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HW-40755

Copy #1 - JT Baker
2 - LV Barker
3 - LA Carter - HE Book
CJ DeBevec - WP Howell
4 - RG Clough
5 - MM Cox
6 - DP Ebright - JW Vanderbeek
7 - EJ Filip
8 - RB Hall
9 - TW Hauff
10 - DL Haynie
11 - ET Hubbard
12 - PC Jerman
13 - AR Keene
14 - CG Lewis
15 - DS Lewis
16 - AR Maguire
17 - ML Mickelson
18 - JG Myers
19 - SL Nelson
20 - GA Priode
21 - LC Roos
22 - OC Schroeder
23 - FAR Stainken
24 - AJ Stevens - HM Parker
25 - HT Wells
26 - EE Weyerts
27 - 300 File
28 - Yellow File

[redacted] RESTRICTED DATA

[redacted] contains [redacted] data [redacted] ned [redacted] Atomic [redacted] 1954 [redacted] al [redacted] disclos [redacted] its [redacted] manne[redacted] an unau[redacted] is [redacted] ced.

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REACTOR SECTION, RADIATION MONITORING

REPORT FOR MONTH OF DECEMBER, 1955

By: P. C. Jerman

Date: January 4, 1956

I. RESPONSIBILITY

The radiation monitoring responsibility for the 108-B building was transferred from the Radiological Sciences Department to Radiation Monitoring Sub-Section, Reactor Section effective December 15, 1955.

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Approved for Public Release
Name/Date J. D. Briggs 1-11-05
Name/Date Buzz Hamm 7-21-05
ORG: PNL NSAT

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JBriggs 8/4/2003

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VI. ACHIEVEMENT

A. Operating Experience

1. Statistics

	B	C	D	DR	F	H	KE	KW	Dec. Total	Nov. Total	1955 To Date
Special Work Permits	92	105	238	100	105	133	56	46	875	775	9751
Routine & Special Surveys	436	732	876	460	653	716	564	363	4800	5160	52108
Air Samples	26	60	191	41	63	93	30	28	532	479	5560
Recorded Hand Counts	1974	2490	3459	1575	2298	5239	1835	2098	20938	22111	105,799
Hand Contamination Cases	3	5	1	3	1	4	1	0	18	7	124
Skin Contamination Cases	2	4	6	9	8	3	0	0	32	38	265
Contaminated Injuries	0	0	0	1	1	0	0	0	2	0	6
Vehicle Surveys	24	15	13	3	46	82	21	34	238	164	1091[1]
Vehicles Contaminated	0	0	0	0	0	5	0	0	5	21	381
No. of Cases of Personnel Clothing Contamination	1	8	5	7	6	11	2	0	40	58	178[2]
No. of Cases of Contamination spread outside radiation zones	0	15	7	4	2	14	0	0	42	42	147[2]
No. of employees for whom 100 mrem/day was authorized	55	80	134	91	71	158	11	4	604	549	2301[2]
No. of employees for whom 100 mrem/day was authorized twice in 7 days	2	0	16	7	4	21	0	0	50	56	228[2]
No. of employees for whom 100 mrem/day was authorized	0	0	0	0	0	2	0	0	2	11	22[2]
No. of employees for whom dose rate 3 rads/hr was established	1	4	8	12	4	6	0	0	35	72	174[2]
No. of Radiation Zone entries	865	1231	3079	1580	1158	3784	767	480	12936	14340	53,646[2]
No. of hours training others	0	20	3	16	9	24	0	0	72	97	269[2]
Reactor Effluents											
Av. of effluent calculations	113	117	93	188	139	365	124	124	1263	1083	13137
Av. beta dose rate (mrads/hr)	3.7	2.7	0.9	3.9	5.2	3.1	2.3	3.6			
Av. gamma dose rate (mr/hr)	7.9	5.2	2.3	9.6	12.1	7.7	8.8	4.3			
Av. total dose rate (mrads/hr)	11.6	7.9	3.2	13.5	17.3	10.8	19.9	7.9			
Av. integrated dose in 24 hours	286.6	176.2	76.8	324.0	384.0	259.	242.0	186.7			
Max. integrated dose in 24 hours	365.0	326.4	295.0	463.0	602.0	468.	338.0	318.7			
Max. integrated dose in 24 hours 1955	379.2	638.4	588.	785.0	1483.	4020.	381.0	318.7			
No. of days operated in excess of 360 mrads/day	2	0	0	18	20	7	0	0	47	54	174

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1. Statistics (continued)

