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REACTOR SECTION, RADIATION MONITORINGREPORT FOR MONTH OF MARCH, 1955By: P. C. JermanDate: April 5, 1955

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MASTER

Reactor Section, Radiation Monitoring Sub-Section

MONITORING ACTIVITIES100-B Area105-B Reactor and Associated Buildings

Normal discharge operations were performed at a maximum exposure rate of 300 mrad/hr, and the associated removal of rear dummy pieces was accomplished at a maximum exposure rate of 225 mrad/hr. Dose rates as high as 2 r/hr were encountered by personnel during the charging of irradiated mint pieces. Interiors of buckets used in transporting mint pieces were found to be contaminated to levels as high as 9 rad/hr at surface including 230 mr/hr at 2 inches. Four process tubes were removed, channels breached, and the tubes replaced at maximum exposure rates of 600 mrad/hr in the discharge area and 200 mr/hr at the front face. Graphite samples reading 20 rad/hr at six inches were removed from a process tube channel at a maximum exposure rate of 500 mrad/hr.

The cushion chamber was entered for inspection and repair work, with the maximum exposure rate being 1 rad/hr including 500 mr/hr. Contamination levels inside the chamber were as high as 10 rad/hr surface including 1 r/hr at three inches. The downcomer was inspected at a maximum exposure rate of 175 mrad/hr including 30 mr/hr. Cleaning work was performed in the inner rod room at a maximum exposure rate of 500 mrad/hr to the hands.

Routine surveys of the transfer area floor revealed several particles giving dose rates as high as 40 rad/hr at surface including 2 r/hr at two inches. The particles were removed at a maximum exposure rate of 100 mrad/hr. The contamination resulted from improper draining of well which operation was complicated because of a plugged floor drain. The drain will be repaired or modified. The silica gel was removed and replaced in the gel towers in the #1 and #2 drier rooms at a maximum exposure rate of 50 mr/hr. Large accumulations of condensate were drained from the #3, #4, and #5 driers at a maximum exposure rate of 600 mr/hr. Floor contamination to a maximum level of 4 rad/hr at surface including 5 mr/hr at two inches was found in the drier rooms. The contamination was reduced to nominal levels.

On three occasions the bed of the Operations pick-up truck was found contaminated on routine weekly surveys. The maximum contamination level found was a spot reading 250 mrad/hr at surface including 8 mr/hr at two inches. In all cases the contamination was removed. Routine surveys also revealed a charging machine part reading 7000 c/m in the 1717-B maintenance shop, a board in a trash can with a surface dose rate of 8 mrad/hr, and 40 thermocouple wells reading a maximum of 9 mrad/hr at surface in a storage bin in the 105-B instrument shop. All items were removed to radiation zones. Six pairs of coveralls worn by members of the railroad track maintenance crew, headquarters at 100-B area, were found to be contaminated to a maximum level of 1000 c/m. Surveys of the coveralls a day later showed the activity had decayed to less than detectable amounts.

The 24-hour dose of the effluent water discharged to the Columbia River exceeded 360 mrad for five days. The maximum was 456 mrad.

All of the 60 air samples taken indicated activity densities of less than the maximum permissible limits for the isotopes involved or the respiratory protection worn. Fresh air protection was required at times in the discharge area and inner rod room.

105-C Reactor and Associated Buildings

During the disposal of one ruptured piece, contamination to levels of greater than 300 rad/hr at 1 inch was spread to the discharge elevator and tubes below when the rear nozzle was removed from the tube. The contamination was removed by flushing and steam-cleaning. The maximum exposure rate encountered during ruptured slug removal work was 5 r/hr. One rubber

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HW-36063

Reactor Section, Radiation Monitoring Sub-Section

105-C Reactor and Associated Buildings (continued)

suit became contaminated to a level of 400 mrad/hr at surface and was removed promptly. Floor contamination of a maximum level of 17 rad/hr at surface including 100 mr/hr at two inches occurred in the 0' far discharge area labyrinth and was removed without difficulty. During removal of the front pigtail and nozzle of a process tube containing a ruptured slug, a maintenance pipefitter received uncontrolled radiation exposure from contaminated water which flowed onto a coverall sleeve. The coveralls were contaminated to a level of 6 rad/hr at surface and the skin to 20 mrad/hr. The dose to the arm was estimated to be 175 mrad. The incident was formally investigated and reported as Radiation Incident, Class I, No. 428 (Document No. HW-35991).

