

KEITH W. ARMSTRONG  
IN CHARGE, COMPLIANCE UNIT  
RADIATION AND STEAM

TELEPHONE  
AREA CODE 546-2700

June 26, 1972

Mr. Lawrence D. Low  
Director, Division of Compliance  
U. S. Atomic Energy Commission  
Washington, D. C. 20545

Subject: Supplemental information to letter of May 31, 1972  
re: Potential exposure of workman to higher than  
permissible concentrations  
R. E. Ginna Nuclear Power Plant Unit No. 1  
Docket 50-244

Dear Mr. Low:

The above notice was made as a possible over-exposure. As no airborne activity sample coincided with the exposure in question, we must assume the concentration was approximately that determined by samples taken before and later. These show an average Iodine 131 concentration of  $3 \times 10^{-7}$   $\mu\text{Ci/cc}$  and an average particulate concentration of  $3 \times 10^{-7}$   $\mu\text{Ci/cc}$ . These values are 33 X iodine MPC, 1000 X unidentified particulate MPC. As no alpha or strontium 90 is present, the MPC value can be  $3 \times 10^{-9}$  which gives a concentration 100X MPC. Since his exposure period was 1/3600 of a 40 hour week, there does not seem to be an over-exposure.

However, because of the lack of a coinciding sample, there did exist the possibility of a higher concentration and a resulting over-exposure. For this reason, the individual was sent to Radiation Management Corporation in Philadelphia, Pennsylvania for a whole body count and the incident was reported. The results of the whole body count indicate that an over-exposure did not occur.

An estimate of the concentrations of radioactive materials to which J. G. was possibly exposed can be calculated from the amount of the radio-nuclides observed in the body immediately after the incident. For the four radionuclides at or above the ICRP investigation levels and Iodine 131, this calculation shows the following:

NUCLIDE	AIRBORNE CONCENTRATION	MPC hrs. EXPOSURE
Co-58	$1.4 \times 10^{-3}$	236
Co-60	$8.4 \times 10^{-4}$	775
Zr/Nb-95	$1.0 \times 10^{-3}$	142
Ce-144	$5.2 \times 10^{-4}$	725
I-131	$1.1 \times 10^{-4}$	100

DATE June 26, 1972  
TO Mr. Lawrence D. Low

This analysis shows a large discrepancy with any samples taken during this operation, which may be due to an error in the estimated exposure time or to the individual's variation from the ICRP lung model.

Of the radionuclides detected, only Co-60 and Ce-144 are appreciably above the investigation level; Co-58 and Zr/Nb-95 are roughly equal to that level. Comparison of the activities present with the maximum permissible body burdens shows that, even if the distribution in the body would be the same as if the nuclides concerned had been absorbed as a soluble compound, and would remain in the body forever, the total body or organ exposure are insignificant, viz. a few percent of the maximum permissible exposures.

The dose received by the lung, however, can be expected to be much higher than the dose to any other organ. A dose calculation has been performed for the four significant nuclides deposited in the lung, using calculational techniques and parameters given by ICRP Publications 2, 10 and 10a.

The effective half life is calculated for two cases:

- (a) the biological half life is equal to that given in the "old" ICRP lung model, viz. 120 days;
- (b) the biological half life is equal to 500 days;  
i.e. the value used in the "new" ICRP lung model (Health Physics 12: 173-207, 1966).

As no data are available on the slow clearance rate in subject J.G., it is felt that the dose estimates obtained this way represent a minimum and a maximum estimate of the lung dose.

The results are given in the following table:

NUCLIDE:	LUNG BURDEN: (pCi)	DOSE TO LUNG, ASSUMING $\sim$ bio:	
		120 d	500 d
Co-60	516	3.1	11
Ce-144	269	2.2	4.7
Co-58	928	0.9	1.2
Zr/Nb-95	777	1.2	1.6
Total:		7.4 rems	18.5 rems

Iodine-131 cannot be regarded as an insoluble lung deposit, as indicated by the relatively high urinary excretion. A dose estimate to the thyroid is obtained using the following assumptions:

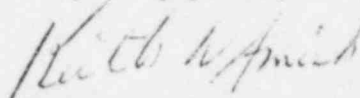
- (a) inhaled I-131 is regarded to be in a soluble ("transportable") form;
- (b) the whole body burden found on the first day (263 nCi) will therefore be regarded to be distributed as follows: 30% in the thyroid (i.e. 80 nCi), 70% elsewhere in the body.

DATE June 26, 1972  
TO Mr. Lawrence D. Low

ICRP Publication No. 10 indicates that 1  $\mu$ Ci deposited in the thyroid delivers a total dose of 5.5 rems to that organ. Therefore, the total dose to the thyroid can be estimated to be  $0.08 \times 5500 \text{ mRem} \approx 450 \text{ mRems}$ . It is felt that this result represents an upper estimate.

The disconnection of the air hose from the mask was evidently a result of the failure to attach the plastic nut properly onto the threaded connection. While crawling thru a narrow manway, the hose was pulled off the threaded fitting. Since this incident, we have instructed personnel to double check their hose connection and we have had an assistant dresser to help and to be sure all connections are properly made up. We are also investigating into various other masks and connectors in an attempt to reduce this accident possibility.

Very truly yours,



Keith W. Amish

xc: Mr. J. P. O'Reilly

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KEITH W. AMISH  
SENIOR VICE PRESIDENT  
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September 20, 1972

Mr. James P. O'Reilly, Director  
Directorate of Regulatory Operations  
Region I  
U. S. Atomic Energy Commission  
970 Broad Street  
Newark, New Jersey 07102

Subject: Supplemental information to letter of June 26, 1972  
re: Potential exposure of workman to higher than  
permissible concentrations

Dear Mr. O'Reilly:

The following supplemental information is a confirmation of telephone conversations on the above incident.

The last sentence of the second paragraph states that an over-exposure (to radiation) did not occur. This is true, but an over-exposure to airborne radioactive materials did take place. Using the nuclides identified in the whole body count, airborne concentrations of radioactive material were calculated. As shown in the paragraph three table, the concentrations calculated are in excess of the 10 CFR 20 limits.

On page two, the table of nuclide lung burdens is labeled "pCi". It should read nano curies. This correction yields the calculated airborne concentrations as shown and results in approximately 18 times MPC exposure.

Very truly yours,

*Keith W. Amish*  
Keith W. Amish

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