1 of 1

HW-7-995
~~IN-02289~~ D-21

SEP 07 1990

INV SEP 21 '83

File

HANFORD ENGINEER WORKS

Route List

DEC 14 1944

CLASSIFIED FILES SECTION

Date 12-9-44

Subject HEW Monthly Report - November, 1944

To R. M. Evans

From W. O. Simon

Copy No. 1 The Area Engineer

BEFORE READING THIS DOCUMENT, SIGN AND DATE BELOW:

R. B. H. ... Jan 4, 1945
 J.

DECLASSIFICATION REQUEST

Classification Cancelled (Change to

Declarer's hand with Dealer

By Authority of LG-PR-2

MR. Dyer 6/29/90
TR BUREAU 8/30/90
MR. J. C. Cline 8/24/90

DISTRIBUTION RESTRICTED TO U.S. ONLY

**DECLASSIFIED
WITH DELETIONS**

**DECLASSIFIED
WITH DELETIONS**

Copies: No. 1 - R. M. Evans - Wilm. - 1
No. 2 - R. M. Evans - Wilm.
No. 3 - Th Area Engineer
No. 4 - 700 Area File
No. 5 - " " "
No. 6 - " " " " 2200

THIS DOCUMENT CONSISTS OF 95 PAGE(S)

HW-7-991-De1

December 10, 1944

HANFORD ENGINEER WORKS

MONTHLY REPORT

NOVEMBER 1944

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

**DECLASSIFIED
WITH DELETIONS**

1

DISTRIBUTION RESTRICTED TO U.S. ONLY

GENERAL

The 100-B Area was in operation all month at a level of 90 MW. Scientific measurements were completed requiring two low level runs, one of three days and the second of one day. The first plant size metal discharge was made starting November 24, amounting to eight tons of approximately 25 g. per ton enrichment.

Pre-operation testing and practice chemical runs continued in the 200-T Area and all equipment is receiving a thorough testing.

300 Area operation continued unchanged but with an increased demand due to the larger contemplated charges in the piles.

The total force increased from 4576 to 4926, a gain of 7.6%. This marks the first flattening of the rapid rate of increase during the previous six months.

The turnover reached a high of 8.01%, a total of 387 persons leaving their jobs. The organization is in the shakedown phase after a very rapid growth and this high figure is not expected to continue.

The village was 76.8% occupied at the end of the month. Construction housing requirements decreased and the period of renovation required before re-occupancy has slowed the rate of growth of the village.

H.E.W. STAFF

MANAGER	W. O. SIMON
ASSISTANT MANAGER	D. O. NUTMAN
PRODUCTION SUPERINTENDENT	F. A. OTTO
TECHNICAL SUPERINTENDENT	S. J. BUGBEE
GENERAL SUPERINTENDENT - PLANT	J. A. GRADY
GENERAL SUPERINTENDENT - VILLAGE	W. O. RHODES
GENERAL SUPERINTENDENT - PROTECTION	T. N. STAPLETON
WORKS ENGINEER	L. A. DARLING
P DEPARTMENT SUPERINTENDENT	M. H. SMITH
S DEPARTMENT SUPERINTENDENT	N. C. KAY
POWER SUPERINTENDENT	F. M. ACKER
MAINTENANCE SUPERINTENDENT	ROSS HARE
ELECTRICAL SUPERINTENDENT	P. S. SKAFF
INSTRUMENT SUPERINTENDENT	V. P. HANSON
SERVICE SUPERINTENDENT	W. T. CLOUD
TRANSPORTATION SUPERINTENDENT	R. T. COOKE
TRAFFIC SUPERINTENDENT	F. D. RADER
MEDICAL SUPERINTENDENT	W. D. HORNWOOD
CHIEF ACCOUNTANT	T. W. BROWN

11-30-44

H.E.W. FORM REPORT

DEPARTMENT	NON-EXEMPT		EXEMPT						TOTAL	
			AT H.E.W.			ELSEWHERE				
	10-31-44	11-30-44	10-31-44	11-30-44	10-31-44	11-30-44	10-31-44	11-30-44	10-31-44	11-30-44
Management	-	-	7	7	-	-	7	7	7	7
P	214	203	108	100	4	4	112	104	326	307
S	43	70	94	101	-	-	94	101	137	171
Technical	92	98	265	266	12	3	277	269	369	367
Power	326	364	70	77	-	-	70	77	396	441
Maintenance	353	503	129	163	-	-	129	163	482	666
Electrical	100	118	37	37	-	-	37	37	137	153
Instrument	171	168	54	55	-	-	54	55	225	223
Village Engineering	55	-	26	-	-	-	26	-	81	-
Protection	1038	982	119	119	-	-	119	119	1157	1101
Service	84	98	43	46	1	1	44	47	128	145
Village	5	5	19	16	-	-	19	16	24	21
Transportation	130	295	25	33	-	-	25	33	155	328
Traffic	-	7	4	6	2	2	6	8	6	15
Medical	166	182	72	83	5	-	77	83	243	265
Accounting	668	682	35	32	-	-	35	32	703	714
TOTAL	3445	3775	1107	1141	24	10	1131	1151	4576	4926

ARRIVALS AND DEPARTURES - EXEMPT ROLL

NOVEMBER 1944

ARRIVALS

<u>Name</u>	<u>Department</u>	<u>Arrival Date</u>	<u>Origin</u>
L. I. Brecke	"	11-6 -44	Clinton Laboratories
Richard D. Caney	"	11-6 -44	" "
Lucian C. Evans	"	11-9 -44	" "
Louis L. Larson	"	11-13-44	" "
John B. Chaney	"	11-17-44	" "
H. K. Strassel, Jr.	"	11-24-44	" "
Joseph F. Donnelly	"	11-24-44	" "
James Fentress	Technical	11-1- 44	Metallurgical Lab
D. A. King	"	11-1-44	" "
Bruce Anderson	"	11-1- 44	" "
T. J. Armstrong	"	11-1- 44	" "
Henry Peterson	"	11-1- 44	" "
L. G. Hulton	"	11-1- 44	" "
Donald S. Webster	"	11-1- 44	Clinton Laboratories
Roy M. Campbell	"	11-1- 44	Metallurgical Lab
Hugh H. Burton	"	11-2- 44	" "
Warren M. Garrison	"	11-6- 44	" "
Rozel E. Curtis	"	11-6- 44	" "
Paul Sevedge	Maintenance	11-3- 44	Construction
A. J. Schwertfeger	"	11-4- 44	Clinton Laboratories
Leland B. Mosher	"	11-7- 44	Construction
Thomas M. Jones	"	11-13-44	"
George A. Keller	"	11-14-44	"
Gilbert R. Moore	"	11-16-44	"
Cecil A. Brenner	"	11-16-44	"
Bryant E. Page	"	11-20-44	"
Roy Scott	"	11-21-44	"
William R. Jones	"	11-21-44	"
Stanley Hendrix	Electrical	11-20-44	New
Thomas B. Farley	Service (Protection)	11-1 -44	Construction
Arne E. Carlson	Service	11-1 -44	"
James L. Gabriel	"	11-17-44	"
William G. Freeland	"	11-21-44	"
Frank J. Ogle	Service (Village Adm.)	11-1 -44	"

continued -

<u>Name</u>	<u>Department</u>	<u>Arrival Date</u>	<u>Origin</u>
Clarence M. Watkins	Traffic	11-3 -44	Construction
Franklin A. Lynn	"	11-3 -44	"
L. J. Plain	"	11-28-44	"
Clyde S. La Porte	Transportation	11-6 -44	"
G. E. Acorn	"	11-6 -44	"
William E. Harden	"	11-7 -44	"
George B. Mullins	"	11-9 -44	"
John S. Phillips	"	11-13-44	"
Charley W. Funk	"	11-14-44	"
C. R. Cole	"	11-14-44	"
John C. Ensor	"	11-14-44	"
Joe E. Millard	"	11-21-44	"
Charles E. Gant	"	11-21-44	"
Robert L. Sutton	"	11-21-44	"
Richard E. Scott	Medical	11-18-44	New
James W. Morris	"	11-29-44	Clinton Laboratories
Walter Singlevich	"	11-29-44	"
H. A. Moulthrop	"	11-29-44	"
L. D. Pahnke	"	11-27-44	"
G. W. Chastian	"	11-29-44	"

DEPARTURES

<u>Name</u>	<u>Department</u>	<u>Date</u>	<u>Reason</u>
Stephen E. Bradley	P	10-24-44	Termination-No Work
Thomas E. Curran	"	11-30-44	Transfer Bridgeport Works
Fr d Moss, Jr.	S	10-5 -44	Termination-Military Serv.
Phil E. Church	"	10-31-44	Termination-Assignment Completed
Harry C. Andrews	Technical	10-30-44	Transfer-Denver Ord. Plant
Clarence M. Cleveager	"	11-1 -44	Transfer-Wayneboro Rayon
Clifford K. Sloan	"	11-30-44	Transfer-Experimental Station
Donald H. Johnson	"	11-1 -44	Deceased
David E. K. Ryan	Maintenance	11-7- 44	Transfer-Denver Ord. Plant
Gregory W. Barber	"	11-10-44	Termination-Medical Rejection
John E. Baldt	"	11-30-44	Transfer-Wilm Chemical Dept.
Alvin F. Schroeder	Electrical	10-31-44	Termination-Voluntary
E. W. Mosley	Service (Protection)	11-13-44	Termination-Voluntary
E. P. Dunham	Service	11-8 -44	Transfer to P & F

2289

<u>Name</u>	<u>Department</u>	<u>Date</u>	<u>Reason</u>
William Finn	Service	11-5 -44	Transfer to F & F
G. A. Sullivan	(Village Adm.)	11-7 -44	Transfer-Du Pont Works
J. V. Quinn	Transportation	10-31-44	Transfer to Krebs
Russell A. Corban	"	11-8 -44	Termination-No Work
Charles E. Gant	"	11-24-44	Termination-Medical Reject
Olaf S. Opdahl	Medical	11-1 -44	Termination-Voluntary
Russell L. Bauer	"	11-11-44	Trans.-Gopher Ord. Works
Edgar H. Cummings	Accounting	11-5 -44	Trans.-Gopher Ord. Works
John E. de Calonge	"	11-15-44	Termination-Force Reduction
William D. Eaton	"	11-20-44	Trans-Indiana Ordnance Wrks.
William J. Lawrence, Jr.	"	11-18-44	" " " "

BAA

	<u>AA</u>	<u>AB</u>	<u>AC</u>	<u>AD</u>
A	-	32	-	34
B	-	148	-	1,170
C	-	-	-	6
D	-	-	13,115	52
E	-	-	36,507	145
F	1,347	5	1,347	5
I "B"	12,759	49	97,806	379
I "Z"	13,375	52	28,167	110
I "X"	2,368	9	2,368	9
J	1,572	6	7,613	29
K	60	-	1,884	7
L	10,965	43	153,073	604
M "B"	5,614	22	77,127	299
M "Z"	19,501	76	34,368	134
M "X"	1,995	8	1,995	8
N	149	1	149	1
O	27,259	107	113,639	442
R	14,535	57	149,262	588
S	41,794	164	262,901	1,030
U	33,440	131	115,992	457
V	-	34	-	-
W	-	275	-	-
X "A"	780	3	-	-
Y	1,615	6	-	-
Z "B"	2,533	10	-	-
Z "Z"	1,464	6	-	-
Z "X"	794	3	-	-
B-1 "Z"	466	2	-	-
B-1 "X"	5,602	22	-	-
C-1	7,972	30	-	-
D-1	3,871	15	-	-
E-1	34,440	136	-	-
F-1	61,455	249	-	-
G-1	1,347	5	-	-
I-1	2,039	8	50,012	197
M-1	2,016	8	2,016	8
Q-1	-	27	-	-
R-1	47,996	189	-	-
S-1	2,016	8	-	-

AE

K-1	1,771,718
A-2	189,090

AF

2,639,340
189,090

HW-7-991-De1

~~2200~~P DEPARTMENTNOVEMBER 1944100-B AREAGeneral

Unit was operated at a level of 90 MW continuously until November 20, except for a one-day shutdown to discharge tube 2374, to permit observation of the conditions of the slugs in this tube. Slugs were found to be in good shape with only very slight evidence of any film. However, considerable difficulty was experienced in the discharge with two jams at the aimer head and an almost complete failure of the slugs to slide out of the escapement.

On November 20, the unit was cut down to a 0.2 MW level and a three-day run was made for the purpose of following the decay of the poison and measuring the new base of reactivity. It was found that an increase in reactivity of 10 to 15 inhours had been experienced, whereas a decrease had been expected.

Following this, 42 tubes were discharged and loaded with calibrated material. Two jams at the aimer head were experienced, which were cleared safely, though with some difficulty and considerable loss of time. One of the tubes discharged contained Farmer samples and papooses and another was a tube of weighed "corrosion" test slugs. With the new material in the 42 tubes, a 24-hour run was made at low level and a positive gain of reactivity measured (about 5-7 inhours).

Next, the total discharge was brought to 8 tons with an additional 22 tubes, during which operation one jam was experienced in the funnel. The funnel was released from its mounting and the situation cleared. Changing the orifices and loading the remaining 95 tubes, already equipped with nozzles, was commenced following completion of the discharge. These tubes were charged with 35 active slugs each as compared to a previous standard of 32.

During the month all front nozzles and about 100 rear nozzles of the remaining 400 tubes not already loaded were installed. The pigtails have not been connected but the orifice and screen assemblies are in place. Work on the associated Panellit units has been started and is about one-half complete.

All the equipment for examining the slugs in the Sorting Pit has been installed. Not enough film was discovered on the slugs to justify a purge, although a definite indication of film was noticeable.

It has been found that all the solid dummies so far discharged can be reused in a reasonable time. The above 95-tube loading employed used 8" solid aluminum dummies in place of all but four perforated dummies in each tube.

Unusual Incidents

The unexplained heating of gas from the cold unit while being purified has not been completely resolved, but the best explanation appears to be that oxygen concentrated in the impure portion remained in the tower after let down, and

reacted with the hydrogen. Based on calculations setting safe limits for the oxygen, the No. 1 Purification Unit was operated 24 hours on cold unit gas without incident.

Problems Solved

No. 1 Purification System has been rebuilt and refrigerant installed with great care to exclude water. Operation has been completely successful so far, with temperatures of -200C being attained. Operation has only been for one 24-hour period under load, but evidence points to no further serious difficulties. No. 2 Purification System is now being rebuilt along similar lines and will be reloaded with new refrigerant.

Problems Unsolved

During the month the charging and discharging machinery (principally the latter) has been studied extensively. A mock-up was built at the 190 Building "hot well", and a new escapement and new aimer head designed and tried out. These proved quite superior to original equipment and were used in the 8-ton discharge of November 23, but the system is still susceptible to considerable improvement.

These improvements will be carried out so far as possible before the December 15 discharge. At the same time, work is being started on two proposed systems more or less fundamentally different from that being used (completely controlled fall and completely free fall).

The orifices in the individual CO₂ lines to the vertical safety rods were removed and this permitted much more extensive purging. At the present it is believed that the gas hazard has thus been eliminated at the cost of a considerable increase in CO₂ consumption. However, a new hazard has apparently been found in that the rods enter the pile during a trip while it is still active, and do not kill it fast enough to avoid being activated themselves. Hence, when they are pulled after a short time they exhibit a strong activity with a half life of about 2½ hours. The investigation of this situation will be continued during the next run.

