



NUCLEAR METALS INC.

Lin SMB-179

DOCKET NO. 40-00672

WV-RR-RI-R3-125

September 12, 1983

U. S. Nuclear Regulatory Commission
Region I
631 Park Avenue
King of Prussia, PA 19406

Attn: Mr. Claude A. Rowe
Radiation Specialist

RE: Amendments to Vendor Reported Dosimetry

Dear Mr. Rowe:

As a follow-up to several of our recent telephone conversations and meetings, please be informed of several amendments to our vendor dosimetry reports.

Item I:

The first item is that of two June 1983 employee vendor supplied film badges with rather high reported gamma doses. One film also had a high respective beta reading. The other badge had a minimal beta reading. A summary of the two employees 1983 whole body dosimetry to date is as follows. Their names, social security numbers and date of birth are listed in an appendix to this letter.

Individual A:

<u>Badge Type</u>	<u>Badge Date</u>	<u>Gamma (mREM)</u>	<u>Beta (mREM)</u>	<u>Skin (mREM)</u>	<u>Comment</u>
Vendor Film	01/01/83	130	210	340	
NMI TLD	01/01/83	120	240	360	
Vendor Film	02/01/83	120	280	400	
NMI TLD	02/01/83	160	330	490	
Vendor Film	03/01/83	170	380	550	
NMI TLD	03/01/83	170	330	500	
Vendor Film	04/01/83	40	190	230	
NMI TLD	04/01/83	140	180	320	
Vendor Film	05/01/83	150	210	360	
NMI TLD	05/01/83	160	220	380	
Vendor Film	06/01/83	2550	Minimal	2550	Badge in question.
NMI TLD	06/01/83	200	250	450	
Vendor Film	07/01/83	110	170	280	Two week period.
NMI TLD	07/01/83	100			

Information in this report was obtained in accordance with the Freedom of Information Act.

CONTAINS INFORMATION PROTECTED BY THE PRIVACY ACT

APPENDIX

B3101A0157 830912
CF ADOCK 04009572
C CF

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

EX-16
11

Individual B:

<u>Badge Type</u>	<u>Badge Date</u>	<u>Gamma (mREM)</u>	<u>Beta (mREM)</u>	<u>Skin (mREM)</u>	<u>Comment</u>
Vendor Film	01/01/83	30	Minimal	30	Employee out sick.
NMI TLD	01/01/83	Minimal	170	170	" "
Vendor Film	02/01/83	10	Minimal	10	" "
NMI TLD	02/01/83	30	30	60	" "
Vendor Film	03/01/83	80	130	210	
NMI TLD	03/01/83	80	200	280	
Vendor Film	04/01/83	60	Minimal	60	
NMI TLD	04/01/83	90	80	170	
Vendor Film	05/01/83	120	90	210	
NMI TLD	05/01/83	140	220	360	
NMI TLD	06/01/83	2820	5830	8650	Badge in question.
NMI TLD	06/01/83	130	90	220	
Vendor Film	07/01/83	50	60	110	Two week period.
NMI TLD	07/01/83	70	110	180	" "

As can be seen in the above data, the two film badge results in question are not in line with the typical results for each individual. The two films in question, though dated 06/01/83, were not received for processing until the latter part of July. The two films were not in the employees badge drawers when all NMI dosimetry was collected/changed on July 1, 1983. Both individuals work in our shipping and receiving area where they package DU penetrators for shipment.

Discussions with Individual A regarding his film reading, work during June 1983 etc., have yielded the following information:

- During June 1983 his work involved packaging of large caliber DU penetrators.
- The quantities of material he worked with in June were similar to past months.
- Wears film and NMI TLD dosimeters next to each other on left shirt pocket. (Actually observed.)
- He began his vacation (scheduled plant shutdown first two weeks of July) a week early. Thus, only worked three weeks in June.
- He thought his badges were in his drawer by guards' desk when he left for vacation.
- However, he believes he may have placed his June badge in our "late turn-in" box after vacation.

Our conclusions regarding Individual A's June film badge reading are as follows:

- The location of the film badge from the third week of June to the time it was turned into Health Physics is unclear.



- The point in time it was turned in is unclear. (It was processed with the July 1983 dosimetry. Thus, was received sometime mid to late July.)
- Our vendor reports no filter pattern on the film, and may have been exposed outside of a holder.
- Our in-house TLD badge correlates well with the film data. His June TLD data is in agreement with past film and TLD data.
- Ambient surveys of the individual's work area typically show readings of 0.1 to 0.5 mRem/hr gamma and 0.7 to 2.0 mRem/hr beta plus gamma.
- Measurements with an ion chamber as close as one foot from packaged (in wood) or unpackaged DU penetrators, in an extended array, yield gamma dose rates of 2.0 mRem/hr. Using this rate and a maximum number of hours in the area (120 hours), we calculate Individual A could receive no more than 240 mRem gamma and whole body in June 1983.
- We feel Individual A's June in-house TLD data is representative of the actual dose received, and have amended his records to reflect this.

