed was broken, and a feed jumper was installed without a prefilter early in May. The unit was then operated for a period of three days with high activity feed from the poor plant start-up. No increase in pressure drop resulted during the operation. The over-all arithmetic decontamination factor was approximately 1.3, with about 80 per cent or greater of the activity due to ruthenium.

PUREX PROCESS TECHNOLOGY

Summary

Following the April-May shutdown, during which the solvent extraction columns were flushed and several major equipment modifications were made, the Purex Plant was started up at a 1.44 capacity factor on May 17. From a process standpoint, the start-up was smooth except for high HAW losses (caused by faulty HAX and HAF instruments) which required a 16 hour shutdown on May 18 for segregation. Attempted rework of this waste immediately after start-up appeared to be unsuccessful, so the waste rework was temporarily discontinued until further investigation of the trouble could be made. When the process performance levelled out, all losses were within flowsheet specifications, and the decontamination factors were considerably improved over the previous operating period. Within a week after start-up, specification plutonium and uranium were being produced from the final solvent extraction cycles.

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Feed Preparation

Irradiated uranium slugs having an exposure of 3.7 to 6.7 MW/T (245 MWD/T) and having a cooling period of 107-159 days were dissolved in the two dissolvers. Radioiodine emissions have been 0.01 curies per day or less.

The gamma scintillation iodine monitor performed without mishap for the entire period. No iodine emissions were found except during dissolving, at which time the iodine leaves the reactor at a constant rate for the entire dissolving period. The A Cell silver reactor was regenerated. No emissions were caused by the regeneration, and subsequent efficiency of the reactor has improved.

In preparation for a low acid flowsheet in the HA Column, the dissolving procedure was changed to a charge of nine tons of metal on top of a five ton heel, with dissolution to a terminal acidity of 0.4 M vice 1.5 M. The frequency of the centrifuge bowl cleanout has been increased so that approximately 30 tons of uranium are centrifuged between cleanouts.

Solvent Extraction

During the April-May shutdown, all of the solvent extraction columns, except the IBX and IBS Columns, were emptied and thoroughly flushed. The IA Column was replaced with a 26.5 inch unidiameter column, and the original IA pulse generator (485 cubic inch displacement) was reinstalled. Installation of a 30 inch pump boot in the IOF Tank G1 was made in order to provide a method to prewash the IOF semi-continuously prior to the IO Column. The final plutonium cycle was put on the second cycle organic system. It was found during the flushing operations of the L Cell plutonium concentration package that the tube bundle on the plutonium concentrator E-L4 had failed. The complete package was replaced with the spare modified as follows:

1. The rotameter between the stripper and concentrator was eliminated and the line between the two was made straight.

2. The reflux from the stripper deentrainment section was routed to the IAF Tank J1.

3. Provisions were made to add nitric acid to the stripper feed stream (2BP) and water to the concentrator.

The modifications to the package were made according to recommendations of laboratory personnel to permit operation under conditions which would not result in a plutonium buildup in the equipment (see 234-5 Development, below).

The solvent extraction batteries were started up under Purex Plant Flowsheet II (HW-43391) conditions at a capacity factor of 1.44. During the first two days, recycled uranium along with the plutonium from the plutonium concentrator package flush was processed. During this time, about 600 units of plutonium were sent to the waste cell from the HA Column. The cause of the loss was due to faulty HAX

and HAF rotameter transmitter calibrations. Because of this loss and several other operational difficulties (e.g., stuck IAF control valve), the plant was shut down, and the high waste loss was isolated and stored in the Waste Rework Tank F8.

Shortly after the subsequent start-up, dissolver solution that contained some of the high plutonium waste solution was started to the HA Column. The decontamination factor for the precycle was unsatisfactory (about 400), and high HC Column losses were experienced (one to six per cent). Raising of the HC Column L/V from 1.3 to 1.7, raising the HC Column frequency from 55 to 70, and replacement of first cycle organic with fresh organic had no effect on the decontamination factor or on the HC Column losses. When waste rework added to the HAF was discontinued, the HCW losses dropped to about 0.2 per cent, and the decontamination factor improved sharply. The waste rework was temporarily discontinued until further investigation could be made.

Tables I and II summarize the performance of the solvent extraction batteries under steady-state operation at month end.

Table I

Per Cent Waste Loss

	U	Pu
Precycle	0.10	0.4
Partition	0.06	0.25 (IBU - 0.05)
Final	0.80	0.10
Over-all	0.96	0.75

Table II

	Gamma Decontamination Factors (dF)			
	Previous Operating Period		Present Operating Period	
	U	Pu	U	Pu
Precycle	3.4	3.4	3.3	3.3
Partition	1.5	1.2	2.3	1.5
Final	1.0	2.0	0.7	2.9
Over-all	5.9	6.6	6.3	7.7

Because of the large holdup in the intercycle uranium concentrators and feed tanks, the plant has not reached a true chemical equilibrium state at report time. However, the preliminary data do indicate that the unidiameter IA Column is giving a more satisfactory decontamination performance than the dual diameter column by about a factor of three. Somewhat higher plutonium losses are being experienced with the present IA Column (0.2 vice 0.02 per cent). This is due to a lower pulse generator operating frequency necessitated by a smaller diameter scrub section.

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The decontamination factor improvement for the final plutonium cycle is believed to be due largely to solids removal, the low acid flowsheet, and the utilization of second cycle organic for the 2AX. Iron contamination of the product has averaged 25,000 parts iron per million parts plutonium.

How much of the over-all decontamination factor improvement is due to the column flushing is difficult to evaluate. However, column operation and stability are much more satisfactory after the flush than they were prior to the flush. Consequently, no upsets have occurred with resulting fission product carryover into the product streams. This undoubtedly has substantially contributed to the over-all decontamination factor improvement.

Waste Treatment

During the shutdown period, the waste concentration and acid recovery systems processed the column flushes without difficulty. When the five per cent caustic flush from the IA Column was jetted to TK-F10, the acid concentrator, E-F6, was emptied of waste solution and flushed with this caustic. The flush was boiled for one hour in the unit. Subsequent operation has illustrated that both tube bundles were cleaned of scale (probably ferric dibutyl phosphate) and now operate at 20-25 psig vice 30-39 psig at the 1.44 capacity factor.

The acid recovery system has operated satisfactorily with an average acid recovery of approximately 70 per cent of the total acid received in F Cell. This recovery percentage is somewhat lower than previously reported because the low acid 2A Column flowsheet has lowered the total acid, while the acid lost to the IWW has remained essentially constant. IWW rates are now at 175 gallons per unit of production, the lowest volume since plant start-up, again because the lower quantity of acid fed to the system has allowed control by water addition to the concentrator feed tanks without overtaxing the fractionator, T-F5.

During the April shutdown, jumpers were altered to allow the following transfers:

(a) IOW and 20W to 241-C Farm, TK-110.

(b) Neutralized IWW to 241-A Farm, TK-103.

(c) Coating wastes to 241-C Farm, TK-104 (not a change).

The contents of TK-102 which were collected from the preceding operation period will not boil (because of their large volume per unit of production), and are being held for disposal to 241-C Farm. TK-102-A contains the following wastes:

	Volume, Gallons
IWW	130,000
50 per cent caustic	67,700
IOW	201,300
20W	58,500
Column flushes	10,800
Miscellaneous (jet dilution, etc.)	38,000
Total	506,700

TK-103-A now contains 49,600 gallons, which includes 16,500 gallons of water heel, 11,200 gallons of neutralized IWW, and 18,600 gallons of IOW solution. The excessive IOW volume has been stored in TK-103 because the high plutonium content resulting from HCW losses might preclude cribbing of the carbonate wastes sent to 241-C Farm.

Organic Treatment

A semi-continuous prewash of the IOF is now being performed in the IOF Tank G1 with sodium carbonate prior to the IO Column. As a result of this procedure, the contact time has been increased, and the IOF/IOO decontamination factor has increased to approximately 30. Furthermore, with this procedure, the carbonate prewash can be used almost to depletion so that over-all carbonate consumption has been reduced 30 per cent. The activity of the IOO has averaged 400 microcuries per gallon. The 20F/200 decontamination factor has likewise been approximately 30, with just the 20 Column contacting. No effect of having the final plutonium cycle on this system has been noted, except for increased plutonium content of the 20F.

As a result of the high HCW plutonium losses observed during the period of waste rework discussed previously, the entire organic inventory in the No. 1 organic treatment system was replaced. Both laboratory and hot semiworks data indicated a possible connection between waste rework and degradation of organic. However, subsequent evaluation of the situation shows that the organic quality was satisfactory after adequate carbonate washing. Approximately 7,000 gallons of organic were discarded during this operation, but the remainder was stored for use. The steady-state organic loss continues to be on the order of 0.5 per cent of throughput.

URANIUM RECOVERY PROCESS TECHNOLOGY

Summary

Over-all uranium losses averaged 1.1 and 0.8 per cent of the virgin and gross feed uranium, respectively. Condensate losses were relatively low and averaged 0.2 per cent of the virgin feed. RCW losses increased significantly when weld leaks forced replacement of the RC Column. Gross gamma logarithmic decontamination factors were consistently about 5.0, and the gross gamma activity of the product shipped to the UO_3 Plant averaged 130 per cent of that of aged natural uranium.

Cobalt-60 in the solvent extraction wastes at concentrations greater than the maximum permissible for ground disposal continued to limit the waste scavenging disposal program. Plant tests being carried out to improve the removal of cobalt from solution during waste treatment are:

(1) Elimination of the complexing effect of ammonia by replacement of ferrous ammonium sulfate in the solvent extraction scrub with ferrous sulfamate.

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(2) Addition of the nickel scavenger in two portions so that any cobalt released by metathesis of ferric-ferrocyanide in the neutralized waste is recarried on the nickel ferrocyanide formed during the second nickel addition.

Solvent Extraction

The first cycle processed feed of about flowsheet composition containing uranium irradiated to 200 MWD/T and aged from 13 to 25 months since pile discharge. RAW uranium losses were generally low and, during steady-state operation, averaged 0.2 per cent of the gross feed uranium to the first cycle.

Losses from the RE Column were consistently less than 0.1 per cent and averaged 0.05 per cent of the gross feed uranium in the RDF. RC Column losses, using 70 per cent of the HW No. 6 Flowsheet RCX rate, were also in this range until weld leaks in the column forced its replacement. The replacement column was the original RC Column used from start-up in May, 1952, until September, 1955, when it was removed for inspection because of abnormally high RCW losses. Since the column replacement, RCW losses at steady-state have ranged from 0.1 to 0.3 per cent in spite of the fact that the RCX flow is increased to 90 per cent of the flowsheet value.

Over-all logarithmic gamma decontamination factors averaged 5.0, and the REU gamma activity ranged from 70 to 250 per cent, averaging 130 per cent of the activity of aged natural uranium. Phosphate ion was used intermittently in the RDIS to improve niobium-zirconium decontamination in the second cycle. The effectiveness of 0.02 M phosphate ion in the RD Column extraction section was dependent on the RDF activity. At feed activities 30 times that of aged natural uranium, there was no significant variation of decontamination performance with phosphate concentration. However, with a feed 100 times aged natural uranium activity, the use of phosphate ion doubled the arithmetic decontamination factor.

Several process leaks caused high uranium concentrations in the canyon waste collection tank 4-6. Consequently, this material (which is usually neutralized, scavenged, and pumped into the "hot" waste disposal system at WR002 tank) was reworked, carrying considerable amounts of the ferrocyanide precipitate into the solvent extraction battery. These solids caused a ten fold increase in RCU activity, but had no significant effect on uranium waste losses. Jetting the RA Column interface solids into the RAW Tank and overflowing the RC Column interface into the RCW Tank reduced the RCU gamma activity about five fold during the rework period. Continued high RCU activities are probably caused by the preponderance of 13 month aged uranium in the feed and by the flush and shutdown for RC Column replacement. Subsequent 4-6 batches have been reworked with no significant effect on column performance.

Waste Treatment

Cobalt-60 is in the UR Plant scavenged waste at concentrations greater than the concentration permitted in ground water. Radiological Engineering Soil Sciences laboratory data and experience at the BY crib site indicate that cobalt-60 is not readily adsorbed by the soil above the ground water. Therefore, the scavenging program has been seriously limited throughout the report period with

only one of the three waste tanks filled during the period meeting cribbing specifications.

Studies made in the Separations Technology Process Chemistry Laboratory show:

(1) Ammonia complexes cobalt-60 and retains the cobalt in solution after the waste has been scavenged.

(2) Replacement of ferrous ammonium sulfate in the RDIS with ferrous sulfate or ferrous sulfamate eliminates ammonia in synthetic wastes, thereby permitting satisfactory scavenging of cobalt-60 by current waste treatment processes.

(3) The addition of a second nickel scavenger butt a short time (three hours) after neutralization of the waste materially improves the removal of cobalt-60.

Replacement of the ferrous ammonium sulfate in the RDIS with ferrous sulfamate to eliminate ammonia from UR Plant waste was started on a test basis at the end of the report period.

URANIUM CONVERSION PROCESS TECHNOLOGY

In general, the quality of the UO_3 produced during the month remained excellent. The reactivity of the powder, which was prepared from 100 per cent UNH containing about 0.05 weight per cent sulfamic acid, was consistently about 1.12. The gamma activity of the product ranged from 35 to 120 per cent of that of aged natural uranium, and leveled out at about 70 per cent that of aged natural uranium at the end of the report period. The total metallic impurities in the product increased gradually from last month's low of 80 parts per million parts of uranium to the month end high of 130 parts per million. The most difficult specification to meet was particle size. Three carloads of powder were out of specifications on the 40 mesh analysis (96.8, 97.4, and 97.4 per cent through 40 mesh vice greater than 98.0 per cent) and were shipped on a customer waiver. Six of the fourteen lots of a fourth carload were remilled to bring the car into particle size specifications. The hammer mill was reconditioned late in the month, and the particle size of the powder appears to be much improved.

Carload 395 was derailed while enroute to the customer, and the entire carload was submerged in water. All of the original drums of the car were returned for rework plus about 20 drums of UO_3, mud, and ballast shoveled up at the wreck site. Fifty-eight drums were dry and intact and required only repackaging. One drum of clean, caked powder was broken up and charged into a relatively dry Luckey pot and recalcined, producing an excellent grade of powder. As soon as the necessary facilities for handling the caked drums can be fabricated, the remaining drums of clean caked powder will be reworked in this manner. A procedure for reworking the UO_3 bearing ballast and the badly contaminated original drum has not yet been established.

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Z PLANT (ISOLATION, PURIFICATION AND FABRICATION) PROCESS TECHNOLOGY

Isolation Process (231 Building)

Excessive amounts of plutonium-containing solids were found by the customer in recent lots of concentrated plutonium nitrate (AT) solution which had been prepared from Purex PR solution by the standard 231 Building (plutonium peroxide) process. These solids appear to be plutonium sulfate (see 234-5 DEVELOPMENT, Sample Can Solids). A higher than average plutonium concentration in the AT solution, along with prolonged storage, are believed to be the cause. A lowering of the final concentration limits and/or reduction in the quantity of sulfate used during the peroxide precipitation are under study as means of alleviating the problem. The nitrate solution was also found to contain appreciable quantities of silica, which presumably passed through the 231 Building process along with the plutonium. It appears that filtration, either of the Purex PR solution or of the AT solution, will be necessary.

A uranium separation factor of 30 for the plutonium peroxide precipitation is indicated by recent runs, confirming earlier data. This particular feed originated at Purex during the recent start-up, and contained four per cent uranium.

Metal Reduction (Task III)

A preliminary study of the metal reduction process has shown that button quality, yield, and density (of alpha phase metal) are influenced by the calcium particle size and/or the calcium/plutonium ratio. Smooth buttons were obtained with an average yield of 98.8 per cent with the use of an 20 per cent excess (over the stoichiometric requirement) of calcium which had passed a five mesh screen. Buttons produced with a calcium (unscreened) excess of 13 per cent were rough, the yields averaged 97.3 per cent, and alpha phase buttons had low densities.

Recuplex

Repeated failures of the H-1 pulse bellows and of the H-8 Roth submerged pump (CCX) resulted in an approximate 20 per cent down time during the month. Slurry losses from powder runs averaged from two to three per cent, using the amended slag and crucible flowsheets (see HW-42626-H, R. B. Richards, Separations Technology Section Monthly Report - April, 1956, page Fc-16). This amounts to a greater than 50 per cent reduction in losses, as compared with the old flowsheet. Also, with use of the altered flowsheet, the formation of crud on the side walls of the glass pulse columns has ceased.

The first seven "hot" Purex runs processed through Recuplex resulted in arithmetic decontamination factors greater than 60. The last four Purex runs had decontamination factors ranging from ten down to five. The lower values were attributed to (a) a column upset, and (b) excess free nitrite ion in the system. Extraction waste losses for the past two weeks averaged 0.0016 g/l, and the solvent buildup over the two week period averaged only 0.008 g/l per day. These results are attributed to (1) improved process and operational control, (2) reduction in the.

rate of irradiation degradation of the solvent (through lower plutonium concentration in the product), and (3) reduced chemical degradation of the solvent (due to the presence of ferrous ion in the feed).

234-5 DEVELOPMENT

Purex Product Solids

The approximately 0.1 per cent of green solids found in concentrated Purex product is largely plutonium polymer, with silica, iron, and phosphorus as the other main constituents. The plutonium to iron ratio is approximately 120/1. The phosphorus is present as phosphate. Only one sample of solids contained significant amounts of DBP. Boiling 70 per cent nitric acid dissolves all solids but the silica.

During flushing of the Purex concentrator, a reddish semi-solid material was obtained which was not soluble in but was more dense than water. This material appears to be primarily plutonium-DBP, iron-DBP, a small amount of organic, and a small amount of solids not identified. The material had a very high gamma reading, one R/hour from seven milliliters of solids. Nearly gamma free plutonium can be extracted from these solids with one M HF. Most of the solids dissolved in ten per cent sodium carbonate solution, leaving ferric hydroxide. The plutonium-DBP can be reprecipitated from the sodium carbonate solution upon acidification.

This red semi-solid is similar in appearance and chemical behavior to material obtained during boiling of TBP and high concentration plutonium solutions, indicating a carryover of organic into the concentrator.

Stripping Studies with Purex 2BP

Purex 2BP solutions were subjected to various boil-down tests to determine whether precipitation could occur. Purex 2BP, as received, had a composition as follows: 0.21-0.26 M HNO_3, 2.29 g/l plutonium, with a valence distribution of 43 per cent plutonium(III), 52 per cent plutonium(IV), and five per cent plutonium(VI). Purex 2BP produces a small amount of solids during a two fold concentration, corresponding to the concentration done in the Purex stripper. Any further dilution of 2BP, such as with reflux water, increases the amount of solids produced; a 20 per cent dilution increases the solids by approximately ten fold. All plutonium still in solution is converted to plutonium(VI) in approximately two minutes after the boiling is started.

Increasing the acidity of Purex 2BP to greater than 0.5 M HNO_3 eliminates solids formation during boil-down. Washing with carbon tetrachloride followed by oxidation of the plutonium to plutonium(VI) also prevents solids. Oxidation with potassium permanganate without washing with carbon tetrachloride (or some other inert solvent) produces large amounts of organic solids containing phosphorus. Oxidation with ozone required approximately 72 hours, probably because of the low concentration of ozone produced by the ozonizer used. Solids were observed at the end of 12 hours, and were filtered out. The solution was refluxed six hours before concentration without the further appearance of solids. Washing the 2BP without oxidation does not prevent solids formation.

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The addition of solids to fresh 2BP solutions did not increase the amount of solids produced on boil-down. The filtered concentrated (two fold) solutions from previous tests were combined and refluxed for eight hours without solids developing, indicating solids of this type probably will not form during further concentration.

These experiments again indicate that solvent or decomposition products are appearing in the 2BP and passing on into the concentrator where they may form solids.

Sample Can Solids

Rocky Flats has reported solids in several sample cans recently produced from Purex product. In two cans (991, 538) which were opened upon their return, only small amounts of solids (2-5 cc) were obtained. These solids contained primarily silica, with corrosion products iron, chromium, nickel, and some copper in small amounts. A very small amount of red solids was found in can 538, but in can 456, approximately 150 g of red solids which contained plutonium sulfate but no phosphate were found. The solids from can 456 have a solubility of approximately 150 g/l in 1.6 M HNO_3, 98 g/l in 6.5 M HNO_3, and 4.0 g/l in water. Saturation of the solution from can 538 with these solids followed by dilution of one volume water to three volumes of AT solution resulted in precipitation of some solids after 48 hours. Other higher dilutions (1/1, 3/1) did not result in precipitation at the end of this time. Thus, dissolution of solids in a can with one volume of one M HNO_3 and addition to one volume of the AT solution should result in a stable solution.

Continuous Task I

As a part of the continuous Task I oxalate development program, the conditions for continuously killing oxalate filtrates with potassium permanganate are under investigation. The conditions necessary for batch killing will also be determined for comparison.

Plant supernatants contain soluble oxalate and insoluble plutonium oxalate fines. A minimum temperature of 45 C is needed, both for a ten minute batch kill and for a continuous kill with a 15 minute hold-up time using concurrent flow. These conditions are for fresh oxalate filtrates containing plutonium(IV) oxalate solids (up to five g/l plutonium). The time required for a complete kill is more dependent upon the temperature than upon the excess potassium permanganate or nitric acid concentrations. The effect of the age of filtrates containing solids is yet to be investigated.

Further tests showed the chemical stability of Dynel filter cloth towards process solutions. Samples of Dynel SD-9 filter cloth exposed to 5 M HNO_3 and 5 M HNO_3 - 0.1 M $H_2C_2O_4$ displayed no change in physical characteristics throughout a seven week static exposure at room temperature. Samples of Dynel SD-9 filter cloth exposed to a 5 M HNO_3 - 0.1 M $H_2C_2O_4$ - plutonium(IV) oxalate slurry displayed some "rotting" or degradation after seven weeks' exposure at room temperature, as evidenced by a loss of tensile strength. A possible explanation of degradation is alpha radiation.

Continuous Task II Prototype

The recommended operating temperature range for the proposed Task II continuous fluorinator is 450-550 C. The temperature range was determined from tests conducted in the Task II prototype continuous fluorinator. All tests were run at a plutonium feed rate of 0.6 kg/hour, with a total plutonium throughput of 1235 grams for the four runs.

Reduction of Oxide

Two plutonium dioxide reductions were made, of 100 gm and 30 gm sizes, with a mole ratio of slagging agent (calcium chloride plus calcium fluoride) to plutonium of 12 to 1, with 100 per cent excess calcium added. After reduction, the mixture was heated for an hour at 950 C to effect coalescence. No agitation or vibration was applied, and examination showed no segregation or coalescence of the fine metal particles.

A cerium dioxide reduction of 50 gm was made with 120 gm calcium chloride and 50 gm calcium (100 per cent excess). After reduction, the mixture was heated to 950 C and vibrated for one hour with a Peterson Vibrolator operating at 20 psi. Examination of the product showed beads of metal up to 1/4 inch diameter. Approximately 60 per cent yield of metal was obtained.

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CHEMICAL DEVELOPMENT SUB-SECTION,

HOT SEMIWORKS

Hot Semiworks activities included decontamination in A and C Cells, and equipment modifications in B and C Cells. Both B and C Cells have been decontaminated to working time limits of 1 to 2 hours. Major maintenance items being worked on are as follows:

(a) Removal of all pulse generators for further modifications to eliminate all Teflon bellows.

(b) Overhaul of all Chempumps in C Cell.

(c) Relocation of Chempumps to a shielded enclosure just inside of C Cell doorway to improve accessibility for maintenance.

(d) Installation of additional jets and alternate process stream routings to increase the flexibility of the equipment.

The work in C Cell is being expedited in order to provide a location for storing dissolver solution currently being held in A Cell. This will permit completion of decontamination and maintenance work in A Cell.

PUREX DEVELOPMENT

Process Chemistry

Miniature Pulse Column Runs. Several "cold" shakedown runs and a few runs employing Purex IAF and laboratory solvent have been made in a recently installed IA-IC miniature pulse column cascade. A gross gamma D.F. (IAF-ICU) of about 500 was obtained in the latter runs. In the miniature columns previously used, the D.F. obtained under similar conditions averaged about 50. The ten-fold increase in decontamination is attributed to a more densely packed section (columns consist of alternate stainless steel seive plates and shredded fluorothene) which further reduces backmixing and affords better phase contacting. A run made with Purex IAF (sampled 3-2-56) which had been refluxed in the presence of 0.1 M $Cr_2O_7^{=}$ for 24 hours and the $Cr_2O_7^{=}$ subsequently destroyed with HNO_2 gave the same gross gamma D.F. (approx. 500) as the same IAF with no pretreatment. A D.F. of about 200 was obtained using a simulated IAF prepared from Redox IAP. The gross gamma content of the feed (1.7×10^4 microcuries/gal.) was two-fold lower than Purex Plant IAF. Two runs were made with 20 and 40 ppm DBP added to the solvent. In both cases the IAF-IAP D.F. was less by a factor of two than with no DBP. Due to the presence of a highly radioactive solid in the ICU (presumably a U-DBP compound), no firm strip column D.F. value was obtained. The Pu loss to the ICW was unexpectedly low in these runs, averaging only 0.04 per cent. About 0.01 per cent loss was observed in the absence of DBP.

A miniature pulse column which utilizes a "goose neck" arrangement between extraction and scrub sections to minimize backmixing without the use of fluorothene packing has been built and operated. This arrangement also permits sampling of the organic phase at the feed point. Runs in this column to date have been made only with synthetic feeds spiked with tracer zirconium. Simulated IA Column runs with these feeds show a feed point D.F. of 25 to 30 and a scrub D.F. of 3.5 to 4.0. Runs were also made in this column in which 0.001 M acrylamide, crotonic acid, glycine, and benzoic acid were added to the feed. An improvement in D.F. was noted in all cases. However, the magnitude of the improvement is questionable due to the low radioactivity of the product. Further runs will be made with these potential complexing agents using Purex IAF.

Solvent Quality. Routine tests (optical density, "C" contact, and fission product behavior in batch IA-IC contacts) on plant IOO and 200 indicate that solvent quality is as good as, if not slightly better than, it was shortly after plant start-up. Even after a recent processing of some rework material which was apparently high in DBP and which caused high HC plutonium losses, the solvent was returned to satisfactory quality (as determined by the above tests) by carbonate washing. There have been some changes in dispersion and disengaging times for both solvent streams, but the significance of these to plant operation has not been determined.

Rework of 2BP Solution. About 10 gallons of off-standard Purex 2BP solution was flushed from the system during the recent shut-down. In batch contacts simulating the IB, 2A, and 2B Columns and using as feed (IBXF), the 2BP material blended with synthetic IBXF in a ratio of one to 6.67, satisfactory plutonium partitioning and waste losses were obtained. Satisfactory rework of the material by blending with IBXF was indicated and has been confirmed by rework of the material in the plant.

HCP Coalescer Studies. Polyethylene cloth and turnings, small glass beads, Fluorothene membrane and turnings, Teflon turnings, boiling chips, York mesh, Duolite A-2, Dowex-50, Permulite S-2, Chempro 47, Asbestos, sintered glass, and Cuno "Micro Kleen" filter were tried as media for coalescing synthetic HCP (cold HCP agitated with plant solvent). Only the "Micro Kleen", a felt material fabricated in tubular form, produced satisfactory coalescing. A plug of this material one-inch thick removed entrained organic at least as thoroughly as centrifugation (30 min. at ca. 1200 x G) at flow rates as high as 1.8 gal./(sq.in.)(hr.). Changes in flow rate, slugs of organic, flooding, and long periods of inactivity do not seem to change the coalescing property of the felt.

Solids in IBX. Black solids isolated from plant IBX, from the 37 per cent ferrous sulfamate prepared in the plant for IBX make-up, and from the IBX filter had essentially the same chemical composition ($>$1% Al, Fe, Mg, Ti; 0.01 to 1% Ca, Mn, Pb, Si, Sn) as shown by spectrographic analysis. None of these solids was completely soluble in boiling concentrated HNO_3 or HCl or in aqua regia. Diffraction patterns were identical for the solids from the

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ferrous sulfamate and the IBX filter, but a different pattern was obtained for the solids in IBX. Definite identification of the solids from present ASTM data is not possible. It is of interest that the diffraction patterns for these three solids are different from those for any of the solids previously isolated from Uranium Recovery Plant solutions.

Complete solution of the iron powder used in the plant to prepare ferrous sulfamate was not obtained by exhaustive treatment with sulfamic acid. A black residue (1.2 wt. %) remained. Similar black residues remained on treating the iron powder with concentrated HCl, concentrated HNO_3, and aqua regia. Spectroscopic and X-ray diffraction study of these solids is in progress.

The black solids obtained from the plant were shown to adsorb radioactive constituents when contacted with plant IAF. Activity adsorbed was greater than 95 per cent Zr-Nb. Radioactive black solids have been observed in plant 2DF solutions and it is possible that these solids enter the system in the IBX. It has been suggested that the Purex Plant consider the use of commercially available 40 per cent ferrous sulfamate solution. This material, some of which is presently on site, contained no solids either as received or when made up to IBX composition.

Solids in IAF and 2DF. A gross gamma D.F. of eight was obtained by filtering (through glass wool) a IAP obtained from a miniature pulse column run made using plant IAF (sampled 4-19-56) containing filterable solids. A D.F. of only two was obtained when either filtered or unfiltered IAP was contacted with an equal volume of water. Thus, the solids, once organic wet, do not seek the interface.

Glass wool filters were found to retain their capacity to remove radioactive solids through as many as 55 column volumes of Purex 2DF or 95 of Purex IAF. A gross gamma D.F. of two was obtained in both cases. The total throughput capacity of these filters is as yet unknown. Filter (or sorption) media other than glass wool are under investigation. A sand filter has shown considerable promise in that a D.F. only slightly less than that obtained with glass wool has been demonstrated and (in contact with glass wool) the filter may be backflushed easily.

Zirconium and Niobium Extraction. Synthetic IAFS (0.81 M UNH, 2.4 M HNO_3, 0.012 M $NaNO_2$, 10 per cent dissolver solution) was contacted with two volumes of 30% TBP-Shell E-2342 (IAX). The aqueous phase was then contacted nine successive times with fresh two-volume portions of (IAX) which had been equilibrated with inactive IAFS. The following Zr and Nb distribution ratios were obtained.

Contact	Equilibrium, Organic Zr, C/m/ml x 10^{-4}	Equilibrium, Organic Nb, C/m/ml	Distribution Ratios, E_a^o Zr	Distribution Ratios, E_a^o Nb
1	1.11	2780	0.0025	0.00013
2	1.26	5480	0.0031	0.00039
3	1.35	6430	0.0038	0.00057
4	1.53	4930	0.0051	0.00097
5	1.38	6160	0.0044	0.0011
6	1.47	8660	0.0056	0.0015
7	1.46	14600	--	0.0026
8	1.31	15200	0.0053	0.0026
9	1.53	15600	0.0064	0.0031
10	1.73	19600	--	0.0035

The amount of zirconium extracted and the distribution ratio observed remained relatively constant for the series of contacts indicating that most, if not all, of the zirconium was present as a single species exhibiting true equilibrium distribution. The observed increase in niobium extraction might be explained by assuming the presence of a non-extractable form converting to an extractable one.

Chemical Engineering Development

Pulse Column Studies. Further studies toward the development of an improved Purex A-type column scrub section cartridge were made. Primary emphasis was on the development of an all stainless steel cartridge which would operate with the organic phase continuous and which would have chloride efficiencies equivalent to or better than the standard cartridge.

Thirty-four A-type column scrub runs were made during the month in a 3-inch-diameter glass pulse column with a 9-ft. cartridge. Purex HW No. 3 Flowsheet modified to include the addition of 0.5 M NaCl in the HAF was used throughout. Ten runs were made in a cartridge of alternate 6-inch zones of polyethylene and stainless steel Raschig rings; six runs were made in a cartridge of 0.08-inch-diameter hole, 21% free area sieve plates; and eighteen runs were made with mixed cartridges containing both stainless steel sieve plates and nozzle plates.

The details of the cartridges and the results of the studies are presented in Tables I, II, and III. Highlights of the findings are summarized below:

1. The dispersion, the flooding frequency and the efficiency of the mixed cartridges containing both stainless steel sieve plates and nozzle plates appear to be dependent upon the cleanliness and/or wettability of the plates. The plates used in these studies were well cleaned and were aqueous wet. Indications are that an "aged" condition of the plates is one in which the plates are partially organic wet. This results in a higher flooding frequency and a lower efficiency than obtained with clean plates.

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2. The all stainless steel mixed cartridges partially inverted when operated organic continuous. The degree of inversion increased with increasing frequency and ranged from 10% to 100% inverted. Consequently, the flooding frequency with the organic phase continuous was approximately the same as, or slightly lower than, the flooding frequency with the aqueous phase continuous.

3. The flooding frequency with the mixed cartridges of sieve and nozzle plates ranged from the same as that obtained with a standard cartridge to 40 cycles per minute lower, depending upon the hole size and free area of the plates used.

4. The lowest H.T.U. values obtained with the mixed cartridges of sieve and nozzle plates were approximately the same as those obtained with the standard cartridge at a comparable per cent of flooding frequency.

5. A cartridge of 0.08-inch-diameter holes and 21% free area had aqueous phase continuous flooding frequencies approximately 40 cycles per minute less than those of the standard cartridge. The lowest H.T.U. values obtained with this cartridge were approximately 50% higher than those obtained with the standard cartridge.

6. The cartridge of mixed packings of polyethylene and stainless steel Raschig rings had a flooding frequency with the organic phase continuous approximately 10 cycles per minute higher, and with the aqueous phase continuous about the same as the standard cartridge. The efficiency of this cartridge with the organic phase continuous was approximately the same, and with the aqueous phase continuous, was approximately 25% higher than that of the standard cartridge.

Continuous Ion-Exchange. Operational and mechanical features of a Higgins-type continuous ion-exchange unit are being studied for application to the Purex plutonium product in lieu of evaporation. Early operation of the equipment was marked by erratic and unpredictable resin movement, apparent expansion and compression of the bed, and excessively high pressure (e.g. 150 psig) necessary to move the bed. These problems appear to have been remedied by venting the high points to rid the columns of air bubbles and jacklegging all outlets to an elevation equal to that of the vents in order to keep the columns full of liquid.

Although the present equipment is unsuited for chemical runs because of product dilution by slip water, a run was made to concentrate a ferric iron solution. Run conditions and results are:

Resin:	Dowex 50, 12% cross linked, 50 - 100 mesh.
Feed:	1 g. Fe^{+++}/l., 0.25 M HNO_3
Feed Rate:	1.5 l./min.
Resin Rate:	52 ml./min. (310 ml./push every 6 minutes)
Resin Loading:	29 g. Fe^{+++}/l.
Waste:	0.001 g. Fe^{+++}/l.
Strip:	5 M HNO_3
Product:	2.4 g. Fe^{+++}/l.
Fe Recovery:	94.5%

TABLE I

DESCRIPTION OF CARTRIDGES
USED IN 3-IN. HA SCRUB COLUMN STUDIES

Cartridge	Description
A	Alternate 6-in. zones of 5/8-in. polyethylene Raschig rings and 1/2-in. stainless steel Raschig rings.
B	Alternate sets of 2 stainless steel sieve plates and 2 stainless steel nozzle plates; 1-in. spacing throughout. Sieve plates - 0.08-in.-diameter holes, 21% free area. Nozzle plates - 1/8-in. holes, 23% free area. Stainless steel spacers above the sieve plates and Saran spacers above the nozzle plates.
C	Stainless steel sieve plates, 0.08-in.-diameter holes, 21% free area on 2-in. spacing.
D	Alternate sets of 2 stainless steel sieve plates and 2 stainless steel nozzle plates; 1-in. spacing throughout. Sieve plates - 1/8-in.-diameter holes, 23% free area. Nozzle plates - 1/8-in.-diameter holes, 23% free area. Stainless steel spacers above sieve plates and Saran spacers above nozzle plates.
E	Alternate sets of 2 stainless steel sieve plates and 2 stainless steel nozzle plates; 1-in. spacing throughout. Sieve plates - 1/8-in.-diameter holes, 23% free area. Nozzle plates - 1/16-in.-diameter holes, 10% free area. Stainless steel spacers above sieve plates and Saran spacers above nozzle plates.

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TABLE II

PUREX 3-IN. HA SCRUB COLUMN FLOODING STUDIES

Flowsheet: Purex HW No. 3, Pu and F.P.'s omitted. NaCl added to HAF. Diluent: Shell E-2342.

Equipment: 3-in.-diameter precision bore glass column with a 9-ft. cartridge as described in Table I.

Pulse Amplitude: 0.6 in.

Run No.	Cartridge[a]	Continuous Phase	Volume Velocity, Gal./(Hr.)(Sq.Ft.), Sum of Both Phases	Flood Freq., Cyc./Min.
3-129-ASH	A	Organic	480	95 ± 5[b]
3-130-ASH	A	Organic	240	135 ± 5[b]
3-134-ASH	A	Aqueous	480	95 ± 5[b]
3-135-ASH	A	Aqueous	240	115 ± 5[b]
3-139-ASH	B	Organic	480	40 [c]
3-140-ASH	B	Organic	240	85 ± 5[c]
3-143-ASH	B	Aqueous	480	65 ± 5
3-144-ASH	B	Aqueous	240	95 ± 5
3-147-ASH	C	Aqueous	480	45 ± 5
3-148-ASH	C	Aqueous	240	115 ± 5
3-153-ASH	D	Organic	480	85 ± 5[c]
3-154-ASH	D	Organic	240	125 ± 5[c]
3-155-ASH	D	Aqueous	480	85 ± 5
3-161-ASH	E	Organic	480	85 ± 5[c][d]
3-162-ASH	E	Organic	240	125 ± 5[c][d]

Notes:

(a) Cartridge identification letters refer to Table I.

(b) With the interface at either top or bottom, this cartridge operated with the organic phase continuous around the polyethylene rings and the aqueous phase continuous around the stainless steel rings.

(c) These columns operated partially inverted. The degree of inversion increased with increasing frequency and ranged from 10% to 100% of the column inverted.

(d) The plates in this cartridge were partially preferentially organic wet.

TABLE III

PUREX 3-IN. HA SCRUB COLUMN EFFICIENCY STUDIES

Flowsheet: Purex HW No. 3, Pu and F.P.'s omitted. NaCl added to HAF.
Diluent: Shell E-2342

Equipment: 3-in.-diameter precision bore glass column with a 9-ft. cartridge.

Pulse Amplitude: 0.6 in.

Run No.	Cartridge[a]	Continuous Phase	Freq., Cyc./Min.	Volume Velocity, Gal./(Hr.)(Sq.Ft.) Sum of Both Phases	Cl^-[b] DF	H.T.U.,[c] Ft.
3-131-ASH	A	Organic	90	245	26.8	1.4[d]
3-132-ASH	A	Organic	80	480	16.2	1.7[d]
3-133-ASH	A	Organic	60	490	6.6	3.0[d]
3-136-ASH	A	Aqueous	90	260	9.5	2.1[d]
3-137-ASH	A	Aqueous	80	500	12.9	2.0[d]
3-138-ASH	A	Aqueous	60	490	6.5	3.1[d]
3-142-ASH	B	Organic	70	250	16.0	1.7[e]
3-145-ASH	B	Aqueous	60	470	12.0	2.1
3-146-ASH	B	Aqueous	80	240	8.9	2.4
3-149-ASH	C	Aqueous	40	480	7.4	2.8
3-150-ASH	C	Aqueous	80	240	9.1	2.4
3-151-ASH	C	Aqueous	60	240	5.0	3.6
3-152-ASH	C	Aqueous	90	240		
3-157-ASH	D	Aqueous	80	480	8.4	2.9
3-158-ASH	D	Aqueous	100	250	11.8	2.0
3-159-ASH	D	Organic	80	480	8.8	2.7[e]
3-160-ASH	D	Organic	100	240	26.6	1.4[e]
3-163-ASH	E	Organic	80	470	6.6	3.0[e]
3-164-ASH	E	Organic	100	250	6.0	3.0[e]

Notes:

(a) See Table I for description of cartridges.

(b) Defined as $\frac{Cl^- \text{ concentration in influent organic}}{Cl^- \text{ concentration in effluent organic}}$.

(c) Height of a transfer unit, over-all organic-film basis.

(d) This cartridge operated organic continuous in the region of polyethylene rings and aqueous continuous in the region of stainless steel rings.

(e) These columns operated partially inverted. The degree of inversion increased with increasing frequency and ranged from 10% to 100% of the column inverted.

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URANIUM RECOVERY DEVELOPMENT

Process Chemistry

Continuous Hydration and Dehydration of UO_3. Hydration and dehydration runs were made in the 16-inch 321 Building trough calciner in an attempt to duplicate results obtained in the 3-inch laboratory calciner (see April monthly report). The UO_3 feed for the hydration run was prepared in the 16-inch unit (Run B-37). It contained about 330 ppm S (U basis) and had an average reactivity ratio (800°C. reduction - 410°C. hydrofluorination) of 0.71 (0.66 to 0.77). The initial part of the hydration run was relatively unsuccessful as evidenced by low reactivity ratios of the hydrated powder. However, operating conditions were soon found which produced a satisfactorily hydrated product. The partially hydrated product produced in the early part of the run was rehydrated. Rehydration was only moderately successful under conditions which were nearly optimum for hydrating "fresh" UO_3. Reactivity ratios (800-410) of the hydrate produced during the period of optimum operation were in excess of one. Dehydration of the hydrated powder was completely successful. Reactivity ratios (800-410) of the dehydrated powder (bulk density approx. 3.1 g./cc.) varied from a low of 1.03 (produced from the rehydrated material) to a high of 1.23. The powder will be evaluated in the K-25 pilot plant. Determination of the feasibility of hydration-dehydration as a plant operation is pending the evaluations at K-25.

Preliminary work done subsequent to the 321 Building run has shown hydration to be much more rapid when dilute nitric acid rather than water is used as the hydrating agent. For example, in small scale beaker experiments hydration was essentially complete in one to two minutes when 3 M HNO_3 was used as the hydrating agent (reagents initially at 25°C.). Essentially no hydration occurs with H_2O under these conditions. It may be possible to obtain the same effect by using a UO_3 feed high in residual nitrate. These studies are being continued.

It has been noted in this laboratory that a freshly cleaved UO_3 surface is highly reactive toward water and furthermore, that a substantial (as high as two-fold) improvement in reactivity is exhibited by hydration of the surface only. This technique would negate the necessity for dehydration. Laboratory work is in progress to determine the feasibility of limited steam addition during milling of continuously produced UO_3.

Laboratory-Scale Continuous Calciner Runs. Attempts to operate the 3-inch trough calciner in the presence of a stoichiometric amount (to react with all of the nitrate present) of formic acid (added via a separate feed line) have proved unsuccessful due to excessive dusting and consequent plugging of the off-gas system. Further studies on stoichiometric formic acid addition will be made in the small scale semicontinuous unit before altering the 3-inch calciner to be operable under these conditions.

Thermobalance Studies. During the first runs made in the newly installed thermobalance, the reduction step was found to be greatly retarded by trace quantities of residual HF (from a previous hydrofluorination) which could not be completely removed by a nitrogen purge of the system. However, steam sparging does remove the residual HF to the extent that normal reduction rates are obtained. The hydrofluorination data presented below were obtained on UO_2 samples reduced in the reactivity ratio apparatus and transferred to the thermobalance for hydrofluorination. Care was taken to cool the UO_2 to room temperature in a hydrogen atmosphere before removing it from the reactor. It has been determined at Los Alamos and K-25 that partial re-oxidation of UO_2 enhances the rate of hydrofluorination. This effect is illustrated in the table below in Runs 4 and 13.

HYDROFLUORINATION OF UO_2 - THERMOBALANCE RUNS

Run No.	UO_3(1)	Reactivity Ratio(2)	Time for 98% Hydrofluorination, Min. 400°C.	500°C.	600°C.
1	Paducah std. reduced at 590°C.		60	35	36
2	Paducah std. reduced at 800°C.	1.00	65	62	54
3	Continuous UO_3 (Run B-37) reduced at 590°C.		130	115	113
4	Continuous UO_3 (Run B-37) reduced at 800°C.	0.71	165	105	115
5	Continuous UO_3 (Run B-19) reduced at 590°C.		41	35	41
6	Continuous UO_3 (Run B-19) reduced at 800°C.	0.93(3)	64	44	72
7	Hydrate-dehydrate prepared in 3-in. calciner from continuous UO_3 (P-127). Reduced at 590°C.		13	13	11
8	Same as 7. Reduced at 800°C.	1.20	14	12	12
9	Same as 7. Reduced at 925°C.		-	13	-
10	Hydrate-dehydrate P-333. Prepared in 16-in. calciner from continuous UO_3 (Run B-37). Reduced at 800°C.	1.13	-	41	-
11	Hydrate-dehydrate P-339. Prepared as in 10. Reduced at 800°C.	1.18	-	26	-
12	Same as 4, except UO_2 removed from reactor at 100°C. and cooled in air to 25°C.	-	-	97	-
13	Same as 12, except UO_2 removed from reactor at 200°C.	-	-	31	-

Note: (1) Milled to pass 325 mesh screen.
(2) 800°C. reduction, 410°C. hydrofluorination.
(3) This high value indicates hydration during milling.

Plots of the hydrofluorination data show that all powders tested react at essentially identical rates until 50 to 60 per cent of the reaction is complete. The reaction appears to be first order during this interval. During the remainder of the hydrofluorination, reaction rate is highly dependent upon the sample history as shown by the data given in the table above. It is of interest to note that no heat killing of the hydrate-dehydrate powder occurred during reduction at temperatures up to 925°C. and that the rate of hydrofluorination is independent of temperature between the limits of 400 to 600°C. (Runs 7, 8, and 9).

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Chemical Engineering Development

Continuous Calcination

Hydration Study. An investigation was made in the 16-inch-diameter calciner of a process to produce UO_3 having a high reactivity ratio. The process consisted of calcination, hydration, and dehydration; each step requiring a separate pass through the calciner. The study comprised the following sequence of runs:

B-37:	Calcination to produce UO_3.
H-1A:	Hydration with two water feed points, no heat applied to shell, and 2000 lb. bed.
H-1B:	Hydration with three water feed points, no heat applied to shell, and 1000 lb. bed.
H-1C:	Hydration with three water feed points, heat applied to shell, and 1000 lb. bed.
H-1D:	Rehydration of H-1B product under approximately H-1C conditions.
DH-1A:	Dehydration of H-1D product with 300°C. bed temp. and 200 lb. bed.
DH-1B:	Dehydration of H-1C product at DH-1A conditions.

Further details of the run conditions together with product properties are given in Table IV.

Highlights of the study are given below:

1. While some questions, e.g., minimum residence time for hydration and dehydration, optimum dehydration temperature, etc. remain to be answered, it has been demonstrated that the process can be utilized in the U.R. Plant continuous calciners to produce UO_3 having a reactivity at least equal to that of pot-produced UO_3.

2. Six thousand pounds from each of DH-1A and DH-1B were sent to K-25 for evaluation in the pilot plant.

3. Conditions for H-1A resulted in excessive agitator power requirement and were deemed inoperable.

4. Heat on the calciner shell is necessary for the production of a reactive hydrate.

5. The lower reactivity of H-1D product could have been due to lower shell temperature and water addition rate or to an inherent difficulty in rehydration.

6. All hydrations (H-1B, H-1C, and H-1D) proceeded smoothly. There was some tendency during H-1C for the powder to lose its free flowing character and accumulate in soft agglomerates up to one inch in diameter. This resulted in increased agitator power requirement and necessitated a slight reduction in water addition.

7. Dehydration DH-1A proceeded smoothly. Dusting of the product and bridging of the feed in the hopper gave considerable difficulty during dehydration DH-1B. It is expected that a dust filter and a vibrated feed hopper would successfully overcome these difficulties.

The following document was issued:

HW-43336 "Test Lots of Continuously-Produced UO_3", by R. G. Geier, dated May 22, 1956.

TABLE IV

RUN CONDITIONS AND AVERAGE PRODUCT PROPERTIES OF HYDRATION STUDY

Equipment: 16-in.-diameter by 8-ft.-long calciner

Run No.	B-37	H-1A	H-1B	H-1C	H-1D	DH-1A	DH-1B
Feed Source	--	B-37	B-37	B-37	H-1B(3)	H-1D	H-1C
Solid Feed Rate, Lb./Hr.	--	250 - 500	300	300	300	300	300
Water Feed Rate, Lb./Hr.	--	0 - 40	30 - 40	60	45	--	--
Reaction Zone Temp., °C.	260±5	90±5	85±5	75±5	75±5	280±40	280±40
Discharge Temp., °C.	315±15	150	100±5	70±10	70±10	300±20	300±20
Minimum Shell Temp., °C.	--	No Heat	No Heat	100	90	300	300
Agitator Speed, RPM	55	42-20	32	40	40	64	64
Dam Level, In.	3.5	3.5-2.5	0	0	0	3	3
Drum Numbers	277-292	None	293-298	304-314	315-325	326-336	337-346
Product, Lb.	18000	200(2)	5600	8600	9200	9300	8500
U, Wt. %	82.5	--	79.8	78.2	78.7	82.4	82.4
NO_3, Wt. %	0.45	--	0.40	0.43	0.40	0.12	0.12
H_2O, Wt. %	0.6	--	3.8	5.3	5.0	0.9	1.2
SO_4, ppm U	1150	--	1030	1090	960	1060	1500
(1) Reactivity Ratio	0.72	--	0.63	0.96	0.75	1.07	1.15
Bulk Density As-Produced Powder	4.1	--	3.6	Too lumpy to measure	3.3	3.2	2.9

(1) Reduction at 810 C. for 2 hr., and hydrofluorination at 410 C. for 1/2 hr.
(2) In Drum P-293.
(3) Drums 299 - 303 (4300 lb.) produced during startup of H-1C were added to H-1B material.

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WASTE TREATMENT

Process Chemistry

Co^{60} in Uranium Recovery Process Wastes. Studies aimed at improving the cobalt decontamination obtained during scavenging of current Uranium Recovery Process waste show that ammonium and ferric ions both limit cobalt removal. Apparently, when the waste is neutralized, cobalt forms complex ions with ammonia which are not carried on the precipitates formed. Decontamination factors obtained decreased with increasing pH (in the range of seven to 10) when ammonium ion was present in the waste. One mechanism proposed to explain the interference of ferric ion postulates that ferric ferrocyanide, formed when sodium ferrocyanide is added to the acidic waste, carries cobalt. As the pH is increased above seven, the ferric ferrocyanide metathesizes to ferric phosphate and/or ferric hydroxide releasing the cobalt to solution.

The interference due to ammonia can be overcome by eliminating (or reducing) the ammonium present in the waste. Ferric ion interference can be reduced by the addition of nickel to the alkaline waste after metathesis of ferric ferrocyanide is complete. Nickel ferrocyanide precipitates and carries cobalt.

In view of these results the following recommendations for test in the Uranium Recovery plant were made.

1. Use ferrous sulfamate instead of ferrous ammonium sulfate and sulfamic acid to reduce the ammonium present.

2. Continue present scavenging procedure.

3. Add additional nickel (0.001 M) to the neutralized waste after metathesis of ferric ferrocyanide.

In laboratory studies involving synthetic wastes spiked with radiocobalt, decontamination factors for cobalt of from 20 to 50 were obtained under present plant conditions while factors of greater than 1000 were obtained under optimum conditions as represented by the above recommendations.

Aluminum in Uranium Recovery Process Wastes. Further analyses of stored and current Uranium Recovery Process wastes show that aluminum is present to some extent in all of them. Pooled U.R. process wastes contain about 3.5×10^{-3} M Al and regular plant scavenging removes about 80 per cent of this leaving the supernatant liquid about 7×10^{-4} M in Al. At this Al concentration, both cesium and strontium are satisfactorily retained by the soil.

As previously mentioned, the Al concentration in scavenged stored wastes can be kept below 5×10^{-4} if the final pH is 9.0 or lower (minimum solubility of $Al(OH)_3$ occurs at pH 7). Satisfactory removal is attained in current wastes at pH 10, but this pH is approached from the acid side (lower $Al(OH)_3$ solubility) while adjustment of stored wastes (if necessary) is from a higher pH (high $Al(OH)_3$ solubility). Studies are in progress to determine necessary pH control to attain adequate Al removal in the scavenging of individual tanks of stored wastes.

Chemical Engineering Development

Cesium Recovery. "Cold" pilot plant studies of cesium recovery from Purex IWW were continued. Simulated IWW neutralized with caustic was fed to a 26-inch baffled, solid bowl centrifuge operating at 1100 x G. to remove the ferric hydroxide. At a pH of 11 and a 20-minute hold-up time, a centrifugate 5×10^{-4} M in iron was obtained from feeds containing 0.007 to 0.07 M ferric hydroxide. The volume of cake formed with a 20-minute holdup time is at least one half that formed with a 10-minute hold-up time. Cake slurry containing more than about 0.3 M ferric hydroxide could not be removed from the centrifuge bowl with a 3 gal./min. steam jet.

Centrifugates from simulated Purex IWW neutralized with ammonium hydroxide to a pH of 6 (0.06 M ferric hydroxide) were 1.4×10^{-4} and 3.2×10^{-4} M in iron at hold-up times of 20 and 10 minutes, respectively. No differences in volume of precipitate or the handling properties of the cake slurries from NH_4OH or NaOH neutralization were evident.

MISCELLANEOUS DEVELOPMENT

Chemical Engineering Development

Hydroclone Studies. A nominal one-gal./min. hydroclone was tested for ability to clarify "cold" catalytic dissolver solution (1.5 M UNH, 0.8 M HNO_3, 0.46 M ANN). Feed rates of 0.5, 0.9, and 1.2 gal./min. and ratios of overflow to feed between 0.15 and 0.9 were studied. The clone was relatively ineffective for clarification. Best performance resulted at 0.9 gal./min. of feed and an overflow to feed ratio of 0.18. Under these conditions the solids concentration of the overflow was reduced to 44% of the feed concentration.

Dissolver Studies. The following document was published during the month:

HW-42666 "Continuous Dissolution of Aluminum-Jacketed Fuel Elements in a Converted Batch Dissolver" by J. T. Krieg and R. E. Van der Cook, dated April 5, 1956.

Separations Equipment Development

In-Line Chemical Instrumentation

pH Measurement. The application of pH measurement for the determination of nitric acid concentration in streams containing high concentrations of ANN and UNH appears feasible. Testing has been in progress on simulated Redox 1AFS and 2DF using a Model-W pH meter with a recorder range of 4 pH units (-1 to 3). Sampling has been the major source of trouble. Evaporation occurs downstream from the jet causing crystalization and subsequent plugging of the discharge line.

This system is scheduled for prototyping on the Redox 1AFS Sampler. A design for the prototype installation is being made concurrent with cold semiworks testing.

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Ion Exchange - Resin - Water Interface. Preliminary testing of a scanning device for locating the resin - water interface in an ion exchange column has started. This device utilizes the difference in electrical conductivity of the resin and the aqueous solution directly above it, the resin being a factor of ten more conductive than the aqueous solution.

Polarograph. A Leeds and Northrup No. 1199-31 calomel electrode is being evaluated for possible application in the polarograph cell. The electrode is immersed in saturated potassium chloride solution contained in a section of polyethylene tubing closed at the lower end with a plug of porous vycor that contacts the sample. Potentially, the use of this assembly will increase the reliability and decrease the cost of the sensing unit.

Automatic Dilution. The automatic dilution apparatus was operated at dilution ratios ranging from 3:1 to 1600:1. At the lower ratios the variations in reproducibility were not detectable within the limit of error of the measuring device (ca. ± 0.005 pH units). At the very high dilution ratios the variations in reproducibility did not exceed ± 0.04 pH units. It now appears that dilutions up to 1000:1 reproducible within ± 0.02 pH units are practical for this apparatus.

Mechanical Equipment

Plug Piston Pulse Generator. A CSGBF graphite piston operated through 2.5×10^6 cycles in a 17-4 PH stainless steel cylinder. Diametral clearances varied from 0 to 1/2 mil at the start and from 1/2 to one mil after 2.5×10^6 cycles. Both the piston and the cylinder were polished, there was no indication of galling.

A double-piston rod seal assembly replaced the U-type Teflon bellows seal at 2.5×10^6 cycles. The double seal consists of a two-inch graphite throttle bushing and a 2 1/4-inch long John Crane Company Type OV Teflon chevron packing assembly. The seal is purged with 8 psig air between the lower graphite throttle bushing and the upper Teflon packing. After 1.5×10^6 cycles, no discernible liquid leakage is occurring past the plug piston when 1/2 standard cubic foot per hour air inflow is employed.

Johnston Splined Shaft Pump. The semi-enclosed impeller deepwell turbine pump placed on test during March was inspected after 1000 operating hours pumping water at 75 gallons per minute against a discharge head of 127 feet of water. No detectable wear had occurred on the 17-4 PH stainless steel journals or the CS-312 graphite bearings.

The unit was equipped with a diffuser bowl supplied by Johnston Pump Company and tested as an agitator. In this arrangement, five pump bowls supplied the diffuser bowl. When sodium hydroxide was added at the bottom of a 10 ft. x 10 ft. tank filled with water nearly complete mixing was accomplished after one minute of agitation. The sampling equipment used was the same as that used to evaluate the Redox agitator that mixed the tank contents equally well in 30 seconds.

