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EW-60225

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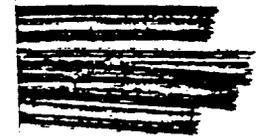
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MONTHLY REPORT - APRIL 1959  
RADIATION MONITORING OPERATION  
HANFORD LABORATORIES OPERATION

Compiled by Staff of  
Radiation Monitoring Operation

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RADIOLOGICAL DEFENSE

The Hanford District Civil Defense organization took part in a Civil Defense Alert Exercise on April 17-18, 1959. This was the first of about six National Civil Defense Exercises which will comprise Operation Alert 1959, and consisted of State directed operations involving nine near-simultaneous nuclear hits in Washington.

Hanford District's participation was directed from the Mobile Emergency Relocation Center at Staging Area Four at Whitstran. Hanford Laboratories supported its Technical Defense function through a limited crew consisting of the TD Coordinator, a combined Plotting Room Director and Radiological Defense Chief, and two Plotter-Engineers. In addition, another Director and Plotting Crew performed parallel operations with the same data, at a nearby site, in the interests of gaining experience and improving techniques. Although an exercise is inherently quite false as compared with a genuine emergency, an attempt was made to do the exercise as realistically as possible.

The TD crew was supplied specific hit data at 9:45 a.m. (for hits at about 11:15 a.m.). Within five minutes it was determined and reported that Hanford District would not directly be seriously affected. In another thirty minutes, sufficient data reduction was accomplished to detail the local effects. Only fringe fallout of low level would strike the Hanford District, from coastal hits; a hit near Coulee Dam would not significantly contaminate the Columbia River; a hit at Larson AFB lay entirely north of this District; all other State hits were remote. By Staff decision, Radiological Defense's contribution ended with this report. From this, the District executed D, D-1, and D+7 reports to State, concluding the exercise.

The Standards for OPAL 59, Annex I, permitted a choice in deriving patterns for predicting fallout. Accordingly, this group employed patterns derived from OPAL 58 data and scaled to match the two map systems in use. Undoubtedly, these preformed patterns greatly assisted in achieving the resulting rapid appraisal. The operation was verbally commended by District officers.

Technical justifications and a procedure for activating the Columbia River Contamination Emergency Plan were drafted and submitted for review.

A Richland residential survey was performed following the discovery of contamination in the shoe of a reactor process operator. No further contamination was found. The individual in question and concerned area personnel assume that the particle had previously fallen into the shoe from a trouser cuff.

GENERAL STATISTICS - APRIL

	<u>Hanford Lab-</u> <u>oratories</u>	<u>Minor &amp; Major</u> <u>Construction</u>	<u>Others</u>	<u>April</u>	<u>Year to</u> <u>Late</u>
Special Work Permits	1593	59	408	2060	8741
Routine and Special Surveys	1388	72	175	1635	6722
Air Samples	2257	12	152	2421	9505
Skin Contamination	6	0	0	6	35

1086772

<u>Exposure Investigation</u>	<u>April</u>	<u>1950 to Date</u>
Radiation Occurrences	3	11*
Potential Overexposures	2	7
Technical Overexposures	1	2

RADIATION MONITORING

Construction Engineering and Utilities Operation

Minor Construction

200 East Area

CC-2339, Renovation of 242-B Building

Work was started on the renovation of the 242-B Building for the Coolant Systems Development program. Dose rates to 4 r/hour were encountered while excavating the export line from 242-B Building to the 106-B tank. General soil contamination was encountered due to previous spills of waste fission products in the area.

Assault masks were worn while breaking process piping in the building; however, air samples revealed no airborne contamination. Dose rates to construction personnel did not exceed 400 mr/hour.

200 West Area

CGH-838, Fission Product Volatilization Studies Test Facility, 292-T Building

Renovation of the 292-T Stack Building was started. Contamination to 50,000 c/m was found on the floor and piping. Contaminated equipment was taken to the burial ground.

CC-2312, Decontamination of Room 179-B and Equipment

The equipment not attached to the wall or floor of room 179-B, 234-5 Building, is being removed to the 231 Building for decontamination.

To date little if any effort has been extended to decontaminate the room itself, but most of the horizontal surfaces in the room and some of the vertical surfaces have been strip-coated. This phase is nearly completed and actual decontamination should commence soon. All glass wool filters over the room exhausts were changed during the first entry to the room after the explosion and have been changed frequently since to assure a good flow of air into the room.

