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REACTOR SECTION, RADIATION MONITORINGREPORT FOR MONTH OF NOVEMBER, 1954

By: P. C. Jerman

Date: December 3, 1954

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Reactor Section, Radiation Monitoring Sub-Section

SUMMARY

There were no Class II and one Class I radiation incidents. The Class I incident occurred at 105-B reactor when irradiated aluminum dummies washed out of a process tube onto the discharge elevator due to improper valving during displacement of poison columns. An Operations Unit employee received a dose of 400 mrad to his hand when he placed it over the end of the rear nozzle to prevent the dummies from coming out.

The 105-D reactor was shutdown for the week beginning November 14, for venturi installation, water flow equalization, and orifice installation. All work was completed without incident. On November 28, the 105-C reactor began an extended outage for the replacement of rear pig-tails by Minor Construction forces. Outside of minor contamination problems, by month end the work had progressed without incident.

The 24-hour dose of the effluent water discharged to the Columbia River exceeded 360 mrad at the 105-H reactor throughout the month and at the 105-DR and 105-F reactors for 9 days and 11 days respectively. The maximum 24-hour doses were 451, 521 and 439 mrad for 105-DR, 105-F and 105-H reactors respectively. The increased activity was tolerated with the concurrence of the Radiological Sciences Department.

General Statistics

	<u>OCTOBER</u>							<u>NOVEMBER</u>							1954 to Date
	B	C	D	DR	F	H	Total	B	C	D	DR	F	H	Total	
Special Work Permits	134	73	82	85	64	152	590	187	175	83	74	108	110	737	8167
Routine & Special Surveys	465	265	414	377	475	701	2697	580	517	473	343	633	499	3045	30334
Retention Basin	158	158	176	173	128	200	993	210	139	137	167	111	150	914	11816
Air Monitoring Samples	43	60	75	46	56	135	415	95	41	80	39	134	40	429	4030
Hand Contamination cases	0	3	0	0	2	6	11	0	1	0	0	2	0	3	116
Skin contamination cases (other than hands)	3	2	1	0	1	11	18	0	1	1	0	2	1	5	257

Retention Basin Effluent

The activity of the water leaving the retention basin was as follows:

	<u>100-B</u>	<u>100-C</u>	<u>100-D</u>	<u>100-DR</u>	<u>100-F</u>	<u>100-H</u>
Average beta dosage-rate (mrad/hr)	3.5	2.3	3.0	5.1	3.6	4.7
Average gamma dosage-rate (mr/hr)	6.3	3.5	6.1	9.1	8.7	10.2
Average total dosage-rate (mrad/hr)	9.8	5.8	9.1	14.2	12.3	14.9
Average integrated dose in 24 hours	235	129	218	341	295	358
Maximum integrated dose in 24 hours	305	211	310	451	521	439
Maximum integrated dose in 24 hours 1954	460	391	670	682	521	854

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100-B Area

105-B Reactor and Associated Buildings

There was one slug failure. Discharge of the tube containing the ruptured slug was unsuccessfully attempted during the minimum recovery time at a maximum exposure rate of 3 rads/hr. The dose rate at the pigtail was 25 r/hr at 2 inches. During this operation, the rubber pants and leggings of the operators became contaminated to a maximum level of 5 rads/hr, including 100 mr/hr. The clothing was removed immediately. The maximum exposure rate caused by the contamination was 75 mrad/hr as measured inside a legging. The discharge elevator was contaminated with spots reading as high as 35 rads/hr at six inches. These spots were reduced to a maximum level of 600 mrad/hr.

A Class I radiation incident occurred as a result of irradiated aluminum dummies being washed out of a process tube onto the discharge elevator because of improper valving during displacement of poison columns. An Operations Unit employee received a dose of 400 mrad to his hand when he placed it over the end of the rear nozzle to prevent the dummies from coming out.

On two occasions irradiated uranium pieces and on one occasion an irradiated 10-66 piece were brought up on the dummy elevator with buckets of poison pieces which were to be reclaimed. In each case the raising of the buckets was adequately monitored. Also the health monitoring system alarm sounded. The buckets were returned to the storage basin for resorting of the material.