The pump is now in service pumping 60 per cent nitric acid for evaluation under corrosive conditions. Plant application is pending until this test is completed.

Bearings. A Polypenco K-51 foot bearing and a Glaskote Enamel bowl bearing have operated 2630 hours in the Johnston P-19-7 deepwell turbine pump with no detectable wear. The pump is equipped with a type 347 stainless steel shaft (journal) and was pumping 60 per cent nitric acid at 21 gpm against an 80-foot discharge head. Type CSGBF graphite and carbon-filled Teflon (15 and 25% carbon) bearings operated the same period of time wore appreciably (up to 15 mils) and were badly scored.

Redox P-125 - Peerless Pump. Testing of this unit was discontinued when plant requirements dictated its return to spare parts. It had operated 2357 hours pumping simulated neutralized waste heated to 90°C. against a 190-foot discharge head. The final 57 operating hours were accumulated at the rate of one hour per day, five days per week to allow for crystal formation as may be occurring in the Redox Plant.

The lower throttle bushing was broken when the unit was taken from service. It is very probable that solids formed during non-operating periods caused the failure of the throttle bushing.

Purex AF-15 Agitator. The shaft that was balanced before installation has operated 5103 hours exceeding by 100 hours the life of the shaft tested in the as-received condition. Operation of the balanced shaft continues to be smooth.

Agitation tests were conducted on this unit using the sampling equipment used to test the Redox agitator and Johnston pump-agitator. From the data it has been concluded that complete agitation is accomplished after 1.5 minutes of agitation.

Screw Pump. An enclosed screw pump designed to pump raw (prior to centrifugation) dissolver solution containing abrasive solids has been placed on test. The unit consists of a two-inch auger enclosed in a Lucite cylinder that rotates with the auger. It is powered by a 1750 rpm motor and is equipped with seals and a slinger ring to protect the flange bearing. To date it has operated 408 hours pumping at a rate of 4.5 gallons per minute against a 2.9-foot discharge head. A new screw of different pitch, diameter, and length is being fabricated. A pump capable of delivering 10 gallons per minute against a 40-foot discharge head is required.

Valves. A total of twelve valves have been undergoing life test and operating characteristic determination tests. The valves were purchased from three vendors, Associated Valve and Engineering Company (Aveco), Hoke Valve Company, and Research Controls Corporation. The Hoke valves are bellows sealed air operated valves. Bellows failure occurred on one unit after 1.9×10^4 cycles. A second unit has now operated 4.14×10^5 cycles without failure. The Research Controls valves have packed stems which have leaked from the start. The valves have operated 4.14×10^5 cycles. The Aveco valves are air operated diaphragm sealed units specially fabricated for the in-line instrument program requirements. They have been operated through 3.2×10^5 cycles. As a result of the tests to date one design (a double diaphragm unit) has been selected for further testing. The Aveco valve has the advantage of being an all stainless steel unit (Hoke and Research Controls use pot metal and aluminum top works, respectively), and it is about one-half the size of the other units. Since space is limited in many locations, size is important.

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Miscellaneous

Heat Exchange. The over-all heat transfer coefficient for an aluminum bayonet heater coated with fluorothene dispersion was determined for the steam - water system and the steam 60 per cent nitric acid system using 90 psig steam. The coefficient for the water - steam system was 89 Btu/(hr.)(sq.ft.)(°F.) at the start and 68 Btu/(hr.)(sq.ft.)(°F.) after 7 days. The coefficient for the steam - nitric acid system was 50 Btu/(hr.)(sq.ft.)(°F.) after the water determinations were made. The coating was peeling from the bayonet when the tests were completed.

Fluoroflex-T Pipe. A glass cloth reinforced, flared connector, Teflon pipe failed at the lower connector flange after 2408 hours of service. Plastic flow of the Teflon reduced the thickness of the flare allowing leakage.

Condensate Mixer. At the request of Redox Process Technology, a water mixing device was designed and tested. The problem was to mix cold water with hot condensate at equilibrium with 40 psig steam to reduce the temperature to 200°F. before it was discharged at atmospheric pressure. Data were taken to define the operating conditions required for satisfactory operation. The results will be published in separate memorandum when the analysis is complete.

CHEMICAL RESEARCH SUB-SECTION,

PUREX

Profile Column Studies

Decontamination data obtained in profile pulse column runs completed during the report period are summarized in Table I. Of particular interest are the following observations:

1. Low acid flowsheets such as have been employed in the Purex plant 2D column appear capable of adequate decontamination with suitably clarified feeds. This may be seen by comparing the results obtained in Runs 5-5, 5-6, and 5-7. In Runs 5-5 and 5-6 in which Purex plant 2DF "as received" was employed as feed, accumulation of an activity-bearing interfacial "crud" was observed. This material tended to concentrate at the column interface (at the aqueous feed introduction point), but a significant fraction of it was transported upward through the scrub section to the product take-off. In Run 5-5 the technique employed for sampling the organic product effected separation of the organic phase from these "cruds" with the result that unrealistic high apparent decontamination factors of 48 to 72 were obtained. The overall decontamination factor of 2.5 computed by difference from the feed and waste activities is a better measure of the actual decontamination obtained in this run. In Run 5-6 the organic product sampling technique was varied with the result that varying amounts of the activity-bearing "cruds" were removed with the organic product samples, and apparent decontamination factors ranged from 2.5 to 55. Centrifugation of these organic product samples reduced the activity in all cases to values corresponding to a decontamination factor of about 55.

   The column was flushed prior to Run 5-7, and this run was made with a filter consisting of a one-foot length of one-inch pyrex pipe tightly packed with glass wool inserted between the 2DF feed tank and the feed pump. This resulted in a significant improvement in decontamination performance. An overall gamma decontamination factor of 210 was obtained with the filtration step accounting for a factor of about 2.5. Only minor amounts of interface "crud" were observed in this run, and centrifugation of the organic product samples did not reduce their activity.

   Decontamination in the extraction section in Run 5-7 was sufficient that the gamma activity in the organic stream entering the scrub section corresponded to a uranium gamma ratio of only approximately 5 so the observed scrub section decontamination factor of 2.3 cannot be regarded as indicative of the scrubbing potential of the "Zebra" cartridge.

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TABLE I

PROFILE COLUMN RUNS

Run No.	Flowsheet	Feed	Uranium Saturation (Percent)	Pulse Frequency[a] (cyc/min)	Gamma Decontamination Factors			
					Extn Sect.	Scrub Sect.	Overall	By Mat'l. Balance[b]
5-1	HW #3-IA	Zr tracer	65	80	3.1	4.3	13.3	9.0
5-2	HW #3-IA	Zr tracer	65	160	1.4	6.5	9.1	6.0
5-3	Low Acid Plant 2D[c]	Zr tracer	65	95	14	3.3	46[d]	--
5-4	Modified Low Acid[e]	Zr tracer	65	130	2.7	10	27[d]	--
5-5	Low Acid Plant 2D[c]	Plant 2DF (as received)	75	95	14 to 60	1.2 to 3.4	48 to 72	2.5
5-6	Modified Low Acid[e]	Plant 2DF (as received)	65	130	8 to 11	0.3 to 5.5	2.5 to 55	5
5-7	Low Acid Plant 2D	Plant 2DF (filtered through glass wool)	75	95	90[f]	2.3	210[d]	--

a Amplitude 0.5 inch in all runs.

b Computed by difference from activities in aqueous feed and aqeuous waste. Dashes denote cases in which activity reported in aqueous waste was greater than that in feed.

c Feed 1.5 M U, 0.3 M HNO_3. Scrub 1.6 M HNO_3

d Gamma ratio of uranium product three or less

e Feed 1.25 M U, 3 M HNO_3. Scrub 1.6 M HNO_3

f Includes decontamination factor of ca. 2.5 in filtration.

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2. Runs 5-1 through 5-4, which employed synthetic feeds spiked with zirconium tracer (purified by TTA extraction) provide additional evidence that adequate decontamination of "soluble" zirconium can be obtained in a pulse column contactor operated on low-acid flowsheets.

In the course of scouting for means of clarifying the plant 2DF used in the aforementioned pulse column runs the experiments summarized in Table II were performed. In these experiments samples of the plant 2DF were subjected to the indicated clarification procedures and then contacted with the same solvent employed in the pulse column runs. After vigorous agitation, the two-phase systems were allowed to settle until visually clear solutions resulted or were centrifuged. Analytical samples of the bulk aqueous and organic phases were then extracted from locations removed from the interface. Comparing the total activity found in the bulk aqueous and organic phases with that in the "clarified" feed, a measure of the "insoluble" activity is obtained.

Considering the nature of the experiment, the results appear remarkably consistent and indicate that about 60 percent of the gamma activity in the plant 2DF is in an "insoluble" form such that it can be essentially completely removed by filtration through glass wool and partially removed by centrifugation. Further, these results indicate that the "soluble" portion of the gamma activity is not precipitated on contact with solvent.

TABLE II

CLARIFICATION OF PLANT 2DF

Clarification Treatment	Gamma Activity in "Clarified" Feed (% of Initial 2DF)	Gamma Activity in Bulk Aqueous and Organic Phases (% of "Clarified" Feed)		"Soluble" γ Activity (% of Init. 2DF)
		Two phase System Centrifuged	Two Phase System Settled at 1G	
None	100	40	50	40 to 50
Centrifugation[a]	60	70	70	42
Filtration through glass wool	40	100	94	38 to 40

a One hour at 2200 RPM in clinical centrifuge (ca. 800 G)

Other information of interest obtained in studies scouting means of clarifying the plant 2DF solution may be summarized as follows:

1. Gravity filtration of the 2DF through a glass wool bed 1.75 inches in depth yielded an initial decontamination factor of 4.4 through three column volumes. The decontamination tapered off with throughput, finally leveling off at a decontamination factor of 2.1 after 40 column volumes and holding at this value for 100 column volumes. The experiment was terminated after 100 column volumes had been passed through the filter though there was no evidence of breakthrough.

2. Centrifugation at 2200 RPM (ca. 800 G) in a clinical centrifuge proved less effective than glass wool filtration in clarifying the 2DF. The gamma decontamination factor after 2.5 hours centrifugation was only 1.75. The activity centrifuged to the bottom of the tubes in this experiment.

MINI STUDIES

Mini runs completed during the report period indicate that the effectiveness of phosphate in improving decontamination in the "A" unit is not increased significantly by raising the temperature from room temperature to 50 C.

A significant improvement in zirconium-niobium decontamination was observed in the "A" unit when Purex plant IAF was processed on the current Uranium Recovery Plant flowsheet, however. Zirconium-niobium decontamination factors were 180 through the "A" unit and 290 through the "C" unit for the following "base-line" flowsheet:

AF: 1.70 M U, 0.77 M HNO_3 (Prepared from Purex Plant 1AF); Relative Flow: 300

AS: 1.5 M HNO_3; Relative Flow: 200

AX: 30 percent TBP in Shell E-2342; Relative Flow: 1300

By comparison, zirconium-niobium decontamination factors were 1200 through the "A" unit and 570 through the "C" unit when the following modified Uranium Recovery Plant flowsheet was used:

AF: 1.25 M U, 4.0 M HNO_3 (Prepared from Purex Plant 1AF); Relative Flow: 300

AS: H_2O; Relative Flow: 100

AIS: 4.0 M HNO_3, 0.1 M Fe $(NH_2SO_3)_2$; Relative Flow: 100

AX: 20 percent TBP in Shell E-2342; Relative Flow: 1350

No explanation can be offered for the fact that lower decontamination was observed through the "A" and "C" units than through the "A" unit alone. Presence of activity-bearing solids in the feed is suspected and will be checked.

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It is planned also to test the above dual-scrub flowsheet with thirty percent TBP.

Chemistry of Zirconium in Purex Systems

Experiments were performed to characterize the extraction behavior of zirconium in TBP-nitrate systems. For these experiments zirconium from three sources was used as feed, as follows:

1. A 30 percent TBP-Shell E-2342 extract of Purex plant HAF. In order to reduce the effects of uranium "back salting" in subsequent extractions the HAF was diluted with nitric acid prior to extraction so that the uranium concentration in the organic extract was only about 0.1 molar.

2. A 30 percent TBP-Shell E-2342 extract of Purex plant 1AF. The 1AF was diluted with nitric acid before extraction in the same fashion as with the HAF.

3. A 30 percent TBP-Shell E-2342 extract of a synthetic feed of the same gross composition as in (1) and (2) but spiked with zirconium tracer purified by TTA extraction.

Complete analytical data are available only for the experiment comparing the effect of nitric acid concentration on the extraction coefficient of zirconium from these three sources. These data are shown in Table IV.

TABLE IV

EFFECT OF NITRIC ACID ON DISTRIBUTION COEFFICIENT OF ZIRCONIUM

M HNO_3 Equilibrium Aqueous	M HNO_3 Equilibrium Organic	M U in Organic	E_a^o (Zr) HAF Zr	E_a^o (Zr) 1AF Zr	E_a^o (Zr) Tracer Zr
0.40	0.036	0.066	0.011	0.026	0.0092
2.32	0.46	0.094	0.055	0.073	0.068
4.64	0.77	0.096	0.34[a]	0.36	0.52
6.96	0.89	0.096	1.95[b] 1.68[a]	1.62	2.2

a Computed by difference from Zr-Nb gamma scan data and chemical analysis for niobium.

b Computed by material balance from chemical analysis for zirconium.

Reproducibility limits have not yet been defined for these measurements, but it appears that the portion of the zirconium in these three feeds which is extractable by TBP responds to changes in nitric acid concentration in at least a similar fashion.

By interpolating the data of Table IV, it is possible to estimate the distribution coefficient for the organic-soluble zirconium in these three feeds in the extraction step by which the organic feeds were prepared. This comparison is shown in Table V.

TABLE V

COMPARISON OF DISTRIBUTION COEFFICIENTS FOR TOTAL ZIRCONIUM AND ORGANIC-SOLUBLE ZIRCONIUM

Initial Aqueous Feed	M HNO_3 in Aqueous in Equilibrium	E_a^o for Total Zr[a]	E_a^o for "Organic-Soluble" Zr[b]
Diluted Purex HAF	2.0	0.0035	0.042
Diluted Purex LAF	1.9	0.084	0.059
Tracer Zr	2.3	0.064	0.068

a Distribution coefficient measured in extraction step by which organic feeds were prepared.

b Distribution coefficients interpolated from data of Table IV.

The presence of any significant amount of "inextractable" zirconium is apparent only in plant HAF, not in plant LAF or in aqueous feed prepared from TTA-purified zirconium tracer.

Another interesting comparison is shown in Table VI in which are reported results obtained on successive scrubs of organic extracts prepared from plant HAF and from a synthetic aqueous feed spiked with TTA-purified zirconium tracer. Unfortunately, this experiment could not be performed with plant LAF since accurate chemical analyses for zirconium could not be obtained at this level.

TABLE VI

COMPARISON OF SCRUBBING BEHAVIOR OF ZIRCONIUM FROM PLANT HAF WITH TTA-PURIFIED ZIRCONIUM TRACER

	E_a^o (Zr)			
Source of Zr	Extraction	1st Scrub[a]	2nd Scrub[a]	3rd Scrub[a]
Diluted plant HAF	0.0035	0.055	0.36[b]	0.72
Zr Tracer	0.064	0.068	0.089	0.061

a Scrubs all 2.35 M HNO_3. Organic U about 0.1 M in all scrub steps.

b Computed by material balance.

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The presence of "unscrubbable" zirconium is indicated in plant HAF but not in the TTA-purified zirconium tracer. In the case of the experiment with plant HAF, the zirconium remaining in the organic after three scrubs comprised about 0.002 percent of the total zirconium, corresponding to a total zirconium decontamination by a factor of 5×10^4.

Then, though this "unscrubbable" zirconium may constitute only a very small fraction of the total zirconium, its presence could be felt in the second and third cycles if it follows the products through the stripping operations.

The immediate objective of planned further studies is to confirm the results of these preliminary experiments. Pending this, emphasis will be placed on evaluating the amounts of "unscrubbable" zirconium present in HAF, elucidating the behavior of these species in stripping and re-extraction operations, and defining the origin of this "unscrubbable" species.

Measurements of the organic phase diffusivity of zirconium have been extended to higher uranium concentrations. The diffusivity of zirconium in a 30 percent TBP-Soltrol solution containing 83 grams uranium per liter was found to be 5.2×10^{-7} cm^2/sec. This yields a value for the $D\mu$ product of 2.05×10^{-8} dynes, in fair agreement with earlier work covering a range of uranium concentrations from zero to 78.5 grams uranium per liter for which the average $D\mu$ product was 2.63×10^{-8} dynes. Thus it is concluded that the major effect of uranium in altering the organic phase diffusivity of zirconium stems from its effect on the viscosity of the solvent.

Organic Complexants for Zirconium-Niobium

A screening program has been initiated in the hope of finding an agent capable of forming organic-soluble complexes of zirconium and niobium by selective extraction away from plutonium(III) and the uranyl ion. Such an agent could perhaps be employed to advantage in an extraction step preceding the first product extraction or in the present Purex partition cycle. Results obtained in preliminary studies with octyl phosphate indicate some hope for such an operation. Batch studies employing Purex plant 1AF and simulating the operation of the Purex 1A, 1BX, and 1C columns showed an eight-fold improvement in plutonium decontamination and a five-fold improvement in uranium decontamination when the 1AP was made 0.01 molar in octyl phosphate prior to the 1B and 1C operations. The plutonium loss to the uranium stream was not increased by the presence of octyl phosphate during the simulated 1BX operation. The uranium loss to the 1CW was not measured but appeared visually to be satisfactorily low. The zirconium-niobium activity retained in the 1CW was removed by carbonate washing, but the octyl phosphate was not. Thus octyl phosphate could not be used in the present Purex partition cycle since it would survive the solvent washing operation and recycle with the solvent.

Similar experiments were also performed employing TTA as the complexant, but chemical analyses necessary to differentiate between zirconium and niobium have not yet been performed. No improvement in niobium decontamination would be expected from use of TTA in such an operation.

Stannous Oxide Head-End Studies

Additional full-level decontamination studies were made, employing as feed Purex plant dissolver solution sampled April 5. Employing 0.1 molar stannous oxide and scavenging from 1.5 molar uranium, 1.5 molar nitric acid, zirconium and niobium decontamination factors were 36 and 69, respectively, when the system was not cooled before centrifugation. When the system was cooled prior to centrifugation, the zirconium and niobium decontamination factors were 50 and 220, respectively. Cumulative decontamination factors through a batch extraction step and two batch scrubs simulating the operation of the HA column are shown in Table VII for these two cases.

TABLE VII

SOLVENT EXTRACTION DECONTAMINATION OF STANNOUS OXIDE SCAVENGED PUREX HAF

Conditions: Extraction: Aqueous 2.6 M HNO_3, Organic uranium saturation 55 percent.
Scrubs: 3.0 M HNO_3

	Decontamination Factors Through					
	Extraction			Two Scrubs		
Experiment	Zr-Nb	Zr	Nb	Zr-Nb	Zr	Nb
Centrifuged while hot	2000	5900	1.9×10^4	1×10^4	1.3×10^5	1.6×10^5
Cooled before centrifugation	2000	5900	-	1×10^4	1.1×10^5	--
Control	260	180	430[a]	6000	5000	8500

a Computed by difference

A substantial improvement in decontamination is apparent for both zirconium and niobium. Since the plutonium in this feed was essentially all plutonium(IV), the plutonium losses were excessively high, of the order of ten percent.

Parallel work examining the carrying of plutonium on stannous oxide has elicited the following information:

1. Wash solutions containing ferrous sulfamate are only slightly more effective than dilute nitric acid in removing adsorbed plutonium(IV), and this technique does not appear capable of reducing plutonium losses to acceptable levels.

2. Carrying of plutonium(IV) appears to be quite sensitive to the amount of stannous oxide employed as shown by the data of Table VIII.

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TABLE VIII

CARRYING OF PLUTONIUM(IV) BY STANNOUS OXIDE
(All systems digested one hour at 100 C)

M U	M HNO_3	M SnO	Pu Carried (%)
0.8	0.08	0.005	0.94
0.8	0.08	0.05	12.2
0.8	0.8	0.005	1.45
0.8	0.8	0.05	5.3
1.6	0.08	0.005	0.59
1.6	0.08	0.05	6.7
1.6	0.8	0.005	0.20
1.6	0.8	0.05	2.2

3. The changes suffered by stannous oxide (Baker's reagent grade) in this operation are different when uranium is present than when uranium is absent. Digestion of stannous oxide in contact with 1.5 M uranium, 2 M nitric acid resulted in a product which had an x-ray diffraction pattern identical with that of the starting material, corresponding to greater than 95 percent stannous oxide. Digestion of the same starting material in contact with 2 M nitric acid containing no uranium resulted in a product containing only 20 to 25 percent stannous oxide and 75 to 80 percent stannic oxide. Further, partial peptization of the solid was observed in the second case, a net loss in weight of about 56 percent being observed despite conversion to the heavier stannic oxide. This behavior is particularly surprising in view of the fact that no such effects were noted in earlier work in which stannous oxide was digested in uranium-nitric acid solutions containing dichromate.

The emphasis in further studies will be placed on defining the lower limit of stannous oxide concentration required to yield adequate zirconium-niobium decontamination. Earlier work with tracer feeds indicated adequate decontamination at stannous oxide concentrations as low as 0.01 molar. This work is currently being repeated with full-level feeds.

Solvent Studies

Results of experiments comparing solvent decontamination by washing with alkaline permanganate and by contacting with pre-formed hydrous oxides of manganese(IV) indicate that the presence of permanganate is not essential to good decontamination, at least for contacts at elevated temperature. A two-hour treatment at 65 C of Purex G-7 solvent (sampled April 9) with 0.1 molar permanganate in 3 percent sodium carbonate yielded decontamination factors of 19, 3.5, and 1.7 for zirconium-niobium, ruthenium, and iodine, respectively. A comparable treatment with 0.1 molar manganese(IV) hydrous oxides (preformed) yielded decontamination factors of 57, 3.6, and 2.0 for zirconium-niobium, ruthenium, and iodine. Two-hour treat-

ments at 25 C yielded decontamination factors of 11 for zirconium-niobium, 4.4 for ruthenium, and 1.6 for iodine when permanganate was employed and 4.0 for zirconium-niobium, 4.0 for ruthenium, and about 2.0 for iodine when preformed manganese(IV) hydrous oxides were employed.

Two-step treatments with hydrous oxides of manganese(IV) indicate that lo[illegible]ueous to organic phase ratios may be employed. Overall decontamination factors were 110 for zirconium-niobium, 7.6 for ruthenium, and 1.9 for iodine when a sample of Purex G-7 solvent (sampled April 9) was subjected to two successive one-hour contacts at 70 C with one-eighth volume portions of a slurry 0.1 molar in preformed manganese(IV) oxides. A comparable treatment with one-half volume portions of the aqueous phase resulted in decontamination factors of 230 for zirconium-niobium, 8.0 for ruthenium, and 2.3 for iodine. This latter treatment resulted in a solvent which had an optical density of only 0.5 at 330 mu as compared with an initial value of 5.2 and which exhibited a "C" contact Eå (U) value of 0.0059. It thus appears that solvent degradation products were effectively removed by this treatment.

Unfortunately, these results could not be reproduced with a sample of Purex G-7 solvent sampled April 30 which was quite high in iodine-131. Treatment of this solvent with pre-formed manganese(IV) oxides under rigorous conditions (20 hours at 50 C and 5 hours at 70 C) sufficed to remove zirconium-niobium but was not effective in decolorizing this solvent.

Radiation Chemistry of TBP Solvent Systems

A number of radiation studies of TBP systems have been completed. Highlights of the findings are as follows:

1. Pure TBP yields 0.16 gram DBP, 0.017 gram MBP, and 0.018 gram n-butyl alcohol per watt-hour of Cobalt-60 radiation absorbed. Other products include dibutyl ether, unsaturates, and gaseous products consisting of hydrogen and hydrocarbon fractions.

2. Dilution of TBP with a paraffin hydrocarbon does not influence the DBP yield. Benzene has a pronounced protective effect, reducing the DBP yield to 0.025 gram per watt-hour at very low concentrations of TBP in benzene. Of particular interest is the fact that the protective action of benzene is proportional to the mol fraction rather than to the mass or volume concentration. The ability of the benzene ring to absorb energy from activated molecules is presumed responsible for its protective action.

3. As reported previously, dilution of TBP with carbon tetrachloride increases the DBP yield, a value of 1.1 grams DBP per watt-hour being attained at 30 percent TBP. Free radical formation from carbon tetrachloride is presumed responsible for this effect. The yield of free chloride is about 0.07 gram per watt-hour absorbed by carbon tetrachloride.

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4. Water and n-butanol also exhibit some protective action toward degradation of TBP. At low concentrations of TBP in n-butanol the DBP yield is reduced by a factor of two. Hydrogen bonding to the phosphoryl oxygen of the TBP molecule may account for this effect. Some protective action is also apparent when uranyl nitrate is present, but accurate analytical data have not yet been obtained.

5. Attempts to dry TBP with sodium revealed a slow reaction at room temperature. Products include a gas which analyzes greater than 97 percent n-butane and a solid tentatively identified as sodium dibutyl phosphate.

WASTE TREATMENT AND FISSION PRODUCT RECOVERY

Cesium Recovery from Purex Waste

Major effort during the past month has been concentrated on two critical facets of the cesium recovery process. These are the conversion of the zinc cesium ferrocyanide precipitate to a product suitable for use as a radiation source and the demonstration of the radiation stability of the precipitation step of the process. Tooling up is now complete for the latter operation, which will be carried out with full level Purex Plant IWW solution on a multi-millileter scale. This will simulate the radiation level of a plant operation as closely as the brick pile facilities in 325 Building will safely permit, and the results should be readily extrapolatable to plant scale operation.

The product conversion work is aimed at converting the zinc cesium ferrocyanide to a material possessing high radiation stability and the characteristics of a non-hygroscopic, free flowing powder which can be readily loaded into source containers. A high specific activity is also desired. While the zinc cesium ferrocyanide satisfies the latter requirement, it is feared (although this has not been demonstrated) that it might evolve gas on prolonged storage due to irreversible decomposition of the cyanide groups. The chlorides or oxides, on the other hand, would be expected to be stable in this regard. A variety of methods for converting the ferrocyanide to a material having the desired characteristics have been scouted, and several show excellent promise. On the basis of the thermodynamic properties of the oxides and chlorides, it would appear possible to convert the zinc cesium ferrocyanide to a mixture of zinc oxide, cesium chloride, and ferric oxide by heating in a stream of chlorine (or other suitable chlorinating agent) and air. This technique is being tested.

A mixture of Cl_2 ($P_{Cl_2} < 0.1$ atm.) and air has been passed over cesium zinc ferrocyanide at various temperatures. It appears that the lowest temperature at which the ferrocyanide can be completely decomposed is 350 C. From visual examination, it takes approximately one hour for complete destruction of the ferrocyanide. Some ferric chloride and probably zinc chloride are produced in spite of the low chlorine pressure. To convert these two to their oxides it is necessary to sweep out the chlorine with air and continue heating in air for about an hour. The resulting material is easily handled and is not hygroscopic and would probably be a suitable product. It is composed of a water soluble fraction and an insoluble one.

The latter is soluble in hydrochloric acid and is presumably ferric oxide. The water soluble portion contains the zinc and cesium with a small amount of iron. X-ray diffraction analysis shows the material to contain a hitherto unknown compound of cesium chloride and zinc chloride. The exact formula of this compound is to be established. This compound is not hygroscopic and though it is soluble in water it is much less soluble than either cesium chloride or zinc chloride. The compound has also been prepared by mixing slightly acidic solutions of the parent chlorides.

The ignition of the ferrocyanide with air alone was also studied. A precipitate was heated in a muffle furnace with free access to air, and decomposition was checked gravimetrically. The iron was apparently converted to the oxide slowly at 500 C, judging from weight loss and formation of a red color, and required over two hours for completion. Oxidation of the iron was rapid at 600 C and some zinc was also converted. Constant weight was attained in 20 minutes at 700 C, and only a slight weight loss was observed on heating the residue to 800 C. From the weight losses, it is hypothesized that the cesium remained as the cyanide. Experiments at higher temperatures were not performed. On the basis of Arco experienc with nickel ferrocyanide, it should be possible to leach the cesium from the ignited precipitate; however, this has not yet been demonstrated. It should be noted that rather vigorous reactions were observed on ignition of ferrocyanide precipitates which had not been washed, and hence contained sodium nitrate.

Ignitions of zinc cesium ferrocyanide-ammonium chloride mixtures were also carried out. Destruction of the ferrocyanide was incomplete unless the solids were intimately mixed. With thorough mixing, decomposition of ferrocyanide appeared to be complete at 400 C as shown by the fact that the product was soluble in dilute hydrochloric acid. On further heating, however, copious white fumes were evolved at 550 C and a boiling black liquid was formed at 600 C. At 800 C, over half of the initial weight had been lost, implying the loss of some cesium, either by evaporation or spattering. Experiments with cesium nitrate showed that this compound decomposes at some temperature between 700 and 800 C and that the cesium product (presumably oxide) is volatile at 800 C and, perhaps, at even lower temperatures.

Although zinc cesium ferrocyanide is not soluble in hydrochloric acid alone, it was found to dissolve in a mixture of nitric and hydrochloric acids (aqua regia). It was also decomposed by boiling, concentrated sulfuric acid to form a yellow solution and a white precipitate, the composition of which has not been established. There is thus a basis for developing a wet chemistry conversion of the ferrocyanide should the dry chlorine-oxygen operation prove to have some serious defect.

Removal of Cesium from Redox HAW

Work on the ion exchange process for recovery of cesium from Redox HAW was suspended, at least temporarily, because of the relatively low loading capacity of the Duolite C-3 resin and the large volume of elutriant which was required. The effort was shifted to scouting the use of nickel ferrocyanide and zinc cesium ferrocyanide for recovering cesium from HAW on the acid side (pH$\sim$2.5). The initial scheme was to carry the cesium (flowsheet concentration ca. 10^{-4} M) from solution with 0.01 M nickel ferrocyanide, metathesize this precipitate with hot 4 M NaOH to convert to

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nickel hydroxide, and then recover the cesium from the supernate by a stoichiometric addition of Zn(II) at pH 7 to 8 to precipitate zinc cesium ferrocyanide. Recoveries were poor, however, and the color of that precipitate which was obtained suggested that it was a ferricyanide rather than the desired zinc cesium ferrocyanide. The scavenging behaviors of zinc and nickel ferricyanide were accordingly investigated.

Preliminary results with zinc ferricyanide are shown in Table IX. The additions of zinc and potassium ferricyanide were based on the assumption that the precipitate was predominately $Zn_3 (Fe (CN)_6)_2$. Cesium concentration was 10^{-4} M.

TABLE IX

SCAVENGING OF CESIUM WITH ZINC FERRICYANIDE

Conditions: Zinc and ferricyanide added to synthetic Redox HAW while stirring. Stirring continued for 10 minutes at room temperature, centrifuged.

M $Zn_3 (Fe (CN)_6)_2$	Prec. Vol. %	Cs DF
0.01*	3	>50
0.01	3	>50
0.001	0.6	>50
0.0008	<0.2	~20
0.0005	Negligible	1.4
0.0001	None	1

* NaOH added to pH 2.5

For purposes of comparison, it may be noted that a 0.01 M concentration of nickel ferrocyanide is necessary to give a cesium decontamination factor of ~100 and that the precipitate volume is much larger (ca. 10% of solution volume).

The precipitate from the 0.0008 M case was washed, dried, and weighed. The specific activity, after flaming, was equivalent to 2.2 curies/gram.

In another series of experiments, zinc ferricyanide was compared to zinc nickel ferricyanide. A cesium decontamination factor of 14 was obtained with the former at the 0.0008 level whereas the same concentration of the latter gave a decontamination factor of 7.3. Employing 0.0002 M zinc nickel ferricyanide the decontamination factor dropped to 1.6 (38% removed). The zinc ferricyanide did not precipitate at the latter concentration, suggesting that its solubility in HAW is somewhat greater than 0.0002 M.

Future work with the zinc ferricyanide will be aimed at determining the effect of variables, establishing the identity of the precipitate, and exploiting application to waste treatment and cesium recovery.

Strontium Removal from Purex Waste

Reexamination of precipitation processes for recovery of strontium from Purex IWW during the month has led to the following results.

Very satisfactory recovery (>98%) of the strontium contained in the leach solution from a ferric hydroxide precipitate was obtained by carrying on barium carbonate.

The supernate from a low pH (3.5 to 5.0) precipitation of the iron in IWW when treated with barium nitrate yields a precipitate of barium sulphate that carries part of the strontium. Satisfactory recoveries have not been achieved with quantities up to 5 g/l (75 percent removal at this level), but indications are that larger quantities of barium would permit at least 90 percent recovery. Carrying of strontium by barium sulphate is not highly pH sensitive over the range 1.5 to 8.0, but the carrying of yttrium on this precipitate increased markedly at pH 8. The strontium carried on barium sulphate was partially removed (30 to 75%) by digestion at the boiling point in 5 M HNO_3.

The precipitation of iron salts from the IWW by hydrolysis of urea after partial neutralization with sodium hydroxide results in a solid of smaller volume (0.06 ml/ml IWW by urea hydrolysis versus 0.24 to 0.3 ml/ml IWW by neutralization with sodium hydroxide). This precipitate does not carry the strontium as effectively as the more bulky one. However, it would be useful for the processing scheme based on the principle of leaving the strontium in the IWW-NS. That the inferior scavenging of strontium by the precipitate produced by urea hydrolysis is due to the character of the precipitate and not to the final pH was shown by another experiment. Excess sodium hydroxide was added to the system after urea precipitation of the iron. Twenty to thirty percent of the strontium remained in the supernate after this treatment versus less than one percent in a normal sodium hydroxide precipitation.

Present indications are that a process could be built around the partial neutralization of IWW with sodium hydroxide and precipitation of the iron salts by hydrolysis of urea to leave the strontium in the supernate. The addition of barium nitrate to this supernate would then carry the strontium from this solution on the barium sulphate formed. The strontium could be separated from the barium sulphate by digestion in nitric acid containing a slight excess of barium. Recovery of the strontium from this solution could be by evaporation and precipitation of strontium fluoride, or possibly this would have to be preceded by removal as the chromate.

RUTHENIUM CHEMISTRY

Solvent Extraction Behavior of Ruthenium

The possibility of employing successive solvent extraction experiments to elucidate the ruthenium species present in process solutions was described in the

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March report, and the results of a preliminary tracer level experiment were reported at that time. The work has now been extended to full level. The results are shown in Table X, and are compared to those of the earlier experiment. While the initial experiment indicated the presence of at least two ruthenium species, the extraction data of the latter could be interpreted to mean that only one ruthenium species was present in the aqueous phase. This is particularly surprising in view of the fact that the same Hot Semi-Works HAF was employed in both cases. It had not been anticipated that the difference in activity levels or the presence or absence of $K_4Ru(NO_2)_6$ would cause a significant change in ruthenium species. The affect of these and other suspected variables (such as the age of the feed) will be examined more closely in later experiments, and an effort will be made to investigate scrub behavior as well as extraction behavior.

TABLE X

SOLVENT EXTRACTION OF RUTHENIUM

Exp. 1. Aqeuous: 1.35 M UNH, 2.0 M HNO_3, 5 g/l $K_4Ru(NO_2)_6$, spiked with 10% HAF from Hot Semi-Works.
Organic: 30% TBP-soltrol, 1st organic equilibrated with 2.0 M HNO_3, succeeding organics equilibrated with 2.0 M HNO_3 and contacted once with 1.35 M UNH, 2 M HNO_3, O/A = 3.
Volume Ratio: O/A = 3.

Exp. 2. Aqueous: 1.41 M UNH, 2.2 M HNO_3, full level, same HAF as Exp. 1.
Organic: Same as Exp. 1 except 1st organic nor pre-contacted, succeeding organics contacted once with 1.41 M UNH, 2.2 M HNO_3, O/A = 3.
Volume Ratios: 1st extraction, O/A = 3, succeeding extractions, O/A = 1.

Extraction	Ruthenium E% Exp. 1	Exp. 2
1	0.0023	0.0029
2	0.0011	0.0025
3	0.00074	0.0025
4	0.00094	0.0028
5	0.00071	0.0026
6		0.0025
7		0.0033

URANIUM PROCESSING

Uranium Reduction

Further experiments were performed to determine the volatility of lithium oxide. Initial efforts to prepare the oxide by decomposing lithium hydroxide or lithium carbonate resulted in a product grossly contaminated with lithium peroxide. However, a sample of relatively pure oxide was finally

prepared by vacuum decomposition of the carbonate at 820 C for 18 hours. An x-ray diffraction pattern of this material corresponded to that from lithium oxide; although a few faint lines due to the carbonate were also present. Some experiments on less pure lithium oxide resulted in half times for the vacuum sublimation process ranging from 20.3 hours at 800 C to 0.4 hours at 1000 C. These values, which were reproducible to about 25 percent, will be rechecked with lithium oxide of higher purity.

A new electrolytic cell employing an internal graphite heater was tested in a uranium electro-refining operation. The electrolyte was composed of 130 grams of lithium chloride-potassium chloride eutectic, 530 grams of sodium chloride and 250 grams of uranium tetrafluoride; the anode was a perforated graphite basket containing scrap uranium; and the cathode was a strip of tantalum about 20 cm^2 in area. In one experiment 51 ampere hours of current were passed through the cell at intensities ranging from 12 to 23 amperes. Uranium was recovered by first grinding the cathode deposit in a mortar and separating the uranium metal from the dross by washing (flotation). The yield of metal obtained in this fashion was 15 to 20 percent.

Flurex Process

Further experiments were conducted to determine the effect of stannous ion in the catholyte on the current density-current efficiency relationship. The Flurex cell utilized vertically positioned membranes nine square inches in area. The cathode was a stirred mercury pool one square inch in area and about one-half an inch deep. The reason for making the membrane to cathode area ratio so high (9) was twofold; to reduce the power requirements and to prevent damage to the membrane, previously noted when current densities of one to two amperes per square inch of membrane were used. In this series of tests the Amberplex C-1 (cation permeable) membrane was replaced with Nepton CR-61 membrane.

Two runs were made using 0.6 molar uranyl nitrate as the feed and 0.05 molar stannous fluoride in the catholyte. The current efficiencies for cathode current densities of 1 and 1.5 amp/in^2 of cathode surface were constant at about 90 percent. This study will be extended to higher current densities to establish the optimum operating conditions.

Analysis for tin in the $NaUF_5$ produced at 1.5 amp/in^2 disclosed less than 0.1 percent, the detection limit of the method. This is in accord with a previously reported value of 5 to 10 ppm of tin as determined spectrographically.

The Nepton CR-61 membrane performed satisfactorily, showing a lower resistance (hence lower power consumption) than the Amberplex C-1 membrane. Further tests will be made to determine the acceptable operating ranges as a Flurex cell component.

A 100 hour run was successfully completed to demonstrate the continuous electrolytic reduction and precipitation of sodium uranium fluoride from Purex final uranium cycle feed (0.6 M UNH, 0.1 M acid deficient). The cell was a typical

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Flurex cell using Amberplex A-1 and C-1 membranes. The current density with respect to membranes and cathode was 0.2 amp/in^2, and the overall current efficiency was 97.6 percent. A gamma decontamination factor of about 24 was realized between feed (2.7×10^5 γ/m/ml Zr-Nb, 1.5×10^4 γ/m/ml Ru-Rh) and product yielding a salt with gross gamma activity 140 percent of natural uranium.

Unfortunately the anion permeable membrane developed a blister early in the run which resulted in a transfer of uranium from the feed chamber to the anode chamber; an occurrence not previously experienced and believed caused by an initially defective membrane. As a result the anolyte of 0.2 molar nitric acid contained 0.5 g/l uranium. Despite the undoubted leakage of fission products into the anolyte, it still contained only one percent of the feed activity.

The anion and cation permeable membranes absorbed less than 0.5 percent of the gamma activity present in the feed. Survey meter readings during the course of the run showed a steady increase in the membrane activity with time; thus, no steady state was obtained with respect to activity absorbed on or by the membranes. The activity in the feed effluent and anolyte remained constant after the initial eight hours of operation. In the catholyte, a cyclic fluctuation occurred as the settling bottles filled with product salt and were replaced with fresh electrolyte. The loss in permselectivity of Amberplex A-1 membrane was found to be less than five percent for cobalt - 60 irradiation doses of 2×10^7 and 1.5×10^8 R.

Preparation of Uranium Hexafluoride

The oxidation of uranium tetrafluoride by oxygen has been further studied using a vertical reactor. The effect of moving bed has been simulated with a travelling heater moving in a direction opposite that of the oxygen flow. Experimental yields of 30 to 40 percent have been obtained using both powder and pelletized feed. These low yields imply extensive side reaction which, it is hoped, can be controlled by the use of a calcium fluoride liner in the reactor.

Surface area measurements on samples of uranium tetrafluoride produced by vacuum decomposition of ammonium uranic fluoride resulted in values of 1.5 to 3 square meters per gram; no correlation with reactivity toward oxidation was found. Uranium tetrafluoride prepared by hydrofluorination of uranium dioxide had a surface area of 0.23 square meters per gram which was not much different from the surface area of electrochemically produced ammonium uranic fluoride (0.35 square meters per gram).

Ammonium uranic fluoride was decomposed in argon at 450 C under atmospheric pressure. The resulting tetrafluoride had a surface area of 1.4 square meters per gram, compared to 1.5 to 1.9 square meters per gram found for samples produced from the same double salt by vacuum decomposition. The product of atmospheric decomposition was found to be more reactive towards oxygen; a fact not expected from the surface area measurements.

UO_3 STUDIES

A series of experiments was performed to determine the affect of pre-heating and post-heating on the surface areas of uranium dioxide prepared by reduction of the trioxide. Samples of both "batch" and "continuous" uranium trioxide were reduced at 590 C followed by heating in hydrogen at 925 C for 1.5 hours. A corollary experiment was done in which samples were heated in nitrogen at 925 C for 1.5 hours prior to reduction at 590 C. X-ray diffraction studies showed that these heat treatments had little effect; structure and particle size (as determined from line broadening) were as expected from oxides reduced at 590 C with no prior or subsequent heat treatment. Surface area measurements, however, contradicted the x-ray evidence as the surface area of the pre-heated sample was only one-fifth of that usually associated with UO_2 formed at 590 C and corresponded to the surface area of oxide formed at 925 C.

Further characterization of UO_3 samples by x-ray diffraction has been done. It has been found that amorphous UO_3 is best produced at a calcination temperature of 350 to 400 C; that the addition of sulfate prior to calcination causes smaller UO_3 crystals to be formed (at least under certain conditions) and, at calcination temperatures where some amorphous UO_3 is produced, increased sulfate increases the amorphous content; and, that calcination of UNH containing 0.6 percent sulfate at 425 C does not produce amorphous UO_3 and phase II, as in the absence of sulfate, but amorphous UO_3 and a new phase, VI. A glass prototype of the bench scale fluidized bed unit has been received and will be used to study fluidizing characteristics of the solid and test dynamic operation of the system.

ISOTOPE SEPARATION

No isotopic analyses have been received this month due to difficulty with the mass spectrometer.

Thermal Diffusion

The run previously described was terminated after a final period of operation during which the column was intentionally vibrated. A solution of uranyl dibutylphosphate in excess dibutylphosphate was used as feed for the 0.20 mm column. The initial concentration of 106 g u/l decreased to 52 g/l at the top of the column after seven (7) days operation. No decomposition is apparent.

Chemical Exchange

The rate of exchange of uranium in the system uranium(IV) chloride (aq.)-uranium(IV) TTA (benzene) at pH 1.3 corresponds to a half-time of about three minutes as determined by experiments using uranium-233 tracer. Almost identical values were obtained whether the tracer was initially in the aqueous or the organic phase. This value is sufficiently accurate for design of an experiment utilizing the Mini mixer settler.

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Ion Exchange

A third "sharp band" ion exchange experiment has been operating for over a month. The experimental conditions are similar to previous runs except that about four times as much plutonium (about 20 grams) is on the column. Samples from the second run which operated through about fo ty band lengths have been prepared for isotopic analysis at KAPL.

NEW SEPARATIONS

Anion Exchange Process

Continued scouting experiments were performed to determine the anion exchange characteristics of plutonium(III) and plutonium(IV) in solutions of sulfuric acid, mixed sulfuric-nitric acids, acetic acid, and mixed acetic acid-sodium acetate. Distribution coefficients in all cases were less than 5; hence, these systems are not practical for an anion exchange process.

Further experiments were done using sulfosolicylic acid as a complexing agent; however, no quantitative results are available. Experiments were also done to determine the anion exchange characteristics in nitric acid - metal nitrate solutions. Qualitatively, high distribution coefficients exist when the nitrate concentration is above six molar.

ANALYTICAL DEVELOPMENT

The integrating circuit and associated equipment changes for use with the direct reading spectrograph attachment were built and initial tests completed. Operation of the integrating circuit is very satisfactory, and leads to precision of a single determination of better than ± 1 percent when intense spectrum lines are used. However, precision attainable with the direct reader and integrator is limited to about ± 2-1/2 percent by a periodic shift of output ratios. Tests are in progress to determine whether this shift is due to optical misalignment caused by mechanical instability, or is inherent in the light source and optical system being used.

In further study of the coulometric titration technique for plutonium assay, it was concluded that the derivative polarographic endpoint is most satisfactory for routine use. High results previously observed can be avoided by use of smaller titration increments and sufficient time between additions; good agreement with other less convenient methods is attained. The presence of 0.1 M HCl in the sample-electrolyte solution appears to lead to results about 0.4 percent low.

Calibration of two of the five gas scintillation fission counters is in progress, using several foils prepared from plutonium containing 2.68 percent Pu-240 as determined by a mass spectrometer. The following results have been obtained:

Mg Pu on Foil	Spontaneous c/m x 10^3 / Induced c/m: Chamber No. 1	Chamber No. 2
4	1.016 ± 0.02	1.010 ± 0.03
2	1.004 ± 0.02	0.997 ± 0.02
1	1.005 ± 0.03	

Further counting with these foils and with others of greater pU-240 content will be made to improve precision and evaluate instrument stability.

Preparation of twelve plutonium fission foils to be used for measurement of neutron induced fission cross section is continuing. Tests are currently being made for the degree of uniformity, total alpha activity and percent of Pu-238 on the foils.

A study of the 0.1 M TTA orthodichlorobenzene system for the analytical separation of fission products and actinide elements is continuing. A preliminary extraction curve for niobium(V) as a function of pH indicates that this ion is 10 percent extracted into the organic phase at a pH of approximately 0.1 and 90 percent extracted at a pH of approximately 1.0. Comparing this curve with those previously studied indicates that this ion cannot be separated from Th(IV) or Pu(III), among the ions for which extraction curves have been established, using this system.

The ultraviolet absorption spectra and the solubilities of the UO_2^{++}, Fe^{+3}, and Cu^{+2} complexes of TTA have been determined. The experimentally determined molar extinction coefficients and solubilities of these compounds in orthodichlorobenzene are summarized in Table XI.

TABLE XI

SOLUBILITY AND MOLAR EXTINCTION COEFFICIENTS FOR THE TTA COMPLEXES OF UO_2^{++}, Fe^{+3}, and Cu^{+2}

Compound	Molar Extinction E	Wavelength mu	Solubility at 74 C (M)
$UO_2(TTA)_2$	2.28×10^4	338	5.22×10^{-3} ($o\text{-}Cl_2C_6H_4$)
	1.79×10^4	380	6.88×10^{-3} (C_6H_6)
$Fe(TTA)_3$	4.72×10^4	336	0.15 ($o\text{-}Cl_2C_6H_4$)
	2.23×10^4	387	
$Cu(TTA)_2$	4.21×10^4	344	

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Design work is underway on an analog computer for use with the five channel gamma spectometer to be used by the Analytical Services Unit. The computer will be a five-variable, five equation (24 coefficient) linear type, with a servo-operated resistance network. Use of the computer is expected to simplify problems involved in the use of the spectrometer, as well as indicating other possible fields of use for analog computers.

Improved techniques in preparation of UO_3 replicas for electron microscopy have resulted in increased resolution and contrast. Better dispersion of the powder (<200 mesh) is achieved by use of a toluene suspension which is allowed to air dry on the microscope slide, and the palladium-carbon replicas are used without Formvar support.

Pronounced differences have been found in the electron micrographs of UO_3 samples prepared in different ways. These may be summarized as follows:

1. Screw calcined powders - crystals 0.1 to 1 micron diameter

2. Pot powders - crystals 1 to several microns diameter

3. Dehydrated hydrates - largest, best-formed crystals, increasing in size with temperature of dehydration.

4. UO_3 from UO_4 heated at 425 C - well formed small crystals similar to screw calcined powder.

Although type 4 crystals are within the size range required for production of x-ray diffraction patterns, previous x-ray diffraction studies had indicated this material to be amorphous. Further study of this material will be made as well as a systematic study of several other UO_3 and UO_2 samples.

IN-LINE ANALYSIS

Liquid Contact Alpha Counting

Study has continued on the problem of preparing suitable zinc sulphide screens by the fusion bonding process, but the method previously reported remains the most satisfactory. Thermal degradation of the polyfluorocarbons used appears to be a problem, since the presence of sulfides lowers the degradation temperature about 100 C. The presence of any organic matter aggravates the problem. Further investigation of temperature, pressure and time relationships to obtain a suitable bond is in progress.

The cell and sensing unit assembly for the in-line installation (SL-4-667) has been completed except for some minor changes in construction. It is expected this equipment will be installed and tested in plant streams in the 222-S laboratory during the coming month.

Acidity Monitoring

Design and construction of prototype equipment for determination of nitric acid and uranium concentrations simultaneously in Purex feed streams has continued. An AC conductivity bridge system has been designed to replace the direct measurement originally planned. The complexity of the overall system is not increased, since the bridge performs some of the functions originally assigned to the computer. In addition, the read-out is directly related to acid concentration, and electronic stability becomes less critical.

The computer to correct the acid conductivity measurement for uranium concentration has been constructed and is ready for testing. Basically the computer operates from a helipot controlled by the uranium recorder pen drive. Proper calibration of the helipot and the associated circuit relates the gain on the acidity recorder to the recorded uranium concentration, automatically correcting the observed acidity concentration.

Miscellaneous In-Line Studies

Preliminary tests have been made to evaluate the Sargent Oscillometer for use as an in-line monitor. Its most promising application appears to be in the determination of uranium in Redox organic streams. While the ability of the instrument to make concentration measurements without direct contact with the stream has advantages, several modifications will be necessary in order to use it with remote sampling. Further study of the possible use of this instrument will be made.

Study is underway on a method to eliminate the necessity for routine use of standard solutions in the in-line uranium photometer. The system being designed for testing involves the use of a pair of optical filters rather than a dual optical system. Advantages to be gained from such a system include elimination of the standard and vent valves which presently cause 75 percent of the in-line maintenance problems, and elimination of the frequent preparation and use of standard solutions.

LABORATORY SERVICES

Laboratory Services actitivies may be summarized as follows: 160,000 gallons of crib-level waste was transported to 200 West Area for disposal. Average plutonium analysis was 1.1×10^{-4} uc/ml. Average gross beta analysis was 5.4×10^{-2} uc/ml.

Approximately 3,000,000 gallons of retention level waste was discharged to the 300 Area pond. Average alpha analysis was less than 4.5×10^{-7} uc/ml. Average beta analysis was ' ss than 8.0×10^{-7} uc/ml.

Due to the high radiation readings and potential fire hazard involved, it was necessary to cover the 300 North Burial Pit to some extent. In order to extend the life of the pit for several months, the boxes were only partially covered by

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pushing them down into the pit with a bulldozer. The east bank of the pit was then stabilized with additional gravel fill, and is now in use. Four loads of gravel were used to provide a roadbed for the construction of a new pipe field in the 300 North Burial Ground.

All other decontamination, building services, and laundry functions were completed in a routine manner.

ANALYTICAL LABORATORIES UNIT -

General Chemical

The Laboratory devoted 90 per cent of its effort to Chemical Development activities including evaluation of UO_3 powders; following chloride distribution in HA column operation; and seeking a suitable method for measuring low-level, non-radioactive cesium. The latter is causing some difficulty due to its lack of distinguishing characteristics and its presence in a preponderance of iron and sodium.

Recognized for some time has been the high expense of sulfate determination in UO_3 powder. The current H_2S evolution method requires 1-1/2 to 2 hours per sample (duplicates included). An alternate method based upon $BaSO_4$ nephelometry failed due to excessive sulfate complexing by uranium.

Radiochemical

A fire-contamination spread hazard has been apparent in vacuum fusion removal of plutonium impurity gases. Fire seemed possible in the event of failure of the quartz system with subsequent surge of air upon 50 gram quantities of 1900°C platinum-plutonium alloy. After discussion with Product Metallurgy, the Laboratory decided the fire potential to be small due to an exposed alloy surface of less than 3 cm^2 and the fact that the alloy never exceeds 40 percent Pu.

Platinum bath material was evaluated for vacuum fusion removal of zirconium impurity gases. Smoother operation resulted compared to the standard iron-tin bath. For zirconium that advantage is outweighed, however, by bookkeeping encumbrances in using platinum metal as a laboratory reagent.

Recently, 234-5 Development requested water measurement at the 0.1% level (lower, if practical) in PuF_4. Direct Karl Fischer titration will be used. The following methods were compared for the measurement of water in stand-in UF_4:

1. Direct Karl Fischer titration
2. Combined Dean & Stark and Karl Fischer titration
3. Vacuum dessication over P_2O_5

Savannah River uses 1. and reports (telecon, C. H. Ice) values agree with plant PuF_4 performance characteristics. Method 2. was expected to separate water from plutonium to permit titration in a relatively non-hazardous system. Treated UF_4 gave 2.31, 2.66, and 2.39% water, by the respective methods. Bumping in 2. was difficult to control especially for drier fluorides; therefore, the separation from plutonium activity advantage could not be assured. In addition, 2. was most time consuming. Two weeks of oven-drying normal UF_4 indicated a 0.1% water content. Direct titration showed 0.04%. Measurement by 2. was not practical for normal UF_4 because of extreme bumping.

The "molybdenum blue" method failed for phosphate in Recuplex streams. A quinine-molybdenum nitrate method worked satisfactorily. Chloride and nitrate did not interfere.

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The separation of Co-60 from pooled plant waste demonstrated the stability of the cobalt cyanide complex. Direct use of hydrogen sulfide gave no precipitation of cobalt sulfide. When preceded by a fuming perchloric acid treatment to oxidize the cyanide, hydrogen sulfide did form cobalt sulfide in good yield. Present Co-60 procedure gives about 80 per cent overall yield, with satisfactory decontamination from foreign nuclides.

Spectrometry

Mass: Demand increased for gas analysis in 1706-KE and KAPL-120 recirculation water. Overtime has been planned for the next two months to meet KAPL-120 requirements of nine (9) samples per week. The uranium spectrometer was down for several days due to source and electronic trouble.

Emission: Overtime was required to complete UO_3 specification analyses.

Water Quality: Sample load fluctuated permitting a one-week assignment of a Laboratory Assistant to General Chemical.

Laboratories work volume statistics are as follows:

	APRIL		MAY	
	No. of Samples	No. of Determinations	No. of Samples	No. of Determinations
Research and Development				
Pile Technology				
Metallurgy Research	65	403	18	120
Pile Engineering	13	65	-	-
Pile Materials	318	1387	1219	2321
Fuel Technology	34	380	68	990
Physics Research	15	23	21	57
Separations Technology				
Chemical Research	1277	1873	952	1332
Chemical Development	720	1567	672	2108
Plant Processes	14	59	22	194
Process Technology	944	1652	576	1282
Other Customers	188	1036	169	1021
TOTAL	3588	8445	3717	9425

TECHNICAL SHOPS UNIT - [redacted]

Mechanical Shops

The work backlog increased to 11,500 hours which is approximately 10% above what is considered to be optimum for this shop. Permission to defer delivery dates was obtained from several customers and overtime was reduced to a total of 84 hours. Terminations and transfers resulted in the craft personnel complement being two below the desired number.

A new method of thermally cutting stainless steel - aluminum, and other non-ferrous alloys was investigated in cooperation with the Metallurgy Sub-Section. The method called the "Heliarc Cutting Process" is owned and licensed by the Linde Air Products Company and is far superior to the powder cutting methods now in use at HAPO. Arrangements are in progress to secure the necessary equipment and to consummate the licensing agreement.

Buildings and Grounds

IR-200, Graphite Machining Facility. The construction contract was awarded to Frank H. Lohse, but no work has been done because of the strike.

ER-3133, Alterations of 325 and 326 Buildings. The project proposal is still being routed for signature.

WO-A-15613 (CC-8826) Construction of Cylinder Loading and Storage Dock. No work was done during this month because of the strike against J. A. Jones Company.

Technical Shops Safe Procedures Forum - Paints and Protective Coatings. The forum was held May 23rd with J. Albert Seneker, of the Anaheim Plant of General Electric as guest panelist. His paper was reproduced for distribution throughout the plant.

Hot Laboratory Equipment Catalog. The items for inclusion in the domestic edition of the AEC's Hot Laboratory Equipment Catalog were collected and transmitted to the Atomic Power Equipment Department for commercial review.

Drafting and Design

To supplement the regular drafting crew six persons were secured on loan, four from the Design Section, and two from the Graphics Unit. The backlog of work remains high requiring considerable shifting of personnel to meet the more urgent projects. Recruiting trips to Portland and Denver by Design Section personnel did not result in any acceptable applications being received at HAPO.

