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OPERATIONS DIVISION MONTHLY REPORT

FOR

MONTH ENDING DECEMBER 31, 1954

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OPERATIONS DIVISION MONTHLY REPORT

for

Month Ending December 31, 1954

by

A. F. Rupp

DATE ISSUED

FEB 4 1955

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OPERATIONS DIVISION MONTHLY REPORT

REACTOR OPERATIONS

ORNL Graphite Reactor

There were no slug ruptures during December, and no further measurements were made on the slug growth.

The automatic controller has operated fairly satisfactorily except that in one instance the controller failed to go into manual operation during a shutdown. The exact cause for this failure has not been found but is believed to be due to a faulty relay.

The canal water demineralizer is now almost complete. The sand filters were successfully decontaminated, by the use of Versene and ammonium citrate, so that the sand could be removed with little exposure to personnel. It is expected that a test run can be made shortly.

The operating data for the ORNL Graphite Reactor and the LITR are given in Table 1. Data on the operation of the reactor exit air filters are given in Table 2. The usage of experimental facilities in the ORNL Graphite Reactor is given in Table 3.

Low-Intensity Test Reactor

The amount of down time during December was quite high because of a shutdown of approximately eight days for installing a circulating fuel loop in hole HB-2. A comparison of the shutdowns in November and in December is given below.

	December	November
Unscheduled shutdowns for operational reasons, hr	2.634	0.834
Regular operations shutdowns, hr	12.000	38.716
Special shutdowns for research, hr	268.133	68.714

The usage of experimental facilities in the LITR is given in Table 4.

The bypass demineralizer installed in September operated very well since the trouble experienced in regenerating in November. The water resistance has consistently been above 500,000 ohms/cm. It is interesting to note that during the eight-day shutdown the resistance of the water increased from about 600,000 to 2,000,000 ohms/cm.

TABLE 2. PRESSURE-DROP DATA

	Pressure Drop (in. water gage)		
	Glass Wool	CWS No. 6	Total Across House
12-31-54	1.6	1.3	4.3
11-30-54	1.5	1.3	4.2
Clean filters	1.1	1.3	3.3

TABLE 1. REACTOR DATA

	ORNL Graphite Reactor			LITR		
	December 1954	November 1954	Total for 1954	December 1954	November 1954	Total for 1954
Total energy, Mwd	101.2	97.6	1201.6	57.0	76.3	858.6
Average power/operating hr, kw	3500	3500	3552	2965	2993	2917
Average power/24-hr day, kw	3263	3254	3292	1839	2543	2353
Lost time, %	6.8	7.0	7.3	38.0	15.3	19.4
Excess reactivity	65 inhr	97 inhr		4.0%	3.5%	
Fuel pieces charged	61	140	1067	1	0	17
Fuel pieces discharged	61	58	1275	1	0	17
Research samples	130	112	1162	15	18	131
Radioisotope samples	144	272	2574	43	39	305

[redacted]

TABLE 3. USAGE OF EXPERIMENTAL FACILITIES – ORNL GRAPHITE REACTOR

Hole Number and Orientation	Dimensions (in.)	Division in Charge of Facility	Person in Charge	Type of Experiment or Usage
1, 2, north and south	4 × 4			Regulating rods
3, north and south	4 × 4	Operations	J. A. Cox	Sulfur exposure for radiophosphorus production
4, north and south	4 × 4	Operations	J. A. Cox	Miscellaneous exposures of special samples
5, 6, north and south	4 × 4			Shim rods
7, 8, 9, vertical	4 × 4			Safety rods
10, vertical	4 × 4	Solid State	J. H. Crawford, Jr.	Low-temperature sample-exposure facility
11, vertical	4 × 4	Operations and Chemical Technology	J. P. McBride	Boron shot safety tube and HRP fuel studies
12, vertical	4 × 4	Operations	J. A. Cox	General exposures of samples in water-cooled facility
13, 14, north and south	4 × 4	Operations	J. A. Cox	Target exposures for radioisotopes and research
15, south	4 × 4	Operations	J. A. Cox	Miscellaneous sample exposures
15, north	4 × 4	Solid State (G.E.)	L. E. Stanford (G.E.)	Miscellaneous large-sample exposures
16, north and south	4 × 4	Operations	J. A. Cox	Sulfur exposure for radiophosphorus production
17, north	4 × 4	Unassigned		Empty
17, south	4 × 4	Physics	E. O. Wollan	Neutron polarization*
18, north and south	4 × 4	Operations	J. A. Cox	Miscellaneous large-sample exposures
19, north and south	4 × 4	Solid State	O. Sisman	Water-cooled exposure facility
20, north	4 × 4			Graphite temperature thermocouples
20, south	4 × 4	Solid State	J. C. Wilson	Creep of metals (no samples during month)
21, north and south	4 × 4	Operations	J. A. Cox	Sulfur exposure for radiophosphorus production
22, north	4 × 4	Solid State (G.E.)		Ionization-chamber tests*
22, south	4 × 4	Operations	J. A. Cox	Two pneumatic tubes for general usage
30	9 × 9	Solid State (G.E.)	L. E. Stanford (G.E.)	Life tests of equipment in radiation (no tests during month)
31	9 × 9			Blocked by one end of air seal H-beam across top of graphite
32, 33	9 × 9			Contain chamber for high-power-level trip circuit

