



**Southeast**  
Missouri State University

ONE UNIVERSITY PLAZA • CAPE GIRARDEAU, MISSOURI 63701-4799 • (573) 651-2000 • <http://www.semo.edu>

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Document Control Desk  
Director  
Office of Nuclear Material Safety and Safeguards  
US Nuclear Regulatory Commission  
Washington DC 20555-0001

**RE:** Thirty day written report for event number 42345 pursuant to 10 CFR Part 30.50(c)(2).

### 1.0 Description of the Event

On Monday, February 13, 2006 the licensee (with the assistance of two contractor Health Physics Technicians) began conducting contamination surveys of equipment and 16 cabinets within Room 25 in the basement of Magill Hall at Southeast Missouri State University in Cape Girardeau, Missouri. The survey was being performed to relocate the equipment and cabinets to change the use of the approximately 500 square foot storage room. These 16 cabinets had not been moved since the basement of Magill Hall went through a decontamination / remediation related to an Americium 241 (Am-241) spill in the year 2000 [See EN# 37282 and EN# 37298].

On Tuesday, February 14, 2006, after many of the cabinets were moved, fixed and loose surface contamination in excess of the facility unrestricted release limits (contained in procedure RP-03 Revision 1, *Exposure Limits*) was identified on the floor under the cabinets. Six areas were identified. Five were in the range of 1,500 to 3,500 dpm/100cm<sup>2</sup> total alpha. One area was approximately 38,000 dpm/100cm<sup>2</sup> total alpha. A smear of one area revealed about 900 dpm/100cm<sup>2</sup> loose alpha.

A stop work was initiated and the Radiation Safety Officer was immediately notified. The locks on Room 25 were changed so that the room was under the control of the RSO, and the room was posted "Caution – Contaminated Area" in accordance with the facility procedures. After consulting with administrative staff and a contractor Certified Health Physicist, the RSO directed the HPTs to re-enter Room 25 to perform limited-scope decontamination of the loose surface contamination of applicable areas of the floor. This work was done by carefully covering the areas of elevated loose surface contamination with paper towels and then wetting the towels to capture and contain the loose contamination. The areas were then wiped and materials were disposed of as radioactive waste. A breathing zone air sampler pump was worn by a HPT who was performing the decontamination work.

Work continued into Wednesday, February 15, 2006. Room 25 was emptied of all equipment and cabinets. All removed materials received a radiological survey and were released for unrestricted use or controlled as radioactive material, as applicable. The loose surface contamination on the floor in Room 25 was reduced to unrestricted release levels. Fixed surface contamination in excess of the unrestricted release limits remained in Room 25. The contractor HPTs left the facility, as planned.

On or about Monday, February 20, 2006, the RSO identified a second location in the basement of Magill Hall where a potential existed for loose or fixed contamination on the floor in excess of unrestricted release criteria. This location was at the north end of a hallway in the basement. The area has previously been used to store a large number of boxes containing rock core samples. The boxes were present at this location prior to the decontamination / remediation effort in the year 2000 and had remained in-place during and after the decontamination / remediation effort. The RSO identified that the boxes has recently been removed, exposing the floor area underneath. The RSO was concerned that, similar to Room 25, that loose or fixed contamination could be present here as well. The RSO notified the contractor that was supplying the HPTs (and who were planning to re-visit the facility the next day) and the RSO controlled access to the area.

On Tuesday, February 21, 2006, a contractor HPT and certified Health Physicist (CHP) arrived at the facility, met with the RSO, and toured the areas in question. After verifying that the necessary radiological controls were in-place, the HPT began decontamination efforts to remove the fixed contamination on spots on the floor in Room 25. The small area in the hallway was cleaned as well. Both efforts utilized Scrubbing Bubbles™ spray and paper towels. Breathing zone air sampling of the HPT conducted the decontamination was employed.