Glass Shop

Total productive man hours for the month was 1046 with 116 jobs being completed. A light work load prevailed throughout the month with no overtime work required.

Photo Laboratory

A normal work load was experienced with all requests for service being met promptly.

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CONTACT ENGINEERING UNIT.-

Operations proceeded routinely throughout the month.

INVENTIONS

All Separations Technology Section 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 May, 1956 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(s)	Title
R. H. Moore	"Use of Tannin Complexes of Metal Hydrous Oxides as Scavenging Agents for Decontamination of Aqueous or Organic Purex Process Streams"
R. H. Moore	"Use of Hydrous Oxides of Manganese as a Scavenger for Decontamination and Purification of Purex Solvents"
W. P. Van Meter	"The Use of Tin to Improve the Electro-reduction Efficiency of Uranyl Ion at a Mercury Cathode"
C. A. Goodall	"The Use of Zinc Ferricyanide as a Carrier Precipitant for Cesium"

RB Richards

Manager, Separations Technology
ENGINEERING DEPARTMENT

RB Richards:khs

DESIGN SECTION

JUNE 12, 1956

VISITORS AND BUSINESS TRIPS

Dr. W. W. Gilbert of the General Engineering Laboratory, Schenectady, New York, visited Hanford on May 3 to discuss aluminum machining problems.

R. Loseby of the Vanton Pump and Equipment Company, Hillside, New Jersey, visited Hanford on May 11 to demonstrate special valves and pumps for use in conjunction with in-line sampling of separations plant process and waste streams.

D. Thompson and W. Fish of the Arnoux Company, Los Angeles, California visited Hanford on May 21 to discuss zone temperature monitoring equipment requirements for the 105-C Building.

C. S. Slenning, H. M. Schmidt, and F. B. Akerson of the Minneapolis-Honeywell Regulator Company of, respectively, Richland, Washington, Philadelphia, Pennsylvania, and Portland, Oregon, visited Hanford on May 22 and 23 for examination of moisture detection equipment and for consultation on flow monitoring equipment requirements.

A. F. Sperry of Panellit, Inc., Skokie, Illinois, and H. C. Donelson of Tower Equipment Company, Mercer Island, Washington, visited Hanford on May 23 through 26 for consultation on zone temperature monitoring equipment for the 105-C Building, pressure monitoring problems in the 100 and 300 Areas, and problems related to the main control panel in the 202-A Building.

R. Hale and W. Mottal of the E. I. du Pont de Nemours Company, Savannah River, South Carolina, visited Hanford on May 26 to discuss the construction and ventilation of enclosures to house test equipment for plutonium purification processes.

E. G. Putnam and J. Klum of W. C. Nickum and Sons, Seattle, Washington visited Hanford on May 28 for technical discussions concerning the design of, and to inspect the construction site of, the silica gel tail-end treatment facilities for the Purex Plant.

R. D. Switters visited the Ames Research Laboratory, Iowa State College, Ames, Iowa on May 2 through 4 to attent the AEC Metallurgy Information Meeting; Oak Ridge National Laboratory, Oak Ridge, Tennessee on May 22 through 24 to attend the Fifth Annual Corrosion Symposium; and the Titanium Metallurgical Laboratory, Battelle Memorial Institute, Columbus, Ohio, on May 25 to obtain information regarding the uses of titanium as a material for process vessels.

D. W. McLenegan visited Washington State College, Pullman, Washington on May 3 to address the Regional Convention of Northwest Senior Mechanical Engineering students.

W. J. Dowis visited Chicago, Illinois, on May 4 through 8 to recruit technical personnel.

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J. G. Bennett visited General Engineering Laboratory, Schenectady, New York, and Electric Products Company, Cleveland, Ohio, to obtain information relative to the design of additional heat generation capacity for the 189-D Building; and Milwaukee Crane and Service Company, Milwaukee, Wisconsin, Whiting Corporation, Chicago, Illinois, Industrial Crane and Hoist Company, Chicago, Illinois, and Cleveland Tramrail Company, Cleveland, Ohio, to discuss the design of special equipment for charge-discharge facilities for the 105-C Building, on May 5 through 12.

H. R. Hughes visited Reno, Nevada on May 6 and 7 to present a talk on Power Reactors to the Rotary Club of Reno, Nevada.

R. C. Walker visited Milwaukee Crane and Service Company, Milwaukee, Wisconsin, Whiting Corporation, Chicago, Illinois, Industrial Crane and Hoist Company, Chicago, Illinois, Euclid Crane and Hoist Company, Cleveland, Ohio, Abell-Howe Company, Chicago, Illinois and Cleveland Tramrail Company, Cleveland, Ohio on May 8 through 11 to discuss the fabrication of the proposed discharge chute traveling wall crane for the 105-C Building; and attended the ASME Convention in Philadelphia, Pennsylvania on May 14.

O. H. Pilkey visited Washington State College, Pullman, Washington on May 11 to deliver a talk to Civil Engineering students.

L. T. Pedersen visited American Air Filter Company, Louisville, Kentucky, C. M. Kemp Manufacturing Company, Baltimore, Maryland, Ingersoll Rand Company, New York, New York, Cambridge Filter Corporation, Syracuse, New York, and Harvard University Air Cleaning Laboratory, Boston, Massachusetts on May 12 through 19 to obtain information relative to the design of the 105-J Building exhaust filters and gas system.

P. W. Swartz visited Valley Iron Works, Yakima, Washington on May 14 to inspect the fabrication of water monitoring turrets for the 100-K Area.

E. Hollister visited Fischer - Porter Company, Hatboro, Pennsylvania and Brown Instrument Company, Philadelphia, Pennsylvania to discuss requirements for flow monitoring equipment; A. C. Ruge Associates, Cambridge, Massachusetts and Lewis Engineering Company, Naugatuck, Connecticut, to discuss temperature detection prototype equipment; and Acromark Company, Elizabeth, New Jersey, to obtain information on automatic marking machinery, on May 14 through 18.

D. A. Conley visited Denver, Colorado on May 16 through 21 to recruit draftsmen and designers.

G. H. Bauer visited Salem, Oregon on May 18 to present a talk to the Salem Chapter of Professional Engineers of Oregon entitled, "Some Problems Facing the Civil Engineer in the Nuclear Field."

M. T. Slind visited General Electric Company, West Lynn, Massachusetts and Cincinnatti, Ohio, on May 21 and 28 to inspect instrument facilities and obtain information on the latest developments in the field of instrumentation; and General Engineering Laboratory, Schenectady, New York on May 22 through 25 to obtain information on the progress of the flow monitoring program being conducted by G.E.L.

G. L. Locke visited General Electric Company, San Jose, California on May 23 to obtain information for the preparation of the Reactor Handbook.

O. W. Priebe visited W. C. Nickum and Sons, Seattle, Washington on May 24 to provide technical assistance to the architect-engineer on the design of the Maintenance Shop for the UO_3 Plant.

M. A. Howard and A. R. Skaran visited General Machinery Company and Kaiser Aluminum Company, Spokane, Washington on May 25, to discuss aluminum machining problems.

ORGANIZATION AND PERSONNEL Personnel Statistics:	April 30			May 31		
	Exempt	Non-Exempt	Total	Exempt	Non-Exempt	Total
Design Management	2	1	3	2	1	3
Process Engineering Sub-Section	73	14	87	74	14	88
Design Planning Unit	18	14	32	20	14	34
Design Engineering Sub-Section	80	11	91	80	11	91
Design Drafting Unit	7	69	76	7	67	74
Total Section Personnel	180	109	289	183	107	290
Rotational Technical Graduates	--	2	2	--	2	2
Total	180	111	291	183	109	292

Accessions - 3

Separations - 2

GENERAL

Design Section effort on design development programs increased substantially during May, while effort on Design Section managed projects, process technology, and customer design orders decreased. Distribution of effort by major components for the month of May was as follows;

	Engineering Man Months Expended	Drafting Man Months Expended	% of Section Effort
Design Development Programs	68.0	12.7	34.4
Design Section Managed Projects	70.5	37.3	46.9
Advance Engineering - FY-1957 & FY-1958	1.8	0.1	0.8
Process Technology	3.7	1.6	2.4
Customer Work	16.0	18.8	15.5
Total	160.0*	70.5*	100.0

*Equivalent man months expended include 8 hours of engineering overtime and 8 hours of drafting overtime, which represents 0.03% of the Section based on the total available hours for a 40 hour week. The Design Drafting Unit production for May was 201 new drawings and 281 drawing revisions for an equivalent of 4.7 man days per drawing.

DESIGN DEVELOPMENT

The distribution of engineering and drafting man months applied to design development programs during May was as follows:

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	Engineering		Drafting	
	Man Months	% of Total	Man Months	% of Total
Metallurgical Design Development	10.2	15.0	2.5	19.7
Reactor Design Development	25.8	37.9	1.9	15.0
Separations Design Development	26.1	38.4	4.2	33.1
Chemical Processing & Reduction Design Development	3.1	4.6	1.5	11.8
234-5 Design Development	2.8	4.1	2.6	20.4
Total	68.0	100.0	12.7	100.0

Metallurgical Design Development

Studies were continued during May of methods of expanding canning facilities in the 300 Area to provide the additional fuel element capacity which would be required for a supplementary production reactor. The following documents relating to this work were issued during the month: HW-43011, "300 Area Sanitary and Process Water Supply System", and HW-43401, "Proposed Equipment Alterations in 313 Building for Project CG-654".

Other metallurgical design development items which were active during the month include studies of improved control of fumes emitted from the pickling, penetration etch, and slug recovery operations in the 313 Building, investigation of methods of mechanizing present 313 Building operations such as shipping box unloading and pickle basket loading, and development of automatic welding equipment.

Reactor Design Development

A study was initiated during the month of the effect of incremental variations in individual design and process parameters on the overall economic performance of an improved production reactor. The objective of this study is to gain better understanding of the application of economic bases set forth by the AEC to be used in consideration of the replacement of existing reactor plants.

Advanced reactor development studies to develop items of technology that are applicable to a wide range of reactor concepts were continued during May. Specific items of new reactor design technology on which effort was expended during the month include preliminary studies of optimum operating conditions for a reactor producing electric power as a by-product, investigation of various alloys for possible use as a material for process tubes in a high temperature reactor, studies of alternate methods of supplying cooling water to the process tubes in a high pressure, high temperature reactor, and studies of the feasibility of a gas-cooled plutonium producing reactor.

A forecast of the water flow requirements of the 100-K Reactors for the period 1956 - 1960 was completed during the month and issued as Document HW-43117. Document HW-42529 was issued in May summarizing the results of preliminary design studies dealing with the application of pressurization or recirculation to the cooling systems of existing reactors as a means of obtaining increased production capacities. An interim report, HW-42523, was also issued describing four possible cases of power recovery from an existing reactor which has been pressurized.

Work was in progress at the end of the month on a report (HW-43422) dealing with the possible use of refrigerants as a working medium in power recovery systems.

Other reactor design development activity during May included studies of possible improvements to vertical safety rod system components in existing reactors, development testing of a prototype tube puller for use in process tube replacement operations, studies of methods of improving the performance of the 190-K process pumping units, and evaluation of prototype temperature monitoring and flow monitoring system components.

Separations Design Development

Work continued during May on studies of building and equipment modifications which would be required to provide for a Phase IV capacity increase in the Redox Plant. Specific items on which effort was expended during the month include layout and equipment studies for combination extraction, solvent recovery and concentration units, and preparation of flowsheets portraying proposed Phase IV conditions.

Studies were initiated during the month of the process, engineering and economic feasibility of recovering and packaging specific fission products (Cesium-137 and Cerium-144) from separations plant wastes. Consideration is being given to the installation of required processing facilities in an existing standby plant.

Document HW-43035, "Installation of Auxiliary Dissolver Off-Gas Heaters at Purex", was issued during May summarizing a study of methods of increasing the temperature of dissolver off-gas discharged from heaters upstream of the Purex Plant silver reactors in order to obtain improved radioiodine removal.

Studies were continued during the month of equipment modifications which would be required to convert the Purex Plant to a Redox-type process as a means of obtaining increased separations capacity. Since the Redox solvent is considered to be a more hazardous chemical than the Purex solvent, equipment modifications would be required to provide a much greater degree of control of process and electrical equipment. Other changes being considered include provision of an inert gas system and provision for the isolation and explosion-proofing of solvent handling facilities.

Criteria for a portion of the scope of work required to reduce air-borne contamination in the 224-U Building electric pot room was issued during May as Document HW-43099. Studies of this problem are continuing.

Other separations design development activity for May included continuation of studies of the application of in-line analytical instrumentation in separations plants, initiation of studies of the feasibility of converting the UO_3 Plant Luckey Pots to continuous operation, completion of a review of the safety aspects of the ferrous sulfamate make-up system in the Purex Plant, and completion of a scope study for the provision of additional disposal facilities for scavenged TBP Plant wastes.

Chemical Processing and Reduction Design Development

Development work continued during the month for the installation of continuous Task I - Task II equipment in the 234-5 Building. Comments on scope drawings which had been previously issued were received and evaluated during the month.

Work was initiated on the preparation of scope drawings for the conversion of

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Recuplex to a manufacturing facility. Principal scope drawings which are being prepared include an engineering flow diagram for Task I filtrate evaporation, evaporator arrangement, modifications to the lower disengaging section of the H-3 column, slag and crucible dissolver hold-up tanks, and a cyclone separator for installation in the line between the J-26A stripper and the J-8 condenser.

234-5 Design Development

Preliminary scope studies were made during May to determine the costs, location, types, and quantities of fabrication equipment which would be required to fabricate a new product

Document HW-43426, "Task VIII Improvements, Universal Gage", was issued during the month summarizing results of development work on a remotely-operated gage for simultaneous measurement of all critical dimensions of coated pieces.

Other 234-5 design development activity during May included completion of a design for a new duct system and drive mechanism on the blower in the "X" gas recirculation system of the Task VII coating unit, testing of methods for mechanical dejacketing of coated pieces, and completion of scope work for the design of an automatic autoradiography device. Document HW-43379, "Task VIII Improvements, Automatic Radiograph", was issued during the month summarizing the development work which was done on the latter item.

Engineering Standards and Materials Development

The following standards were completed during May:

New Standards

D-4-1-b,c,d,e, & f - Horizontal and Down Guy Assembly Standards
D-6-50, 51, 52, 53, 60, 80, 81, 165, 167, & 168 - Street Light Wiring Standards
D-10-102 - 3-Phase Primary Vertical Position, 12° - 90° Turn.
D-10-120 - 3-Phase Primary Tangent with 3-Phase Tap at 90°.
D-10-121 - 3-Phase Primary Tangent with Single Phase Crosstap.
D-10-122 - 3-Phase Primary Tangent with Single Phase Tap.

Revised Standards

HW-5309-S, Rev. 2, HWS-8061-S through HWS-8064-S, Rev. 2, and HWS-8065-S, Rev. 1 - Standard Specifications pertaining to the use of stainless steels.
C-3-3 - Steel Ladder Rung for Concrete Walls, Rev. 2
E-5-2 - Manhole Frame, Cover and Rung, Rev. 1
E-5-11 - Septic and Siphon Tanks, Rev. 2
E-5-29 - Single Post Marker or Guard Post, Rev. 2
D-1-45 - 20 Amp., 240 Volt Receptacle, Plant Buildings, Rev. 1

Design Instruction Sheets were also completed during the month for use with the Horizontal and Down Guy Assembly Standards and the Standard Specifications pertaining to the use of stainless steels listed above.

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PROJECTS, PROCESS TECHNOLOGY AND CUSTOMER WORK

Statistics:

Engineering and drafting effort of the Design Section on projects, process technology and customer work for May was distributed as follows:

	Engineering		Drafting	
	Man Months	% of Total	Man Months	% of Total
Reactor Plant Modifications for Increased Production	7.6	8.3	2.3	4.0
Advance Design - Reactor Plant	21.5	23.4	5.8	10.0
100-K Reactor Plants	3.8	4.1	0.7	1.2
Steam-Driven Auxiliaries 165-KE & KW	2.9	3.2	2.4	4.1
Continuous Charge-Discharge Equipment - C Reactor	5.5	6.0	8.9	15.4
Purex Capacity Increase	2.8	3.0	1.6	2.8
Purex Radioiodine Removal Facilities	4.0	4.3	2.0	3.5
Redox Capacity Increase	2.8	3.0	2.2	3.8
Redox Radioiodine Removal Facilities	2.3	2.5	0.9	1.5
Hanford 4X Program	2.4	2.6	1.0	1.7
Fuel Element Pilot Plant - Semi-Works	6.5	7.1	7.5	13.0
Other Design Section Managed Projects	8.4	9.1	2.0	3.5
Advance Engineering - FY 1957 & FY 1958	1.8	2.0	0.1	0.2
Process Technology	3.7	4.0	1.6	2.8
Customer Work	16.0	17.4	18.8	32.5
Total	92.0	100.0	57.8	100.0

CA-512 - 100-K Area Facilities

Work continued during the month on CA-512, Revision 4, which includes the modification and installation of various facilities for the satisfactory completion of the 100-K Reactor area.

Design work was completed during May for ventilation system corrections - Building 1720-K and 1704-K, flame failure detection and re-ignition systems - Building 165-K, and activated silica piping - Building 183-K.

CA-513 - Purex Separations Facility

Detailed design was started during the month for the provision of an additional remote crane for the Purex Plant, together with necessary building modifications to provide maintenance facilities for the new crane. During May, the procurement specification bid assembly for the new 40-ton crane was completed and issued for comment. A design progress schedule for the new crane and building modifications is currently being prepared.

CG-558 - Reactor Plant Modification for Increased Production

Design activity on Project CG-558 during May included work on design revisions

such as provision of pressure switches to activate the emergency turbines in the 190 Building in the event of low pressure at the top of the risers, and preparation of a performance test procedure to be used in determining actual operating characteristics and performance efficiencies of the primary pumping system.

CG-600 - 100-C Alterations

Detailed design was completed during the month for Project CG-600, 100-C Alterations.

CG-613 - Hanford 4X Program - Metal Conversion Plant

The General Electric Company portion of detailed design for the UO_3 Plant modifications in connection with the Hanford 4X Program was completed in February. Design of the Maintenance Shop, being done by Nickum and Sons, Architect-Engineers, is essentially complete. Design Section activities during May included design revisions to incorporate additional safety features such as provision of enclosures for all wiring to reactors and transformers in the 224-UA Building, and preparation of a performance test procedure to provide a method of determining the operating characteristics and product characteristics of the continuous calciners under varying operating conditions.

CG-621 - Redox Contamination Control Facilities

Detailed design for Project CG-621, Redox Contamination Control Facilities, was completed in March. Design Section effort was expended during the month on the design of an in-line gamma radiation monitor which was determined to be required in connection with in-cell ozonization facilities.

CA-625 - Additional Waste Disposal Facilities - 200 Area

Based on a revised design progress schedule which was transmitted to HOO-AEC on March 2, 1956, detailed design for project CA-625 was 94% complete at the end of May. A revised project proposal is being routed for Management approval which requests deletion of the Phase II portion of the project, which was for the provision of a shelf design for a second additional Redox Tank Farm, and which presents a revised design completion schedule and a revised design cost estimate ($55,000).

CG-638 - Alum Activated Silica Water Treatment Facilities - Phase II

Design of activated silica addition facilities has been suspended pending a decision on the use of an additive other than activated silica (Separan) which is currently undergoing in-pile testing.

CG-642 - Design of Continuous Charge - Discharge Equipment - C Reactor

Detailed design of full-scale continuous charge-discharge equipment for C Reactor advanced to 35% complete during May.

CG-643 - Redox Capacity Increase - Phase III

Work continued during the month on the preparation of design scope for Redox Capacity Increase - Phase III. Preparation of a revised project proposal for Project CG-643 was initiated during the month. The purpose of this revised proposal is to

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request authorization of additional work within currently approved funds. This work includes provision of new jumpers and dunnage necessary for installation of the existing spare D-6 condenser, and modification of the spare 2-B column.

CG-644 - Silica Gel Tail-End Treatment Facilities - Purex

Based on a revised design progress schedule for Project CG-644 which was transmitted to HOO-AEC on May 17, 1956, detailed design of silica gel tail-end treatment facilities for the Purex Plant was 34.3% complete at the end of May. A revised project proposal was completed and routed for Management approval during the month which requests an extension in the design completion date and a reduction in authorized funds. This proposal is based on a Management decision that construction of these facilities is not justified at this time, but that a design package should be prepared to provide for construction at a later date, if necessary.

CG-647 - Back-Up Radioiodine Removal Facilities - Purex

Detailed design of back-up radioiodine removal facilities for the Purex Plant advanced to 99% complete during the month.

CG-648 - Auxiliary Radioiodine Removal and Nitric Acid Recovery Facilities-Redox

Detailed design was completed during May for auxiliary radioiodine removal and nitric acid recovery facilities for the Redox Plant.

CG-653 - Modifications - Redox Cooling Water Disposal

Detailed design of facilities to provide for segregation and separate disposal of Redox process cooling water and steam condensates was 88.5% complete at the end of the month. A revised design progress schedule for Project CG-653 was approved by HOO-AEC on May 8, 1956.

CG-654 - Advance Design - Reactor Plant

Additional funds in the amount of $350,000 were authorized by HOO-AEC during the month for Project CG-654, bringing total funds authorized for this project to $500,000. The objective of this total authorization, as stated in Directive HW-371, Modification 2, dated May 25, 1956, is to obtain a limited scope package for a new reactor embodying a recirculation cooling system. This scope package is to include estimated costs and delivery schedules of the key items of the water plant, recirculating system and major reactor components, and is to be complete in itself such that final scoping and detailed design could proceed expeditiously if authorization were given at some future date.

CG-657 - Improvements to Redox Plant Ventilation System

Detailed design of improvements to the Redox Plant ventilation system, consisting of two portable ventilation filter units for the Redox canyon and an enclosure for the Redox canyon crane electrical switchgear, was 9% complete at the end of the month. A design progress schedule for Project CG-657 was approved by HOO-AEC on May 18, 1956. Authorization of total project funds of $205,000 was received from HOO-AEC during the month.

CG-660 - Modifications and Additions to the Metallographic Cell - Radiometallurgy Building

Work continued during the month on the preparation of detailed design for equipment modifications and additions to the metallographic cell in the Radiometallurgy Building in the 300 Area. Funds in the amount of $20,000 were authorized late in February for initiation of design and partial procurement for metallographic cell modifications. A revised project proposal requesting total project funds of $135,000 was awaiting Management approval at the end of May.

CG-661 - Additional Heat Generation Facility - 189-D Building

Studies were continued during the month to determine the most effective and economical method of supplying additional heat generation capacity in the 189-D Building required for studies to establish limiting values of reactor process tube powers.

CG-663 - Steam-Driven Auxiliaries - Buildings 165-KE and 165-KW

Detailed design of steam-driven auxiliaries and associated equipment for Buildings 165-KE and 165-KW advanced to 15% complete during May. A design progress schedule for Project CG-663 was approved by HOO-AEC on May 3, 1956.

CG-664 - 350° C. Flow Loop - 314 Building

Funds in the amount of $120,000 were authorized by HOO-AEC during the month for the installation in the 314 Building, 300 Area, of a recirculating flow loop to be used for corrosion testing of fuel element jacketing materials. A design progress schedule for Project CG-664 was transmitted to HOO-AEC for approval on May 28, 1956.

CG-665 - Metal Loading Facilities - 100-B, D, DR, F, and H Areas

During May, funds in the amount of $150,000 were authorized by HOO-AEC for the provision of an auxiliary, non-personnel, elevator for use in metal charging in each of the 105-B, D, DR, F and H Buildings.

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

Detailed design of zone temperature monitoring facilities for 100-B, C, D, DR, F and H Areas advanced to 55% complete during the month.

CG-672 - Monochromatic Neutron Beam Facility

Funds in the amount of $112,000 were authorized by HOO-AEC during May for the design, procurement, and installation of a monochromatic neutron beam facility in the 105-KE Reactor. The information provided by this facility will be used to obtain closer control of reactivity during pile operation and to provide adequate reactor safeguards. A design progress schedule for Project CG-672 was transmitted to HOO-AEC for approval on May 28, 1956.

CG-676 - Fuel Element Pilot Plant - Semi-Works

Detailed design for the installation of a semi-works facility in the Fuel Element Pilot Plant, 300 Area, for the production of lead-dip processed internally and

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externally cooled fuel elements advanced to 20% complete during May. Work was initiated during the month on the preparation of a project proposal to request total project funds. A design progress schedule for Project CG-676 was approved by HOO-AEC on May 23, 1956.

D.O. A00278 - In-Line Analytical Instrumentation for Separations Process Control - Project Proposal (CG-686)

During May, a project proposal requesting $550,000 for the provision of in-line analytical instrumentation for improved process control in the Redox and Purex Plants was approved by Management and forwarded to HOO-AEC for approval.

D.O. A-00280 - Relocation of Purex Cooling Water Swamp - Project Proposal (CA-683)

A project proposal requesting $333,000 for the relocation of the Purex cooling water swamp from the present area east of the 202-A Building to a natural depressed area south of Gable Mountain was approved by Management and forwarded to HOO-AEC for approval during the month.

D.O. A-00285 - High Level Metallurgical Examination Cell, 327 Building - Project Proposal (CG-682)

During May, a project proposal requesting $16,500 for the design of a high level metallurgical examination cell for the 327 Building, 300 Area, was approved by Management and forwarded to HOO-AEC for approval.

D.O. A-00426 - Radiotelemetering Network - Project Proposal

Work was initiated during May on the preparation of a project proposal for a Radiotelemetering Network for collecting and measuring, and recording on a current basis at a central location, various meteorological and radiological data.

D.O. A-00432 - Expansion of Hot Semi-Works Decontamination Facility - Project Proposal

Project proposal preparation was initiated during the month for alterations and additions to the 201-C Building to provide expanded decontamination facilities for the Hot Semi-Works.

D.O. A-00437 - Additional Waste Disposal Facilities for Scavenging Programs - Project Proposal (CA-688)

During May, a project proposal was prepared on a priority basis and routed for Management approval requesting $216,000 for the provision of additional disposal facilities for scavenged TBP plant wastes. These additional waste disposal facilities are required as a result of the recent discovery of radiocobalt in TBP plant wastes.

D.O. A-00440 - Increased Electrical Service for the 189-D Building - Project Proposal

Work was initiated during the month on a project proposal to request funds for providing increased 440 volt electrical service in the 189-D Building.

DESIGN WORK COMPLETED DURING MAY

D.O. 101344 - 165-KE & KW As-Builts (CA-512-W)
D.O. 101385 - Redox Plant - Concrete Burial Box
D.O. A-00229 - Non-Destructive Testing Prototype Equipment
D.O. A-00323 - Corrosion Testing Facilities - 314 Building
D.O. A-00360 - As-Builts - Luckey Pots (CG-613)
D.O. A-00864 - Fly Ash Collection Equipment(CA-590)
D.O. A-00371 - Centralized Maintenance Lunch and Locker Room Facilities - 100-B, D, & F Areas
D.O. A-08200 - Drawing for Slug Catcher Net - 105-C
D.O. A-12867 - 241-A Tank Farm - Flow Diagram
D.O. A-13004 - Redox Plant - Drawings for Remote Lifting Device
D.O. A-15730 - 3706 Building - Office Space Revisions
D.O. A-22767 - Plans and Specifications for Additional Street Lights
D.O. A-25101 - Scope for Tube Mock-Up Facility - 100-H Area
D.O. A-25106 - Design Push-Pull Machine
D.O. C-52887 - Roof Inspection - 100-B, D, F & H Areas
D.O. C-96726 - Procurement Drawing - Connector Tube Rest
D.O. C-98850 - Building 325 - Structural Check

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.

INVENTOR	SUBJECT
C. A. Rohrmann	A process for the elimination of toxic nitrogen oxides from waste gases.
G. L. Davis	An electromagnetic system for conversion of analog information to digital form.
D. W. McLenegan	A system of temperature monitoring of reactor coolant in connection with the use of annular fuel elements.

Acting Manager - Design
ENGINEERING DEPARTMENT

O. H. Greager:HDT:les

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PROJECT SECTION

May 1956

I. SUMMARY

A. Organization and Personnel

Following is a summary of personnel changes in Project Section during the month:

	April 30, 1956	May 31, 1956	Net Change
Employees on payroll	344	343	-1
Technical Graduates, Rotational	8	3	-5

The end-of-month status involved these changes:

	Project Section	Technical Graduates Rotational
Payroll additions	1	
Payroll removals	4	
Transfers into Section	6	
Transfers from Section	4	5
Transfers within Section	2	

One exempt position remained open, and this is to be filled on June 15, 1956. Six additional assignments were obtained for nonexempt employees who had been laid off because of the strike, and by the end of May 1956 there remained 19 employees without assignments.

B. Scope of Activities

At the end of the month, completion status of major construction was as follows:

Project No.	Title	Completion Scheduled	Completion Actual
CA-512	100-K Area Facilities, Revisions #3 and #4	100%	100%[a]
CA-512	1706 KER Recirculation Facilities	96%[b]	81%
CA-513-E	Purex Facilities, Part E	97%[c]	94%[c]
CA-546	Fuel Element Pilot Plant	100%	98%
CG-558	Reactor Plant Modifications, Phase I	59%	54%
CG-558	Reactor Plant Modifications, Phase II	13%	10%
CA-586	First Capacity Increase, 230 KV System	98%	94%
CG-598	Purex Acid Fractionator	69%	53%
CG-600	100-C Alterations	1%	0.8%

a Complete except for revisions and start-up items.
b Rescheduled for contract time extension and new schedule.
c For work now authorized, excluding the second remote crane on which no construction has been done.
(See note on page Fe-4.)

Project No.	Title	Completion Scheduled	Completion Actual
CG-613	Hanford 4X Program, Metal Conversion Plant	87%	59%
CG-621	Redox Contamination Control Facilities	50%	43%
CG-643	Redox Capacity Increase, Phase III	90%[d]	90%[d]

C. Craft Labor

For the second consecutive month, all construction project work remained in a suspended state, except for the minor portions assigned to plant forces. Two other exceptions occurred when on May 11 the electrical contractor for the 230-KV Capacity Increase obtained permission for a foreman and crew to work in 100-K, and on May 22 the painting contractor for two high tanks at 100-C secured agreements to permit resumption of work.

Conferences and negotiations between the unions and contractors were conducted throughout the month, but no appreciable results were announced. On May 23 and 24, 1956, meetings between representatives of the Associated General Contractors and the unions were held in Spokane, and these meetings likewise ended with no announced progress. A rumored settlement and return to work on May 24 did not materialize. By the end of the month there were strong indications of a general return to work under conditions that prevailed before the strike, and with due provisions for continuing the negotiations.

D. Safety and Security

About 25 meetings were conducted for discussions of safety, security, and health topics. This total represents a numerical increase as well as a higher percentage of attendance. The replacement of electrical outlets with a safer type has been conducted throughout the office areas.

The program for studying the hazards of zirconium has been expanded to include analysis of the recent accident at Oak Ridge National Laboratories and the possible information to be derived therefrom. This study bears particular emphasis on inspectors who may be near to or handling zirconium products. The normal review of safety and security procedures was continued by all components of Project Section.

E. Highlights

Inspection Sub-Section

The total work load for inspection has decreased from 507 orders for items requiring inspection as of May 1, 1956, to 469 orders at the end of the month. Of these, 432 were assigned as follows: off-site inspectors, 352; on-site inspectors, 71; and government agencies, 9. The numerical decrease of orders was attributed partly to the completion of 108 orders as compared with the receipt of 70 new orders requiring inspection, but the monetary value of assigned orders remained high at about $9,600,000. On-site inspection functions were delayed through lack of manpower to unload and prepare engineered items for

d For work now authorized.

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inspection. The work load for the Corrosion Evaluation Program has remained constant during the month. The most significant order now being inspected is that for the venturis to be used in the Reactor Plant Modification Program; the vendor is expected to begin shipment of production units during June 1956. The major personnel changes were the transfer of M. H. Gardner to the Engineering and Construction Operation and his replacement by J. U. Schuster as supervisor of the Pacific Southwest Area.

Project Service Sub-Section

In addition to performance of routine functions major emphasis during May 1956 was placed on participation in the organizational studies. Detailed plans were continued toward realignment of functions and proposed assignments of personnel. Some special work was done on the analysis and summary of Minor Construction activities as they were affected by the current strike.

Reproduction output increased slightly from the April 1956 level to a total of 277, 102 square feet. The operating efficiency increased sharply because of work on bid assemblies, the tracing rehabilitation program, and preparation of the disaster file. The Engineering Files Unit cooperated in these functions in addition to routine tasks. Its largest single order was 6,426 prints for the Reactor Modification Program. Estimating work load increased to 44 completed estimates, comprising the following: study, 28; construction, 11; project proposal, four; and fair cost, one. Field Surveys continued routine services to the manufacturing areas and performed additional work on the Suburban Land Survey.

Minor Construction Sub-Section

All construction work remained in a suspended state for the second consecutive month, and the handling of incoming shipments by service contractor personnel was curtailed sharply. Exempt personnel continued detailed planning of work sequences and scheduling of items to be resumed as soon as the current strike can be settled. Nonexempt personnel continued routine work as assignments were available in warehousing and administrative functions. The Manager - Minor Construction completed a two-week trip to AEC sites at Portsmouth, Ohio; Savannah River, South Carolina; Oak Ridge, Tennessee; and Paducah, Kentucky. His primary purpose was to make a comparative study of the methods of performing Minor Construction work at those sites and at Hanford.

On May 8, 1956, a letter was written to summarize effects of the strike upon Project Section components and the Hanford portion of the J. A. Jones Construction Company. The key factors for consideration were estimated losses, liquidation of costs, handling and storage of materials, railroad demurrage, and transshipment to construction sites. Data on these factors have been maintained so that proper adjustments and backcharges may be made after the strike.

Project Engineering Sub-Section

Project work was conducted under the severe limitations imposed by the strike, and engineers continued the interim work of reviewing manpower requirements, establishing work sequences, and coordinating tasks to be performed when the construction program is resumed. First priority has been assigned tentatively to CG-613, Metal Conversion Plant, with second priority for CG-558, Reactor

Plant Modifications. On May 7, 1956, the Sub-Section accepted responsibility for six projects previously assigned to Community Engineering. These items include extensions of street, sewer, and water facilities, and they represent a total estimated cost of about $2,000,000.

Problems of material and equipment deliveries have been alleviated by the prolonged strike; however, close attention has been given to assure adequate materials and equipment when construction work is resumed.

F. Monthly Report of 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.

None.

Manager - Projects

II. STATISTICAL AND GENERAL

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NOTE: Many major projects and several of the lesser ones are behind schedule because of the strike. Since the strike has been settled, new construction schedules are being prepared as rapidly as practicable.

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PROJECT INDEX

300 Area and General Projects

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* Excluding 1706 KER

** 1706 KER Facilities

CA-548 - New VSR Test Tower

	Scheduled	Actual
Detailed Design:	100%	97%

Directive Completion Date: March 1, 1957
Total Authorized Funds: $ 125,000 - GE $16,500 - AEC $108,500
Total Estimated Cost: $ 125,000

The detailed design drawings, by W. C. Nickum & Sons, were reviewed in principle by the General Electric Company. The Commission has been advised of needed corrections to the detailed design in order to approve for actual construction.

HAPO Design Section detailed design completed. The General Electric Company approvals are secured and tracings sent to the Commission for approval signatures.

The control estimate has indicated a probable expenditure of funds in excess of the present funds authorized. A review of the present scope is being made in order to reduce the magnitude of the work to come within these funds.

CG-578 - Effluent Water Monitoring Improvements - 100-B, D, DR, F and H Areas

	Weighted	Scheduled	Actual
Field Progress:			
P.F.	100%	98%	98%

Average Manpower:
P.F. 3

Approx. Accumulated Manpower: (man-days)
P.F. 4,650

Directive Completion Date: July 1, 1956
Total Authorized Funds: $ 532,000
Total Estimated Cost: $ 532,000

Modifications to control room recorders is 70% complete. The six flow regulators installed in the test at the 105-B Reactor have shown improved flow stability over the existing unregulated sample lines. Eight additional regulators will be installed in the "B" sample room and further tests will be conducted as soon as these have been installed.

CG-579 - Effluent Water Monitoring Improvements - 100-C

	Weighted	Scheduled	Actual
Field Progress:			
P.F.	100%	19%	20%

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CG-579 - Effluent Water Monitoring Improvements - 100-C (Con't)

Average Manpower: P.F. 10

Approx. Accumulated Manpower: (man-days) P.F. 320

Directive Completion Date: September 1, 1956
Total Authorized Funds: $ 168,000
Total Estimated Cost: $ 168,000

Scoping, preliminary and detailed design are the responsibility of the Design Section.

The structural supports for the Gamma Monitoring turrets have been installed in both sample rooms. The cooling ducts have been fabricated and located in the sample rooms. The turrets have been placed upon the structural members. The rotameter racks have been placed and rotameters installed. Detailed checking and testing of the spectrometer assembly is continuing.

CA-586 - First Capacity Increase - 230 KV System

	Weighted	Scheduled	Actual
Detailed Design:		100%	100%
Field Progress: BPA	44.4%	100%	97%
L.S.	52.0%	100%	93%
M.C.	2.0%	100%	68%
P.F.	1.6%	30%	40%
Total		99%	94%

Average Manpower: L.S. 7

Approx. Accumulated Manpower: (man-days)

L.S.	1,890
M.C.	260
P.F.	90

Directive Completion Date: August 1, 1956
Total Authorized Funds: $ 1,100,000 - GE $119,500 - AEC $980,500
Total Estimated Cost: $ 1,100,000

W. L. Ridge Construction Company

No work was performed during this reporting period due to strike.

Casey Electric Company

On May 11, 1956, Casey Electric craftsmen (4 linemen and 1 foreman) reported to work in 100-K Area. Under the direction of the Westinghouse Installation Engineer the oil circuit breaker assembly has been continued. Two zig-zag lightning arrestors have been assembled and all the pedestal insulators have been installed in the switching station. Installation of the power and control conduit has been started by the electricians.

The 230 KV disconnect switches have been installed in the switching station and only the adjustment operations remain to be performed. Installation of the static wire and road crossing guards in 100-K Area has been completed.

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CG-656 - Installation of Raw Water Cross-Tie - 105-C

	Scheduled	Actual
Detailed Design:	100%	100%

Directive Completion Date: February 1, 1957
Total Authorized Funds: $ 25,000
Total Estimated Cost: $ 25,000

The field work release was issued to Minor Construction on May 7, 1956. Procurement bids are being reviewed. Work by Minor Construction will begin upon termination of the current labor difficulties.

CG-661 - Additional Heat Generation Facility - 189-D Building

Total Authorized Funds: $ 22,400
Total Estimated Cost: Not Established

Detailed design is the responsibility of the Design Section.

Preliminary design work is continuing.

CG-667 - Improved Space Utilization - 105-B, D, and F Buildings

Project Preparation: 100%

Total Authorized Funds: $ 1,900
Total Estimated Cost: $ 212,000

The project proposal was transmitted to the Commission and is awaiting authorization.

ER-1230 - Slug Saw and Etching Equipment

Project Preparation: 100% Scoping: 100%

Total Estimated Cost: $ 47,750

The project proposal is being routed for approval signatures within the General Electric Company.

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CA-586 - First Capacity Increase - 230 KV System (Con't)

Temporary 440 volt power has been obtained from the 1717-K Building.

Removal of the temporary guard structures and installation of permanent guard crossings in 100-K is essentially complete.

CG-616 - Installation of Acid Feed Equipment, 100-B,D,DR,F and H Areas

	Weighted	Actual
Field Progress:		
F.P.	90%	
M.C.	10%	1%
Total		1%

Approx. Accumulated Manpower: (man-days)
M.C. 40

Directive Completion Date: October 1, 1956
Total Authorized Funds: $ 400,000 (Interim Authorization)
Total Estimated Cost: $ 470,000

Scoping, preliminary and detailed design are the responsibility of the Design Section.

The bid package was sent to prospective bidders during the week of May 21, 1956. The bid opening date is scheduled for June 25, 1956.

No physical work accomplished this period due to labor difficulties.

A control estimate is being prepared for the work included under this project.

CG-638 - Alum Activated Silica Water Treatment Facility - Phase II

Directive Completion Date: April 1, 1957
Total Authorized Funds: $ 275,000
Total Estimated Cost: $ 275,000

Scoping, preliminary and detailed design are the responsibility of the Design Section.

All work on this project has stopped until "Separan" has been thoroughly evaluated in production tests.

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ER-1238 - Central Semi-Automatic Dummy Decontamination Facility

Total Estimated Cost: $ 230,000

Statements were submitted to Design Planning for use in preparing a project proposal for the 105-H Wash Pad Installation.

ER-E-492 - Aerial Line Relocation - 107-B, C, D, DR and F

Total Authorized Funds: $ 1,500
Total Estimated Cost: $ 216,000

Comments have been received for incorporation in the final draft of the project proposal. It appears that additional justification for this work will be required.

CA-513-A, B, C and D - Purex Facility - Expansion of 200 Areas Facilities

Total Authorized Funds: $ 79,750,000 - GE $7,972,000 AEC $71,778,000
Total Estimated Cost: $ 79,750,000

The CA-513-B, C and D portions of this project are complete. The following items remain to be accomplished on CA-513-A:

a. Fabrication (by vendor), insulation and mock-up on site of two spare concentrators, expected late this year.

b. Paving of miscellaneous roads and walks in vicinity of 202-A Building.

c. Installation of miscellaneous valves and controls for the Failed Equipment Disposal Tunnel. This work will be done when Minor Construction forces return to work. Procured items are now on site.

d. Modification of gamma monitor on steam condensate header which is now inoperable because of high temperatures around scintillation element. This is a start-up item, to be done when Minor Construction returns to work.

CA-513-E - Purex Facility - Expansion of 200 Area Facilities

	Scheduled	Actual
Field Progress: *		
F.P.	100%	100 %
M.C.	98%	91.4%
Total	98%	93.6%

Directive Completion Date: April 1, 1958
Total Authorized Funds: $ 3,100,000 - GE $2,662,000 - AEC $438,000
Total Estimated Cost: $ 3,100,000

No construction progress by Minor Construction since March 22, 1956, due to the labor strike.

Items of work remaining are:
a. Iodine Monitors - 95% complete.
b. Continuous Samplers - 35% complete.
c. Second Remote Crane - 0% complete.

Detail design of second remote crane is the responsibility of the Design Section. Detail design of crane started April 17, 1956.

* Field progress does not include second remote crane. Division of work cannot be made until detail design is more advanced. Total field progress including crane is: Scheduled - 52%
Actual - 50%

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CG-598 - Purex Acid Fractionator

	Weighted	Scheduled	Actual
Detailed Design:		100%	100%
Field Progress:			
F.P.	6.6%	100%	100%
M.C.	93.4%	66%	50%
Total		69%	53%

Approx. Accumulated Manpower: (man-days)
M.C. 2,870

Directive Completion Date: September 1, 1956
Total Authorized Funds: $ 920,000
Total Estimated Cost: $ 920,000

No construction progress has been made since March 22, 1956, due to the labor strike.

A project proposal revision, requesting extension of time, will be issued when the current labor difficulties are resolved.

Tanks TK-U5 and TK-U8 were shipped by railroad from vendor's plant (Lummus Company) on May 14, 1956.

CG-613 - Hanford 4X Program - Metal Conversion Plant

	Weighted	Scheduled	Actual
Field Progress:			
F.P.	28.5%	98%	87%
M.C.	70.2%	85%	48%
P.F.	1.3%	85%	80%
Total		87% *	59%

Approx. Accumulated Manpower: (man-days)
F.P. 3,782
M.C. 5,586
P.F. 394

Directive Completion Date: December 31, 1956
Total Authorized Funds: $ 4,000,000
Total Estimated Cost: $ 4,000,000

* A revised schedule will be prepared at the end of the current strike.

CG-613 - Hanford 4X Program - Metal Conversion Plant (Con't)

Procurement General

All critical materials have been shipped or received, except for the screw conveyor. This vendor has submitted partial drawings for a revised design to provide the dust tight seals required.

Phase III - Installation of Process Equipment, Building 224-UA - L. H. Hoffman

The final decision relative to the method of providing mechanical protection to the exposed wiring in the electrical gallery is still being held up pending receipt of the contractor's estimate for the alternate method. A drawing, showing the details of installation and fabrication of wiring ducts, has been prepared.

A punch list of corrective items for the contractor to rectify has been prepared.

Phase IV - Contract for Railroad Car Loading Facility - L. H. Hoffman

No work has been done on this contract during this reporting period due to the strike.

Phase V - Maintenance Facility

Final design drawings and specifications have been received from W. C. Nickum & Sons, the Architect-Engineer, and are being reviewed. These will be transmitted to the Commission during the forepart of June for bid preparation, after the necessary corrections, etc., have been made.

A radiological survey of the site has been completed and it still appears feasible for a lump sum contractor to perform the bulk of the work connected with this facility, after the shielding wall is completed by Minor Construction. Some of the work by the fixed-price contractor will be performed under SWP conditions.

Construction activities by a fixed-price contractor will start six (6) to eight (8) weeks after the strike is settled.

Phase VI - Railroad Car Modifications

The Commission has directed the railroad companies to hold up the modification work on the cars until the strike is settled. However, at least one company completed its work.

Minor Construction Work

No work has been performed during this reporting period due to the strike.

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CG-613 - Hanford 4X Program - Metal Conversion Plant (Con't)

Calciners

The No. 5 unit has been tested and is ready for shipment. It has been indicated that the castings for the feed nozzles are too porous to be accepted. This is being resolved between Struthers Wells and the foundry.

General Project Status

A revised project proposal will be issued after settlement of the strike to request an extension of time. A complete revaluation of the funds required to complete the project is being made.

CG-621 - Redox Contamination Control Facilities

	Weighted	Scheduled	Actual
Field Progress:			
M.C.	20.8%	57%	51%
P.F.	79.2%	51%	41%
Total		50%	43%

Average Manpower:

P.F. 2

Approx. Accumulated Manpower: (man-days)

M.C. 1,092
P.F. 1,040

Directive Completion Date: December 31, 1956
Total Authorized Funds: $ 765,000
Total Estimated Cost: $ 765,000

Scoping, preliminary and detailed design are the responsibility of the Design Section

In-Cell Ozonization

Completion of this phase is awaiting receiver tank which is to be obtained from Minor Construction.

Order for spare E-13 tank was placed May 10, 1956 with Wyatt Metal & Boiler Works. Shipping promised March 14, 1957.

Modification to the J-6 Vent

Installation of nozzles, dunnage fabrication, installing vessel on dunnage and jumper fabrication is essentially complete. Mock-up remains to be done. This unit is tentatively scheduled for installation during the next building shutdown.

CG-621 - Redox Contamination Control Facilities (Con't)

Contaminated Equipment Replacement

The vendors on H-4, 5 & 6 vessels are still placing material orders.

Canyon Washdown Facilities

No work accomplished since March 22, 1956, due to the current labor difficulties.

CG-624 - Redox Railroad Tunnel Ventilation Barrier

	Scheduled	Actual
Field Progress:		
M.C.	*	8%

Approx. Accumulated Manpower: (man-days)
M.C. 38

Directive Completion Date: September 1, 1956
Total Authorized Funds: $ 57,000
Total Estimated Cost: $ 57,000

Scoping, preliminary and detailed design are the responsibility of the Design Section.

The modifications to the lifting mechanism of the sliding doors are being made and the doors prepared for the mock-up test.

* A Directive, HW-355, Modification #1, has been issued extending the completion date to September 1, 1956. A revised schedule is being prepared and will be issued when the current work stoppage is resolved.

CA-625 - Additional Waste Disposal Facilities - 200 Areas

Total Authorized Funds: $ 115,000 - GE $115,000 - AEC $0
Total Estimated Cost: $ 3,500,000

Preliminary and detailed design, including field surveys, are the responsibility of the Design Section.

A revised project proposal deleting Phase II design is being circulated for approval signatures.

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CG-635 - Redox Stack Particulate Sampler

	Actual
Detailed Design:	100%

Directive Completion Date: August 1, 1956
Total Authorized Funds: $ 40,000
Total Estimated Cost: $ 42,000

Detailed design is the responsibility of the Design Section.

The start of field construction is being delayed by the strike.

CG-636 - SWP Service Facilities - Redox

Total Authorized Funds: $ 100 (Project Section)
Total Estimated Cost: $ 157,000

The project proposal preparation is the responsibility of the Design Section.

The project proposal is being routed for approval signatures within the General Electric Company.

CG-643 - Redox Capacity Increase - Phase III

	Weighted	Scheduled	Actual
Field Progress:			
M.C.	25%	75%	75%
P.F.	75%	95%	95%
Total		90%	90%

Approx. Accumulated Manpower: (man-days)
M.C. 193
P.F. 200

Directive Completion Date: October 1, 1956
Total Authorized Funds: $ 211,500
Total Estimated Cost: Not established (Approx. $1,000,000)

Detailed design is the responsibility of the Design Section.

Additional justification has been submitted to the Commission relative to the request for authorization and additional funds for advanced procurement of critical materials and limited on site fabrication which will be required for additional work on this project.

CG-643 - Redox Capacity Increase - Phase III (Con't)

No progress has been made by Minor Construction on the second 2E column due to the work stoppage. The vendor's promised shipping date on materials needed for this modification remains June 5, 1956.

Plant Force work remaining to complete is mock-up of second 2E column.

CG-644 - Silica Gel Tail End Treatment

Project Preparation: *

Total Authorized Funds: $ 60,000 (Interim Authorization for Design)
Total Estimated Cost: $ 490,000

* Revision No. 1 of the project proposal, requesting authorization for construction will not be submitted to the Atomic Energy Commission on the basis of lack of justification.

Preparation of the project proposal and management of the architect-engineer's detailed design are the responsibility of the Design Section.

	Weighted	Scheduled	Actual
Nickum & Sons Design	70%	32%	32%
General Electric Design	30%	0%	0%

Design completion date of architect-engineer: August 10, 1956.

CG-647 - Back-Up Radio Iodine Removal Facilities, Purex

Directive Completion Date: September 15, 1957
Total Authorized Funds: $ 1,150,000
Total Estimated Cost: $ 1,150,000

Detailed design is the responsibility of the Design Section.

Approximately 25 purchase orders have been placed, having a total value of approximately $120,000. These include the absorber tower, the caustic scrubber, and the acid storage tank.

CG-648 - Auxiliary Radio-Iodine Removal & Nitric Acid Recovery, Redox

Directive Completion Date: September 15, 1957
Total Authorized Funds: $ 870,000
Total Estimated Cost: $ 870,000

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CG-648 - Auxiliary Radio-Iodine Removal & Nitric Acid Recovery, Redox (Con't)

Preliminary and detailed design are being managed by the Design Section.

Contract action is being performed by the Atomic Energy Commission.

A project estimate based upon 100% completion of project design is in preparation.

The procurement of engineered and long term items is being expedited short of the expenditure of premium funds for this purpose.

CG-653 - Redox Cooling Water Disposal

	Weighted	Scheduled	Actual
Field Progress:			
F.P.	37%	21%	0.5%
M.C.	45%	14%	0.5%
P.F.	18%	12%	30 %
Total		16%	6 %

Average Manpower:

P.F. 6

Approx. Accumulated Manpower: (man-days)

F.P. 6
P.F. 67

Directive Completion Date: September 30, 1956
Total Authorized Funds: $ 225,000
Total Estimated Cost: $ 225,000

Scoping, preliminary and detailed design are the responsibility of the Design Section.

Notice to proceed was issued to Erwen Construction Company on May 8, 1956.

The contractor's layout work is complete; however, the construction phase is behind schedule because of the strike.

Plant Forces resumed jumper fabrication on May 15, 1956.

CG-657 - Improvements to Redox Plant Ventilation

Directive Completion Date: July 31, 1957
Total Authorized Funds: $ 205,000
Total Estimated Cost: $ 205,000

Detailed design is the responsibility of the Design Section.

This proposal was approved by the Commission and Directive HW-380, Mod. #1, authorizing the total funds requested was issued May 7, 1956.

CA-662 - 2101-M Building Conversion

Total Authorized Funds: $ 2,000
Total Estimated Cost: $ 123,500

The preparation of a scope revision to the project proposal has been deferred pending clarification of future warehousing plans.

CA-668 - Installation of Sprinkler System, 275-EA Building

Project Preparation: 100% Scoping: 100% Prelim. Design: 100%

Total Authorized Funds: $ 2,000
Total Estimated Cost: $ 26,000

The Commission is processing a request to the General Electric Company for a study of overall warehousing facilities and sprinkler requirements for same.

CA-675 - Change House Facilities - 275-W Building

Project Preparation: 100% Scoping: 100% Prelim. Design: 100%

Total Authorized Funds: $ 4,800
Total Estimated Cost: $ 33,500

The project proposal has been approved by the Commission Review Board. Design only is being authorized at this time as construction funds will come from the FY 1957 Budget.

CA-683 - Relocation of Purex Cooling Water Swamp

Total Estimated Cost: $ 333,000

Preparation of the project proposal is the responsibility of the Design Section.

The project proposal is being routed for approval signatures within the General Electric Company.

IR-203 - Coating Waste Transfer Line, 241-S to 241-U

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	Actual
Detailed Design:	100%

Directive Completion Date: November 30, 1956
Total Authorized Funds: $ 17,800
Total Estimated Cost: $ 17,800

Field work will commence as soon as the current labor difficulties are resolved.

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IR-207 - Gantry Crane Facility - 241-A Tank Farm

	Actual
Detailed Design:	100%

Directive Completion Date: January 31, 1957
Total Authorized Funds: $ 17,600
Total Estimated Cost: $ 17,600

Design has completed final design and the construction estimate based on this design is being prepared.

Information is being compiled, for submission to the Commission, as a basis for securing a fixed-price contractor to perform a portion of the work. Field work by Minor Construction is held up pending settlement of the current strike.

ER-2778 - In-Line Monitoring Instruments - Redox & Purex

Total Estimated Cost: $ 550,000

Preparation of the project proposal is the responsibility of the Design Section.

The project proposal is being routed for approval signatures within the General Electric Company.

ER-2780 - Improved Conveyor System for the RMA Fabrication Line

Total Authorized Funds: $ 150 (Project Section)

Project proposal preparation, preliminary and detailed design, including field surveys, are the responsibility of the Design Section.

A project proposal will not be submitted, since a less expensive method of improving the conveyor system has been proposed.

ER-2781 - Shelters for Regulated Docks - Purex

Informal Request: 99% Scoping: 100% Prelim. Design: 100%

Total Estimated Cost: $ 16,500

Preparation of the informal request is the responsibility of the Project Section. The informal request is being circulated within the General Electric Company for approval signatures.

ER-2783 - Modifications to Redox 233-S Concentration Building

Total Authorized Funds: $ 150 (Project Section)
Total Estimated Cost: $ 98,000

Project proposal preparation is the responsibility of the Design Section.

The project proposal is being routed for approval signatures within the General Electric Company.

ER-2785 - Alteration & Expansion of 2704-C Lunchroom & Office Facilities

Project Preparation: 100% Scoping: 100% Prelim. Design: 100%

Total Authorized Funds: $ 1,500
Total Estimated Cost: $ 32,000

The project proposal is being routed for approval signatures within the General Electric Company.

ER-2786 - Task V Improvements, 234-5 Building

Total Authorized Funds: $ 200 (Project Section)
Total Estimated Cost: $ 150,000

Project proposal preparation, preliminary and detailed design, including field surveys, are the responsibility of the Design Section.

The project proposal is being circulated for comments by the Design Section.

ER-2787 - Renovation of 271-BXR Building & Equipment

Project Preparation: 80% Scoping: 100% Prelim. Design: 100%

Total Authorized Funds: $ 200

Preparation of a project proposal to renovate the subject facility is in progress. It is planned to renovate the building shell and necessary electrical detail with a fixed-price contractor and rebuild the instrument control panel and wiring with Minor Construction forces. Plant forces will rehabilitate and calibrate instruments.

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ER-2788 - Reduction of Air Borne Contamination - 224-U Building

Total Authorized Funds: $ 200

Project Proposal preparation is the responsibility of the Design Section.

Pertinent information has been furnished the Design Section for use in preparation of the project proposal. Present scope includes new electric pot agitators, seals and supports, new cover assemblies, and improvements to the nitric acid off-gas system.

ER-2789 - Additional Waste Disposal Facilities - BC Crib Area

Total Authorized Funds: $ 200

Project proposal preparation is the responsibility of the Design Section.

Design Section was requested to prepare a proposal on a rush basis to provide ditching facilities for TBP Scavenging Wastes which normally would have been handled by the 216-BC Cribs installed on Project CG-603. Information pertinent to the preparation of a project proposal was determined and submitted to the Design Section.

CA-546 - Fuel Element Pilot Plant

	Weighted	Scheduled	Actual
Field Progress:			
F.P.	53.6%	100%	99%
M.C.	45.7%	100%	96%
P.F.	.7%	100%	95%
Total		100%	98%

Approx. Accumulated Manpower: (man-days)

F.P.	550
M.C.	4,200
P.F.	175

Directive Completion Date: May 1, 1956 *
Total Authorized Funds: $ 1,600,000 - GE $787,500 - AEC $812,500
Total Estimated Cost: $ 1,600,000

All Engineering procurement is now complete with exception of lock cylinders for new offices.