*None during month.

TABLE 3. (continued)

Hole Number and Orientation	Dimensions (in.)	Division in Charge of Facility	Person in Charge	Type of Experiment or Usage
34	9 × 9			Contains chamber for No. 2 power-level galvanometer
35	9 × 9			Blocked by one end of air seal H-beam across top of graphite
36	9 × 9			Contains chamber for high-power-level trip circuit
37	9 × 9			Test facility for ionization chambers
40	9 × 9			Contains chamber for No. 1 power-level galvanometer
41	6-in. dia			Rear wall suction-pressure tap; hole into discharge manifold
42	6-in. dia			Unit pressure differential tap; hole into discharge manifold
43	6-in. dia			Unused (inaccessible); hole into discharge manifold
44	6-in. dia			Unused; hole into discharge manifold
45	6-in. dia			Gas discharge from hole 22 pneumatic tubes; hole into discharge manifold
46, 47	6-in. dia			Used for viewing west end of graphite with periscope; vertical holes into discharge manifold
50, north	4 × 4	Solid State	J. H. Crawford, Jr.	General sample-exposure facility
50, south	4 × 4	Physics	E. O. Wollan	Neutron spectrometer
51, north	4 × 4	Solid State	J. H. Crawford, Jr.	Water-cooled U^{235} neutron converter
51, south	4 × 4	Physics	C. G. Shull	Neutron spectrometer
52, north	4 × 4	Solid State	J. H. Crawford, Jr.	Facility for exposing samples at liquid-nitrogen temperatures
52, south	4 × 4	Physics	L. D. Roberts	Low-temperature work
53, 54, 55	4 × 4	Solid State (G.E.)	L. E. Stanford (G.E.)	Half-holes for miscellaneous large-sample exposures*
56, north	4 × 4	Physics	E. C. Campbell	Fast pneumatic tube
56, south	4 × 4	Physics	H. S. Pomerance	Oscillator for measuring neutron absorption cross sections
57, north	4 × 4	Training School	H. S. Pomerance	General-purpose neutron collimator
57, south	4 × 4	Physics	S. Bernstein	Neutron polarization*
58, north	4 × 4	Unassigned		Empty
58, south	4 × 4	Chemistry	H. Levy	Neutron spectrometer

*None during month.

TABLE 3. (continued)

Hole Number and Orientation	Dimensions (in.)	Division in Charge of Facility	Person in Charge	Type of Experiment or Usage
59	4 × 4	Unassigned		Half-hole; blocked by work at hole 17, south
60	4 × 4	Solid State	J. C. Wilson	Half-hole for creep of metals (no samples during month)
61	4 × 4	Operations	J. A. Cox	Half-hole for miscellaneous large-sample exposures
East and west animal tunnels				General exposures of large samples to low flux
Thermal column		Physics		Used by several groups for low-level neutron flux work
Inclined animal tunnel in thermal column				Exposures of biological specimens
West core hole		Physics		Lid tank for shielding studies
A	1.68-in. dia	Operations	E. E. Beauchamp	Charging-face hole containing 20 small cans of $CaCO_3$
B	1.68-in. dia	Unassigned		Charging-face hole; empty
C	1.68-in. dia	Solid State	J. C. Pigg	Charging-face hole; insulation test
D	1.68-in. dia	Solid State	C. E. Schilling	Charging-face hole; uranium samples
1069	1.5-in. dia	Unassigned		Charging hole containing an aluminum liner used for general exposure of suitable samples
1768, 1968	1.75 in. square	Solid State	R. H. Kernohan	Charging holes containing neutron converter donut; used for general exposures of samples to fast-neutron flux
1867	1.75 in. square	Solid State	R. Weeks	Charging hole containing neutron converter donut; used for general exposures of samples to fast-neutron flux
2079	1.5-in. dia	Operations	J. A. Cox	Charging hole containing pneumatic tube; used for exposure of research and radioisotope samples
0857, 0880, 1484, 1853, 2857, 2880				Charging-face holes containing boron-coated thermopiles for reactor instrumentation
Others				Seven uncharged peripheral holes contain $CaCO_3$ for radioisotope production; 409 uncharged peripheral holes remain unused