So far no personnel contamination has resulted from the clean-up although the outer layer of protective clothing is usually quite contaminated upon exit from the room.

\* Corrected Total

300 AreaProject CGS-790, High Level Receiving and Storage Addition - 327 Building

Extension of the building exhaust ductwork to include the new building addition was initiated by construction forces. The work required replacement of existing ductwork in the west half of the canyon basement in order that the system be capable of handling the new addition. Much of the work was in the vicinity of the liquid waste line, but efforts to reduce dose rates were successful enough to permit a full working shift. The maximum dose rate encountered was 350 mr/hour at 12 inches with an average dose rate of 20 mr/hour while working near the crib line. Frequent air samples showed that respiratory protection was not required.

A survey of the area around the floor slab of the new addition after completion of the backfill revealed that remaining surface contamination was limited to the corner created by the lunchroom and canyon, and to the small section of asphalt south of the slab. Particles to 5000 c/m were detected near the corner of the building and fixed contamination to 30,000 c/m was found on the asphalt.

Project CA-744, 306 Building Addition

Removal of the contaminated asphalt and soil east of the 306 Building was accomplished under SWP conditions. The area had previously been used for storage of barrels containing uranium turnings and sludge. Removal of the asphalt and top layer of soil reduced the contamination from a maximum of 60,000 c/m to background levels and the area was released.

Transportation100 Areas

Routine surveys of 100 Area garages did not reveal any unusual conditions. A total of five vehicles were surveyed and released to the 1100 Area. Miscellaneous items including batteries and barrels were surveyed and released for public sale.

200 Areas

One hundred and forty-six vehicles were surveyed at the 200-W garage during April. Of this number 27 per cent were found to be contaminated. This represents the lowest percent contaminated since November 1958.

Radiation Monitoring was provided at Riverland on 13 occasions when maintenance and decontamination was performed on locomotives and cask cars. No unusual conditions were noted.

Railroad track maintenance personnel were checked daily while working on the track in 200-E Area.

Railroad tracks were removed from the 212-P Building without incident.

1100 Area

Major maintenance on locomotive #3730 was accomplished under SWP conditions. Much of the contamination, which ranged to 50,000 c/m on the locomotive, was attributed to the recent contamination spread at the burial ground in 200-W Area. Steam cleaning successfully removed low level contamination from the wheels of the locomotive before they were shipped off-site for repair. Work on the traction motors was permitted after decontamination reduced levels from 20,000 c/m to 500 c/m. Frequent surveys of the pit and of tools showed no spread of the contamination.

Purchasing and Stores

100 Areas

Monitoring was provided for prospective bidders while inspecting salvage material located in the Hanford 101 storage area. To date twenty-five prospective bidders have visited the site. Personal surveys on exit from the Radiation Zone did not reveal any contamination.

200 Areas

Twenty-seven lots of miscellaneous equipment were surveyed and released for public sale.

300 Area

A survey of a cask received from an off-site installation revealed 1000 c/m smearable contamination and 20,000 c/m was detected on the bed of the commercial carrier. The contamination was removed by chipping a small area from the wooden bed of the trailer. AEC officials were notified according to established procedures.

Protective Equipment Decontamination Operation

Air Sample Results

Location	Number of Samples	Number Above		Maximum Concentration	
		10 <sup>-10</sup> µc FP/cc	10 <sup>-12</sup> µc Pu/cc	µc FP/cc	µc Pu/cc
2724-W	152	0	0	< 1x10 <sup>-10</sup>	< 1x10 <sup>-12</sup>

2724-W Building

Instrument Research and Development will investigate the requirements and feasibility of building a mask monitoring instrument to detect 0.004 µc of mixed fission products in one minute.

Routine surveys revealed no unusual conditions.

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Security and Patrol

200 Areas

Routine surveys of badgehouses and gatehouses in the 200 Areas revealed no unusual conditions.

Electrical Distribution

200 Areas

Radiation Monitoring was provided for removal of poles and equipment in 200-W Area. One pole was found to be contaminated to 40,000 c/m. Personnel checks revealed no contamination.