No work has been accomplished by Minor Construction since March 22, 1956. No work has been accomplished by F. H. Lohse, contractor, on the new offices since April 5, 1956.

* Request for extension of time will be submitted upon termination of the current strike.

CA-590 - Fly Ash Equipment - Building 384

Project Preparation: 100% Scoping: 100% Prelim. Design: 100%

Directive Completion Date: October 30, 1956
Total Authorized Funds: $ 44,000 - GE $6,000 - AEC $38,000
Total Estimated Cost: $ 44,000

The architect-engineer, V. Small and Associates, sub-contractor for F. H. Lohse, who is contractor for design and construction, is on schedule. Construction was scheduled to start June 1, 1956, depending on settlement of the current strike.

CA-601 - General Grounds Improvements - 300 Area

	Scheduled	Actual
Detailed Design:	100%	100%

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CA-601 - General Grounds Improvements - 300 Area (Con't)

Directive Completion Date: December 1, 1956
Total Authorized Funds: $ 60,000 - GE $5,000 - AEC $55,000
Total Estimated Cost: $ 60,000

Invitations to bid are to be issued June 1, 1956 with the bid opening scheduled for June 22, 1956.

CG-614 - Hanford 4X Program - 300 Area

	Weighted	Scheduled	Actual
Detailed Design:		100%	100%
Field Progress:			
F.P.	16.1%	65%	0%
M.C.	2.1%	100%	100%
P.F.	81.8%	100%	100%
Total		93.3%	83.9%

Approx. Accumulated Manpower: (man-days)
P.F. 829

Directive Completion Date: July 1, 1956
Total Authorized Funds: $ 340,000
Total Estimated Cost: $ 340,000

Scoping, preliminary and detailed design are the responsibility of the Design Section.

All work is completed except for the lump sum work on the change house which is stopped as a result of the strike.

The 100 storage pallets received have been rejected because of welding. The vendor has been asked to correct these.

CA-615 - Mechanical Maintenance Shop Centralization - 100 Areas

	Weighted	Scheduled	Actual
Detailed Design:		100%	100%
Field Progress:			
F.P.	65%	0%	0%
M.C.	2%	0%	0%
P.F.	33%	26%	45%
Total		9%	15%

Average Manpower:
P.F. 2

Approx. Accumulated Manpower: (man-days)
P.F. 140

CA-615 - Mechanical Maintenance Shop Centralization - 100 Areas (Con't)

Directive Completion Date: February 28, 1957
Total Authorized Funds: $ 92,000 - GE $42,000 - AEC $50,000
Total Estimated Cost: $ 92,000

Alteration No. 1 to Invitation to Bid was issued by the Commission on May 18, 1956. Comments on original invitation to bid were transmitted to the Commission on May 17, 1956.

CG-618 - Replacement of Steam Line Support Poles

	Weighted	Scheduled	Actual
Field Progress:			
M.C.	100%	**	31%

Approx. Accumulated Manpower: (man-days)
M.C. 460

Directive Completion Date: August 31, 1956
Total Authorized Funds: $ 110,000
Total Estimated Cost: $ 110,000

** A revised schedule will be prepared after the current strike.

There has been no activity on this project during this reporting period due to the labor strike.

CG-620 - Melt Plant Modifications - 314 Building

	Scheduled	Actual
Detailed Design:	6% *	10%

Directive Completion Date: May 31, 1956
Total Authorized Funds: $ 143,000
Total Estimated Cost: $ 143,000

* The design schedule was transmitted to the Commission on May 14, 1956.

Purchase specifications for the vacuum melt furnace are being prepared.

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CG-630 - Alterations to Minor Construction Fabrication Shops

	Weighted	Scheduled	Actual
Detailed Design:		100%	100%
Field Progress:			
F.P.	15%	25%	0%
M.C.	85%	56%	59% *
Total		51%	50% *

Approx. Accumulated Manpower: (man-days)
M.C. 582

Directive Completion Date: October 15, 1956
Total Authorized Funds: $ 93,000
Total Estimated Cost: $ 93,000

* No progress was made because of the current strike.

Invitations to bid are to be issued June 8, with the bid opening scheduled for June 25, 1956.

CA-633 - Remodeling of Facilities - Kadlec Hospital

Project Preparation: 100% Scoping: 100% Prelim. Design: 100%

Directive Completion Date: April 1, 1957
Total Authorized Funds: $ 90,000 - GE $3,210 - AEC $86,790
Total Estimated Cost: $ 90,000

Design by the architect-engineer, Nickum & Sons, is scheduled for completion June 1, 1956 and work is on schedule. Construction contracts are to be awarded before end of FY 1956.

CA-639 - Painting Water Plant Structures - 100-DR

	Scheduled	Actual
Detailed Design:	100%	100%

Directive Completion Date: August 31, 1956
Total Authorized Funds: $ 75,000 - GE $8,500 - AEC $66,500
Total Estimated Cost: $ 75,000

The bids have not been returned from AEC - Washington where they were sent for evaluation.

CA-641 - Street Extensions - Hains, Gaillard, Harris

	Scheduled	Actual
Detailed Design:	100%	100%

Directive Completion Date: August 1, 1956
Total Authorized Funds: $ 5,700 (G.E. Portion)
Total Estimated Cost: $36,000

Invitations to bid were sent out May 14, 1956, and the bid opening is set for June 5, 1956.

CG-646 - Modifications to Pickling Machines - 313 Building

Project Preparation: 100% Scoping: 100%

Directive Completion Date: January 1, 1957
Total Authorized Funds: $ 55,000
Total Estimated Cost: $ 55,000

Preliminary and detailed design are the responsibility of the Design Section.

Partial vendor detail design prints were received on May 17 for review and approval. Although these were nine days late, the review has been made. One drawing was returned unapproved.

CA-649 - FY 1956 Water Tank Replacement

Directive Completion Date: February 28, 1957
Total Authorized Funds: $ 58,500 - GE $12,000 - AEC $46,500
Total Estimated Cost: $ 58,500

Bid invitations for detail design and construction were issued May 11, 1956. Bids are to be opened June 6, 1956.

CA-650 - Replacement, Repair and/or Removal of Valve Houses - 100-B, D & F

Directive Completion Date: December 31, 1956
Total Authorized Funds: $ 65,000 - GE $3,500 - AEC $61,500
Total Estimated Cost: $ 65,000

The bid package information is being formulated for submittal to the Commission. Detailed design, which is scheduled 100% complete, has not yet been received from the architect-engineer, W. C. Nickum & Sons.

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CA-652 - Water and Sewer Facilities - Wellsian Way

	Scheduled	Actual
Detailed Design:	95%	95%

Directive Completion Date: November 30, 1956
Total Authorized Funds: $ 12,000 (GE Portion)
Total Estimated Cost: $133,000

Specifications on this job are being combined with those on Project CA-677, Replacement of Thin-Wall Steel Water Lines - FY 1956. Estimated completion date for this work is June 1, 1956.

CG-658 - Shielded Personnel Monitoring Station - 747 Building Addition

Total Authorized Funds: $ 150
Total Estimated Cost: $ 160,000

The project proposal has been transmitted to AEC, Washington and is awaiting authorization.

CG-659 - Decontamination Facilities - 100-H, 200-W & 300 Areas

Project Preparation: 100%

Total Authorized Funds: $ 1,000
Total Estimated Cost: $ 60,000

The project proposal was returned unapproved by the local AEC Work Review Board. Employee and Public Relations Department is preparing a letter to answer objections by the Commission.

CG-660 - Modifications & Additions to Metallographic Cell - Radiometallurgy Bldg.

Project Preparation: 100% Scoping: 100%

	Scheduled	Actual
Detailed Design:	Not Scheduled	90%

Total Authorized Funds: $ 20,000 (Interim Authorization)
Total Estimated Cost: $ 135,000

The project proposal, Revision 1, requesting total funds of $135,000 was transmitted to Financial Department on May 9, 1956.

Procurement was started May 21, 1956.

CG-660 - Modifications & Additions to Metallographic Cell-Radiometallurgy Bldg.

Bids have been received for fabrication of one cathodic etcher and four grinder-polishers. Placement of the order for the cathodic etcher is dependent upon availability of a small piece of zircalloy. The vendor will be notified of hazards involved in machining this metal.

Remaining design under interim authorization is awaiting bids on D.C. Motors.

CA-670 - Roof Repairs - Central Stores

	Actual
Detailed Design:	100%

Directive Completion Date: October 31, 1956
Total Authorized Funds: $ 26,000 - GE $2,800 - AEC $23,200
Total Estimated Cost: $ 26,000

Bid package information was transmitted to the Commission on May 8, 1956. The Invitation for Bids is being prepared.

CG-671 - Improved Calibration Facility - 3745 Building

	Actual
Detailed Design:	100%

Directive Completion Date: March 1, 1957
Total Authorized Funds: $ 22,500
Total Estimated Cost: $ 22,500

Advanced Bid Notices were sent out May 8, 1956. Bid Invitations were sent out May 15, 1956; and the bid opening is scheduled for June 11, 1956. Construction time is 90 days.

CG-673 - Replacement of Obsolete Radio-Communications Equipment

Project Preparation: 100% Scoping: 100%

Total Authorized Funds: $ 1,000
Total Estimated Cost: $ 181,000

The project proposal was transmitted to the Commission on April 24, 1956; however, no work authority will be received until after July 1, 1956.

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CG-676 - Fuel Element Pilot Plant - Semi-Works

Directive Completion Date: Not Established
Total Authorized Funds: $ 120,000
Total Estimated Cost: $ 400,000

Scoping, preliminary and detailed design are the responsibility of the Design Section.

Negotiations are being carried out with the vendor for two induction furnaces.

Preparation of the revised project proposal for construction funds was started on May 21, 1956.

The Commission has recommended fixed-price contractor performance. They anticipate that five weeks will be required from receipt of the bid package until a contractor can start work.

CA-677 - Replacement of Thin-Wall Steel Water Lines - FY 1956

Scoping: 100%

	Scheduled	Actual
Detailed Design:	100%	100%

Directive Completion Date: December 31, 1956
Total Authorized Funds: $ 3,400 (G.E. Portion)
Total Estimated Cost: $ 29,000

Specifications on this job are being combined with those on Project CA-652, Water and Sewer Facilities - Wellsian Way. The estimated completion date for this work is June 1, 1956.

CG-680 - Corrosion Testing Facilities - 314 Building

Project Preparation: 100% Scoping: 100% Prelim. Design: 100%

Total Authorized Funds: $ 1,900
Total Estimated Cost: $ 171,000

The project proposal is being routed for approval signatures within the General Electric Company.

CA-685 - Alterations to Buildings 325 and 326 (ER-3133)

Project Preparation: 100% Scoping: 100%

Total Authorized Funds: $ 2,000
Total Estimated Cost: $ 23,000

The project proposal is being routed for approval signatures within the General Electric Company.

IR-200 - Graphite Machining Facilities - 300 Area

Project Preparation: 100% Scoping: 100% Prelim. Design: 100%

	Actual
Detailed Design:	100%

Directive Completion Date: August 1, 1956
Total Authorized Funds: $ 18,700 - GE $4,850 - AEC $13,850
Total Estimated Cost: $ 18,700

The Notice to Proceed was issued to the contractor, F. H. Lohse, on May 7, 1956. The effective contract starting date is May 17, 1956. The contractor has ordered materials, but other construction progress is stopped by the current strike.

IR-202 - Lighting Improvements - Central Stores - Building 1171

	Actual
Detailed Design:	100%

Directive Completion Date: November 1, 1956
Total Authorized Funds: $ 17,000 - GE $1,500 - AEC $15,500
Total Estimated Cost: $ 17,000

The low bidder has been disqualified because of a proposal for alternate fixtures; and the second low bidder, F. C. Wood Company, has been notified of award of contract.

IR-204 - Office Addition to 141-M Building

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	Actual
Detailed Design:	100%

Directive Completion Date: December 1, 1956
Total Authorized Funds: $ 15,000
Total Estimated Cost $ 15,000

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IR-204 - Office Addition to 141-M Building (Con't)

Invitations to bid are to be issued June 1, 1956 with the bid opening scheduled for June 22, 1956.

Job 0050 - Painting of Two High Tanks at 105-C

	Weighted	Scheduled	Actual
Field Progress:			
F.P.	100%	100%	35%

Directive Completion Date: October 15, 1955
Total Authorized Funds: $ 9,000
Total Estimated Cost: $ 9,000

Contractor resumed work on May 22, 1956, and has agreed to prepare a revised schedule.

Job 0068 - Addition to BY Telephone Exchange

Scoping: 100% Prelim. Design: 100%

Directive Completion Date: June 1, 1956
Total Authorized Funds: $ 4,150
Total Estimated Cost: $ 4,150

There has been no change because of the strike.

Job 0069 - Disposal Program - Streets (AEC - 152A)

Project Preparation: 70% Scoping: 100% Prelim. Design: 100%

Directive Completion Date: Not Established
Total Authorized Funds: $ 60,000 (G.E. Portion)
Total Estimated Cost: $ 675,000

Preparation of the project proposal was delayed because of priority of projects CA-677 and CA-652.

The estimated completion of the project proposal is June 1, 1956.

Job 0070 - Disposal Program - Water Meters

Project Preparation: 50% Scoping: 30% Prelim. Design: 50%

Total Authorized Funds: $ 5,200

Job 0070 - Disposal Program - Water Meters (Con't)

An interim sum of $5,200 has been authorized by the Commission to prepare a project proposal. Scheduled date for completion of this proposal is June 1, 1956. A rough draft of the project proposal is being prepared. Scoping of the project is being accomplished in cooperation with the Design Section.

ER-3122 - Replacement of Deaerator - 384 Building

Total Authorized Funds: $ 1,000

There was no change in status of this project proposal since the previous report. Manufacturing Department will advise action to be taken on preparation of the proposal.

ER-3134 - General Improvements - Central Stores

Scoping: 100%

Total Authorized Funds: $ 1,800
Total Estimated Cost: $ 14,000

The informal request "Grounds Stabilization and Drainage" has been rewritten and is being routed for signatures within the General Electric Company.

ER-3137 - Evacuation Warning System - 300 Area

Project Preparation: 100% Scoping: 100% Prelim. Design: 100%

Total Authorized Funds: $ 2,000
Total Estimated Cost: $ 29,000

The specifications, scope drawing, and bid information were transmitted to the Commission on May 21, 1956.

ER-3139 - Oil, Paint, and Solvent Storage Facility - 300 Area

Total Authorized Funds: $ 750
Total Estimated Cost: $ 16,000

The informal request is being modified at the request of the Manufacturing Department. Construction funds are available from FY 1957 Budget.

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ER-3145 - Lunch and Locker Room Facilities - 100-B, D & F

Project Preparation: 50% Scoping: 95% Prelim. Design: 100%

Total Authorized Funds: $ 2,000

Scope design has been completed and is being reviewed by Reactor Section. Detail information is being tabulated for scope estimate of cost.

ER-3147 - Explosion-Proofing 321 Building

Total Authorized Funds: $ 500

This engineering request has been closed out and all charges transferred to the user, Separations Technology Section.

ER-3148 - Modification of Trailers for Shipment of "J" Casks

Total Authorized Funds: $ 250

The engineering request is being closed out.

ER-3149 - Minor Construction Stores Study

Total Authorized Funds: $ 300

No work was performed during this period.

ER-3151 - Procurement of Drill Press for Graphite Machining Facilities

Total Authorized Funds: $ 700
Total Estimated Cost: $ 803

Purchase Order No. HA-56-4114 was placed on April 30, 1956 with Buckner-Weatherby Company, Inc., for purchase of the drill press. The item was shipped from the factory on May 10 and delivery was expected on May 29, 1956.

ER-3152 - Laboratory Facilities for Radiochemical Analysis

Project Preparation: 20% Scoping: 80%

Total Authorized Funds: $ 2,000

Work has begun on preparation of the project proposal.

ER-3153 - Public Address Systems - 100 and 200 Areas

Project Preparation: 10% Scoping: 60%

Total Authorized Funds: $ 2,000

A separate project proposal will be prepared for the 100 Areas Public Address System.

Present scope will require further study. Preliminary cost evaluations were given to the user for their evaluation and review of transmission equipment and methods.

ER-3154 - Drilling & Developing of Geological & Hydrological Wells

Total Authorized Funds: $ 750

The project proposal is in preparation. The estimated cost of work as presently scoped is $137,000. Funds are available from the 1957 Budget.

ER-3155 - Fire Protection Facilities - 1717-B,D,F,H and 1704-H Buildings

Project Preparation: 30% Scoping: 85%

Total Authorized Funds: $ 2,000

The project proposal is being prepared.

ER-3156 - Roof Repairs - 190-D, F and 186-D Buildings

Project Preparation: 80% Scoping: 100%

	Actual
Detailed Design:	40%

Total Authorized Funds: $ 1,400
Total Estimated Cost: $ 28,000

The project proposal is being routed for the necessary approval signatures. The project cost which has been established as a maintenance expense is $28,000.

ER-3158 - Relocate Dormitories - 100-H Area

Project Preparation: 50% Scoping: 50% Prelim. Design: 50%

Total Authorized Funds: $ 2,000

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ER-3158 - Relocate Dormitories - 100-H Area (Con't)

Studies have been made on moving one dormitory and two dormitories. Also, studies are in progress on moving one dormitory and using the 100-H Fire Station for offices. Also, study on using only the 100-H Fire Station is being made. A preliminary study was made on using 100-B Fire Station and 100-B Change House for offices. A final decision as to how project proposal should be prepared was made on May 22, 1956.

ER-3164 - Perform Managing Engineering Work on North Trunk Sewer

Total Authorized Funds: $ 120

The required drawing was made and issued to the user, thus completing the request.

ER-4001 - Foreman Information Lectures (Mfg. Dept)

Total Authorized Funds: $ 560

The first lecture was delivered during April and the others are being scheduled.

AEC-115 - Additional Richland Water Supply

Scoping: 90% Prelim. Design: 85%

	Actual
Detailed Design:	80%

Directive Completion Date: April 30, 1957
Total Authorized Funds: $ 22,000
Total Estimated Cost: $ 22,000

An interim sum of $2,500 has been authorized by the Commission to begin work on Title I & Title II work of this project. Components of this project are as follows:

	Scope	Design	Specs
ER-A-3160 - Irrigation System	100%	95%	50%
ER-A-3161 - Additional Hose Bibs	100%	100%	50%
ER-A-3162 - Abandon Irrigation Canal	75%	95%	50%
ER-A-3163 - Storm Sewer	100%	98%	50%

AEC-153 - Surburban Land Survey

	Weighted	Scheduled	Actual
Field Progress: P.F.	100%	86%	50%

Average Manpower: P.F. 10

Approx. Accumulated Manpower: (man-days) P.F. 20

Directive Completion Date: June 30, 1956
Total Authorized Funds: $ 25,000 - GE $18,000 - AEC $7,000
Total Estimated Cost: $ 25,000

Maps of sections 4 and 34 were turned over to AEC for comment May 16, 1956.
Maps of sections 3, 15, 16 and 9 are near completion, for AEC comments.

DECLASSIFIED

CA-512 - 1952 Reactor Expansion - 100-K Area Facilities

Total Authorized Funds: $ 162,000,000 - GE $28,210,000 - AEC $133,790,000
Total Estimated Cost: $ 162,000,000

Revision #3 and #4

	Weighted	Scheduled	Actual
Detailed Design:			95%
Field Progress:			
F.P.	8.72%	35%	0%
M.C.	43.30%	88%	84%
P.F.	47.98%	58%	56%
Total		69%	63%

Average Manpower:

P.F. 2

Approx. Accumulated Manpower: (man-days)
M.C. 4,342
P.F. 3,851

Directive Completion Date: November 1, 1956

Four of the remaining six valves have been repaired. A document describing the failure of the Filter Plant Backwash Valves has been prepared and forwarded to the Commission.

Because of the strike, all work was suspended on the Heat Exchanger Pit Equipment, the 107-K Tank Foundation Repairs, the Temperature Monitoring Controller Enclosure, the Area Drainage Sewer System, the Flame Failure Detection & Ignition System, and the Thermal & Biological Water Supply System. All the material has been ordered for the Gamma Water Monitoring System, and procurement by the fixed-price contractor is continuing for the Modifications to the Heating and Ventilating Systems in the 1704-K and the 1720-K Buildings.

No work was performed on the Test Hole Tube Replacement and the Outlet Face Ball Valves.

The Solids Feed Purge System work was completed with the installation of two modified cartridges. Two of the cartridges to be used for spare parts remain to be modified.

The installation of the Building Vacuum System test apparatus has started. An order has been placed for the basic beta monitoring equipment, and the work is continuing on instruments and electrical in the 300 Area.

All the material for the Activated Silica System Piping is available and the installation will proceed as process and operating conditions permit.

Revision No. 5 to the project proposal is being circulated for approval signatures within the General Electric Company.

CA-512 - 1952 Reactor Expansion - 100-K Area Fac. - 1706-KER Rec. Loop

	Weighted	Scheduled	Actual
Field Progress:			
F.P.	60%	100% *	83%
M.C.	40%	89%	76%
Total		96%	80%

Approx. Accumulated Manpower: (man-days)
F.P. 3,476
M.C. 2,676

Directive Completion Date: September 1, 1956

* To be re-established since time extension has been granted.

There has been no construction since April 5, 1956 on the fixed-price portion, and March 22, 1956 on Minor Construction work, due to the current labor difficulties.

CG-642 - Continuous Charge-Discharge Facility - 105-C

Total Authorized Funds: $ 200,000 (Interim Authorization)
Total Estimated Cost: Not Established

Detailed design, including procurement of equipment components for testing purposes, is the responsibility of the Design Section.

The detail design is proceeding and the detail drawings are being reviewed for approval. Project scoping is complete with Design Council approved.

CG-663 - Steam Auxiliaries for the 165-K Steam Generators

Project Preparation: 100%

Directive Completion Date: August 1, 1957
Total Authorized Funds: $ 555,000
Total Estimated Cost: $ 555,000

The project scoping is proceeding and requisitions are being prepared by the Design Section for certain engineered equipment.

CG-672 - Monochromatic Beam Neutron Spectrometer

Directive Completion Date: June 30, 1957
Total Authorized Funds: $ 112,000
Total Estimated Cost: $ 112,000

Scoping, preliminary and detailed design are the responsibility of the Design Section. The detailed design is being initiated.

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CG-674 - Water Plant Component Test Loop 1706-KE (ER-1234)

Project Preparation: 100% Scoping: 100% Prelim. Design: 100%

Total Authorized Funds: $ 300
Total Estimated Cost: $ 125,500

The project proposal has been transmitted to the Commission and is awaiting authorization.

CG-678 - Laboratory Facilities for the Special Irradiation Studies

Project Preparation: 100% Scoping: 100%

Total Estimated Cost: $ 45,000

The project proposal has been transmitted to the Commission and is awaiting authorization.

CG-558 - Reactor Plant Modifications for Increased Production - Phase I

	Weighted	Scheduled	Actual
Field Progress:			
F.P.	40.28%	75%	64%
M.C.	51.82%	47%	46%
P.F.	7.88%	52%	54%
Total		59%	54%

Average Manpower:

P.F. 2

Approx. Accumulated Manpower: (man-days)

F.P.	33,742
M.C.	79,701
P.F.	3,531

Directive Completion Date: December 15, 1957
Total Authorized Funds: $ 25,900,000
Total Estimated Cost: $ 25,900,000

Scoping, preliminary and detailed design are the responsibility of the Design Section.

The 151-D Transformer again failed in test at the vendor's factory. Indications are that some redesign will be required. A new shipping schedule is expected from the vendor. A serious delay in shipping the transformer could affect the DR and D shutdown schedule.

No work was performed this period by construction forces because of the labor difficulties. Plant Forces have started the replacement of Panellit gage switches preparatory to the B shutdown. A serious failure rate in existing gages at F has occurred recently and it may be necessary to replace F gages prior to the CG-558 shutdown.

CG-558 - Reactor Plant Modifications for Increased Production - Phase II

	Weighted	Scheduled	Actual
Field Progress:			
F.P.	56.00%	31%	11%
M.C.	40.81%	10%	9%
P.F.	3.18%	4%	2%
Total		21%	9%

Approx. Accumulated Manpower: (man-days)

F.P.	6,222
M.C.	7,663
P.F.	59

Directive Completion Date: December 15, 1957
Total Authorized Funds: $ 11,200,000
Total Estimated Cost: $ 11,298,200

Scoping, preliminary and detailed design are being managed by the Design Section.

No work was performed this period because of the labor difficulties.

CG-600 - 100-C Alterations

	Weighted	Scheduled	Actual
Field Progress:			
M.C.	80.4%	1%	1%
P.F.	19.6%	3%	0%
Total		1%	0.8%

Approx. Accumulated Manpower: (man-days)

M.C.	44

Directive Completion Date: April 15, 1957
Total Authorized Funds: $ 675,000
Total Estimated Cost: $ 765,000

Scoping, preliminary and detailed design are being managed by the Design Section.

The revised project proposal is being routed for approval signatures within the General Electric Company.

DECLASSIFIED

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

Directive Completion Date: January 1, 1958
Total Authorized Funds: $ 900,000
Total Estimated Cost: $ 900,000

Scoping, preliminary and detailed design are being managed by the Design Section.

The procurement of engineered material for the Zone Temperature Monitoring System is progressing. It is estimated that the controllers will be ordered in about two months. The controller specification was issued for comment on May 17, 1956.

Ladish Company drawing B-1052 which gives the details of the rear face pigtail adapter was approved and returned to Purchasing on May 15, 1956.

The Construction Progress Schedule will be prepared when the present labor difficulties are over.

III. REPORT OF VISITORS

A. To Hanford, May 1956

None.

B. To Other Installations, May 1956

W. C. Royce visited the General Electric Company, Schenectady, New York, from May 1 through May 4, 1956, to attend a balancing seminar at the Schenectady Works.

H. Radow visited F. T. Crowe and Company, Seattle, Washington, from May 21 through May 22, 1956, to witness equipment testing.

R. T. Gardner visited the following AEC sites from May 6 through May 18, 1956, to compare methods of performing Minor Construction work: Aiken, South Carolina; Oak Ridge, Tennessee; Portsmouth, Ohio; and Paducah, Kentucky.

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ADVANCE ENGINEERING SECTION

MAY 1956

Advance Engineering, Pile Technology, and Design Section personnel are engaged in a preliminary survey of the suitability of various reactor types for an experimental study of the use of a plutonium-natural uranium fuel cycle in power reactors. Two types of graphite moderated reactors, a tank-type water moderated reactor and a callandria type D_2O moderated reactor, are being considered.

F W Albaugh

Manager, Advance Engineering

FW Albaugh:pk

EMPLOYEE AND PUBLIC RELATIONS DEPARTMENT

MONTHLY SUMMARY - MAY 1956

PERSONNEL PRACTICES SECTION

The number of applicants interviewed in May was 884 as compared to 1121 for April. In addition, 46 new applicants applied by mail. Open, nonexempt, nontechnical requisitions decreased from 104 at the beginning of the month to 103 at month end. Sixty-six employees were added to the roll and 79 removed during the month. The separation rate for fiscal month of May was .75% and for fiscal month of April .76%. These rates when converted to annual rates are 9.78% and 9.91% respectively. During May 48 new requests for transfer to other type work were received by Employment and 42 transfers were effected. Attendance recognition awards were distributed to 88 employees in May, including five who qualified for six-year awards.

There were no employee deaths during the month of May. One hundred and nine visits were made to employees confined to Kadlec Hospital, and 30 checks were delivered to employees confined at the hospital or at home. At month end participation in the Pension Plan was 98.9%, in the Insurance Plan 99.6%, and the Employee Savings and Stock Bonus Plan 55.0%. At month end there were 648 nonveterans registered under Selective Service and 733 military reservists were on the roll. Since August 1, 1950, 430 employees have terminated to enter military service, of which 184 have returned, 67 have not claimed re-employment rights, leaving 179 still in military leave status.

Sixty-one adopted suggestions were approved for awards in May resulting in cash awards totaling $1,285 with a total net savings of $8,140.31. Since the beginning of the 1955-56 season, 292 offers have been extended to BS/MS graduates for the Personnel Development Program. There have been 99 acceptances to date. Acceptances have been received from 65 experienced candidates. To date 635 PhD cases have been considered, 251 have been invited to visit and 124 have accepted invitations to visit.

EMPLOYEE COMMUNICATIONS AND PUBLIC RELATIONS SECTION

During the month 55 releases were issued -- 41 locally, 9 regionally and 5 nationally. Information given to one of the local papers resulted in a favorable editorial concerning Hanford's record in labor peace.

Community Relations activities were stepped up for the month following the AEC's approval of the proposed program for the community. Included were revisions in the format of the monthly mailing to community leaders; planning for a physician's day; three editions of the radio program, INSIDE HANFORD; and two television shows.

A ten-week campaign for promoting the use of the Suggestion Plan was inaugurated, coordinated with the Company's 50th anniversary in this field and Hanford's entry into the 10th year of operation.

Employee Communications and Public Relations (Contin)

Other activities in the employee communication field included continued emphasis on safety; a report on the feasibility of liquidating costs for employee publications; a decision to have all such publications printed on site in the future; and the issuing of six periodic publications, two employee newsletters, revision of two existing booklets and the drafting of a new booklet.

"Channel 4669", a HAPO produced film, will be shown at the June meeting of U. S. Atomic Energy scientists in Chicago. A stepped up production schedule is making it possible to complete the film in time for the meeting.

A total of 397 graphic plates were completed during the month of May. Among these were detailed isometric drawings of a fully automatic slug welding machine for use of a vendor as fabrication work drawings; 40 illustrations and charts on corrosion studies for the ORNL Symposium; 24 reactor face temperature maps; and two cut-a-way illustrations of waste storage tanks.

Increased activity in the preparation of technical reports has been reflected in an increase in the work load and liquidation figure of photographic work. Should this trend continue, it may be possible to reduce prices for services to customers.

During the month a total of 21,853 photographic prints were made and 1,280 negatives exposed.

UNION RELATIONS SECTION

The Ching Panel has accepted jurisdiction of the dispute involving construction Teamsters, Operating Engineers, and Cement Masons employed by the J. A. Jones Company in Minor Construction activities and other lump sum contractors on the project. It is expected that work will be resumed on June 6.

John S. Harlow, Seattle attorney, has accepted an offer to act as impartial arbitrator in the dispute with the Hanford Atomic Metal Trades Council involving a one-day disciplinary layoff.

SALARY AND WAGE ADMINISTRATION SECTION

The HAPO non-exempt salary manual, a part of Appendix B of the prime contract, was brought up to date and submitted to the Commission.

A comparison of HAPO with total Company exempt salary statistics, as of 10/1/55, was issued to the Commission.

The survey of rates being paid electronic data processing employees was completed and a report is being prepared.

A suggested procedure to be used in cases of employees who are on a restricted work status was formulated and submitted to management.

In order that HAPO Salary data transmitted to Accounting Services for compilation with overall Company data will be current and accurate, new procedures were formulated and installed. These procedures involve coding P-353 and P-1445 salary administration forms for function, title, work description and reporting level.

Salary and Wage Administration (Continued)

Audits of 15 exempt positions were conducted in the Engineering Department. Audits of non-exempt positions were conducted throughout HAPO and covered 103 different jobs.

The qualification for exempt status of designers in the various classifications at HAPO has been investigated. At month end legal opinion was that as presently constituted these positions did not meet the requirements for exempt status. Regrouping of work elements in these positions is receiving further study.

EDUCATION AND TRAINING SECTION

A new program called "Creative Thinking" was given for the first time during May to a group in the Transportation Section. Modifications to the program will be continued and it is being scheduled for additional presentations.

Another new program on "How to Make Exempt Appraisals" is being prepared and is scheduled for presentation during July.

A program developed last year, "Report Writing" appears to be filling a definite need at Hanford. The interest in this program has been widespread.

Nine students have now completed their work for Master's degrees and will receive diplomas at schools affiliated with our program. Also, two candidates who took coursework through the school and wrote theses while working at Hanford will receive Ph.D degrees from Oregon State College in June.

Plans have been formulated for orientation of 76 new graduates reporting on the program during the summer months and also for the 43 summer program personnel who will be at Hanford this year.

HEALTH AND SAFETY SECTION

Long continued efforts to effect a transfer of Industrial Medical activities from the hospital to the adjacent Medical Dental Building now seem to be acceptable to the Methodist group and the AEC and details of the transfer are being negotiated.

One disabling injury resulted from the sudden appearance of three deer in the plant highway causing a pickup to slide and roll over.

Community will qualify for the first time for the General Manager's Safety Award on June 12 if no disabling injuries occur before then.

Measles and chickenpox continued to be the major acute problem.

The Pacific Northwest Conference of the Methodist Church voted to take over administration of Kadlec Hospital. They voted to rename the hospital the Kadlec Methodist.

AUXILIARY OPERATIONS AND PLANT PROTECTION SECTION

There were five fire alarm responses during the month including one false alarm. Losses were $856.

Agreement has been reached between the Commission and the Methodist Board that the 700 Area plant will supply steam to the hospital buildings on a continuing permanent basis.

Dormitory W-16 was made ready for occupancy by HHFA sales personnel during May.

Security violations increased to 20 during May as compared to 9 for April. Number of unaccounted for documents was reduced from 194 to 193.

COMMUNITY SECTION

Richland has been awarded certificates of Achievement for "No Traffic Deaths", "Accident Records", and "Public Safety Education" by the National Safety Council in the 1955 Traffic Safety Award Program.

Excavation for repair and correction of a faulty sewage collection line on Lee Boulevard north of Carmichael School was made during the month. It was found that the sewage line had been laid approximately one foot above grade at the center-line of Lee Boulevard. It was necessary to excavate the entire roadway and sidewalk on each side of the street to gain sufficient elevation to correct the condition. This work caused Lee Boulevard to be closed to traffic for a period of two weeks. This condition has been corrected and sidewalk and street repair are now in process.

PERSONNEL PRACTICES SECTION

May, 1956

	April, 1956	May, 1956
Applicants interviewed	1,121	844

157 of the applicants interviewed during May were individuals who applied for employment with the Company for the first time. In addition, 46 applications were received through the mail.

	April, 1956	May, 1956
Open Requisitions		
Exempt	2	1
Nonexempt	104	103

Of the 104 open, nonexempt, nontechnical requisitions at the beginning of the month, 77 were covered by interim commitments. Of the 103 open, nonexempt, nontechnical requisitions at month end, 68 were covered by interim commitments. During May, 78 new requisitions were received requesting the employment of 107 nonexempt, nontechnical employees.

	April, 1956	May, 1956
Employees added to the rolls	63	66
Employees removed from the rolls	82	79
NET GAIN OR LOSS	- 19	- 13

	Fiscal Month April, 1956		Fiscal Month May, 1956	
	Male	Female	Male	Female
Separations Rate:	.48%	2.02%	.53%	1.72%

	Fiscal Month April, 1956	Fiscal Month May, 1956
Over-all Separations Rate	.76%	.75%

During May, 18 employees left voluntarily to accept other employment and 1 left to enter military service.

Transfer Data

Accumulative total of requests for transfer received since 1-1-56	326
Number of requests for transfer received during May	48
Number interviewed in May, including promotional transfers	48
Transfers effected in May, including promotional transfers	42
Transfers effected since 1-1-56, including promotional transfers	233
Number of stenographers transferred out of steno pool in May	4
Transfer requests active at month end	438

ADDITIONS TO THE ROLLS

	Exempt	Nonexempt	Community Firemen	Total
New Hires	8	29	--	37
Re-engaged	-	--	--	--
Reactivates	1	27	--	28
Transfers	1	--	--	1
Total Additions	10	56	--	66

TERMINATIONS FROM THE ROLLS

	Exempt	Nonexempt	Community Firemen	Total
Actual Terminations	7	35	--	42
Removals from rolls(deactivates)	3	30	--	33
Transfers	4	--	--	4
Total Terminations	14	65	--	79

GENERAL

	4-1956	5-1956
Photographs taken	325	247
Fingerprint impressions	80	117

PERSONNEL SECURITY QUESTIONNAIRES PROCESSED	4-1956	5-1956
General Electric cases	190	133
Facility cases	20	10
Total	211	143

Newspaper advertisements were placed in the Denver Post on May 16th, 17th and 18th for Draftsmen and Designers. The Employment Representative - Men and the Supervisor - Design Drafting Unit recruited in Denver on the 18th and 19th of May. Eleven candidates were interviewed, two of which were former employees who had resigned to work for the Sterns-Rogers Company. It appears that there is a definite shortage of qualified drafting personnel, if the two recent recruiting trips are a good sample.

Advertisements for Draftsmen were placed in the ABENDPOST, a German language newspaper which is printed in Chicago. This advertisement ran from May 28 through June 3, 1956.

The Separations Section has given notice that it will be necessary to reduce its force by four Process Crane Operators effective June 15, 1956, and one Sign Painter Trainee at a later date.

An additional 8 Separations Section employees were transferred during the month bringing the total of personnel transferred to 105.

The Community Section will reduce its force by 50 Painters, 5 Carpenters, 2 Female Janitors and 2 Truck Drivers - Light. The Reactor Section can utilize 10 Painters and 3 Carpenters which will reduce the number to receive layoff notices.

In connection with the validation study of the GE Selection Program for Supervisors, the regular exempt appraisals for candidates upgraded to exempt positions have been reviewed and summarized. As appraisals were available for only 29 cases a special rating form has been made up and is now being mailed to supervisors for completion. It is planned to correlate rating results with test results, and over-all selection plan results. In addition, a survey report will be made to poll opinions among management who have used the Selection Program.

INVESTIGATIONS STATISTICS

	4-1956	5-1956
Cases received during the month	181	101
Cases closed	204	257
Cases found satisfactory for employment	186	106
Cases found unsatisfactory for employment	29	27
Cases closed before investigation completed	1	6
Special investigation conducted	--	2

Perfect Attendance Recognition Awards

Total one-year awards to date since January 1, 1950	5674
One-year awards made in May	30
Total two-year awards to date since January 1, 1950	3307
Two-year awards made in May	19
Total three-year awards to date	2011
Three-year awards made in May	16
Total four-year awards to date	1106
Four-year awards made in May	13
Total five-year awards to date	394
Five-year awards made in May	5
Total six-year awards to date	40
Six-year awards made in May	5

Service Recognition

Total Service Recognition Pins presented to date	5949
Five-year Service Recognition Pins presented during May to Exempt personnel	18
Five-year Service Recognition Pins presented during May to Non-exempt personnel	91

During May, 7 people whose continuity of service was broken while in an inactive status were so informed by letter.

The following contacts were made with employees during the month of May:

Employee contacts made a Kadlec Hospital	109
Salary checks delivered to employees at Kadlec Hospital	24
Salary checks delivered to employees at home	6

Five employees retired during the month of May, namely:

Leo Stebbins	W 2766-6116	Normal Retirement
Ward B. McVay	W 11495-6166	"
John C. Harris	W 2258-4621	"
George W. Iseminger	W 2099-6371	"
Wilbur W. Benedict	W 11170-4621	"

All matters pertinent to retirement have been discussed with these employees in order that they will be fully informed of their retirement benefits.

Two retired employees expired during the month of May, namely:

John H. Hill	5/12/56	Normal Retirement
Charles C. Crawford	5/16/56	"

All necessary arrangements will be made to settle matters of business existing between the Company and beneficiaries of the deceased.

Since September 1, 1946, 192 life insurance claims have been paid totaling $1,365,489.

A total of *38 new employees attended Orientation Programs given by members of this group during the month of May. Of this number, 97% have signed up to participate in the Pension Plan, 100% have signed up to participate in the Insurance Plan, and 86% have signed up to participate in the Good Neighbor Fund.

*One employee is temporary, therefore not eligible for Insurance or Pension.

Nineteen letters were written in regard to matters concerning deceased employees.

At the end of the month, participation in the Employee Benefit Plans was as follows as compared with last month's participation:

	APRIL	MAY
Pension Plan	98.9%	98.9%
Insurance Plan	99.6%	99.6%
Savings & Stock Bonus	54.7%	55.0%
Good Neighbor Fund	71.4%	71.5%

Total number of non-veteran employees subject to military service training through Selective Service System 648

Number Classified 1A	156
Number Classified 1AO	1
Number Classified 1D	56
Number Classified 2A	102
Number Classified 3A	237
Number Classified 4A	4
Number Classified 4F	88
Number Classified 2S	3
Number Classified 4D	1
	648

Number of Technically Trained & Engineering Personnel for whom deferments are currently being requested 108

Number of Non-Technically Trained & Engineering Personnel for whom deferments are being requested 5

113

Accumulated total of deferments requested 1656

Accumulated total of deferments granted 1329

Preliminary deferments granted June Technical Graduates 2

Current number of deferment requests pending 18

Current number of deferment requests denied 0

Current number of deferment requests granted 10

Preliminary letters to local boards in regard to deferments of Technical Graduates expected on rolls in June 14

During Month of May

Number of deferment requests pending at Local Board level 14

Number of deferment requests pending at Appeal Board level 3

Number of deferment requests pending at Presidential Appeal level	1
Total	18
Number of deferment requests denied by Local Boards	0
Number of deferment requests denied by State Appeal Boards	0
Number of deferment requests denied by Presidential Appeal Board	0
Total	0
Number of deferments granted by Local Boards	10
Number of deferments granted by State Appeal Boards	0
Number of deferments granted by Presidential Appeal Board	0
Total	10
Number of Technically Trained & Engineering Personnel, denied, or requesting no further appeal, now pending induction	1
Number of Technical Graduates with over two years of deferments	74
Number of Selective Service vulnerable Technical Graduates Enlisted	0
Number of Selective Service vulnerable Technical Graduates Drafted	1
Number of Technical Graduates called to active duty under R.O.T.C.	0
Reservists Data - Total Number of Reservists on Roll	
Number of Active Reservists	162
Number of Inactive Reservists	550
Number of employees in the National Guard	21
Total	733
Reservists and National Guard members subject to drills, tours of duty, Cruises, Summer Camp and/or weekly or monthly meetings	253
Military Service Leaves of Absence - August 1, 1950 thru May 31, 1956	
Reservists	128
Selective Service System	293
Female Employees Enlisted	9
	430
Total number returned to roll	184
Reservists 80	
Sel. Serv. Sys. 104	
184	
Known number not claiming reemployment rights	67

Number of employees still on Military leaves 179

Suggestion Plan

	April	May	Total Since 7-15-47
Suggestions Received	281	279	19879
Acknowledgements to Suggesters	293	260	
Suggestions Pending Acknowledgement	33	52	
Suggestions Referred to Departments for Investigation	339	342	
Suggestions Pending Referral to Departments	45	56	
Investigations Completed and Suggestions Closed	288	287	
Adopted Suggestions Approved by Board for Award	106	61	
Total Net Savings	$12,262.74	$8,140.31	
Total Cash Awards	1,790.00	1,285.00	
Total Number Suggestions Outstanding to Departments	618	565	

Cumulative suggestion statistics for the first five months of 1956, compared with the same period for 1955, are:

	1955	1956	% Change
Received	1,290	1,396	+ 8.2%
Adopted	449	348	-22.5%
% Adopted	34.7%	24.9%	-25.3%
Awards	$9,374	$7,760	-17.2%
Savings	$70,894	$48,688	-31.3%
Award/Savings	13.2%	15.9%	+20.5%

Life Insurance

Sixty-two requests for code information were received from insurance companies and investigation agencies and furnished during the month of May, 1956. The code information is supplied in accordance with a prearranged plan whereby employees of this project may be insured on the same basis of those working elsewhere.

Insurance Statistics

Claims reported to Department of Labor

April, 1956	
Long Forms	Short Forms
20	378

May, 1956	
Long Forms	Short Forms
31	377

Total since September, 1946 - 32,752

Claims reported to Travelers	April, 1956	May, 1956
	5	7*

*Of the claims reported to Travelers Insurance Company during the month of May, six were property damage and one was bodily injury.

Operations - Workmen's Compensation Claims

a. Raymond Mathews, 8002301 -- Date of Injury: 6-24-55; Employer: General Electric Company; Nature of Injury: Right inguinal hernia.

Mr. Mathews, a janitor in the Auxiliary Operations and Plant Protection Section, appealed to the Board following rejection of his claim for a hernia. A hearing was scheduled in Richland on May 9, 1956. When the claimant failed to appear, the Examiner called him and Mr. Mathews stated that he did not want to proceed with the prosecution of his appeal and requested that the matter be dismissed. In accordance with his request, the Board entered an order on May 15, 1956, dismissing the appeal.

b. William J. Mateer, 8001589 -- Date of Incident, October 16, 1956; Employer: General Electric Company; Nature of condition: Dermatitis.

Mr. Mateer, a serviceman in the Community Section, appealed to the Board of Industrial Insurance Appeals from an order of the Department of Labor and Industries closing his claim without a disability award. The testimony brought out that he had followed his trade as a painter for about 23 years, and had been employed by General Electric Company as a painter since 1946. In October of 1953, he noticed a "breaking out" on his hands and wrists and it was later necessary to give him other employment where he was not exposed to paint and paint products. Following receipt of all evidence the Board issued its "Decision and Order" on May 17, 1956 granting Mr. Mateer a permanent Disability award of 30 percent of the maximum allowable for unspecified disabilities.

Liability Insurance

a. Milo Riste vs. General Electric Company, B-6835809
Curtis Swearingen vs. General Electric Company, B-6835841.

On May 23, 1956, a deposition was taken of one of the plaintiffs' prospective witnesses, Dr. Frank S. Miller, a Spokane physician who specializes in diseases of the lung. Mr. Gavin, the Travelers attorney, has advised that the plaintiffs' attorneys have stated that $25,000 for the Swearingen case and $15,000 for the Riste case are the lowest figures they will consider for settlement. The cases have been set for trial in the Franklin County Superior Court on June 14, 1956. The possibility of settling the cases is still being considered.

Personnel Development Program

During the reporting period one additional offer was extended and 15 acceptances and 39 rejections were received to offers previously extended. Status for the recruiting season to date may be summarized as follows:

Offers	292
Acceptances	100
Rejections	145

Acceptances as per cent of total offers	34.4%
Acceptances as per cent of total replies	40.0%

Personnel Development Program (continued)

At the present time there are 37 open offers. Since most schools will be graduating their seniors within the coming week or so returns from open offers may be expected to be extremely low.

The returns for the 1955-56 season are somewhat better than last year's results and excellent when compared with the Engineering Program conducted by Engineering Services. To date they have received approximately 17.2% acceptances based on total offers and 24% based on total replies.

The following table summarizes Personnel Development Program recruiting to date by fields:

Field	Offers Extended			Acceptances			Open Offers			Rejections			On the Roll
	BS	MS	Total*	BS	MS	Total*	BS	MS	Total	BS	MS	Total	
Engineering:													
Chemical	76	5	81	23	1	24	10	3	13	43	1	44	7
Electrical	36		36	11		11	7		7	18		18	1
Mechanical	69	2	71	20		20	10		10	39	2	41	4
Metallurg.	10	1	11	3		3	2		2	5	1	6	2
Science:													
Chemistry	23	5	28	13	3	16	1		1	9	2	11	3
Physics	34	5	39	11	2	13**	10		10	13	3	16	3
Other	24	2	26	12	1	13	3	1	4	9	-	9	2
TOTALS	272	20	292	93	7	100	43	4	47	136	9	145	22

Summer Programs

On summer assignments 14 juniors have accepted temporary assignments for the coming summer. One offer remains open and clearance is in process for this individual should his plans permit him to join this program. The quota for the summer was 15.

Ten acceptances for graduate students for summer assignments have been received, meeting that quota.

Twelve professors have accepted summer assignments meeting this quota also.

Experienced BS/MS Recruiting

Of the 251 cases considered during the month of May, the majority were responses from newspaper advertisements. Resume advertising was cancelled on May 13 with the exception of ads for metallurgists, and mechanical design engineers.

Twenty-two invitations to visit were made this month and there have been 10 experienced candidates who visited the Hanford Operation. Seven employment offers have been extended with 9 offers accepted and 9 people placed on the roll.

Experienced BS/MS Recruiting (continued)

Follow-up and field recruiting were conducted in Chicago on May 6, 7 and 8 with rather disappointing results. There were two invitations to visit extended as a result of this effort but there have been no acceptances as yet.

Field recruiting was conducted on May 26, 27 and 28 in San Francisco and on May 29 in Portland with equally disappointing results. One physicist has been invited to visit as a result of the Portland trip and one mechanical engineer was invited as a result of the San Francisco trip.

We will have a representative visiting the Rocky Mountain Arsenal at Denver on June 4 and 5 to interview personnel who are being or soon will be separated from military service. There will also be a representative conducting field recruiting in Los Angeles area on June 3 and 4. We also have a representative of this office meeting with the Company advertising agent in New York City to discuss an effective advertising campaign for the next several months aimed at attracting a limited number of engineers and scientists of the highest caliber.

The following table summarizes this action by fields:

		INVITATIONS				OFFERS			
Field	Cases Consid.	Ext.	Visited	To Visit	Open Invitations	Ext.*	Acc.*	Open*	OTR
Engineering:									
Chemical	114	22	18			16	11	2	8
Electrical	79	19	16			18	8	1	5
Mechanical	179	32	23	1	7	22	14	1	8
Industrial	46	5	3	1	1	4	4		4
Metallurgical	42	9	5		1	5	4		1
Civil	25	3	3			3	3		3
Geological	9	2	2			3	3		3
Science:									
Chemistry	131	14	11			19	12		11
Physics	79	19	8	2	4	6	3		2
Math-Statistics	110	14	8	2	1	7	5		2
Other:	557	18	12	2	1	25	18	-	16
Totals	1,371	157	109	8	15	128	85	4	63

Offer totals include 24 carry-overs from the 1954-55 season of which 20 were acceptances not on the roll as of 9/1/55, and 4 were open offers at that time.

PhD Recruiting

The following table summarizes the current season's activities to date in comparison with the same point of the 1954-55 season:

	5/31/56			5/31/55		
	New	Exper.	Total	New	Exper.	Total
Candidates	545	90	635	497	46	543
Invitations	231	20	251	181	10	191
Accepted	115	9	124	106	6	112
Visited	88	9	97	76	6	82
Offered	35	4	39	28	5	33
Accepted	7	0	7	9	3	12
On the Roll	8	0	8	5	3	8

Hanford was represented among 17 GE interviewers at the Washington, D. C. American Physical Society meetings April 26 - 28, at which over 1,800 physicists were registered. Advertisements covering all Company activities were run in three morning and three evening editions of Washington papers during the period of the meetings. The GE representatives interviewed a total of 38 candidates from whom no active PhD physicist candidates have been developed to date for Hanford.

As a result of interviews conducted at the Dallas American Chemical Society National Convention in April, Hanford has invited one chemist to visit and expressed interest in two others.

The following table summarizes the PhD activity for May:

	New Appl.	Invited	Accepted	Visited	Offered	Accepted
New PhD's	19	19	8	6	7	3
Exper. PhD's	21	4	-1	0	0	0
Total	40	23	7	6	7	3

Terminations

Losses of Technical and/or exempt personnel totalled 11 for May, 1956. These included 4 transfers to other General Electric sites, one who entered military service and 6 who terminated for other employment.

EMPLOYEE COMMUNICATIONS AND PUBLIC RELATIONS

During the month 55 releases were issued to the press. The breakdown by category, distribution and content was as follows:

SUBJECT		DISTRIBUTION	
Administration and Legal	1	Hanford Area	41
Organization Changes	1	West Coast Area	9
Employee Benefits & Pay	6	National	5
Union Relations	3		
Employment Services	3	CONTENT	
Richland	6		
Utilities & Public Works	1	Information	7
Plant Services	3	Pictures	3
Safety, Fire	4	Short	44
Technology & Research	17	Long	1
Health, Medicine & Sanitation	5		
Education & Library	1		
Good Will	2		
Richland & Hanford Protection	2		

Copies of two current magazines are carrying articles about Hanford operations or personalities. One of these FIELD AND STREAM, circulation 857,000, contains an article, CAN FISH SURVIVE THE ATOM?, based on local experience. AMERICAN magazine is featuring a Hanford lady scientist in an article called, ATOMIC MISS.

In addition to the usual number of local releases dealing with speeches, retirements and other aspects of the operation, information was supplied to a local reporter this past month regarding General Electric's relations with the unions over the past few years. The information which was supplied resulted in the appearance in the TRI-CITY HERALD of a complimentary editorial stating that Hanford provides evidence that labor and management can get along peacefully over a long period of time.

In the future visits will be made to local newspapers on a more regular basis. The first of these visits occurred during the month of May. In addition, visits were made to the Seattle newspaper offices and to the Seattle offices of the Associated Press, United Press and International News Service. It is expected that this visit to Seattle will result in a considerably better showing for Hanford information in regional releases.

Twenty-three papers for presentation at meetings received all required approvals as did four manuscripts for publication. During the month seven speeches were arranged.

Two representatives of McGraw-Hill publishing company visited Hanford during the month and it is hoped that the establishment of this contact will lead to increased publication of material authored by Hanford employees.

Discussions were held during the month with a representative of Education and Training concerning university relations. As a result better integration and expansion of the program to supply speakers to student chapters of technical societies is anticipated, as well as increased opportunities to include Hanford exhibits at University open houses and special events.

EMPLOYEE COMMUNICATIONS AND PUBLIC RELATIONS

The major portion of the proposed community relations program which was presented to the AEC in April for the purpose of discussion and reimbursement has been approved. Portions of the program not specificially approved -- newspaper advertising, open houses, and a community attitude survey -- may be presented formally as additional individual requests for reimbursement at a future time.

Activities in the community relations area included two mailings to community leaders; the adoption of revised format for the Community Newsletter including a more interpretative approach to subject matter; inclusion of a Hanford display in the Umatilla Ordnance Depot Armed Forces Day celebration; planning for a permanent Hanford display, a float for Atomic Frontier Days, and a visit of physicians to the plant; three editions of the radio program, INSIDE HANFORD, and one edition of HANFORD SCIENCE FORUM on television; and a repeat of a special television program, AN ATOMIC STYLE SHOW.

At the request of the Columbia Broadcasting system and in cooperation with KWIE, the local CBS outlet, a special feature on Kadlec Hospital facilities was prepared for release on the CBS-Sunday Desk show in commemoration of National Hospital week.

Six periodic publications for management or employees were issued during the month; two employee newsletters were published; revisions of two booklets begun and a draft of a new booklet prepared. One of the employee newsletters concerned the current status of the Hanford reorganization study, the other concerned the community property disposal situation.

A team of three made up of a representative of the Section, the Printing Unit and the AEC visited the Seattle Government Printing Office to investigate the possibility of having plant publications printed by that office, since off-site contracts will no longer be let. Since it was determined that Hanford's printing plant could produce such publications at the same or at a lower price than the GPO, publications in the future will be printed on site.

A report on the feasibility of liquidating costs for all such publications in the future has been completed.

During the month a 10-week campaign for promoting the Suggestion Plan was inaugurated. Theme of the campaign will be MAKE 1956 HANFORD'S BEST SUGGESTION YEAR; appeals will be made to find better ways of doing jobs and reducing costs. The campaign will mark the Company's 50th anniversary of Suggestion Plan activity and Hanford's entry into the tenth year of such activity.

Preliminary work is being performed for the production of a motion picture on safety for Hanford. Meanwhile, features, news stories and editorials in the GE NEWS continue to emphasize the necessity for employee safety awareness. A letter of commendation for the work done by the GE NEWS in promoting safety was received from D. F. Hayes, Chief of the AEC's Safety and Fire Prevention branch in Washington, D.C.

Articles in the GE NEWS also continued to emphasize opportunities for advancement and improved job understanding and satisfaction. The latter category included features on the activities of the Earth Sciences Unit, plant wide tours for HAPO women, and the underwater telephoto camera used by Fuel Technology and Optical Engineering.

EMPLOYEE COMMUNICATIONS AND PUBLIC RELATIONS

United States atomic energy scientists meeting in Chicago in June will view the classified film, CHANNEL 4669, produced at Hanford. A stepped up production schedule is making it possible to complete the film in time for the meeting.

During the month of May, 397 plates were completed by Graphics. Distribution of assignments were as follows:

Distribution of Graphics May Assignments	Precent
General Administrative (Including Operations Research)	--
Employee and Public Relations	18
Engineering	44
Manufacturing	10
Financial	7
Radiological Sciences	19
Atomic Energy Commission	2

	April	May
Total assignments completed	64	53
Total assignments backlog	33	24

Graphics Statistical Summary	Graphs or Charts	Illustrations	Other
Report Material (Includes Technical Publications)	50	9	--
Technical or Scientific Illustrations	3	21	4
Mechanical Art (Flow charts, schematics, maps, etc. - not for publication)	41	--	17
Lecture Material (Includes plates for slides)	24	10	33
Posters	--	1	3
General (Posting of current data, assembly, revisions, etc.)	48	--	133
	166	41	190

A graphic illustrator worked throughout the month developing detailed isometric drawings of a fully automatic slug welding machine. These will be used by the vendor as fabrication working drawings, and their use demonstrates the growing interest in the use of graphic work in the early design stages of new facilities or equipment.

Other assignments included the completion of over 40 illustrations and charts on corrosion studies for the ORNL Symposium; eight illustrations on Radiometallurgy facilities and equipment; 24 reactor face temperature maps; three detailed cut-a-way illustrations showing differences of the original tube and gunbarrel assembly as compared with that of the 558 tube arrangement; and two cut-a-way illustrations of waste storage tanks to show capacities, flow and other specified details. The balance of the work included routine charts, maps and illustrations.