Several loose timbers and pieces of steel plate were removed from the cushion chamber at a maximum exposure rate of 1 rad/hr including 100 mr/hr. The maximum surface dose rate on timbers was 2.5 rads/hr including 20 mr/hr at two inches. The removal of the timbers resulted in lowering the pressure in the cushion chamber so that the effluent vapor problem in the cushion chamber corridor was eliminated.

All of the 62 air samples taken indicated activity densities of less than the maximum permissible limits for the isotopes involved or the respiratory protection worn.

105-C Reactor and Associated Buildings

There were twelve slug failures. A process tube containing a "J" metal ruptured slug was discharged by means of the charging machine about five hours after the reactor was shutdown. The pigtail dose rate was 45 r/hr, and the discharge area work was performed at a maximum exposure rate of 500 mrad/hr. During discharge of the tube the charge elevator health monitoring system alarm sounded because of fission gas and contaminated water flowing out the front nozzle and personnel left the elevator immediately. Surveys made a few minutes later revealed a maximum dose rate of 100 rads including 50 mr/hr. Contamination giving dose rates as high as 2.5 rads/hr including 100 mr/hr at 3 inches was found on nozzles below the tube being discharged. The contamination was subsequently removed. The ruptured piece was canned at a maximum exposure rate of 1.5 rads/hr due to fission gas, with fresh air masks worn.

Sticking of irradiated third safety balls in the ball trough because of a stuck slider valve resulted in a dose rate of 300 r/hr at eight inches from the trough. The slider valve was freed by means of a six-foot bar at a maximum exposure rate of 5 r/hr. Subsequently the ball elevator was operated intermittently from the ball control room, with no entry made to the room proper. During a later outage the irradiated balls were located in the separator-collector hopper on top of the reactor. The maximum dose rate at the discharge elevator machinery room near door to the balcony was 150 mr/hr and on the balcony was 1 r/hr. No uncontrolled exposures to these radiation levels occurred. The irradiated balls were transferred to a cask and buried at a maximum exposure rate of 600 mr/hr. Maintenance work was performed on the

Reactor Section, Radiation Monitoring Sub-Section

105-C Reactor and Associated Buildings (continued)

valves in the ball tunnel at a maximum exposure rate of 1 r/hr.

An extended outage was begun on November 28 for replacement of rear pigtails. This work is continuing beyond month end and is being performed by Minor Construction forces. The maximum exposure rate encountered has been 75 mrad/hr with the average being 40 mrad/hr. One Minor Construction employee worked in the discharge area without his badge and pencils. The work was continuously monitored with timekeeping records indicating an exposure of 50 mrad.

For about three days the beta to gamma ratio of the activity of the effluent water was inverted from the normal ratio of 1 to 2. During this period the ratio was as high as 2.3 to 1. The cause appeared to be a change in the lime-alum coagulant feed to process water. The total activity was lower than normal, with the beta activity about normal and the gamma activity much lower than normal.

All of the 52 air samples taken indicated activity densities of less than the maximum permissible limits for the isotopes involved or the respiratory protection worn.

100-D Area

105-D Reactor and Associated Buildings

The reactor was shutdown for one week for the purpose of venturi installation, flow equalization and orifice installation. The discharge face crossheader orifices were installed at a maximum exposure rate of 150 mrad/hr. Flow equalization work, involving rear nozzle and thermocouple replacement, was done at a maximum exposure rate of 250 mrad/hr, and at an average exposure rate of 75 mrad/hr. The venturi installation on the charge rate was accomplished at an average exposure rate of 3 mrad/hr. Two process tubes were removed and replaced at maximum exposure rates of 250 mrad/hr in the discharge area and 1 rad/hr on the charge elevator. Repairs were made on the downcomer at an average exposure rate of 25 mrad/hr at the top and 170 mrad/hr at the bottom. Contamination levels up to 3.3 rads/hr including 75 mr/hr at 2 inches were observed at the downcomer base.