Potentially contaminated areas within the Hanford reservation are being checked to determine if linemen require surveys before eating. A count rate meter has been installed at 2101-E to replace the portable GM at that location.

Miscellaneous and Others

A survey of approximately 5,000 square feet of ground area at the site of a new meteorology tower revealed 4 particles of contamination. Maximum activity was 60,000 c/m.

Hanford Laboratories Operation

Chemical Research and Development Operation

100 Areas

Analytical Laboratories

Routine monitoring of the laboratories did not reveal any unusual conditions or spread of contamination. Hand dose rates from effluent samples received for analysis did not exceed 10 mrad/hour.

200 West Area

Chemical Effluents Technology

Air Sample Results

<u>Location</u>	<u>Number of Samples</u>	<u>Number Above</u>		<u>Maximum Concentration</u>	
		<u><math>10^{-10}</math> <math>\mu\text{c}</math> FP/cc</u>	<u><math>10^{-12}</math> <math>\mu\text{c}</math> Pu/cc</u>	<u><math>\mu\text{c}</math> FP/cc</u>	<u><math>\mu\text{c}</math> Pu/cc</u>
222-U	144	0	0	$< 1 \times 10^{-10}$	$< 1 \times 10^{-12}$

222-U Building

A work procedure was prepared for a field test involving strontium-90 to determine crib capacities.

300 Area

Air Sample Results

<u>Number of Samples</u>	<u>Number Above</u>		<u>Maximum Concentration</u>	
	<u>10<sup>-10</sup> µc FP/cc</u>	<u>10<sup>-12</sup> µc Pu/cc</u>	<u>µc FP/cc</u>	<u>µc Pu/cc</u>
238	0	2	< 1.0x10 <sup>-10</sup>	*3.1x10 <sup>-11</sup>

\* 2-4B Exhaust - 325 Building.

<u>Number of Samples</u>	<u>Number Above</u>		<u>Maximum Concentration</u>	
	<u>10<sup>-11</sup> µc U/cc</u>		<u>µc U/cc</u>	
40	0		< 1.0x10 <sup>-11</sup>	

325 Building

Monitoring was performed during a plutonium separation from irradiated rubidium chloride in laboratory C-4C. Although radiation measurements up to 3 rads/hour were obtained, the work was well planned. The maximum body dosage rate obtained was 200 mrad/hour including 50 mr/hour at 2 feet.

Continuous monitoring was provided for hood cleanup in laboratory 5-4E and C-4D. Hand and body dosage rates did not exceed 1.5 rads/hour and 250 mrad/hour respectively.

Extremely high dosage rates were obtained on dissolver solution samples in laboratory C-4D which necessitated a special barricade for protective purposes. Radiation measurements up to 200 rads/hour at 1 inch and 5 r/hour at 6 inches were obtained. Average field readings of 200 mr/hour restricted handling and transferring of this sample.

Following instrument maintenance work in a spectrometer cave in laboratory 1-1D, skin, clothing, and room contamination were detected. Radiation monitoring had been provided at the start of the job and intermittently thereafter. Future work at this location will be followed closer with exit personnel surveys performed by monitoring personnel. Skin contamination of 300 c/m, laboratory coat contamination of 25 mrad/hour at surface, and smearable floor contamination to 3000 c/m were detected. In conjunction with the personal clothing contamination, a house survey was performed in Richland with negative results. This was recorded as radiation occurrence report number 59-0-16.

Routine removal of dry and liquid waste from 325 Building was completed with dosage rates up to 17 rads/hour at the container surface and 1 r/hour at 2 inches.

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Monitoring was provided during the changing of all GWS basement filters. Radiation measurements were very low and no particular problems were encountered.

## 329 Building

Frequent monitoring was provided the analytical group in laboratory 12-A during the handling of high level radioactive filters. Radiation measurements up to 23 rads/hour at 3 inches including 1.5 r/hour at 5 inches were obtained. Momentary hand exposures of 11 rads/hour were received with average body dosage rates not exceeding 100 mrad/hour. Glove contamination was noted but well controlled.

Continuous monitoring was provided for the disposal of a  $Co^{60}$  source and storage cask in the 300 North burial ground. Dosage rates of 1.5 r/hour were obtained during the removal of the source from the cask and placement into the pipe trench. Laboratory filters in the 329 A block were changed with good contamination control.

