DEPARTMENT OF THE ARMY
UNITED STATES ARMY RESEARCH LABORATORY
2800 POWDER MILL ROAD
ADELPHI, MARYLAND 20783-1197

Duplicate

REPLY TO
THE ATTENTION OF

AMSRL-CS-AL-RK (385-11c) 27 October 1997

MEMORANDUM FOR Director, U.S. Army Nuclear and Chemical Agency,
ATTN: MONA-ARO, 7150 Heller Loop, Suite 101,
Springfield, Virginia 22150-3198

SUBJECT: Permit Number DORF-1-97 - Revised Compliance Plan

1. References:

a. Memorandum, Army Reactor Office, Subject: Nuclear Reactor Possession Permit Number DORF-1-97.

b. Memorandum, AMSRL-CS-AL-RK, 15 Aug 97, Subject: Permit Number DORF-1-97 - Compliance Plan

c Memorandum, Army Reactor Office, 3 Jun 97, Subject: Nuclear Reactor Possession Permit.

2. Memorandum 1c transmitted Permit Number DORF-1-97, issued to the Director of the Army Research Laboratory (ARL), for the possession and management of residual radioactive materials at ARL's past DORF facility. Condition D2 of Permit DORF-1-97 requires ARL to develop, document, and implement a plan with sufficient procedures to ensure that the residual radioactivity remains fixed in place and does not become loose or airborne. Memorandum 1b transmitted ARL's proposed compliance plan. In memorandum 1a, the Army Reactor Office requested modification to ARL's Proposed plan, and resubmission of the compliance plan for final approval. ARL's revised plan in it's entirety is as follows:

a. Two large signs shall be constructed and affixed in two locations in the exposure room. The signs shall bear the following information, directions, and points of contact:

WARNING

o Concrete walls, ceiling, and floor of this exposure room are slightly radioactive. No drilling, cutting, grinding, chipping, jack hammering, etc.

o Restrictions on personnel access is not required, but unnecessary presence is discouraged. Personnel dosimetry is not required.

o Report any structural damage, unauthorized entry, or planned change in use or ownership to: Army Research Lab (ARL) , (301) 394-6310, or Army Reactor Office (ARO), (703) 806-7861

o Copy of permit from ARO is attached

b. Because the radioactivity is presently fixed in the concrete matrix, no significant concern for personnel exposure to airborne radioactivity, or releases of airborne material to the environment exists unless the concrete matrix is significantly disturbed. Upon notification of a desire to disturb the concrete, and before any such disturbance, ARL will use survey and assay information and modeling to predict compliance with Army regulations, and Titles 10 and 40 of the Code of Federal Regulations.

c. Unless disturbed, the radioactivity will not deliver an internal dose to individuals. Gamma radiation levels inside the exposure room, however, are greater than background, and can therefore deliver a dose exceeding that due to background alone. The gamma survey found the average background gamma levels in the reference alcove to be about 2 microrem/hr at 1 meter, and the average gamma levels in the exposure room to be about 29 microrem/hr at 1 meter. The gamma dose rate due to permitted material is therefore estimated to average about 27 microrem/hr at 1 meter, with a relatively uniform distribution within the exposure room. It is therefore estimated that even in the worst case scenario where a worker was present in the exposure room for 2000 hours/yr, the resulting gamma dose would be about 54 millirem/yr, which is below the 100 mrem/yr limit. Nevertheless, as an ALARA measure, the posted signs will be worded to discourage unnecessary presence of personnel in the exposure room.

d. To obtain data and information to support the effectiveness of this plan, the exposure room will be inspected semi-annually by ARL. During the visit, a few wipe tests will be performed to monitor for removable contamination, and an inspection will be made to ensure the concrete has not been disturbed.

e. The exposure room does not warrant posting as a "Radiation Area", "Airborne Radioactivity Area", or "Radioactive Materials" area, per 10 CFR 20, and exempt concentrations tabulated in 10 CFR 30. The hazard analysis attached as enclosure 1 demonstrates that even if the concrete were disturbed, only minor personnel doses would result.

f. The signs above as well as periodic inspections will ensure that no decommissioning or decontamination efforts commence until ARL writes and submits a plan to ensure that dose, environmental release, rad waste, rad shipment, rad storage, and rad handling considerations and precautions are taken. As a further precaution, to institutionalize within the Walter Reed Army Medical Center (WRAMC) ARL's and the Arm Reactor Office's concern for controlling access to and disturbance of the exposure room concrete, the memorandum at enclosure 2 has been sent to the Commander and Health Physics Office of WRAMC.