	B	C	D	DR	F	H	KE	KW	Dec. Total	Nov. Total	1955 To Date
Exposure Hours											
Operations	709	433	842	447	501	2283	375	226	5816	6643	35,684
Power	0	0	0	0	0	0	0	0	0	10	13
Maintenance	982	631	4249	619	515	593	221	341	8151	9068	37,970
Process	787[3]	75	30	0	5	0	0	5	902	1064	3,048
Engineering	7	0	18	52	32	719[4]	0	7	835	829	5,160
Radiation Monitoring	58	200	409	106	224	426	90	80	1593	1982	10,882
Others	214	0	42	30	2	8	223	32	551	54	9,003
Total	2757	1339	5590	1254	1279	4029	909	691	17848	19650	101,760
Personnel Exposure (from Estimated Exposure Record Cards)											
Operations	9920	12563	15719	10017	12555	34604	3912	2593	101,883	108,292	311,481[5]
Power	0	0	0	0	0	0	0	0	0	29	39[5]
Maintenance	7165	12544	64233	8190	13303	11588	1343	1341	119,707	168,068	407,222[5]
Process	3681[3]	1323	250	0	73	0	0	40	5,367	6,927	16,053[5]
Engineering	89	0	96	358	204	5389[4]	0	82	6,218	5,176	12,903[5]
Radiation Monitoring	1789	4900	8947	3119	3146	6311	899	1530	30,641	32,530	96,265[5]
Others	503	0	1023	644	145	218	1385	73	3,991	669	13,177[5]
Total	23147	31330	90268	22328	29426	58110	7539	5659	267,807	321,291	857,140[5]

1. August through December only
2. September through December only
3. For work at process tube examination facility
4. For work on P-13 and -12 recirculation loop
5. October through December only

Exposure and exposure hours recorded in the "others" category includes that for employees who have not recorded a payroll suffix on their Estimated Exposure Record Cards.

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2. Monitoring Activities

Radiation Incidents

There were one Class II and no Class I radiation incidents during the month of December.

Class II, No. 99-C, radiation incident occurred at the H reactor on December 8 and involved a chief operator in the Operations Sub-Section who received localized exposure in excess of the weekly permissible limit from a radioactive particle on the right side of his head. The employee was engaged in rupture removal work in the discharge area and the exact mechanism by which the particle became lodged on his head was not determined. The total dose to the small skin area, as determined from film studies, was established at 2.5 rads. This incident is reported separately in document HW-40618.

External Exposure Control

There were 39 slug failures during the month requiring a total of 314 hours of discharge area time for removal. There were 8 slug failures at C, 3 at D, 6 at DR, 8 at F, 14 at H and none at the B, KE or KW reactors. Higher than normal dose rates to personnel continued to be encountered in the discharge areas at the C and H reactors due to the spread of contamination during rupture removal operations. This same problem is also increasing in magnitude at the DR reactor. A maximum dose rate to personnel of 6 rads/hr was encountered at the DR reactor during installation of the guillotine tube cutter following the removal of a rupture. Two highly contaminated pushpoles, used during rupture removal operations at the H reactor, were placed in pipe containers and removed to the burial ground at dose rates to personnel of 700 mr/hr.

Tube replacement activities continued at the D reactor during the month. Dose rates to personnel were reduced considerably for all phases of the work as the result of concerted efforts to control contamination spread. Twenty of the 63 tubes that were removed at the D reactor were purged with super-cel prior to splitting operations and a two-fold reduction in dose rates was realized. Ten process tubes were replaced at the H reactor. All of these tubes had contained ruptured slugs and the dose rates encountered were higher than those encountered at the D and F reactors. Considerable difficulty was encountered at the D reactor in removing a stuck tube splitter. Dose rates to personnel reached 250 mr/hr at 5 feet during the withdrawal and burial of the front 12 feet of this process tube.

Special studies continued during the month into the radiation exposure problems associated with tube removal operations. An analysis of the exposure used by Maintenance and Radiation Monitoring personnel during the work at the D reactor in December indicated that less exposure per tube was required than for any of the past work. The exposure required was as follows:

Maintenance - 4.8 man-shifts per tube
Rad. Mon. - 1.2 man-shifts per tube

These figures exclude the exposure required in removing the stuck tube splitter mentioned above since this operation was considered to be of an unusual nature and not representative of normal operation.

Burial of process tubing was suspended at the D and F reactors during the month pending the development of methods and equipment which will reduce the personnel exposure required for the operation.

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Monitoring Activities (continued)

Replacement of third safety system balls continued at the C reactor during the month at average dose rates to personnel of 450 mr/hr with a maximum of 2 r/hr encountered during work at the ball separator on X-2 level.

The inner tube of front-to-rear process facility 3674-KE was removed and sectioned at the KE reactor at dose rates to personnel which reached 1 r/hr. The chute liners were replaced at the D reactor at dose rates to personnel which reached 500 mrads/hr.