## 340 Building

Numerous trips were made by the waste trailers to the 200 West Area with dosage rates at 2 inches from the tankers not exceeding 2 r/hour.

## 3706 Building

Monitoring was provided on 10 occasions for the processing of HAPD 19A samples. The maximum body dose rate observed was 1 rad/hour at 2 feet. A hand dose rate of 30 rads/hour at 6 inches was necessary for a brief interval to recover an ampoule that was inadvertently pulled from the shielding block.

## Biology Research

### 100 Areas

#### Air Sample Results

<u>Location</u>	<u>Number of Samples</u>	<u>Number Above</u>		<u>Maximum Concentration</u>	
		<u><math>1 \times 10^{-10}</math> <math>\mu</math>c FP/cc</u>	<u><math>1 \times 10^{-12}</math> <math>\mu</math>c Pu/cc</u>	<u><math>\mu</math>c FP/cc</u>	<u><math>\mu</math>c Pu/cc</u>
108-F	43	2	0	$2.1 \times 10^{-10}$	$< 1 \times 10^{-12}$
141-H	9	0	0	$< 1 \times 10^{-10}$	

The experiment to determine the uptake of strontium-yttrium-90 in rainbow trout was completed without incident. A maximum dose rate of 1.2 rads/hr was reported while spiking the individual gelatin capsules. A maximum of 40,000 c/m was detected in the gastrointestinal tract during autopsy of the fish. No activity was observed on the blood samples following bleeding of the fish.

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A total of twelve beagle dogs were exposed to plutonium-239 aerosol concentrations in the 141-F3 Inhalation Laboratory. The dogs were autopsied at varying intervals to determine uptake of the isotope. A maximum of 5,000 c/m was detected on the nose of the dogs following thirty minute exposures in an enclosed glove box. Contamination up to 40,000 d/m was observed on the electrostatic precipitator filters following removal. Thermal precipitator grids were also obtained following each exposure; however, no radiation was detected. The grids were analyzed in the electron microscope in an effort to determine particle size of the plutonium-239 inhaled by the dogs. The inhalation experiments and autopsies were conducted without incident or spread of contamination.

The isotopes of strontium-yttrium-90 and calcium-45 were utilized in a retention study on young rats. A total of ninety 21-day old female rats received intraperitoneal injections of 4  $\mu$ c of each of the isotopes. Hand dose rates to inject the rats did not exceed 80 mrad/hour.

The experiment of exposing rats to X-radiation following intravenous injection with plutonium-239 in quantities up to 25  $\mu$ c/rat continued in the 102-F Building. Hoods were utilized for all injections and no spread of contamination was noted.

A permeability study was conducted on yeast cells utilizing phosphorus-32 in concentrations of 1 mc/ml. A radiation measurement of 34 rads/hour was measured over the cells. Hand dose rates were limited to 500 mrad/hour while transferring the cells to the automatic fraction collector.

Routine surveys of all Biology facilities did not reveal any spread of contamination or unusual conditions.

## Reactor and Fuels Research and Development Operation

### 100 Areas

#### 1709-D Building

Gold foils reading 130 mrad/hour at the surface were removed from wooden sample carriers without any spread of contamination. The foils were removed with six inch tongs and the hand dose rate was limited to 5 mrad/hour.

### 200 West Area

#### Air Sample Results

<u>Location</u>	<u>Number of Samples</u>	<u>Number Above</u> <u>10<sup>-10</sup> <math>\mu</math>c FT/cc</u>	<u>Number Above</u> <u>10<sup>-12</sup> <math>\mu</math>c FT/cc</u>	<u>Maximum Concentration</u> <u><math>\mu</math>c FT/cc</u>	<u>Maximum Concentration</u> <u><math>\mu</math>c FT/cc</u>
231	329	0	4	< 1x10 <sup>-10</sup>	2.5x10 <sup>-12</sup>
234-5	51	0	1*	< 1x10 <sup>-10</sup>	1.4x10 <sup>-11</sup>

\*Does not include the air samples obtained covering the period during which the hood exploded.

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231 Building

Radiation monitoring was provided during the fabrication of several types of clad fuel rods and fuel elements. Materials used as cores for these included alloys of aluminum with plutonium-239, uranium-235, uranium-238, and neptunium-237.

