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RADIATION PROTECTION OPERATION
REPORT FOR THE MONTH OF MARCH, 1960

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by

REPOSITORY DOE-Richland
OSSE HUMAN TEST SUBJECT STUDIES
COLLECTION ZINC STUDY

A. R. Keene

BOX No. G75018

RADIATION PROTECTION OPERATION
HANFORD LABORATORIES OPERATION

FOLDER MARCH MONTHLY REPORT

April 11, 1960

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HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON

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RADIATION PROTECTION OPERATION
MONTHLY REPORT -- MARCH 1960

A. ORGANIZATION AND PERSONNEL

On March 14, 1960, Evelyn VanFossen transferred to the Radiation Monitoring Operation to replace Joan M. Weston who transferred to Professional Placement and Relations Practices. Donald W. Constable, Technical Graduate, was placed on a three-month rotation with the Radiological Development Operation effective March 1. The force of the Radiation Protection Operation remained at a total of 133.

B. ACTIVITIES

There were no new cases of plutonium deposition confirmed during March, thus, the total number of deposition cases that have occurred at HAPO is 249 of which 180 are currently employed.

Radiation Monitoring was provided for vapor-plating olive material in the 231 Building. The maximum hand dose rate encountered, while wearing lead gloves, was 10.2 rems/hour including 200 mr/hour of gamma radiation with the remainder due to neutron radiation. The unshielded surface dose rate is expected to approach 400-500 r/hour, due primarily to soft gamma radiation having an average energy of 44 kev. A film study to determine the surface dose rate due to gamma radiation was unsuccessful. Further studies utilizing calibrated film of 44 kev energy are in process.

A surface dose rate of 9 rads/hour was encountered in the 231 Building while handling clad fuel rods containing palm material. Self-reading pencils have proven useful to control both body and hand exposure for this work.

Flow rates in the Columbia River dropped to 36,000 cf/s for several days in the middle of March. The normal flow rate for March is about twice this figure. The filling of the Priest Rapids Dam pool caused the low flow rates. Special samples were collected for isotopic analysis to increase HAPO knowledge of potential exposure from Columbia River water at low flow rates.

Discrepancies have been noted in the analysis results when comparing the amounts of radioisotopes reported discharged to the Columbia River at Hanford, and compared to the amounts measured with those expected at Pasco during 1959. To resolve the differences, three HAPO laboratories have performed analyses of the same sample for the same identical isotopes. A sample of the 100-KE reactor effluent water, taken at the same time during February, was submitted to the Purex Analytical Laboratory, Radiological Chemical Analytical Laboratory, and Radiological Chemistry Laboratory. The results of the analyzed radioisotopes were compared for the single sample. The highlights of the testing produced the fact that for two of the isotopes of principal interest, As⁷⁶ and Np²³⁹, Purex is apparently low by a factor of 2 for As⁷⁶; Radiological Chemical Analytical Laboratory is high by a factor of 2 for Np²³⁹. Purex results also appear high on Na²⁴ and low on Cr⁵¹. Zn⁶⁵ results were in good agreement. Investigations are currently in process by the concerned laboratories to reconcile these differences. To ascertain complete accuracy multiple samples must be analyzed for comparison.

The Whole Body Counter operated satisfactorily during March with a minimum of down-time for equipment failure. Routine counting continued with a total of 141 HAPO employees and three nonemployees being processed.

A cooperative experiment was initiated by Radiological Physics with Dr. C. L. Finch of the University of Washington. The purpose of the experiment is to determine the uptake of orally administered Fe^{59} . Three subjects were given iron salt and three were given hemoglobin solution at the University of Washington. Two weeks later, they were brought to the WBC and counted. These three subjects were compared with two HAPO employees who volunteered and were given intravenous injections of Fe^{59} . The total result of the experiment cannot be reported until the University of Washington has completed their calibrations. Incidental to the experiment, an Fe^{59} calibration was obtained for the HAPO Whole Body Counter. The calibration was in good agreement with the value extrapolated from data for Na^{22} .

In calibration of the WBC for Zn^{65} , differences in calibrations have been obtained with different people. The discrepancies may be due to the distribution of Zn^{65} in the body for different individuals. A study was made on the distribution of Zn^{65} in one employee for a period of one month. The initial deposition of Zn^{65} was in the area of the liver, however, later counts showed a spread to the head and the legs.

Counting individuals in the WBC lying prone on a table by moving the crystal in four-inch increments has proven to agree within 5% with regular counts for K^{40} , Fe^{59} , Zn^{65} , and Cs^{137} based on the total count observed. Theoretically, this procedure is necessary for an ideal count, however, these data confirm that the HAPO technique is entirely satisfactory.