Some of the causes for accidental trips have been eliminated or reduced, but too many are still occurring. The Panellit Unit is still the major offender. Work on this situation will be pushed in order to make "free running" more attractive.

Work on the ventilating fans is continuing, with progress being made, but satisfactory operation has not yet been attained.

The gas leaks on the front face have been brought well under hazardous limits, but not stopped completely. The Project Group is working on redesign of the rubber sleeves for covering the bellows.

100-D AREA

105 Building - Pile

Test Work with Construction

During the month the personnel assigned to D Area have worked with Construction in testing equipment as its installation neared completion. Some highlights were the following:

2289

- 10-28 - High tanks and filtered water lines flushed.
- 10-30 - First test on shim rods.
- 11-2 - Pile cross headers flushed with filtered water.
- 11-4 - Pumps and lines at 107 tested.
- 11-9 - Scrapped horizontal rods for first time.
- 11-9 - Crane and cask given final test.
- 11-15 - All vertical rods dropped together.
- 11-18 - Made hydrostatic test on unit at 200# against closed valves.
- 11-23 - 190 Bldg. started pumping water through return bends in valve pit at 300# pressure.

Construction of the building was completed on November 25th.

110 Building - Helium Storage

The storage tanks were accepted on November 15. A gas car was delivered on November 15. The unloading of this car was begun on the 18th and completed on the 19th.

115 Building - Gas Purification and Circulation

As of November 28, the building is still in the hands of Construction. The major items that remain to be completed before acceptance by Operations are as follows:

1. Re-install and test electric gas heaters.
2. Test automatic operation of ventilating system.
3. Complete satisfactorily the testing of the low pressure system with air.
4. Run-in and check operation of the vacuum pumps.

300 AREA

313 Building - Metal Fabrication

Outgassing and Straightening

Outgassing has proceeded throughout the month without trouble. All analyses have shown less than one part per million of residual gas. Two parts per million is the allowable limit.

During the straightening operation, a total of six bars have been broken. All of these bars were found to have defects in the form of radial cracks at the break.

Machining

Machining was started on a part-time basis on November 6, following a several week shut-down, and was up to one shift capacity by November 20. Machining scrap averaged 2% as compared with 1 1/2% during previous normal operation. However, operation was improved, and during the last week the standard figure of less than 1 1/2% was met.

"Hydromite" is being used as a coolant for the machining operation.

Canning

Canning was continued by the submerged process on a three-shift, six-day per week basis with two assembly units in operation. Overall canning yield to 111 class material has been 84.6%. This compares with 84.8% for the month of October. The yield has been definitely affected by operation on "A" grade material. A breakdown of the yields for the various grades is as follows:

Z Material	-	91.2%
X Material	-	89.8%
A Material	-	74.8%

All material canned in October was Z material. A new quench procedure was started November 15, and has done much to improve the quality of the finished slugs. Fluoroscoping of the top cap to control the machined thickness of the cap was started on November 15. With this procedure the cap is fluoroscoped and marked for cutoff to give a .350 cap. The cap is again fluoroscoped after machining, as an inspection procedure. The limit specified is .340 to .360.

Bad welds for the month of November were 2.9% as compared with 2.2% for October. Bad welds are found to be largely due to poor top cap wetting and extremely close control is necessary. A new procedure for checking caps for wetting prior to assembly has considerably improved the wetting picture.

Autoclave rejects have been at a rate roughly half that for October. The November results show .42 rejects per thousand on "A" material, .29 rejects per thousand on "Z" material, and .17 rejects per thousand on "X" material.

Inspection and Testing

A new accounting system has been started which provides for a complete daily inventory of materials on hand.

A new system of slug marking to show the date and shift canned has been started.

Recovery

The recovery of the existing stock of canned rejects was completed on November 15, and the equipment turned over to Construction for moving to Bldg. 313.

Approximately one-half of the accumulated recovery sludge was concentrated to a slurry and shipped from the Plant. The remainder of the sludge will be filtered and held for shipment.

305 Building

The 305 Building was operated fourteen days.

Routine testing - 153 tests - 1683 pieces.

Special testing: 1 - 3½ hour test for Technical; 1 - 6 hour test for Technical;
10 tests on unbonded pieces (110 pos.); 130 tests for 100-B
(1430 pos)

8 DEPARTMENTNOVEMBER 1944OPERATIONS

In the T Section of the West Area, the month of November was consumed in making repairs and adjustments to equipment and instruments. By the end of the month, all mechanical work in the cells was essentially complete, and dummy runs had started in the dissolvers. A major mechanical difficulty developed during equipment trials early in the month when it was discovered that the 5 HP gear reducers for the precipitator agitators showed some defects. Alterations or repairs were made as described in the Maintenance Department Report.

Hazard disclosures have been made to all Operations personnel in T Plant.

STATUS OF CONSTRUCTION WORK

Construction work in the U Section of the 200-W Area is practically complete, except for running in.

Flushing of service and process lines and calibration of vessels and instruments is now proceeding in U buildings, with every endeavor by Operations to detect mechanical troubles before Construction leaves the Area.

The Finishing Bldg. (231) is scheduled for completion in December. Owing to possible future changes in design as process experience is accumulated, Cells 3, 4, and 5 are equipped with hoods and apparatus, but will not be piped up by Construction. Cells 1 and 2 now are essentially complete. Recent experience at Clinton has shown that additional ventilation of the individual vessels in the hoods will be required in this building.

In the 200-East Area, Bldgs. 2704, 2707, 2709, 2713, 2715, 2720, 2722, and 2734 (Stores and Service Buildings) are ready for initial inspection by Operations. In the Canyon Bldg. 221, piping through the concrete has been completed and poured except in Section 20. Deck level pours are complete through Section 7.

All tanks at 241-B, Waste Storage, have been sealed, and backfilling has been completed to grade. Backfilling also has been started at 241-C. Completion of all waste storage facilities is planned before the end of December.

METEOROLOGY SECTION

Bldg. 622, the Meteorological Office and Observation Tower, is complete except for grading. Considerable calibration work remains to be done before the building will be of service. In the meantime, the group is continuing its functions of making wind direction, velocity, and stack dilution forecasts from its base in 200-East Area.

RAW MATERIAL STORAGE (BIDGS. 212-N, 212-P, 212-R)

Raw Material Storage Bldg. 212-N is complete and in operation. Transfer of Clinton active material from shipping containers to standard transfer buckets was completed.

Bldg. 212-P has had an initial inspection and acceptance, and is standing-by, essentially complete.

Bldg. 212-R has not been accepted, pending changes in the well pumps and until the full complement of casks and buckets are received.

TECHNICAL DEPARTMENTNOVEMBER, 1944100 AREAPhysics SectionReactivity

Analysis of the month's run of 105B at 90 MW and the low, 0.2 MW, level runs at the beginning and end of this period has received concentrated attention. Mr. Farmer and the Technical Division have taken an important part in this work. A summary of the conclusions arrived at by Mr. Farmer from the observations made during this run follows.

An attempt has been made to fit the critical positions before, during, and after the run in terms of a theory in which the following reasons for changes of reactivity have been considered:

1. Formation of product
2. Depletion of 25
3. Burning of boron
4. Contribution of miscellaneous fission products
5. Contribution of Sm^{149}
6. Power coefficient due to Wigner effect
7. Xenon poison including its variations due to scrams and to the fact that the power level drifted during the run by 1.3% due to fall in inlet water temperature.

The following effects presumably also contribute to changes of reactivity, but have been excluded from consideration since no reliable information was available for estimating them.

8. Effect of variations of the inlet water temperature on nuclear properties.
9. Effect of changes in the purity of helium.

It is found that the best fit of the experimental data is obtained by assuming a branching ratio of 0.34% for Sm^{149} . With this assumption, there is a maximum error of ± 3 inhours. This error is apparently an accidental one only to a small degree. It may result to a considerable extent from the factors 8 and 9, above, which were neglected, or from

2283

incomplete knowledge of the nuclear factors of the poisoning phenomenon. It does not appear, however, that introducing a parent of samarium or giving a large coefficient to the anti-poisoning of 27 will reduce the disagreement appreciably.

Assuming that no effect important for a long high power run has escaped notice, it is possible to calculate the changes of reactivity to be expected in a 2004-tube pile operated at 250 MW for 100 days. These changes are given in the following table.

Days	⁴⁹	25	Boron	Fission Products	¹⁴⁹ Sm	Total
0	0	0	0	0	0	0 1h
10	+49	-51	12	-4	-17	-11
20	111	-102	23	-3	-30	+2
30	191	-154	35	-11	-42	+19
40	262	-205	45	-15	-53	+35
50	334	-256	55	-19	-62	+53
60	405	-308	65	-22	-69	+71
70	477	-359	74	-26	-77	+39
80	548	-410	84	-30	-83	+109
90	620	-461	93	-34	-89	+128
100	691	-512	101	-38	-95	+143

An expected additional gain in the power coefficient above its present value has not been included in this table since no data are available for its extrapolation beyond a few thousand megawatt-days. The table shows an initial decrease of reactivity which results from the trailing of the product. This loss is more pronounced if the pile is brought suddenly to a very high power, and in the present run was consequently much less and was overshadowed by the positive graphite power coefficient.

A re-estimate of the absorption cross section and branching ratio for Xe^{135} was made from an analysis of the reactivity-time curve during the first eight hours after the power of the pile was dropped from 90 MW to 0.2 MW. The absorption cross section is estimated to be 2.4×10^{-18} sq. cm. and the fission branching ratio, 6.8%. The curve carried through the three days of low power operation using these constants gave a reactivity of about 380 inhours at the end of this time which compares with the figure of 360 inhours observed on the basis of successive rod calibration. The rod calibrations have been the subject of considerable study because of departures from the simple, expected Bessel function shape. For the cases in which three or less shim rods were in the pile, the calibration obtained agreed with the shape of the curve to be expected from a Bessel function neutron distribution. However, when four or more rods in addition to regulating rod A were in the pile, the flux distribution was shifted away from the rods by approximately 15 inches. The calibration curves of these configurations

2209

were obtained by constructing the whole curve from measured exponential rise observations made at successive points. The curves obtained depart slightly from the Bessel function.

From the observations made immediately after dropping the level of the pile, a power coefficient for the reactivity due to the rise in graphite temperature was estimated as $+0.49$ inhours/megawatt. This figure applies to the pile with saturated Xenon poisoning at the end of the 90-megawatt run. The graphite temperature fell exponentially with a relaxation time of 22 minutes. The power coefficient due to the rise in metal temperature was calculated to be -0.34 inhours/megawatt.

A procedure to be followed after scram shut downs of the unit was developed in order to recover some of the production time lost due to these scrams and also to bring the Xenon poisoning to its saturated value as soon as possible. Following scrams during the 90-megawatt run, the power was brought to 110 megawatts for a time equal to four times the length of time the unit was down.

Monitoring Exit Water for Slug Coating Failure

The study of the behavior of the installed monitoring system has progressed to a point where routine operation was possible. A report describing the equipment and method of operation of the system has been prepared.

Work on the background activity resulting from the deposit of active film in the monitoring ion chambers continues. It has been determined that this background can account for over half of the activity reading observed for a header sample. At the present time with bucking of the outputs of chambers, this background effect does not reduce the header monitoring sensitivity.

Scanning of the pile face immediately after shutdowns by means of H.I. instruments has not detected localized regions of higher activity which might result from a burst jacket.

Activity of Pile Discharge Water

It was definitely established by chemical and radioactivity methods that the activity of half-life greater than 10 hours is due to Na^{24} (14.8 h). The definite presence of the Mn^{56} (2.6 h) activity was similarly established. The strong component of half-life 16 minutes has not yet been identified.

A study was made of the procedure to be followed during a purging of the pile. It appears that major difficulty can be expected in isolating highly active wash water because of the slow operation of the basin sluice gates. Radiochemical analysis of film removed from active discharged slugs showed the presence of long-lived components.

2288

Approximately 40% of the activity of film, out of the pile about five days, appeared to be due to chromium, and about 20% due to iron. These components probably have half-lives of 47 and 26 days, respectively. The decay curves are being analyzed.

Graphite Monitoring

Graphite samples were removed from test hole B on November 6 and 23. Column 2273 which contained three capsule slugs was discharged, and further recharged on November 28. The capsule samples have not been tested at this date. The following results were obtained for the test hole samples:

Effect of Graphite Irradiation

Source of sample	W	W	X	W
Exposure in 105B, MW-days in central tube	1.57	2.18	2.18	3.66
Previous exposure, W days (Clinton)	0	0	3.5(90°C)	0
% Change, thermal conductivity	78	80	43	85
% Change, electrical conductivity	71	73	34	75

The relation between thermal conductivity of longitudinally cut MC graphite and the duration of exposure in the test hole up to approximately 13 W days can be expressed by means of the relation, $k = 0.13 E^{-0.50}$, where k is thermal conductivity in cal./sq.cm.(°C/cm) sec, and E is the extent of exposure as measured in MW-days output of the central column. This relation is based on results obtained on five different sets of samples which received irradiation at about 30°C, for 0.34, 0.61, 1.57, 2.18 and 3.66 MW-days (central tube).

A group of ten samples containing both irradiated and non-irradiated material was sent to Chicago for cross-check measurements of thermal conductivity and energy storage. Measurements are to be made of the elastic moduli of these samples and the capsule samples to be forwarded in the near future in an attempt to make the best evaluation of the disadvantage factors of the test sample exposure positions. The change in this property has the advantage of being relatively insensitive to exposure temperature. A series of thirty-two samples, prepared and measured at Chicago, were charged into test hole B. These samples are scheduled for removal at regular shutdowns and forwarding to Chicago for these tests.

The gas thermometer of hole C was found to have a small leak within the pile where it cannot be readily repaired. By means of an oil manometer attached to the call in the pile, with allowance made for the leakage rate of the assembly, it was determined that the graphite temperature in the center of the pile, with the unit operating at 90 MW, was $49^\circ \pm 1^\circ$ C. This is to be compared with the value of 55° C indicated by the thermocouples in the graphite. The graphite temperature relaxation time, measured with the oil manometer on rapid change in level from 90 MW to 0.2 MW on November 20, was found to be 24 ± 1 minutes, assuming a graphite temperature of 49° C.

Design changes were recommended for the B hole of 105D unit. These changes have already been incorporated at 105B. A decision was reached to charge graphite samples in capsules in four tubes at 105D.

Preparation for 105D Start-Up

The test pile which was originally constructed in 305 for standardizing foils and counting sets, has been rebuilt in the Standards Building. It has been recalibrated and used for standardization of instruments by several groups in the Technical Department and the Health Instrument Group.

Revised Operating Standards to cover the initial charging of 105D have been prepared. All the Operating Standards for 105 operation have been reviewed, revised where necessary, and are ready for printing in final form and approval.

The neutron diffusion length of 105D was measured in the same way as in 105B. A neutron source was placed in the center of the central tube and the neutron intensity measured by means of foils placed at the center of tubes in the central horizontal plane. The diffusion length was found to be 49.3 cm., this measurement being made prior to replacement of the air in the unit by helium. It compares with the figure of 47.8 found at 105B under the same conditions. The greater diffusion length found at D is in line with the better quality of the graphite in this unit.