Balls reading 10 rad/hr at three inches were removed from the third safety system at a maximum exposure rate of 500 mrad/hr including 200 mr/hr. Repair work on octant monitoring chambers was performed during several outages. The maximum exposure rate encountered for this work was 2.4 rad/hr including 400 mr/hr. Graphite samples were charged into the "D" experimental hole at a maximum exposure rate of 2.5 r/hr. The beam emanating from the hole measured 100 r/hr at the reactor face.

Ground contamination in the form of particles was found in the vicinity of the 105-C exhaust stack during a survey of a temporary radiation zone. The maximum uncorrected surface dose rate from particles was 200 mrad/hr. Analysis of particle samples by the Biophysics Control Laboratory identifies them as having originated at the reactor. Possible sources are being investigated. A routine survey of the 1716-B Transportation Garage revealed a pair of coveralls contaminated to a level of 2500 c/m on a knee. Film surveys of the coveralls revealed a particle giving a dose rate of about 115 mrad/hr at surface, less than 5 mrad/hr at one-half inch and less than 2.5 mrad/hr at one inch. No appreciable exposure to the employee who wore them was indicated. Surveys of all vehicles and equipment worked on while wearing the coveralls revealed no detectable contamination. Routine surveys of the trash-lugger within the exclusion area revealed contaminated material on three occasions. The maximum level was 10,000 c/m. The material was removed and buried.

Maintenance forces began installation of equipment in the storage basin for the metal examination facility. The maximum exposure rate encountered with the storage basin water level lowered five feet was 550 mrad/hr including 50 mr/hr.

The 24-hour dose of the effluent water discharged to the Columbia River exceeded 360 mrad for one day. The dose was 377 mrad.

All of the 55 air samples taken showed activity densities of less than the maximum permissible limits for the isotopes involved or the respiratory protection worn. On several occasions fresh air protection was required in the discharge area during ruptured slug removal.

100-D Area

105-D Reactor and Associated Buildings

There was one slug failure. It was confirmed by a rear pigtail dose rate of 35 r/hr at 2 inches. The maximum exposure rate for removal of the ruptured piece was 1.5 rad/hr. During charge-discharge operations the first 10 perfs from the rear of tubes were retrieved and placed in 20 gallon cans at an average exposure rate of 120 mrad/hr. Dose rates up to 4.2 rad/hr including 260 mr/hr at 2 inches were measured over the top of the cans. Dose rates through the sides of the loaded cans were 100 to 150 mr/hr at 2 inches. On one occasion, while removing downstream dummies from a process tube, the third dummy from the

Reactor Section, Radiation Monitoring Sub-Section

105-D Reactor and Associated Buildings (continued)

rear gave an off-scale C.P. meter reading (greater than 5 r/hr) at 4 feet. The piece fell into the storage basin before an accurate dose rate could be measured. Personnel meters worn by employees at the work site were processed and revealed a maximum dose in the order of 5 mr. A planned dose rate of 100 r/hr was received by an Operation Unit supervisor for four seconds while he removed one of two irradiated slugs from the 0' catwalk in the discharge area. The second slug was removed by another supervisor at a dose rate of 40 r/hr for four seconds. The dose received in either case was no greater than that planned.

Two horizontal control rod tip sections were removed from the inner rod room and buried. The maximum exposure rate received during this work was 500 mr/hr. The #8 horizontal control rod thimble was removed and buried at a maximum exposure rate of 2 r/hr. Three radioactive specks were found on the ground after the thimble was loaded onto a flatbed truck. The specks gave a maximum dose rate of 100 mrad/hr, including 10 mr/hr at 2 inches. They were promptly removed. During an attempted removal of the #2 horizontal control rod thimble, the thimble separated and only a short portion of it was removed. As of month end, work is in progress to remove the remaining thimble section. Exposure rates up to 2 r/hr were encountered.

A portion of the downcomer vent pipe was replaced with piping of larger diameter at an exposure rate of 30 mrad/hr. This installation appears to have entirely corrected the discharge of vapors and water from the downcomer vent. Entry was made to the #1 and #2 junction boxes of the effluent line for the removal of timbers at an average exposure rate of 200 mrad/hr. Minor construction forces entered the #2 junction box and welded a blank in the D-DR tie-in line at an average exposure rate of 50 mrad/hr.

Surveys of 26 pieces of road maintenance equipment revealed contamination on the trailer bar of an asphalt spreader of 10 mrad/hr at surface.