Increased activity in the preparation of technical reports has been reflected in an increase in the work load and liquidation figure of photographic work. During

EMPLOYEE COMMUNICATIONS AND PUBLIC RELATIONS

May liquidations increased by almost $5,000 over the previous month. Meanwhile, a close watch is being kept on the work loads and the ability of personnel to complete the work with the number of employees now assigned, rather than increasing the staff. Should this be possible, reduction of prices for services to customers may be possible.

Several unusual photographic assignments were completed during the month. One was of the tensile testing cells for Radiometallurgy. Through the use of a wide angle lens and a hand held camera and bounce flash, a detailed photograph was produced free of distortion. Another included special assistance to the Coatings and Corrosion Unit of Fuel Technology in obtaining motion studies of slugs rupturing in a glass autoclave.

During the month 21,853 prints were produced of which 9,079 were identification prints, and 1,280 negatives were exposed. The attached statistical report contains additional information regarding prints produced and negatives exposed.

PHOTOGRAPHY UNIT MONTHLY REPORT MAY, 1956	Requests	I. D.	2" X 3"	4" X 5"	5" X 7"	8" X 10"	8½" X 11"	11" X 14"	16" X 20"	N E G.	35mm Color Slides	35mm B&W Slides	3¼" X 4" Color Slides	3¼" X 4" B&W Slides	16mm M.P. Film
GENERAL MANAGER	2				46	44				65	6				
EMPLOYEE & PUBLIC RELATIONS	1			12	4					6					
Salary & Wage Admin.	4	6			2		8								
Education & Train.	2		1				84			5					
Emp. Comm. & Publ. Relations	117		161	73	75	431	12	3	3	436			4		200'
Auxiliary Oper. & Plant Protect.	7	7,939				37	10			8					
Community	16			250		37				4					
Health & Safety	2					14				6					
ENGINEERING	1						216			12					
Advance Engr.	2						6			9				31	
Design	18					16	333	3		52				29	
Project	11	15		96		106	90			29					
Pile Tech.	118		208	1,093	193	31	6,489		50	353			2	151	440
Separations Tech	13			1		19	124			47			2	36	
MANUFACTURING															
Reactor	14	948				22	68			24					100'
Separations	12	54				51	34			27				8	
Metal Prep.	20	1			328		652	20		69					

PHOTOGRAPHY UNIT
MONTHLY REPORT
MAY, 1956

	Requests	I. D.	2" X 3"	4" X 5"	5" X 7"	8" X 10"	8½" X 11"	11" X 14"	16" X 20"	N E G.	35mm Color Slides	35mm B&W Slides	3¼" X 4" Color Slides	3¼" X 4" B&W Slides	16mm M.P. Film
T. Plant	5					62		265		20					
Transportation	1					12									
Purchasing & Stores	1						9			3					
Elec. Util.	1					18				6					
FINANCIAL	7	10			36	46				16				2	
RADIOLOGICAL SCIENCE															
Radiological Records and Standards	3		24	6			60			3					
Biophysics	12	31				17	21		5	4				3	
Biology	16					48				42	1		24	17	
Radio. Eng.	1													2	
Radio. Adm. & Comm	8	6				44				10		2			
A.E.C.	26	69		29		516				24				16	
TOTAL	441	9079	394	1560	684	1571	8216	291	58	1280	7	0	34	295	740'

	MARCH	APRIL	MAY
TOTAL ASSIGNMENTS	331	324	441
TOTAL NEGATIVES	1,302	897	1,280
TOTAL PRINTS	27,178	16,797	21,853

UNION RELATIONS SECTION

May, 1956

The Ching Panel has accepted jurisdiction of the dispute involving construction Teamsters, Operating Engineers, and Cement Masons employed by the J. A. Jones Company in Minor Construction activities and other lump sum contractors on the project. Agreement has been reached between the parties on a return to work on the basis of the status quo existing as of March 21. This means that the contractors will reinstitute isolation pay and will provide bus transportation pending receipt of Panel recommendations. It is expected that work will be resumed on Wednesday, June 6. No date has been set for the Panel hearing.

John S. Harlow, Seattle attorney, has accepted an offer to act as impartial arbitrator in the dispute with the Hanford Atomic Metal Trades Council involving a one-day disciplinary layoff given each of two mechanics in transportation. The hearing is scheduled for Monday, July 2, in Richland.

Approximately 35 supervisory people attended the May 16, four-hour Labor-Management Relations course conducted by this Section in Dormitory W-10.

Grievance Statistics:

A total of forty (40) grievances were received and five (5) Step II grievance meetings were held during the month. A breakdown of the grievances received and processed follows:

ALL DEPARTMENTS

	HAMTC	HGU	BSEIU	Total Unit	Total Nonunit	Total
Received this month	39	0	0	39	1	40
Received this year	213	3	0	216	15	231
Received 1955 though this month	221	2	0	223	11	234
Step I						
Pending April 30	0	0	0	0	0	
Settled this month*	23	0	0	23	0	23
Settled this year	147	3	0	150	3	153
Pending May 31	0	0	0	0	0	
Step II						
Pending April 30	52	1	0	53	2	
Settled this month**	16	0	0	16	2	18
Settled this year	77	2	0	79	11	90
Pending May 31	45	0	0	45	0	

*Grievances brought to Step II prior to March 1, 1956, but never processed by the union are, for the purpose of this report, considered settled at Step I.

**Grievances which the union formally indicated their intention to submit to arbitration but have taken no further action since March 1, 1956, are, for the purpose of this report, considered settled at Step II.

ALL DEPARTMENTS (Cont'd.)

	HAMTC	HGU	BSEIU	Total Unit	Total Nonunit	Total
Arbitration						
Pending April 30	3	0	0	3	0	
Settled this month	0	0	0	0	0	
Settled this year	0	0	0	0	0	
Pending May 31	9	0	0	9	0	
Total settled this month	39	0	0	39	2	41
Total settled this year	224	5	0	229	14	243

BY DEPARTMENTS

	Received		Settled Step I*		Settled Step II**	
	This Mo.	This Year	This Mo.	This Year	This Mo.	This Year
Manufacturing						
Reactor - Unit	20	102	14	73	6	33
- Nonunit	0	1	0	0	0	1
Separations - Unit	14	63	7	45	6	29
- Nonunit	0	5	0	1	0	4
Metal Preparation - Unit	3	24	2	18	1	5
Transportation - Unit	0	6	0	3	0	2
Electrical Utilities - Unit	0	1	0	1	0	1
Employee & Public Relations						
Community - Unit	1	3	0	2	0	0
Aux. Ops. & Pl. Pro. - Unit	1	12	0	5	2	6
Radiological Sciences - Unit	0	5	0	3	1	3
- Nonunit	1	4	0	1	2	2
Engineering - Nonunit	0	3	0	0	0	3
Financial - Nonunit	0	2	0	1	0	1
Total	40	231	23	153	18	90

*Grievances brought to Step II prior to March 1, 1956, but never processed by the union are, for the purpose of this report, considered settled at Step I.

**Grievances which the union formally indicated their intention to submit to arbitration but have taken no further action since March 1, 1956, are, for the purpose of this report, considered settled at Step II.

BY SUBJECTS

	Manufacturing		Emp. & Pub. Relations		Radiological Sciences		Engineering		Financial	
	This Mo.	This Year	This Mo.	This Year	This Mo.	This Year	This Mo.	This Year	This Mo.	This Year
Unit										
Recognition	0	1	0	1	0	0				
Jurisdiction	20	85	2	5	0	1				
Health-Safety-Sanitation	0	6	0	0	0	0				
Hours of Work	0	4	0	1	0	0				
Overtime Rates	8	59	0	2	0	3				
Vacations	0	2	0	0	0	0				
Seniority	4	11	0	2	0	1				
Wage Rates	3	7	0	1	0	0				
Miscellaneous	2	11	0	3	0	0				
Grievance Procedure	0	3	0	0	0	0				
Sick Leave	0	6	0	0	0	0				
Continuity of Service	0	1	0	0	0	0				
Nonunit										
Wage Rates	0	4	0	0	0	0	0	1	0	1
Miscellaneous	0	1	0	0	0	0	0	2	0	1
Sick Leave	0	1	0	0	0	0	0	0	0	0
Hours of Work	0	0	0	0	1	1	0	0	0	0
Distribution of Overtime	0	0	0	0	0	1	0	0	0	0
Job Training	0	0	0	0	0	1	0	0	0	0
Work Assignment	0	0	0	0	0	1	0	0	0	0
Total	37	202	2	15	1	9	0	3	0	2

SALARY AND WAGE ADMINISTRATION SECTION

1. Revised HAPO structural organization charts as of April 15, 1956, were completed during May.

2. The HAPO non-exempt salary manual, a part of Appendix B of the prime contract, was brought up to date and submitted to the Commission.

3. A comparison of HAPO with total Company exempt salary statistics, as of 10/1/55, was issued to the Commission.

4. The report on the first-line supervisory pay differential study for the Manufacturing Department was completed and issued during the month.

5. Internal reports prepared during the month included:

   a) Trends in weighted average position levels and salary distribution data, 1/1/55 to 3/31/56.
   b) Relative salary status of 12 Community positions in comparison to positions in 11 Northwest cities as compiled from the recent municipal survey.
   c) Draft of procedures for processing salary administration papers in the Salary Records Unit.

6. The survey of rates being paid electronic data processing employees was completed and a report is being prepared.

7. A suggested procedure to be used in cases of employees who are on a restricted work status was formulated and submitted to management.

8. In order that HAPO salary data transmitted to Accounting Services for compilation with overall Company data will be current and accurate, new procedures were formulated and installed. These procedures involve coding P-353 and P-1445 salary administration forms for function, title, work description and reporting level.

9. Audits of 15 exempt positions were conducted in the Engineering Department. Audits of non-exempt positions were conducted throughout HAPO and covered 103 different jobs.

10. The qualification for exempt status of designers in the various classifications at HAPO has been investigated. At month end legal opinion was that as presently constituted these positions did not meet the requirements for exempt status. Regrouping of work elements in these positions is receiving further study.

11. Contacts made during the month disclosed in several instances that employees are not familiar with all aspects of the salary plan. A brochure on salary administration is being prepared (approximately 30% complete) for distribution to exempt employees. It is hoped that this publication will aid supervision in insuring that the salary plan and its operation are thoroughly understood by their employees.

EDUCATION AND TRAINING SECTION

May, 1956

PERSONNEL DEVELOPMENT PROGRAM FOR NUCLEAR ENERGY

I. Present Assignments

Department	Last Month	This Month
Engineering		
Pile Technology	9	11
Separations Technology	4	4
Design	3	2
Project	9	2
Manufacturing		
Metal Preparation	0	3
Separations	8	7
Reactor	9	12
Production	1	0
Financial		
Procedures & Computing	4	3
Employee & Public Relations		
Education & Training	0	1
Total	47	45

II. Permanent Placements

There were three placements off the program as follows:

Project - 2
Pile Technology - 1

It was anticipated that there would be 7 placements during May; however, only three were actually placed. It now appears that the other 4 will be placed during June.

III. Additions

There was one addition to the program during the month of May; namely, a graduate of Gonzaga University with a B.S. degree in Electrical Engineering.

At the present time there are 76 new graduates now scheduled to report on the program during the summer months. Plans for orientation of these personnel have continued. This year's program will be held on July 9, 10 and 11. In an effort to acquaint these graduates with recreational facilities in the Northwest, information on recreational and travel facilities in Washington, Oregon and Idaho have been obtained to pass out to them. A copy of the 1955 Annual Report of the company and the information booklet, "Horizons at Hanford" is also to be given to the new graduates. Plans have been made to acquaint the new graduate with a recent graduate of the same school who has been on the payroll for two or three years as a further effort to orientate these people. Also, a list of the Richland organizations and contact representative will be given to each graduate to assist them in entering community life in Richland.

IV. Selective Service

There was one loss to the armed forces due to Selective Service during the month. This was a Mechanical Engineer by training with three years' service with the company. This now makes a total of 61 Technical Graduates who were program members at the beginning of their industrial career who have entered the armed forces.

TECHNICIAN TRAINING PROGRAM

Approximately 15 present employees applied for transfer to the Technician Training Program. It now appears that only three or four will have the necessary qualifications for a transfer. Interviews have been held with all those that requested and their qualifications were given careful consideration.

A visit was made to Portland State College to evaluate a new engineering aide program established last year by this school. There is a considerable number of these type of programs in eastern schools, but this is the first such program established in the Northwest. There is a similar program at the University of San Francisco. The curriculum at Portland State College appears to have been well formulated and the instructional staff is of a high quality. It was hoped that graduates of this program would be available in sufficient numbers to reduce to some extent the hiring of high school graduates for the Technician Training Program. Unfortunately, there will only be 20 graduates from this program in the first class which will finish its two-year course in 1957. Close contact will be maintained with the school in an effort to encourage a few of these graduates to seek employment at Hanford.

UNIVERSITY RELATIONS

Plans are now complete for the orientation of the summer program personnel who will be at Hanford this year. The numbers in each group are as follows:

College Professors - 12	Graduate Students - 10
College Juniors - 15	High School Teachers - 6

Contacts were made with the various public schools in Richland to procure housing for the summer for the university professors. Fortunately it was possible to find furnished facilities for all twelve professors here in Richland.

PERSONNEL DEVELOPMENT COURSES

The following Personnel Development Courses were presented during the period between April 25 and May 25:

COURSE	NUMBER OF TIMES PRESENTED	NUMBER IN ATTENDANCE
Job Relations Development	2	39
Responsibilities of a Supervisor(McGregor)	2	44
Job Instruction Training	1	8
Labor Management Relations	1	29
HOBSO I	1	125
Principles and Methods of Supervision and Leadership	1	15
Cost Control	3	44
Conference Leading	3	49
Effective Human Relations	1	14
Customer Relations	6	336
Report Writing	4	73
Creative Thinking	1	14

The Creative Thinking program was given for the first time during May. A job problem was selected and the number of workable ideas resulting from this conference indicates that it may be another worthwhile program.

An advanced Customer Relations program was presented to Community fireman. This four-hour "refresher" was given prior to beginning of the annual home inspections.

HOBSO I was given to 125 members of the St. Elizabeth Hospital Staff in Yakima on May 21.

At the request of the Yakima Retail Trade Bureau, Customer Relations was presented to 144 members of this organization at a breakfast meeting on May 22.

The continued interest in Report Writing indicates this program is filling a definite need at Hanford. At present we are studying possible ways of extending this service to fill additional requests.

SCHOOL OF NUCLEAR ENGINEERING

Spring Term

Classes will end the first week of June. A questionnaire is being sent out to all participants in the Spring Term to determine the student attitude toward the School. Results of this survey will aid the School in improving its curriculum.

Course and Instructor Approvals

Final approvals have been received from the University of Washington for all new instructors and new courses given in the Spring 1956 Term. Approvals from the State College of Washington are still pending.

Fall Term

The School continues to arrange courses and instructors for the Fall Semester.

Visits

On April 26, H. C. Mayer, Jr. visited many professors on the campus at Oregon State College.

On May 10, 11 and 12, H. C. Mayer, Jr. visited a number of staff members at the University of Washington in connection with the School of Nuclear Engineering. He also attended all sessions of the regional meeting of the American Society for Engineering Education. Much discussion centered around enrollments, increasing costs and nuclear engineering curriculum. It appears that many schools agree with the nuclear engineering program which the School of Nuclear Engineering proposed several years ago. The University of Washington is launching their own graduate program in nuclear engineering this fall for engineering graduates.

On May 16 Drs. S. E. Hazlet and J. L. Culbertson from the State College of Washington visited Richland to counsel their own students.

June Graduates

Nine men have now completed all their work for a Master's degree and will receive a diploma at the June commencement. In addition, two candidates who took some course work through the School and wrote a thesis while working at Hanford will receive a Ph.D. degree from Oregon State College this June.

EMPLOYEE & PUBLIC RELATIONS DEPARTMENT
HEALTH & SAFETY SECTION
MAY 1956

General

Personnel Changes

Fourteen additions and 10 deletions resulted in an increase of 4 to a total of 220.

Employee Relations

Employee attendance at 49 meetings was 348.

Visits

F. J. McKinnon attended an A.E.C. Safety meeting at the University of California, Berkeley.
Mr. Galbraith attended the annual meeting of the American Association of Bacteriologists in Houston, Texas.
Dr. D. Rowlett attended the annual meeting of Western Association of Public Health Officers in Salt Lake City.
J. A. Seneker of General Electric Anaheim Plant in California, conducted a forum on paint hazards in the 300 Area.

Industrial Medicine

Long continued efforts to effect a transfer of Industrial Medical activities from the hospital to the adjacent Medical-Dental Building now seem to be acceptable to the Methodist group and the A.E.C. and details of the transfer are being negotiated.

Safety and Fire Prevention

One disabling injury resulted from the sudden appearance of three deer in the plant highway causing a pickup to slide and roll over. Medical treatment cases continued low at 321 for plant and 17 for community.
Community will qualify for the first time for the General Manager's safety award on June 12 if no disabling injuries occur before then. The handling of Zirconium is receiving special attention in view of the recent explosion elsewhere.

Kadlec Hospital

With the approaching transfer of the hospital, activities were concerned with providing space for operations such as purchasing and storage of supplies and accounting work which are now supplied to the hospital by operations outside the hospital. The gradual transfer of long service hospital employees desiring transfer to permanent assignments with General Electric is being effected in order to make the final transfer as smooth as possible.
Operation continued within the budget.
The Pacific Northwest Conference of the Methodist Church voted to take over administration of Kadlec Hospital. They voted to rename the hospital the Kadlec Methodist Hospital.

Public Health

Measles and chickenpox continued to be the major acute problem. The number of cases of measles and chickenpox alone for May (measles 311, chickenpox 63) amounted to 58% of all cases reported for the year through April.

HEALTH & SAFETY SECTION

MAY 1956

Industrial Medical Services

Dispensary visits increased from 5,468 to 5,702. There was one disabling injury. There were 28 nurses on the non-exempt roll. Two nurses were transferred from the hospital staff during the month.

Examinations decreased from 800 to 766. There were no examinations for contractor employees due to the strike. The total number of examinations completed so far this year was 4,446.

There were three information meetings held during the month, one for nurses and two for physicians. A scientific meeting was also held for physicians. Dr. Russell reported on papers heard at the Industrial Medical Association meeting held in Philadelphia.

Plans for moving Industrial Medical service facilities from Kadlec Hospital to the Medical-Dental Building include discontinuing night shift nursing coverage in Richland. Studies include costs for laboratory, x-ray and pharmacy services and space requirements.

The Health Activities Committee met on May 17th and the health topic on food poisoning was presented. Material on this subject was prepared for distribution throughout the plant. First quarter absenteeism for non-exempt employees was 37% above that for the first quarter of 1955. Male absenteeism increased from 2.47% to 2.75%, female from 3.8% to 4.05%. Organization components whose absenteeism was over 4% for the first quarter of 1956 were listed and distributed. Total absenteeism for April was 2.61% as compared to 2.44% for April, 1955. Sickness absenteeism was 1.86% as compared to 1.76% in 1955.

Net costs for the month of April were approximately the same as incurred in March, however both gross costs and expense credits were considerably lower. The decrease in expense credits was due to the strike of construction forces. Decreased salary costs and supplies expense accounted for the major portion of the decline in gross costs. The decrease in the level of costs prevented a possible budget overrun, and it now appears that the operation will maintain its present favorable budget position for the balance of the fiscal year.

Costs-Operations

	April	March	Increase (Decrease)
Salaries	$33,174	$35,347	$(2,173)
Continuity of Service	2,986	3,181	(195)
Laundry	185	156	29
Utilities, Transportation, Maintenance	4,310	4,409	(99)
Supplies and Other	5,457	6,253	(796)
Total Gross Costs	46,112	49,346	(3,234)
Less: Revenue	948	683	(265)
Expense Credits	6,015	9,187	3,172
Net Cost of Operation	$39,149	$39,476	$ (327)

HEALTH & SAFETY SECTION

MAY 1956

Industrial Medical Services (Continued)	April	May	Year to Date
Physical Examinations			
Operations			
Pre-employment	66	33	282
Rehire	16	13	55
Annual	382	403	1893
Interim	44	35	293
A.E.C.	18	8	112
Re-examination and recheck	171	198	722
Termination	75	69	372
Sub-total	772	759	3729
Contractors			
Annuals	0	0	6
Pre-employment	8	3	161
Recheck	1	3	69
Termination and Transfer	15	1	223
Interim	4	0	258
Sub-total	28	7	717
Total Physical Examinations	800	766	4446
Laboratory Examinations-Clinical			
Operations			
Government	83	20	482
Pre-employment, Termination, Transfer	814	557	3627
Annual	2166	2299	10501
Recheck (Area)	236	220	1619
First Aid	37	39	160
Sub-total	3336	3135	16389
Contractors			
Pre-employment, Termination, Transfer	147	18	3812
Total Clinical Laboratory Examinations	3483	3153	20201
X-Ray			
Operations			
Government	6	2	40
Pre-employment, Termination, Transfer	97	65	410
Annual and Interim	498	462	2469
First Aid	51	59	232
Sub-total	652	588	3151
Contractors			
Pre-employment, Termination, Transfer	11	3	489
First Aid	0	2	23
Sub-total	11	5	512
Total X-ray	663	593	3663
Electrocardiographs	150	171	743
Physical Therapy Cases Referred	236	163	622

HEALTH & SAFETY SECTION

MAY 1956

Industrial Medical Services (Continued)	April	May	Year to Date
First Aid Treatments			
Operations			
New Occupational Cases	420	440	2230
Occupational Case Retreatments	1330	1547	7866
Non-occupational Treatments	3699	3715	18019
Sub-total	5449	5702	28115
Construction			
New Occupational Cases	2	0	80
Occupational Case Retreatments	14	0	248
Non-occupational Treatments	3	0	61
Sub-total	19	0	389
Total First Aid Treatments	5468	0	28504
Disabling Injuries			
General Electric	1	1	6
Contractors	0	0	0
Total	1	1	6
Nurse Visits			
Calls made	2	0	2
Employee Personal Illness	1	0	1
Absent due to illness in family	0	0	0
Not at home when call was made	1	0	1

HEALTH & SAFETY SECTION

MAY 1956

Kadlec Hospital

The average daily adult census decreased from 63 to 54.2 as compared with 56.4 a year ago. This represents an occupancy percentage of 49.7 broken down as follows: Mixed Services (Medical, Surgical, Pediatrics) 48.4; Obstetrical Service 55.2. A further breakdown of the Mixed Services shows an occupancy percentage of 42.2 on Medical, 62.5 on Surgical, and 36.8 on Pediatrics.

The maximum and minimum daily census ranged as follows:

	Maximum	Minimum
Mixed Services	52	29
Obstetrical Service	19	7
Total Adult	67	38

The average daily newborn census increased from 8.9 to 11.1 as compared with 11.0 a year ago.

Nursing hours per patient day:

Medical, Surgical, Pediatrics	4.10
Obstetrical	3.02
Newborn	3.23
Total Adult	3.94

Nursing hours in May increased from 3.18 as a result of the decrease in patient census.

The ratio of hospital inpatient employees to patients (excluding newborn) for the month of April was 2.26. When newborn are included the ratio is 1.88.

The net expense for the operation of Kadlec Hospital for April was $10,633 as compared with $14,096 for March. Summary is as follows:

Kadlec Hospital net expense $10,633

This represents a decrease of $3,463 from March primarily as a result of increased revenue from the higher patient census and by decreases in certain expenses incurred in March, such as A.H.A. membership dues of $800, decreased utility charges of $300 and the discontinuance of accruals for public liability claims of $300. Gross costs decreased $1,484 and expense credits increased $126.

The latest information on the project for servicing the hospital and the renovation of the sprinkler systems and also the installation of the emergency generator system is that it is progressing on schedule and that the contract will be let before the end of June, 1956, thus securing the funds allocated for that purpose.

The delivery room and operating room floors will be treated by our own housekeeping personnel to restore the conductivity of these floors.

HEALTH & SAFETY SECTION

MAY 1956

Hospital Unit (Continued)

During the first week of May, Dr. Turner and Mr. Freesz (representative from Maloney and Whitney, Architect Engineers retained by the Methodists) visited the hospital to develop initial scoping on needed remodeling for Methodist operation of the hospital.

Attendance at employee relations meetings for Health and Safety Section follows:

	Meetings	Attendance
Hospital	33	261
Industrial Medicine	5	19
Public Health	9	51
Safety & Fire Prevention	1	11
General	1	6
Total	49	348

Kadlec Hospital held its 8th Annual Open House on May 8, 1956 during National Hospital Week. The number of visitors who made the tour of the hospital was 336. They visited all sections of the hospital except the patient areas - were shown in addition to the usual operating facilities, the contributions recently made by the Ladies Auxiliary, such as the hoist for patients in Physical Therapy, the redecorated nurses' lounge, and the new drapes for the nursery.

On May 9, also in conjunction with National Hospital Week, an emergency evacuation drill for the hospital was conducted, utilizing the services of the Civil Defense group from Transportation. It was highly successful, ten "bed patients" being loaded on a truck within fifteen minutes from the time the alarm was sounded.

Hospital Unit (Continued)	April	May	Year to Date
Kadlec Hospital			
Average Daily Adult Census	63.0	54.2	60.3
Medical	21.6	15.6	20.6
Surgical	24.1	20.0	21.9
Pediatrics	9.3	7.0	9.2
Mixed	55.0	42.6	51.7
Obstetrical	8.0	11.6	8.6
Average Daily Newborn Census	8.9	11.1	9.0
Maximum Daily Census:			
Mixed Services	67	52	72
Obstetrical	13	19	19
Total Adult Census	75	67	83
Minimum Daily Census:			
Mixed Services	38	29	26
Obstetrical Service	4	7	2
Total Adult Census	46	38	29
Admissions: Adult	399	383	1945
Discharges: Adult	385	398	1932
Medical	95	81	462
Surgical	161	172	830
Pediatrics	72	56	326
Mixed	328	309	1618
Obstetrical	57	89	314
Newborn	51	84	294
Patient Days: Adult	1888	1679	9174
Medical	648	483	3137
Surgical	723	619	3326
Pediatrics	278	218	1399
Mixed	1649	1320	7862
Obstetrical	239	359	1312
Newborn	266	345	1373
Average Length of Stay: Adults	4.9	4.2	4.7
Medical	6.8	6.0	6.8
Surgical	4.5	3.6	4.0
Pediatrics	3.9	3.4	4.3
Mixed	5.0	4.3	4.9
Obstetrical	4.2	4.0	4.2
Newborn	5.2	4.1	4.7
Occupancy Percentage: Adults	57.8	49.7	55.3
Medical	58.4	42.2	55.7
Surgical	75.3	62.5	68.4
Pediatrics	48.9	36.8	48.4
Mixed	62.5	48.4	58.8
Obstetrical	38.1	55.2	41.0
Newborn	34.2	42.7	34.6

(Occupancy Percentage based on 109 adult beds and 26 bassinets.)

HEALTH & SAFETY SECTION

MAY 1956

Hospital Unit (Continued)	April	May	Year to Date
Avg. Nursing Hours per Patient Day:			
Medical, Surgical, Pediatrics	3.22	4.10	
Obstetrics	2.94	3.02	
Newborn	4.00	3.23	
Avg. No. Employees per Patient (excluding newborn)	2.26		
Operations: Major	51	47	261
Minor	56	42	241
E.E.N.T.	57	69	315
Dental	1	3	7
Births: Live	55	82	301
Still	0	0	1
Deaths	7	5	22
Hospital Net Death Rate	.92%	.41%	.35%
Net Autopsy Rate	57.1	60.0	50.0
Discharged against advice	2	0	3
One Day Cases	84	108	454
Admission Sources:			
Richland	83.7	79.4	83.3
North Richland	.5	.2	.3
Other	15.8	20.4	16.4
Admissions by Employment:			
General Electric	79.0	75.7	79.0
Government	4.0	2.6	3.4
Facility	5.0	6.6	5.9
Contractors	2.8	1.6	2.4
Schools	1.2	4.4	1.8
Others	8.0	9.1	7.5
Hospital Outpatients:			
First Aid	531	419	2217
Clinical Laboratory	184	183	817
Bacteriological Laboratory	63	38	312
X-Ray	81	125	543
Physical Therapy	179	350	1306
Physical Therapy Treatments			
Outpatient Treatments	217	187	1217
Inpatient Treatments	257	31	634
Total	520	218	1851
Pharmacy			
No. of Prescriptions Filled	2811	2779	13301
No. of Store Orders Filled	590	530	2649

HEALTH & SAFETY SECTION

MAY 1956

Hospital Unit (Continued)	April	May	Year to Date
Kadlec Hospital (Continued)			
Clinical Laboratory Examinations			
Outpatient Examinations	568	436	2501
Hospital	3316	3136	15846
Total	3884	3572	18347
X-Ray Examinations			
Outpatient Examinations	88	131	518
Hospital	188	174	991
Public Health	5	6	78
Total	281	311	1587
Electrocardiographs			
Outpatient Examinations	0	0	1
Hospital	40	35	189
Total	40	35	190
Bacteriological Laboratory			
Treated Water Samples	190	211	935
Milk Samples (Inc.Cream & Ice Cream)	42	42	196
Other Bacteriological Tests	566	302	2143
Total	798	555	3274
Patient Meals			
Regulars	2648	2529	13014
Children under 8	438	429	3055
Specials	1126	997	5163
Softs	704	473	2879
Tonsil and Adenoid	103	93	537
Liquids	174	148	708
Surgical Liquids	70	79	359
Total	5263	4748	25715
Cafeteria Meals			
Noon	1210	1427	6824
Night	217	247	1215
Total	1427	1674	8039

HEALTH & SAFETY SECTION

MAY 1956

Public Health Unit

The number of cases of measles and chickenpox alone for May amounted to 58% of all cases reported for the year through April. Of the 427 reports, 311 were measles and 63 were chickenpox. The peak in measles incidence has been passed, with 579 cases reported for the year to date.

A 12% increase in field visits was brought about by the high communicable disease load.

Visitors to the Unit were Waring Fitch and Duane Anderson, of the State Department of Health Hearing Conservation Program, and Miss Hazel Furman, nursing consultant of the State Department of Health.

Dr. C. Don Platner, Walla Walla orthopedist, supervised a crippled children's clinic. A State Department of Health team assisted in the examination of 24 youngsters, and recommendations were made for their continued care.

Eleven children were examined at a hearing clinic by Dr. H. L. Cahn, otologist. Remedial care was advised for the youngsters who were referred through the school hearing testing program.

The annual preschool health roundup was planned with the Richland Preschool P.T.A. Screening examinations will be done at each school by private physician volunteers. Immunizations will be given and public health nurses will be available for conferences with parents with special problems.

A meeting was held with operators of nursery schools and child care agencies. The group agreed to comply with accepted standards for the operation of such establishments.

Twenty-one new families consulted the social service counselors during May in regard to family or personal problems. Continuing service was given to 78 families who had sought help during previous months. Service was completed for 22 families.

The counselors were largely concerned with parent-child difficulties, marital conflicts and personal adjustment problems of children and adults. Of the 295 interviews held, 133 were with parents who were concerned about their children's development or behavior, 27 were with persons who were concerned about their marriage, 79 were directly with children and adolescents and 38 with adults in regard to problems of personal adjustment, 18 were in regard to other physical, mental or economic problems.

In addition to direct counseling with clients, the social service counselors participated in 49 conferences and 41 meetings and spent 27 hours in the Richland schools in consultation with principals and teachers.

Regular inspections of local food service establishments were carried out with no significant violations.

Public Health Unit (Continued)

Inspections and recommendations were made to correct the following problems: ice machines in 200 W area, locker and shower room cleanliness at Carmichael Junior High School and mosquito breeding in private housing area.

Classes were prepared and presented to high school biology class, hospital food service personnel and dairy company employees.

A case of psittacosis has been confirmed in a bird sold by a local dealer. Other birds were placed under quarantine and five were sacrificed for laboratory examination.

HEALTH & SAFETY SECTION

MAY 1956

Public Health (Continued)	April	May	Year to Date
Education			
Pamphlets distributed	10,989	10,640	52,917
News Releases	15	8	56
Staff Meetings	5	5	17
Classes	3	10	84
Attendance	55	99	1,511
Lectures & Talks	6	10	46
Attendance	127	220	2,486
Films Shown	13	26	76
Attendance	342	1,218	2,921
Community Conferences & Meetings	17	13	73
Radio Broadcasts	17	0	33
TV Broadcasts	6	4	28
Immunizations			
Diphtheria	61	3	135
Diphtheria Booster	8	1	954
Smallpox	316	74	1,461
Tetanus	47	4	249
Tetanus Booster	0	1	1
Tuberculin Test	45	13	199
Immune Globulin	324	126	555
Other	0	1	1
Social Service			
Cases carried over	73	78	306
Cases admitted	31	21	123
Cases closed	27	22	88
Remaining case load	77	77	341
Activities:			
Home Visits	5	4	26
Office Interviews	215	291	1,173
Conferences	40	49	279
Meetings	47	41	238
Sanitation			
Inspections made	126	90	374
Conferences held	41	32	149

HEALTH & SAFETY SECTION

MAY 1956

Public Health (Continued)	April	May	Year to Date
Communicable Diseases			
Chickenpox	23	63	174
Erysipelas	2	0	2
Food Poisoning	0	4	4
German Measles	13	7	64
Impetigo	0	1	4
Infectious Hepatitis	1	0	1
Measles	207	311	579
Mumps	12	14	68
Pinkeye	2	1	4
Ringworm	0	0	2
Roseola	3	8	19
Scarlet Fever	5	9	41
Strep. Infection (Throat)	2	9	21
Thrush	0	0	2
Tuberculosis	0	0	2
Whooping Cough	0	0	80
Total	270	427	1,067
Total No. Nursing Field Visits	442	505	1,958
Total No. Nursing Office Visits	43	27	112

COMMUNITY SECTION

MAY 1956

ORGANIZATION AND PERSONNEL:

	BEGINNING OF MONTH		END OF MONTH	
	EXEMPT	NONEXEMPT	EXEMPT	NONEXEMPT
Community Administration	1	1	1	1
Maintenance & Renovation Unit	7	128	7	126
Police Unit	14	26	14	25
Commercial & Residential Property Unit	5	22	5	20
Fire Unit (Includes 31 Firemen)	49	0	48	0
Electrical Unit	4	16	4	16
Transfer Study	1	1	1	1
Engineering Unit	3	4	2	4
Water & Sewerage Utilities Unit	6	27	6	27
Library Unit	4*	10**	4*	10**
Public Works & Recreation Unit	6	39	6	39
	100	274	98	269

	Exempt	Nonexempt
Additions to Payroll	1	2
Transfers In	2	3
Removals from Payroll	0	1
Transfers Out	5	9

Net decrease 7

*Includes one half-time employee.
**Includes two half-time employees.

MAINTENANCE AND RENOVATION UNIT

May, 1956

		Exempt	Nonexempt
Employees -	Beginning of month	7	128
	Reactivate from illness leave	0	1
	Transfers out	2	1
	Upgraded from non-exempt to exempt	2	2
Employees -	End of month	7	126

INTERIOR PAINT REPORT - FY 1956

May, 1956

FOREMEN: C. M. FRUH; D. W. LUKINS

TYPE UNIT	NO. UNITS SCHEDULED	COMPLETED THIS MONTH	COMPLETED TO DATE	BALANCE TO BE PAINTED
A	409	59	363	46
B	352	77	289	63
C	160	0	154	6
D	2	0	1	1
E	23	1	11	12
F	65	16	43	22
G	5	0	3	2
H	68	16	47	21
K	57	1	56	1
L	38	0	36	2
M	7	1	1	6
Q	28	0	4	24
R	24	0	6	18
S	5	0	0	5
T	0			
U	77	1	6	71
V	185	0	28	157
Y	20	1	19	1
Z	2	0	1	1
1BP	9	0	7	2
2BP	36	0	36	0
3BP	16	4	15	1
Tract	19	0	3	16
1BR Apt.	27	0	4	23
2BR Apt.	69	0	63	6
W-13 Apt.	5	0	3	2
TOTAL	1708	177	1199	509

Units added: 6

Est. MH B. F.	54,782	Actual MH B. F.	56,171½
Est. MH This Month	8,711	Act. MH This Mo.	8,807
Total Est. MH	63,493	Total Act. MH	64,978½

66 manhours were spent on partial paint jobs in houses being renovated.

PLUMBING SHOP

May, 1956

FOREMAN: F. L. ELSENSOHN

Electric water heaters replaced	16
Laundry trays replaced	44
Miscellaneous plumbing work orders completed	31
Miscellaneous steam work orders completed	13
Plumbing for floor and sink linoleum	101
Cleared major sewer stoppages caused by tree roots	69
Cleared major stoppages in main sewers	16
Street steps replaced	8
Repaired sidewalks torn up in cleaning sewers	35
Plumbing for shower stall replacement	19
Repaired radiators	2
Plumbing and steam repairs in hospital and public health buildings	50.1 hrs.
Worked on plumbing service orders	132.6 hrs.
Hauled salvage to North Richland	23.0 hrs.
Broke up foundations and filled wells where tract houses were removed	170.0 hrs.
Loaned plumbers to Public Works for irrigation line repairs	37.0 hrs.

Made routine steam inspections once each week in Government owned commercial facilities, dormitories, and apartments.

Excavated with backhoe machine, for this Unit and for Public Works, for the cleaning out of roots in sewer lines and to repair all leaking and broken underground piping; backfilled, and landscaped excavated portions.

SERVICE ORDER CREW

FOREMAN: G. O. DENNEY

A.	Service orders on hand at beginning of month	552
B.	Received during the month	2000
C.	Completed during the month	2130
D.	On hand at end of month	422

E. A total of 82 manhours were expended on work orders.

F. Backlog of service orders by craft:

Plumbing	242
Electrical	15
Carpentry	165
Total	422

RENOVATION AND LABOR CREW AND MECHANICAL SHOP

May, 1956

FOREMAN: Z. H. MAYBERRY

Houses renovated	11
Minor carpenter repairs to renovated houses	11
Trash pickups	10
Sprayed for insect control	9
Sprayed for basement odors	6

Provided weekly service of delivering linens and janitorial supplies to occupied dormitories.

Provided weekly pickup and delivery of laundry from various General Electric Company units to Richland Laundry & Dry Cleaners.

A. Millwright Crew:

Routine furnace inspections	208
Furnace service orders	85

A new condenser and receiver was installed on O.B. ward air conditioning unit.

Three of the six refrigeration compressors in surgery unit have been mounted on new bases to eliminate vibration.

Provided routine maintenance for Kadlec Hospital.

B. Sheetmetal Crew:

Shower stalls fabricated and installed	22
Coal hatch flashings replaced	16
Ranch house bathroom flashings replaced	50
Gutters replaced	20
Smokepipes replaced	16
Chimney flashings replaced	9

C. Service Crew:

Tree removal orders completed	68
Delivered topsoil	2
Filled basements and wells where houses were removed	9

LINOLEUM & CARPENTER SHOP

May, 1956

FOREMAN: R. M. MARTIN

Replaced bath wall tile	21
Repaired bath wall tile	3
Replaced bath floor linoleum	12
Repaired bath floor linoleum	1
Replaced kitchen floor linoleum	12
Repaired kitchen floor linoleum	1
Replaced bedroom floor linoleum	4
Replaced living room floor linoleum	4
Repaired living room floor linoleum	4
Replaced utility room floor linoleum	1
Replaced dining room floor linoleum	2
Replaced hall floor linoleum	2
Replaced steps and landing linoleum	4
Replaced sink top linoleum	80
Repaired sink top linoleum	2
Replaced work bench linoleum	11
Replaced cupboard top linoleum	3
Replaced kitchen sinks	7
Replaced ranch window screens	46
Repaired ranch ladders	2
Repaired roofs	3
Repaired siding	4
Repaired walls	1
Repaired screen doors	2
Repaired exterior doors	2
Repaired interior doors	1
Repaired porches	2
Replaced sash balances	5
Replaced prefab window screens	37
Repaired street steps	33
Repaired tile - Kadlec Hospital	1
Repaired door - Potts' Rainbow Service	1
Chempoints	147
Paint touch-ups	77
Installed sill caps	59
Made interior house repairs	135
Coated roofs	20
Jack & shim	10

COMMUNITY SECTION
RICHLAND POLICE DEPARTMENT
MONTHLY REPORT
MAY, 1956

ORGANIZATION	EXEMPT	NON-EXEMPT
EMPLOYEES - BEGINNING OF MONTH	14	26
TRANSFERS IN	0	0
TRANSFERS OUT	0	1
NEW HIRES	0	0
TERMINATIONS	0	0
TOTAL - END OF MONTH	14	25

GENERAL

EFFECTIVE MAY 28, THE NUMBER OF EMPLOYEES OF THE RICHLAND POLICE DEPARTMENT WAS REDUCED FROM 40 TO 39 BY THE TRANSFER OF A PATROLMAN TO THE SECURITY PATROL. A REQUISITION HAS BEEN PLACED TO OBTAIN A REPLACEMENT.

THE RICHLAND POLICE DEPARTMENT WAS ADVISED FRIDAY, MAY 25, IN A TELEGRAM RECEIVED FROM G. C. STEWART, EXECUTIVE VICE PRESIDENT OF THE NATIONAL SAFETY COUNCIL, THAT RICHLAND HAD BEEN AWARDED CERTIFICATES OF ACHIEVEMENT FOR "NO TRAFFIC DEATHS", "ACCIDENT RECORDS", AND "PUBLIC SAFETY EDUCATION" IN THE 1955 TRAFFIC SAFETY AWARD PROGRAM.

THE ANNUAL TEEN-AGE ROAD-E-O, SPONSORED BY THE JUNIOR CHAMBER OF COMMERCE, WAS HELD ON MAY 13. TAKING TOP HONORS WAS IRVIN ROGERS, WHO WAS ALSO WINNER OF THE 1953 AND 1955 CONTESTS. FOR WINNING FIRST PLACE 3 YEARS, IRVIN WILL KEEP THE LARGE POLICE ATHLETIC LEAGUE TROPHY. FIRST PLACE WINNER IN THE GIRLS' DIVISION WAS BONNIE BLOSSOM, WHO ALSO TOOK FIRST PLACE IN 1955.

THE ANNUAL SCHOOL BOY PATROL PICNIC, SPONSORED BY THE POLICE ATHLETIC LEAGUE, WAS HELD ON THURSDAY, MAY 24. APPROXIMATELY 300 BOYS WERE IN ATTENDANCE AT THIS ALL DAY AFFAIR. THE BOYS WERE TREATED TO A MOTION PICTURE SHOW IN THE MORNING, FOLLOWED BY A LUNCH OF HOT DOGS, COLD DRINKS, ICE CREAM, AND ALL THE TRIMMINGS, FURNISHED BY THE POLICE ATHLETIC LEAGUE. DURING THE AFTERNOON, AWARDS, TROPHIES, AND MEDALS, ALSO FURNISHED BY THE POLICE ATHLETIC LEAGUE, WERE PRESENTED TO BOYS FROM EACH SCHOOL, AS WELL AS TO THE TWO OUTSTANDING SCHOOL PATROLS DURING THE YEAR. LADIES OF THE AMERICAN LEGION AUXILIARY SERVED.

ON MAY 10 CAPTAIN C. F. KLEPPER ATTENDED THE ANNUAL BUSINESS MEETING OF THE WASHINGTON POLICE OFFICERS' ASSOCIATION HELD IN WALLA WALLA ON MAY 10 AND 11.

MEMBERS OF THE TRAFFIC CONTROL GROUP CONDUCTED 6 TRAFFIC SAFETY MEETINGS DURING THE MONTH OF MAY.

ONE GROUP OF BLUEBIRD GIRLS WERE CONDUCTED ON A TOUR OF POLICE HEADQUARTERS.

TRAFFIC

RICHLAND	1956 APR.	1956 MAY	1955 APR.	1955 MAY	1956 TOTAL TO DATE	1955 TOTAL SAME PERIOD
REPORTABLE ACCIDENTS	18	12	15	17	138	97
PROPERTY DAMAGE ACCIDENTS	15	9	12	16	124	86
INJURY ACCIDENTS	3	3	3	1	14	11
TOTAL PERSONS INJURED	3	4	4	1	16	14
FATAL ACCIDENTS	0	0	0	0	0	0
ACCIDENTS-DAYLIGHT HOURS	15	11	13	14	106	68
DARKNESS "	3	1	2	3	32	30
ACCIDENTS-BUSINESS DISTRICT	5	6	7	4	39	22
RESIDENTIAL "	10	4	6	10	88	60
OTHER "	3	2	2	3	11	16
ACCIDENTS INVESTIGATED	12	8	12	13	88	64
CRIMINAL COMPLAINTS FILED	9	7	8	10	53	33
VIOLATIONS CONTRIBUTING TO ACCIDENTS:						
NEGLIGENT DRIVING	4	2	1	6	23	12
FAIL. TO YIELD RIGHT OF WAY	7	6	8	3	43	24
FOLLOWING TOO CLOSELY	1	2	2	2	17	12
DRUNK DRIVING	0	0	0	0	2	2
PEDESTRIAN VIOLATION	1	0	1	1	2	3
INATTENTION TO DRIVING	0	0	0	0	1	2
RECKLESS DRIVING	0	0	1	0	0	1
SPEEDING	0	1	0	0	1	1
UNSAFE SPEED	1	0	0	0	39	18
IMPROPER BACKING	2	0	0	0	2	5
IMPROPER PARKING	0	0	0	0	0	0
DISREGARDING STOP SIGN	0	0	0	2	0	4
HIT AND RUN	0	0	0	1	0	2
IMPROPER PASSING	1	0	1	1	3	3
IMPROPER TURN	0	1	0	0	3	3
FAILURE TO SIGNAL	0	0	0	0	0	1
DEFECTIVE EQUIPMENT	0	0	1	1	1	2
WRONG SIDE OF ROAD	0	0	0	0	0	1
ANIMAL IN ROAD	0	0	0	0	0	1
BICYCLE VIOLATION	1	0	0	0	1	0

RICHLAND	1956 APR.	1956 MAY	AVE. PER ACCIDENT 1956 APR.	AVE. PER ACCIDENT 1956 MAY	AVE. PER ACCIDENT 1955 APR.	AVE. PER ACCIDENT 1955 MAY
ACCIDENT PROPERTY DAMAGE	$5,305.00	$2,695.00	$294.72	$223.75	$241.88	$210.29

TRAINING

ADVANCE TRAINING FOR RICHLAND POLICE MEMBERS AT THE SMALL ARMS RANGE FOR THE PERIOD IN FIELD INSTRUCTION WAS AS FOLLOWS:

.38 CALIBER REVOLVER	½ HOUR
TOTAL NUMBER OF MEN REPORTING AT THE RANGE	10
NUMBER OF MEN FIRED OVER THE ARMY-L COURSE	10

QUALIFICATIONS ON THE ARMY-L COURSE AS FOLLOWS:

EXPERT	2	20%	MARKSMAN	5	50%
SHARPSHOOTER	3	30%	UNQUALIFIED	0	00%

ACTIVITIES	MARCH	APRIL	MAY
BANK ESCORTS AND DETAILS	0	0	0
BIKES IMPOUNDED	2	6	6
BIKES REGISTERED	22	15	113
CHILDREN LOST OR FOUND	26	17	27
COMPLAINTS INVESTIGATED	95	149	119
DEATHS REPORTED	0	2	0
DOG, CAT, LOOSE STOCK, OTHER ANIMAL COMPLAINTS	14	11	15
DOGS, OTHER ANIMALS, RPTD LOST OR FOUND	9	14	8
DOORS, WINDOWS, REPORTED OPEN IN FACILITIES	71	80	82
EMERGENCY MESSAGES DELIVERED	4	10	2
FIRES INVESTIGATED	24	12	13
GUNS REGISTERED	12	5	4
LAW ENFORCEMENT AGENCIES ASSISTED	6	6	9
LETTERS OF INQUIRY	111	133	97
MISCELLANEOUS ESCORTS AND DETAILS	7	8	9
PERSONS INJURED BY DOGS	3	3	2
PLANT DEPARTMENTS ASSISTED	28	26	38
PRISONERS PROCESSED THROUGH JAIL	13	10	3
PRIVATE INDIVIDUALS ASSISTED	23	22	32
PROPERTY LOST OR FOUND	13	31	19
RECORDS INQUIRIES	33	35	25
REPORTS PROCESSED THROUGH RECORDS	202	201	218
STREET LIGHTS OUT REPORTED TO ELECTRICAL	166	101	102
TRAFFIC SAFETY MEETINGS (MAY ATTEN. 355)	9	7	10
TOTALS	884	904	953

MONTHLY REPORT
RICHLAND POLICE DEPARTMENT
MAY 1955

OFFENSES	KNOWN	UNFOUNDED	CLEARED OTHER*	CLEARED ARREST
PART I				
1. Criminal Homicide	-	-	-	-
A. Murder & Non. Neg. Mans.	-	-	-	-
B. Mans. by Negligence	-	-	-	-
2. Rape	-	-	-	-
3. Robbery	-	-	-	-
4. Aggravated Assault	-	-	1**	-
5. Burg-Break. & Entry	3	2	-	-
6. Larceny Over $50.00	3	-	-	-
Under $50.00	33	-	1	2
7. Auto Theft	-	-	-	-
TOTAL PART I CASES	39	2	2	2
PART II				
8. Other Assaults	1	-	1	-
9. Forgery & Counterfeit	-	-	-	-
10. Embezzlement & Fraud	-	-	-	-
11. Stolen Prop:Buy:Receive	-	-	-	-
12. Weapons:Carry:Possessing	-	-	-	-
13. Prostitution	-	-	-	-
14. Sex Offenses	8	-	6	-
15. Offenses Ag. Fam. & Child	-	-	-	-
16. Narcotics	1	-	-	-
17. Liquor Laws	-	-	-	-
18. Drunkenness	1	-	-	1
19. Disorderly Conduct	-	-	-	-
20. Vagrancy	-	-	-	-
21. Gambling	-	-	-	-
22. Drunk Driving	-	-	-	-
23. Viol. Road & Driving Laws:				
Failure to Stop & Identify	-	-	-	-
Speeding	26	-	14	12
Stop Sign	24	-	8	16
Negligent Driving	10	-	1	9
Right of Way	6	-	2	4
Reckless Driving	3	-	1	2

	OFFENSES	KNOWN	UNFOUNDED	CLEARED OTHER*	CLEARED ARREST
	Defective Equipment	14	-	12	2
	Illegal Passing	2	-	1	1
24.	Parking	11	-	6	5
25.	All Other Traffic Violations	51	-	15	36
26.	All Other Offenses:				
	Vandalism	8	-	2	-
	Public Nuisance	4	-	-	4
	Fire	3	-	1	-
	Mischief	3	-	3	-
	Property Damage	1	-	1	-
	Bike Violations	6	-	6	-
	Illegal Use of Firearms	1	-	1	-
	Permitting Vicious Animal to Run	1	-	-	1
	Prowlers	2	-	1	-
	Juvenile Delinquency	2	-	2	-
	Trespassing	1	-	1	-
	Arson	1	-	-	-
27.	Suspicion	-	-	-	-
	TOTAL PART II CASES	191	-	85	88
	PART III				
28.	Missing Persons	4	-	4	-
	Lost Persons	14	-	14	-
	Lost Animals	8	-	1	-
	Lost Property	8	-	5	-
29.	Found Persons	5	-	5	-
	Found Property	27	-	7	-
	Found Animals	-	-	-	-
	TOTAL PART III CASES	66	-	36	-

OFFENSES	KNOWN	UNFOUNDED	CLEARED OTHER*	CLEARED ARREST
PART IV				
30. Fat. M.V. Traff. Accid.	-	-	-	-
31. Pers. Inj. M.V. Traff. Accid.	3	-	-	-
32. Prop. Dam. M.V. Accid.	9	-	-	-
33. Other Traffic Accidents	-	-	-	-
34. Public Accidents)				
35. Home Accidents)	No Accurate Statistics Kept			
36. Occupational Accidents)				
37. Firearms Accidents	-	-	-	-
38. Dog Bites	2	-	-	-
39. Suicides	-	-	-	-
40. Suicide Attempts	-	-	-	-
41. Sud. Death & Bod. Found	-	-	-	-
42. Sick Cared For	-	-	-	-
43. Mental Cases	-	-	-	-
TOTAL PART IV CASES	14	-	-	-
COMPOSITE TOTALS				
PART I,II,III,IV CASES	310	2	123	90

Cases listed under "Cleared Other" are those cleared by various means other than arrest, such as: order from the prosecutor, juvenile probation officer or other situations in which a mutual agreement is obtained. They are definitely cleared cases and differ from the arrest column only in that there was no arrest. **One Aggravated Assault cleared for previous year.

Property reported stolen	Richland	$3,184.38
Property recovered	Richland	1,764.00

MONTHLY REPORT RICHLAND POLICE DEPARTMENT JUVENILES INVOLVED MAY 1956

OFFENSES	NO. CASES	JUVENILES	SEX	7	9	11	14	15	16	17
Vandalism	2	5	M		1	1	2	1		
Mischief	3	5	M	1	1		2	1		
Trespassing	1	4	2 M 2 F				2	2		
Juvenile Delinquency	2	2	F						2	
Illegal Use of Firearms	1	1	M							1
Indecent Exposure	5	2	M				1	1		
Prowler	1	1	M							1
Fire	1	1	M				1			
TOTALS	16	21		1	2	1	8	5	2	2

RICHLAND POLICE DEPARTMENT
RICHLAND JUSTICE COURT CASES
MAY, 1956

VIOLATIONS	NO. OF CASES	NO. OF CONV.	NO. OF FORF.	CASES CONT.	CASES DISM.	SENT. JAIL	SENT. SUSP.	LIC. REV.	CASES ORIG. PREV. MONTH	BAIL FORF	FINES	FINES SUSP.
No Driver's License	14	9	5							$ 33.50	$ 84.50	$ 30.50 (6)
No Certificate of Registration	3	2		1							2.50	5.00 (1)
Defective Equipment	2	2									20.00	7.50 (1)
Negligent Driving	14	8	4	2				1		150.00	367.50	127.50 (7)
Drunk Driving	1				1							
Reckless Driving	5	2	1	2				1		100.00	125.00	25.00 (1)
Speeding	14	8	5	1					2	60.00	85.00	20.00 (4)
Stop Sign	15	6	8	1						67.50	62.50	17.50 (3)
Inattention to Driving	2	1			1				1		15.00	10.00 (1)
Fail. to Yield Rgt of Way	5	3	1	1					1	50.00	127.50	45.00 (2)
Fail. to Comply Restric Signs	20	14	4		2					30.00	90.00	5.00 (1)
Perm Oper Motor Veh by Unlic Op	2	2									80.00	50.00 (2)
Illegal Parking	11	6	3	1	1					10.50	17.50	4.50 (3)
Illegal Passing	1			1								
Illegal "U" Turn	1		1							5.00		
No Vehicle License Plate	1	1									15.00	7.50 (1)
Invalid Vehicle License	2		1	1					1	5.00		
Improper Right Turn	1			1								
Violation SR Act	1	1				1	1				50.00	40.00 (1)
Vagrancy	1	1				1	1		1			
Public Intoxication	1		1			1	1			12.50		
Public Nuisance	4	2	1	1						27.50	35.00	12.50 (1)
Petit Larceny	2	2				1	1				31.00	
Indecent Liberties	1				1				1			
Riding Double on Bicycle	1	1									7.50	5.00 (1)
Permitting Vicious Animal to Run at Large	1			1								
Totals	126	71	35	14	6	4	4	2	7	551.50	1,215.50	412.50 (36)

1 Negligent Drvg - Lic susp 60 days.
1 Reckless Drvg - Lic susp 45 days.
1 Speeding - Cont'd indefinitely - gone to Japan.
1 Invalid Vehicle License - Cont'd indefinitely - left state.
1 Violation SR Act - Placed on probation 6 months. Refrain from use of intox liquors. Refrain from going to places where liquor is sold or dispensed. Violate no laws cnty or stat 20 days cnty jail, 18 days susp.

1 Vagrancy - 30 days cnty jail, susp for 6 months good behavior.
1 Public Nuisance - Susp when muffler is repaired.
1 Petit Larceny - 30 days cnty jail, 15 days susp.
1 Indecent Liberties - Trans to Superior Court.

COMMERCIAL AND RESIDENTIAL PROPERTY UNIT
COMMUNITY SECTION
May, 1956

PERSONNEL - COMMERCIAL AND RESIDENTIAL PROPERTY UNIT:

	Exempt	Non-Exempt
Employees - beginning of month	5	22
Transfers In	0	1
Transfers Out	0	3
New Hires	0	0
Terminations	0	0
Employees - end of month	5	20

PERSONNEL - COMMERCIAL AND NONCOMMERCIAL FACILITIES:

	Commercial	Noncommercial	Total
April	1610	82	1692
May	1615	80	1695
Net Change	+5	-2	+3

SUMMARY OF ROUTINE ITEMS PROCESSED:	Commercial	Noncommercial	Total
Work Orders	40	1	41
Back Charges	1	0	1
FY Work Orders	427	35	462
FY Back Charges	12	2	14

CONTRACTS AND NEGOTIATIONS:

A. Commercial

1. Supplemental Agreements

a. Western Union Telegraph Co. - to provide for a renewed term and new payments.

b. Stanley N. Randolph - to provide for a new term.

