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2229 Main Street, Concord, Massachusetts 01742 (617) 369-5410

May 24, 1984

ATTACHMENT I

INDIVIDUAL'S PERSONAL INFORMATION

Name:
Position:
SS No.:
DOB:

(b)(6)



May 24, 1984

ATTACHMENT II
EVALUATION OF EXPOSURE

Introduction

As indicated in Attachment I, the individual that received the exposure in excess of regulatory limits is a Health Physics Technician. He is assigned to our Foundry area to perform routine surveys and often, with his high level of motivation and interest, becomes involved in non-routine surveys and investigations.

We have in past correspondence described in detail the operations performed by the Melting and Casting Technicians in this area. Whole body and extremity dosimetry is issued and read-out on a weekly frequency. The subject individual of this report is also on the weekly dosimeter change frequency. All individuals in the facility are subject to administrative quarterly dose limits which are two-thirds that of the NRC limits. The application (i.e., actual values) of administrative limits depends on the dosimeter type and frequency. For instance, with the weekly frequency these administrative dose limits are 64 mRem deep dose whole body, 385 mRem shallow dose whole body, and 961 mRem deep and/or shallow dose extremity.

The above information is discussed because of this individual's integral job function in the area, and the actual events leading to his recent extremity exposure.

Discussion

During the third week (April 16, 1984 - April 22, 1984) of this quarter the Melting and Casting Procedures were changed in the Foundry resulting in an upward trend in extremity exposures for the Melting and Casting Technicians. The change was that of requiring cleaning and zirconia painting of the interior of the crucible extension. This was done in order to improve casting chemistry. Attachment III shows the crucible extension as it would be used in a melt cycle. As can be seen, these extensions are not subject to contact with molten depleted uranium metal. They do, however, pick up unsupported Th-234/Pa-234m daughter product activity, as do other internal components of the furnace. The Foundry Melting and Casting Technicians had, up to this point in time, minimal extremity contact with these extensions. Additionally, we had instituted the decay of extensions, crucibles, break off rod and pour cup by storage for a six week decay period. This latter item was initiated to maintain exposures ALARA.

As stated, once the above procedure was implemented, an increase in the Melting and Casting Technicians' extremity dosimetry values was observed. Based on our weekly dosimetry tracking, several individuals were receiving hand exposures which would have placed them above our quarterly administrative limit before the end of the calendar quarter. This prompted an investigation and evaluation as to the cause and possible solution to the problem. (Note: No other individuals in the area have received exposures anywhere near that described below nor has anyone else been restricted from work in the area.)



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Part of the investigation involved a number of surveys of the furnace graphite components being placed in 55 gallon drums for decay. Also, surveys of used graphite components coming back into the area for re-use were performed. The radiological surveys were done by the subject individual and were no doubt the cause of extremity exposure in excess of regulatory limits. Surveys were performed with the individual in the standard safety equipment; that is, an aluminized cape/apron, plastic face shield/safety glasses, leather gloves, company issue uniform, and the required whole body and extremity dosimetry. The survey results indicated beta dose rates on the interior surfaces of the extensions that were quite high. The results are below. Also, it is unclear at this time if the zinc painting contributed to the plating of Th-234/Pa-234m on these interior surfaces.

Typical Dose Rate Range 60 to 80 RAD/hr (primarily beta)
Highest Observed Dose Rate 217 RAD/hr (primarily beta)

The individual's whole body and extremity dosimetry for the second calendar quarter of 1984 is outlined below. All values are in mRem.

<u>Period</u>	<u>Whole Body</u> <u>Deep</u>	<u>Whole Body</u> <u>Shallow</u>	<u>Right Extremity</u> <u>Shallow</u>	<u>Left Extremity</u> <u>Shallow</u>
4/02-4/08/84	Minimal	Minimal	90	70
4/09-4/15/84	Minimal	Minimal	Minimal	Minimal
4/16-4/22/84	Minimal	Minimal	Minimal	Minimal
4/23-4/29/84	Minimal	Minimal	70	70
4/30-5/06/84	Minimal	70	1940	400
5/07-5/13/84	Minimal	60	8780	20,790
5/14-5/16/84	-	-	180	180
TOTALS:	Minimal	130	11,060	21,510

On Wednesday, May 9, 1984, a routine call-in from our dosimetry vendor indicated the individual had, during the previous week, received an exposure of 1940 mRem to his right hand while performing surveys of crucible extensions. At that time, the Dosimetry Health Physicist spoke to the individual and instructed him to stop the surveys. Six extensions were surveyed from April 30, 1984 to May 6, 1984. However, by the time we received the routine call-in, sixteen additional extensions were surveyed during the beginning of the week of May 7, 1984. On Wednesday, May 16, 1984, a call-in was received for the May 7, 1984 - May 13, 1984 exposure period. The individual was immediately pulled from duties in restricted areas on May 16, 1984. The next day his currently dated TLD rings (i.e., May 14, 1984) were sent for processing; results were received on May 21, 1984 for the partial week. He was issued spare TLD rings for the remainder of the week.