Contamination Control Experience

All cases of personnel skin contamination were readily cleaned to less than detectable limits. A Class II radiation incident, reported above, resulted when a radioactive particle was lodged on employee's head for a period of time which led to exposure in excess of the weekly permissible limit. No other case of personnel contamination presented exposure problems. Most cases of personnel skin contamination were caused by the improper or careless removal or handling of contaminated protective clothing.

Routine surveys of plant vehicles revealed five which were contaminated. All vehicles were decontaminated to less than detectable limits. All cases of vehicle contamination resulted from the movement of contaminated equipment and material.

All cases of personal clothing contamination were reduced to less than detectable limits and such clothing was returned to the affected employees.

Marked improvements in the control of contamination were made at the D reactor during tube replacement activities. Concerted efforts were made by all groups to minimize the spread of contamination through correct operation of cable scrubbers, complete and consistent decontamination of tube splitters and breaches and more frequent hosing down of the reactor faces. These efforts resulted in more favorable dose rates to personnel and less frequent use of fresh air mask equipment. The super-cel purge of 20 process tubes, mentioned above, resulted in large reductions in contamination levels on splitters, breaches and cables.

Contamination levels to 4500 c/m on the filter media at 183-F necessitated personnel monitoring on three occasions for cleaning operations.

Contamination levels to 10 rads/hr at surface on the floor, hoppers and ball collectors on top of the reactor at the H reactor continue to present problems for work in this area. Decontamination work will be carried out when the press for other radiation work has diminished.

The internal contamination in the primary loop equipment for the in-pile recirculation test at the H reactor was reduced to normal levels during the month after repeated flushing of the system. Surface contamination levels on floors and equipment in the -12 level area are higher than normal due to the spread from leaks in the system.

Difficulty was encountered at the H reactor in controlling contamination spread during the replacement of ten process tubes. The presence of high level fission product contamination in these tubes led to the gross contamination of the charge face and tube replacement equipment.

There were several cases of contamination spread beyond radiation zone boundaries. Contamination to 1250 mrads/hr was spread outside an existing radiation zone at the D reactor during disposal of old chute liner material. Other cases were limited, for the most part, to step-off pad contamination and in all cases prompt action was taken to prevent further spread.

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Monitoring Activities (continued)

An employee of the Power Sub-Section, while attempting to remove contamination from the soles of his shoes with a file, suffered a cut to his right middle finger and contaminated the wound to 300 c/m. The contamination in the wound was readily reduced to less than 100 c/m by the First Aid Nurse.

Airborne Contamination Experience

Fresh air masks were required on several occasions in the discharge areas of the B, D and H reactors during decontamination efforts, rupture removal operations and tube replacement activities. The improved control of contamination at the D reactor during tube replacement reduced the frequency of fresh air mask use.

Air monitoring activities were complicated at the D reactor during the month by radon activity which appeared to accompany snowstorms.

Gas leaks on the charge face of the B reactor were corrected during the month eliminating the problems associated with such leaks. Gas leaks continue to present problems at the C and F reactors for work on the charge faces and fresh air masks are required on frequent occasions. The failure to blank off an empty process tube channel on the discharge face of the D reactor led to gas activity to 750 mrads/hr in the discharge area when entry was made for a poison discharge. A blank was installed to prevent re-occurrence.

Fresh air masks were required at the C reactor during third safety system ball replacement operations due to the high levels of airborne contamination.

Non-Routine Monitoring

In conjunction with the study at the C reactor to determine the adequacy of viewer and discharge area rear wall shielding, during discharge while operating, the following dose rates were observed: (1) 17 r/hr in the near viewer at the window, (2) 10 r/hr at the wall in the near viewer, (3) 40 mr/hr through the rear wall shielding at the 20 foot level, (4) 1.6 r/hr through the 20 foot viewer window.

At the request of the Reactor Design and Development group, the hydraulic fluid used in the ball valve actuating system was sampled and analyzed for possible radioactivity. No detectable activity due to radioisotopes was observed.

A comprehensive survey of the 111-B Building was made during the month to determine the exact extent of contamination and the feasibility of decontaminating the building for tenancy. Extensive contamination was disclosed and a decision is pending as to decontamination work which may or may not be carried out.

A study has been initiated at the H reactor to determine if the gamma monitoring equipment can be calibrated for the quantitative measurement of the radioisotope activity in reactor effluent.

Radiation surveys made following increases in power level at the KE reactor have necessitated establishing the C and D machinery rooms as radiation zones.

Final results of the mass filming of the KE reactor indicate no significant radiation leakage through the biological shield.

Two modified Purex production shipping casks were filmed at the KE reactor. The radiation levels observed were considered to be nominal and it was recommended that

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Monitoring Activities (continued)

the shielding in other new casks be modified to conform to that in the casks which were filmed.