Engineering Section

Measurements of Pile Deflections

Based on experience with several types of deflection measuring instruments installed on the 105B unit, recommendations were made regarding the type and number of such instruments which should be installed on the 105D and F piles. A summarizing report was prepared covering observations made on the 105B pile from start-up to December 1.

Lubrication of Slugs during Pile Charging

Experiments to determine a practical plant procedure for lubricating tubes and slugs during charging operation were performed using mock-up equipment in the 105B flow laboratory. Conclusions reached as a result of these tests are:

- (1) To reduce the initial pushing force effectively, the column of slugs must be moved while the initial shot of lubricant is present in the tube. If the lubricant is washed out before the slugs are moved, little or no benefit is realized.
- (2) If not renewed, the oil film on a slug is broken through when the slug is pushed a distance corresponding to about ten slug lengths. It is, therefore, necessary to maintain some lubricant in the tube throughout the pushing period if effective lubrication is to be obtained.

2289

A procedure based on these findings was used in the first major push of metal at 105B. Adaptation of plant charging and discharging equipment for lubrication is necessary before trouble free operation can be assured. Further development work on this problem is in progress.

Ventilation in Building 105B

A high-spot survey was made of the distribution of ventilation air in 105B Building. It was found that air flows in certain areas differed appreciably from design expectations. Recommendations were made for minor changes which should correct the most objectionable ventilation features observed during the test. A complete evaluation of air distribution in Bldg. 105B is scheduled during the coming month.

Performance of 107B Retention Basin

A study was initiated to determine the efficiency of the retention basin in preventing channeling or by-passing of water when the total flow through the basin is about 29,000 gal./min. In this connection, experiments are being carried out in which both sudden large additions and small continuous additions of sodium dichromate are made to the outlet water from the 105B unit, and the distribution and flow of this water through the basin determined by analyzing for dichromate in appropriate water samples taken from the basin. This work is nearing completion and a report will be prepared giving the data and recommendations.

Air Suction in Downcomer Pipes

In order to determine the effect on air pumping of having the bottom section of a downcomer pipe completely filled with water, experiments were performed at 105B. Only a slight decrease in the amount of air pumping was observed in passing about 1500 gal./min. of water down a 40-ft. length of 10-inch i.d. pipe when the discharge end was 5-1/2 feet below rather than two feet above the liquid level in a tank. Air pumping was also observed at flow rates as low as 200-300 gal./min. Recommendations were made regarding methods for eliminating air pumping in the downcomer of the 105F unit.

Pile Charging-Discharging Equipment

The Project Engineering Group in cooperation with the Technical Department is making a strong effort to develop improvements in existing charging-discharging equipment at 105B which would insure satisfactory operation during the first large push of active metal. Start-up experience has indicated that trouble could be expected due to slugs jamming in the turning section of the aiming tubes, sticking in the hose below the catching funnel, holding-up in the escapement, and failing to slide down the escapement chute into the buckets. Full-scale experiments were carried on to evaluate various modifications to equipment intended to overcome the difficulties mentioned above.

2389

As a result, a new type of turning section and a new type of slug sorter were developed. Using these devices, reducing the slack in the funnel hose, and providing a means for shaking the hose if necessary, the first large push of metal was successfully accomplished. Difficulties were encountered in two instances due to slippage of the clutch on the mixing tube and in one instance, to three active slugs jamming in the catching funnel. Further development work is planned to improve existing "controlled fall" equipment and evaluate "free fall" methods of discharging slugs from pile units.

Helium Purification

The composition of the circulating gas in the 105B pile prior to November 29 as shown by two methods of analysis was as follows:

	<u>By Chemical Analysis</u>	<u>By Mass Spectrometer</u>
Hydrogen (by volume)	1.4%	0.5%
Oxygen	0.6%	less than 0.1%
Nitrogen	1.4%	1.8%
Helium by Difference	96.6%	97.6%
Helium plus Hydrogen	98.0%	98.1%

On November 29 and 30, while the pile was shut down and after activity in the gas had decreased to a point below detection, the No. 1 purification unit of 115B was operated using this gas. A set of operating conditions was established which was considered safe on the basis of an assumed average oxygen concentration of less than 2% in the gas entering the adsorbers. The gas was handled successfully with no evidence of burning or heat generation in the adsorbers. Purification of the gas was complete as shown by the thermal conductivity instruments. Results of check chemical analyses are not yet available.

All Building 115B equipment has now been operated successfully although there still remains considerable work to be done on instruments and controls in this building.

The refrigeration system of the purification unit mentioned above was rebuilt during the month in accordance with recommendations of the Technical Department. The recommended changes are now being incorporated in the initial installation of the refrigeration units at 115D and F.

Container for Handling "Hot" Materials

Design of a shipping container for Farmer samples was completed and construction of three units is under way. Each container can take two Farmer samples or one W slug. About seven inches of lead shielding are provided. Drawing H-1-216 gives details of the construction.

Study of Methods for Handling Stuck Pile Slugs and Tubes

Work was continued during the month to gain further experience in the use of special tools designed to free a blistered slug inside a W tube. Using mock-up equipment, situations are being investigated which might possibly develop in pile operation. To gain more knowledge of the ways in which blistered slugs might stick in pile tubes and the forces required to pull them, experiments are under way in which bonded slugs, placed inside a short section of W tube mounted in a piece of standard graphite, are made to blister by exposure in a steam autoclave. The degree of blistering is controlled by the exposure time. In this way, possible consequences of slug blistering or tube sticking may be anticipated.

Water and Corrosion Group

Aluminum Corrosion

Corrosion tube No. 2374 was discharged from the pile at 105B on November 6. A maximum penetration of 0.0001 in./mo. was obtained based on weights of the pieces before and after exposure. No pitting or etching was observed. Corrosion tube No. 2574 was discharged from the unit on November 24. Although complete gravimetric data are not yet available, corrosion rates are apparently comparable to those noted above.

Film Formation

Tube pressure drops were constant until about November 7 when a slight trend upward was noticed. By November 24 the increase was 1 to 4 lb./sq.in. after correction for changes in flow rate and inlet water temperature. This increase is barely outside the limit of accuracy of the pressure gages, but was considered significant because in every case an increase was noted. This was confirmed by the inspections of November 6 and 24. No film was found in the earlier inspection, but a thin brown film was found at the latter. No oxalic acid purge is planned until further data are available.

Changes in Water Composition in Building 105

Dichromate reduction, if any, is less than 0.01 ppm. Cr in the central tubes of a 1500-tube pile operating at 110 MW. Hydrogen peroxide formation is about 3.6×10^{-2} N under these conditions as contrasted with 3.2×10^{-2} N at the 90-MW level.

Flow Laboratory

Gravimetric data on slugs exposed in the flow laboratory tubes are in good agreement with the similar data on pile tubes. However, at an inspection on November 21, no film was observed on the slugs in the flow laboratory tubes. The runs are being extended to determine

220-

whether there is significant difference in film formation between the unit tubes and the flow laboratory tubes.

Two new tubes were installed in the 100B flow laboratory. One supplies water for bath tests of punctured slugs at 55, 80 and 95° C. The other is not equipped with heating jackets and is being used for tests conducted by the Engineering Group.

Film Prevention on Activity Counters at Retention Basin

Activity measurements at the retention basin were found by the Instrument Department to be unsatisfactory because of a large background count caused by deposition of an active microfilm on the counter cell. It has been determined that the film can be prevented or removed by feeding nitric acid to give a final concentration at the counter cell of 0.05%. Acetic acid was also found to remove the film. Sodium silicate has been found to prevent the film buildup, but it does not remove film. Because of the greater ease in handling the latter material it was selected for a trial run. Results were satisfactory and a feed of 0.1% to the sample water is now being used.

Analytical

The procedure for pH determinations has been reviewed and studied as a result of inconsistencies in the results. Measurements are now made with a flow type cell. The pH meter is standardized with buffer of pH 4.0 and checked with buffer of pH 7.00 which has been cooled to within $\pm 3^\circ$ C of the temperature of the sample. The new procedure has given better results, probably due to the elimination of the temperature compensator from consideration.

The analytical laboratory in the 100B Area is ready for use and a few analyses have been made.

~~SECRET~~200 AREAPlant Assistance SectionEquipment Tests in 221 and 224 Building

In cooperation with the S Department, tests have been made on the performance of the cell equipment in Bldgs. 221-T and 224-T to determine:

- a) Jet dilution and transfer rates.
- b) Jacket heating and cooling rates.
- c) Sparger heating and dilution data.
- d) Distributor spray performance (acid dilution, temperature rise, and spray distribution).
- e) Dissolver performance (off gas rates, column performance, and kettle vacuum during water boil-up tests).

The results of these tests have been given in weekly Technical Progress Letters. A formal report giving a compilation of the test data is to be prepared following the completion of the chemical runs in December.

Gasket Studies

Tests have been made to determine the chemical resistance of G-1, G-9 and G-X gaskets, and test equipment has been installed in 221-T for further checking of the physical properties of various gasket materials.

231 Filter Tests

A plant test program has been approved concerning the development of a suitable test procedure for determining the efficiency of the 231 Building exhaust filters. The proposed development work is based on the measurement of dust leakage through the filter by means of 39 tracer carried on particles of controlled size introduced into the air stream. Efficient functioning of the filters is necessary to insure removal of product-carrying dust and mist in the air exhausted from the hoods.

Ventilation Studies

A plant test program has been approved to develop the necessary information to permit the preparation of recommendations for standard procedures and conditions to be followed in operating the ventilating systems in buildings 224-T, 221-T and 271-T. Preliminary measurements have been made and the necessary draft gages are being installed to permit completion of the work.

Miscellaneous Problems

Minor problems which have been investigated during the month include a survey and recommendations concerning the inadequate steam supply to 224-T (larger reducer valve required), method of connecting 3 g.p.m. jets in 224-T and 231 Building, and 1/2 inch stainless valve delivery rate at various hydrostatic heads.

Sampler Modification

Several modifications of the plant sampler design have been drawn up as well as a modified design based on the Site I sampler. These alternate designs are to be evaluated in Cell 3 of Building 224-T.

Metal Cooling in 212 Building

Since the required cooling water flow through the 212 Building is of considerable interest, calculations were made regarding the expected heat evolution from the stored metal and the cooling water flow necessary to dissipate this heat.

Periscopes

Two periscopes for viewing the interior of the 12, 26, and 40 inch centrifuges have been built. Preliminary tests indicate that these instruments will be very satisfactory in meeting the requirements discussed in the original request for their fabrication.

Operating Standards

All of the preliminary drafts of the 221 and 224 Building operating standards have been prepared. These standards, which are based primarily on Clinton Laboratory recommendations, are to be submitted for approval to representatives of the Metallurgical Project on December 12 - 15. Similar standards for the 231 operations have been prepared and are to be submitted for approval at the same time.

Plant Performance Records

Proposed forms for making daily, weekly, and monthly reports of plant results in the 221 and 224 buildings have been submitted for approval

Semi-Works Section

Building 221-T: Head End

Operations throughout the month have been for the purpose of checking performance of equipment and effecting the small alterations and repairs necessary to insure satisfactory mechanical performance with process conditions as defined by the present flowsheet. Until November 26th, work was on a two-shift basis. On that date, three-shift operations was started.

2209

The chief problems encountered during the month and their solutions are as follows:

- 1) Control of jetting rate to centrifuges. The piping was such that at the specified feed rate an intermittent syphoning effect varied the discharge pressure, hence, the discharge rate of the jet. The problem was solved for two of the three centrifuges by cross connecting the two (alternate) discharge lines in such a fashion that the one not in service vented the one in service preventing the formation of a syphon, and by installing an individual pressure reducing valve to control steam pressure on the jet in service. The control of feed rate to the third centrifuge (used for extractions) is not yet as satisfactory as desired even with these changes, but it is expected that satisfaction will be attained shortly.
- 2) Control of chemical feed rates. Satisfactory control, which can be readily duplicated from run to run, was attained by providing and calibrating a valve position indicating disc.
- 3) Improving accuracy of weigh tanks. Minor piping revisions and re-hanging and re-bending of pipes to and from weigh tanks was required to give satisfactory weighing accuracy.
- 4) Reducing air leakage to dissolver. The dissolver lid had to be hand-fitted by filing to obtain a satisfactorily tight joint.
- 5) Improving temperature control during oxidations. The temperature recording instruments on the vessels used for this purpose read only every four minutes which was too infrequent for satisfactory control. The difficulty was corrected by switching the connections on existing instruments.

During the month the dilution resulting from jetting has been determined for all jets. It varies over the range 1 - 2.5%. All jets have been operated over extended periods (More than 48 hrs.) to clean steam supply lines. The jet on the dissolver discharge has been lowered to reduce the suction lift. Lubrication systems have been thoroughly checked, and oil piping to motor reducers revised to insure a proper oil level. The hydraulic control piping connections on centrifuges have been revised to include a flexible section. Permanent skimmer stops have been installed.

On November 30th, a dissolver run was made to simulate the coating removal operation. Empty cans were used as the source of aluminum and the number charged corresponded to that for a three-batch dissolver charge. Operation of the dissolver was readily controlled and entirely satisfactory.

Building 321

Construction of Building 321 is nearly complete. The cleaning of equipment and lines in Cells A, B, and C and the initial operating tests on agitators and jets in these cells are largely complete. All centrifuges have had their initial run-in, and all installations checked to date are satisfactory.

Operating instructions and log sheets for semi-works operations in this building have been prepared and are ready for typing.

Process Chemistry Section

General

During the period before the Area startup, process chemistry work has been of the following three types:

- 1) Work on immediate plant equipment and process problems.
- 2) Work designed to prepare equipment and personnel for emergency problems which may arise in the plant.
- 3) Work designed to reduce the time cycles of process steps and to simplify the 200 Area process with the aim of processing more than one ton daily per canyon.

Sample Can Leakage

One of the first units on the order of 500 stainless steel containers designed for storage and shipment of the product nitrate solution from the 231 building has been received and submitted to tests. It has been found that, during gentle sloshing of liquid in the closed container (such as would occur as a result of normal vibration or swaying in transportation), droplets are ejected from the gas escape capillary in considerable volume. This makes it impossible for the container to do its job safely under the proposed conditions of use. Therefore, the following four investigation approaches are being taken in the hope of obtaining a suitable method of storage and shipment before 231 Building production begins:

- a) Design has been requested to modify the present can for shipping under pressure.
- b) Test models of variations on the original gas isotope capillary are being made in the Central Shops and tested when ready.

- c) Optimum conditions for evaporation of the nitrate to a solid or viscous paste are being determined. It appears that this operation can be carried out on a normal batch in about six hours by passing a stream of hot air over the liquid while heating the container on a water bath.
- d) The possibility of freezing the liquid during shipment is being tested. A final product solution was prepared in accordance with October 5 H.E.W. flowsheet, and consisted of 24% product nitrate, 35% HNO_3 with a density of 1.55. This solution showed an appreciable increase in viscosity when the temperature was lowered to -40°C , the viscosity increasing markedly until solidification occurred at -62°C . Upon allowing the cake to warm slowly, the solid became mushy, but not fluid, at -28°C and completely fluid at -18°C . From this, it appears that it should be possible, though somewhat troublesome, to ship the product as a solid by cooling it.

231 Building Construction

Periodic inspections of the progress of construction in the 231 Building have been made and suggestions have been given relative to the welding and the centrifuge installations in the stainless steel hoods, and the enclosing of pipes to prevent collection of hazardous dust.