The effluent line junction box just outside the reactor building was opened and nine timbers were removed. The maximum dose rate on the timbers was 750 mrad/hr including 200 mr/hr at 2 inches. The maximum exposure rate for this job was 250 mrad/hr. The near side sample room and outer rod room drains were isolated from the effluent system by a new piping arrangement. No abnormal effluent vapor activity was observed in these locations since the change was made. The wooden screen was removed from the 1904 discharge chamber and replaced with a steel screen of approximately 4 square inch mesh at a maximum exposure rate of 700 mrad/hr.

Abnormal radiation levels were observed near the storage area chutes immediately following start-up after the extended outage as the result of the drain valve on the far riser in the discharge area being left open. Maximum dose rate at the chute railings was 120 mrad/hr including 80 mr/hr, and at the water surface, 400 mrad/hr including 250 mr/hr at 2 inches. The area was restricted immediately, and the condition was corrected when the reactor was shutdown for poison discharge.

A survey made of twelve 10' x 10' plots within the 105-D-BR exclusion area revealed one particle in a plot south of 105-D-B building reading 75,000 c/m at 1 inch. All other plots showed no evident of particles. A particle reading 80,000 c/m at 6 inches was found and removed during a survey of railroad trackage outside the exclusion area.

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Reactor Section, Radiation Monitoring Sub-Section

103-D Reactor and Associated Buildings (continued)

Twenty-five plant vehicles within the 100-D Area were surveyed. A spot of contamination was found on the flat bed of a truck which read 80,000 c/m at 1 inch. This contamination resulted from a thimble removal operation in another area. Vehicles belonging to the Road Maintenance Unit were routinely surveyed. Several were found contaminated and were cleaned at the 200 West Area vehicle decontamination station. At month end three vehicles were still contaminated, the maximum level being 30,000 c/m. Daily surveys of Road Maintenance Unit personnel revealed one pair of plant issue coveralls contaminated to 400 c/m and one personal shoe, to 600 c/m.

A total of 80 air samples was taken. The maximum activity density found was 3.6×10^{-7} uc/cc due to effluent vapor in the air conditioning room. All discharge area samples collected were less than 5×10^{-9} uc/cc.

105-DR Reactor and Associated Buildings

The failure of five "J" metal slugs was evidenced by surveys of rear pigtails. Dose rates from the pigtails of tubes containing the ruptured pieces ranged from 300 to 1200 mr/hr above the general background levels. The tubes were discharged at a maximum exposure rate of 5 rads/hr including 1.5 r/hr.

Exposure rates up to 250 mrad/hr were experienced while repositioning downstream dummy patterns. A maximum dose rate of 13 rads/hr, including 200 mr/hr at 2 inches was observed on perforated aluminum dummies removed. Mattress plates were replaced at an average exposure rate of 60 mr/hr. Graphite samples were charged into a process tube channel at a maximum exposure rate of 1 rad/hr.

A thermal neutron monitor assembly was installed in the "C" experimental hole. An exposure rate of 6 r/hr was experienced while removing the graphite plug. A dose rate of 25 r/hr was measured in the unshielded beam. Samples were removed from the test wells on top of the reactor at a maximum exposure rate of 500 mrad/hr. The maximum dose rate on any one sample was 5 rads/hr including 30 mr/hr at 2 inches.

The 24-hour dose of the effluent water discharged to the Columbia River exceeded 360 mrad for nine days during the month. The maximum was 451 mrad.

A total of 39 air samples were taken. The maximum activity density on any sample collected in the discharge area was 3.7×10^{-9} uc/cc. A sample taken in the far sample room showed an activity density of 1.7×10^{-7} uc/cc which was due to effluent vapor.