TABLE 4. USAGE OF EXPERIMENTAL FACILITIES – LITR

Facility Number	Type of Facility	Division in Charge of Facility	Person in Charge	Type of Experiment or Usage
HB-1	6-in.-ID beam hole	Physics	E. C. Smith	Chopper-type neutron velocity selector
HB-2	6-in.-ID beam hole	Solid State and G.E.	D. S. Billington	General exposures of large samples and loops; loop being prepared
HB-3	6-in.-ID beam hole	Solid State	J. C. Wilson	Creep of metals
HB-4	6-in.-ID beam hole	Chemistry	G. H. Jenks	HRP loop test
HB-5	6-in.-ID beam hole	Chemistry	G. H. Jenks	HRP fuel stability and corrosion tests
HB-6	6-in.-ID beam hole	Chemistry	G. H. Jenks	HRP fuel stability and corrosion tests
HR-1, 2	Pneumatic tubes	Operations	J. A. Cox	General short exposures of research and radioisotope samples
C-28	Hollow fuel element in core	Solid State	T. H. Blewitt	Exposure of metal crystals to high, fast flux
C-38	Hollow fuel element in core	Solid State	J. B. Trice	Exposure of specimens for flux determination methods
C-42	Hollow Be core piece with access tube from top plug	Solid State (G. E.)	L. E. Stanford (G. E.)	Exposure of miscellaneous small specimens
C-44	Hollow Be core piece with access tube from top plug	Chemical Technology	J. P. McBride	Blanket stability and corrosion tests
C-46, 48	Hollow Be core piece with access tube from top plug	Solid State	G. W. Keilholtz	ANP fuel tests (no tests during month)
C-29, 49	Mg tray in core space	Operations	J. A. Cox	Exposures of research and radioisotope samples
C-39	Be core piece with four vertical holes	Operations	J. A. Cox	Exposures of research and radioisotope samples
V-1	Inclined low-flux hole			Contains boron-coated thermopile for reactor instrumentation
V-2	Inclined low-flux hole	General Electric	L. E. Stanford	General exposure facility
V-3, 4	Inclined low-flux hole	Unassigned		Empty

TABLE 5. PROCESSED RADIOISOTOPE PRODUCTION DURING DECEMBER

Product	Source	Amount (mc)	Specific Activity (mc/g)
Antimony-124	LITR irradiation	3,933	4,680
Calcium-45	W irradiation	3,088	15
Calcium-45	LITR irradiation	194	14
Cesium-134	W irradiation	3,124	21,995
Chromium-51	LITR irradiation	2,768	2,689
Cobalt-58	Arco irradiation	28	No carrier added
Iodine-131	Graphite Reactor metal	79,986	No carrier added
Iron-55	W irradiation	220	1,900
Phosphorus-32	Graphite Reactor irradiation	21,927	40,000
Sodium-24	LITR irradiation	1,209	1,969
Strontium-85	Brookhaven cyclotron*	3.0	No carrier added

*Special preparation for Brookhaven.