Discussions with Individual B regarding his film reading, work during June 1983 etc., have yielded the following information:

- During June 1983 his work involved packaging of large and small caliber DU penetrators.
- The quantities of material varies from day to day, but June was similar to past months.
- Wears film and NMI TLD dosimeters on his belt, left or right side. (Actually observed.)
- Believes his film badge was in his drawer by guards' desk when he left for vacation.
- Does remember losing his film badge in a DU processing area for a half day during the month of June. It was found by a fellow employee and returned to him directly the same day.
- Individual remembers losing his NMI TLD picture badge around mid-June. Remembers finding it by guards' desk after vacation and turning it in.
- Individual was out on an injury during the months of January and February 1983.

Our conclusions regarding Individual B's June film badge reading are as follows:

- The location of the film badge from July 1st to the time it was turned in to Health Physics is unclear.
- The point in time it was turned in is unclear. (It was processed with the July 1983 dosimetry. Thus, was received sometime mid to late July.)
- Our vendor reports some filter pattern on the film, but may have received additional exposures out of the holder.
- Our in-house TLD badge correlates reasonably well with the film data. A doubling of his June TLD data is appropriate seeing he lost it mid June.
- Ambient surveys of the individual's work area typically show readings of 0.1 to 0.5 mRem/hr gamma and 0.7 to 2.0 mRem/hr beta plus gamma.



- Measurements with an ion chamber as close as one foot from packaged (in wood) or unpackaged DU penetrators, in an extended array, yield gamma dose rates of 2.0 $\mu\text{rem/hr}$. Using this rate and a maximum number of hours in the area (160 hours), we calculate Individual B could receive no more than 340 μrem gamma whole body in June 1983.
- We feel Individual B's June in-house TLD data doubled is representative of the actual dose received, and have amended his records to reflect this.

Item II:

The second item we would like to discuss is that of the vendor supplied TLD ring data for our Foundry personnel during the June 27 to July 1, 1983 exposure period.

The dosimetry for this group is handled separately from others in the plant. This is due to the badge frequency. As stated above, the facility was shut-down for vacation the first two weeks of July. On July 1, 1983 after all employees had left, all dosimetry was collected and changed. This involves setting up the next exposure period's badges in a second set of boxes with individual drawers for each employee. When a new exposure period begins the boxes are exchanged. The past exposure period's dosimeters are usually checked in and sent out for processing within the next day. However, due to the vacation, the dosimeters for the Foundry personnel were taken out of the drawers and placed together in a small cardboard box. They were stored in this manner for the entire vacation period. Unfortunately, a number of the labels on the TLD rings were contaminated. (This was determined after the rings were read-out.) When the results on these rings were reported to us, we knew something was wrong. Individuals who had not even been in the facility that week had readings of several hundred μrem . One individual had a TLD ring reading that was way out of line for this "short week". (Note: melting/casting was only done the first three days of the exposure period.) His TLD ring label was the most contaminated. These results prompted us to ask our vendor to count the labels for contamination. They did so on an internal proportional counter and obtained results from background to as high as 9,617 cpm (Eff. = 0.35 c/d for C-14, BG = 19 cpm). The contamination obviously self-irradiated a number of TLD rings and irradiated many unused TLD rings.

The contamination data prompted us to go a step further. At our request, our vendor placed all of the labels on similar un-used TLD rings for over a week. The rings were then read-out. The following is a list of the initial readings and the corrected readings. The amount of correction was based on the second TLD ring reading or knowledge that the individual was not in a DU processing area during the period in question. Again, the individuals' names etc., are in the appendix to this letter. The corrections we've made are as follows:



<u>Individual</u>	<u>Initial Reading (mRem)</u>	<u>Corrected Reading (mRem)</u>	<u>Comments</u>
C	60	Minimal	Not in DU Area.
D	190	Minimal	" " " "
E	790	680	Based on 2nd TLD data.
F	240	Minimal	Not in DU Area.
G	420	400	Based on 2nd TLD data.
H	200	Minimal	Not in DU Area.
I	220	Minimal	Not in DU Area.
J	320	Minimal	Not in DU Area.
K	40	Minimal	Not in DU Area.
L	330	170	Based on 2nd TLD data.
M	7330	4380	Based on 2nd TLD data.
N	1390	1260	Based on 2nd TLD data.
O	90	Minimal	Not in DU Area.
P	30	Minimal	Not in DU Area.
Q	100	Minimal	Not in Du Area.

It should be noted that most of the individuals indicated as being "not in DU Area" were actually in one of our rented facilities used for materials storage. There is no DU at this facility. We can only conclude that during the rather long storage period (i.e., thru vacation), the more contaminated TLD rings irradiated themselves and those that were unused.