GENERAL

A. Commercial

1. John R. Ingram subleased space in the Richland Development Co. Building for the operation of an insurance office.

2. Young Fashions subleased space in the Bailey Building No. 1.

3. K. D. and L. L. Vowels d/b/a Bud & Gene's, subleased the Continental Oil Station at Stevens Drive and Knight Street.

4. E. O. Powers subleased the True's Oil Co. Station at 750 George Washington Way.

5. Chris Stordahl subleased space in the Densow Drug Building for the operation of a barber shop.

6. Young Fashions sublease expired in the E. J. Hanson Building.

7. Barf's Shoe Repair sublease expired in the Richland Investment Co. Building.

8. Steve's Photo Shop sublease expired in the Richland Development Co. Building.

9. C. D. McGuinness d/b/a Columbia Motors opened for business on Lee Boulevard.

10. V. O. McVicker reopened and is operating Helen's Millinery in McVicker's Building No. 1.

11. Guernsey T. Ford terminated his sublease in the E. C. Maillard Building.

B. Noncommercial

1. The plot of land in the 1300 block on Jadwin Avenue, which had been leased to the Church of Jesus Christ of Latter-day Saints, was sold to the church on March 28, 1956.

2. The plot of land and old church building in the 500 block on Goethals Drive was sold to the South Side United Protestant Church on May 11, 1956.

3. Two private boat moorage permits were issued.

4. Seven pasture permits were cancelled, one was assigned, and two were issued.

COMMERCIAL PROSPECTS:

Inquiries were received during the month concerning the establishment of the following types of enterprises in Richland.

Electrical Appliances Lumber Yard

COMMERCIAL AND RESIDENTIAL PROPERTY UNIT - COMMUNITY SECTION May, 1956

SUMMARY OF OCCUPANCY AND EXPANSION STATUS:

	APRIL	MAY
A. Commercial		
1. Number of Government-Owned Buildings	40	40
a. Number of Businesses operated by Prime Lessees	38	38
(1) Number opened	0	0
(2) Number closed	0	0
b. Number of Businesses operated by Sublessees	25	25
(1) Number opened	4	0
(2) Number closed	1	0
Total Businesses in Government-Owned Buildings	63	63
2. Doctors and Dentists in Private Practice	31	31
3. Number of Privately-Owned Buildings	85	85
a. Number of Business operated by Prime Lessees	53	55
(1) Number opened	0	2
(2) Number closed	0	0
b. Number of Businesses operated by Sublessees	124	125
(1) Number opened	1	5
(2) Number closed	5	4
Total Businesses in Privately-Owned Buildings	177	180
4. Privately-Owned Buildings under Construction	8	8
5. Total Number of Businesses in Operation	240	243
a. Total openings	5	7
b. Total closings	6	4
B. Noncommercial		
1. Government-Owned Buildings		
a. Churches	1	0
b. Clubs and Organizations	5	5
c. Government Agencies	2	2
Total	8	7
2. Privately-Owned Buildings		
a. Completed and in Use	13	13
b. Under Construction	2	2
3. Church Plots and Buildings in Private Ownership	11	13
4. Pasture Land Permits	99	94
5. Private Boat Moorage Permits	64	66

COMMERCIAL AND RESIDENTIAL PROPERTY UNIT
TENANT RELATIONS

PROGRESS REPORT

	Orders Incomplete April 30, 1956	Orders Issued 4-30 to 5-30.	TOTAL ORDERS Incomplete May 30, 1956
Service Orders	992	2083	621
Work Orders	1096	385	901
Service Charges		241	

PRINCIPAL WORK ORDER LOAD	Incomplete April 30, 1956	Incomplete May 30, 1956
Laundry trays	55	19
Kitchen Cabinet Linoleum	47	36
Kitchen floor linoleum	13	5
Bathroom tileboard	18	6
Shower Stalls	18	1

ALTERATION PERMITS ISSUED - April 111
May 101

T-V Antenna	18	Basement Excavation	1
Electric Heat	3	Tool Shed	1
Letter Box Plate	1	Air Conditioner	7
Outlet Wiring	1	Automatic Dryer	14
Backdoor	2	Refinish floors	1
Clothesline Poles	1	Patio	5
Fence	17	Basement Partition	1
Porch Canopy	1	Concrete Walls	3
Automatic Washer	19	Tool Shed	1
Dishwasher	1	Flagstone by Kitchen Window	1
Bathroom Cabinet	1	Storm Windows	1

INSPECTIONS - - - - - - - April 796
May 643

Alteration Permits	15	Renovations	83
Lot Lines	20	Shows	75
Steps and Walks	12	Linoleum	60
Sinks	15	Laundry Trays	19
Yard	1	Paint (Interior)	111
Dormitories	125	Miscellaneous	21
Cancellations	86		

TENANT STORES

MERCHANDISE ISSUED	TOTAL AMOUNT
Shades	2506
Reflectors	31
Ice cube trays	64
Meat Tenders	5
Drip Trays	9
Hydrator Glasses	4
SC Drip Pans	8
Door Stops	21
Furniture Delivery	20
Furniture Recall	21
Grass Seed per pound	2

RECALL AND DELIVERY OF RANGES AND REFRIGERATORS MONTH OF MAY

	DELIVERY		RECALLED	
	RANGES	REFERS	RANGES	REFERS
A	1 SC	3 TA		3 TA
B	3 SC	6 TA		7 TA
F		1 TA		1 TA
H				1 TA
L				1 GE
Q		2 GE		2 GE
U		1 TA		
Y	2 GE	1 TA	2 GE	1 TA LGE
1 BR		2 TA		2 TA
2 BR		2 TA	1 SC	5 TA
3 BR	2 SC	1 TA	3 SC	2 TA
TOTAL	8	19	6	26

RANGES IN WAREHOUSE		REFERS IN WAREHOUSE	
SC	27	TA - 7'	11
Frigidaire	1	GM - 7'	4
GE	9	GM - 6'	2

COMMERCIAL & RESIDENTIAL PROPERTY UNIT
RESIDENTIAL LEASES

MAY 1956

DORMITORY REPORT

	Beds Available	Vacant Beds	Occupied Beds
Men	399	108	291
Women	305*	72**	233*
Total	704*	180**	524*

*This includes 2 beds used for Dormitory Offices
**This includes 9 beds vacant in Dormitory M 13.

Waiting Lists:

	Single Rooms	Double Rooms
Men	0	0
Women	0	0

The following Dormitories are in stand-by condition:

W 11-38 beds M 6-39 beds M 8-39 beds
W 12-38 beds M 7-39 beds

Total beds 193

Dormitories released for temporary office use:

W 15-50 beds W 21-50 beds
W 16-50 beds W 17-50 beds

Total beds 200

RESIDENTIAL LEASING

CANCELLATIONS		ALLOCATIONS	
Voluntary terminations	20	New tenants	36
Transfers	5	Moves (within Richland)	20
Move off Project	14	Turnovers	5
Turnovers		Total	61
Separation	1		
Death	1	Houses on which leases were	
Marriage	2	cancelled "Ready to Rent"	51
New Pastor	1	Houses on which leases were	
Move to Dormitory	1	cancelled sent to "Renovation"	16
Death	1		
Not Eligible	1	Number persons on Master List	488
Moves	20	Number names on Move List	6330
Total	67		

RICHLAND HOUSING

HOUSING UTILIZATION AS OF MONTH ENDING MAY 31, 1956
HOUSES OCCUPIED BY FAMILY GROUPS

	Conven.	A&J	T	Pre Cut	Ranch	Pre Fab	Dorm Apt.	A&J Apt.	2BR Apt.	4th Hsg.	Tract	Total
G. E.	2216	267	10	401	890	1127	7	55	59	208	23	5263
Comm. Fac.	102	17		26	47	56		5	3	8	3	267
AEC	67	25		16	32	25	3	3	5	8	2	186
Other Gov't.	11	3			3	2					1	20
Post Office	10				2	8					1	21
Schools	68			6	13	39			2	1		129
Comm. Act.	10			1	6	5				1		23
Med. Fac.	3	16			1	2				3		25
J. A. Jones	3	3			3							9
Minor Const.						1						1
Not Cert.	2	2			2	1				1	1	9
Total	2492	333	10	450	999	1266	10	63	69	230	31	5953
Ready to Rent	4					5		1	1		1	12
In Renovation	4				1	5						10
Boarded Up											2	2
Total	2500	333	10	450	1000	1276	10	64	70	230	34	5977

	Begin Month	Moved In	Moved Out	End of Month	Difference
Conventional	2496	+15	-19	2492	-4
A&J	333	+0	-0	333	0
"T"	10	+1	-1	10	0
Precut	450	+5	-5	450	0
Ranch	998	+8	-7	999	+1
Prefab	1270	+25	-29	1266	-4
Dorm Apts.	10	+0	-0	10	0
A&J Apts.	64	+0	-1	63	-1
2BR Apts.	70	+1	-2	69	-1
4th Hsg.	230	+3	-3	230	0
Tract	31	+0	-0	31	0
Total	5962	+58	-67	5953	-9

COMMUNITY SECTION
RICHLAND FIRE DEPARTMENT
MONTHLY REPORT

May 1956

ORGANIZATION & PERSONNEL	EXEMPT	NON-EXEMPT
Employees - Beginning of Month	17	32
Transfers In	0	0
Transfers Out	0	1
Terminations	0	0
New Hires	0	0
End of Month	17	31

FIRE PROTECTION

Fire Loss (Estimated):	Government	$ 25.00
	Personal	0.00
	May Total	$ 25.00
	1956 Total	$77,060.06*

*Includes final compilation of figures on March 19, Pennywise Drug Fire, amounting to $18,806.06 Structural and $54,435.00 Stock and Fixture Damage.

Response to Fire Alarms	25
Ambulance Responses	26
Inside Schools or Drills	22
Outside Drills	2
Safety Meetings	8
Security Meetings	3
Alarm Boxes Tested	210

Fire Department ambulances participated in the trial evacuation of Kadlec Hospital on May 9.

Five juvenile groups, totaling 62 youngsters with nine adult leaders and two General Electric employee groups, totaling 28 people, were conducted on tours of the Central Fire Station during May.

One Boy Scout was examined for Firemanship Merit Badge on May 10.

On May 11, one Fire Department ambulance with two firemen and two officers participated in the "Dear Doctor" live television show over Station KEPR to explain and demonstrate ambulance service.

Captain Hatfield was detailed May 14 and 16, to instruct Carmichael Junior High public health classes in first aid and resuscitation.

On May 26, the West Richland Volunteer Fire Department requested assistance on a fire involving a Benton County REA Storage Building, containing flammable liquids in drums. The Richland tank truck was dispatched.

The Fire Department officers training course, conducted by the State Board for Vocational Education, held each Tuesday evening since April 10, in the Central Fire Station was completed April 29. In addition to Richland Fire Department officers, many of whom attended during off-duty hours, representatives of the Hanford Works industrial, Pasco and Kennewick Fire Departments also attended.

The evening of May 30, one engine company was dispatched at the request of Police Department to ladder a downtown commercial building in an effort to apprehend a prowler atop the building.

The 1956 residential hazard inspection program, which started May 14, resulted in 535 inspections with 573 hazards detected. Engine Company personnel devoted slightly under 219 man-hours on this activity during the period May 14 to 31. Firemen reported 306 "Not at Home" residents in the area covered.

FIRE PREVENTION

A total of 213 buildings were inspected, resulting in the preparation of 16 hazard reports. Two hundred and four fire extinguishers were inspected and serviced; 3 removed and 4 installed. Eleven fire hose standpipes were also inspected.

Fire Marshal Pigg was guest speaker at the Richland Rotary Club's May 15 Luncheon on National Fire Safety Contests. This same day the National Fire Safety Contest grand award trophy was formally presented to the Richland Chamber of Commerce at their weekly meeting and Marshal Pigg related events of his trip to Washington, D. C., to accept the award.

Assistant Fire Marshal Hayes conducted refresher courses in residential hazard inspections for all fire department personnel.

Annual tests and repairs of the Kadlec Hospital automatic sprinkler systems were supervised by the Fire Prevention staff. Plans for alteration of these sprinkler systems were also reviewed.

The Assistant Fire Marshal met with School District representatives to draw up rules on the use of decorations in public schools. Hayes also assisted AEC Engineers and contractors on final acceptance test of new Columbia High School alarm system and modifications of the Chief Joseph Junior High system. Assistance was given the Public School Safety Supervisor in preparation of regulations in compliance with Richland codes. Surprise fire drills were supervised at Columbia High School and Chief Joseph Junior High. Suggestions were submitted to the principals for improving the evacuation procedure.

Special electrical wiring and building exits were inspected at the Community House prior to the recent Instrument Show.

Instigated correction of serious fire hazards encountered in the First Baptist

Church attic.

Inspected exterior exposure hazards of all commercial buildings with relation to trash disposal.

Provided Public Health with Washington State fire safety requirements on Home Nurseries to assist them in conducting a meeting of Nursery operators.

Serious hazards encountered in Westgate Shopping Center were reported to Commercial Real Estate for enforced correction.

Accompanied Deputy State Fire Marshal on an inspection of Kadlec Hospital to determine necessary corrections for issuance of a State license under private operation.

Recommended installation of a standard automatic sprinkler valve at Jason Lee School to prevent false alarms. Tripped sprinkler system at Chief Joseph School, caused by failure of automatic air compressor; requested supervised cleaning, draining and resetting of systems.

Conferences were held with several merchants on use of incinerators after June 18, removal of trash wagons.

Richland Motors was requested to install static ground wire on 55-gallon drum of paint thinner.

COMMUNITY SECTION
RICHLAND ELECTRICAL UNIT
MONTHLY REPORT
MAY 1956

ORGANIZATION AND PERSONNEL	Exempt	Non-Exempt
Employees Beginning of Month	4	16
New Hires		1
Transfers In		1
Transfers Out		1
Terminations		1
Total End of Month	4	16

SYSTEM MAINTENANCE AND OPERATION

Outside Lines

Poles set	5
Poles transferred	21
Anchors and guys installed	4
Street lights installed	1
Mast arms installed	1
Street lights relamped - 1100 Area	103
Street lights relamped - 700 Area	7
Flood lights relamped - 1100 Area	8
Flood lights relamped - 700 Area	4
Traffic signals relamped	5
Primary line footage added	0
Primary line footage removed	0
Transformer KVA added	312.5
Transformer KVA removed	275.0
New services installed	0
Services removed	1
Scheduled outages	4
Unscheduled outages	8
Trees trimmed	127
Stand by and escort	3

TRAFFIC SIGNALS

Operational failures	3
Routine check R. R. signal at Van Giesen	4
Total signals in operation - automatic	19
Total signals in operation - manual auxiliary	6
Total signals in operation - flasher	3

UTILITIES - ELECTRICAL MAINTENANCE

Electrical motors checked and serviced - irrigation	60
Electrical motors checked and serviced - water	72
Electrical motors checked and serviced - sewage	50

FIRE DEPARTMENT TEST AND MAINTENANCE

Inside circuit and equipment checks	6
Outside circuit checks	3
Inside faults repaired	3
New circuits placed in operation	0
Outside faults repaired	3
New boxes placed in operation	0

SUBSTATIONS

Main feeder breaker checks - BB1S1	4
Main feeder breaker checks - BB1S2	4
Secondary and pad located stations - checked jumpers, cutouts, grounds and general condition.	26

METERING - OPERATION, MAINTENANCE, CONSUMPTION AND REVENUE

Voltage and load checks	0
Meters tested - customer's requests	3
New meters shop tested	2
Faulty meters replaced or repaired	5
Damaged meters and covers	2
Residential read-ins	104
Residential read-outs	107
Residential disconnects	0
Residential reconnects	0
Radio interference checks	1
Overloaded meters changed out	2
Routine meter tests	3

Consumption and Revenue for Month of April

	No. of Meters	KWH	Revenue
Residential - Schedule 1	6,963	8,959,093	$ 82,646.75
Commercial - Schedule 2	420	3,524,096	28,312.78
Total	7,383	12,483,189	110,959.53

TRAFFIC SIGNAL SYSTEM

Performed routine lamping as programmed and repaired traffic signal at Symons & Stevens. Repaired time clock on traffic signal at Stevens & Lee Blvd. Replaced faulty cable on traffic signal at George Washington Way & By-Pass.

FIRE PROTECTION SYSTEM

Made a portable relay tester and adjusted control board relays at the Central Fire Station. Performed routine fire alarm box repair and relocation including the clearing of ground faults on two fire alarm circuits. Rewired F.A. box 251 to allow for future routine testing.

SEWAGE TREATMENT AND DISPOSAL SYSTEM

Performed extensive motor and switch maintenance service at the sewage lift station #1. Replaced motor at Riverside Park sewage lift station. Installed new light fixture in basement of sewer lift station #1.

GENERAL COMMUNITY MAINTENANCE

Performed air conditioner motor maintenance, connected hot water heater in W-20, and installed additional wiring for Instrument Show at the Community House. Placed signs, on back charge basis, for Horse Show and Armed Forces Day.

WATER SYSTEM

Performed rewiring of controls at Irrigation Station #3 and #6. Refused motor at #4 and rebuilt motor at #3 Irrigation Stations. Replaced worn motor bearings at #3000 "A" Well. Delivered poles for bridge across canal and for supports at excavation on Lee. Braced 2 poles for sewer excavations.

SUBSTATION AND METER MAINTENANCE

Performed routine transformer and substation maintenance. Overhauled 11 distribution transformers.

OUTSIDE LINES

Continued on pole line rebuild work with associated transfer of other facilities such as telephone and television. Transferred all utilities to new BPA poles along Thayer Drive. Continued on transformer installation work to take care of increased demand due to heating loads. Replaced all plant security locks used on Richland Electrical System facilities with new locks. Two transformers were refused and four house services were replaced due to wind damage. Received and completed four back charge work orders. Provided escort service for 2 cranes and 1 house.

CALL OUTS

Ten non-exempt and seven exempt employees were called out during the month to repair seven cases of trouble.

COMMUNITY SECTION
ENGINEERING UNIT
MONTHLY REPORT
MAY 1956

PERSONNEL	Exempt	Non-Exempt	Total
Employees Beginning of Month	4	4	8
Transfers Out	3	0	3
Transfers In	1	0	1
Terminations	0	0	0
Total End of Month	2	4	6

BUILDING PERMITS ISSUED

1. W. R. Hobbs - 1018 Willard - Utility Building
2. Densow Drug - 1015 Wright - Additions to Store
3. Harold Schmitt - 1327 Totten - Tool Shed
4. M. S. Fisher - 1213 Wright - Patio
5. Wm. McIntyre - 1031 Cedar - Roof over Patio
6. H. D. Farr - 406 Abbot - Garage, storage shed
7. 1 Sign Permit

NEW MUNICIPAL CONSTRUCTION STARTED

NONE

ENGINEERING JOBS COMPLETED

A-5801 - Property Signs
C-11489 - Plat and Legal Description - "Bethel Church of Nazarene"

STATUS OF ENGINEERING UNIT PROJECTS

G-01020 - Falley Field Improvements - Contract awarded. Contractor started work May 29, 1956.

G-01021 - Lowering of Irrigation Risers - Contract awarded. Contractor started work May 29, 1956.

G-01022 - Development Riverside Park, Newton to No. End of Park - Contract awarded. Contractor started work May 29, 1956.

G-01023 - New Sewage Treatment Plant Road - Design 98% complete.

G-02205 - Additional Street Lights, Richland, Washington - Design 98% complete. Bid package being prepared and project advertised.

C-0572 - Study of Drainage Ditch from Swift Blvd. to Origin on Wellsian Way - Plans to AEC for approval 3-26-56.

C-9457 - Retirement of Separate Irrigation System - Drawings and specifications materially complete.

C-95450 - Replace Lot Line Corner Stakes - an open active file. Work being performed as requested.

BUILDINGS UNDER CONSTRUCTION

First Baptist Church (Richmond & Raleigh Sts.) - 98% complete. Progressing slowly.

Plans, Specs., Inspections, Central U.P. Church (Alternate #1) - 50% complete. Work progressing as scheduled.

Plans, Specs., Inspections, Richland Lutheran Church - 25% complete. Work progressing as scheduled.

Plans, Specs., Inspections, L. G. Cook Building - Building materially complete. Open for business.

Plans, Specs., Inspections, Parker Hansen Building - 90% complete. Portions of building now occupied.

Plans, Specs., Inspections, Moore's Service Station - Work stopped by owner. No progress.

Plans, Specs., Inspections, Parcell's Bulk Station, Wellsian Way - 95% complete. No progress this month.

Plans, Specs., Inspections, True's Oil Co. ("Old Rose Garden Site") - Construction materially complete. Final inspection to be made.

Plans, Specs., Inspections, Charles D. McGuinness - 95% complete. Open for business.

Plans, Specs., Inspections, Rice's Rug Service - 80% complete.

COMMUNITY SECTION
PUBLIC WORKS AND RECREATION UNIT
MONTHLY REPORT
MAY 1956

ORGANIZATION AND PERSONNEL	Exempt	Non-Exempt
Employees Beginning of Month	6	39
Transfers Out	1	1
Transfers In	1	1
New Employees	0	0
Terminations	0	0
Total End of Month	6	39

ROADS AND STREETS

Approximately 150 lineal feet of sunken curb on Williams and Goethals was removed and replaced.

The drain ditch between George Washington Way and Goethals was cleaned by the Transportation Section on work order from this unit. The floor of the ditch had built up over the years to a depth of 18 to 24 inches of silt.

Hot oil and blacktop patching was completed on Davidson, Swift and Lee Streets in preparation for seal coating. Cottonwood remains to be done. Also, surplus rock and debris is yet to be removed from the streets named.

Continued patching with blacktop of street deteriorations, water, meter box installations, sewer excavations, cave-ins, etc.

Continued maintenance of storm sewer facilities.

Lee Street was closed between Wellsian and Thayer Drive to permit sewer line excavation to correct a faulty line. Backfill and cleanup has been accomplished. Blacktopping, curb and sidewalk replacement will be made as time permits.

Materials used this month are as follows: 126 tons Blacktop; 42 cubic yards of 3/4 Minus Rock; 13 cubic yards of 1/2 Chips.

The Traxcavator went out-of-service May 22. Clutch assembly is on order and is expected on June 8.

The Elgin Sweeper is awaiting parts shipped May 31 from Elgin, Illinois via Railroad Express. These parts are expected at any time.

The Haise Loader that is also out-of-service for a motor overhaul is also awaiting parts that are on order.

SANITATION

Waste removal during the month required collection and disposal of the following: Residential: 1036 tons; Commercial Facilities: 297 tons; Trailers: 115 tons; for a total of 1448 tons.

High water on the Columbia River necessitated moving the Disposal Grounds to a

PUBLIC WORKS AND RECREATION UNIT

SANITATION (CONT'D.)

new location south of By-Pass Highway opposite Duane Avenue extended on May 29, 1956.

PARKS AND PUBLIC GROUNDS

General cleanup of assigned areas continued during May.

Assigned on a permanent five (5) day a week basis one (1) Serviceman at Riverside Park Monday, Thursday, and Friday with four (4) hours worked Saturday and Sunday weekly for cleanup and refilling of Wading Pool.

Mosquito Control continued during May with adult mosquitoes in the village proper receiving special attention. Also, lowlands along the Yakima River were sprayed by airplane. Crew placed on special shift on 5-21-56. Complaints have been few since shift change.

Flood conditions of both the Yakima and Columbia Rivers have received attention during the latter part of May, especially at Riverside Park where patrolling, barricading, and necessary precautions have been taken to keep the park open for public usage.

The Wading Pool at Riverside Park opened for public use on 5-21-56. Usage has been normal for this early in the season.

Watering of assigned lawn areas continued during May. Two (2) Servicemen were placed on shift schedule on 5-21-56, 11:48 P.M. to 8:18 A.M.

Maintenance of shelterbelt areas continued during May with one (1) Serviceman being used on this work.

Assisted Waste Removal group on garbage collection after the 30th of May holiday.

RECREATION

General

The monthly visit of the Red Cross Blood Bank was held in the Social Hall, Tuesday, May 1.

The Minnesingers Annual Concert was held at Chief Joseph Junior High School on Friday, May 4, at 8:00 P.M. This boys' choral group is a co-sponsored activity of the Public Works and Recreation Unit and the Richland Youth Council.

The Instrument Society of America gave its annual show at the Community House on Wednesday and Thursday, May 9 and 10, to an estimated 3500 people.

Memorial Softball Field was the scene of the Pony League Jamboree on Saturday night, May 19, at 7:30 p.m.

The League of Women Voters held their Spring Banquet in the Social Hall on Wednesday, May 23.

The Washington State Music Teachers' Association's annual meeting was held at

PUBLIC WORKS AND RECREATION UNIT

RECREATION (CONT'D.)

General (Cont'd.)

the Community House on Saturday, May 26.

The Richland Police Athletic League gave its annual School Boy Patrol Party at Riverside Park on Thursday, May 24 with about 400 boys and girls in attendance.

Attendance Statistics - May 1956

	No. of Sessions	Youth	Adults	Sub Total
A. Community House				
AAU Boxing	17	225	68	293
American Little League	1		25	25
American Red Cross	1		165	165
Area Bowling League	1		8	8
Atom Bowling League	1		14	14
Atomic Energy Commission	1		15	15
Benton County Republican Convention	1		150	150
Boy Scouts	2	34	6	40
Boys of Woodcraft	2	25	5	30
Campfire Girls	1	2	20	22
City Council	3		110	110
Colt League	2	58	27	85
Fencing	4		20	20
Games Room	20	734	139	873
Gentrics	1		21	21
Hi Spot	7	1 713	37	1 750
Instrument Society of America	4	350	3 125	3 475
International Folk Dancers	3	6	44	50
League of Women Voters	1		80	80
Maint. #2 Bowling League	1		25	25
Minnesingers	1	22	7	29
100 Area Chief Operators	1		7	7
Play-For-Fun League	1	2	4	6
Pony & Colt League	2		121	121
Rec-A-Teers	4		235	235
Richland Chess Club	5		34	34
Richland Citizen's League	1		15	15
Richland Coin Club	2	6	14	20
Richland Rod & Gun Club	2	29	180	209
Richland Softball Association	1		30	30
Richland Women's Club	1		200	200
Social Security	2		71	71
Stamp Club	1	6	20	26
Wash. State Music Teachers' Assoc.	1	50	10	60
YWCA	1	20	30	50
Youth Movement Group	1		5	5
Total Community House	101	3 282	5 087	8 369

PUBLIC WORKS AND RECREATION UNIT

RECREATION (CONT'D.)

Attendance Statistics - May 1956 (Cont'd.)

	No. of Sessions	Youth	Adults	Sub Total
B. Parks and Playgrounds				
Wellsian Lake	30	1 500	750	2 250
Ball Field Bookings	210	3 640	860	4 500
Hi School P. E. Classes	20	3 600	300	3 900
Memorial Softball Field	20	1 500	2 900	4 400
Picnic Bookings	68	2 040	2 690	4 730
Playlots	30	6 600	3 300	9 900
Triple-O-League	2		360	360
Jefferson Little League	20	1 500	2 400	3 900
Columbia Baseball	20	1 000	1 900	2 900
Total Parks & Playgrounds	420	21 380	15 460	36 840
C. Summary				
Community House and Parks and Playgrounds total for May 1956	521	24 662	20 547	45 209
Calendar Year to Date				100 427

COMMUNITY SECTION
WATER AND SEWERAGE UTILITIES UNIT
MONTHLY REPORT
MAY 1956

ORGANIZATION AND PERSONNEL

	EXEMPT	NON-EXEMPT
Employees Beginning of Month	6	27
Transfers Out	0	0
Transfers In	0	0
New Employees	0	0
Terminations	0	0
Total End of Month	6	27

DOMESTIC WATER

Normal operations were continued throughout the month.

Routine overhaul work on number 4 well was completed and the well was returned to service.

The 14" and 20" feeder mains from 3000 area were out of service to facilitate an exchange of sand traps on these lines. Some difficulty was encountered for a few days in maintaining desired water supplies because of excessive line friction with these two lines out of service. However the re-installation of these sand traps have been completed and the feeder mains returned to service.

Several complaints have been received because of excessive sand in water system. We have endeavored to correct this condition by flushing sand from water mains in affected areas through fire hydrants. We have encountered some difficulty with sand stopping water meters in commercial facilities along George Washington Way in Uptown business district. It is hoped that the exchange of sand traps will alleviate the sand problems.

Construction of the new Sedimentation Basin at the 3000 area well field was completed and put in service on May 29, 1956.

DOMESTIC WATER DATA

	Well Production	Av. Da. Prod.	Total Consumpt.	Av. Da. Cons.
Richland	135,480,000	4,370,300	466,640,300	15,052,900
North Richland	335,610,000	10,826,100	34,340,000	1,107,700
Columbia Field	91,288,800	2,944,800		
300 Area			59,596,000	1,922,400
Total	562,378,800	18,141,200	560,576,300	18,083,000

WATER AND SEWERAGE UTILITIES UNIT

Maximum daily production 25,973,400 gallons on May 29, 1956

Maximum daily consumption 25,703,400 gallons on May 29, 1956

SEWERAGE SYSTEM

Normal operations and routine maintenance were continued throughout the month.

The south trunk sewer main was excavated on Lee Blvd. east of Thayer Drive to correct a faulty condition that has existed since the sewer was constructed. It was found that the sewer line had been laid between two manholes with a rise of approximately 1 foot at about the mid-point. It was necessary to re-lay approximately 70 feet of sewer line to get down to grade with high manhole. The excavation necessary to make this correction required cutting all of the roadway and the sidewalk on each side of the street. Some additional problems were encountered with telephone cable, power pole anchors, power poles, water mains, storm sewers, and school yard irrigation systems. Although there was many obstacles the job was completed without serious incident or interuption of any services except for having the street closed to traffic.

The barminutor units at the main sewage lift station have been removed after developing some troubles. These units were recently installed on a performance guarantee basis. The contractor and the equipment vendor were notified and are now in the process of correcting the troubles.

SEWERAGE DATA

Plant No. 1 Total Flow	43,700,000	Average Daily Flow	1,409,600
Plant No. 2 Total Flow	82,864,000	Average Daily Flow	2,673,000
Total Flow	126,864,000		4,082,600

IRRIGATION SYSTEMS

All irrigation pumping stations have been put in service. Some section of the distribution systems are out of service waiting repairs.

COMMUNITY SECTION
RICHLAND PUBLIC LIBRARY
MONTHLY REPORT
MAY, 1956

ORGANIZATION AND PERSONNEL

	EXEMPT	NON-EXEMPT
Employees beginning of month	4	10
Transfers in	0	0
Transfers out	0	0
New Hires	0	0
Terminations	0	0
End of Month	4	10

GENERAL

Circulation

Books	18,225	
Magazines	463	
Pamphlets	86	
Records	1,093	
Pictures	0	
Interlibrary Loans	30	
Grand Total		19,897

Current Book Stock

Books added this month	241	
Books withdrawn this month	10	
Grand Total		38,952
Phonograph records added	89	
Phonograph records withdrawn	0	

Registration

Adult	126	
Juvenile	82	
Juvenile registrations dropped	18	
Net Total	190	
Total registered borrowers		21,709

Meetings in North Hall	17	
Children's Story Hour Attendance (through May 16)	754	(Preschool - 576 Elementary- 178).

Miss Marie Golubski, Children's Librarian, visited the Richland Public Schools from May 14 through May 29 to tell the children in the second through seventh grades about the Children's Summer Reading Club, "Speed Into Space Through Books". Miss Golubski talked with 3,061 children during these visits. The Summer Reading Club started May 28, with 112 children registering the first day. As of May 31, 196 children had registered for participation in the

Reading Club.

Miss Golubski, Children's Librarian, was in Seattle May 9 and 10, observing children's television programs on the Seattle television stations and talking with program planners for these children's programs. It is hoped that the Richland Public Library will be able to obtain some public service time from the local television station for children's story hour programs this fall.

Art exhibits of works of Richland Junior and Senior High School students were on display in the North Hall this month.

AUXILIARY OPERATIONS AND PLANT PROTECTION SECTION

MONTHLY REPORT - MAY 1956

ORGANIZATION AND PERSONNEL

Number of employees on payroll:

	Beginning of Month	End of Month	Increase	Decrease
Staff	2	2		
Administration Area Maintenance	105	104		1 (a)
Security and Patrol	471	474	3 (b)	
Fire Protection	129	128		1 (c)
Office Auxiliaries	114	115	1 (d)	
Telephone	82	82		
TOTALS	903	905	4	2

NET INCREASE: 2

(a) - Administration Area Maintenance

1 Reactivated
2 Transferred in
1 Transferred out
3 Terminations

(b) - Security and Patrol

1 Transferred in
3 Reactivated
1 Deactivated

(c) - Fire Protection

1 Termination

(d) - Office Auxiliaries

6 New Hires
1 Reactivated
5 Transferred out
1 Termination

FIRE PROTECTION UNIT

Fire Responses

HAPO	4	Loss	$575.00
Outer Areas	3	Loss	281.00
Totals	7		$856.00

Description of Fires

Manufacturing - Separations - T.B.P. Operations
200-West - Time 10:29 AM - 5/1/56

During cutting of process jumpers at 221-U Building, uncooled material was discarded into a wooden box containing about two feet of sawdust. This ignited and caused a smoldering fire. Extinguishment was effected by area employees prior to arrival of the Fire Department. No loss.

Radiological Science - Biophysics - Methods Unit
300 Area - Time 2:03 PM - 5/2/56

Caused by the chemical reaction which took place while laboratory employees were using wet ash on sage brush under a hood in Room 9A, 329 Building. Responded to box alarm No. 26, on arrival found visible fire in hood and duct on second floor Fire was extinguished using a minimum of water from booster line. Loss $575.00.

Manufacturing - Electrical Utility - Line Maintenance
Outer Area - Time 10:40 PM - 5/7/56

Cracked insulator and rain caused a leakage of electrical current to ignite cross-arm and top of pole, damaging same sufficiently to necessitate replacement. Pole No. L2, L3, C8, 14 was located at mile post No. 10, Route 11A, south of sub-station. Patrol notified Fire Department. Loss $271.00.

Manufacturing - Radiation Monitoring Sub-Section - Laundry
Outer Area - Time 12:22 PM - 5/10/56

Responded to a request for assistance from 300 Area Radio Operator to help in a vehicle accident north of area, at railroad crossing on Route 4S. Helped in cutting victim from cab and loading in ambulance. No fire.

Manufacturing - Transportation - Bus and Rail
Outer Area - Time 7:40 AM - 5/20/56

Waste material used in wheel journal box of locomotive No. HW-3731, ignited while enroute between 100-K and 100-D. Responded to a telephone alarm, on arrival found train crew had extinguished fire using CO_2 and dry chemical extinguishers. Fire Department stood by until box had cooled. Loss $10.00.

Engineering - Minor Projects Sub-Section - Minor Construction
White Bluffs - Time 10:31 AM - 5/23/56

Sudden surge in water pressure was the probable cause that tripped sprinkler alarm in Warehouse #1, transmitting box alarm No. 321. Fire Department responded and a check of the building was made with no evidence of fire. Alarm system was reset. No fire.

Engineering - Minor Projects Sub-Section - Minor Construction
200-East - Time 5:37 PM - 5/29/56

Auxiliary system tripped and actuated master box No. 52, Blaw-Knox Pipe and Electrical Shop, cause unknown. Building was checked with no evidence of fire. Reset alarm system and returned to quarters. No. fire.

Drills Held During May

Outside drills held	135
Inside drills held	108

General

The Safety Committee of four firemen and an officer made their monthly tour of all Fire Stations on May 25. Hazards were listed and are being corrected.

Two classes on artificial respiration were held at 200-West with a total of 36 plant employees attending.

A class on the proper use of Chemox Masks was held at 200-West with 12 employees attending.

Two fire extinguisher demonstrations were conducted in the 200-West and 300 Areas with a total of 41 employees attending.

47,350 feet of fire hose and 903 feet of ladders were used for drill purposes during May.

Fire Extinguishers

Inspected	1909
Installed	19
Delivered to new locations	14
Seals broken	40
Serviced	553
Weighed	702

Gas Masks

Inspected	64
Services	11

Hand Lines inspected	101
Hose Boxes inspected	32
Sprinkler Systems inspected	1

OFFICE AUXILIARIES SUB-SECTION

Plant Mail

Internal mail and postal both increased during the past period. Teletypes decreased slightly.

Special assignments increased sharply. A total of seventy-two separate mailings from Addressograph were distributed on the various lists.

A mail stop survey was completed in 300 Area during the past period and the personnel records for mail location purposes were brought up to date. The mail runs were also revised and work loads shifted for better time distribution.

Addressograph and collating work remained at a high level and plate making for addressograph was also high as the home address file was reviewed and revised.

Two pieces of equipment were replaced on the collator by the company from which it was purchased which will enable the machine to reach a fuller capacity of production.

Types and pieces of Mail Handled	April	May
Internal	4,172,457	4,964,936
Postal	98,638	106,779
Special	2,153	2,193
Registered	12,054	10,909
	4,285,302	5,084,817
Total postage used	$3,499.25	$4,064.81
Total teletypes handled	3,246	2,794
Total Store Orders handled	552	585

Addressograph	Number of Runs	Total Copies	Number of Runs	Total Copies
Plate name list	120	174,866	22	164,540
Housing list	20	49,097	20	55,321
Payroll list	9	16,396	14	27,709
Total New Plates	4,136		5,135	
Total Corrected Plates	3,248		6,182	
	7,384		11,317	
Machine Collating (sheets)	168,657		150,206	

Printing Unit

On May 8, 1956, the Supervisor of Printing visited the United States Government Printing Office, Seattle, Washington. The purpose of the trip was to inspect the printing facilities in Seattle, to determine if certain pamphlets and booklets, now being procured from commercial sources out of contract field printing allotments, could be reproduced by the Seattle Field Service Division for the Hanford project. The equipment in Seattle is actually a duplication of the equipment we have here at Hanford, with the exception of the Linotype machine, which is limited to produce Century Text type, and not especially suited for the kind of material required in pamphlets and booklets.

It was established also that the Seattle office would require much more time to produce a job for Hanford because of existing commitments than would be required to produce the same job here in our shop.

Printing requests for priority scheduling ran above normal during the month. In order to meet target dates requested, overtime had to be scheduled on the following orders:

Top Secret for AEC, 43 masters for 5 copies each.
12,000 HHFA Richland Housing disposal information leaflets.
9,600 (2 page) General Manager's Employee Newsletter on Reorganization.
9,700 General Manager's Employee Newsletter re information on the appraisals of housing in Richland.
10,000 General Manager's Employee Newsletter re GE Pension Plan.
50 sets HAPO Organization Structural charts.

Orders requiring unusual printing and finishing operations:

1,000 copies Employee Handbook of Safe Practices
150 copies Transportation Section Safety Rules Booklet.
950 copies of manual for stenographers called "This Way, Please".
42 Technical Information & Research and Development Reports.

Large Orders:

One 50,000 Terms and Conditions
One 281,248 G-88-DS "Don't Say It--Write It"

Work Completed	April	May
Orders received	408	374
Orders completed	380	390
Average orders on hand	68.8	87.3
Copies printed	856,690	1,261,085
Vacuum frame plated masked	548	532
Negatives processed	780	664
Photo copy prepared	271	310
Litho plates processed	604	537

Stenographic Unit

Three Stenographers and two Stenographer-Typists were assigned to the Stenographic Unit in May. Four transfers were effected to other plant units and seventeen temporary assignments were made.

The revised "This Way Please" was completed and 702 copies have been distributed to date. Distribution was made upon individual requests from supervision.

Work load was consistently heavy throughout the greater part of the month. Assignments were completed for 78 people against 59 cost codes. Larger assignments included 46 hours typing material for safety attitude survey, 129.5 hours typing ozalid masters for Project Section, 78.5 hours typing for Manufacturing-Administration, 41 hours typing for Reactor-Process, and 268.5 hours typing for Reactor-Maintenance.

	April	May
Total Production hours	1,840	2,062.5
Training Hours	190	131.5
Unassigned hours	43	56
Meeting hours	27	2.5
Absence hours paid	48	48
Vacation hours	40	80
	2,188	2,380.5

Office Equipment Unit

The annual physical inventory was completed by Stores and our records have been posted accordingly.

The expendable office furniture account No. 93 was valued at $20,393 on April 30 or an average of 5.6 months supply on hand.

A total of 132 service orders and seven work orders were issued during the month. This is approximately 75% increase over our average monthly issues. No safety priority orders are incomplete.

There were 599 debit and credit store orders processed during the month or an average of 31 per working day.

The following is a detail of number of pieces of furniture handled during May:

	Inter-Plant		Off Site		
Item	Issued	Rec'd	Issued	Rec'd	Salvage
Bookcase	18	6	0	20	0
Blackboard	22	0	0	30	0
Cabinet	73	22	0	4	21
Card File	6	0	0	0	0
Costumer	25	16	0	0	0
Chair	241	197	0	112	71
Desk	112	37	0	6	5
Daveno	19	7	0	0	0
Table	29	45	0	22	9
Miscellaneous	322	21	0	434	21
	867	351	0	628	133

Office Equipment Unit (Continued)

A survey of all plant lunch rooms was made to determine the total number of chair seats that would be required to upgrade the existing bench and picnic type tables now in use. This survey indicated that a total of 869 seats would be needed. The replacement of these temporary lunch room tables with permanent fixtures is being planned.

The open type shelving purchased for replacement of standard four drawer cabinets has been received. Two locations are now using the equipment and they have been favorably accepted by supervision and file clerks.

Office Machines

A total of 4,202 machines were in service and stock on April 20, 1956. A total of 11 new machines were received during the month.

An IBM listing has been forwarded to all custodians of office machines for the annual physical inventory and utilization survey of office machines.

One ditto machine was removed from service which was located in the 200-East Area. One field trip was made to Yakima to see the new A.B. Dick Offset machine demonstrated by the Rosser-Sutton Company.

Office Machine Repair Unit

During the month, fifteen requisitions were issued to purchase office machine spare parts. This is an above average amount of requisitions for any one month; the reason being that parts inventory cards were reviewed during the month and stocks brought up to specified level.

Space was obtained during the month in the 2705-Z Building, 200-West Area, to establish an Office Machine Repair Shop. This shop will serve both the 200-East and 200-West areas. One mechanic has been selected to work out of this shop. The assignment will be effective June 20, 1956.

Three new Royal electric typewriters were received during the month. A representative of the Royal Company checked out the machines for proper operation, gave maintenance instructions, and explained various design changes on this model to our mechanics.

During the month, the work load increased on the repair of city water meters. This was due to large amounts of sand being pumped into the city water system. Seven meters were cleaned and repaired for commercial facilities.

Orifice plate changes were made at the following locations: Desert Inn, The Mart, Columbia High School, and the Carmichael Junior High School. A different size orifice plate is used during the winter than in the summer; this was the change over to the summer orifice. Steam flow meters in the above locations were checked for proper operation.

Office Machine Repair Unit

Survey was made in the 702-B Telephone Building to determine the necessary equipment needed to relocate master time clock systems from the presently used 702 Building to the new 702-B Building. This change will be made necessary upon sale of the City Telephone System. Work was started on several special relay cabinets, a part of the required equipment.

Repair tickets processed:	April	May
	504	435

Duplicating Unit

During the month an additional Model 1250 offset press was received and assigned to 200-West Duplicating, replacing a Model 80 duplicator. The installation should assist in handling lengthy runs, and orders requiring the use of card stock.

On May 25, 1956, a new duplicating facility was opened in 200-East Area, at the request of the Purex Sub-Section. This office is equipped with an Ozalid contact machine which will provide while-you-wait service on requests for blue line copies. In addition, multilith and embosograf service will be available at this location.

Among the priority orders processed during the month were: The Biology Research Annual Report for 1955, consisting of 188 pages and a total of 140,182 copies, which was handled by 300 Area Duplicating. The 703 Duplicating office completed for AEC Budget Division, the FY 1958 HOO Budget; the order consisted of approximately 550 masters and a total of 24,750 copies.

	April	May
Orders received	4,069	4,276
Orders completed	3,746	4,246
Orders on hand	243	135
Offset Plates	16,601	18,477
Offset Copies	1,108,896	1,239,903
Verifax masters	3,691	3,975
Verifax copies	10,239	11,311
Ditto Masters	394	249
Ditto Copies	6,618	5,318
Xerox Plates	2,075	2,092
Ozalid Masters	166	61
Ozalid Copies	1,050	726
Embosograf Orders	37	22
Embosograf Copies	688	122
Number of copies duplicated	1,129,566	1,259,472

ADMINISTRATION AREA MAINTENANCE SUB-SECTION

Approximately 800 gallons of used crankcase oil were applied to portions of 700 Area grounds to alleviate extremely dusty conditions.

Spot patching and repairs were made to 700 Area roads. Height of temporary walk leading south from 703 fifth wing was increased to provide improved facilities for pedestrian traffic.

ADMINISTRATION AREA MAINTENANCE SUB SECTION (Continued)

Spring application of CMU Weed control has been completed.

Remainder of hedge has been removed from area ground steam and water softening plants, to improve appearance and facilitate grounds maintenance work.

Arrangements have been made with HOO AEC for providing steam meters at two additional buildings which will be tranferred along with the hospital.

Preliminary discussions were had with AEC personnel regarding space requirements for the new J. A. Jones procurement group.

Administration Area space occupancy was broken down by individual components in preparation for annual landlord report and possible future personnel moves.

Current order for Hauserman office partition is expected shortly after June 1. Practically all of this shipment is already committed.

A number of estimates and sketches were provided to customer groups and additional work was done on as-built maps.

Fire warden training meetings were continued.

Additional refinements were made in 703 fifth wing air conditioning system.

Building and Equipment Maintenance

Revisions to the first floor interior of W-16 as necessary to provide office space for HHFA were completed. This job included fabrication of counter and shelving in the lobby; removal of 22 clothes closet partitions; installation of three new doorways, four security window grates, and 20 convenience outlets; conversion of incandescent lighting to fluorescent; and overall painting.

Approximately 11,000 square feet of asphalt floor tile were applied in the third and fourth wings of Building 703. All floor tiling presently planned for Building 703 will be completed on June 1, 1956 and men assigned to swing shift on May 16, 1956 to perform this work will return to day shift on June 4, 1956.

A total of 80 lineal feet of Hauserman partitioning was erected during the month, of which 36 lineal feet involved relocation.

Interior cycle painting was completed in 701-A; three rooms of 760; and lobby, stairwell and first floor hall of W-10.

Spray painting of 15 cross walks and 200 lineal feet of curbing was completed for Community Section, and approximately 80% of the work involved in spraying railroad crossing caution signs on the roadway at 36 crossings within the barricade was completed for Transportation Section.

Electrical heating elements were installed in air ducts of Building 747 to correct a heating deficiency in the southwest section of this building.

Building and Equipment Maintenance (Continued)

A large sheetmetal "hot stick" box was fabricated, painted, and installed on a hydraulic ladder truck for the Richland Electrical Unit.

Approximately 100 file cabinets were secured to prevent tipping, and all other safety work orders have been kept current.

Overhaul of No. 3 boiler at Building 784 was started and is now about 50% complete. Included in the completed work was the replacement of 19 boiler tubes.

A replacement line of stainless steel and brass was fabricated and installed between the mixing tank and water softener at Building 784-A.

Alterations were completed on drain and vent lines from urinals in men's room of Building 1170 as necessary to correct overflowing of these urinals which has been prevalent for some time and was the source of employee complaints. The original drains served two fixtures each and an overflow would occur whenever a pair were flushed together. The changes involved running a separate drain and vent from each fixture and alteration of the sewer and vent headers to accommodate these new lines.

Miscellaneous work completed in the 700 Area includes: installation of a bank of "dust-stop" air filters at 702-B, a steam radiator and 12 buzzer circuits in 762, one receptacle circuit in 703, three fluorescent fixtures (2 in 762 and one in 702), and grounding wires from 15 appliances at 747; replacement of 2 faulty water coolers in 703; replacement of an inadequate evaporative air cooler at 744; repair of four main valves and three pilot valves on PRV's, and four Tempco hot plates at 747; fabrication of seven funnel racks for 747, and an exhaust hood for dryer in 760 reproduction room; and replacement of linoleum on six desk tops and one counter.

Work completed for Transportation Section includes: Installation of two evaporative air coolers, five new electrical circuits, two door closer motors and brackets, and a new door and baffle in hot air plenum, all at 1171; overhaul of the Ray Oil burners at 1170 and 1171, and about 70% of the overhaul work on the 1171 hot air furnaces; fabrication and installation of a stainless steel tank in 1171 radiator shop; inspection of 1171 fire alarm system; revisions of 1172 gas pump light circuits and Richland barricade signal and fixture circuits; relamping of 1170, 1171 and meteorological tower and offices; and semi-weekly testing and repair of Civil Defense sirens, which this month included the adjustment of variable resistors at No. 3 siren as necessary to compensate for changed resistance on the phone lines to this siren.

Included in services completed at Central Stores were: cleaning and overhaul of the Ray oil burner; re-building of electrical contactors on lift truck No. 5505; fabrication of two sheet metal cabinets for janitorial supplies and equipment; laying of 900 square feet of masti-pave flooring and installation of a fluorescent fixture in Warehouse 15; routine relamping and battery service; and excess crating as requested.

Seasonal maintenance was continued on buildings and equipment in the 600, 700, Central Stores and Transportation Shops areas, and locksmith and glazing service was supplied to all plant areas.

Building Service

A total of 515 venetian blinds were tank washed this month. This blind washing program, started on April 23, has now covered all 700 Area buildings except 703.

The window washing cycle commenced in March has been completed in all area buildings with exception of 761 and 762.

Concrete floors in 713 are being repainted with color-seal and this work is approximately 40% complete.

Routine janitorial service was continued per schedule in all 700 Area buildings, Central Stores and Buildings 1170 and 1171 of Transportation Section.

Steam Operations

Number 4 boiler was in operation at the beginning of the month, with Numbers 1 and 2 in reserve. Number 3 boiler is in process of having biennial major overhaul.

Increased heating load made it necessary to add number 2 boiler to the line on May 10. Decreased heating load permitted Number 4 boiler to be removed from service on May 15, and Numbers 1 and 4 are now in reserve.

The quantity of steam generated was approximately 0.9% more than for same period of previous year.

Two loads of sulphuric acid were sent to 300 Area Power House.

The stainless steel valves were repaired and piping replaced on acid side of water softening equipment. New acid mixing tank is about 50% complete.

All discharge valves on Worthington Compressor were replaced.

All electric motors in Steam Plant were lubricated during month of May.

The sanitary sewer that was leaking into the settling basin was repaired.

It was necessary to replace main steam valve at Village Theater because of excess leakage.

Approximately 75% of main steam line valves to 700 Area buildings and commercial facilities have been closed for the summer.

Coal consumed:	843 Tons
Steam generated:	12,010.2 M. Lbs.
Steam leaving plant:	10,509.0 M. Lbs.
Steam delivered:	8,053.8 M. Lbs.
Total water softened:	1,757,300 Gallons
Total soft water sent to hospital:	62,920 Gallons
Total soft water sent to 784 heating plant:	1,691,380 Gallons

TELEPHONE SUB-SECTION

Overall evaluation figures for telephone properties comprising the Community telephone facilities were transmitted orally (via telephone) from Gordon Jorgensen to R. W. Beck and Associates to E. S. Staples on May 31. Formal transmittal of the information is expected about June 6.

Five telephone service trucks were replaced because of their age and deteriorated condition. Identification numbers of the replaced vehicles are reported under Plant Telephone Operations and Commercial Telephone Operations.

Plant Telephone Operations

Information for a June edition of the Plant telephone directory was furnished to the printer on May 14.

Located and cleared two moisture faults in the old 13-quad trunk cable between the BY and White Bluffs exchanges and one similar fault in the cable serving the Gable Maountain radio station.

Arranged traffic meters and associated circuits in the 700 Area Plant Exchange as required to register all traffic handled by Information Operators.

Modified the power switchboards in the 200-EW and White Bluffs Exchanges to remove wiring and equipment formerly used in connection with operation and control of motor generators. The motor generator battery chargers were replaced in April 1956 with rectifier type chargers.

Relocated CX test-jack cable terminations on the intermediate distributing frame in the 700 Area Plant Exchange to provide space for growth and improved wiring arrangement.

Completed an annual switch inspection, cleaning and oiling routine in the 700 Area Plant Exchange.

Maintenance of PAX and PBX systems serving the 202-A, 202-S, 271-T, and 234-5 buildings required 85 manhours.

Cable maintenance personnel expended 130 manhours gas pressurizing trunk cables and 200 manhours performing maintenance work associated with the gas pressurizing program.

Inventoried and packaged 25 items of dial exchange equipment in preparation for delivery to Excess. This equipment consisted largely of items removed from telephone exchanges in connection with Projects C-276, C-402, Ca-512W, and CA-533. The estimated total value of the equipment is $18,000.

During the month telephone service trucks, Nos. IC-14800 and IC-6956, were replaced with new trucks, Nos. IC-266 and IC-299.

Prepared closing statements for two Work Orders covering minor cable additions in the 300 Area and one Work Order covering an open-wire line addition in the 100-D Area.

Commercial Telephone Operations

Excavation work of the Community Water and Sewerage Unit to uncover a sewerage line under Lee Boulevard near the Carmichael School undermined four telephone cable ducts and caused sufficient damage to the ducts as to require that they be replaced and encased in concrete. Cables within the ducts were not damaged.

Prepared an estimate of the cost of providing clearances under telephone cables that would be necessitated by the transfer of buildings W-15 and W-17 to the 100-H Area.

Completed transfer of subscriber telephone services from Cable 4 to Cable 10 in the blocks south of Lee Boulevard and between Sanford and Smith Streets. This transfer eliminated the need for an old ring-suspended cable which can now be removed.

Repaired three cable sheath defects in Richland distribution cables. The sheath damages were caused by cable hardware cutting the sheath.

Repaired two cases of trouble in the Richland-Pasco trunk cable on the east side of the Columbia River. In one instance the cable was found to have a sheath crack near an old splice sleeve and in the other instance the trouble was caused by a bullet penetrating the cable.

Replaced a cable terminal behind 1409 Farrell Lane as a result of a pole being replaced at that location.

Prepared an engineering job description covering the transfer of a cable to a new pole line between Platt and Thayer in the 1600 block.

Telephone service trucks, Nos. IC-14798, IC-7030 and IC-14578, were replaced with new trucks, Nos. IC-287, IC-280 and IC-238.

Established three additional Richland-Kennewick toll trunks. The necessary work in the Richland Exchange for accomplishing this increase was completed in December 1955, but the required additional cable circuits to Kennewick did not become available until May 1956.

Coincidentally with distribution of the May 1956 edition of the Richland telephone directory, telephone numbers serving Sears Roebuck, Montgomery Ward, and the Seattle First National Bank were changed to improve the service to those subscribers.

Installed ten temporary telephones in the American Legion Building for the Chrysler Corporation to be used in connection with a special sales training program.

By periodic observation in the Richland Exchange a case of intermittently poor transmission on a Pasco toll trunk was discovered. Pacific Telephone and Telegraph employees in Pasco investigated and found that the difficulty was due to a broken connection in their exchange equipment. This case of trouble very likely accounts for some of the recent complaints received regarding poor transmission on long distance calls.

Radio System Operations

On May 1, Radio Maintenance personnel temporarily installed two 25-watt loudspeakers on the roof of the 3707-D Building together with a 50-watt audio-amplifier inside the 3707-D building to demonstrate the sound coverage of the loudspeakers. The demonstration was carried out at the request of people in the 300 Area who are planning a public address system to be used when evacuating the area.

On May 8 public address and sound recording equipment was temporarily installed and operated in the Carmichael School auditorium in connection with a meeting of employees of the Financial Department.

Removed two mobile radio sets from automotive vehicles and installed four similar radio sets in other vehicles.

Radio Maintenance personnel completed on May 15 the installation of an intercom and paging system in the 712 building for the Records Operations Unit.

Shop serviced 37 mobile receivers, 43 mobile transmitters, 6 fixed-station transmitters, 6 fixed-station receivers, 9 intercom units, 4 radio remote control units, 2 sound projectors, 3 public address systems, 11 pack-type transmitter-receiver units, 1 radio noise locator, 1 Western Electric amplifier and 1 Western Electric oscillator.

Field serviced 94 mobile transmitter-receiver units and 10 fixed-station units.

Prepared and processed Missing Property and Property Disposal documents to cover the loss of a Motorola mobile radio set which was inadvertently sold with an automotive truck at Public Auction of excess equipment on April 23, 1956.

Only one Radio Station outage occurred during the month. Station KKE 624 in the 703 Building was out of service on May 8 from 5:38 AM to 6:02 AM due to improper manipulation of switches on the control panel.