231 Building Filter Tests

In discussions with the Technical Plant Assistance Group and the Health Instruments Group, the applicability of various possible radioactive tracers for use in the checking of the 231 building outlet gas filters for macro leaks has been evaluated and the use of 39 recommended. The use of 0.1 mc. per test should allow the detection of leakage of 0.1% with a counting rate of 100/min. from the activity of the effluent gas sampled by a precipitation.

Product Loss in Metathesis Step

In the course of recent Site X operation, a product loss of 1% or more has been observed in the supernatant from the K_2CO_3 -KOH metathesis step. This loss has been recovered by precipitating $\text{La}(\text{OH})_3$ from the supernatant and re-centrifuging. Since this operation had not been anticipated in the H.E.W. flowsheet, and since it would complicate operation, possibilities of avoiding it are being investigated. It was thought possible that even small amounts of oxalate precipitated by bismuth or lanthanum from the oxalate-reduced solution of the cross-over cycle might complex and solubilize

2200

product in the alkaline metathesis solutions and so be the cause of the loss. Tests at various oxalate concentrations have been made and indicate that the loss is probably not due to this factor.

Problem of 39 During Operation

It has been recognized for some time that, for metal processed at cooling times of less than 45 days, the activity from 39 even after two cycles of bismuth phosphate process might be such as to interfere with control laboratory measurements of decontamination of fission activity. The estimates previously made as to the minimum cooling times at which such interference would occur are based on a comparison of the total number of 39 disintegrations with the total disintegrations of fission activity. These estimates have now been somewhat refined on the basis of calculations which use the available data on the characteristics of the radiations of 39 as contrasted to the radiations of mixed fission activity and on the basis of experiments designed to determine the number of gamma radiations/39 disintegration. The results indicate that the gamma counting yield/disintegration of 39 may be as much as a factor of 40 less than that of mixed fission activity. If this is so, a factor of 10^7 decontamination at the end of the H.E.W. process can be measured at any time after about 32 days of cooling without interference from 39. Since a cooling time of some 48 days to Cell F is being recommended for initial operation in order to be on the conservatively safe side relative to radiation hazards, it is probable that no difficulty will be met in the control laboratories.

Coating Removal Problems

Samples of scale, found on slugs following treatment with caustic - sodium nitrate mixtures in slug recovery work, have been examined, tested with potential solvents, and submitted for analysis. Some proved to contain predominantly aluminum and silicon while some are predominantly bronze. Further work on this problem is awaiting observations on the dead metal slugs following coating removal in the 221 T dissolver tests.

Laboratory tests indicate that the caustic used in coating removal may be added slowly over the course of an hour to the sodium nitrate solution containing aluminum slug jackets with a resultant control of reaction rate and without appreciable increase in solid residue. However, it has been found that if the divergence from flow sheet conditions is too great, rather bulky highly insoluble residues may be formed. This occurs for example, if one half the flow sheet amount of caustic is added followed by heating the mixture for several hours and allowing it to stand at room temperature overnight. The residue which is formed may amount to nearly half the weight of the original aluminum and appears to be quite difficult to dissolve in either caustic, dilute nitric acid, or concentrated nitric acid.

Corrosion Tests

The Technical Plant Assistance Group has requested that tests be made to determine whether the use of graphite as a lubricant on gaskets used in 25-12 stainless steel systems may tend to induce corrosion. Test samples for this work are being supplied by the Technical Metallurgy Section and are to be subjected to exposure in process solutions during the next month.

Stack Gases

Tests on the variables effecting the evolution of iodine from the dissolver pot into the stack gasses have been delayed due to the lack of a satisfactory analytical procedure for the effluent iodine absorbed in caustic. These tests will be resumed as soon as 2 millicuries of radioiodine arrive early next month.

Chicago has reported the presence of a radioactive rare gas of 0.1% fission yield and greater than 2.5-year half-life in mixed fission activity. The amount of this gas present in mixed fission activity is said to have an activity 10 times that of 5.5-day Xe for metal which has been processed 100 days and cooled 60 days. Estimates based on available data for the radiations of this gas and its half-life, and on the dilution factors required to bring the 5.5-day Xe below tolerance indicate that the physical hazards from the presence of this long-lived activity in the stack gases are negligible.

Heavy Isotopes

It is possible that new isotopes with hazardous amounts of gamma radiation, or with relatively short half-lives for alpha disintegration, may be formed in much larger amounts relative to product at H.E.W. than at Site I. This follows because the amounts of these isotopes produced increases as the square or higher power of the total KW days of operation. Such isotopes, of 49 or 39, would appear with the product in the 231 building and, if gamma emitters, might make the isolation process inoperable without the use of shielding. If new short-lived alpha emitting isotopes appear, they may change the specific alpha counting rate of H.E.W. product by several-fold relative to that of Site I product and so make control laboratory analysis quite misleading.

Ten 1-kg. samples of product have been prepared in aluminum capsules, and arrangements have been made for irradiating these in the 105 pile if it is decided as necessary to take the precaution of having such samples available for examination in case decontamination or specific activity troubles are encountered in the 200 Area processing. These samples are such that they can be processed in the laboratory within less than a day after removal from the pile and, therefore, have a potential usefulness in investigating plant difficulties, which is not afforded by plant solutions.

2289

It is planned to examine samples of the product in the first 30 g/ton metal processed in the 200 area to determine whether the product has the same specific alpha, gamma, and beta counting rates as that observed with Site X product. Similar examinations of batches from progressively longer pile operations should probably allow the presence of any new isotopes, which may appear at higher values of ΔN day operation, to be recognized before present in sufficient quantity to be seriously harmful.

Waste Disposal

Investigations in the laboratory have indicated that during the neutralization of metal waste solution with sodium carbonate, there is an increase in pH and a decrease in viscosity up the point where 60% of the flow sheet amount of carbonate has been added. Very little increase occurs during the addition of the last 40% of the carbonate. In order to learn whether it would be feasible to cut down on the amount of carbonate used, the amount of suspended solid remaining in the solution after addition of increments of the carbonate has been determined. It was found that the solid content progressively decreases until the full flow sheet amount of carbonate has been added. For this reason, it seems desirable to retain use of the present quantity.

Counting Equipment

Considerable attention has been given to the spacing of counter tubes and shelves in the beta counting sets, the performance characteristics of the alpha sets, the use of standards and of geometry calculations for calibration of geometry counters, the determination of resolution corrections on both the alpha and beta sets, the desirability of plotting and posting conspicuously plateau curves and operating voltages, the desirability of determining and posting the window thickness on all mica window Geiger tubes used in 3706 Building, and other similar problems.

Demonstrations for Plant Operators

At the request of the "S" Department, about 12 demonstrations of the chemical and physical changes in plant processes were given to small groups of operators during the last month. These demonstrations were designed to familiarize operators with the types of reactions which occur when the valves are turned in the control gallery.

Extraction Step Losses

Unpredictable and confusing extraction step losses are still found occasionally both in the laboratory and the Site X Plant, and there is no assurance that serious losses of this nature may not occur in the H.E.W. process. For this reason, during the month work has been done on review of the possible causes of these difficulties and possible

2289

means for their control. A comprehensive survey of the available information in this connection from work at Sites X and C has been compiled.

The salicylaldehyde method developed at Site X for determining hydrazine has been modified for use in testing dissolver solutions in the plant. Tests are in progress on the variables effecting the production of hydrazine during metal dissolving; on the effect of iron, temperature, time of digestion, and mode of addition of HNO_3 on the decomposition of hydrazine; and on the effect of hydrazine and the III state of product on carrying of product by bismuth phosphate in the extraction step.

Experiments in the Clinton plant on the optimum time for addition of sulfuric acid prior to extraction and on the best reagent and optimum conditions for pre-reduction are being followed closely.

Decontamination in the Cross-over Cycle

Until recently very little information has been available on either overall or specific decontamination factors in the cross-over cycle. In order to be in a better position to interpret plant results, and to recognize the variables involved, tests have been made of the specific decontamination of Zr, Cb, and Ba. They indicate that the decontamination of Zr and Cb in the cross-over cycle should be greater than 1000 while that of barium quite low, of the order of four. Since earlier laboratory results on the decontamination of barium by lanthanum fluoride by-product precipitations under similar conditions show a much better factor for this element, it is hoped that improvements may be made in this respect by changes in plant conditions. Since the use of fluosilicate complexing in operation is seriously contemplated, an endeavor is being made to determine the cause of the relatively poor cross-over decontamination obtained in Site X plant runs using the fluosilicate procedure.

Tracer Supply

In order to be prepared to deal with problems involving poor decontamination of specific elements in the plant and in order to have available test materials for the specific fission product analyses, a supply of individual fission product tracers is being prepared and maintained. The elements available include Zr, Cb, Ba, La, Ru, Ce, Pr, Y, and Sr. A number of these tracers are being extensively used in work designed to shorten and simplify plant operating procedure.

Instruments

A Kirk-Craig quartz micro balance has been delivered and is being put in working order for use in examining product and by products in small amounts of high activity process solutions.

A Beckman Spectrophotometer is now in operation for use in determining the valence state of product in process solution and determining whether the product has been complexed by reagents in such solution.

2500

A micro-burette has been calibrated and made ready for use in potentiometric titrations of small amounts of activity solutions and for use as an independent means of determining the product content in the solutions.

The Instrument Development Group has nearly completed the preparation of a PP 54 circuit with accompanying ionization chamber for measuring activities of plant materials over wide ranges from the Geiger counter range to above the electroscope range. A nitrogen filled alpha counter is also being prepared for high speed alpha counting, and for use in alpha range measurements using the mica absorber technique, should such measurements be necessary.

Extraction Step at High UNH Concentrations

The flow sheet calls for the carrying out of the extraction step at 20% UNH. Site I tests have suggested that it may be possible to work at 25% UNH. Further appraisals of this variable here in the laboratory indicate that 28% UNH probably will be allowable if the nitric acid concentration is kept below 0.2 N. Carrying at high UNH concentrations is extremely sensitive to acidity. It appears that processing at relatively high UNH concentration coupled with some shortening of the present time cycles should allow processing of at least 1.5 tons of metal/day/canyon.

Metathesis of Bismuth Phosphate

At present, plant procedure is rather severely limited, both with respect to the acidity at which the decontamination cycles are run and with respect to waste volumes, by the fact that it is necessary to use 10 N nitric acid to dissolve the bismuth phosphate product cakes. Recent laboratory experiments indicate that the bismuth phosphate product cake may be metathesized satisfactorily in the plant centrifuges. It has been found that a 1/2-hr. gentle mixing of a bismuth phosphate cake with an amount of 15% KOH equivalent to a 50-gal. bowl wash in the plant gives essentially complete metathesis. Following such a treatment, the metathesized cake is readily dissolved in a tenth of the proportion of nitric acid called for by the flow sheet. Sodium hydroxide is less satisfactory than potassium hydroxide in that it tends to produce jell formation. It is apparent that the metathesis procedure may allow much greater flexibility than is now available with regard to combination of batches following the extraction step, with regard to utilizing the optimum acidity for decontamination in the cycles, and with regard to waste volumes/ton of metal.

Improved Decontamination by Washing Extraction Step Product Cake

There is considerable evidence that Zr and Cb are at least partially carried in a colloidal or incompletely dispersed form in the extraction step. This has led to the testing of various reagents as washes for removing this suspected form of Zr and Cb from the extraction precipitates. Preliminary tests using 0.5 to 0.9 molar ammonium bi-fluoride with precipitates made from extraction step solutions

2289

spiking with Zr and Cb tracer indicate an improvement of decontamination of these elements in the extraction step from the usual factor of 10 to a factor of several hundred. This procedure is now being checked on some old Clinton dissolver solution which is available, and is to be checked on H.E.W. dissolver solution when available. If it proves as effective in these tests as in the tracer solution tests, it is possible that it may, in addition to improving the extraction step decontamination, lead to improvement in the Zr and Cb decontamination in the first cycle, since it is believed to remove dispersed forms of Zr and Cb which do not carry completely in the by-product precipitation and remain to be carried by the product precipitate. The process is now being tested with washes of the size suitable for centrifuge bowl operation. Only slight information is available on the corrosion of 25-12 stainless by ammonium bi-fluoride solution. That available indicates a corrosion of the order of 0.0004 inches/month, in 5 N. ammonium bi-fluoride. Further corrosion tests are now being made.

Of various other washes which have been tried on the product cake from the extraction step, including hydrogen fluoride, oxalic acid, citric acid and tartaric acid, oxalic acid appears to be the most effective but not as effective as ammonium bi-fluoride. Ammonium fluosilicate is to be tested when available.

Decontamination Carriers for Lanthanum

No good specific decontamination-carrier for lanthanum prior to the lanthanum by product precipitation in the cross-over step is available under process conditions. For this reason a survey has been made of various lanthanum compounds, the arsenate, vanadate, tungstate, and phosphate, as possible lanthanum scavengers. None of these have proven to be sufficiently insoluble under process conditions.

Scavengers of Improved Physical Characteristics

The Ce and Zr phosphate scavengers are rather difficult to centrifuge completely and their large bulk and gelatinous character produce undesirably high product losses. For this reason tests of decontamination by Zr phosphate and Zr hydroxide externally prepared and dried have been made. These scavengers are considerably less bulky than those formed directly within the process solutions. Present results indicate that they do not carry Zr and Cb at tracer concentrations nearly as effectively as does bismuth phosphate. However, there are indications that they may be more effective in removing "colloidally dispersed" Zr and Cb (such as is believed to be present at the start of the first decontamination cycle), than is bismuth phosphate.

Specific Decontamination Effects of Minor Process Changes

Since it has been questioned as to whether the ferrous ammonium sulphate used as a reductant in the decontamination cycle may decrease the decontamination of barium in the product precipitation step, the

2289

effect of sulfate on the carrying of barium under these conditions has been tested. A decontamination factor for barium of 110, independent of sulfate concentrations, has been found. At the same time a decontamination factor for lanthanum of 80, likewise independent of sulfate concentration, was found.

The presence of 0.5 M. fluosilicate ion appears to decrease the decontamination of barium and lanthanum in the product precipitation steps of the decontamination cycles by a factor of about 2 or 3. In connection with the possible use of fluosilicate in the plant process a determination of the effect of this ion on the solubility of product phosphate under product precipitation step conditions has been made. The fluosilicate is found to have little, if any, effect.

Since the presence of iron has been found to improve markedly the decontamination of lanthanum in the product precipitations of the decontamination cycles, the effect of iron on the decontamination of lanthanum in the UNH extraction step solutions has been determined. The results now available indicate that the improvement with 0.03 M. iron is not greater than a factor of 2 or 3.

Optimum Conditions for Addition of Zr Scavenger

It has been found that the addition of Zr carrier to Zr tracer solutions over a considerable range of differences in acidity between the two solutions does not alter the completeness of carrying (i.e., of exchange between carrier and tracer) of the tracer when the carrier is precipitated as zirconium phosphate. Hence, it appears that the conditions for adding Zr scavenger in the plant are satisfactory from the standpoint of obtaining complete exchange with the active Zr in solution.