100-F-H Area

105-F Reactor

There were no slug failures. Two horizontal rods and their thimbles were removed with a maximum exposure rate of 2.0 rads/hr including 500 mr/hr. Exposure rates received during leak testing of process tubes ranged from 80 mr/hr to 200 mrad/hr including 125 mr/hr. Four leaking process tubes were found and three replaced. The fourth was blanked off and shielded. During the removal of one tube an exposure rate of 1.5 rad/hr including 1 r/hr was received when the tube was pushed 8 feet with the discharge area crew in the immediate vicinity. This occurred as the result of communications system failure. The filter for an air sample taken at the time gave a dose rate of 90 mrad/hr. There was no personnel exposure to this airborne activity, in that the crew left the discharge area immediately after the section of tube was pushed out. One process tube was removed to the front of the reactor into a pipe at a maximum exposure rate of 300 mr/hr.

Reactor Section Radiation Monitoring Sub-Section

105-F Reactor (continued)

Of thirty vehicles surveyed, two trucks were found with low level contamination. In both cases the contamination was reduced.

The 24-hour dose of the effluent water discharged to the Columbia River exceeded 360 mrad for 11 days during the month. The maximum was 521 mrad. "Hot springs" along the banks of the river opposite the 107-F retention basins upstream to the 181-F building indicate severe leaks in the effluent system.

Of the 134 air samples taken, 58 were taken in and around the lunch room in an effort to locate the source of effluent vapor which gave rise to activity densities as high as 1.5×10^{-7} uc/cc in the lunch room. The source was not found. All activity densities were below the maximum permissible limits for the isotopes involved or the respiratory protection worn.

105-H Reactor

There were three slug failures. All ruptured slugs were removed without undue exposure to personnel. Dose rates as high as 12.5 rads/hr including 350 mr/hr at 4 inches were measured from nozzles in the lower portion of the discharge face. The high level radiation was due to contamination. Work in this region was performed with an exposure rate of 3 rads/hr. Dose rates with the discharge area as a whole were higher than normal.

Repair of a horizontal rod tip in the outer rod room was completed at a maximum exposure rate of 500 mr/hr. Removal of horizontal safety rod thimble was complicated by contamination on the roller guides in the inner rod room. The maximum dose rate measured was 25 rads/hr including 800 mr/hr at 6 inches. The maximum exposure rate received during removal operations was 3 rads/hr. The new thimble could not be inserted because of an obstruction. The channel was blanked off and shielded.

Removal of the external P-13 equipment at the "A" experimental hole was completed. Dose rates due to contamination measured at heat exchange pipes were as high as 18 rads/hr at surface including 500 mr/hr at 3 inches. The maximum exposure rate encountered during removal work was 800 mr/hr. While the reactor was shutdown, a leak developed in the piping on the No. 1 experimental level which flooded the -9 level and temporarily put the reactor control instruments out of service. The area had been previously contaminated up to 250 mrad/hr including 46 mr/hr which inhibited repair work. A facility for irradiation of Neptunium was inserted into the "Y" facility on the No. 2 experimental level at nominal exposure rates.

Exposure rates encountered on the wash pad were higher than normal due to the high number of ruptured slugs experienced in October. Underwater lamps were contaminated up to 12 rads/hr at surface including 100 mr/hr. An exposure rate of 3 rads/hr to the hands was received while relamping. An exposure rate of 100 mr/hr was received while decontaminating perforated aluminum dummies which had surface dose rates up to 10 rads/hr. A total of 58 vehicles were surveyed. None was found contaminated.

The 24-hour dose of the effluent water discharged to the Columbia River exceeded 360 mrad throughout the month. The maximum was 439 mrad.

Of the 40 air samples taken, one taken in the discharge area indicated an activity density in excess of the maximum permissible limit, however the sampling equipment was found to be contaminated. The sample showed 1.8×10^{-3} uc/cc. A second sample taken with portable

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Reactor Section, Radiation Monitoring Sub-Section

105-B Reactor (continued)

equipment failed to confirm the high activity.

100-K Area

105-KW Reactor

Metal was brought into the reactor building. After inspection it was placed in storage rooms. Exposure rates to construction personnel working in the building were maintained below 1 mr/hr.

P. E. Jerman

Radiation Monitoring
Reactor Section

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