Statistical Data

	At 20th of May	Change from Previous Month	Change from Year Ago
Residential Subscribers	6260	+ 18	+ 378
Business Subscribers	429	+ 13	- 52
Paystations (North Richland)	16	None	None
Paystations (Richland)	49	None	- 15
Official Subscribers:			
Richland Exchange	227	- 1	- 749
700-1100 Areas	937	+ 4	+ 937
Process Areas Exchanges	1666	+ 5	+ 52
		+ 39	+ 551

Telephone Facilities - Installed, In Service and Available

	Exchange Lines			Unassigned
	Installed	In Service	Unassigned	Party Lines
North Richland	600	16	584	
Richland Community	4022	3744	278	882
700-1100 Areas	1230	917	313	
Process Areas	2050	1660	390	
	7902	6337	1565	882

Radio Stations - In Service

	At 20th of May	Change from Previous Month	Change from Year Ago
Fixed Stations	34	0	0
Mobile Stations	161	0	+ 5
	195	0	+ 5

SECURITY AND PATROL SUB-SECTION

Document Report

Number of classified documents and prints unaccounted for as of May 1, 1956: (97 of the above 291 documents are chargeable to E.I. du Pont de Nemours & Co.) 291

Number of classified documents and prints reported as unaccounted for during May: 0

Number of classified documents and prints either recovered or downgraded in classification during May: (This print, which was located, is not chargeable to E.I. du Pont de Nemours and Company) 1

Number of classified documents and prints remaining unaccounted for as of June 1, 1956: (97 of the above 290 documents are chargeable to E.I. du Pont de Nemours & Co.) 290

The Non-Technical Review Board held three meetings during May and reviewed a total of 124 documents. Of this number -

7 had their classification retained,
11 were downgraded to "Official Use Only",
99 were declassified, and
7 were not within the scope of the Board.

Security Education

Six items which appeared in the Works News were concerned with the subject of security.

377 security meetings were held and attended by 4,896 Hanford Atomic Products Operation personnel. A representative of the Plant Protection Services Unit showed one of the security films at some of these meetings or presented a tape recording of Ronald Reagan's recent lecture at Hanford, as indicated below:

Film Title	Number of Meetings	Average Attendance per Meeting	Total
In Any Direction	11	17	187
Badge of Honor	1	41	41
The Living Contract	1	30	30
Turn Left Across the Bridge	3	21	63
Ronald Reagan's Lecture on "Communism in Hollywood"	16	20	320

The following Organization and Policy Guides were revised and issued as instructions:

14.1 "Plant Evacuation", April 27, 1956
15.28 "Foreign Travel", April 25, 1956

The following security posters were posted in the plant areas during the reporting period:

100 copies of the poster supplied by the Department of Defense, Washington, D.C., with the slogan "Don't Give Secrets Away"

650 copies of the poster with the slogan "As You Measure the Future, Secure the Classified Parts"

1,100 copies of the leaflet, also supplied by the Department of Defense, with the same slogan as the poster were distributed throughout the plant.

The May 24th issue of "Management News Bulletin" had an announcement of security interest, a reminder to "Employees who use Extended Material Passes and/or Contraband Passes to submit requests by June 1 for the next six months period."

Statistical Report of Patrol Activities

	100-B	100-D	100-F	100-H	100-K	200-E	200-W	300
Pat Searches	93	37	84	55	58	0	0	4
Escorts	4	6	2	5	12	42	41	3
Ambulance Runs	0	1	1	2	3	2	6	7
Passes Issued:								
One Day Temporary	21	18	7	9	16	5	39	37
Travel	1	0	3	0	0	0	0	124

Statistical Report of Patrol Activities (Contin)

	100-B	100-D	100-F	100-H	100-K	200-E	200-W	300
Red Tag	79	40	26	36	75	124	231	65
Telephonic	0	0	0	0	0	0	0	10
Supervisor's Post Contacts	419	193	183	149	193	307	448	233
Other Patrol Activities (Computed by Hours)								300 & 700
File Check	186	218.5	245.7	499	377	284	262	2,294
Building Check	357	121	309.1	1229	377	284	262	744

Arrest Report

Violation	Number of Violations	Cont. Cases From April	Cases Cleared	Pending	Fined
Failure to Observe Stop Sign	0	1	1	0	1
Illegal Parking	6	2	6	2	6
Negligent Driving	1	0	1	0	1
Totals	7	3	8	2	8

Citation Tickets Issued:	6
Other Arrests:	1
Warning Tickets Issued:	32
Verbal Warnings:	0

Patrol Training Activities

821 Patrolmen attended Round Table Meetings, Safety and Security Meetings during the period covered by this report. However, since we only have 397 Patrolmen on the roll, some of them attended more than one meeting.

178 Patrolmen attended Firearms Training during the same period.

General

Since the second cycle concerning the audit and inspection of custodians of classified material was started September 1, 1955, our Security Audit and Investigation Unit has completed 980 audits.

Security Administration

Daily Badge Log Entries:	2,302
"Q" Clearances:	37
"L" Clearances:	11
Formal "P" Clearances Issued:	19
"P" Approval Clearances Issued:	26
Category Access Granted:	36
Category Access Withdrawn:	38

Security Administration (Contin)

Category Access Revised:	46
Number of Photos for "A" Badges:	192
Number of Photos for "B" Badges:	980
Number of Persons Re-Photographed:	113

Number of Photo Identification Passes Laminated and Issued: 339
Total of 430 "A" Badges were assembled and distributed to the areas.
Total of 226 "A" Badges were received from the areas.
Total of 41 "A" Badges were received from the areas for repair.

Top Secret Clearances

Clearances were cancelled for 23 employees during May.
Clearances were requested for 23 employees.
Clearances were granted to 42 employees.

[redacted]

HANFORD ATOMIC PRODUCTS OPERATION
General Electric Company
Richland, Washington

REPORT OF VISITORS FOR PERIOD ENDING MAY 31, 1956

Name - Organization	Purpose of Visit	Person Contacted	Arrival	Departure	Restricted Data Class.	Restricted Data Unclass.	Areas
EMPLOYEE AND PUBLIC RELATIONS DEPARTMENT							
I. Visitors to this Operation							
W. S. Hill General Electric Company Schenectady, New York	Discuss manpower and metallurgical problems	T. G. Marshall	5-9-56	5-9-56	X		300-309
D. A. McCune General Electric Company Schenectady, New York	Job interview	T. G. Marshall	5-2-56	5-2-56		X	300-XXX
II. Visits to other Installations							
F. J. McKinnon to: University of California Berkeley, California	Attend annual conference of AEC and Contractor on Safety and Fire Protection	D. F. Hayes	5-23-56	5-24-56		X	
ENGINEERING DEPARTMENT - DESIGN SECTION							
I. Visits to other Installations							
R. H. Beaton to: E. I. du Pont de Nemours Savannah River Plant Augusta, Georgia	Inspect production facilities and discuss technical problems	W. P. Overbeck A. A. Johnson R. I. Martens	5-28-56	5-29-56	X		
R. D. Switters to: Oak Ridge National Lab. Oak Ridge, Tennessee	Attend Fifth Annual Nuclear Plant Corrosion Symposium	E. G. Bohlmann	5-22-56	5-24-56	X		

[redacted]

DECLASSIFIED

[redacted]

Name - Organization	Purpose of Visit	Person Contacted	Arrival	Departure	Restricted Data Class.	Restricted Data Unclass.	Areas
R. D. Switters to: Ames Laboratory Iowa State College Ames, Iowa	Attend AEC Metallurgy Information Meeting	B. A. Rogers	5-2-56	5-4-56	X		
II. Visitors to this Operation							
R. Hale E. I. du Pont de Nemours & Co. Savannah River Plant Augusta, Georgia	Discuss construction and ventilation of enclosures to house test equipment	E. O. Swain	5-16-56	5-16-56	X	700	
W. Mottal E. I. du Pont de Nemours & Co. Savannah River Plant Augusta, Georgia	Discuss construction and ventilation of enclosures to house test equipment	E. O. Swain	5-16-56	5-16-56	X	700	
ENGINEERING DEPARTMENT - ENGINEERING ADMINISTRATION SECTION							
I. Visitors to this Operation							
M. A. de Ferranti General Electric Company New York, New York	Provide expert Manager Development Consulting services. Describe nature and magnitude of Hanford operation from other GE plants	A. B. Greninger	5-31-56	6-1-56	X	100-B 105-B,105-C 100-D 105 100-F 105 100-H 105 100-K 105-KE, KW 200-E 202-A,201-C 200-W 221-T, 231, Redox, 221-U 300 303; 700	
II. Visits to other Installations							
B. W. Borgmier to: U. S. Atomic Energy Comm. Fernald, Ohio	Attend AEC meeting to devise a production reactor fuel element classification guide	C. L. Karl	5-2-56	5-4-56	X		
J. L. Jaech to: U. S. Atomic Energy Comm. Washington, D. C.	Attend annual meeting of Accountability representatives	D. F. Musser	5-8-56	5-9-56	X		

[redacted]

DECLASSIFIED

[redacted]

Name - Organization	Purpose of Visit	Person Contacted	Arrival	Departure	Restricted Data Class.	Restricted Data Unclass.	Areas
ENGINEERING DEPARTMENT - PROJECT SECTION							
I. Visits to other Installations							
R. T. Gardner to: E. I. du Pont de Nemours Savannah River Plant Augusta, Georgia	Study operations similar to Minor Construction at Hanford	C. H. Peden R. D. Mason	5-6-56	5-10-56		X	
R. T. Gardner to: H. K. Ferguson Co. and U. S. Atomic Energy Comm. Oak Ridge, Tennessee	Study operations similar to Minor Construction at Hanford	C. Leach S. R. Sapirie G. W. Comer	5-11-56	5-18-56		X	
R. T. Gardner to: U. S. Atomic Energy Comm. Portsmouth, Ohio	Study operations similar to Minor Construction at Hanford	D. Brumley K. A. Dunbar, AEC L. M. Buhr, AEC	5-14-56	5-15-56		X	
R. T. Gardner to: U. S. Atomic Energy Comm. Paducah, Kentucky	Study operations similar to Minor Construction at Hanford	K. C. Brooks W. J. Hammer P. F. Lumbie	5-17-56	5-18-56		X	
ENGINEERING DEPARTMENT - PILE AND SELARATIONS TECHNOLOGY SECTIONS							
I. Visitors to this Works							
J. E. Duncan Radiation Laboratory University of California Livermore, California	Fabrication consultation on Whitney Project	O. J. Wick	5-15-56 5-23-56	5-19-56 5-29-56	X X	200-W 231, 234,235 200-W 231, 234, 235	
W. W. Gilbert General Engineering Lab. Schenectady, New York	Machinability problems for Whitney Project	J. J. Cadwell O. J. Wick L. D. Turner	4-30-56	5-3-56	X	100-K 105-KW 200-E 202-A 200-W Redox, 231, 234, 235 300 303; 700	

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Name - Organization	Purpose of Visit	Person Contacted	Arrival	Departure	Restricted Data Class.	Restricted Data Unclass.	Areas
E. D. Holland Radiation Laboratory University of California Livermore, California	Coordinate work on components for Whitney Project	O. J. Wick	5-8-56	5-11-56	X	200-W	231, 234, 235
N. E. Huston North American Aviation Co. Canoga Park, California	Coordination of operation and installation of NAA 109 pile experiment	J. A. Berberet R. K. Marshall	5-10-56	5-31-56	X	100-D 100-K 300	105 105-KE, KW XXX; 700 303 5-10 only
W. K. McCarty, Jr. North American Aviation Co. Canoga Park, California	Coordination of operation and installation of NAA 109 pile experiment	J. A. Berberet R. K. Marshall	5-1-56	5-31-56	X	100-D 100-K 300	105 105-KE, KW XXX; 700 303 5-10 only
T. R. Neville, Jr. Knolls Atomic Power Lab. Schenectady, New York	Liaison work on KAPL-120 loop program	J. A. Berberet	2-8-56	7-1-56	X	100-D 100-H 100-K 300	XXX 105 105-KE, KW 303
L. W. Niedrach Knolls Atomic Power Lab. Schenectady, New York	Discuss electro-winning	W. H. Reas R. B. Richards	5-4-56	5-4-56	X	300	XXX; 700
E. B. Powell Knolls Atomic Power Lab. Schenectady, New York	Discuss third run and modifications of KAPL 120 loop program	J. A. Berberet T. R. Neville, Jr.	5-21-56	5-23-56	X	100-D 100-H 100-K 300	XXX 105 105-KW XXX; 700
M. J. Ryan Radiation Laboratory University of California Livermore, California	Fabrication consultation on Whitney Project	O. J. Wick	5-8-56	5-11-56	X	200-W	231,234,235
D. Schiff Westinghouse Electric Corp. Pittsburgh, Pennsylvania	Discuss analysis of absorbing media, successive generations solution, direct solution of transport equation, numerical results for escape probability and digital results [redacted]	G. W. Stuart	5-10-56	5-11-56	X	100-K 300	105-KE, KW XXX

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Name - Organization	Purpose of Visit	Person Contacted	Arrival	Departure	Restricted Data Class.	Restricted Data Unclass.	Restricted Data Areas
S. Stein Westinghouse Electric Corp. Pittsburgh, Pennsylvania	Discuss analysis of absorbing media, successive generations solution, direct solution of transport equation, numerical results for escape probability and digital results	G. W. Stuart	5-10-56	5-11-56	X	100-K 300	105-KE, KW XXX
H. C. Thomas Mass. Institute Technology Cambridge, Massachusetts	Scavenging program (waste program)	T. R. McKenzie R. E. Burns	5-23-56	5-23-56	X	200-W 300	221-U XXX
G. W. Watt University of Texas Austin, Texas	Process consultations on separations processes	R. B. Richards	5-21-56	5-25-56	X	200-E 200-W 300	201-C,202-A Redox, 234, 235 303; 700
J. C. Woodhouse E. I. du Pont de Nemours & Co. Savannah River Plant Augusta, Georgia	Discuss dingot program	V. R. Cooper	5-9-56	5-12-56	X	300	303
L. J. Haight Johnson Pump Company Pasadena, California	Equipment consultation on pumps and agitators	A. E. Smith J. Dunn	5-15-56	5-15-56	X	300	XXX
R. J. Hale E. I. du Pont de Nemours & Co. Savannah River Plant Augusta, Georgia	Cubicles and high level radiation	C. G. McCormack R. E. Burns	5-15-56	5-15-56	X	200-W	Redox
F. Hittman G. L. Martin Company Baltimore, Maryland	Discussions on Project Pied Piper	J. A. Berberet A. M. Platt	5-8-56	5-8-56	X	100-K 300	105-KW XXX
C. D. McKeoreghan G. L. Martin Company Baltimore, Maryland	Discussions on Project Pied Piper	J. A. Berberet A. M. Platt	5-8-56	5-8-56	X	100-K 300	105-KW XXX

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Name - Organization	Purpose of Visit	Person Contacted	Arrival	Departure	Restricted Data Class.	Restricted Data Unclass.	Areas
R. D. Rowe General Machinery Company Spokane, Washington	Equipment consultation on pumps and agitators	A. E. Smith J. Dunn	5-15-56	5-15-56	X	300	XXX
II. Visits to other Installations							
W. K. Alexander to: Phillips Petroleum Co. Idaho Falls, Idaho	Consultation on Engineering Test Reactor facility design	R. J. Nertney	5-17-56	5-18-56	X		
J. M. Atwood to: Oak Ridge National Lab. Oak Ridge, Tennessee	Attend Fifth Annual Nuclear Plant Corrosion Symposium	E. G. Bohlmann	5-22-56	5-24-56	X		
T. K. Bierlein to: Ames Laboratory Iowa State College Ames, Iowa	Attend AEC Metallurgy Information Meeting	B. A. Rogers	5-2-56	5-4-56	X		
R. J. Brouns to: E. I. du Pont de Nemours Savannah River Plant Augusta, Georgia	Discuss analytical methods and in-line instrumentation on Purex Process Control	C. H. Ice	5-21-56	5-22-56	X		
R. J. Brouns to: Knolls Atomic Power Lab. Schenectady, New York	Discuss analytical chemistry problems of mutual interest	W. H. Alter	5-23-56	5-24-56	X		
R. J. Brouns to: Argonne National Lab. Lemont, Illinois	Discuss radiochemical program	M. H. Studier C. E. Crouthamel	5-28-56	5-28-56	X		
R. J. Brouns to: Aircraft Nuclear Propulsion Project Cincinnati, Ohio	Discuss analytical chemistry problems	E. W. Rebol	5-29-56	5-29-56	X		
J. J. Cadwell to: Ames Laboratory Iowa State College Ames, Iowa	Attend AEC Metallurgy Information Meeting	B. A. Rogers	5-2-56	5-4-56	X		

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Name - Organization	Purpose of Visit	Person Contacted	Arrival	Departure	Restricted Data Class.	Restricted Data Unclass.	Areas
P. A. Carlson to: Ames Laboratory Iowa State College Ames, Iowa	Present technical report at AEC Metallurgy Information Meeting	B. A. Rogers	5-2-56	5-4-56	X		
V. R. Cooper to: Mallinckrodt Chem. Wks. St. Louis, Missouri	Attend Metal Development Advisory Committee meeting	C. D. Harrington	5-23-56	5-24-56	X		
E. A. Coppinger to: Oak Ridge National Lab. Oak Ridge, Tennessee	Discuss fission products recovery techniques and separations problems	F. L. Culler	5-7-56	5-11-56	X		
D. O. Darby to: Oak Ridge National Lab. Oak Ridge, Tennessee	Study new pulse column technology and metal recovery plant equipment and processes and IA column decontamination	J. Chandler J. Flanary	5-7-56	5-11-56	X		
J. M. Davidson, III to: Material Testing Reactor Phillips Petroleum Co. Idaho Falls, Idaho	Consultation on installation of GEH-9 experiment	H. T. Watanabe	5-21-56	6-4-56	X		
R. L. Dillon to: Oak Ridge National Lab. Oak Ridge, Tennessee	Attend Fifth Annual Nuclear Plant Corrosion Symposium	E. G. Bohlman	5-23-56	5-24-56	X		
B. A. Evans to: Iowa State College Ames Laboratory Ames, Iowa	Present technical report at AEC Metallurgy Information meeting	B. A. Rogers	5-2-56	5-4-56	X		
M. D. Freshley to: Ames Laboratory Iowa State College Ames, Iowa	Attend AEC Metallurgy Information Meeting	B. A. Rogers	5-2-56	5-4-56	X		

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Name - Organization	Purpose of Visit	Person Contacted	Arrival	Departure	Restricted Data Class.	Restricted Data Unclass.	Areas
S. (nmn) Goldsmith to: Oak Ridge National Lab. Oak Ridge, Tennessee	Attend Fifth Annual Nuclear Plant Corrosion Symposium	E. G. Bohlmann	5-22-56	5-24-56	X		
O. H. Greager to: Mallinckrodt Chem. Wks. St. Louis, Missouri	Attend Metallurgy Development Advisory Committee meeting	H. Thayer	5-23-56	5-24-56	X		
O. H. Greager to: U. S. Atomic Energy Comm. Washington, D. C.	Discuss Hanford development program and review Reactor Handbook	E. J. Bloch W. N. Munster F. Pittman	5-21-56	5-22-56	X		
N. D. Groves to: Oak Ridge National Lab. Oak Ridge, Tennessee	Attend Fifth Annual Nuclear Plant Corrosion Symposium	E. G. Bohlmann	5-22-56	5-24-56	X		
R. O. Gumprecht to: U. S. Atomic Energy Comm. Washington, D. C.	Present technical report on discharge concentrations in Hanford Reactors to AEC meeting	D. F. Musser	5-7-56	5-9-56	X		
K. M. Harmon to: Dow Chemical Company Rocky Flats Laboratory Boulder, Colorado	Discussions on chemistry and metallurgy of plutonium	I. B. Venable R. Miller E. J. Walko	5-7-56	5-11-56	X		
H. H. Hopkins, Jr. to: Oak Ridge National Lab. Oak Ridge, Tennessee	Discuss ion exchange, metallix, and Purex processing	F. R. Bruce I. Higgins	5-1-56	5-2-56	X		
H. H. Hopkins, Jr. to: E. I. du Pont de Nemours Savannah River Plant Augusta, Georgia	Discuss process technology and Purex processing	L. C. Peery J. O. Morrison	5-3-56	5-4-56	X		
H. H. Hopkins, Jr. to: Knolls Atomic Power Lab Schenectady, New York	Discuss process technology	H. W. Alter	5-7-56	5-7-56	X		

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Name - Organization	Purpose of Visit	Person Contacted	Arrival	Departure	Restricted Data Class.	Restricted Data Unclass.	Areas
B. M. Johnson, Jr. to: Argonne National Lab. Lemont, Illinois	Discuss uranium oxide problems and uranium conversion processes	S. Lawroski	5-7-56	5-8-56	X		
B. M. Johson, Jr. to: Oak Ridge National Lab. Oak Ridge, Tennessee	Discuss uranium oxide problems and uranium conversion processes	F. R. Bruce	5-9-56	5-11-56	X		
D. E. Johnson to: Ames Laboratory Iowa State College Ames, Iowa	Present paper at AEC Metallurgy Information Meeting	B. A. Rogers	5-2-56	5-4-56	X		
D. C. Kaulitz to: Material Testing Reactor Phillips Petroleum Company Idaho Falls, Idaho	Remodifications to GEH-4, installation of equipment	D. R. Alvord	5-14-56	5-18-56	X		
M. C. Lambert to: U. S. Atomic Energy Comm. Washington, D. C.	Present paper at annual meeting of AEC Materials Management representatives	D. F. Musser	5-7-56	5-9-56	X		
M. C. Lambert to: Oak Ridge National Lab. Oak Ridge, Tennessee	Discuss UO_3 program	H. A. Bernhardt	5-10-56	5-11-56	X		
N. R. Miller to: Oak Ridge National Lab. Oak Ridge, Tennessee	Attend Fifth Annual Nuclear Plant Corrosion Symposium	E. G. Bohlmann	5-22-56	5-24-56	X		
J. E. Minor to: Ames Laboratory Iowa State College Ames, Iowa	Attend AEC Metallurgy Information Meeting	B. A. Rogers	5-2-56	5-4-56	X		
R. L. Moore to: Oak Ridge National Lab. Oak Ridge, Tennessee	Consultation on fission product utilization and process chemistry	F. L. Culler A. F. Rupp	5-7-56	5-11-56	X		

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Name - Organization	Purpose of Visit	Person Contacted	Arrival	Departure	Restricted Data Class.	Restricted Data Unclass.	Areas
R. Weidner to: Material Testing Reactor Phillips Petroleum Company Idaho Falls, Idaho	Consultation on GEH-4 test program	D. R. Alvord D. R. Alvord	5-14-56 5-24-56	5-26-56 5-28-56	X X		
H. C. Rathvon to: Oak Ridge National Lab. Oak Ridge, Tennessee	Discuss ion exchange, metallix, and Purex processing	F. R. Bruce I. Higgins	5-1-56	5-2-56	X		
H. C. Rathvon to: E. I. du Pont de Nemours Savannah River Plant Augusta, Georgia	Discuss process technology and Purex processing	L. C. Peery J. O. Morrison	5-3-56	5-4-56	X		
P. H. Reinker to: Ames Laboratory Iowa State College Ames, Iowa	Attend AEC Metallurgy Information Meeting	B. A. Rogers	5-2-56	5-4-56	X		
J. W. Riches to: Ames Laboratory Iowa State College Ames, Iowa	Attend AEC Metallurgy Information Meeting	B. A. Rogers	5-2-56	5-4-56	X		
A. E. Smith to: E. I. du Pont de Nemours Savannah River Plant Augusta, Georgia	Consultation on in-line instrumentation and equipment developments as bearings, pumps	C. H. Ice	5-21-56	5-23-56	X		
A. E. Smith to: Knolls Atomic Power Lab. Schenectady, New York	Consultation on in-line instrumentation and equipment developmens as mechanical dejacketing, bearings, and pumps	J. K. Davidson	5-23-56	5-25-56	X		
W. H. Swift to: Oak Ridge National Lab. Oak Ridge, Tennessee	Discuss ion exchange, metallix, and Purex	F. R. Bruce I. Higgins	5-1-56	5-2-56	X		

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Name - Organization	Purpose of Visit	Person Contacted	Arrival	Departure	Restricted Data Class.	Restricted Data Unclass.	Areas
W. H. Swift to: E. I. du Pont de Nemours Savannah River Plant Augusta, Georgia	Discuss process technology and Purex processing	L. C. Peery J. O. Morrison	5-3-56	5-4-56	X		
W. P. Wallace to: Ames Laboratory Iowa State College Ames, Iowa	Attend AEC Metallurgy Information Meeting	B. A. Rogers	5-2-56	5-4-56	X		
D. C. Worlton to: Argonne National Lab. Lemont, Illinois	Attend meeting of Program Committee	W. J. McGonnalge	5-22-56	5-23-56	X		
D. C. Worlton to: Oak Ridge National Lab. Oak Ridge, Tennessee	Discuss non-destructive testing devices	R. B. Oliver	5-23-56	5-24-56	X		
D. C. Worlton to: E.I. du Pont de Nemours Savannah River Plant Augusta, Georgia	Discuss non-destructive testing devices	A. H. Dexter	5-24-56	5-25-56	X		

FINANCIAL DEPARTMENT

I. Visits to other Installations

V. D. Donihee to: U. S. Atomic Energy Comm. Washington, D. C.	Attend annual meeting of Accountability representatives	D. F. Musser	5-7-56	5-9-56	X		
D. M. Johnson to: Knolls Atomic Power Lab. Schenectady, New York	Discuss financial information	R. T. Greer	5-22-56	5-22-56	X		

MANUFACTURING DEPARTMENT

I. Visitors to this Operation

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Name - Organization	Purpose of Visit	Person Contacted	Arrival	Departure	Restricted Data Class.	Restricted Data Unclass.	Areas
N. Bonicelli Aircraft Nuclear Propulsion Cincinnati, Ohio	Inspect remote handling devices	A. R. Keene	5-8-56	5-9-56	X		200-W Redox 300 303
A. H. Dustin Aircraft Nuclear Propulsion Cincinnati, Ohio	Inspect remote handling devices	A. R. Keene	5-8-56	5-9-56	X		200-W Redox 300 303
II. Visits to other Installations							
G. E. Backman to: Naval Radiological Defense Laboratory San Francisco, California	Participat in "Operation Redwing"	G. L. Baietti J. E. Law	3-12-56	8-1-56	X		
L. W. Barker to: Naval Radiological Defense Laboratory San Francisco, California	Participate in "Operation Redwing"	G. L. Baietti J. E. Law	3-12-56	6-30-56	X		
H. E. Berg to: U. S. Atomic Energy Comm. Fernald, Ohio	Discuss planning and scheduling	W. Warner	5-2-56	5-4-56	X		
H. E. Berg to: National Lead Company Fernald, Ohio	Discuss planning and scheduling	J. C. Mead	5-2-56	5-4-56	X		
H. E. Berg to: Mallinckrodt Chem. Wks. St. Louis, Missouri	Discuss planning and scheduling	J. U. Shepardson	5-4-56	5-4-56	X		
C. W. Botsford to: Reactor Testing Station Arco, Idaho	Examine and evaluate special remote handling equipment and special work methods under radioactive conditions	J. Conley	5-21-56	5-25-56	X		

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Name - Organization	Purpose of Visit	Person Contacted	Arrival	Departure	Restricted Data Class.	Restricted Data Unclass.	Areas
C. W. Botsford to: E. I. du Pont de Nemours Savannah River Plant Augusta, Georgia	Examine and evaluate special remote handling equipment and special work methods under radioactive conditions	A. A. Johnson	5-28-56	6-1-56	X		
G. D. Brown to: Naval Radiological Defense Laboratory San Francisco, California	Participate in "Operation Redwing"	G. L. Baietti J. E. Law	5-21-56	8-30-56	X		
A. (mm) Brunstad to: U. S. Atomic Energy Comm. Washington, D. C.	Present paper on "Coulometric determination of plutonium and uranium at AEC meeting	D. F. Musser	5-7-56	5-9-56	X		
L. A. Carter to: Naval Radiological Defense Laboratory San Francisco, California	Participate in "Operation Redwing"	G. L. Baietti	5-21-56	8-31-56	X		
C. E. Frantz to: Material Testing Reactor Phillips Petroleum Company Arco, Idaho	Consultation on operational and maintenance problems similar to Hanford	B. Wing J. Davidson	5-24-56	5-25-56	X		
W.M. Mathis to: Oak Ridge National Lab. Oak Ridge, Tennessee	Review mechanized handling of materials and conditions behind zirconium incident	L. B. Emlet	5-28-56	5-29-56	X		
R. E. Olson to: U. S. Atomic Energy Comm. Fernald, Ohio	Discuss uranium quality control	W. Warner	5-2-56	5-4-56	X		
R. E. Olson to: National Lead Company Fernald, Ohio	Discuss uranium quality control	J. C. Mead	5-2-56	5-4-56	X		

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Name - Organization	Purpose of Visit	Person Contacted	Arrival	Departure	Restricted Data Class.	Restricted Data Unclass.	Areas
R. E. Olson to: Mallinckrodt Chem. Wks. St. Louis, Missouri	Discuss uranium quality control	J. U. Shepardson	5-4-56	5-4-56	X		
E. W. O'Rorke to: Mallinckrodt Chem. Wks. St. Louis, Missouri	Attend Metal Quality Advisory Committee meeting	C. D. Harrington	5-23-56	5-24-56	X		
W. W. Windsheimer to: National Lead Company Fernald, Ohio	Discuss proposal for Production Reactor Fuel Element Classification Guide	C. L. Karl	5-2-56	5-4-56	X		
RADIOLOGICAL SCIENCES DEPARTMENT							
I. Visitors to this Operation							
H. C. Thomas Mass. Institute of Technology Cambridge, Massachusetts	Disposal of fission wastes, and introduction of radioactive material into earth	J. F. Honstead J. M. Nielsen	5-14-56	5-18-56	X	200-W 222-U 300 XXX	
II. Visits to other Installations							
J. W. Healy to: Oak Ridge National Lab. Oak Ridge, Tennessee	Attend Bio-Medical Directors meeting	Dr. Dunham	5-31-56	6-2-56	X		
C. K. Irwin to: Naval Radiological Defense Laboratory San Francisco, California	Participate in "Operation Redwing"	A. L. Baietti J. E. Law	5-21-56	8-31-56	X		
H. A. Kornberg to: Oak Ridge National Lab. Oak Ridge, Tennessee	Attend AEC Bio-Medical Directors Meeting	A. Hollaender	5-30-56	6-2-56	X		
B. G. Lindberg to: Naval Radiological Defense Laboratory San Francisco, California	Participate in "Operation Redwing"	A. L. Baietti J. E. Law	3-12-56	6-30-56	X		

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RADIOLOGICAL SCIENCES DEPARTMENT

MAY, 1956

SUMMARY

There were twenty informal, nine Class I, and two Class II radiation incidents. Neither Class II incident was of major significance. In addition, a 1955 case of plutonium deposition was fairly reliably established to have gone beyond the formal permissible limit.

The emission of I^{131} was satisfactorily controlled.

All remaining members of the group of sheep fed 5 μc I^{131} per day for four years developed tumors. This setting of a tumor producing dose feeds back on the so-called indifference dose. It means, in practice, that permissible limits for I^{131} release are not likely to be increased.

Temporary measures to control the release of Co^{60} to ground water from TBP wastes were established. The growth of a retaining water mound under the 200-E Area also helps to slow down the travel of the existing contaminated water.

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RADIOLOGICAL SCIENCES DEPARTMENT

MAY, 1956

The month-end force of 427 included 37 supervisors, 100 engineers and scientists, 26 clerical, and 264 other personnel.

Number of Employees on Payroll	
Beginning of Month	429
End of Month	427
Net decrease	2

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.

Name	Title of Invention
None	None

There were 31 radiation incidents, including 9 Class I and 2 Class II incidents. One of the Class II incidents involved an exposure of about 30 rads to a heel, as a result of wearing a shoe with an imbedded radioactive particle; the other had to do with an exposure of about 2 rads on the face of an employee sprayed with a contaminated solution.

In addition, a plutonium deposition case that originated a year ago is now believed to be in excess of permissible limits. A full accounting of this incident and what is being done about it will be issued separately. The excess of the deposit over the formal limit (which is believed to be conservative) is so low that no actual deleterious effect is anticipated.

Several important audits of radiation protection practices were completed this month. In almost all cases, the need for further improvement was established. Some results were:

1. Wearing of personnel meters

   An omission percentage of 0.7% was observed, compared with 5% in one previous audit. The target here has to be 0%.

2. Laundering of contaminated clothing

   Frequency of unsuccessful decontamination was 10%. However, the severity of all cases was low.

3. Use of Radioactive Material Pass

   Frequent departures from approved practices were noted. This topic will receive considerable attention through appropriate channels.

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Radiological Sciences Department

4. Reliability of bioassay results

Results with uranium were good. With plutonium and fission products, the reliability of the results was somewhat lower than is normally anticipated. However, in the difficult range of 0.05 to 0.18 d/m, all positive samples tested were identified as such. As applied in the bioassay program proper, these would all have led to re-sampling to firm up the quantitative aspects. The audit in this important program will be repeated.

Redesign of the new plastic film badge achieved a further substantial reduction in real size and the previous appearance of clumsiness. Five hundred samples of this model will be fabricated and used for an opinion survey in the field.

The average emission of I^{131} from stacks was less than 6 curies per week. There was no untoward deposition of the material on vegetation. Detectable fallout of nuclear detonation debris continued throughout the Pacific Northwest. This was apparently a hang-over from foreign tests, rather than from the U.S. spring series.

As a curiosity in radiation protection, it may be noted that the purloining of contaminated mud from crib disposal sites, by swallows engaged in nest building, created a hazard that needed correction in the 100-H Area.

A review of concentrations of specific radioisotopes in the reactor effluent water during the past six months shows values as much as 50% less than corresponding figures for previous years. This timely occurrence is believed to be related to changes in influent water quality, including its pH. Definitive correlations in this field have not yet been established.

Major activity continued, and considerable progress was achieved, in the overall objective of applying other than chemical separation methods to the low-level radio-analysis of effluent water samples and the like. Activation analysis was applied to the thorium bioassay procedure with great success; as little as 0.001 μg Th can be so measured.

In Earth Sciences, it is noted that the rebuilding of the 200-E ground water mound by the Purex Operations is already slowing down the travel of existing contaminated ground waters to the southeast. This will postpone, though not ultimately cure, the problems that seemed to be developing near the 300 Area. The note on water supply for 300 Area last month (HW-42626) proved to be misleading. The normal water supply for that area comes from North Richland and that supply is not in jeopardy.

The necessary steps have been taken to keep the TBP process in operation through the use of emergency discharge facilities. This was necessary as a result of the timely detection of the unanticipated Co^{60} contamination of ground water. The Process Chemistry Unit now expects to modify the process to prevent the complexing of the cobalt ion.

Laboratory tests on the detection of Pu in the body by external means continued to be generally favorable. There has not yet been action on the formal project for a body monitor facility.

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Radiological Sciences Department

The biological studies on Cr(VI) ion in water were terminated. Data are now adequate to define the necessary controls to be used by the reactor section.

All remaining members of the group of sheep fed 5 μc I^{131} per day for four years or more now show some form of tumor of the thyroid. This sets a limit for a tumor producing dose which is such that one feels a little less comfortable about the dose alleged to produce no deleterious effect. The practical application of this is that one should expect no relief from the present permissible limits for I^{131} release. This justifies the earlier proposals to spend considerable money on I^{131} control on what then seemed to be a rather borderline decision.

The yield of goslings in the area was unusually low this year; this was due to the early flooding of nest sites. The radioactivity of the goose eggs showed the fairly standard ratio of:

Shell:Yoke:White = 20:10:1

The Activity is essentially all due to P^{32}. There is considerable species variation in this uptake. Representative relative activities of eggs are:

Gulls:Terns:Geese:Puddle ducks = 1:30:50:100

Pigs, at the animal farm, are being increasingly used as desirable experimental animals. Current work on the animal includes:

(1) Exposure of skin to electron beams of the Van-de-Graaff accelerator for dosage reconciliation with beta-ray sources.

(2) Metabolic distribution of plutonium hydroxide administered intratracheally.

(3) Use of a pig as a substitute for man in the experimental body monitor.

The LD 50 (in 30 days) for rats irradiated over the abdomen only was about 1650 r. For irradiation of the exteriorized intestine, the figure was 1550 r. With Y^{91} fed intragastrically, the LD 50 was about 1500 rads. The agreement of these numbers adds confidence to the laboratories' plans to investigate other levels of damage by radioisotopes in the intestine. Such data are badly needed to rationalize the current possible overemphasis on hazards of gut irradiation.

With plutonium, the apparent LD 50 in gut is 15,000 rads, equivalent to either 150,000 rem or 300,000 rem, depending on the RBE conventionally used. This is clear proof of the long-suspected fallacy of applying conventional dose calculations to this case.

The wave of work in connection with the N.A.S. studies of radiation effects was practically concluded. The preliminary report is to be issued on June 12. There has been considerable success, in some parts, in confining the reports to a factual statement of the issues without publication of extensive recommendations that could inappropriately find themselves written into code or legislation.

Concurrent with this activity, the ICRU and the ICRP prepared revised recommendations in Geneva. These exist only in draft form; their general effect is to be

Radiological Sciences Department

more restrictive on radiation exposure. The findings will be issued locally as soon as they are formalized.

All members of the department were advised of the intended placement of their groups in the event that current reorganization plans should be activated. The numbers involved in groups subject to a spallation process are sufficiently small to permit individual counselling to avoid demoralizing uncertainties.

HM Parker

Director,
RADIOLOGICAL SCIENCES DEPARTMENT

HM Parker:kss

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APPENDIX

1. Condensed Exposure Records

Type	Number of Readings	Potential High Results	Confirmed High Results
Pocket chambers - gamma	283,614	26	0
Pocket chambers - slow neutron	2,116	3	0
Film Badges - beta-gamma	49,679	24	0
Neutron film	1,026	5	0
Pu bioassay	1,322	35	0
F. P. bioassay	1,590	4	0
U bioassay	559	6	0
Alpha hand counts	55,561	0	0
Beta hand counts	52,608	0	0
Thyroid counts	20	0	0

Radiological Sciences Department

2. Regional Monitoring Records

Sample Type and Location	Activity Type	Average Activity Density µc/ml	Trend* Factor
Drinking Water and Related Materials			
Benton City Water Company Well	alpha	1.0×10^{-8}	--
Richland, N. Richland, Benton City Wells	alpha	$(<0.5 \text{ to } 1.1) \times 10^{-8}$	--
100 Areas	beta	$(<0.5 \text{ to } 9.5) \times 10^{-7}$	-5
200 Areas	beta	$(2.0 \text{ to } 3.4) \times 10^{-7}$	-2
Pasco, Kennewick, McNary Dam	beta	$(<0.5 \text{ to } 7.2) \times 10^{-7}$	--
Backwash Solids - Pasco Filter Plant	beta	1.3×10^{-2}	-6
Backwash Liquids - Pasco Filter Plant	beta	8.5×10^{-7}	-2
Anthracite, Sand Filter - Pasco Filter Plant	beta	3.0×10^{-5}	-2
Other Waters and Related Materials			
300 Area Wells 1 and 3	alpha	$(0.7 \text{ to } 2.1) \times 10^{-7}$	+2
300 Area Well 4	alpha	2.2×10^{-7}	--
Well 4 measured as Uranium	U	1.0×10^{-7}	-2
107 and 108 Wells	beta	$(<0.005 \text{ to } 1.1) \times 10^{-4}$	-9
Other Wells on the Reservation	beta	$(<0.5 \text{ to } 1.7) \times 10^{-7}$	-4
Columbia River - Hanford Ferry	beta	6.4×10^{-6}	-2
Columbia River - Below Reactors	beta	4.9×10^{-6}	-2
Columbia River - Paterson to McNary	beta	2.4×10^{-7}	--
Columbia River - Shore Mud	beta	$(1.2 \text{ to } 4.8) \times 10^{-5}$ µc/gm	--
Raw Water - Operating Areas	beta	$(<0.05 \text{ to } 3.2) \times 10^{-6}$	-2
Reactor Effluent Retention Basins to River	beta	7,700 to 18,500 µc/sec/reactor $(2.2 \text{ to } 5.5) \times 10^{-3}$	-- --
Reactor Effluent Retention Basins to River	alpha	<0.04 µc/sec/reactor $<5 \times 10^{-9}$	-- --
I-131 in Farm Wastes to River	I-131	12.5 µc/day 1.7×10^{-7}	+3 +2
I-131 in Columbia River - Hanford	I-131	3.2×10^{-8}	--
300 Area Pond Inlet	alpha	3.6×10^{-6}	--

DECLASSIFIED

DECLASSIFIED

Radiological Sciences Department

Sample Type and Location	Activity Type	Average Activity Density µc/ml	Trend* Factor
Atmospheric Pollution			
Gross Alpha Emitters	alpha	$(<0.4 \text{ to } 1.2) \times 10^{-14}$	--
Gross Dose Rate - Separations Areas	beta - gamma	1.0 to 3.9 mrad/day	--
Gross Dose Rate - Residential Areas	beta - gamma	0.6 to 5.1 mrad/day	-2
Active Particles - Separations Areas	beta	$(0.3 \text{ to } 1.6) \times 10^{-12}$	--
I-131 Separations Areas	I-131	$(0.07 \text{ to } 1.7) \times 10^{-12}$	--
I-131 Separations Stacks	I-131	0.80 curie/day	-2
Ruthenium - Separations Stacks	$Ru^{103-106}$	<0.01 curie/day	--
Active Particles - Wash., Idaho, Ore., Mont.	--	0.016 to 0.052 ptle/m^3	-2
Active Particles - Project	--	0.008 to 0.110 ptle/m^3	--
Tritium (as oxides) - Reactor Stacks	T	1.1 curies/day	--
Vegetation			
Environs of Separations Areas	I-131	$(<3 \text{ to } 3) \times 10^{-6}$ µc/gm	-5
Residential Areas	I-131	$<3 \times 10^{-6}$ µc/gm	-2
Eastern Washington and Oregon	I-131	$<3 \times 10^{-6}$ µc/gm	-7
Non-Volatile Beta Emitters Wash. and Ore.	beta	$(<0.1 \text{ to } 1.6) \times 10^{-4}$ µc/gm	-11
Alpha Emitters - Separations Areas	alpha	$(0.5 \text{ to } 8.0) \times 10^{-7}$ µc/gm	--

* The trend factor shows the n-fold increase (+) or decrease (-) from last month, where values of n less than 2 will not be noted.

FINANCIAL DEPARTMENT MONTHLY REPORT

May, 1956

A revised FY 1956 Financial Plan was received from HOO-AEC during May. D led reconciliation with the previous Financial Plan and with our mid-year budget indicates only minor changes.

Unofficial information from the AEC Budget Division indicates that HAPO's FY 1958 Plant Acquisition and Construction Budget, which called for $54,161,000 in new funds for FY 1958, has been reduced approximately $5,000,000 by the local AEC office. Three budget items, B-5827, "Engineering - Increased Reactor Power - Design Only" in the amount of $800,000; B-5850, "Engineering - Continuous Charge-Discharge, 105-B, D, DR, F, H, KE & KW - Design Only," $500,000; and B-58135, "Utilities Additions - 300 Area," $1,345,000, were deleted. In addition, B-5809, "Second Remote Mechanical Production Line, 234-5 Building" was reduced from $4,000,000 to $1,500,000; and "General Plant Projects - FY 1958" was reduced from $3,000,000 to $2,000,000. Other minor changes were made, including some increases. A complete reconciliation will be made as soon as official information is available.

A major portion of the Community's construction projects were transferred to the Engineering Department for management and cost accumulation. The only projects remaining with the Community Section other than work orders are those of a minor nature.

The "Annual Survey of Manufacturers" report to the Bureau of Census was prepared and transmitted to the local AEC for forwarding to Washington. This report includes such data as salaries paid, number of employees, cost of materials, capital expenditures, production inventories, and the value of products shipped.

Arrangements have been made to change the method of reporting motor vehicle costs to conform to the method outlined in the AEC Manual. The full cost of motor vehicle operation, including continuity of service expense, will be reported on the annual motor vehicle report. In the past, by agreement with the AEC, an appropriate IME percentage has been added to direct costs to permit an equitable comparison with the costs of other Government agencies.

Because it is anticipated that the Community Section will receive numerous requests for blueprints of Richland houses as disposal plans progress, procedure has been developed whereby these may be obtained through the office of the City Engineer at a reasonable cost. Authority for blanket approval for this activity as well as for other real estate disposal activities has been received from the Commission.

The second semester of Business Training Course class work was completed on May 26. Of the 67 students enrolled, one failed to receive a passing grade and one received a passing grade, but one which was too low to permit the student to continue BTC work. Next fall's classes will begin September 10.

An IBM listing of residential property was completed and transmitted to the AEC during the month. Listings indicated recorded first cost, accrued reserve at June 30, 1956, and net book value of houses, ranges, refrigerators, land, and land improvements. Residences had a total first cost of $47,669,000 with an accrued reserve of $15,531,000.

A physical inventory of T Plant, 200 West Area, was completed during the month. Reconciliation is under way and will be completed prior to transfer of the plant and related equipment to stand-by in June.

The balance in Unclassified Property pertaining to construction projects at May 31 was $305,000. This consists of equipment that has been transferred to projects under construction.

Machine tools previously arranged for delivery from Portsmouth under the upgrading program were received by the field components during the month. The plant's machine tools have been substantially upgraded during the past year from better equipment available from the closeout of AEC construction contracts.

The reclassification of property records from type to functional codes was completed in May after six months' work. The conversion provides figures by processes, utilities and service facilities for all buildings and equipment. In making the change, pennies were also eliminated to set up whole-dollar accounting for these accounts.

Twenty-five appropriation requests having a dollar value of $154,049 were processed during the month. Nine project proposals and informal requests, representing an aggregate of $1,261,800, were reviewed, and sent to the Commission during the month. After receipt and analysis of AEC directives and work authorities, fourteen Project Authorizations were issued for a total of $1,555,000.

Computation on the IBM 702 electronic data processing machine of tube wall thickness in all standard Hanford reactors is nearing completion. Corrosion figures have been obtained for two periods, one from start-up to January 1, 1956, and the other from January 1, 1956 to May 1, 1956. The two sets of figures have been combined for all except one reactor, and this will be done in the near future. A program is now being planned which will compute tube wall thicknesses every three or four months to keep corrosion data current.

A book and physical quantity variance report covering the General Supplies Inventory was accomplished on the 702 machine on May 17. A total volume of approximately 60,000 cards were processed. The job required close scheduling and deadlines by several groups, including Inventory Accounting, Stores, Key-punch and Computing personnel. To meet the final deadline, it was essential to take full advantage of the 702's speed and capacity. This required approximately 5 hours of main-frame elapsed time.

The shipment of irradiated enriched uranium slugs to the Phillips Petroleum Corporation at Arco, originally scheduled to begin in March but delayed because of an Idaho State highway ban on truck shipments, was begun in May. The schedule of transfers now calls for two shipments per week and will continue through September, 1956. The SS Accountability Section reports that the over-all program represents a major inventory reduction.

In a meeting of AEC and G.E. representatives on May 10, eight letters submitted to the Commission for approval in connection with the revised Prime Contract were reviewed and an agreement reached in each case as to further action required. At the end of May, drafts of half a dozen other documents required to implement the provisions of Supplemental Agreement No. 33 had been drawn and it is anticipated that most of the documents necessary for approvals or agreements with the Commission will have been completed by the end of June.

The April "Summary of Disbursements" sent to the AEC's Finance Division on May 18, showed net disbursements of $6,957,296 as follows:

Payrolls and payroll deductions disbursed	$4 469 394
Material (including orders placed on requirements contracts) and freight	2 671 370
Taxes and insurance	378 562
Employee benefits	144 240
Subcontracts and agreements	76 225
Advances for travel and living expense	71 537
Miscellaneous	272 186
Gross Disbursements	8 083 514
Less Cash Receipts	1 126 218
Net Disbursements	$6 957 296

Nonreimbursable costs billed to Schenectady for May, to be charged against the fee or the overhead allowance, amounted to $2,881, as follows:

Conference expense	$1 275
Nonreimbursable travel expense for employees attending G.E. Advanced Management Course	664
Travel and living expense variation	425
Duplicating costs for Elfun Society	350
Nonreimbursable travel expense for employee for Company-approved speaking engagement	99
HAPO's share of storage charges for atomic vault at Iron Mountain	52
Cost of operating Company-owned car	16
Total	$2 881

Detailed reports for the Financial Department appear on succeeding pages, as follows:

Summary of Cash Disbursements, Receipts and Advances	I - 5
Auditing Section	I a - 1
Budgets and Measurements Section Contract Cost Section	I b - 1 through I b - 5
General Accounting Section	I c - 1 through I c - 8
Personnel Accounting Section	I d - 1 through I d - 3
Procedures and Computing Section	I e - 1 through I e - 7
Property Accounting Section	I f - 1 through I f - 6
SS Accountability Section	I g - 1 through I g - 4
Personnel and Organization Statistics	I h - 1 through I h - 2

SUMMARY OF CASH DISBURSEMENTS, RECEIPTS AND ADVANCES

A summary of cash disbursements and receipts (excluding advances by the Atomic Energy Commission of $6,800,000 for May and $7,630,000 for April) for the months of May, and April, 1956 is shown below:

Disbursements	May	April
Payrolls (net)	$3 185 638	$3 154 051
Materials and Freight	2 269 794	2 202 775
Payroll Taxes	770 865	1 149 730
Payments to Subcontractors	515 100	544 820
Group Insurance Premium	232 585	232 486
United States Savings Bonds	231 872	340 518
Special Expenses for Year 1955	75 058	-0-
Travel Advances to Employees	68 806	71 536
Pension Plan—Employees' Portion	19 883	23 123
All Other	248 500	364 475
Total	7 618 101	8 083 514
Receipts		
Sales to AEC Cost-type Contractors	124 927	101 192
Rent	113 705	110 065
Sundry Accounts Receivable	79 354	41 403
Electricity	79 308	83 165
Hospital	58 288	50 886
Telephone	53 236	55 047
Refund of Travel Advances to Employees	12 563	8 320
Bus Fares	9 357	9 464
Sale of Surplus by Auction	5 520	496 194
Refunds from Vendors	2 008	6 404
Income from Collateral Funds	-0-	156 029
Other	8 419	8 049
Total	546 685	1 126 218
Net Disbursements	$7 071 416	$6 957 296

Outstanding advances as of May 31, and April 30, 1956 were as follows:

	May	April
Cash in Bank - Contract Accounts	$2 092 542	$2 363 958
Cash in Bank - Salary Accounts	20 000	20 000
Total	$2 112 542	$2 383 958

AUDITING SECTION

May, 1956

Reports were issued for the following audits:

Procurement Activities
Accounts Payable

At month-end a report was being prepared for the audit of Stores Activities.

Field work was continued on the following audits:

Weekly Payroll and Timekeeping
Travel, Living and Entertaining Expenses
Construction Costs

An audit of General Accounts was started during the month.

Follow-ups were made to determine the extent of compliance with recommendations in reports of the following audits:

Shipping Activities
Employment Administration and Practices
Accounts Receivable

Four employee information meetings, one of which included health, safety and security subjects, were held during the month.

BUDGETS AND MEASUREMENTS SECTION
AND CONTRACT COST SECTION
MONTHLY REPORT - MAY 1956

General

BTC classwork was completed on May 26 with final grades tabulated and mailed to Schenectady the following week. Of the 67 students enrolled, one failed to receive a passing grade and one received passing but was too low in standing to be permitted to continue BTC work. Schedule of next semester class assignments were prepared and sent to each student by personal letter from the Manager - Finance.

Budget Consolidations

A revised FY 1956 Financial Plan was received from HOO-AEC during May. Detailed reconciliation with the previous Financial Plan and with our Midyear Budget indicates only minor changes based on later information as to our spending pattern. No difficulties were apparent.

The FY 1958 and Revised FY 1957 Budget has been the most difficult from our standpoint of those prepared in recent years. Many special requests for additional information and reconciliations have been received and are time-consuming. However, by the end of May the work was essentially completed.

Employee and Public Relations Cost

An analysis of over-under absorbed costs indicates that Employee and Public Relations Department costs will be overliquidated approximately $65,000 at the end of the current fiscal year due to three primary causes: (a) a $17,000 credit to Office Machine Repair following booking of a previously unreported inventory, (b) the unusually cold weather caused an overliquidation of 700 Area Steam Plant costs ($20,000), and (c) Administration Area costs were overliquidated approximately $20,000 because of an increase in floor space without a proportionate increase in operating costs. Consideration is being given to changing rental rates in the 700 Area; however, no definite action will be taken until the results of the current organization planning are known.

It is anticipated that the Community Section will receive numerous requests for blueprints of Richland houses as disposal plans progress. A procedure has therefore been developed whereby these may be obtained through the office of the City Engineer at a reasonable cost. Blanket approval for reimbursement for this and other real estate disposal activities is being sought from the Commission and will be received prior to incurring any costs for this program.

A major portion of the Community's construction projects were transferred to the Engineering Department for management and cost accumulation. The only projects remaining with the Community Section other than work orders are those of a minor nature.

Work is progressing toward the development of a fee schedule covering services required of Industrial Medical which will be used by hospital management in discussions relative to providing or procuring Industrial Medical services following disposition of the hospital. This study is expected to be completed within ten days.

Employee and Public Relations Cost (Continued)

The adult patient day census at the hospital for May was 54.2 as compared to the bogey of 55.0. A low census during the last week in May accounted for a decrease from 57.0 to the lower final figure. The average for the past seven days has been only 44.3 whereas the bogey for the month of June calls for an average of 49.0.

Engineering Cost Unit

Stand-by costs incurred as a result of the strike by Minor Construction forces amounted to $130,342 at April 30. Costs for the month of May are estimated to be an additional $95,000.

Prior months overliquidation of reproduction expenses was reduced by $23,109 in May. This was accomplished by establishing and applying, retroactive to July 1, 1955, quantity rates for reproduction charges for contract bid packages, the primary cause of the credit balance.

A more comprehensive form has been developed for reporting the activity in Minor Construction equipment accounts. Major Equipment and Shop Equipment assets and reserves will be reported on this new form this month and Small Tools will be included in June.

Inasmuch as physical inventories of Minor Construction Stores are now seven captions behind as a result of the work stoppage, considerable effort will be required when work is resumed to complete all scheduled physical counts prior to the end of the calendar year.

Through the month of May, costs in the amount of $111,776 had been incurred in support of the FY 1958 Plant Acquisition and Construction Projects budget. After discussion with AEC Financial personnel, it was agreed that these costs would be retained in Construction Work in Progress over year end or until such time as a uniform policy for disposition is established within the Commission.

The obligated funds status for Plant Acquisition and Construction Projects at April 30, 1956, is reflected in the following schedule:

	9200 Program		9700 Program	
(amounts in thousands)	FY 1955 and Prior Years	FY 1956	FY 1955 and Prior Years	FY 1956
Funds Obligated	$70 788	$8 620	$205	$135
Less:				
Cost at 4-30-56	44 950	2 017	198	96
Unexpended Obligations	$25 838	$6 603	$ 7	$ 39

Unexpended obligations are more than sufficient to finance anticipated expenditures for some time.

Unofficial information from AEC Budget Division indicates that our FY 1958 Plant Acquisition and Construction Budget requesting $54,161,000 of new funds for FY 1958 has been reduced approximately $5,000,000 by local AEC. Three budget items, B-5827, "Engineering - Increased Reactor Power - Design Only" in the amount of $800,000; B-5850, "Engineering - Continuous Charge-Discharge, 105-B, D, DR, F, H, KE & KW - Design Only" in the amount of $500,000; and B-58135, "Utilities Additions - 300 Area" in the amount of $1,345,000 were deleted. In addition, B-5809,

Engineering Cost Unit (Continued)

"Second Remote Mechanical Production Line, 234-5 Building" was reduced from $4,000,000 to $1,500,000; and "General Plant Projects - FY 1958" was reduced from $3,000,000 to $2,000,000. Other minor changes were made; however, they are not known at this time. A complete reconciliation will be made as soon as official information is available.

Reconciliation of the physical and book values of shop materials inventory held by Technical Shops in the 320 Building is still in process. Studies thus far have indicated an apparent overage of physical inventory as compared to book value.

A program of work simplification has been initiated within Technology Cost with each employee calculating the time spent each month on routine reports and other duties. Careful study is being made of this data to determine areas where economies can be realized.

A meeting was held with Semi-Works Operation Unit personnel to stress the importance of proper cost coding of source documents, to explain the flow of costs, to describe the manner of funding and to discuss generally other financial topics.

A new form, "Capital Addition and Retirement Closing Report", has been prepared by Capitalization and Depreciation Unit for the purpose of providing rather extensive information for capital work orders. A meeting was held with Technical Administration personnel to explain the type of information required to properly complete the form.

General and Consolidations Cost Unit

Procedures and Computing Section will overliquidate slightly in May as planned. No refunds for past overbilling were given in May, and it is not likely that refunds of any magnitude will be processed in June. May and June costs will benefit equally from the $5,860 refund for return of IBM panels. This reduction is partially offset by extra shift equipment rental charges in excess of budget, so that cost decrease per month will be approximately $2,200 instead of $2,930.

Capitalization of Radiological Sciences experimental equipment has gone satisfactorily, with $3,200 charged to Equipment in Service in May. It is anticipated that $16,000 additional equipment will be capitalized in June, of which approximately $2,000 will reduce Protection of Plant and Personnel costs, and approximately $14,000 will reduce Biophysics Research and Development costs, the latter guaranteeing an underrun in this heretofore very tight program.

Manufacturing Cost Unit

Revised production assumptions for the FY 1957 and FY 1958 Budget were received from the AEC and a review made to determine whether a major change in total cost would result. No revision of budget detail appeared to be warranted since only minor adjustments would be required.

A TS rough draft report comparing Redox and Purex total costs at various production rates was prepared for the Manager - Finance. This comparison showed the effect of fixed and variable costs on total unit costs and the additional production required from the higher capacity Purex plant to meet Redox unit costs.