Optimum Conditions of Cross-over Operation

It has been suggested that it may be desirable to use lower HF concentrations in the product precipitation of the cross-over cycle in order to increase the safety factor relative to corrosion. The present flow-sheet calls for 0.5 N. HF. Results obtained at Clinton some time ago showed poor carrying using 0.2 N. HF. However, these tests were made with one shot addition of lanthanum rather than the two shot addition now employed. Laboratory tests completed during the month indicate that with two shot addition satisfactory carrying may be expected with HF concentrations as low as 0.25 N. HF, if the present flowsheet quantities of lanthanum are used.

It has been suggested that a determination be made of the minimum quantity of lanthanum that can be used in the product precipitation step of the cross-over, since some difficulty has been encountered in removing the amounts now used from the centrifuge bowl following metathesis in the low volume of acid required for transfer to the 231 Building. It has been found that 0.5 N. HF addition will give

2289

good product yield at product concentrations of 30g/batch and 100g/batch. The 250 g/batch level has not yet been tested.

Tests indicate that it should be possible to eliminate peroxide decomposition in the 224 Building by transporting the peroxide supernatants to the 224 Building and introducing them into the 5 normal nitric acid solution of the cross-over step prior to the initial oxidation. In the presence of 0.005 N. iron, complete destruction of peroxide is obtained in these solutions simply by a 1-hour heating. Normal process yields are obtained through the cycle following such treatment of recycling liquors.

Isolation Chemistry Problems

Since the question was raised on the stability of peroxide solutions such as the supernatants from 224 operation, a series of experiments on the position of peroxide in such solutions containing various concentrations of peroxide up to 8% has been made. These tests have been made at temperatures up to 45° and indicate no violent decomposition at any time, but rather a slow continual decomposition in which less than half of the peroxide is decomposed in 5 hours at 0.003 N. iron, and less than 15% is decomposed in 5 hours when the concentrations of iron is 0.005 N., the initial peroxide concentration being 8% in both cases. About 20% of the peroxide still remained at 20 hours in the case of the 0.005 N. iron solution.

Several advantages might occur from use of lower peroxide concentrations than the 10% now specified in the isolation flow-sheet. This would include less effervescence and the requirement of less nitrite for peroxide destruction. Therefore, tests have been made to determine the minimum feasible concentration of peroxide. These tests indicate that, in solutions of 1 N. nitric acid, the solubility of product peroxide is no higher when 4% peroxide is employed instead of 10% peroxide. A slight increase in solubility was observed in going to 2.5% peroxide. However, when 2 N. nitric acid is employed, solubilities increase appreciably at peroxide concentrations lower than 10%.

DECLASSIFIED
WITH DELETIONS

300 AREA

Development Line

The development line work has for its immediate principal object, elimination of the tin bath. One reason for this is because of the deleterious effect of tin on the corrosion resistance in water of the Al-Si alloy. This work is being carried out along three distinct lines: (1) straight Al-Si dip, (2) double dip, bronze - Al-Si, (3) double dip, lead - Al-Si.

The straight Al-Si dipped slug is prepared for dipping in the same manner as those used in the triple dip process. The piece is held in a pair of tongs similar to those used for bronze dipping and is agitated vigorously in the Al-Si bath. Vigorous agitation is necessary to prevent the Al-Si from freezing around the cold slug and thus delaying the operation with the waiting period necessary for the Al-Si to melt off. After the dip, the slug is lifted from the bath and grasped near the center with tongs. The Al-Si bath surface is skimmed free of oxide, the slug re-submerged and agitated, the surface again skimmed, and the slug removed. It is then transferred to the canning bath and inserted in the can. Approximately 800 slugs have been prepared in this manner.

Extensive metallographic examinations have been made of single dip slugs produced on the development line. Results of the examination in comparison with regular triple dip production slugs are shown below.

Can Wetting

No significant difference in wetting between the two processes has been observed.

Minimum Can Wall Thickness

	<u>Single Dip</u>	<u>Triple Dip</u>
No. of Slugs Tested	23	48
Average Min. Thickness - Inches	0.017	0.022
Least Min. Thickness - Inches	0.009	0.009
Greatest Min. Thickness - Inches	0.021	0.032

Radiographs

	<u>Single Dip</u>	<u>Triple Dip</u>
No. of Slugs Tested	50	200
% Average Voided Area	0.06	0.11
Maximum % Voided Area	0.33	0.44
Minimum % Voided Area	0.0	0.0

DECLASSIFIED
WITH DELETIONS

Compound Layer Thickness

	<u>Single</u>	<u>Dip</u>	<u>Triple Dip</u>
Average Thickness - Mils	1.7		1.5
Average Minimum Thickness - Mils	1.4		0.9
Average Maximum Thickness - Mils	1.9		2.0

The compound layers of single-dip slugs, resemble closely the compound layers of triple dipped slugs from current plant production.

Brittleness of Bond

There is no significant difference between single-dip slugs and current production triple-dip slugs in bond brittleness as shown by chiseling tests.

Corrosion

Studies are in progress.

Autoclaving Before Welding

789 slugs have been autoclaved 40 hours, prior to welding, with no failures. To date, the pieces welded after autoclaving have welded satisfactorily.

It is planned to discontinue, temporarily, all experimental work on this problem pending outcome of corrosion testing now underway.

The double dip process involving bronze - Al-Si is now fairly well standardized. The slug is first dipped in bronze and then Al-Si. Following this, it is removed from the bath, the tong position changed, and then the slug is dipped in the Al-Si and inserted into the can.

To date 175 pieces have been assembled by this method and are now being inspected and tested.

In the study of single-dip slugs, attempts have been made to find a preheating medium which would serve to shorten the length of the Al-Si dip. A large variety of salt baths, combinations of chlorides, fluorides, carbonates, cyanides, nitrates and nitrites have been tried without success due to severe oxidation of the base metal. The most promising procedure appears to be that of preheating the slug in lead. This is now being studied. The operating conditions are to dip the slug in lead and then insert it into a can.

The lead surface is kept from oxidizing with a 1/2 inch layer of Al-Si. Promising results have been obtained.

2289

Plant Assistance

Study of methods of wetting McCauley drawn heavy bottom cans has shown that they may be wet satisfactorily by brushing with a circular steel brush when filled with Al-Si in the canning operation. Least minimum can wall thickness was found to be 0.022 inches and averaged 0.027 inches on 6 slugs examined.

Drawn cans as prepared by Chicago were tested for ease of wetting. They were found to wet as satisfactorily as the Aluminum Company's extruded cans and much better than the McCauley drawn cans.

A method for accurate control of top cap thickness by fluoroscoping, marking the top cap length, machining the top cap to the mark, and then re-fluoroscoping has been put into use. This method gives a top cap of the desired dimensions.

Occasionally, in the dipping operation, slugs show black spots on removal from the tin bath. Cross-sections of two typical specimens have shown that the slugs are wet continuously by the bronze, but that a miscellaneous collection of dirt, dross and oxide is intermingled with the tin layer. Spectroscopic analysis showed the dross to consist chiefly of copper, iron, nickel and silicon, probably as oxides. It was recommended that greater care be exercised in keeping the dipping pots clean and free of contamination.

Slugs with sharp dents or dimples are occasionally encountered in finished assemblies. Cross-sections of these slugs have shown that the Al can and slug are well wet with Al-Si, but that the combined layers of Al can and Al-Si are reduced in thickness. The deformations probably occur while the Al-Si layer is still molten.

There have been a total of four sidewall failures in the steam autoclave testing of all immersion canned slugs to date. Cross-sections were made of three of the slugs and in all cases the point of failure occurred in a small penetrated spot, or near a penetrated region. The top cap closures were sound, and the bonding of the can to the slug above and below the point of failure was satisfactory.

Examination of weld beads produced by two passes at 75 amperes with a 0.050-inch shoulder has shown them to be as good as welds produced by two passes at 65 amperes with an 0.080-inch shoulder. Because of increased rate of production resulting from use of the former procedure, a plant production test has been recommended. A summary of data on beads produced under various operating conditions is as follows:

DECLASSIFIED
WITH DELETIONS

	0.080-Inch Shoulder					0.050-Inch Shoulder	
	2 passes 65 amps.	1 pass 75 amps.	2 passes 75 amps.	1 pass 80 amps.	2 passes 80 amps.	1 pass 75 amps	2 pass 75 amp
No. of Caps	6	6	6	6	6	6	6
Total No. Cross-sections	12	12	12	12	12	12	12
Least Min. Bead Thick- ness-Inches	0.019	0.010	0.019	0.010	0.019	0.015	0.020
Av. Min. Bead Thick- ness-Inches	0.025	0.014	0.024	0.019	0.024	0.021	0.023

In connection with the compressed cap program, a study has been made of the growth characteristics of the compound layer in the time interval between removal of the slug from the bath and quenching. It was found that no significant increase in compound layer thickness occurred even up to cooling completely in air. The change in compound layer thickness has been found to depend on length of dip.

A method for measuring accurately the depth of scratches in the aluminum can of the finished assembly has been developed in cooperation with the Instrument Development Division. It is not planned to use this as a production inspection tool, but rather to set up standard slugs and for umpire work. Standard slugs and standard cans have been set up to aid inspection.

Testing

790 regular plant submersion canned slugs, not previously autoclaved, with the weld faced off to a depth of 0.080-inches passed 80 hours in the steam autoclaves without a failure. Previous to this group, 210 development line submersion canned slugs, which had passed 80 hours in the steam autoclave, were faced off 0.080-inches and tested 80 hours in the steam autoclave with only one failure.

Radiographs of 200 slugs during the month showed average voided areas of 0.11%/slug. Variation among slugs was from 0.0 to 0.44%.

STATISTICSMetal Reactivity Tests - 305

In order to improve the reactivity of canned slugs, two process changes were introduced during the month, namely:

- 1) The bottom ends of the cans are reduced to a thickness of 0.345 inches before canning.
- 2) The extent of machining of top caps is now governed by fluoroscopic inspection, with the objective of leaving a thickness of 0.350 inches.

From data taken before the change, it was determined that the rate of change of reactivity with canned slug length was 0.797 inhours/foot for the 11-slug sample or 0.731 inhours/inch of average slug length. Following the process change, the reactivity increased 0.08 inhours and the mean slug length decreased 0.045 inches. These values are consistent, but the length reduction is slightly less than the expected value.

Correlation of reactivity with average bare slug weights for the four types of slugs made, after allowing for variations in overall length, has shown an increase in reactivity of 1.922 inhours/pound increase in mean slug weight. The combined effect of length and weight can be represented by the equation:

$$dih = 1.922W - 0.731L \text{ ft.} - 8.816$$

where W = average slug weight, pounds.
L ft. = average slug length, inches.

Special tests were made during the month to secure replacement slugs for the first push having properties closely duplicating the original slug properties.

Autoclave Tests

For submersion canned slugs made during the month, the failure rates have been:

<u>Type</u>	<u>Failure per 1000</u>		
	<u>Top</u>	<u>Can</u>	<u>Total</u>
A	0.357	0.178	0.535
Z	0.194	0.049	0.243
<u>X</u>	<u>0.000</u>	<u>0.225</u>	<u>0.225</u>
Overall	0.196	0.098	0.294

Last month's overall figure was 0.525. The improvement is not yet statistically significant but the trend has continued downward.

Slug Recovery

During the month, the backlog of rejected slugs was processed through recovery. The slug weight reports were closely followed in order that only necessary weight limit revisions might be made promptly. While the average weight of the last two days' production of type Z slugs fell below the 7.84 limit, the overall average remained well above it, and no revision was made.

105 Water Control

Additional studies on water pressure data have shown an average standard deviation of pressures of individual tubes from day to day of one pound, which indicates that a departure of more than three pounds from the average value of any tube would be due to other than chance causes. Tube pressure averages vary about header averages with a standard deviation of four pounds. This means that to secure maximum sensitivity from a direct inspection of pressure readings, individual limits would be required for each tube. Upon reviewing these analyses with the members of the technical staff concerned, it was decided to set up, instead, a procedure for detecting and reporting promptly significant changes in header averages.

Review of the water analyses has indicated that potential improvements in control may be expected from a revision of the basis for changing settings of addition pumps and has indicated degree of protection offered by various sampling frequencies. A separate detailed report of this study is in preparation.

INSTRUMENT DEVELOPMENT

100 Area

The underwater microscope in 105-B has been installed and tested with satisfactory results. Plastic windows will eventually replace the present glass window.

Illumination for the underwater viewer has been requested. This will probably comprise mercury arc lamps.

The construction of the underwater telescope has commenced. The novel features of this instrument are continuously variable magnification and automatic focusing.

An optical device has been designed to measure the deflection of the center of the 105-D pile discharge face. The unit indicates this motion by the position of a light beam on a scale which is visible from the top periscope. The unit will be capable of indicating face deflection to within 0.005 inches.

An attempt was made to install the pneumatic collars in the aluminum traverse. They were not capable of exerting sufficient force to push the tubing into the pile without pulling out the shoe in the collar. The point of failure occurs when the collar exerts a force of 70 lbs. The traverse was again closed and can not be used until the collar design can be improved.

The first of two new proportional counter equipments for 105-D pile has operated satisfactorily during tests in the standard pile in Building 3745. More extensive tests are now being run on a second counter unit in order to determine, in particular, the counting losses at high rates. Both units are new in design and, on the basis of the present experience, appear to avoid most of the troubles which were encountered with the units in 105-B.

Six new boron coated neutron counters underwent thorough testing and calibration before they were installed on the headers in the discharge area of 105-B. Initial data on these new units indicate that the new design of moderators included is effective in reducing the leakage neutrons into the units by a factor of more than 10. It is expected that this installation will contribute much information toward determining the practicability of using this type of equipment to detect slug jacket failures.

Installation work on differential thermocouples, to indicate the difference in water temperature across 105-D pile at low power, is proceeding in accordance with recommendations made recently. The couples have a hot junction 2 feet underwater in the cushion chamber, and cold junctions in tanks into which water is bled from the four inlet risers. The difference in temperature between any selected riser and the exit water is measured with a Type "K" potentiometer located in the control room. The installation is being made so that a

2389

chopper amplifier can be used in place of the galvanometer on the potentiometer to provide means for a continuous record of water temperature. The equipment is capable of detecting thermocouple voltages equivalent to $1/40$ °C.

The work of Van Horn and Lewis, from Chicago, on the mass spectrograph, has been followed while we have been assisting them in the installation of this equipment in 105-B. Their data has indicated no difference in inlet and outlet gas in the 105-B pile within the accuracy of their measurement. The practical sensitivity of the equipment has been limited by difficulty in eliminating residual backgrounds of gas in the instrument itself. This effect is particularly noted in the case of water vapor where it is known that there is a difference between the quantity of water in the inlet and outlet gas. A complete report of these findings is being made by these two men.

The differential ion chambers installed in 105-B pile continue to give reliable service, although the gamma activity to which they are subjected changes during pile operation, leaving them out of balance at the conclusion of each extended run. Balance is also difficult to maintain since it is often necessary to change the position of the neutron chamber in order to obtain a particular calibration.

A program has been started in cooperation with the Maintenance Department to test thoroughly the helium thermometer which is to be installed in test hole "C" in 105-D. A study of the aluminum bulbs which are now on hand is being made in order to insure that the bulb to be installed is gas tight.

200 Area

Four proportional alpha (Simpson) counters were received from Chicago. These are now being tested and turned over to the Maintenance Department for installation.