A considerable variance was noted in the dose rates obtained from the different shipments of neptunium oxide with 400 mrad/hour at two inches being the maximum observed at the time the shipment was received. Preliminary studies of the neptunium have been quite inconclusive to date because of the uncertainty of the age of the material upon receipt at the 231 Building. Further attempts to obtain this data are planned. A continuing check has been made of the hoods where the oxide is mixed and compacted. No buildup in the radiation measurements due to neptunium contamination on the inside surfaces of the hood has been detected to date.

Neutron measurements using both the new BF<sub>3</sub> and neutron film were made while a thin film of plutonium was vapor-plated on a one-inch diameter disc of beryllium. Both the instrument and film indicated dose rates less than 1 mrem/hour at four inches.

Visual inspections of all hood gloves in the 231 Building are now being made routinely by Radiation Monitoring to check for cracks and other weak spots in the gloves. A total of 61 gloves were changed as a result of these inspections during the month of April. A resulting decrease was noted in the number of glove ruptures occurring during the month.

A chip of plutonium-aluminum which read  $1 \times 10^6$  d/m on a Juno was found in room 34 during a routine survey of the 231 Building. This was documented as Radiation Occurrence #59-0-15.

234-5 Building

The normal work routine in the 234-5 Building was interrupted by an explosion in hood 16. One employee was injured and contaminated as a result of the explosion, and three other employees received skin contamination to varying degrees. This has been documented as Potential Overexposure #HL-38-C.

Rooms 176 and 179-A and corridors B and J have been decontaminated. Room 179-B, which was grossly contaminated, has been turned over to Minor Construction for decontamination.

300 AreaAir Sample Results

<u>Number of Samples</u>	<u>Number Above 10<sup>-10</sup> µc FI/cc</u>	<u>Maximum Concentration µc FI/cc</u>
552	250	2.5 x 10 <sup>-8</sup>

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<u>Number of Samples</u>	<u>Number Above 10<sup>-11</sup> <math>\mu\text{c U/cc}</math></u>	<u>Maximum Concentration <math>\mu\text{c U/cc}</math></u>
172	3	1.9x10 <sup>-11</sup>

325 Building

Movement of ceramic fuel material from the laboratories to the basement continues with no unusual problems involved. The maximum dosage rate on any of this material was 130 mrad/hour at surface including 5 mr/hour at 2 inches on a carton containing  $\text{UO}_2$  powder. During swaging operations in the basement, a rupture of a rod containing  $\text{UO}_2$  powder occurred spreading uranium contamination on equipment and floor areas. A temporary shoe cover zone was established until cleaning could be initiated. No personal contamination was detected.

326 Building

Monitoring was provided for the installation of a lead cave under a hood in laboratory 11-A with dosage rates up to 1 r/hour at 3 inches. Smears from the immediate floor area disclosed no contamination problem. Trimming and mounting of replica samples from the 327 Building were accomplished in room 21A with hand dosage rates up to 1.9 rads/hour including 30 mr/hour at 6 inches.

3730 Hot Shop

On several occasions monitoring was provided at this facility for work on irradiated graphite samples. Dosage rates on graphite cores up to 7 rads/hour at 4 inches including 400 mr/hour at 6 inches were recorded.

327 Building

As a sample was being transferred into north D cell it apparently became wedged between the cask and entry port, and when the cask was moved away the sample dropped to the papered area in front of the port. All personnel evacuated the area immediately. Personal surveys showed contamination to 8000 c/m on the coveralls of two employees but no skin contamination was detected. Tongs were used to pick up the sample with a body dose rate of 1.4 rads/hour at 5 feet. Particulate contamination to 4.5 rads/hour including 500 mr/hour at 2 inches was detected on the floor below the entry port. All entries to the area were made while wearing assault masks until decontamination was completed.

A personal survey of an employee after he had completed a routine transfer of a polished uranium wafer from D cell to the X-ray cell revealed high level particulate contamination on the shoulder of his coveralls. Investigation showed that the contamination had probably occurred at D cell and that the employee was exposed for not more than 15 minutes. Results of film studies of the contaminated clothing indicated a localized dose to a significant skin area of 1.1 rads including 20 mr. The incident

was recorded as Technical Overexposure #153-C. At the investigation meeting the particulate contamination problem that exists in the canyon was discussed and the recommendations for achieving better control were listed in the report of the incident.