On Wednesday, February 22, 2006 the contractor HPT conducted loose and fixed contamination surveys to assess the effectiveness of the decontamination and, if possible, to release the areas for unrestricted use. The areas in question received a 100% scan survey to identify any remaining small areas of elevated activity. During the scanning survey, some additional small areas of elevated activity were identified and decontaminated. These areas were allowed to dry and were then re-surveyed. The floor areas to be released from radiological control were then smeared and fixed-point measurements were taken. A preliminary evaluation of the survey data indicated that unrestricted release criteria was met, and the RSO elected to remove the "Caution – Contaminated Area" postings from Room 25 and the area in the hallway. Room 25 remained under the control of the RSO via a lock on the door.

Subsequent data analysis by the contractor revealed a small area in Room 25 that required additional decontamination to reduce the levels of fixed contamination to meet unrestricted release criteria. No loose surface contamination in excess of this criteria has been identified. The area in question is approximately 1m<sup>2</sup> in size. Additional decontamination of this area is planned.

## **2.0 Location of the Event**

Magill Hall at Southeast Missouri State University in Cape Girardeau, Missouri. Two locations in the basement:

- Room 25
- A small area at the north end of the basement hallway. Refer to figure 1.

### **3.0 Isotopes, quantities, and chemical and physical form of the licensed material.**

The contamination is assumed to consist entirely of Am-241 based upon investigations conducted during the year 2000 decontamination / remediation. The loose surface contamination was in the form of dry dust and oily dust on the surface of the concrete floor. The loose surface contamination was easily removed via wet wiping. The most likely mode for the deposition of the contamination was migration of the dust under the cabinets and boxes of rock cores during the scabbling of the concrete floor in the immediate area during the year 2000 decontamination / remediation effort.

### **4.0 Date and Time of the Event**

The event was discovered on the morning of Tuesday, February 14, 2006.

### **5.0 Corrective Actions Taken or Planned**

#### Actions taken

1. The areas were promptly controlled, posted, and decontaminated as described in Section 1.0. Areas were released for unrestricted use with the exception of a small area in Room 25 which exhibits a low level of fixed contamination in excess of unrestricted release limits.
2. The potential internal dose for personnel in the immediate area was assessed.

#### Actions planned

1. The small area of fixed contamination in Room 25 will receive additional decontamination to meet unrestricted release limits. This will be completed by April 15, 2006.
2. The basement areas of Magill Hall will be inspected for additional locations where loose and fixed contamination on surfaces may be obscured by materials or equipment. Such areas, if any, will be posted and placed under the administrative control of the RSO. This will be complete by April 15, 2006

### **6.0 Extent of Exposure of Individuals**

The discovery of loose and fixed surface contamination in two basement areas of Magill Hall presents a minimal potential for radiological risk as supported by:

- The contamination resided underneath storage cabinets and under numerous heavy boxes of rock cores.
- The cabinets and boxes of rock cores had not been moved since some time prior to the facility decontamination effort in the year 2000. The cabinets and boxes of rock cores were found to be at the same location and positions as they were during the year 2000 basement decontamination effort.
- The most likely mode of contamination under the cabinets and boxes is that material from the floor decontamination (aggressive surface removal) in the immediate surrounding areas migrated under the items and remained there.
- Since the cabinets and boxes had not been moved or disturbed, there is no route of internal or external exposure to personnel transiting the hallway or working in Room 25.
- The most likely time for personnel to receive a potential radiation exposure was during the initial removal of the cabinets and boxes on February 13, 2006. The only credible route of exposure between the year 2000 effort and February 14, 2006 is inhalation of airborne contamination during the removal of the boxes and cabinets on February 13th.

An assessment of the potential for personnel to receive a Committed Effective Dose Equivalent (CEDE) via inhalation of the loose surface contamination is presented below.

The level of loose surface contamination was assessed on 2/14/06 at about 1015 by obtaining a smear sample on a small area of elevated activity on the floor in Room 25. The smear result was 937 dpm/100cm<sup>2</sup> alpha and is assumed to be Am-241 contamination.

Using the concept of the indoor re-suspension factor as described in NUREG-1720, the potential airborne radioactivity in the immediate area can be estimated using Equation 1 below.