Film badge preparation was centralized and servicing of all badges from the 3705 Building started on March 28, 1960.

The comparison film badge exchange experiment between Savannah River, Rocky Flats, Los Alamos, and Hanford has proceeded. Some differences in results have been noted, however, a complete report will be published when all of the data has been submitted.

Some initial studies of the Bausch and Lomb microdensitometer reader have indicated a linear response for Co^{60} irradiated silver glass dosimeter rods in the range of 20 to 1,000 rads. A 50% fading was observed during the first 24 hours following irradiation. A fading rate of 2% to 4% per week is indicated after the first day. Due to the rapid rate of fading, it is doubtful whether doses of less than 10 rads can be determined with certainty. Doses above 1,000 rads have not yet been studied.

Installation of all major components at the Columbia River Monitoring Station has been completed. Continued electrical malfunctioning resulted in a visit of Minneapolis-Honeywell Regulator Company personnel to make repairs on equipment. With the exception of the alarm circuit, which has not been tested, all components appear to be functioning adequately. A test period of about four weeks will be used to observe the system under constant use and to make any necessary adjustments. The official termination of the construction phase of this project met the AEC deadline of March 31.

All equipment that was authorized and ordered on an appropriation request titled "Precision Medium Speed Digital Measuring Instruments and Plastic Man Phantom Including Skeleton and Body Organs" has arrived. This equipment will be used for a variety of neutron dosimetry studies leading to data useful in the development of a full energy range personnel neutron dosimeter.

C. EMPLOYEE RELATIONS

Six suggestions were received for evaluation. Five suggestion evaluations were made during the month. There are three outstanding suggestions at month end. Three suggestions by RPO personnel have been adopted, but have not been presented to the board for approval of payment.

There were eight medical treatment injuries during the month for a frequency of 3.41. No security violations occurred during March.

Students from local public schools visited the Whole Body Counter during March.

Radiation protection training included: A lecture on "Effects of Nuclear Weapons and Basic Defense" to employees of Special Separation Processing and Auxiliaries Operation (Reiox, CPD); four 2-hour orientation talks to Plutonium Metallurgy, Radiographic Testing, and Chemical Effluents Technology personnel; four 2-hour lectures on radiation protection to Fire Protection employees in the 100 and 200 Areas; as well as several orientation and training lectures to numerous groups in the 300 Area.

D. SIGNIFICANT REPORTS

EW-64468 "A Portable Civil Defense Air Sampler" by L. F. Kosher.

EW-64523 "Analysis of Radiological Data for the Month of February, 1960" by R. L. Junkins.

EW-64591 "Monthly Report - March 1960, Radiation Monitoring Operation" by A. J. Stevens.

ENVIRONMENTAL MONITORING - RESULTS - (Mid-February 1960 - Mid-March 1960)

<u>Sample Type and Location</u>	<u>Activity Type</u>	<u>Monthly Average</u>	<u>Units</u>
<u>Drinking Water</u>			
100-F Area	Isotopic	0.7	% MPC _{GI} *
Separations Areas	Gross Beta	1.1×10^{-7}	µc/cc
Pasco	Isotopic	5.8	% MPC _{GI} **
Kennewick	Isotopic	1.2	% MPC _{GI} **
Richland	Gross Beta	$<3.0 \times 10^{-8}$	µc/cc
<u>Columbia River Water</u>			
Above 100-B Area	Gross Beta	1.2×10^{-8} ***	µc/cc
100-F Area	Isotopic	2.6	% MPC _{GI} *
Hanford	Isotopic	2.2	% MPC _{GI} *
Pasco	Isotopic	16	% MPC _{GI} **
McNary Dam	Gross Beta	1.3×10^{-6}	µc/cc
Vancouver, Washington	Isotopic	0.4	% MPC _{GI} **
<u>Columbia River Mud</u>			
Pasco Vicinity	Gamma Emitters	3×10^{-5}	µc/g
<u>Atmosphere</u>			
I ¹³¹ Separations Areas	I ¹³¹	9.7×10^{-14}	µc/cc
I ¹³¹ Separations Stacks	I ¹³¹	0.2	Combined curies/day
Active Particles - Project	--	2.3	ptle/100 m ³
Active Particles - Environs	--	1.0	ptle/100 m ³
<u>Vegetation</u> (Control limit for vegetation is 10^{-5} µc I ¹³¹ /g)			
Separations Areas	I ¹³¹	1.6×10^{-6}	µc/gm
Residential	I ¹³¹	$<1.5 \times 10^{-6}$	µc/gm
Eastern Washington and Oregon	I ¹³¹	$<1.5 \times 10^{-6}$	µc/gm
Fission Products less I ¹³¹ - Wash. and Ore.	Gamma Emitters	2.4×10^{-5}	µc/gm

*The % MPC_{GI} is the percent of the maximum permissible limit for occupational exposure to the gastrointestinal tract calculated from drinking water limits contained in NBS Handbook 69.