Radiation Analysis Experience

A control procedure is being developed to realistically control the contamination which has presented problems during the routine handling of railroad cask cars.

The comprehensive study into the expsoure problems associated with large scale process tube replacement continued during the month.

Two samples of a full face mask manufactured by the Scott Aviation Corporation were received. The facepiece appears to offer many of the features which are desirable to those wearing a mask. One of the outstanding features is the large "picture" window which gives unobstructed vision to the wearer. Evaluation of the mask is in progress.

B. Equipment Experience

Incandescent bulbs located in the time-delay circuits of the Beckman amplifiers at the KW reactor caused low chamber response when these bulbs burned out. The bulbs are located such that they are not visible and burn-out cannot be observed readily. Instruments will modify all amplifiers in the KE and KW reactors so that the bulb is visible at all times and replacement can be made as soon as failure occurs.

A repair shop has been established at the H reactor for the repair of Staplex air samplers. Spare parts are in stock and samplers are being returned to service within 24 hours after they are received at the shop.

Two sedan delivery vehicles have been procured as replacements for pickup trucks assigned to the 100-B and 100-D Monitoring Units. These vehicles will be equipped with two-way radio systems and the necessary monitoring instruments to serve in the event of an emergency in reactor facilities.

C. Improvement Experience

To insure the proper investigation of H.M. chamber alarms on the charge elevator at the C reactor, the automatic reset feature has been removed. A manual alarm reset switch and indicator light have been located in the monitor room to insure that Radiation Monitoring personnel are aware of an alarm signal and to encourage adequate follow-up.

A more efficient method for calculating the gamma dose for K reactor effluent has been developed and is being used at both K reactors.

All five-fold handcounters at the H reactor have been converted to three fold counters. The changes will significantly reduce the maintenance costs for the instruments.

There were no inventions reported this month.

D. Events Influencing Costs

Overtime requirements during December continued to be large due to the extended outage at the D reactor and the increased frequency of slug failures in all reactors.

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F. Significant Reports Issued

1. Routine

"Reactor Section, Radiation Monitoring Sub-Section Report for month of November, 1955", HW-40211, dated December 1, 1955, author, P. C. Jerman.

"Radiation Monitoring Sub-Section, Reactor Section, Management Report for December, 1955" Confidential - Undocumented, dated December 21, 1955, author, P. C. Jerman.

2. Non-Routine

"Manufacturing Department, Radiation Incident Investigation, Class II, No. 99-C", HW-40618, dated December 28, 1955, P. C. Jerman, author.

"Summary of Radiation Exposure of Maintenance and Radiation Monitoring During Tube Replacement at 105-D", dated December 28, 1955, H. E. Book, author.

"Suggestions for Reduction of Personnel Exposure and Manpower Requirements During Tube Replacements", dated December 27, 1955, author, P. C. Jerman.

III. Organization and Personnel

A. Organization and

There were no changes in organization structure or nomenclature during the month.

B. Force Summary

	Start of Month	End of Month	Net Change
Monthly	25	29	+4
Weekly	74	72	-2
Sub-Section Total	99	101	+2

Force changes during the month included:

1. Promotion of G. Hayman Jr., L. M. Mitchell, L. M. Osthy and C. L. Stairet to Supervisors-in-Training effective December 1.

2. Transfer of one Radiation Monitor Journeyman from Radiological Sciences Department.

3. Procurement of one Radiation Monitor Trainee.

C. Safety Experience

There were no major, sub-major, or near serious accidents during the month. There were two minor injuries reported.

D. Radiation Experience

As of month end, there are fifteen personnel in the Sub-Section who have exceeded the annual working limit for gamma radiation. To control radiation exposure of personnel during calendar year 1956, a rotation program is being set up whereby approximately 12 Sub-Section Monitors and Journeymen will transfer every 60 days to Radiation Monitoring of Separations Section and the Radiological Sciences Department. Five rotations will be made during the year thereby removing all Sub-Section Monitors and Journeymen from Reactor Monitoring for one 60 day period.

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E. Personnel Activities

S. C. Nelson, Junior Engineer, W. C. Seidle, Technical Graduate, and K. G. Warner, L. M. Mitchell, G. Herman Jr., L. M. Osthy and C. L. Steiret, Supervisor-in-Training attended the Radiological Sciences Training School for exempt personnel during the month.

At month end there were no Rotational Training Technical Graduates assigned to the Radiation Monitoring Sub-Section.

Radiation Hazards discussions and training lectures were conducted in all Units during the month, both for new and old employees in all Sub-Sections.

Training aids for use in the Radiation Training lecture series have been delivered by the Graphics Unit. The first series of lectures for Radiation Monitoring Trainees is scheduled to start on January 9, 1956.

Radiation Hazards Topic #47, Entitled, Localized Exposures, was issued December 28, 1955.

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