During several routine sample transfers high air concentrations were attributed to existing contamination in the transfer tasks. Dose rates to 20 rads/hour including 200 mr/hour at 6 inches were observed over empty casks. Decontamination of the casks was accomplished with a maximum body dose rate of 600 mrad/hour including 150 mr/hour at 18 inches.

Work on the building exhaust ductwork by construction forces (Project CGH-790) resulted in limited air exhaust from the west end of the canyon. This necessarily restricted the work of building personnel at B and C cells. No flushing of waste was permitted while construction employees were in the basement. In order to reduce the dose rates to construction workers, maintenance forces wrapped lead sheet around the welds of the crib line. The maximum body dose rate encountered was 1 r/hour at 12 inches. The exhaust filter for B cell was also changed prior to entry of construction employees. The maximum body dose rate encountered was 2 r/hour at 6 inches from the filter box.

Survey of the load lugger after disposal of radioactive waste from the 327 Building revealed smearable contamination to 3000 c/m on the external surfaces of the lugger. Decontamination was accomplished by building personnel. Dose rates to 5 r/hour at 2 feet were encountered while hooking up to the load lugger for removal of waste to the 300 North burial ground.

306 Building

A routine survey of the Fabrication Laboratory revealed smearable floor contamination to 20,000 c/m. The survey also revealed contamination to 40,000 c/m on the process shoes of two employees. It was recommended that the shoes be discarded. A follow-up survey showed that the floor contamination had been reduced to 2000 c/m.

Laboratories Auxiliaries Operation

Radiographic Testing Operation

Area	X-ray jobs for which Radiation Monitoring was provided	Surveys Written	Maximum Dose Rate to Personnel*	Maximum Radiation Level Observed
100	4	5	45 mr/hour	45 mr/hour
200	25	51	25 mr/hour	400 mr/hour
300	2	4	20 mr/hour	20 mr/hour
TOTALS	31	60		

\*X-radiation only.

Hand dose rates while handling radioactive material did not exceed 400 mr/hr.



Physics and Instrument Research and Development Operation

300 Area

305-B Building

Several irradiations of 2000 and 3000 watt-minutes were accomplished with the PCTR with a core loading of a  $UO_2$  seven rod cluster. The maximum dose rate encountered between the faces of the reactor was 1.9 r/hour two and one-half hours after a 3000 watt-minute irradiation. The dose rate from the seven rod cluster was 2.6 r/hour at 2 inches. A surface hand dose rate of 12 rads/hour, corrected for source size, was observed during the removal of foils from the  $UO_2$  pellets.

3745-B Building

A neutron dose rate survey was conducted with the positive ion accelerator operating at 11  $\mu$ a, 1.85 Mev and using the thick beryllium target. The fast neutron dose rate at the door to the generator room under these conditions was 140 mrems/hour and the dose rate at the control panel was 20 mrems/hour. Surveys outside the building revealed a maximum dose rate of 55 mrems/hour at the northwest corner of the chain barrier. The dose rate at the corner of the Fire Protection building and in the control room of 3745-A was 2 mrems/hour.

326 Building

Four new Pu-Be neutron sources received by the Research Physics group were monitored with the modified  $BF_3$  and double moderator. The maximum neutron dosage rate on any one source was 35 mrems/hour including 2 mr/hour at 2 feet. The dosage rate at 1 meter was approximately 16 mrems/hour. Smears were made on all the sources with results showing less than 500 d/m and 100 c/m.

There will be times when all four Pu-Be sources will be used together as one combined source so dosage rate measurements were obtained under these conditions. The following fast neutron measurements were obtained from the combined sources using the double moderator dosimeter:

<u>Source Distance</u>	<u>Fast Neutron in mrems/hour</u>
15 inches	200
2 feet	150
1 meter	80

Radiation Protection Operation

300 Area

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3745 Building

Exposure of the cobalt source in the north room resulted in a maximum dose rate of 26 mr/hour at the barricade north of the building. The survey showed that the exposure of calibration film for the disaster film program using the cobalt source would have to be conducted in the 3745-A Building.

*A. J. Stevens*  
Manager  
RADIATION MONITORING

AJ Stevens:ljw

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