TABLE 6. UNPROCESSED RADIOISOTOPE PRODUCTION DURING DECEMBER

Product	Units
Service irradiations	33
Arsenic-76	2
Arsenic-77	2
Bromine-82	9
Calcium-45	2
Chromium-51	1
Copper-64	2
Gallium-72	1
Gold-198	47
Hafnium-181	1
Iodine-131	10
Iridium-192	3
Iron-55,59	1
Lanthanum-140	1
Phosphorus-32	7
Potassium-42	13
Promethium-147	1
Rhenium-186	1
Rubidium-86	4
Selenium-75	1
Silver-111	4
Sodium-24	16
Strontium-89	2
Sulfur-35	1
Zinc-65	1
Zirconium-95	5
Total	171

TABLE 7. SPECIAL RADIOISOTOPE PREPARATIONS DURING DECEMBER

	Number	Amount
Co^{60} sources	19	7392 curies
Ir^{192} sources	3	40 curies
Cs^{137} sources	3	12 curies
Sr^{90} sources	3	3.9 curies
Kr^{85} ampoules	4	460 mc
H^{3} ampoules	6	4750 mc
A^{37} ampoule	1	3000 mc

After the reactor began operating again, the resistance immediately dropped to 800,000 ohms/cm, which level has been held. The radioactivity in the reactor cooling water has been generally less than 60,000 counts/min/ml.

There were four accidental shutdowns because of instrument failure during December. In an attempt to remedy this situation, the period sigma amplifier, the period amplifier, and the power supply in the log N chamber were changed.

RADIOISOTOPE PRODUCTION AND SALES

Data on the production of processed and unprocessed radioisotopes are given in Tables 5 and 6; special-preparations data are given in Table 7; and a summary of radioisotope shipments is given in Table 8.

TABLE 8. RADIOISOTOPE SHIPMENTS

	December 1954	November 1954	December 1953	August 1946 Through December 1954
Separated material	806	884	859	50,944
Unseparated material	170	211	169	13,371
Total	976	1095	1028	64,315
Nonproject	895	1004	932	
Project	66	80	73	
Foreign	15	11	23	
Total	976	1095	1028	

TABLE 9. DATA ON Co^{60} RECEIVED DURING DECEMBER

Source	Number of Pieces	Size	Curies Per Piece	Specific Activity (curies/g)
W	252	$\frac{1}{8} \times \frac{1}{8}$ in.	3.8–4.2	8.8–9.6
W	252	$\frac{1}{8} \times \frac{1}{4}$ in.	3.8–4.2	8.8–9.6
W	36	1 × 1 cm	50–65	7.3–9.4
MTR	27	2 × 2 cm	100–120	37–44
MTR	27	2 cm × 1 mm	120–150	44–55

Approximately 900 curies of Cs^{137} was purified and stored for use in preparing sources.

Two hundred twenty cans containing cobalt metal were prepared for W irradiation.

Data on Co^{60} that was received and that has been sorted, measured, and stored are given in Table 9.

RADIOISOTOPE DEVELOPMENT

Fission-Product Pilot Plant

Design work for the Fission-Product Pilot Plant for the entire month consisted in formulating criteria for the architect-engineer. As a necessary corollary to this effort, much preliminary design on the process and the cell block was accomplished.

The following major design work was performed:

1. Calculations leading to specification of requirements for building services were completed.
2. The general layout of the cell block was revised to achieve lower cost construction and more space.
3. A cost comparison was made of stainless steel cell liners and stainless-clad cell liners, which proved stainless steel to be the more economical cell lining.
4. Preliminary calculations of ventilation and heating requirements were made.

On the assumption that ten air changes per hour are necessary, 36,000 cfm must be supplied. Of this amount, it is estimated that 2210 cfm will be supplied to the cell ventilation system by steady leakage and that 2750 cfm will be supplied by frequent opening of cell doors and plugs. The remainder will be removed by roof-ventilating fans in the chemical makeup areas and by exhaust through wall vents. The supply will be balanced against the losses to give a slight positive pressure inside the building.

Status of design in the Engineering Department is as follows: Preliminary architectural drawings

for the architect-engineer have been completed, building criteria data sheets have been published, and work on criteria for the architect-engineer is in progress in the various groups concerned. Estimated completion date of criteria for the architect-engineer is January 31, 1955.

As a part of the equipment development program, centrifugation studies were made of slurries of the Tc-TPAN (tetraphenylarsonium nitrate) precipitate, the Fe-urea precipitate, the Fe-NH_4OH precipitate of the rare earths, the Fe-$CaCO_3$ coprecipitation of strontium, and the rare-earth oxalate precipitate. A 14-in.-dia, solid-bowl Bird centrifuge was used. All tests were run at 3100 rpm (1900 *g*), while the residence time of the slurry in the bowl was varied. The results are summarized as follows:

1. The TPAN-Tc precipitate is easily centrifuged. The residence time can be decreased to 1.4 min before a loss of more than 1.5% is experienced. It was demonstrated that the TPAN could be leached from the cake in the centrifuge bowl by using water at a temperature of 50°C. The maximum loss of TPAN (rhenium was used as a tracer in place of technetium) in the leach water in the first test was 0.6%, and was 4.4% in the second test. The TPA-TcO_4 precipitate was dissolved in water at a temperature of 85°C.