A study of the causes and cures of microphonic troubles in alpha counters (hand, standard and low geometry) has indicated that nearly all the trouble from spurious effects arises from vibration of the collector electrode with respect to its surroundings. Very little disturbance is a result of vibration of the type 38 tube itself, or its elements.

A method of modifying the contact microphones used in Building 221-T to give increased output was devised. This change has not been generally adopted in the building because of the need for removing and modifying such a large number, and because the increased amplifier gain is believed to result in sufficient improvement. The latter change, however, has resulted in severe microphonic feedback, and premature tube failures in many instances. It has been found that the microphonics can be stopped by placing tight fitting lead damping rings on the tops of the first amplifier tubes.

A sample amplifier is to be analyzed in the laboratory to determine if any cause other than overdriving during microphonic feed back is responsible for the tube failures.

Assistance was given the Maintenance Department in calibrating the G.E. chambers in position in the process cell walls of Building 221-F.

A G.M. tube device for surveying the subsurface regions surrounding the 75 foot waste storage tanks was nearly completed. An early initial background survey of the dry wells is scheduled.

An optical viewer for the small centrifuge was built and delivered to the 200 Area Plant Assistance Group. The viewer for the large centrifuge was rebuilt to make it splash proof.

300 Area

A device for measuring the depth of scratches in canned slugs was designed and built. Its principal feature is a dial gage and narrow stylus indicating the depth of the scratch.

Health Instruments

Extensive work has been done on development of alpha hand counter equipment. Two models of the cellular type alpha hand counter have showed objectionable microphonic characteristics. The second design has been developed to a point where it is usable when contained in a Celotex lined box. Work is also being pushed on a "Handee" type counter which has been successfully used at Clinton. This unit differs from conventional alpha counting construction in that the pulses are created by ionization between a high potential electrode and ground and transmitted to the input of the amplifier through a coupling capacitor. Although in its early stages this unit exhibited microphonic characteristics, it is being improved as more experience is obtained.

Work is proceeding on the installation of the recently designed equipment to monitor the exit water from the 100-B and D retention basins. The discovery that sodium silicate would keep contaminating materials in suspension in the water has reduced the expected difficulties with background. The overall system incorporates chemical feed pumps and a mixing tank to prepare the water before it is delivered to the beta and gamma monitors. A sample of active water from 105-B was used to test the equipment in the laboratory.

Early in the month the final design of the frisking meter was completed. This unit can be mounted around a doorway to indicate the presence of contamination on the clothing of personnel passing through. A hand probe is incorporated in the equipment so that particular areas of the clothing can be scanned in order to locate sources of activity. This initial model has been set up, by the Health Instrument Group in Building 3706

~~2289~~

LABORATORIES

Bath Control Group, Bldg. 3706

79 1/2 routine samples and 67 special samples were analyzed during the month, resulting in a total of 1,319 routine determinations and 122 determinations of a special nature. A breakdown of these determinations is as follows:

	<u>Routine</u>	<u>Special</u>
Aluminum	108	16
Chromium	4	-
Copper	359	16
Iron	4	-
Nitric Acid	38	1
Phosphoric Acid	17	-
Residue	-	7
Silicon	380	-
Sodium Hydroxide	-	4
Tin	308	16
Heavy Metal	101	62

222-T Laboratory

Assays

Four B-G counters and one standard, one magnetic, and one vacuum chamber A counter are now in operation. Two proportional A counters, modified to give satisfactory operation with the present 94% methane supply, are also available.

Tests of the assay methods as written in the Laboratory Manual are now under way with analyses being run on synthetic process solutions having the proper product level.

F. P. Analyses

Investigation of the extent of interference of 39 in the determination of F.P. is being continued. Evidence of possible interference has been found for a relatively few specific determinations.

45 samples were analyzed during the month, resulting in a total of 104 determinations of specific activities.

Ion Analyses

Tests of the ion methods as written in the Laboratory Manual are substantially complete and service is being provided in connection with the preliminary plant test runs. To date a total of 211 determinations has been made in connection with can dissolving tests. These were distributed as follows:

-1
[REDACTED]
~~SECRET~~

Acidity	4
Aluminum	45
Copper	6
Hydroxide	6
Iron	5
Residue	3
Nitrogen Oxides (in stack or vent gases)	24
Hydrogen (in vent gases)	68
Ammonia (in stack or vent gases)	50

706 and 271-T Laboratories

Work Completed During Month

	<u>No. of Samples</u>	
	<u>706 Lab.</u>	<u>271-T Lab.</u>
Essential Materials	47	15
Water Analyses	118	—
Miscellaneous and Special Work	14	2
Process Reagents	—	3

Work Partially Completed at End of Month

Essential Materials	6	1
Water Analyses	6	—
Miscellaneous and Special Work	1	5
Process Reagents	—	—

Gasket Testing

Work was done during the month and is still in progress on testing of gasket materials in cooperation with the 200 Area Technical Plant Assistance group. G-1, G-9 and G-X materials are being tested in contact with 1 N. nitric acid, 10 N. nitric acid, H₂O, lubricating oil and hydraulic fluid. Koroseal is being tested in contact only with 1 and 10 N. HNO₃.

Significant results to date are as follows:

1. The G-1 and G-9 materials disintegrate in 10 N. nitric acid in about 2 hours. The G-1 material in contact with 1 N. nitric acid showed evidence of blistering after 5 days exposure, became brittle after 12 days exposure, and very brittle after 24 days.
2. Koroseal in contact with 1 N. nitric acid was bleached from brown to yellow and the shape of the specimen was materially changed after 7 days exposure. In 10 N nitric acid Koroseal bleached white and severely blistered after 7 days exposure

Development and Special Analysis, Bldg. 3706

Development of the following procedures for use in control work was completed:

Nitrogen oxides - Vent and stack gas analysis, high and low range (for chemical runs).
Sulfate - High range for chemical runs only.
Heavy metal Semiquantitative for amounts down to 10^{-9} grams.
Tin Polarographic control method for use on Al-Si alloy.
Time of analysis reduced from about 3 hours to 1 hour.
Essential materials - Assay method for sodium nitrite, KOH in K_2CO_3 .
 H_2O_2 - Method for 231 control.
B, Cd, Li - Quantitative spectrographic procedure for use on various types of materials, particularly 300 Area essential materials.

Spectrographic analyses of 64 samples were made during the month. A large proportion of these were quantitative.

Three microscopic analyses were completed on special request. Preliminary examinations were made of several other samples prior to further investigation by other groups. Development in microscopy included the semiquantitative heavy metal method listed above, and qualitative tests for traces of Li and Fe.

Miscellaneous and Special Analyses

85 analyses were made of hydrogen in metal.

A number of helium samples were analyzed for impurities and several standard gas mixtures were prepared and analyzed for use in standardizing the mass spectrograph in the 100 Area.

Heavy metal analyses in pickling acid sludge and in the bronze bath were run on several samples, and the methods were investigated rather extensively.

202 chemical analyses were made on a variety of samples and for various constituents for 200 Area Problems.

POWER DEPARTMENTNOVEMBER 1944

2249

100-B AREA

No serious operating problems occurred during the month and uninterrupted service was maintained consistent with process requirements. Continued difficulty has been experienced with the hydraulic operated automatic valve in the raw water line in 105 Valve Pit leaking past the seats. It has been necessary to remove the valve on several occasions to true up the seats. While leakage has been materially reduced, it is not yet entirely satisfactory. In order to have a supply of water available from this source during such outages, an eight inch by-pass line is being installed around this automatic valve. Similar by-passes are also to be installed in D and F Areas.

The export water system has not operated entirely satisfactorily due to pressure in the system falling off sufficiently to open the surge suppressors in both the 100-B and 100-D Areas. It developed that this was caused by improper operation of the cone valve at the 200-W Area reservoir. It is indicated that the air control system on this cone valve is not satisfactory and should be replaced with either a manual or automatic hydraulic control.

No. 3 boiler was internally inspected and found in very good condition.

100-D AREA

Construction work on power buildings was completed in this area on November 30 with the exception of Building 186. All flushing has been completed and the equipment is currently undergoing a "shake-down" run for testing and setting of control equipment. Preliminary running of the process water pumps in Building 190 indicates satisfactory performance to date.

Considerable difficulty is being experienced with the transfer conveyor in Building 184 Power House, and it is indicated that design changes will be necessary before satisfactory operation can be expected.

All refrigeration units in Building 186 have been run with the system under vacuum. The system was charged with refrigerant on November 30. Excessive vibration and overheating at the gland seal was evidenced on the initial start of the M-2 unit and internal inspection revealed several cracks in the seal ring on the casing diaphragm. The York engineer indicated this was due to internal stress in the compressor casing. This unit was returned to the factory and it will be several months before a replacement can be secured. The remaining units will supply sufficient refrigeration to satisfy our needs until warm weather.

200-W AREA

Satisfactory operation of all equipment was experienced during the month except as noted in remarks under 100-B Area.

200-B AREA

Buildings 282 and 283 were placed in service; however, construction work has not yet been completed. No unusual difficulties have been noted to date. One boiler in Building 284 is in service and supplying steam for the Construction Department. Considerable construction work has yet to be done in this building.

200-N AREA

Repairs to the well pumps are still in progress. Water to the area is being supplied from the export water line.

POWER STATISTICS

	<u>Unit</u>	<u>100-3 Area</u>
<u>Building 181 (River Inlet)</u>		
River Stage	Feet above sea level	Max. 388.4 Min. 385.3 Avg. 386.3
River Temperature	Avg. ° F	54.50
Water Pumped to Reservoir	G.P.M. Avg. Rate	36,859.
<u>Building 182 (Reservoir)</u>		
Water Pumped to Filter Supply	G.P.M. Avg. Rate	31,243.
Water Pumped to Export System	G.P.M. Avg. Rate	515.
Water Inlet Temperature	Avg. ° F	54.00
Water Outlet Temperature	Avg. ° F	54.50
<u>Building 183 (Filter Plant)</u>		
Filtered Water to Power House (Building 184)	G.P.M. Avg. Rate	295.
Filtered Water to Process	G.P.M. Avg. Rate	26,616.
Filtered Water to Fire and Sanitary	G.P.M. Avg. Rate	209.
Chlorine used in Process Water	Lbs.	10,122.
	P.P.H. Avg.	.87
Line used in Process Water	Lbs.	57,637.
	P.P.H. Avg.	4.95
Ferrisul used in Process Water	Lbs.	225,652.
	P.P.H. Avg.	19.4
Raw Water Analysis		8.04
Filtered Water Analysis		7.37
Alkalinity - M.O., Raw	P.P.H. Avg.	66.
Alkalinity - M.O., Filtered	P.P.H. Avg.	57.
Res. Cl ₂ - Settled	P.P.H. Avg.	.4
Res. Cl ₂ - Finished	P.P.H. Avg.	.15
Iron - Raw	P.P.H. Avg.	.13
Iron - N. Clearwell	P.P.H. Avg.	.03
Iron - S. Clearwell	P.P.H. Avg.	.03

2288

	<u>Unit</u>	<u>100-B Area</u>
<u>Building 183 (Filter Plant) - continued</u>		
Chlorides (Filtered Water)	P.P.M. Avg.	1.08
Hardness (Finished Water)	P.P.M. Avg.	74.
Turbidity (Raw Water)	P.P.M. Avg.	2.7
Turbidity (Filtered Water)	P.P.M. Avg.	0.
Water Temperatures (Raw Water)	Avg. ° F	59.0
Water Temperatures (Filtered Water)	Avg. ° F	59.0

Building 184 (Power House)

Steam Generated (Total)	M Lbs.	97,060.
Steam Generated (Avg. rate)	Lbs./hr.	130,453.
225% Steam to Plant (est.)	M Lbs.	81,450.
15% Steam to Plant (est.)	M Lbs.	2,230.
Coal Consumed	Tons	6,694.
Boiler Evap.	Lbs. steam/lb. coal	7.25
Coal in Storage	Tons	21,071.

Building 185 (Deaerator Plant and Chem. Add. Plant)

Water Flow (Avg.)	G.P.M.	26,616.
Chemicals Consumed:		
Dichromate	Lbs.	24,275.
Sodium Silicate	Lbs.	331,740
Chemical Analysis:		
pH		7.61
Dichromate	P.P.M.	2.0
Silica	P.P.M.	13.8
Dissolved Iron	P.P.M.	.03

Building 190 (Process Pump House)

Unchilled Water Pumped	G.P.M. Avg.	27,381
Water Temperature, Unchilled	Avg. ° F	55.0

Building 105 (Valve Pit)

Chemicals Used:		
Dichromate	Lbs.	100.
Chemical Analysis: "A" Header-Std. Limits		
pH	7.5-7.8	7.6
SiO ₂		13.9
Na ₂ Cr ₂ O ₇ · 2H ₂ O	1.8-2.2	1.9
" B " Header		
pH		7.58
SiO ₂		13.7
Na ₂ Cr ₂ O ₇ · 2H ₂ O		2.0

<u>CONTINUED -</u>	<u>Unit</u>	<u>100-B Area</u>
Chemical Analysis: "C" Header		
pH		7.62
SiO ₂	P.P.M.	13.7
Na ₂ Cr ₂ O ₂ · 2H ₂ O	P.P.M.	2.0
"D" Header		
pH		7.63
SiO ₂	P.P.M.	13.9
Na ₂ Cr ₂ O ₂ · 2H ₂ O	P.P.M.	2.0
Composite: B and C Headers		
pH		7.60
SiO ₂	P.P.M.	13.7
Na ₂ Cr ₂ O ₂ · 2H ₂ O	P.P.M.	2.0
Composite: A and D Headers		
pH		7.61
SiO ₂	P.P.M.	13.8
Na ₂ Cr ₂ O ₂ · 2H ₂ O	P.P.M.	1.9
<u>200-7 Area</u>		
<u>Building 282 (Reservoir)</u>		
Raw Water Pumped	G.P.M. Avg. Rate	800
<u>Building 283 (Filter Plant)</u>		
Filtered Water Pumped	G.P.M. Avg. Rate	452.
<u>Building 284 (Power House)</u>		
Steam Generated (Total)	M Lbs.	37,423.
Steam Generated (Avg. Rate)	Lbs./hr.	50,300.
Coal consumed	Tons	2,755.
Boiler Evap.	Lbs. steam/lb. coal	6.79
Coal in Storage	Tons	24,410

MAINTENANCE DEPARTMENTNOVEMBER 1944

2203

GENERAL

At the month's end the Maintenance Department had reached 226% of its Sixth War Loan Quota.

The labor turnover for the department was 1.16%. The man days lost due to absenteeism totalled 568 and represented 3.55% of the departmental force.

On November 22, 1944, the Village Engineering Organization became a part of the Maintenance Department and will henceforth function as the 700 and 1100 Areas. The department assumed responsibility for the maintenance work in the entire village on November 27, 1944.

The supervisory training program was continued and ten meetings were held. This program will continue until all Maintenance Supervisory Personnel have been covered.

Work order statistics for plant areas during the month were:

	Work Orders on Hand <u>10/26/44</u>	Work Orders Completed in <u>November</u>	Work Orders on Hand <u>11/30/44</u>
100-B Area	135	735	268
100-D Area	-	88	45
200-T Area	417	727	459
300 Area	<u>161</u>	<u>535</u>	<u>168</u>
Total	713	2135	940

100-B AREA

The breakdown of work orders by department and type of work was as shown below:

Power	36%	"New Work" (alterations)	49.2%
Process	34%	Maintenance work	50.8%
Miscellaneous (Technical, Service, Transportation)	<u>30%</u>		<u>100 0%</u>
	<u>100%</u>		

Tools for the installation and replacement of Process Aluminum Tubes were developed and completed. The new development was a combination reamer, roller and flange removal tool which eliminates scoring of the gun barrels when removing old tubes.