**Equation 1**

$$RF = \frac{\left( Airborne \frac{uCi}{ml} \right) (2.22E + 10)}{\left( Surface Contamination \frac{dpm}{100cm^2} \right)}$$

Where: RF is the re-suspension factor and is based upon the type of physical activity taking place in the immediate area of the contamination.

Typical values for RF are provided in Table 1.

**Table 1**

Work Activity	Re-suspension Factor (RF)
Hot work, grinding, plasma arc cutting, dry abrasive processes, OR use of air tools or equipment with air exhaust in areas with dry, dusty contamination in excess of 5,000 dpm/100cm <sup>2</sup> ( $\alpha$ )	1.0 E-04
Saw cutting, aggressive work, use of tools or equipment causing moderate vibration OR use of air tools or equipment with air exhaust in areas with dry, dusty contamination less than 5,000 dpm/100cm <sup>2</sup> ( $\alpha$ )	1.0 E-05
Routine surveillances, tours, and inspections. Minor routine maintenance work. HP surveys.	1.0 E-06

The RF of 1.0 E-06 is most applicable to the work in Room 25 and in the basement hallway. Using the observed loose surface contamination level, a DAC value of 3.0 E-12  $\mu$ Ci/ml for Am-241, and Equation 1, the level of airborne radioactivity in the vicinity of the work would only have been about 0.01 DAC. This equates to a maximum CEDE of less than 1 mrem for an 8 hour exposure or an intake of about 0.0001 ALI (Class W, bone surfaces). There is no potential deep dose equivalent (DDE) for this event, therefore the estimated TEDE is equal to the estimated CEDE.

In the improbable situation where the work activity warranted an RF value of 1.0 E-05 (and there is no evidence to support this), the level of airborne radioactivity in the vicinity of the work would only have been about 0.14 DAC. This equates to a maximum CEDE of about 3 mrem for an 8 hour exposure or an intake of about 0.0007 ALI. At a DAC fraction of 0.14, and estimation of the potential internal dose (via DAC-hour tracking) would not generally be required.

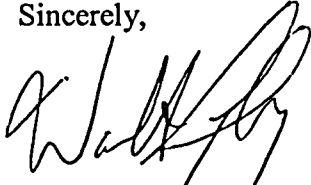
In the non-credible situation where the level of loose surface contamination was underestimated by a factor of 10 (i.e., using a value of 9,370 dpm/100cm<sup>2</sup>) AND a RF value of 1.0E-05, the level of airborne radioactivity in the vicinity of the work would have been about 1.41 DAC. This would have required a posting of "Caution, Airborne Radioactivity Area", the use of personal breathing zone air sampling, and DAC-hr tracking. Even so, this equates to a maximum CEDE of less than 28.2 mrem for an 8 hour exposure or an intake of about 0.007 ALI. This value does not exceed 1/2 of the federal legal limit for members of the general public.

These estimates are supported by a review of the air sampling that was conducted in the room and in the breathing zone of the health physics technicians (HPTs) who worked in Room 25 and who discovered the loose and fixed surface contamination. These individuals are the most likely maximally exposed individuals for the incident.

For the air sample taken in Room 25 on 2/14/2006, the result is a DAC fraction of 0.1. This result is at a level at which DAC-hour tracking to assess potential internal dose is not required. For the breathing zone air sample worn by one HPT during survey and decontamination activities on 2/15/06, the result is a DAC fraction of 0.03.

The discovery of loose and fixed surface contamination in the basement of Magill Hall posed a minimal risk to human health, safety, and the environment.

Sincerely,

A handwritten signature in black ink, appearing to read 'Walt W. Lilly', written in a cursive style.

Walt W. Lilly  
Radiation Safety Officer and Professor of Biology  
Southeast Missouri State University  
573-651-2359  
wlilly@semo.edu

cc: USNRC Region III  
2443 Warrenville Road  
Suite 210  
Lisle, Illinois 60532-4352

**Figure 1 - Basement of Magill Hall**