3. The point of contact in this office is the undersigned at (301) 394-6310.

Michael Borisky

MICHAEL BORISKY
Health Physicist

Author: MBORISKY at po6_arl
Date: 9/11/97 1:21 PM
Priority: Normal
TO: aro@usanca-smtp.army.mil at DDN
TO: jmanfre@hqamc.army.mil at DDN
TO: KSAUNDERS (Keith Saunders)
Subject: Dorf Compliance Plan
---------- Message Contents ----------

Mr. Burns and Maj Bredehoft,

We are concerned about the level of control you are requesting we place over the exposure room at DORF. With only one HP at ARL-ALC juggling all aspects of the rad program, both ionizing and nonionizing, it is a necessity for ARL to ensure our level of effort and control is commensurate. I have therefore crunched some numbers in hope of better explaining to you why in our judgment the originally submitted compliance plan was commensurate with the potential hazards posed. I should have submitted this kind of analysis to you earlier, as our judgment was to a large part based upon the implications of the very low specific activity.

1. External Radiation Hazard: The average net gamma level at 1 meter is approximately 27 microrem/hr. A worker present for 2000 hours a year would only receive about 54 millirem, which is well below the 100 mrem allowed for pregnant teenagers. Considering the exposure room is generally unoccupied, the hazard is even more insignificant.

2. Disturbance of Concrete - Potential Hazard: The post-excavation analysis showed the concrete activation IN 1980 was:

Co-60: 5-29 pCi/gm (17 pCi/gm average)
Eu-152: 24-68 pCi/gm (38 pCi/gm average)
Eu-154: 2-5 pCi/gm (3 pCi/gm average)

Correcting for decay to JULY 1997, the averages becomes

Co-60: 1.9 pCi/gm
Eu-152: 15 pCi/gm
Eu-154: 1.5 pCi/gm

What is the health significance of these specific activities in the event the concrete was disturbed, and made available for inhalation and ingestion? Looking at NRC NUREG 1500, Table B-2, we see that for the renovation scenario, which includes jack hammering of concrete, the following specific activities in the concrete would correspond to 15 mrem/yr:

Co-60: 19.4 pCi/gm
Eu-152: 43.4 pCi/gm
Eu-154: 39.8 pCi/gm

As you can see, we are well below these specific activities.

The expected renovation dose using the sum of the fractions of specific
activity to that leading to 15 mrem/yr under the renovation scenario would be:

$$(1.9/19 + 15/43 + 1.5/39) \times 15 \text{ mrem/yr} = 7.3 \text{ mrem/yr}$$

So it appears that even in the event that the concrete was disturbed, no significant dose would occur from inhalation and ingestion because of the very low specific activity of the radionuclides in the concrete.

What hazard does the concrete pose during normally occupancy, where contamination might be released from surfaces by normal activities? NRC NUREG 1500 Table B-2 equates the following surface contamination levels with 15 mrem/yr during building occupancy:

Co-60: 5,200 dpm/100 square centimeters
Eu-152: 11,000 dpm/100 square centimeters
Eu-154: 10,200 dpm/100 square centimeters

Since 2.2 dpm equals 1 pCi, these number equate to the following:

Co-60: 2,364 pCi/100 square centimeters
Eu-152: 5,000 pCi/100 square centimeters
Eu-154: 4,636 pCi/100 square centimeters

Given the specific activity measured in the concrete, the activity in the following mass of concrete would have to become available at the surface for each 100 square centimeters for the surface contamination limits to be exceeded and would require all the activity to the depth indicated to be available at the surface:

		depth
Co-60:	1,244 gms	5.3 cm
Eu-152:	333 gms	1.4 cm
Eu-154:	3,090 gms	13.5 cm

As you can see these are large masses of concrete to become available to the surface of each 100 square centimeters.