The 24-hour dose of the effluent water discharged to the Columbia River exceeded 360 mrad for five days. The maximum was 467 mrad.

A total of 67 air samples were taken. The maximum activity density in the discharge area was 5.1×10^{-8} uc/cc. The maximum activity density due to effluent vapor was 5.3×10^{-7} uc/cc in the discharge elevator machinery room.

105-D Reactor and Associated Buildings

A captured slug was contained by a cover pigtail with rate of 5 r/hr at 2 inches diameter. A dose rate of 500 mr/hr at 2 inches from adjacent pigtails. Exposure rates up to 2 rad/hr were received while removing the rear nozzle. Following a purge of the process tube, discharge area activity levels were found to have increased about 20% over that normally found. The average exposure rate for charge-discharge operations including the retrieving of perforated aluminum drums was 200 mrad/hr.

An electrician entered the discharge area without his personnel meters. He had been approved to take an extended exposure of 100 mrad and received an estimated exposure of 64 mrad before the oversight was discovered. A Plant Laundry employee surveyed himself after picking up laundry from the reactor building and found a spot of contamination on his right overall leg. The contamination appeared to be in the form of a particle and gave an uncorrected dose rate of 15 mrad/hr including 2 mr/hr at 2 inches. Film surveys of this particle through two thicknesses of cloth revealed no significant exposure was received. Gamma spectrometer analysis of the particle indicated that the contaminant was a rare earth element.

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EW-36063

Reactor Section, Radiation Monitoring Sub-Section

105-DR Reactor and Associated Buildings (continued)

The "J" metal shipment program was reactivated. Four new casks were radioautographed after initial loading. The average dose rate through the sides of the casks was 60 mr/hr at 2 inches. This is twice that experienced with the casks used previously. A columnated beam about 1/4 inch in diameter through the bottom of one cask was indicated by film studies and showed a dose rate of 1 r/hr.

The 24-hour dose of the effluent water discharged to the Columbia River exceeded 360 mrad throughout the month.

A total of 42 air samples were taken during the month. The maximum activity density was 4.9×10^{-9} uc/cc in the inner rod room. The maximum activity density due to effluent vapor was 3.8×10^{-8} uc/cc in the far sample room.

100-F-H Areas

105-F Reactor and Associated Buildings

Reactor operation was resumed on March 1, following the extended outage for the replacement of horizontal rods. Abnormally high dose rates were encountered in the discharge area during a shutdown to discharge poison. The maximum exposure rate was 160 mrad/hr including 100 mr/hr at 3 feet from the tube caps. The activity was believed due to process gas. Fresh air masks were worn. Radioactive gas was also prevalent at the front face immediately following start up. However, the activity decreased as the gas purity increased. The maximum dose rate observed was 750 mrad/hr and the maximum exposure rate was 150 mrad/hr. Fresh air masks were worn when warranted.

The galvanometer chamber in the "A" experimental hole was repositioned at a low power level. The exposure rate was quite low. However, intensity of the beam from the hole showed a dose rate of 300 mrem/hr, neglecting the fast neutrons, as follows: 100 mr/hr gamma; 6000 intermediate neutrons/cm²/second (125 mrem/hr); 10,000 slow neutrons/cm²/second (83 mrem/hr). Samples were discharged from the "E" experimental hole at a maximum exposure rate of 500 mrem/hr including 450 mr/hr, gamma, and a 50 mrem/hr neutron allowance.

A test of the third safety ball washer in the transfer area was made. Seizable contamination was reduced from about 2000 c/m to about 200 c/m, but the dose rate of 1 to 2 r/hr at 2 inches remained unchanged in that the balls had been irradiated.

The 24-hour dose of the effluent water discharged to the Columbia River exceeded 360 mrad throughout the month. The maximum was 631 mrad.

All of the 37 air samples taken indicated activity densities below the maximum permissible limits for the isotopes involved or the respiratory protection worn.

105-H Reactor and Associated Buildings

There was one slug failure. It was discovered after normal discharge from a tube. Five stack charges were encountered during charge-discharge operations. These charges were successfully removed at a maximum exposure rate of 3 rad/hr. During charge-discharge operations the rear dummy charges were retrieved and placed in 20 gallon cans. The dummies in one can showed a dose rate of 12 rad/hr including 2 r/hr over the top of the can. These dummies were dumped into the basin. In general this method of retrieving dummies has reduced exposure rates and the contamination problems encountered while decontaminating dummies in the wash pad.