Two failures occurred in joints of the underground water lines. One was in the 20" export line and was repaired by caulking. The other was in a 42" raw water line, resulting from a cracked weld. The defective weld was chipped out, rewelded and stress relieved.

2289

The 115 Building refrigeration system in No. 1 room was altered. Improved construction and cleaning methods were used in the installation. Initial operation has been satisfactory and provided the basis for a similar installation in 115-D and will be followed in 115-F and No. 2 room in 115-B.

Aiming and escapement devices in 105 Building have been revised to conform with developments by the Project Group on the full scale mock-up tests. Preliminary trials showed improvements over the previous devices.

100-F AREA

The Maintenance Area Engineer and his group followed the progress of Construction.

200-T AREA

The present backlog of work orders represents seventeen days' work for the present crew size.

It was necessary to perform considerable work in the 221-T Building. Major items were:

1. The hydraulic lines on all centrifuges were altered, in accordance with Wilmington Design recommendations, to eliminate leaks at the threaded joints.
2. All 5 HP Philadelphia Gear Reducers were removed to determine the reason for excessive oil leakage along the output shaft. Two reducers had porous castings, permitting oil to leak from the reservoir, while a third had an oil drain hole drilled, permitting oil to drain into the grease packed bottom bearing. Further checks revealed that the oil overflow piping carried too high an oil level in the reservoir, causing oil to flow into the grease packed bearings. In agreement with Wilmington Design, the overflow piping was lowered and the oil inlet piping was altered to permit the installation of a breather on the oil reservoir.
3. All 15 HP Philadelphia Gear Reducers were removed to permit cleaning of the tanks and also to change the oil piping similar to the smaller reducers.

300 AREA

The maintenance on expendable items - such as, tongs, steel sleeves, furnace repairs - was a major item. The following equipment was replaced: 31 crucibles, 4 stainless steel pots and 6 new style stainless steel rings. 406 stainless steel sleeves were supplied.

The overhaul program on the Gisholt Lathes was completed. The Lodge and Shipley Lathes were also overhauled.

The filter press installation in Building 314 was completed and placed in operation.

Due to the colder weather, both boilers have been in operation approximately 90% of the time as the peak loads averaged about 19,000 lb. of steam per hour. Construction has started the installation of the water softener system. The north wall of the new building annex blocks the clean out door on the stack, and this information has been referred to the Design Division.

Considerable work has been necessary to get the Ventilating Systems of the 3706 Building in proper balance.

PROJECT ENGINEERING

Work Log

<u>Area</u>	<u>Project</u>	<u>Field Change Requests</u>	<u>Wilmington Design</u>	<u>Work Orders 30 to 3100</u>	<u>Work Orders 3100-3500</u>	<u>Area Total</u>
100	\$ 8,200	\$ 13,250	\$12,320	\$2,425	\$2,650	\$ 38,845
200	3,100	59,729	—	4,130	3,064	70,023
300	6,402	14,945	30,000	2,730	2,050	56,177
700 & 1100	2,720	117,560				120,280
Multiple		188,667				188,667
	\$20,422	\$394,151	\$42,320	\$9,335	\$7,764	\$473,992

Engineering Summary

	<u>Projects</u>	<u>Field Change Requests</u>	<u>Engineering Studies</u>
On Hand 11/1/44	11	34	10
Requests Received	6	22	13
Submitted or Completed	7	24	7
Cancelled	3	13	0
On Hand 11/30/44	7	19	16

Drawings and sketches completed - 171.

The prints handled by our Blueprint File Group are:

New and revised prints received from Hanford, Wilmington, etc.	8,738
Prints turned out by the Reproduction Room	12,443
	<u>21,181</u>

HW-7-441-De1

ELECTRICAL DEPARTMENTNOVEMBER 1944GENERAL

On November 15 the Electrical Department was assigned responsibility for du Pont Operations approval of all changes, additions and alterations to the Project telephone system. Arrangements and procedures have been completed for conducting the additional work.

Under arrangements with the Construction Division, work is progressing on rehabilitating the Hanford-Richland 66 KV line.

Power system fault tests at the B.P.A. 230 KV Midway Substation were conducted November 26, 27 and 28 by the Bonneville Power Administration. The test program was not completed due to troubles that developed in a Westinghouse breaker. Nevertheless certain relay difficulties were revealed by the tests which are being corrected. If possible, arrangements will be made to complete these tests during December.

A conference was held on November 28 regarding changes to Project relay protection. This meeting was attended by R. N. Reynolds from the Wilmington Design Division and representatives of B.P.A. It was agreed that changes in ground current protection on the main transformer banks should be made.

DISTRIBUTION100-B Area

A routine inspection of all 230 KV switches and oil circuit breakers in 151-B Substation was made. One breaker would not reclose and it was found that in the first pole part of the movable contact guide on the grid stack assembly was broken. Two new grid stacks were installed in No. 1 pole. Contacts and alignment were readjusted in No. 2 and 3 poles. This breaker failure was discussed with the Design Division representative and a Westinghouse representative. Further investigations and reports will be made by the breaker manufacturer.

Regular maintenance inspections on distribution and lighting circuits were continued in this area.

100-D Area

Relay and control circuits in the 151-D Substation were tested, calibrated and set prior to station acceptance. The station was taken over by Operations on November 6 and connected into the 230 KV Loop. Relays at 251 and 151-B were set at their final values to coordinate with the relays at 151-D and at Midway.

Initial inspection was made of the complete area for electric lines and sub-stations.

2209

100-F Area

Substation 151-F was energized and operated as a tee tap connection. Construction finished the installation of the last 230 KV oil circuit breaker here, and the complete "F" Sub Loop was tested.

The following substations have been energized:

1. 152 GLF
2. Substation feeding 181-F
3. Substation feeding 184-F

200-Y and W Areas

Routine maintenance of overhead distribution lines, fence lights and substations was started with the exception of the "U" Area. Electric lines in the "U" Area were given their initial inspection.

200-Z Area

Further progress was made in connection with setting up substation and lin maintenance headquarters in the 2713-B Building, and collecting emergency spare parts for repair work.

Considerable time was spent in drawing up single line diagrams of the several areas to be used for dispatching purposes.

300, 700 and 1100 Areas

Maintenance of the 700 Area and Divisions 1, 2 and 2½ of the 1100 Area was taken over by this department on November 13. The remainder of the 1100 Area was taken over November 20 for night coverage only. The Richland line headquarters was set up and shift coverage was started for Richland and the 300 Area.

251 Substation

Construction has erected a dispatcher's office at this station.

Routine inspection was made on the Midway breaker located at this station and minor repairs were made.

100-B AREA

The lighting circuits for Buildings 1701-B, 1709-B and 1720-B were changed from the normal supply feeder to the emergency feeder.

On Sunday, November 26, power surges occurred on the 230 KV transmission line feeding the area at 1:00 A.M., 2:05 A.M., 2:34 A.M., 3:49 A.M. and 4:22 A.M. These were initiated by B.P.A. tests at the Midway Station and had been anticipated. The MG set in the 184-B Building kicked off on each surge.

All instruments in the Control Room of 190-B Building went out of service on the surge at 3:49 A.M. due to a failure of insulation on wiring to the inverter which supplies these instruments

2280

In the 183 B Building the fire and sanitary water pumps kicked off on each surge.

A training program was conducted during the month.

100-D AREA

Buildings 105-D, 181-D, 182-D and 184-D, as well as all buildings in the 1700 group, have been accepted by Operations as of November 30.

100-F AREA

An Electrical Department supervisor is assigned to this area to follow Construction progress.

200 AREAS

A new forecast of eventual personnel requirements was made, totalling fifty exempt and non-exempt men, for the 200 and 300 Areas.

A training program was conducted during the month.

An examination of the upper motor bearings of the Crocker Wheeler motors in the Philadelphia Gear Works gear-reducers in 221-T Building revealed some faulty conditions. These conditions were corrected and Construction was notified to correct such conditions in areas not yet taken over.

Procedures for crane maintenance and operation and portable tool inspection were put into effect.

300 AREA

On November 13, 1944, the number of shift electricians on duty nights and Sunday was reduced from two to one. The men so released were assigned to day duty on "New York" work orders to reduce the backlog.

Pot furnace failures were reduced with the elimination of the Tercod and the use of the graphite pots. There were, however, two failures - Furnace 2A on November 1 and 3A on November 29. Both failures were due to corroded terminals.

A road light circuit outage on November 16 from twilight to 11:20 P.M. was caused by improper functioning of the protector relay due to dust.

An X-ray machine was installed in Building 3745.

The machine shop motor circuits in Building 3722 were rearranged and the building relighted.

Power service, 440 volt 3 phase, was installed to Building 3741 and the building was wired for motor circuits.

HW-7-991-De/ 2282

H.E.V. ELECTRIC POWER STATISTICS

(All figures except percentages to be multiplied by 1,000)

	<u>Power</u> <u>KWH</u>		<u>Reactive</u> <u>RKVAH</u>		<u>Average</u> <u>Power Factor</u> <u>%</u>		<u>Maximum</u> <u>Demand</u> <u>KV</u>		<u>Load Factor</u> <u>%</u>	
	<u>Oct.</u>	<u>Nov.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Oct.</u>	<u>Nov.</u>
Midway Sub. (Loop)	8510	10970	20	127	100.0	100.0	15.6	22.0	73.4	69.3
Hanford Sub. (Constr.)	4609	4520	-	-	-	-	8.9	8.6	69.6	73.0
Pasco Sub. (Richland and 300 Area)	<u>4066</u>	<u>5872</u>	1465	1397	94.1	97.0	9.6	13.7	56.9	59.5
H.E.V. (Total)	17185	21362	-	-	-	-	30.9	41.6*	74.0	71.2

*Maximum coincidental demand for H.E.V.

LOOP SUBSTATIONS

	<u>Power</u> <u>KWH</u>		<u>Maximum Demand</u> <u>KW</u>		<u>Load Factor</u> <u>%</u>	
	<u>Oct.</u>	<u>Nov.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Oct.</u>	<u>Nov.</u>
100-B	6430	6330	-	10000	-	88.0
100-D	960	2660	-	8000	-	46.3
100-F	-	10	-	-	-	-
251	750	1470	-	-	-	-
Village	3494	5618	-	-	-	-
300 Area	442.4	438.0	-	-	-	-

DECLASSIFIED

INSTRUMENT DEPARTMENTNOVEMBER 1944GENERAL

The activities of the department have increased greatly during the month due to 100-D and 200-T start-ups.

The training school in 717 Building was discontinued with the conclusion of the pre-operations training program.

The tube shop, 717-A, has been placed in operation.

Counting room requirements in 300 Area have increased the load carried by the groups in that area.

100-B AREA

Principal work involved in revisions and new installations are as follows:

1. It has been found necessary to shield the permanent PC Tube installed in tube 0453. An improvement of the present arrangement is required and a study is being made as to possible solutions.
2. The 5" tube in 42" downcomer room, measuring water activity, was re-located at top of near discharge riser room. Calibration of this system in terms of power level appears to have advantages over the chambers now located below the piles.
3. All units of the Pressure Monitor showing erratic fluctuation have been throttled in extension of a previous program.
4. In connection with current loading and contemplated loading plans, 280 units of the Pressure Monitor 35-85 PSI have been revised, calibrated and reinstalled.
5. Investigation of required method of eliminating contamination from 107 Building instrument devices was made. It has been found that sodium silicate will prevent buildup of contamination and that nitric acid is required to remove contamination after it is present. Sodium silicate feed is to be provided for new equipment now under construction.
6. All contemplated changes of location and arrangement of area monitoring equipment were made in accordance with the requirements of the H.I. Group.

100-D AREA

The work of placing instrument equipment in service has been continued. Present status of the various buildings is as follows:

Building 181-D (River Pump House) - Complete - All instruments in service.

Building 182-D (Reservoir) - Complete - All instruments in service.

Building 183-D (Filter Plant) - All instrument items are complete and in operation with the exception of automatic flow-level control system. This is held up by defective influent control valves.

Building 184-D (Power House) - All equipment is operative. Final adjustments have been completed on Boilers 1 and 2 Control System. Work on Boilers 3 and 4 is under way. All auxiliary controls are in service.

Building 185-D (Chemical Feed) - All instruments are either in service or ready for service. Equipment supplied for deaeration function is ready but will not be used at present.

Building 186-D (Demineralization) - A crew is following the instrument installation work and checking connection of this equipment. Present status of installation work is as follows:

H₂O Control Panel Units - 17-24 complete.

DA Control Panel Units - G to M complete.

Building 189-D (Refrigeration) - Instrument equipment is being checked and adjusted as it is made available. Present status is estimated at about 80% complete.

Building 190-D (Process Pumping) - All measurement instruments have been placed in service. Initial adjustments on control equipment have been made on basis of experience gained at 100-B. Test equipment has been set up for initial tests. All control equipment has been tried out in service.

Building 105-D - A program of testing and checking was carried out in conjunction with Construction Electrical Department.

Building 115-D - The major portion of equipment is in readiness for operation. Remainder of work must be done while equipment is in operation.

Building 107-D (Retention Basin) - All equipment installed is ready for service, although some difficulties exist regarding transmission circuits to 105 Building.

200 AREA

The instruments in 200-T Area are now tuned up and ready for operation with a few minor exceptions. The following list indicates the detailed status of instruments in the various buildings of this area:

Building 221 - Twenty G.E. tubes damaged by water have been repaired. All Beckman Amplifiers and switches checked and adjusted. Victoreen Integrators checked and placed in operation. G.E. tubes calibrated with assistance of Technical Department. New vibration microphones installed and tested in canyon. Vibration amplifiers modified - 60% complete. Electronic "Tobble Indicators" converted to 60 cycle sweep circuit. Ring Balance meters calibrated. A few leaky lines still exist. Dip legs in all vessels checked and adjusted.

Building 284 (Boiler House) - Placed on full automatic control.

Building 222 - Counting room in operation.

Building 224 - All equipment in operating condition.

Building 622 (Meteorological Tower) - Instruments standardized.

300 AREA ACTIVITIES

In addition to the normal shift coverage of Buildings 313 and 314, the following additional field work has been started:

Building 321 - Instruments checked and shift coverage provided.

Building 3706 - Counting room maintained on a scheduled basis.

Eleven instruments of various types were fabricated and 1285 film badges were drilled.

700 AREA

Industrial Instruments

A total of forty orders were completed in the 700 and 1100 Areas, of which fourteen shop jobs were on watch, clock and meter repairs. Special work completed during the period included repair and calibration of all pressure gauges carried in stock, completion of 700 and 1100 Area instrument inventory and design and fabrication of a magnetizing coil to increase meter sensitivities. Further instruction was given employees on Micromax service and repair.

Electronics Shop

Pocket Chambers - 939 units were received from the field and 651 units were successfully processed and returned to the H.I. Group. On hand are 500 units for additional rework.

Victoreen Integrators - 30 integrator chambers were given complete overhaul, 17 amplifiers were serviced, 3 new installations were made in 614 Building and 23 field trips covering routine servicing of monitor stations were completed.