3. Summary: These calculations suggest that because the specific activities of the radionuclides is so very low, disturbance of the concrete by either renovation activities or normal occupancy is not capable of creating a significant hazard. Nor is the external radiation level capable of creating a hazard.

4. Discussion: We recognize that even though the specific activities of the contamination in the walls is so very low, it is still "licensable" material, and that from a decommissioning and environmental perspective it is significant, due to issues of public acceptance and perception. But from a health perspective, it is really insignificant, even in the event that the concrete was disturbed and made available for inhalation and ingestion. We agree that some level of surveillance should be exercised. But, given the very low external radiation level and contamination levels, we propose that the posting of the sign coupled with periodic inspections is commensurate with the potential hazard. The wipes would simply be used as a very sensitive method (since counted in a internal proportional counter) of detecting any liberation of activity. ALARA analysis, external exposure measurements to include establishment of background levels, an elaborate and detailed survey plan, specifying the months of survey, use of photographs of exposure room, etc, seems like gross overkill given what is revealed above. Was is most important in our judgment is an inspection to watch for a change in ownership, use, and the condition of the signs. Given that the sign warns people that the walls are radioactive, we doubt someone would disturb them anyway. But even if they did, no significant dose would

result.

5. Please consider the above, and please reconsider the level of effort you are requesting. Again, or goal and necessity is to keep our efforts commensurate with the potential hazards posed. We hope the analysis above provides you the additional information you need, and apologize for not providing it earlier.

Sincerely,

Michael Borisky
Health Physicist
(301) 394-6310

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REPLY TO
THE ATTENTION OF

AMSRL-CS-AL-RK (385-11m) 22 October 1997

MEMORANDUM TO Commander, Walter Reed Army Medical Center,
6825 16th Street,
Washington, DC 20307-5001

SUBJECT: Building 516 - Notification Requirements

1. Until 1980, Walter Reed Army Medical Center (WRAMC) building 516 at Forest Glen housed a nuclear research reactor where an Army Research Laboratory (ARL) predecessor organization conducted nuclear weapons effects testing. Although the facility was decontaminated and decommissioned in 1980, a recent survey of radiation levels has concluded that the concrete exposure room remains radioactive above today's limits for unrestricted release. The Army Reactor Office (ARO) has therefore issued a permit to ARL to ensure the exposure room is properly decontaminated before the building is ever released for unrestricted use.

2. As a condition of the permit, ARL must notify you of the radiological condition of the building, and request prior notification of any plans or desires to disrupt the concrete, or change the use or ownership of the building. As you know, the building is currently being used for radioactive waste storage by your Health Physics Office.

3. The concrete floor, walls, and ceiling of the exposure room are slightly radioactive. Assays conducted in the past identified the radionuclides to be Eu-152, Eu-154, and Co-60, estimated to be at specific activities today of about 15, 1.5, and 1.9 pCi/gm, respectively. The radioactivity is not removable on the surface, but is rather an integral part of the concrete matrix. The resulting net external radiation level is approximately 27 microrem/hr above background at 1 meter from the surface. If the activated concrete was disturbed by drilling, cutting, jack hammering, chipping, etc., inhalation and ingestion of the radioactivity could result in internal dose. It is for this reason that ARO is requiring prior notification of plans or desires to disrupt the concrete, or change use or ownership of the building.

4. Therefore request ARL and the ARO be notified in advance by WRAMC of any plans or desires to disrupt the concrete, or change the use or ownership of the building. The POC at ARL is Mr. Michael Borisky, (301) 394-6310, and the POC at ARO is Mr. Brandon Burns, (703) 806-7861. Further request that permanent notices be posted in the WRAMC facilities management office and building management files to ensure that future facilities managers are aware of the notification requirements associated with building 516. Your cooperation with this matter is greatly appreciated.

O. J. WILLIAMS
COL, QM
Chief of Staff

CF: WRAMC Health Physics Office, 6825 16th Street, Building 41, room 38, Wash. DC 20307-5001