The "Annual Survey of Manufacturers" report to the Bureau of Census was prepared, documented and transmitted to the local AEC for forwarding to Washington. This report is prepared annually and includes such data as

Manufacturing Cost Unit (Continued)

salaries paid, number of employees, cost of materials, capital expenditures, production inventories, and the value of products shipped.

Document HW-43413, "Distribution of Redox Costs", was issued and document HW-32748, same title, was recalled. A revaluation of the distribution of Redox costs was made in order to reflect the revisions which have been made in the process as a result of equipment and process modifications in connection with the program, Phase II, for increasing the capacity of Redox.

In furthering the Reactor Section Manager's objective of informative, educational and interesting cost meetings, an agenda was prepared by the Financial Representative for the May meeting. Illustrative charts were furnished and speakers assigned to cover the following topics:

1. Reactor Gas Consumption: history, current experience and measures necessary to curtail present losses.

2. Water Treatment Costs - The effect of low Ph control, seasonal turbidity, and use of sulfuric acid.

3. Progress on cost reduction for expendable dummies.

4. Tube Replacement Progress and Tool Cost Experience.

5. Overtime - Past experience and the current improvement trend.

As part of a survey of maintenance requirements for the Reactor Section a complete list of all routine work orders issued to the maintenance units was prepared for the Area Maintenance Superintendents. This list included statistics on manhours and cost charged to the work orders.

An investigation was completed of three discrepancies found in Reactor Section Overtime Lunch Authorization slips. Due to the potential misuse of frozen lunches, a request was made to lunch custodians to tighten their control of lunch disbursements and inventory procedures.

The new ledger, utilizing pegboard paper, was inaugurated during the month. A group meeting was held on May 21 for the purpose of explaining the over-all method of operation. As a follow-up on the group meeting, individual attention was given as vouchers were actually processed.

Beginning in March, 1956, the IBM Expense Code Run was issued on a monthly basis rather than the previous weekly basis. This had the effect of replacing a 22 page Separations Preventative Maintenance Report issued monthly by Reports and Records which was eliminated at the suggestion of the Financial Analyst.

Arrangements have been made to change the method of reporting motor vehicle cost as outlined in the AEC Manual. Full cost of motor vehicle operation including continuity of service expense will be reported on the annual motor vehicle report as compared to a previous IME percentage which was estimated to compare with cost of other government agencies.

An estimate of June 30, 1956, inventory balances was prepared in order to point out the status of HAPO inventories with respect to the FY 1956 Financial Plan. It

Manufacturing Cost Unit (Continued)

appears that net inventories will be close to Financial Plan at year end, although continued careful planning is required. Close watch will be maintained over inventories and a report will be prepared weekly during June to point out any significant available information.

GENERAL ACCOUNTING SECTION
MONTHLY REPORT - MAY, 1956

ACCOUNTS PAYABLE UNIT

The number of vouchers processed during May numbered 4958 and amounted to $4,042,211, as compared to 4847 vouchers amounting to $4,518,435 recorded during April. Vouchers processed during the first five months of 1956 numbered 24,471, as compared to 21,445 recorded during the same period in 1955, or an average increase of 600 invoices per month.

Cash discount earned during May amounted to $9,882, with a fiscal year-to-date total of $95,619. In conjunction with the earned discount figure it is interesting to note that the total operating cost for Accounts Payable (May estimated) during the same fiscal period was approximately $112,000.

Freight bills paid during the month numbered 1380 and amounted to $268,810. This reduction in volume as compared to previous months was due primarily to the hold-up on shipments relative to engineering orders.

Active contracts handled by Accounts Payable, excluding requirements orders, numbered 52, and contract commitments at month-end amounted to $456,587. Payments on these contracts during May were $97,007 of which $13,525 applies to contracts having no fixed commitments.

Requirements contract orders placed during May numbered 12 in the amount of $338,939, and commitments at month-end totaled $762,476. Payments under requirements contract orders were $400,829.

Following is a resume of Accounts Payable statistics for May and April:

Accounts Payable:

	May	April
Balance beginning of month	$ 728 610	$ 792 715
Vouchers entered	4 042 211	4 518 435
Cash receipts	2 007	6 404
	4 772 828	5 317 554
Less: Vouchers Paid	4 200 593	4 588 944
Balance at end of month	$ 572 235	$ 728 610
Number of vouchers recorded	4 958	4 847
Number of checks issued	2 934	2 897
Number of freight bills paid	1 380	1 500
Amount of freight bills paid	$ 268 810	$ 294 752
Number of purchase orders received	2 058	2 203
Amount of purchase orders received	$1 575 226	$1 811 768
Amount of cash discount earned	$ 9 882	$ 9 773

ACCOUNTS RECEIVABLE UNIT

In connection with the revised policy governing electricity meter deposits, approximately 1,500 letters outlining the policy for refunding deposits were

ACCOUNTS RECEIVABLE UNIT, Continued

mailed to eligible customers on May 4. This represents approximately 65% of the customers with meter deposits on file. The letter outlined our proposed routine of applying meter deposits to current electricity accounts, and the customer was asked to sign in a space provided for that purpose and return the letter, thereby indicating concurrence with the proposal. As of the end of the month, 1,400 letters had been returned, with all but 10 recipients agreeing with the proposed routine. Cash refunds have been made to those customers who did not agree with the proposal.

Invoices in the amount of $25,326 each were issued to the Union Pacific Railroad Company and the Northern Pacific Railroad Company on May 1. These invoices represent the sixth (of 25) annual payments due for the use of the southern railroad connection serving HAPO. Payments were received on May 15 and May 16, respectively.

As requested by Federal National Mortgage Association, a statement of account setting forth the annual land rental charges relative to our land lease with Spokane Housing, Inc., was furnished. These charges, amounting to $10,360.33, are due on June 30, and it is anticipated that payment will be received prior to the due date.

The gross accounts receivable balance at May 31, 1956 amounted to $322,114, a decrease of $72,956 when compared to the balance of $395,070 at April 30. This decrease results from decreases in all major Accounts Receivable categories except Telephone where an increase of $2,636 was reflected. The increase in the Telephone account was brought about by decreased cash receipts as compared to prior months.

Disconnect notices were mailed to 621 telephone subscribers, and the service of 19 subscribers was suspended due to nonpayment of bills. During the month, 502 delinquent notices and 108 final notices were mailed to electricity customers, while the service of one electricity customer was suspended due to nonpayment of his bill.

Accounts Receivable statistics are summarized below:

Account	Balance 4-30-56	Net Charges	Collections	Balance 5-31-56	Active Accounts
Kadlec Hospital					
Active	$ 96 784	$ 57 734	$ 62 897	$ 91 621	1 742
Collection Agencies (69 accounts)	7 669	512	1 860	6 321	
Electricity	50 896	68 183	96 518	22 561	3 850
Telephone	23 170	57 129	54 493	25 806	6 852
Sundry					
Active	29 169	75 218	77 937	26 450	308
Collection Agencies (115 accounts -a)	8 783	202	2 055	6 930	
AEC Cost-Type Contractors	127 553	90 469	124 927	93 095	34
Rents	30 835	379 919	381 159	29 595	6 695
Equipment Sales to Facilities (1 account)	17 799		349	17 450	1
Safety Shoes	1 431	2 195	2 299	1 327	230

ACCOUNTS RECEIVABLE UNIT, Continued

	Balance 4-30-56	Net Charges	Collections	Balance 5-31-56	Active Accounts
Loans to Employees (4 accounts)	$ 981		$ 23	$ 958	
Sub-Total	$395 070	$731 561	$804 517	$322 114	19 712
Reserve for Bad Debts	(36 605)			(35 676)	
General Ledger Balance	$358 465			$286 438	

(a- Includes all utility and rental accounts.

ADMINISTRATIVE PLANNING

A total of 49 new or revised Organization and Policy Guides were issued during May. Of these, 25 were instruction or policy guides; 24 were organization guides. In addition six were in the process of duplication or distribution at the end of the month. The 25 instruction guides are as follows:

02 Control of Organization Structure
This instruction was reviewed to determine if any revisions were necessary. Nomenclature was revised but no substantive changes were made.

04.I.3 Research and Development
This policy guide was revised to reflect the change in the method of securing approval for Research and Development programs and budgets, to reflect changes in AEC requirements concerning the use of Research and Development funds for the purchase of equipment normally classified as capital and to change definitions.

04.5.1 Property Management - Machine Tools
This policy guide was revised to amplify the procedure dealing with reports required on machine tool utilization.

04.8 Retirement of Government Property
This instruction, formerly known as "Reporting Loss, Destruction or Retirement of Property," was revised to eliminate the Special Loss Report (now contained in OPG 09.4) and to make reference to that guide.

04.12 Control of Equipment on Loan or Temporary Use Off-Site
This instruction was revised to bring nomenclature up-to-date to change a form number reference.

05.1 Plant and Equipment Appropriations
This instruction was revised to reflect changes in federal legislation and AEC procedures, to present a more detailed description of Preliminary Proposals and to amplify and clarify Project Revisions.

05.3.4.1 Authorization for Work Performed by Battelle Memorial Institute
This policy guide was revised to amplify the procedure and clarify the policy statement.

06.4 Employees Testifying in Legal Actions and Proceedings
This instruction was revised to bring nomenclature up-to-date.

08.3 Correspondence and Office Practices
This policy guide was revised to add the requirement that carbon copies of AEC correspondence be sent to the Records Service Center and to change the responsibility for the issuance of "This Way Please" to the Office Auxiliaries Sub-Section.

09.4 Special Incident Reports
This new instruction requires the reporting of serious and property damage incidents, as defined, to the General Manager and to HOO-AEC.

12.1 Reporting Inventions and Discoveries
This instruction was revised to clarify the statement of directive policy and the procedure; and to provide for design patents.

13.15 Disciplinary Action
The directive policy in this instruction was completely re-written in order to present a more definitive statement of HAPO's disciplinary procedures.

13.22 Attendance Recognition Plan
This instruction was revised to eliminate a superfluous sentence, with no substantive changes.

14.1 Plant Evacuation
This instruction replaces the former Master Evacuation Procedure for the areas and, because of its scope and detail, is essentially a new guide.

14.2 Richland Civil Defense
This policy guide was revised to bring nomenclature up-to-date and to restate responsibilities under the new civil defense concept.

14.3 Use of Industrial Medical Services
This policy guide was revised to clarify the policy statement and to bring nomenclature up-to-date.

14.5 Use of Radio Transmitters in a National Emergency
This new instruction restates requirements formerly included in OPG 14.2.

15.28 Foreign Travel
This instruction was revised to add the requirement that foreign travel on official business requires AEC approval.

18.1 Weekly Time Cards
This instruction was revised to reflect changes in time card procedure and to eliminate much unnecessary detail.

18.3 Bargaining Unit Wage Rate Rules
18.4 Non-Bargaining Unit Wage Rage Rules
These instructions were revised to reflect increases in isolation pay and shift differential.

18.14.1 Employment of Women and Minors
This instruction was revised to require written approval of the personal physician and notification of expected delivery date for an employee to work during pregnancy.

18.14.2 Part-Time Employees
This policy guide was revised to bring the provision concerning the Insurance Plan up-to-date.

20.5 Organization Announcements
This policy guide establishes HAPO policy with respect to announcing appointments and organization changes.

22.5 Printing and Duplicating
This instruction was revised to prohibit the use of illustrations or color without HOO-AEC approval.

A report was made summarizing AEC Transmittals received within HAPO during May, 1956.

A summary of organization and policy guides issued during April was sent to all section and department managers.

One complete OPG book was compiled and 680 extra copies distributed.

The following organization and policy guides are currently being reviewed or revised:

04.1.1 Performance of Project Work
04.5.2 Property Management of Special Equipment
04.10 Control of Reactor and Other Special Materials
04.11 Control of Material and Supplies
12.2 Employee Patent and Confidential Information Agreement
13.2 Membership in Trade and Professional Societies or Associations
14.4 Washington State Industrial Insurance and Medical Aid
21.5 Processing of Excess, Salvage and Scrap
21.10 Control of Tools, Jigs and Fixtures for Engineered Equipment or Material

CONTRACT REIMBURSEMENTS

In a meeting of AEC and G.E. representatives on May 10, eight approval letters submitted to the Commission by General Electric in connection with the revised Contract were reviewed and decisions reached as to such further action in each case as deemed necessary. At the end of the month the Contract Reimbursements group had finished drawing or reviewing drafts of documents required in half a dozen other instances to meet the provisions of Supplemental Agreement No. 33 and it is anticipated that most of the necessary approvals by, or agreements with, the Commission under the revised contract will have been obtained by the end of June.

Commission approvals were received with respect to the following matters during the month of May:

1. Temporary off-site storage (at KAPL, Arco or Evendale, possibly on a reciprocal basis) of vital payroll records during periods while material is being accumulated for scheduled microfilming and ultimate storage by AEC.

2. Expense of obtaining the services of an employee of G.E.'s Anaheim (California) plant, Chemical Materials Department, as a consultant (consisting of travel and living expense only) in connection with the safety aspects of paint and surface coatings used by HAPO.

3. Attendance of HAPO employee at one-week G.E. advanced buying seminar.

4. Conformance of HAPO's system of accounting to the Contract requirements as recited in Article XVII, Section 1 of Contract W-31-109-Eng-52. The accounting system was described in six procedural manuals submitted to the AEC covering accounts payable, accounts receivable, cash controls, cost accounting, general ledger and payrolls.

Agreements were entered into, in accordance with Article II, paragraph 8(d) of the Prime Contract, by an exchange of correspondence on the following work to be performed by HAPO:

1. Special radiochemical analysis of Pacific Samples, to be performed for the AEC's Division of Biology and Medicine.

2. Assistance in the AEC's Disposal Program in Richland.

The April "Summary of Disbursements" sent to the AEC's Finance Division on May 18, showed net disbursements of $6,957,296 as follows:

CONTRACT REIMBURSEMENTS, Continued

Payrolls and payroll deductions disbursed	$4 469 394
Materials (including orders placed on requirements contracts) and freight	2 671 370
Taxes and insurance	378 562
Employee benefits	144 240
Subcontracts and agreements	76 225
Advances for travel and living expense	71 537
Miscellaneous	272 186
Gross Disbursements	8 083 514
Less: Cash Receipts	1 126 218
Net Disbursements	$6 957 296

Nonreimbursable costs billed to Schenectady for May, to be charged against the fee or the overhead allowance, amounted to $2,881 as follows:

Conference expense	$1 275
Nonreimbursable travel expense for employees attending G.E. Advanced Management Course	664
Travel and living expense variation	425
Duplicating costs for Elfun Society	350
Nonreimbursable travel expense for employee for Company-approved speaking engagement	99
HAPO's share of storage charges for atomic vault at Iron Mountain	52*
Cost of operating Company-owned car	16
Total	$2 881

* Only item chargeable to overhead allowance.

The Contract Reimbursements group handled 31 inquiries on reimbursement problems during May, 18 of which originated in departments other than Financial.

GENERAL BOOKS UNIT

Interest income of $2,760 was received in May from the State of Washington for the semi-annual interest payment on $200,000 of Washington State Pension Award funds invested in U. S. Government series K bonds.

Proceedings were begun in May to initiate investment in Government securities of an additional $175,000 presently in the Washington State Pension Award bank account which is excess to current cash requirements.

An additional $275 travel and living expense variation budget allocation was made to the Engineering Department in May. This allocation was necessitated by an underestimation of the variation incurred prior to March 9, the effective date of the revised variation budget, but not booked until April.

GENERAL BOOKS UNIT, Continued

The Financial Department budget for conference expense was increased $125 in May. This allocation was required due to expenditures in connection with the Business Training Course and the increased emphasis on recruitment of technically trained employees which could not be anticipated at the time the budget was established.

Travel and living and conference expense reports processed in May totaled 306, representing an expenditure of $62,139, as compared to 341 reports in April amounting to $59,242.

Travel and living expense variation reported in May totaled $426 from 2,151 days in travel status for an average daily variation per employee of $.20 per day. At this date, it appears that the present variation budget allocations will be adequate and a budget excess of approximately $1,000 will exist at year end.

Following are cash and travel and living expense statistics for the month of May, along with the previous month's figures:

	May	April
Advances from AEC		
Balance at beginning of month	$2 383 958	$ 1 711 254
Advances received from AEC	6 800 000	7 630 000*
Other cash receipts	546 685	1 126 218
	9 730 643	10 467 472
Less disbursements	7 618 101	8 083 514
Balance at end of month	$2 112 542	$ 2 383 958
Advances requested for subsequent month	$6 150 000	$ 7 400 000**
Travel and Living Expenses		
Travel Advances to employees		
Balance at beginning of month	$ 71 382	$ 67 397
Advanced to employees	69 819	71 547
	141 201	138 944
Less:		
Travel, living and conference expenses reported by employees	62 139	59 242
Cash refunded by employees	12 563	8 320
	74 702	67 562
Balance at end of month	$ 66 499	$ 71 382
Outstanding Travel Advances to Employees		
Current	$ 57 542	$ 61 248
Outstanding over 30 days	8 957	10 134
Total	$ 66 499	$ 71 382
Number of expense reports submitted by employees	306	341

* Includes refund from the Administrative Fund during April of $1,930,000.
** Includes funds in transit as of May 31, 1956 in the amount of $600,000.

PERSONNEL ACCOUNTING SECTION

May, 1956

Office Letter No. 218 was issued on May 21, 1956, outlining timekeeping procedures for the Memorial Day Holiday and indicating the time of delivery of salary checks during the holiday week.

Copies of certain payroll records are maintained in off-site storage to be used in the event of a major catastrophe resulting in destruction of the local payroll records. This storage has been maintained in Schenectady along with the "yellow file". Because the "yellow file" is being discontinued, arrangements are underway to provide off-site storage of such records at another location.

Each department manager was given an analysis of absenteeism in his department for the year 1955 and for the months of January through April 1956, which showed the time lost through absences in terms of man-days and dollar values. Considerable interest has been shown in these analyses, and several constructive suggestions have been received from the departments for improvement in this type of report.

A study of the flow of insurance claims and the procedures used to process these claims was started during May. Through the application of work-simplification principles and realignment of the flow-process, it is believed that considerable time and effort can be saved in processing claims under the Insurance Plan.

A safety inspection of the spaces occupied by the section was conducted by Mr. W. S. Roe and Mr. E. F. Charette on May 17.

PERSONNEL ACCOUNTING SECTION

May, 1956

STATISTICS

Number of HAPO Employees	Total	Monthly Payroll	Weekly Payroll
Changes During Month			
Employees on Payroll at Beginning of Month	9 371	2 325	7 046
Additions and Transfers In	67	11	56
Removals and Transfers Out	(79)	(14)	(65)
Transfers from Weekly to Monthly Payroll		(4)	4
Transfers from Monthly to Weekly Payroll		19	(19)
Employees on Payroll at End of Month	9 359	2 337	7 022

Overtime Payments During Month	May Number	May Amount	April Number	April Amount
Weekly Paid Employees	5 951	$74 527-a)	6 184	$82 777-b)
Monthly Paid Employees	249	20 565	316	25 514
Total	6 200	$95 092	6 500	$108 291

Gross Payroll Paid During Month	May	April
Engineering	$ 787 192	$ 786 163
Manufacturing	2 596 435	2 568 254
Other	1 171 426	1 158 787
Total	$4 555 053-a)	$4 513 204-b)

(a- Payments to weekly paid employees are for four week periods.
(b- Payments to weekly paid employees are for four week periods.

Employee Benefit Plans	Number Participating May	Number Participating April	Percent Participation May	Percent Participation April
Participation in Benefit Plans at Month End				
Pension Plan	8 631	8 587	98.9%	98.9%
Insurance Plan				
Personal Coverage	9 451	9 464	99.6	99.6
Dependent Coverage	6 735	6 744	-	-
U. S. Savings Bonds				
Stock Bonus Plan	5 146	5 131	55.0	54.7
Savings Plan	1 032	1 049	11.0	11.1
Both Plans	5 609	5 604	59.9	59.8

Pension Plan	May	April
Number retired	5	5
Number who became eligible for participation	84	118
Number who applied for participation	81	114
Number who elected not to participate	3	2
Replies not received	-	2

Insurance Plan - Number of Claim Payments		
Employee life insurance	-	2
Employee accident and health insurance	586	458
Dependent accident and health insurance	520	440
Total	1 106	900

Good Neighbor Fund	May	April
Number participating	6 695	6 691
Percent of participation	71.5%	71.4%

Suggestion Awards		
Number of awards	64	107
Total amount of awards	$1 285	$2 025

Preferential Rates		
Number (eliminated) or added	(7)	-
Number currently in effect	473	480

Number of Military Allowance Payments	2	-

PROCEDURES AND COMPUTING SECTION

MAY, 1956

GENERAL

Computation on the 702 of tube wall thickness in all standard Hanford reactors is nearing completion. Corrosion figures have been obtained for two periods, one from startup to January 1, 1956, and the other from January 1, 1956 to May 1, 1956. The two sets of figures have been combined for all except one reactor, and this will be done in the near future. A program is now being planned which will compute tube wall thicknesses every three or four months to keep corrosion data current.

During the month of May, a special report was prepared for the Property Accountability Unit on Richland housing. This report gave the first cost, reserve and net cost for each house. The costs were broken down to show the amounts applicable to stoves, refrigerators, land and land improvements and buildings.

The book and physical quantity variance report, covering the General Supplies Inventory completed 4:00 p.m. Thursday, May 17, was delivered to Inventory Accounting for evaluation at 8:00 a.m. Monday morning. A total volume of approximately 60,000 cards were processed, requiring close scheduling and deadlines by several groups, including Inventory Accounting, Stores, Keypunch and Computing personnel. To meet the final deadline, it was essential to take full advantage of the 702's speed and capacity. This required approximately 5 hours of main-frame elapsed time.

PROCEDURAL ANALYSIS

Printing Orders Received in Forms Control		398
Items Ordered:		
Miscellaneous Forms	681,205	
IBM Card Forms	290,000	
Total		971,205
Rejections:		
Printing Orders		8
Items		9,570
Orders Increased in Quantity		3
Orders Decreased in Quantity		1
Number of Forms Obsoleted		14
Number of Forms Designed and Redesigned		85

Preliminary planning has been completed on the first phase of the Stores Spare Parts Inventory control study. The objectives of this phase will be to create a description record file on magnetic tape and produce spare parts catalogs as

required. During the initial conversion of each caption, the history record and traveling requisition will also be created. To implement these objectives, an 884 typewriter tape-punch system has been designed and will be installed upon receipt of the forms and required pin-feed platens.

Work continued on the punched card General Supplies inventory control system for Stores. A one-operation routine on the IBM 884 was developed in which the information card is typed and a paper tape prepared for machine processing. Other card forms and output reports are in process of development.

Actual property accountability test data of record transcriptions and change input have been provided to programmers for use in debugging of the main system pass. Complete tables of formalized descriptive names have been supplied for use in report preparation. Report passes have been assembled and debugging is ready to be undertaken as soon as the main input pass has been completely debugged and suitable output from it is available.

A plan has been developed to process transcribed records in three groups as soon as the main input pass of the system has been checked out, producing certain preliminary reports in the course of the operation. Each input group will contain about 22,000 input records, requiring a full reel of magnetic tape. The main system pass will incorporate this input data into master records which, it is anticipated, may be condensed onto one reel of tape for the system master record.

Pull card decks used in the preparation of a supervisors' directory and a functional title report for Salary Administration have been keypunched to include title names. This will enable the reporting of vacant titles at the end of these reports. Procedures have been altered to effect this change.

Discussions were held with unit heads of Classified Files, Records Center, and Procedural Analysis to develop a mutually acceptable procedure for recording, filing, and obtaining access to Classified Documents stored in Records Center. It was agreed that documents will be routed to Records Center and indexed by box number for purposes of locating for reference.

Five analysts spent the greater portion of May working on the conversion of Monthly Payroll to EDPM. Progress is being made on all phases of the conversion but it appears unlikely at this time that checks will be written, using the new program, for June, 1956. Coding is complete on the check writing pass and salary distribution passes. Incomplete routines include the attendance, statistical and calculation passes. A training program was initiated with Monthly Payroll Unit employees covering conversion and operation of the EDPM processing of Monthly Payroll.

The testing of the revision to the Weekly Payroll for insurance, pension, and excludable earnings calculations was completed. The year-to-date pension and year-to-date excludable earnings have been built up from the week ending January 1, 1956 to date, in preparation for the conversion to the revised weekly payroll. Listings showing excludable hours as submitted by payroll for the calculation of excludable earnings have been generated and submitted to Payroll. All corrections to year-to-date excludable earnings and year-to-date pension gross were made for the weeks up to and including week ending May 20, 1956. The weekly payroll procedure has been revised to generate a listing of the new union dues deduction type 714.

A listing was prepared for Employee Services Unit of all exempt and non-exempt employees of requested Job Classifications.

A listing was made of employees according to organization code of names furnished by the Security Procedures Unit.

A 702 pass was programmed for the calculation of Accident Ratio for the Personnel Accident study procedure. This calculation replaces the calculation formerly done on the 605.

A 702 program was written for the preparation of a report for transportation of all vehicles according to type and vehicle number, make and description.

A machine plug board inventory was made of all panels in the section. Lists were made of the panels according to type and serial number, and total on hand of each type. This report was used as a basis for the subsequent return of 279 panels to IBM Company.

A study is currently being made for the establishment of a standard billing method for the section.

RECORDS OPERATIONS

Quantity of records received, processed and stored:

Employee and Public Relations Department	31	Standard	Storage	Cartons
Engineering Department	55	"	"	"
Financial Department	139	"	"	"
Manufacturing Department	101	"	"	"
Radiological Sciences Department	272	"	"	"
	598			

Records Retention and Disposal Schedule Number 229, "Transportation Utility Records" consisting of 33 individual records was prepared for internal submission. Records Retention and Disposal Schedules Number 226, "Metal Preparations Operations and Process Records" consisting of 40 individual records and Number 228, "Electrical Utility Records" consisting of 32 individual records were submitted to the Atomic Energy Commission for approval.

NUMERICAL ANALYSIS

During the month, a rotational trainee was transferred from the Numerical Analysis Unit.

On May 7, W. C. McGee of the Numerical Analysis Unit addressed the Mathematics Club at Washington State College in Pullman. The subject of his address was "High Speed Computation".

Further work has been done on the multi-channel exposure test. The number of channels to be studied has been reduced from 16 to 4, and the report arrangement modified to produce more useful results. Three reports are presently planned: (1) report of source data and calculated variables; (2) an exposure report for 30 minute intervals; and (3) a summary report for 24 hour intervals. Curves have been fit to temperature and flow calibration data for use in the calculation of exposure.

Conversion of the power and exposure study to the 702 has been delayed by a number of last minute changes in problem specification. The original report arrangement has been discarded in favor of a new arrangement which is not yet completely specified. The tube master record is being enlarged to include additional charge data, and provision will be made for obtaining arithmetic averages of flow, temperature, and power for the period of any charge. These changes are designed to produce information more indicative of the rupture problem. Work of similar nature is presently being done for the Operations Research Study. This work will require data accumulated in the old power and exposure study, and is proceeding satisfactorily.

Special request exposure calculations are now being made routinely on the 702. Reports for April and May were completed during the month.

Accountability calculations of Pu yield and U235 burnout in the K reactors were completed. The calculations were made for various exposure levels, and involved the evaluation of simple exponential functions.

An additional run of the resonance escape probability code was made, using a different value of neutron temperature. In spite of the refinements made in the code, the results still showed the undesirable properties noted earlier. The trouble was traced again to the numerical differentiation of a tabular function. By rearranging certain expressions, it was shown that taking second derivatives could be eliminated entirely; and, though the first derivatives would still be required, they could be obtained much more accurately by using denser tabular values. These changes will require reprogramming, which is now under way. Additional features in the new program will be a more accurate expression for the blackness, and the use of a table of neutron collision probabilities to obviate the evaluation of Bessel functions.

Further investigation has been carried out on the generation of random numbers on the 702, for use in the Monte Carlo treatment of neutron diffusion. One method, due to D. H. Lehmer, was studied in some detail and found to be deficient in a number of respects. Consultation with Dr. Lehmer revealed that his method was derived for use on the ENIAC, and worked there because of a certain sampling technique used. A number of promising modifications to the method were suggested by Dr. Lehmer, and the program for generating prime numbers has been used to investigate one of these.

Calculation of neutron modal collision probabilities in a Hanford lattice was carried out. These probabilities are related in a simple manner to those calculated independently with the successive generation program, and were obtained by solving a transcendental equation involving the arctangent. The method of calculating the successive generation probabilities is presently being reviewed in detail, in an attempt to resolve apparent discrepancies between these figures and similar calculations made elsewhere.

Additional calculations of uranium temperature coefficients were completed. These calculations consist essentially of averaging certain energy-dependent cell characteristics over a Maxwellian distribution of neutron energies, with the neutron temperature as a parameter. Modifications to the code are being considered.

Work on the critical mixtures calculation is continuing. The code, written entirely in fixed-decimal arithmetic, has been tested. In attempting the production runs, memory failure trouble was encountered, due apparently to a

particular sequence of programmed instructions. The cause of the trouble is presently being located.

Some 60 additional cases of special slug design calculations were completed during the month, under two separate requests. In one of these requests, the calculations were based on enrichment ratios obtained in an earlier run of the problem of minimizing production cost using a certain cell design. The final results of these calculations were then compared to determine the error incurred in making certain approximations in the minimizing code. Also, work was undertaken on the determination of cell reactivity resulting from different types of loading and cell conditions. Parameters to be studied include slug type, cell moisture, and lattice size.

The evaluation of certain numerical integrals useful in foil counting measurements was carried out. The integrals are used as correction factors to the measured activity of cadmium covered foils, and were evaluated for a variety of cadmium thicknesses. Other physics calculations performed this month included theoretical buckling calculations, Bessel function calculations, and the solution of three systems of simultaneous equations.

Machine testing of the non-linear isotope buildup code has been completed, and several sample runs made. The code contains an inaccurate formulation of cell blackness which will have to be corrected before accurate results are obtained.

A distribution report on ingot density was prepared in connection with the metal quality program. The report covered the period from October 1955 to March 1956. Also, an additional 1400 cases of statistical calculations were run in connection with experiments on crystal orientation in fuel metal.

The calculation of temperature dependent stress in an infinite hollow cylinder has been completed for the low temperature case. An attempt was made to circumvent oscillation trouble encountered in the high temperature case, by halving the time step used to integrate the equations. The trouble appeared again at the same place, and attempts are now being made to determine its cause.

The calculation of tube wall corrosion in all standard Hanford reactors from startup to May 1, 1956 has been completed. The calculations were based on empirical constants determined earlier from sample data, and were made in two time steps: from startup to January 1, 1956, and from January 1, 1956 to May 1, 1956. A program has been written which will bring accumulated corrosion figures up to date, using the most recently computed corrosion figures as input. This program could have been used in making the January to May calculation; but because the program had not been fully tested, and because of the urgent need for the results, the same thing was accomplished by using the original program on January to May data, and combining results for the two time periods with a separate pass. It is anticipated that corrosion calculations of this type will be made every three or four months, and will eventually include all Hanford reactors. In addition to the above, work is well under way on a two-year prediction of tube corrosion. These calculations will be based on the most recently obtained corrosion figures, and on a tube temperature distribution obtained by averaging past individual tube temperature readings. Average temperature distributions have been obtained for all reactors involved and placed on magnetic tape, and production will begin as soon as the necessary corrosion figures are available.

Additional work relating to corrosion experiments was completed this month. A program for determining parameters in an expression for slug corrosion has been programmed and is now being tested. Data from corrosion tests on stainless steel is presently being processed to yield statistical sums of chemical constituents and corrosion rates. The latter work has been delayed considerably because of bad data.

COMPUTING OPERATIONS

Because the work load for the 702 electronic data processing system has consistently grown from month to month, it is apparent that immediate plans must be made to relieve the 702 with a smaller data processor. Serious consideration is being given to the installation of an IBM Type 650 Magnetic Drum Data Processing Machine. One major obstacle to using two different kinds of processors is the fact that each machine is instructed in a manner peculiar to that machine. To overcome this obstacle, a coding system named "OmniCode" is being developed.

OmniCode is a system of automatic programming which is being developed on the assumption that the language of a really good programming system can be used to advantage in preparing programs for any high-speed digital computer. If this assumption is correct, significant savings in terms of money, time, and personnel can be realized in computing and data processing installations using more than one type of machine. This situation exists at Hanford where a 702 is in operation and a 650 may be installed in the near future. The first version of OmniCode is being designed for use in scientific and engineering calculations on the 650. In time, it will be made available for both scientific and commercial applications on either the 650 or 702. Ideally, programs will be written without regard to the computer being used.

The exempt payroll pass showing the statistical report, force report, and location report is being charted and coded. This pass will be ready for testing shortly. The exempt payroll calculation pass is completed as follows:

One thousand five hundred lines of programming were completed for the phase that will write the payroll register, including current pay data and year-to-date totals, and the five separate deduction reports.

One thousand lines of programming were completed for the phase that assembles details of days worked, adjustments, overtime and holiday payments and deductions to arrive at net pay.

An additional five hundred lines of programming were compiled for the executive portion of the pass that controls which phase is to be performed. This includes exception routines for error condition and unusual circumstances, and necessary entries for the internal control procedures.

The three phases above are keypunched and ready for testing.

The file maintenance portion of the monthly payroll calculation pass has been approximately 80% flow-charted with approximately 1500 instructions coded and ready for keypunching.

The above phases represent about 75% of an estimated eight-thousand program entries for the calculation pass. The remaining portions are relatively minor and include the internal control, cross footing, and miscellaneous small routines necessary to tie the major phases into an operating machine program.

A parallel run will be made of the 702 Utilization and Billing report this month in order to completely test out the revised program. The new program provides more detailed information on time used for debug, assembly, sort and production runs and also a more complete breakdown of machine time charged to IBM.

A Property Accountability application for the 702 covering all movable property has been written and is currently being tested. This includes a corrective procedure which corrects old records and several report passes which show:

1. The custodian of the equipment
2. The equipment that each custodian has charged to him
3. The value of the equipment by classification group
4. A catalog of all movable property

In addition to this, all business transacted during a week and during a month is tabulated, and reports of this business are available to the customer. Also, receipts for the custodian are prepared by the 702.

General procedure for the first phase of the Rupture Analysis Study has been more clearly outlined and defined. Details for building usable data and producing proof listings for editing have been completed. Programs for these purposes have been written and are ready to be tested with actual data. Plans are progressing for a procedure to obtain needed information of a classified nature from the edited data and initial work on this step of the job is under way. All necessary auxiliary and correlating passes have also been written and are being tested for use.

During the month of May, the following non-routine assignments were completed for customers:

Atomic Energy Commission	1
Employee and Public Relations	2
Engineering	29
Financial	10
Radiological Sciences	5
	47

Service charges for the month amounted to $88,157.93. Services by customer were as follows:

Atomic Energy Commission	$ 223.30	*
Employee & Public Relations	582.91	01%
Engineering	26 492.32	30
Financial	51 790.75	59
Manufacturing	1 832.94	02
Operations Research & Synthesis	2 656.97	03
Radiological Sciences	4 578.74	05
	$88 157.93	100

*less than 1%

PROPERTY ACCOUNTING SECTION

MAY, 1956

PROPERTY ACCOUNTABILITY UNIT

Physical inventories of Engineering and Radiological Sciences Departments were completed during the month and reconciliation started. A total of 9992 items of cataloged uninstalled items were inventoried as opposed to the 5535 items currently recorded as their property. Typing of custodian control cards, covering property for which custodians had no record, is 65% complete.

Instruction meetings were held with Transportation Section personnel prior to physical inventories, scheduled to commence June 4, 1956, of motor vehicles, heavy equipment and railroad rolling stock.

A physical inventory of T Plant, 200 West Area was completed during the month. Reconciliation is underway and will be completed prior to transfer of the plant and related equipment to standby in June 1956.

Mechanization of records for health instruments and miscellaneous equipment was completed during May. To date 16,200 items of property or 74% of the total items recorded as uninstalled equipment have been converted to IBM. The updating of items previously converted to IBM started during the month with completions on the following: machine tools, firearms and binoculars, photographic, motor vehicles, industrial medical and laundry equipment. In addition to the foregoing, approximately 3000 changes were processed against office machines as a result of revision of nomenclatures and errors in original transcription. All accounts converted except laboratory, shop, office machines and miscellaneous equipment have been audited and questionable items cleared for transcription or vouchering.

An IBM listing of residential property was completed and transmitted to AEC during the month. Listings indicated recorded first cost, accrued reserve at June 30, 1956 and net book value of residences, ranges, refrigerators, land and land improvements. Residences had a total first cost of $47,669,000 and accrued reserve of $15,531,000.

Application of new functional coding to all property records was completed during May. The conversion provides automatic segregation by processes, utilities and service facilities for all buildings and equipment. The application of functional coding and elimination of pennies from individual records required 12 man-months to complete.

CAPITALIZATION AND DEPRECIATION UNIT

The balance in Unclassified Property pertaining to construction projects at May 31 was $305,000. This consists of equipment that has been transferred to projects that are under construction. The unitization rate for May was $656,000 per man-month. Unitization of four projects was completed during May and closed to classified accounts. Unitization of four additional projects was

CAPITALIZATION AND DEPRECIATION UNIT (Continued)

completed but cannot be closed to classified accounts until we receive final billing from Contract Cost and the AEC.

The program of compiling the new composite depreciation rates and reserve adjustments based on the new AEC standard service lives is progressing satisfactorily. Composite rates and reserve adjustments have been computed for all facilities in the 100 Areas, 200 Areas, 300 Area, General Reservation, Research, Plant and Equipment Held for Future Use, and Construction Facilities. Most of the work on General Facilities and Community has been completed. We anticipate completing the computation of the new composite rates and reserve adjustments by June 15, 1956.

During the month of May, standardization of nomenclature and commodity code classification of shop equipment was completed and made ready for mechanization. Information necessary for mechanization was also completed for 4000 items of laboratory equipment. These items consist mainly of instruments. It is anticipated that the program of standardizing nomenclature and establishing commodity code classification for uninstalled equipment will be completed during June.

The recast of plant cost for the 200 West Area was completed during May. Plant costs are segregated by processes for each six-month period from the beginning of the plant operation through December 31, 1955.

INVENTORY ACCOUNTING UNIT

The physical inventory of general supplies in custody of Stores Sub-Section was conducted May 16 and 17, with the exception of medical supplies which was conducted May 9. Verification of the physical count to custodial records is currently in progress.

Preliminary preparations for conducting the physical inventory of special materials were completed during the month. The inventory, scheduled to begin July 2, 1956, will include beryllium, gold, lithium, palladium, platinum and zirconium.

The physical inventory of survey instruments on Property Accountability records was taken May 2 and 3. Survey instruments in custody of Minor Construction which could not be counted because of a work stoppage will be counted during the week of June 11. The reconciliation of the physical inventory to Property Accountability records will be completed after the inventory of Minor Construction survey instruments.

Reconciliation of the physical inventory of excess materials and equipment taken April 12 and 13 is in progress and a report of results will be issued upon completion.

The physical inventory of railroad track materials in the custody of the Transportation Section was conducted May 10 and 11. Reconciliation of the physical to book value is in progress and a report of results will be issued upon completion.

PROPERTY MANAGEMENT UNIT

At the request of the Metal Preparation Section a series of seminar meetings were held with their supervision to explain HAPO property management policies and procedures and to discuss the program's objectives. Approximately sixty area supervisors attended the four meetings. The meetings were well received and a great deal of interest displayed.

A Property Management Standards Guide has been prepared to assist field components in establishing and maintaining an adequate property management program and also for use in evaluating existing practices. Distribution of copies to all components is planned.

Machine tools previously arranged for delivery from Portsmouth under the upgrade program were received by the field components during the month. The plant's machine tools have been substantially upgraded during the past year from better equipment available from the closeout of AEC construction contracts.

Seventy-nine requests for the disposal of property were processed during the month. Twenty-five appropriation requests having a dollar value of $154,049 were processed during the month.

APPROPRIATIONS UNIT

During the month, a study was made relative to Federal budgeting trends, fiscal year 1957 Plant and Equipment Congressional Hearings and fiscal year 1958 budget presentations, and a report was issued recommending improved budget practices to be applied to the fiscal year 1959 Plant and Equipment Budget. In general, the recommendations apply to long-range planning and presentation of program-type budgets which would reflect extended programs but would request only the funds required for a specific year. The following programs were recommended:

Program 1 - Increased Production
Program 2 - Reduction of Operating Costs
Program 3 - Maintaining production and eliminating unsafe conditions
Program 4 - Providing adequate laboratory and development facilities
Program 5 - Initiation of new programs
Program 6 - General plant projects

Further action planned for this subject includes the arrangement of the fiscal year 1958 Plant and Equipment Budget presentation into the suggested program categories. This arrangement can be used as an example to be studied for future budget patterns.

During the month one project meeting was held with representatives of the Manufacturing Department. Projects reviewed for scope, justification, and cost included: Continuous Charge-Discharge - C Reactor, Adequate Fresh Air Systems, and Ball 3X Improvements.

Project Number	Title	Amount of This Request	Totals*	Date to AEC	Disposition
CG-583	Moisture Monitoring System for Detection of Leaking Process Tubes - 100-B, D, DR, F & H Areas	$ -	$ -	5-21-56	Extension of completion date. AEC Board Meeting 6-7-56.
CG-624 Rev. 1	Redox Railroad Tunnel Ventilation Barrier	-	-	4-16-56	HW-355, Mod. 1, dated 5-9-56 auth. extension of completion date.
CG-648 Rev. 1	Auxiliary Radioiodine Removal and Nitric Acid Recovery Facilities, Redox	810,000	870,000	1-19-56	HW-367, Mod. 2, dated 5-4-56 auth. GE $870,000.
CG-654 Rev. 1	Advance Design - Reactor Plant	500,000	600,000	3-26-56	HW-371, Mod. 2, dated 5-25-56 auth. GE $500,000.
CG-655	Crib Methods Selection Tests	100,000	100,000	1-25-56	Work Auth. AEC-151-B(2), dated 4-12-56 auth. initiation of work from Advance Engineering funds.
CG-657	Improvements to Redox Plant Ventilation	205,000	205,000	1-19-56	HW-380, Mod. 1, dated 5-7-56 auth. GE $205,000.
CA-658	Shielded Personnel Monitoring Station - 747 Building Addition	150,000	150,000	1-19-56	Disapproved by AEC-Washington.
CA-662	2101-M Building Conversion	123,500	123,500	2-14-56	Held without action pending warehouse study.
CG-664	350° C. Flow Loop - 314 Building	120,000	120,000	3-14-56	HW-385, dated 5-9-56 auth. GE $120,000.
CG-665	Metal Loading Facilities - 100-B, D, DR, F & H Areas	150,000	150,000	3-19-56	HW-386, dated 5-14-56 auth. GE $150,000.
CG-667	Improved Space Utilization - 105-B, D, & F Buildings	212,000	212,000	4-6-56	Directive to auth. design from 1956 funds. Construction from 1957 funds.

Project Number	Title	Amount of This Request	Totals*	Date to AEC	Disposition
CA-668	Sprinkler System - Building 275-EA	$ 26,000	$ 26,000	3-16-56	Held without action pending warehouse study.
CA-670	Roof Repairs - Central Stores	26,000	26,000	4-5-56	AEC-79, dated 4-27-56 auth AEC $26,000. Work Auth. dated 5-3-56 auth. GE $2,800.
CG-673	Replacement and Modernization of Plant Radio System	181,000	181,000	4-24-56	To be auth. from 1957 funds.
CG-674	Water Plant Component Test Loop - Building 1706-KE	125,500	125,500	4-26-56	Design to be auth. from 9950. Construction from 1957 funds.
CA-675	Change House Facilities - 275-W Building	33,500	33,500	4-17-56	AEC-82 dated 5-9-56 auth. AEC $4,800 for design. Work Auth. dated 5-21-56 auth. GE $2,300.
CG-678	Laboratory Facility for the Special Irradiations Studies	45,000	45,000	5-7-56	AEC Board Meeting 6-7-56.
CG-680	Corrosion Testing Facilities - Building 314	140,000	140,000	5-18-56	AEC Board Meeting 6-7-56.
CG-681	Hanford Equipment in the ETR	80,000	80,000	5-24-56	AEC Board Meeting 6-7-56.
CG-682	High-Level Examination and Cut-Off Cell -327 Building	16,500	16,500	5-16-56	Approved by AEC Board 5-24-56.
CA-683	Relocation of Purex Cooling Water Swamp	333,000	333,000	5-21-56	AEC Board Meeting 6-7-56.
CG-684	Adequate Fresh Air Systems - 105-B, D, DR, F & H	88,500	88,500	5-18-56	Approved by AEC Board 5-24-56.

Project Number	Title	Amount of This Request	Totals*	Date to AEC	Disposition
CG-686	In-Line Monitoring Instruments - Redox and Purex	$ 550,000	$ 550,000	5-21-56	AEC Board Meeting 6-7-56.
IR-208	Steam Sparging - Demineralized Water Storage - Purex	8,800	8,800	5-16-56	Approved by AEC 5-28-56.

SS ACCOUNTABILITY SECTION
MONTHLY REPORT - MAY, 1956

SUMMARY

Our February report directed attention to the delay in shipment of irradiated enriched uranium aluminum slugs to Phillips Petroleum Corporation at ARCO due to the Idaho State Highway ban on truck shipments. This restriction has been rescinded and the first shipment has been made. Scheduled transfers call for two shipments per week and will continue through September 1956. The overall program represents a major inventory reduction.

UNIT ACTIVITIES:

Metal Preparation Area-SS Accountability Unit

Clarification of Accounts

One of the continuing problems associated with the clarification of accounts related to the Normal Uranium and Depleted Uranium stored in the 300 Area Underground Waste Tanks. The problem has now been resolved by A.E.C. acceptance of our proposal to consider the entire account as Depleted Uranium and to charge 9,900 lbs. as unrecoverable material. Written approvals have been furnished by the A.E.C. The account represented practically every conceivable limitation. The major portion of the SS transfers were made in 1944 under du Pont, the record of Normal Uranium and Depleted U segregation was inconclusive, the material was not homogeneous and could not be sampled nor could it be processed in TBP due to emulsification characteristics. There still remains the problem of removal for which some further limitations are evident.

Reactivation of C Slug Program

It has been ascertained that Manufacturing-Operations will resume the use of "C" slugs late in the calendar year. Due to the difficulties in measurement by non-destructive methods considerable preparation has been devoted to the question of "Receiver's Weights." As of the present time, definition of standards specifications, representative samples for isotopic enrichment determination and 305 Reactivity tests coupled with emission spectrometer assay appear to provide a feasible non-destructive test program.

Manual Issuance

The SS Accountability Manual for Normal Uranium was issued on May 3, 1956.

Reactor Area-SS Accountability Unit

Conversion Factors

Conversion factors have been prepared for calculating plutonium produced and uranium lost by fission in the KE and KW reactors. It will now be necessary to make an adjustment of inventories and transfers to Separations in order that our reports will be more accurate. The adjustment is now in the process of being calculated.

Liquidation of Engineering Department's Inventory

A temporary delay has been encountered in the return to production channels of Technology held materials due to a lack of transfer buckets.

SS Accountability Section
Monthly Report-May, 1956

Manufacturing - SS Accountability Cooperative Effort

One of the desired improvements has been the standardization of Reactor Area field records. A standard memorandum record system has now been devised by Mfg-Production Scheduling, and has been accepted by SS Accountability and by the various area operations superintendents. Ledger sheets and inventory location charts have been submitted for forms approval and reproduction. It is expected that the system will be in full operation by June 30, 1956.

Year End Adjustments

Work papers and routines are being developed for making the several adjustments required on or prior to the end of this fiscal year. These adjustments stem from improved conversion data developed by plant physicists and from more accurate factor weights calculated at the time of receipt from off-site.

Unit Transfer of Accounts

Due to the doubtful status of A.E.C. production programs, we delayed transfer of certain accounts from the Metal Preparation Area Unit to Reactors until such time as their status could be determined. In view of the reorganization study now in progress we have decided to transfer thorium enriched uranium and Engineering Department held metal to the Reactor Area. Pile holdings have been consolidated with Metal Preparation Area records and will now be broken down / areas. Completion date is scheduled for prior to June 30, 1956.

Separations Areas-SS Accountability Unit

Production Status

Redox operation continued on high MWD material. Late in the month Purex operation was resumed on low MWD material. During the shutdown improved decontamination facilities were installed and appear to have materially improved performance. This will probably result in the elimination of non-routine recycle and reprocessing in TBP and Recuplex which have been the source of high imprecisions in these accounts. The high-low problem extends to Metal Fabrication where Recuplex is reprocessing low material while the RMA line is on high MWD material. UO_3 operation has been on a moderate level with production tied into feed from Purex.

Accounting Practices and Reviews

At the time we took over records in the Metal Fabrication Area the first problem was to define the contents of the records previously maintained by operations and to compare them with the SS Accountability records. Items of duplication were then eliminated and the two systems reduced to one method. In the meanwhile, a standard accounting system was devised for purposes of uniformity in accounts and for improved accounting procedures. Two approaches were used: Accounting Procedures and Audit of existing records. Recommendations of both approaches are now on record and have been integrated to one consistent recommendation. The field Unit is now preparing for installation of the system. Complete agreement exists among custodian, field Unit and SS Accounting. The problem is now one of available personnel and the maintenance of an adequate rate of progress.

Procedures Revision

The RMA line custodian is considering process revision involving continuous Task I and Task II operation. This process change has been anticipated by the revised accounting procedure and will not require further revision.

SS Accountability Section
Monthly Report-May,1956

Improvement in Purex Basic Charge
Technological difficulties have made the Purex dissolvers an undesirable measurement point, particularly due to the fact they constitute the initial measurement at Purex. This limitation has been eliminated by shift of the initial measurement point to E-5 where improved accuracy and precisions exist.

Information to Operations
Metal Fabrication Operations has requested daily information and procedures are now being devised to provide the data as requested. Factors receiving consideration include improved accuracy in source data where a high rate of error has been observed.

Re-work on UO_3 - Train Wreck Material
Processing of the UO_3 returned from the Thompson Falls train wreck has progressed on schedule. Further process decisions are required in order to firm up the ultimate disposition of the material and SS Accountability problem.

Nitrate Returns
As the direct result of A.E.C. investigation of Plutonium Nitrate-Shipper-Receiver problems a substantial portion of a shipment was returned to HAPO. Most of the material represented initial shipment of Purex separated materials. A high solids content was noted during re-analysis at this site. The solids problem reacted favorably to acidity adjustment with the result the major portion of the returns were reshipped. A portion of the return was mixed with virgin material prior to shipment.

Inventory Verification
Review of Purex April physical inventory disclosed a duplicate entry. This situation developed due to the failure to adhere to cut-offs. As a result, material was included in tank inventory and in transfers from the process.

Raffinate Disposition
A review of the return to process of ANL raffinates is in progress. This material was objectionable to process due to the presence of hexone decomposition products. Process apparently devised a method involving extreme dilution whereby very small quantities were added to the process stream. The original quantity has been carried in inventory on a book value basis and requires adjustment. Operations is collecting the evidence for supporting basis for the adjustment which should be made during this fiscal year.

SS Accounting Unit

Factor Weight Adjustment
We forwarded recommendations to the A.E.C. whereby factor weight difference accounts would be removed from the inventories of certain classes of SS materials. These recommendations have been accepted and approved. We are now treating these accounts as Book-Physical Inventory Differences.

Time Factor
A review of Section performance in meeting Material Balance Report due dates indicates all Units are capable of submitting accurate reports on time.

Reorganization of Isolation Facility Accounts
A reorganization study of the 231 Bldg. process SS Accountability procedure was released on May 18. Application now rests with the Separations Area Unit.

SS Accountability Section
Monthly Report-May, 1956

SS Measurements Unit

Inventory Inspection

We observed two physical inventories in which considerable progress was noted. First, the Fuel Assembly Unit has centralized its holdings with marked improvement in inventory control. We also observed the inventory of the Coatings and Corrosion Unit where procedure changes have improved over-all control.

J-Slug - Measurement Commitments

The reactivation of J slug shipments was used as the basis of measurement review of the A.E.C. 101 Shipping documents. No change was required.

Manual Revision

We reviewed the Redox Inventory Manual for process compliance. Only a few minor items required review and re-write. A similar review of the Uranium Recovery Manual is now in progress.

Metal Fabrication-Physical Inventory

Satisfactory progress is being made with inventory forms constituting the main problem. Completion is expected prior to June 30, 1956.

UO_3 Shipper-Receiver Variance

Improved weighing procedures at UO_3 have materially reduced the frequency of variances. In addition, a trip report issued by R. Dragoo of the USAEC-Hanford Operations Office has aided in the clarification of Receiver's procedure.

TBP-UO_3 Analytical Verification

A technical verification of TBP-UO_3 - SS Accountability analysis for February, 1956 was completed and published under Document HW-43063. Findings have been accepted by the Analytical Sub-Section.

Purex Inventory Precisions

Standardization of procedures and conditions at Purex have now progressed to the point where formulas for Purex inventory precisions could be prepared and we have proceeded to complete this portion of the Reliability control problem.

Bias Correction

Considerable effort has been expended in the attempt to isolate an assignable cause for bias in the Redox dissolver solutions. The problem is highly technical and may involve analytical interferences. The problem is complex and does not appear to be capable of solution on the basis of present data. Further review is in progress.

FINANCIAL DEPARTMENT PERSONNEL AND ORGANIZATION

May, 1956

	Current Month	Prior Month
Personnel Changes During Month		
Employees at beginning of month	506	508
Additions and transfers in	8	12
Removals and transfers out	(10)	(14)
Employees at end of month	504	506
Personnel by Unit at Month-End		
General	11	11
Auditing Section	17	17
Budgets and Measurements Section	13	13
Contract Cost Section		
General and Consolidations Cost Unit	11	11
Engineering Cost Unit		
General	4	4
Design Cost	8	8
Project Cost	18	20
Technical Cost	12	12
Employee and Public Relations Cost Unit		
General	2	2
Plant Activities Cost	10	10
Community Cost	5	5
Medical Cost	3	3
Manufacturing Cost		
General	2	2
Financial Representatives	13	13
Budgets and Control	19	17
Reports and Records	16	16
Analysis and Studies	3	3
	126	126
General Accounting Section		
Accounts Payable Unit	24	24
Accounts Receivable Unit	20	21
General Books Unit	16	17
Administrative Planning	3	3
Contract Reimbursements	5	5
	68	70

	Current Month	Prior Month
Personnel Accounting Section		
Payroll Planning and Analysis Unit	6	7
Weekly Payroll Unit	16	16
Monthly Payroll Unit	13	12
Benefit Plans Accounting Unit	13	13
Payroll Reports Unit	9	9
Weekly Payroll Records Unit	7	7
	64	64
Procedures and Computing Section		
Computing Operations Unit	25	25
Numerical Analysis Unit	11	11
Procedural Analysis Unit	15	14
Scheduling Unit	24	25
Records Unit	7	7
	82	82
Property Accounting Section		
Appropriations Unit	5	5
Inventory Accounting Unit	12	12
Property Accountability Unit	30	29
Property Management Unit	4	4
Capitalization and Depreciation Unit	20	21
	71	71
SS Accountability Section		
Reactor Area - SS Accountability Unit	5	5
Separations Area - SS Accountability Unit	18	19
Metal Preparation Area - SS Accountability Unit	8	8
SS Accounting Unit	7	7
SS Measurements Unit	9	8
	47	47
Rotational Trainess	5	5
	504	506

OPERATIONS RESEARCH AND SYNTHESIS SECTION

May 1956

The following is the month end summary of personnel:

	As of 4-30-56			As of 5-31-56			Net Change		
	Ex	Non-Ex	Total	Ex	Non-Ex	Total	Ex	Non-Ex	Total
General	1	1	2	1	1	2	0	0	0
Oper. Research Analysts	4	0	4	4	0	4	0	0	0
TOTAL	5	1	6	5	1	6	0	0	0
		*	*	*					

The study of the 100 area data processing problem has been completed. Conclusions and alternatives are presented in a report which is now in rough draft form. The key to the problem of gaining the potential intelligence that lies in reactor data and making it available for appropriate management decision turned out to be the creation of a decision domain in the area of reactor data processing. Organizational steps should be taken to make it possible for management decisions to be made relative to reactor data on the basis of the needs and potential of the entire system. This is a straightforward and "obvious" conclusion, yet it is interesting to note that the thinking evolved through two stages where the essence of the problem seemed to be (1) the application of more sophisticated data processing techniques and more consistent accuracy specifications, and (2) complete integration with mutual compatibility between all elements of the system. The above two requirements are indeed important, but they will logically follow proper organizational implementation. These concepts have been presented to the people who are in a position to carry them out, and they intend to do so at the earliest possible time.

The survey of data processing requirements in the area of personnel measurements indicated a definite interest on the part of management in an improved personnel register, particularly with respect to an integrated, authoritative, and accurate inventory of personnel and skills available to the operation. Some re-alignment of this program will be necessary to take into account the decentralization of personnel practices in the present organizational study.

Preparations for the processing of tube population data required for comprehensive slug rupture analysis are continuing. Delays in the completion of certain data processing by other components concerned with this problem have put this program approximately three weeks behind schedule.

Investigations of mathematical models related to reactor economics and operations are continuing. The primary difficulty in this area seems to be the reconciliation of technical adequacy and mathematical feasibility.

The preliminary study of assembly line balancing problems in the Z plant operation is continuing.

END

DATE FILMED

9/14/92