**The % MPC_{GI} is the percent of the maximum permissible concentrations for persons in the neighborhood of controlled areas for continuous exposure to the gastrointestinal tract calculated from drinking water limits contained in NBS Handbook 69.

***This location is now sampled quarterly. The most recent result is tabled.

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EXPOSURE EVALUATION AND RECORDSExposure Incidents above Permissible Limits

	<u>Whole Body</u>	<u>Localized</u>
March	2	1
1960 to Date	2	3

Gamma Pencils

	<u>Pencils Processed</u>	<u>Paired Readings 100-280 mr</u>	<u>Paired Readings Over 280 mr</u>	<u>Lost Readings</u>
March	17,634	307	5	4
1960 to Date	57,096	695	12	7

Beta-Gamma Film Badges

	<u>Badges Processed</u>	<u>Readings 100-300 mrad</u>	<u>Readings 300-500 mrad</u>	<u>Readings Over 500 mrad</u>	<u>Lost Readings</u>	<u>Average Dose Per Film Packet mrad (mR)</u>	<u>mr(s)</u>
March	10,419	1,105	275	50	33	11.73	20.25
1960 to Date	32,565	2,941	558	127	95	10.83	20.12

Neutron Film Badges

	<u>Film Processed</u>	<u>Readings 50-100 mrem</u>	<u>Readings 100-300 mrem</u>	<u>Readings Over 300 mrem</u>	<u>Lost Readings</u>
<u>Slow Neutron</u>					
March	1,251	1	0	0	7
1960 to Date	3,570	1	0	0	13
<u>Fast Neutron</u>					
March	322	14	15	0	6
1960 to Date	756	53	23	0	10

Bioassay

	<u>March</u>	<u>1960 to Date</u>
Plutonium: Samples Assayed	709	2,190
Results above 2.2×10^{-8} $\mu\text{C}/\text{sample}$	62	129
Fission Products: Samples Assayed	656	2,138
Results above 3.1×10^{-5} $\mu\text{C FP}/\text{sample}$	1	1
Uranium: Samples Assayed	311	910
Confirmed Plutonium Deposition Cases	0	5*

*This brings the total number of plutonium deposition cases which have occurred at Hanford to 249.

Uranium Analyses

<u>Sample Description</u>	<u>Following Exposure</u> Units of 10^{-9} μ c U/cc			<u>Following Period of No Exposure</u> Units of 10^{-9} μ c U/cc		
	<u>Maximum</u>	<u>Average</u>	<u>Number Samples</u>	<u>Maximum</u>	<u>Average</u>	<u>Number Samples</u>
Fuels Preparation	57	5.6	62	42	4.2	31
Hanford Laboratories	16	4.6	35	13	3.4	31
Chemical Processing	53	2.3	45	21	2.4	48
Chemical Processing*	5.2	4.1	3	3.7	3.0	3
Special Indicators	111	13	15	-	-	-
Random	18	1.1	38	-	-	-

* Samples taken prior to and after a specific job during work week.

<u>Thyroid Checks</u>	<u>March</u>	<u>1960 to Date</u>
Checks Taken	0	0
Checks above Detection Limit	0	0
<u>Hand Checks</u>		
Checks Taken - Alpha	31,801	93,072
- Beta-gamma	43,309	132,592
<u>Skin Contamination</u>		
Plutonium	23	69
Fission Products	46	115
Uranium	5	19

CALIBRATIONS

<u>Portable Instruments</u>	<u>Number of Units Calibrated</u>	
	<u>March</u>	<u>1960 to Date</u>
CP Meter	839	2,670
Juno	272	861
GM	716	2,282
Other	185	540
Total	2,012	6,353
<u>Personnel Meters</u>		
Badge Film	1,252	3,976
Pencils	-	1,912
Other	493	1,273
Total	1,745	7,161
Miscellaneous Special Services	868	1,488
Total Number of Calibrations	4,625	15,002

A. J. Stevens
for the Manager,
Radiation Protection

AJ Stevens:kc

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