Item III:

As you noted in your May 25, 1983 inspection, our dosimetry vendor reported a 110 Rem dose to a TLD ring issued to one of our Quality Control employees. The individual is listed in this letter's Appendix as Individual R. Our investigation into this reading up to the point of your inspection yielded the following information:

- Our vendor does not digitize glow curves therefore we can not evaluate the original readout. If the chip was contaminated with an organic (i.e., WD-40) it may have burned on read-out and caused a light spike. Also, if the chip was contaminated with uranium an irrelevant alpha dose may have resulted. Without a glow curve or the chip this could not be evaluated.
- The ring was dated 12/01/82, however, it was not received by Health Physics for processing until the end of February 1983. (Note: supervisors in all plant areas are notified of employees not turning in dosimeters monthly. They are instructed to notify employees of the situation.)
- The individual was issued two rings on January 1 and again on February 1, 1983. Readings were in the range of 100 to 130 mRem for each month and appear to have been worn to some degree.
- Storage of rings for Quality Control personnel in the December 1982 time frame was in our facility's QC area in A-Building. (Note: there is a low energy cabinet x-ray system in this area.)



- There was a communication problem when the dose was initially called in by our vendor on March 10, 1983. We are not sure why, but the dose was first reported or received (?) as 11 Rem. The correct reported dose of 110 Rem was communicated to us on March 11, 1983 when the vendor was contacted regarding the particular reading.
- During an initial interview with the individual it was learned that he inspects large caliber DU penetrators. (It is also known that our penetrators are sub-equilibrium with respect to daughter product activity. This is due to observed un-supported activity in our Foundry area.) He doesn't work over-time and spends about five hours per day on the floor. Much of the time is spent with paper work.
- The individual worked sixty-one days during the three month period in question.
- An initial calculation showed that he would have to have held a fully equilibrated penetrator for the entire 8 hour work day for the entire period to produce such a reading. Obviously, the reading was suspect.
- During the discussion with the individual it was learned that he stored his rings in his locker. (A practice against policy.) It was requested that he open his locker for a survey with a GM meter. Upon doing so a paint brush used to dust penetrators off was found in the top, where the ring was stored. The brush was quite contaminated. At this point we felt we had identified the reason for the suspect TLD ring readings. Further, our experience with extremity monitoring on Quality Control personnel had shown typically monthly doses in the range of 1 to 2 Rem per month. There was never then or now a reason to believe the reading was valid.
- The contaminated brush was used to irradiate similar TLD rings in a planar array. By mid to late April the data was analyzed for this experiment. It (data) indicated a dose of approximately 26 Rem could be accounted for with the level of contamination on the brush.

The result of your inspection concluded that an exposure NOT in excess of regulatory limits had occurred. We understand this to be the situation as well and subsequent to your inspection we initiated a time study on the individual. At the same time we performed a dose rate survey of large caliber penetrators with our vendors TLD rings. In mid July the results were received and analyzed. They are as follows:

- Direct observation of the individual yielded an elapsed time of 58 minutes while inspecting 17 penetrators. This is 3.41 minutes per penetrator which is similar to your personal observation.
- The penetrator survey showed, on the average, a dose rate of 90 mRem/hr. (It is our understanding that for DU metal, our vendors TLD ring compares well with NRC's TLDs.)
- With the above data and a work load of thirty penetrators per day we calculate a probable dose of 10 Rem to the individual's hand.
- During the time study we issued the individual additional TLD rings. Both read-out at 50 mRem after the inspection of 17 penetrators. We calculate 2.94 mRem/penetrator inspected.



Using this data and a work load of thirty penetrators per day, we calculate 6 Rem to the individual's hand.

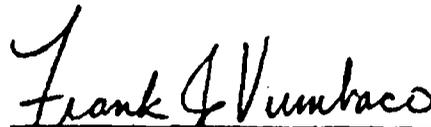
We conclude that 10 Rem is a conservative and reasonable estimate to the individual's hand during the December 1, 1982 to March 1, 1983 time frame. This is in line with your estimates. The dose has been partitioned for the three month period and we have amended this individual's record. It may never be resolved why the TLD ring read out 110 Rem. However, we have shown by calculation that an exposure in excess of regulatory limits did not occur.

If you have any questions regarding these dosimetry amendments, please feel free to contact us.

Sincerely,



David J. Allard
Supervisor of Health Physics



Frank J. Vumbaco, Manager
Health and Radiation Safety

DJA:FJV:smk
Attachment



CC: Mr. Thomas T. Martin, Director
Division of Engineering and Technical Programs
Region I, USNRC

Mr. John Kirneman, Chief
Materials Radiological Protection Section
Region I, USNRC

Mr. Frank Costello
Dosimetry Specialist
Region I, USNRC

Mr. Frank Archibald
Industrial Radiation Control Supervisor
Massachusetts Dept. of Labor and Industries
39 Boylston Street
Boston, MA

Mr. Roger Waite
American Nuclear Insurers
Engineering Consultant
42 Middlebrook Road
West Hartford, CT

Mr. Richard Fliszar, Health Physicist
AMCOM
Dover, NJ

Mr. Frank Farley
DCASMA

Mr. Ken Gabourel
DCAS

APPENDIX

~~"CONTAINS INFORMATION PROTECTED
BY THE PRIVACY ACT"~~

<u>Name</u>	<u>SSN</u>	<u>DOB</u>	<u>Correspondence Identification</u>
(b)(6)			A B C D E F G H I J K L M N O P Q R

~~"CONTAINS INFORMATION PROTECTED
BY THE PRIVACY ACT"~~