2. Results of the Fe-urea tests varied widely, depending on the control of the precipitating condition, from a minimum of 0.6% loss to a maximum of 26.5% loss at a residence time of 1.7 min. However, composite results of the three best runs indicate that 2.1 min is the minimum residence time to maintain solids losses below 5%. A one-quarter plant-size batch (200 liters) of Fe-urea slurry was run in order to check the cake capacity of the centrifuge and the amount of solution necessary to dissolve the cake in the bowl. The cake built up to a thickness of about $\frac{3}{8}$ in. in the lower third portion of the bowl, but was very thin in the top portion. Over-all loss of solids in the centrifugate was 7.7%. Approximately 40% of the iron was lost during the slurry makeup. The cake was easily slurried from the bowl after being digested in 4.2 liters of 7 *N* HNO_3 at 60°C for $2\frac{1}{2}$ hr.

3. The rare-earth oxalate precipitate is easily centrifuged. At a residence time of 1.1 min, only 1.7% was lost in the centrifugate. The cake was dissolved in 4.2 liters of 7 *N* HNO_3 at 45°C.

Another phase of the equipment development study was testing of Carpenter 20 and types 347, 316, and 304 stainless steel in simulated crystallizer solution at 90°C. No corrosion in any of the samples was detected under these conditions.

Shielded Transfer Vessel

Delivery of the hemispherical shells required for the shielded transfer vessel has been delayed until February 1955.

I^{131} Plant, Building 3028

Fabrication of the spare dissolver for the I^{131} Plant is complete. Installation has not yet been scheduled.

Technetium Purification

Tetraphenylarsonium nitrate does not consistently carry tracer amounts of technetium; the results were very erratic, the losses varying from 2.0 to 98%. Addition of a very small amount of perchlorate (1 mg/liter, or 1 ppm) improved the carrying so that more than 98% of the rhenium tracer was precipitated consistently. Most of the TPAN can be leached from TPA perchlorate or TPA perrhenate with small losses, and can then be recycled to the main stream. Technetium can be separated from perchlorate by sulfide precipitation.

Density of CsCl Powder

A solution of CsCl was evaporated to dryness and heated at 110°C for 48 hr. The salt was scraped from the walls of the beaker and placed in a cylindrical container. A rod was used to pack the powder in the container, but this was not satisfactory because a dense layer formed on top and prevented the air from escaping. It was found that the salt had to be pulverized and the container vibrated before the air could be removed. The density obtained by vibrating and packing was 2.1 g/cc.

Cesium Source Containers

Two aluminum containers were fabricated to be tested as source containers for very large amounts of Cs^{137} (5 kilocuries). They were made of 2S aluminum, 1.9 cm ID and 28 cm long, and had press-fit plugs. One of the containers was filled with KCl. The plug was pressed in place and welded, and it appears that these operations can

be done relatively easily by remote control. Further tests will be made to check the corrosion of the aluminum when in contact with radioactive CsCl.

Cs^{137} Purification

Two high-level purification runs were completed in the cesium equipment installed in Building 3029. A total of 990 curies of Cs^{137} was recovered in the form of CsCl in 400 ml of water. An exact analysis of the starting material is not available, but it was estimated to contain 1100 curies of Cs^{137}.

No difficulties were encountered in operating the equipment; however, considerable difficulty was had in estimating the volume of alum crystals remaining in the crystallizer. It is important to reduce the alum crystals to small amounts in order to eliminate potassium and rubidium impurities in the final product and to reduce the aluminum content for the subsequent $Al(OH)_3$ precipitation step. The product was analyzed spectrographically and was found to have a Cs:Rb:K ratio of 100:20:1. The starting material had a Cs:Rb:K ratio of 100:50:20. Therefore, while considerable reduction in the rubidium and potassium content was effected, it is evident that the alum crystallizations were not carried far enough to completely remove the rubidium.

Boron-10

A wafer that contained 300 g of B^{10} was made for the Physics Division. The boron was formed into a right cylinder 4 in. in diameter and $^{15}/_{16}$ in. thick under a pressure of 200 tons.