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In addition to the above dosimetry logistics, the individual was interviewed by the Dosimetry Health Physicist, the Manager of Health and Radiation Safety, and the Vice President, Health/Safety. (His self-disappointment was quite evident at the time.) He was asked to estimate his extremity exposures through calculation, which has resulted in the following shallow dose estimates for the two exposure periods in question:

<u>Period</u>	<u>Estimated Extremity Exposure (mRem)</u>
4/30/84 - 5/06/84	5,560
5/07/84 - 5/13/84	12,330
<hr/>	
TOTAL:	17,890

As can be seen, the estimates are well within a factor of 3 and 2 for the two respective periods. The agreement is good, in that, some statistical and systematic errors are to be expected with a TLD readout.

Conclusions

The individual has an appointment to be examined by our Company Physician on Thursday, May 24, 1984. This is routine for anyone who has been pulled from an area for radiological concerns.

The Melting and Casting Procedures have been changed back, such that there will be no cleaning or painting of crucible extensions. Additionally, all new extensions have been modified to allow remote/shielded (aluminum) handling. The extremity dosimetry in the area is being critically evaluated each week in order to maintain exposures within our administrative limits. Meetings with much communication between the Melting and Casting Technicians and the Health Physics Department Staff have increased in frequency. It is being stressed that all those involved use uniform safety procedures so new dose reduction measures will be reflected in the dosimetry.

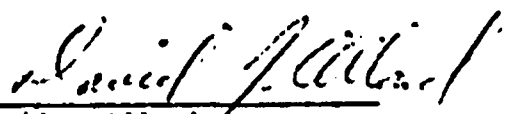
The Health Physics Technician presently in the area is under instruction to perform routine surveys (ambient, smears and air) only. Any non-routine surveys must be cleared through a member of the Health Physics Staff. Previously, the Staff member would review the survey results in relation to the work to be performed by the production worker. This should prevent re-occurrence of a similar exposure scenario.



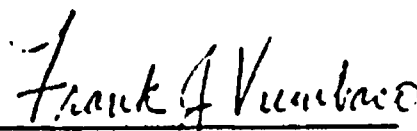
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Lastly, we are planning to obtain a telescopic survey instrument once we identify one suitable for our radiation fields. Inquiries are currently being made to various Health Physics equipment vendors as to availability.

Respectfully submitted,



David J. Allard
Dosimetry Health Physicist

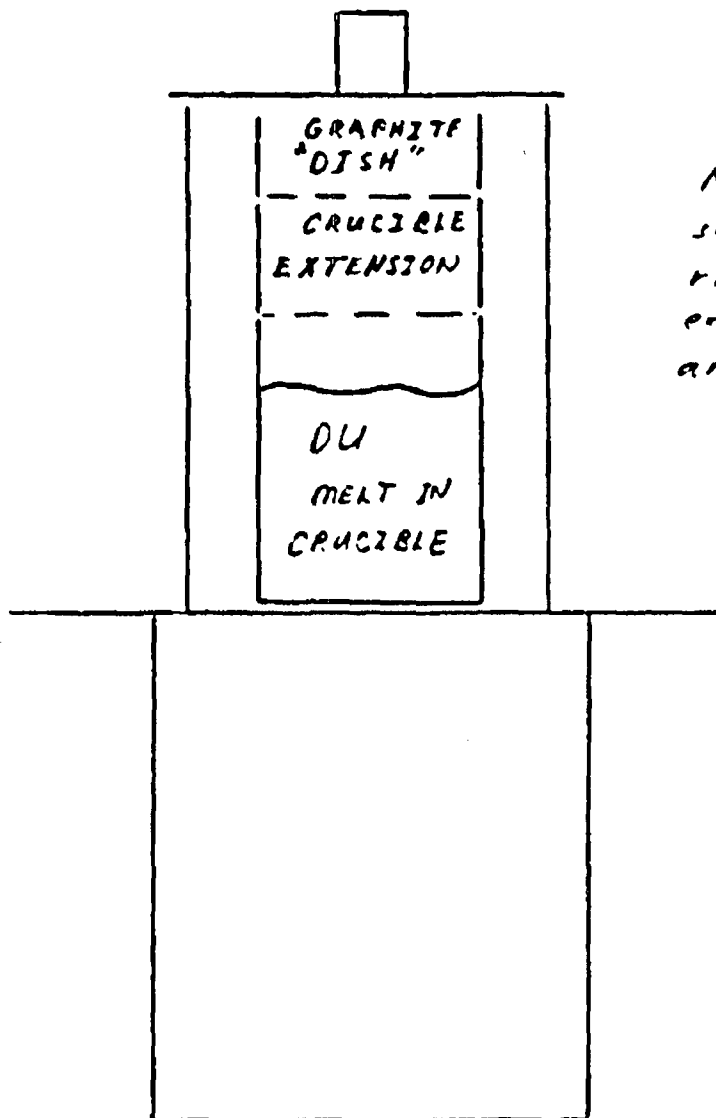


Frank J. Vumbaco, Manager
Health and Radiation Safety

FJV/DJA/swk



FOUNDRY FURNACE



NOTE: components
shown are geometrically
right cylinders. The
extension is graphite
and open on top and bottom.