Reactor Section, Radiation Monitoring Sub-Section

105-K Reactor and Associated Buildings (continued)

Removal of the P-13 assembly from the "A" experimental hole was accomplished without incident. The job was well planned and executed. The maximum exposure rates encountered were 400 mrad/hr while removing external shielding and piping on the No. 1 experimental level; 300 mrad/hr while observing the assembly through a lead glass window after it had been drawn into a capsule inside a lead cave constructed on the experimental level; and 65 mrad/hr at 350 feet while pulling the capsule from the 105 building to a water filled concrete pit. Extrapolation of the dose rate data indicated dose rate of 9000 to 12000 r/hr at one foot.

Irradiation of samples for the neptunium experiment continued on No. 2 experimental level. Two U^{238} samples were irradiated. When discharged, these samples gave dose rates up to 200 mrad/hr at 15 feet which activity decayed to 20 mrad/hr at 15 feet within 5 minutes. The maximum exposure rate encountered was 5 r/hr.

The emission of neutrons from the front of 13 dry channel tubes was observed. The maximum neutron flux density included 600 fast neutrons/cm²/second (75 mrem/hr), 6000 intermediate neutrons/cm²/second (125 mrem/hr) and 360 slow neutrons/cm²/second (3 mrem/hr).

The 24-hour dose of the effluent water discharged to the Columbia River exceeded 360 mrad for eighteen days. The maximum was 491 mrad.

All of the 29 air samples taken during the month indicated activity densities below the maximum permissible limit for the isotopes involved or the respiratory protection worn.

100-K Area

105-KK Reactor and Associated Buildings

Loading of the reactor was started and critical tests were performed. The maximum dose rate encountered was 220 mrad/hr at surface including 120 mrad/hr at 2 inches from a container of "C" slugs removed from a process tube. The maximum exposure rate while discharging tubes was 25 mrad/hr. Contamination was negligible.

105-KW Reactor and Associated Buildings

The reactor was started up on March 11. Several building surveys were made as the power level was increased.

Gamma radiation beams up to 180 mrad/hr with no detectable neutrons were observed coming from experimental tubes 100% and 100% due to trapped air in the tubes. The situation was corrected by opening the rear face sample lines for these tubes and thus permitting the trapped air to escape. Subsequently, the same tubes showed no gamma rays with the following reading 400 mrad/hr at 15 feet and 40 mrad/hr at approximately 80 feet. The condition was again corrected by opening the rear face sample line. In both instances the radiation from the tubes activated the charge elevator E.M. chamber alarm. Plans are to modify these test facilities to prevent this condition from recurring.

A beam of 986 mrem/hr was found at channel #4 in the process monitoring room as follows: 60 mrad/hr gamma, 5000 slow neutrons/cm²/second (41 mrem/hr); 500 intermediate neutrons/cm²/second (10 mrem/hr); 7000 fast neutrons/cm²/second (875 mrem/hr). Shielding was installed which reduced this reading to 4 mrad/hr. A process gas leak developed at octant monitoring hole #1A on the No. 1 experimental level. The maximum dose rate in the vicinity was 3 rad/hr. The leak was sealed by the addition of gasketing material. The maximum radiation level observed on top of the reactor at 1000 MW was 79 mrem/hr opposite vertical safety rod

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HW-36063

Reactor Section, Radiation Monitoring Sub-Section

105-KW Reactor and Associated Buildings (continued)

number 23 as follows: 21 $\mu\text{r/hr}$ gamma; 1000 slow neutrons/ $\text{cm}^2/\text{second}$ (8 mrem/hr); 1500 intermediate neutrons/ $\text{cm}^2/\text{second}$ (31 mrem/hr); 150 fast neutrons/ $\text{cm}^2/\text{second}$ (19 mrem/hr).

Filming of the top of the reactor biological shield was started on March 24. The film processed by month end indicated no shielding leakage.

Eleven air samples were taken. None exceeded the maximum permissible limits for the isotopes involved or the respiratory protection worn.

FORCE SUMMARY

	<u>Start of Month</u>	<u>End of Month</u>	<u>Net Change</u>
Monthly	21	22	/1
Weekly	<u>58</u>	<u>60</u>	<u>/2</u>
Sub-Section Total	79	82	/3

P.C. Jerman
Radiation Monitoring
REACTOR SECTION

PC JERMAN:gb

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