Beckman RXG Amplifiers - 27 units were tested and sent to the field. A backlog of 24 amplifiers are on hand for test.

Beckman Switches - 22 units were tested and sent to the field.

Tube Shop

Mica Window Tubes - The production of mica window tubes has been delayed by technical difficulties in setting up processing equipment and training of personnel. Processing techniques have been modified to meet new problems that have developed in the Hanford tube design.

[REDACTED]
2589

Thin Walled Glass Tubes - The following is the schedule of requirements for thin walled glass tubes, and provision is being made to meet the demand:

<u>Date</u>	<u>Total</u>
December 1	88
December 15	115
January 1	175
February 1	222

Special Jobs - Three low geometry chambers were assembled and eleven coated P.C. tubes were assembled. A second duplex manifold vacuum line is being built and is 75% complete.

HW-7-991-D-1
2289PROTECTION DEPARTMENTNOVEMBER 1944INVESTIGATION

The following summary reflects the work of the Investigation Division during the month of November:

Number of investigation (Personnel) cases received....	1660
Number of cases closed.....	1130
Number of employees approved for clearance.....	872
Construction personnel files reviewed for transfers...	1228
Number found unsatisfactory for employment.....	231
Number found satisfactory for employment.....	1093
Commercial facilities investigated.....	7

The volume of work received showed a slight increase over the October volume.

PATROLReports and RecordsForce Report

	<u>Entire Patrol</u> <u>October 31</u>	<u>Entire Patrol</u> <u>November 30</u>	<u>Hanford and</u> <u>Pasco Areas</u> <u>November 30</u>
Patrol Supervisor	1	1	
Asst. Division Supervisor	1	1	
Captains	8	8	3
Lieutenants	23	22	6
Sergeants	78	76	20
Instructors	2	2	
Patrolmen	1008	945	225
Patrolwomen	12	9	7
Radio Operators	30	24	4
Clerks	4	3	1
Steno-Typists	16	15	4
Messengers	3	3	2
Seamstresses	2	2	
Office Helpers	5	7	2
Total	1193	1118	274

Unusual Incident Reports

Checking unauthorized persons in Areas	9
Stolen property reported	14
Traffic violations	111
Fires	24
Utility failures	12
Drunk and disorderly conduct	22

Unusual Incident Reports (Contd.)

2200

Lost and found property reported	10
Ambulance runs	7
Damaged government equipment and property	18
Accidents	17
Missing person	1
Deaths	3
Hunting on restricted territory	3
Fire hazards reported	2
Unlocked or open windows, doors and files	188
Dogs disposed of	2
Contraband articles picked up	2
Safety hazards	7
Escorts	13
Malicious mischief	2
Total	467

Duties Performed Other Than Protection

<u>Area</u>	<u>Services Performed</u>	<u>Safety Hazards Reported</u>	<u>Fire Hazards Reported</u>
100-B	3	0	0
100-D	7	7	5
100-F	17	23	8
200 East	5	38	29
200 West	9	28	40
300	22	19	9
101-145	1	4	1
Richland	66	15	8
Training	0	3	1
Outer Area Traffic	12	8	4
Total	142	145	105

Special Duty

155 Special Escorts were furnished during the month.

Master Key System

In the 100-B Area, locks and keys have been delegated and departments have been notified that they are available for the cylinder locks and the padlocks. The filing system for Patrol is practically completed.

In the 100-D Area, the locks have practically all been installed and the Master Key System set up. In the 100-F Area, the cylinder latches have not been installed and the Patrol received only the padlocks. A survey is being made in the 300 Area to determine the holders of keys, as this area was advanced relative to the other areas and the keys were issued to Operations before the Patrol Department was instructed to handle the Master Key System.

Training School

All men entering Training School were given an examination for driver's license.

Men in training are assigned to the Pistol Range for three (3) days for instruction in safe and proper handling of firearms. Men are qualified to carry sidearms.

Three (3) days of classroom instruction is given after which all men spend one (1) week in various areas where they receive instruction and practical experience in shift routine, badge-checking and various other plant protection procedures.

On November 20, 1944, regularly scheduled meetings were started for all members of Patrol supervision. Each supervisor receives additional instruction each week. These meetings are scheduled for seven (7) weeks. All meetings are held in the Sacajawea Grade School Building, Room 112. All members of supervision have been present once each week to date.

SECURITY

Number of employees cleared 861
Number of visitors for classified areas 18

Employee badges issued for Operations classified buildings & areas:

	<u>Transfers</u> <u>From</u>	<u>Classification</u> <u>Change</u>	<u>Temporary</u>	<u>Permanent</u>
300 Area	114	64	140	292
200-W	30	25	266	269
100-B	<u>223</u>	<u>49</u>	<u>200</u>	<u>284</u>
	367	138	606	845

Employee badges issued for Construction classified bldgs.
and areas 638
Construction personnel badges issued for Operations Areas 35
Employee Authorization Cards issued 129

Visits were made to Hanford Engineer Works by the following persons during the month of November:

Enrico Ferri	-	Chicago	Douglas J. Marsden	-	Westinghouse Elec. & Mfg
J. E. Van Horn	"	"	F. H. Foxton	-	International Business Machines
L. G. Lewis	"	"	Mildred Wardlow	-	"
R. S. Stone	"	"	Robert M. Simson	-	Arthur Anderson & Co.
A. H. Compton	"	"	M. F. Carroll	-	Marnham Company
Mrs. E. Tracy	"	"	G. M. Cloudy	-	York Refrigeration Co.
Wilfred Ball	"	"	Max Fishstein	-	Simplex Valve & Meter Co

225

W. H. Ward - du Pont
R. Williams "
A. W. Skerry "
J. E. Tilley "
R. W. Reynolds "

The combination pass and badge system and other protective measures, as outlined in inter-office memorandum dated November 20, were installed in the 212 North Building on November 20, 1944.

Discussions were held with Production Department Supervision and the Protection Program outlined in inter-office memorandum dated November 27 agreed upon for the 100-D Area. This program will be placed in effect about December 5, 1944. Area badges are now being prepared.

Discussions were had with supervision in charge of the 321 Building and protective measures agreed upon for the restriction of that building on December 4, 1944. The building is to be inclosed within a fence and access limited to only those persons having a special symbol on their area badge.

A procedure was also issued for the handling of area badges and pencils which are to be worn by employees engaged in the movement of process material between the 100 and 200 Areas. This procedure is covered in inter-office letter dated November 29, 1944.

In order to tighten up on the protection of the various Operations areas, all persons entering or leaving the areas are now subject to search, as outlined in inter-office memorandum dated November 27, 1944.

The Security Educational Program was discussed at the Central Safety Meeting, and it was agreed that a part of each Safety Meeting would be devoted to Security education. Personnel of the Protection Department will attend such meetings upon request to assist with the educational program. Minutes of each Security meeting will be submitted to the Protection Department.

Four field investigations were conducted of alleged security violation during November.

SERVICE DEPARTMENTNOVEMBER 1944PERSONNEL

<u>Department</u>	<u>Additions During November</u>	<u>Intra-Dept. Transfers</u>		<u>Terminations</u>	<u>Net Change</u>
		<u>In</u>	<u>Out</u>		
Management	-	-	-	-	-
P Department	24	1	32	12	- 19
S Department	26	11	1	2	• 34
Technical	13	3	10	8	- 2
Power	50	21	6	20	• 45
Maintenance	129	86	3	28	• 184
Electrical	25	-	1	6	• 18
Instrument	1	1	1	3	- 2
Village	1	-	1	3	- 3
Village Engineering	-	-	81	-	- 81
Service	31	1	-	15	• 17
Transportation	219	-	-	46	• 173
Traffic	9	-	-	-	• 9
Medical	31	12	1	20	• 22
Accounting	67	3	-	59	• 11
Protection	111	-	2	165	- 56
Totals	<u>737</u>	<u>139</u>	<u>139</u>	<u>387</u>	• <u>350</u>

Additions to Roll in November..... 737

	<u>Exempt</u>	<u>Non-Exempt</u>	<u>Total</u>
New Hires	5	200	205
Re-employs	-	14	14
Reinstates	22	471	493
Construction Transfers	9	-	9
Other Plant Transfers	8	2	10
Sub-Totals	<u>44</u>	<u>687</u>	<u>731</u>
Payroll Exchanges	4	2	6
Totals	<u>48</u>	<u>689</u>	<u>737</u>

Terminations in November..... 387

	<u>Exempt</u>	<u>Non-Exempt</u>	<u>Total</u>
Voluntary Quits	4	237	241
Military Service	1	6	7
Discharge	-	14	14
Transfer to Construction	-	-	-
Medical/Inves. Rejects	2	71	73
No Work	4	13	17

continued -

	<u>Exempt</u>	<u>Non-Exempt</u>	<u>Total</u>
Trans. to Other Plants	14	11	25
Deceased	<u>1</u>	<u>3</u>	<u>4</u>
Sub-Totals	26	355	381
Payroll Exchanges	<u>2</u>	<u>4</u>	<u>6</u>
Totals	28	359	387

2200

Breakdown of Terminations by Causes:

No Work.....	13
Personal Illness.....	31
Another Job.....	16
Voluntary (Personal & Family Reasons).....	116
Illness in Family.....	36
Return to School.....	2
Personal Business.....	5
Dissatisfied with Work.....	15
Misconduct.....	14
Medical/Investigation Rejects.....	73
Released for Cause.....	4
Housing.....	8
Household Duties.....	4
Getting Married.....	6
Military Service.....	7
Deceased.....	4
Transportation.....	2
Transfer to Other Plants.....	25
Total.....	381

Labor Turnover - Exclusive of Military Service Terminations..... 7.87%

Total Labor Turnover..... 8.01%

Plant Absenteeism - November 1944:

Male.....	4.29%
Female.....	5.28%
Total Plant Average.....	4.42%

Status of Transfers and Hires from Construction (Non-Exempt)

Construction Employees Interviewed.....	1,532
Accepted.....	817
Rejected.....	574
Considering.....	141

Distribution of Non-Exempt Construction Transfers and Hires

P Department.....	32
S Department.....	-
Technical.....	2

2288

continued -

Power.....	43
Maintenance.....	41
Electrical.....	2
Instrument.....	-
Village.....	-
Village Engineering.....	36
Service.....	31
Transportation.....	193
Traffic.....	8
Medical.....	10
Accounting.....	43
Protection.....	<u>7</u>
Total Placed on Roll.....	448
Total Placed on Roll Since 6-24-44.....	1,346

Status of Non-Exempt Gate Interviews

Number Interviewed.....	851
Accepted.....	265
Considering.....	54
Rejected.....	40
Construction Inquiries.....	137
Medical/Investigation Rejects.....	22
Miscellaneous.....	333
Total Placed on Roll.....	200

Approximately 43% of the terminations for the month of November occurred in the Protection Department, 15% in the Accounting Department and 12% in the Transportation Department.

SELECTIVE SERVICE

Following are the numbers and percentages of various age groups of male Operations employees as of November 30, 1944:

	<u>Total</u>	<u>Percent</u>
Number of male employees, 38 years of age and older, including 4F's and 1C's.....	1,264	34.8%
Number of male employees under 38 years of age, including 4F's and 1C's.....	<u>2,365</u>	<u>65.2%</u>
Total number of male employees.....	3,629	100 %
Number of 4F's.....	363	10 %
Number of 1C's.....	121	3 %
Number of male employees 30-37, excluding 4F's and 1C's	1,150	31 7%

continued -

	<u>Total</u>	<u>Percent</u>
Number of male employees 26-29, excluding 4F's and 1G's.....	526	14.5%
Number of male employees 18-25, excluding 4F's and 1G's.....	<u>205</u>	<u>5.7%</u>
Total number male employees under 35.....	2,365	65.2%
Total male employees under 30, excluding 4F's and 1G's.....	731	20.1%

CLASSIFIED FILES

Statistics relating to the handling of classified material for the month of November are as follows:

	<u>November</u>	<u>October</u>	<u>September</u>
Incoming Mail	7,938	8,468	8,399
Outgoing Mail	4,980	3,056	2,610
Inter-Area Transfer	5,961	5,760	5,627
Documents Routed	4,995	5,367	4,962
Requests - File Documents	1,803	1,478	1,529
Technical Library Services	530	481	339

During the month, daily classified messenger service was provided for 100-D Area.

SAFETY AND FIRE PROTECTIONSafety

Plant Safety Record - 7 Days.

Injury Statistics

	<u>November</u>	<u>October</u>	<u>Total to Date</u>
Major Injuries	1	1	3
Non-Tab Major Injuries	1	0	3
Sub-Major Injuries	2	2	12
Minor Injuries	293	303	1,713

Non-Tab Major Injury P.I. #5

On November 2, 1944, Patrolman in 100-B Area, sprained ankle while walking on gravel. He was hospitalized on October 5, 1944 for treatment of infection which he alleged was a result of the sprain.

Major Injury P.I. #6

On November 23, 1944, Electrician in Maintenance Department, sustained hot water burns to the calf and thigh of left leg while working in Building 1120, Commercial Laundry. Location of the burns necessitated hospitalization for treatment.

DECLASSIFIED
WITH DELETIONS

*Sub-Major Injury SM #10

Injury was reclassified from a Minor to a Sub-Major Injury on November 7, 1944. Injury occurred on October 25, 1944 and is charged to October experience. Crane Operator in 200-W Area, received electric shock and was kept in hospital for observation for a 48-hour period.

Sub-Major Injury SM #11

On November 7, 1944, Transportation Foreman in 100-B Area, sustained a fracture of right arm while attempting to crank a starting motor on caterpillar tractor.

Sub-Major Injury SM #12

On November 21, 1944, Patrolman [redacted] working in 200-W Area, sustained fracture of the right third finger while attempting to move a tool weighing about 150 lbs. The finger was caught between tool and pile of material.

A total of 78 Safety Meetings were held during the month of November with an attendance of 893.

Fire Protection

<u>Fires</u>	<u>Operations</u>	<u>Construction</u>	<u>Estimated Damage</u>
Inside Village	9	1	\$770.00
Outside Village	3	-	-

Inside Village - Operations

- 11- 3-44 - Grease fire at 501 Russell Street. Damage \$5.00.
- 11- 3-44 - Smoke combustion at 1313 Williams St. Damage \$5.00.
- 11- 3-44 - Heat duct ignited studding at 1409 Haines Avenue. Damage \$200.00.
- 11-16-44 - Combustion of gas in furnace at 1518 Johnston Avenue blew smoke pipe off heater and flue. Damage \$20.00.
- 11-20-44 - Pan of grease ignited at 321 Callum Avenue.
- 11-22-44 - Mattress in Room 116, Dormitory J-7, burned; probably caused by cigarette. Damage \$10.00.
- 11-23-44 - Faulty smoke pipe ignited wood crate of onion peeling placed close to smoke pipe at 1519 Thayer Drive.
- 11-25-44 - Children playing with matches set loose paper on fire in basement, which ignited first floor joist and flooring of home, 208 Benham St. Damage \$455.00.
- 11-18-44 - Privately owned car on fire at George Washington Way and Knight St.

Inside Village - Construction

- 11-20-44 - Men's washroom at Smith-Hoffman & Wright Barracks on fire. Damage \$75 00.

**DATE
FILMED**

11 / 26 / 93

END