RADIOACTIVE-WASTE DISPOSAL

A total of 59.4 curies of beta activity was discharged to White Oak Creek from the settling basin and the retention pond (see Table 10); this discharge is 5.5 times that of last month. Much of the activity was the result of a series of operating accidents at the Solvent Column Pilot Plant Building. One of the accidents was the leaking of a discharge line from a waste tank. The other was a spill at the thorium waste tank which overflowed and contaminated the surrounding ground and ground water. The ground water surrounding these tanks is pumped to the settling basin.

A total of 116,400 gal of wastes containing 196 curies was transferred to chemical-waste storage pit No. 2 this month from chemical-waste tank W-6. The total of all wastes discharged to the waste storage pit No. 2 to date is 1,261,758 gal containing 15,893 curies. There was 88,000 gal of waste put into the chemical-waste system.

Chemical-waste storage pit No. 3 is still under construction. The pit now lacks only a gage board and protective fencing for completion.

Lead shielding was placed around the valves, lines, and pump head in the pump pit housing the pump to the chemical-waste storage pits in anticipation of the increasingly radioactive wastes from the Hot Pilot Plant operations.

A piece of the transfer pipeline to the waste storage pit from the south tank farm was removed to allow revisions for servicing the new waste storage pit. Visual inspection of this piece of pipe indicated that no undue corrosion or wear has resulted from its use during the first seven months of operation.

A visual inspection was made of the impellers of all the cell and hood exhaust fans. The paint on the impellers and in the housings has begun to scale off, but the impellers are in good condition. Conditions are such as to make repainting a very expensive and difficult job. It has been decided to forego this work at present.

TABLE 10. ACTIVITY DISCHARGED TO WHITE OAK CREEK

Source	December 1954		Average Per Month, 1954		Average Per Month, 1953	
	Gallons	Beta Curies	Gallons	Beta Curies	Gallons	Beta Curies
Settling basin	14,250,000	58.7	13,200,000	19.8	19,450,000	24.1
Retention pond	780,000	0.7	520,000	1.4	500,000	11.7
Total	15,030,000	59.4	13,720,000	21.2	19,950,000	35.8

The dampers at the inlet and outlet of all fans were greased to improve their action. The outlet damper on the 75-hp fan is frozen in the open position. The sheaves on the 75-hp motor and the Radioisotope Area hood exhaust fan were realigned.

MISCELLANEOUS OPERATIONS

Water Demineralization

The production of demineralized water was 435,140 gal this month, compared with 390,990 gal in November.

The trouble encountered last month with the anion columns giving poor capacity continued in December. It was found that the caustic soda being used had approximately 1.2% chloride and almost 1% carbonate. The high amount of chloride present in the caustic explains the chloride found in the demineralized water. The investigation is being continued for an explanation for the poor regeneration of these columns.

Operating data on the demineralizers are given in Table 11.

Hydrogen Liquefaction

The new hydrogen liquefier, which failed during testing, has been returned to the shops to be rebuilt; therefore no liquid hydrogen was produced.

Activation Analysis

A total of 196 requests for information concerning activation analyses has been received; 95 have developed into requests for analyses, 76 of which have been completed.

Decontamination Services

About 115 man-hours was spent on plant equipment decontamination this month.

Off-Shift Services

A total of 393 man-hours was expended in performing various services requested by other divisions. The work included filling of cold traps, maintaining furnace operation, checking test-loop operations, maintaining bottled oxygen supply, and generally ensuring continued operations of equipment and experiments on evening shifts and week ends.

New Schedule for Reporting Activities of Operations Division

This is the last of the series of Operations Division Monthly Progress Reports, which have been issued as printed and bound ORNL reports since 1948. In the future, monthly reports will be issued in multilith form with a limited internal distribution list only. Comprehensive annual reports on the individual activities of the Operations Division, such as Reactor Operations, Radioisotope Program, etc., will be issued as ORNL printed reports, with standard distribution lists.

TABLE 11. AVERAGE AMOUNTS OF WATER PASSED THROUGH REGENERATION UNITS DURING NOVEMBER AND DECEMBER

	Number of Regenerations		Amount of Water Through Each Unit (gal)	
	December	November	December	November
No. 1 cation	9	6	37,133	44,400
No. 2 cation	6	5	42,533	42,750
No. 1 anion	26	11	9,513	27,127
No. 2 anion	24	14	12,667	15,500