



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION III
2443 WARRENVILLE RD. SUITE 210
LISLE, IL 60532-4352

February 27, 2017

Mr. Gregory P. Crouch, M.S., M.P.H
Radiation Safety Officer
Indiana University
Jordan Hall, Room 071
1001 E. Third Street
Bloomington, IN 47405-6801

SUBJECT: NRC INSPECTION REPORT NO. 030-00692/2016-001(DNMS)
INDIANA UNIVERSITY

Dear Mr. Crouch:

On February 1, 2017, The U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Swain Hall West at Indiana University in Bloomington, Indiana. The purpose of the inspection was to determine whether remediation activities were conducted safely and in accordance with NRC regulations and your NRC license, No. 13-00108-05. At the conclusion of the inspection on February 1, the NRC inspector discussed the results of the inspection with you.

The inspection consisted of an examination of remediation activities as they relate to safety and compliance with the Commission's rules and regulations. Areas examined during the inspection are identified in the enclosed report. Within these areas, the inspection consisted of a selective examination of procedures and representative records, and interviews with personnel. Specifically, the inspector reviewed remediation activities in six rooms and involving the removal of contaminated drain and exhaust ventilation systems in Swain Hall West. The inspector concluded radiological controls were no longer needed in these areas, except for the sub-basement.

No violations of NRC requirements were identified during this inspection.

In accordance with Title 10 of the Code of Federal Regulations (CFR) 2.390, "Public Inspections, Exemptions, Requests for Withholding," of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC's Public Document Room or from the Publicly Available Records System (PARS) component of NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC's website at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

G. Crouch

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We will gladly discuss any questions you have concerning this inspection. If you have any questions, please contact Dr. Peter Lee of my staff at 630 829-9870.

Sincerely,

/RA/

Michael A. Kunowski, Chief
Materials Control, ISFSI, and
Decommissioning Branch
Division of Nuclear Materials Safety

Docket No: 030-00692
License No: 13-00108-05

Enclosure:
IR 030-00692/2016-001(DNMS)

G. Crouch

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Letter to Gregory Crough from Michael Kunowski dated February 27, 2017

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INDIANA UNIVERSITY

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U.S. NUCLEAR REGULATORY COMMISSION
REGION III

Docket No: 030-00692

License No: 13-00108-05

Licensee: Indiana University

Facility: Swain Hall West

Location: Bloomington, Indiana

Date: December 13 and 14, 2016 (onsite)
December 15, 2016, through Feb 1, 2017
(in-office review)

Inspector: Peter. J. Lee, Ph.D., CHP, Health Physicist

Approved By: Michael A. Kunowski, Chief
Materials Control, ISFSI, and
Decommissioning Branch
Division of Nuclear Materials Safety

Enclosure

EXECUTIVE SUMMARY

INDIANA UNIVERSITY NRC Inspection Report 030-00692/2016-001(DNMS)

This inspection reviewed remediation activities in six rooms (Rooms 243, 244, 301, 302, 330, and 331) and the removal of contaminated drain system and exhaust ventilation systems in Swain Hall West at the Bloomington campus of Indiana University.

Remediation Activities

- The inspector determined that the U.S. Nuclear Regulatory Commission (NRC) has no regulatory concerns and the licensee could proceed with demolition and remodeling of the Swain Hall West without radiological controls, except the sub-basement. (Section 2.0)

Dose Assessment

- The inspector made a dose calculation for a hypothetical member of the general public accessing the contaminated rooms between the late 1970s, when licensed activities in these rooms ceased, to 1985 when remodeling covered over residual contamination. The estimated total dose received was less than 30 mrem, well below the current annual dose limit of 25 mrem per year in 10 CFR 20.1402. This hypothetical dose is not a health and safety or regulatory concern. (Section 3.0)

Waste shipment

- The inspector determined that the licensee had complied with NRC and the U.S. Department of Transportation (DOT) regulations for shipments of radioactive waste. (Section 4.0)

Report Details

1.0 Background

The licensee (with its contractor) removed residual radioactive contamination from specific locations within Swain Hall West to allow demolition and remodeling of these areas without radiological controls. This effort included the removal of contaminated drain piping and exhaust ventilation system components from Rooms S-12 and S-18, and remediation in Rooms 243, 244, 301, 302, 330, and 331.

The radioactive materials was likely in use in these areas from the late 1950s through the late 1970s. Records suggest that Rooms 243, 244, 301, 302, 330, and 331 had been converted to offices by 1985. During the previous remodeling of those rooms to office use, vinyl tile was installed over the original contaminated concrete floor. No records of close-out surveys from the mid-1980s were available during the current inspection; however, NRC decommissioning-related survey recordkeeping requirements in 10 CFR 30.35(g) did not take effect until mid-1988.

2.0 Remediation Activities (Inspection Procedure (IP) 87104)

2.1 Inspection Scope

The inspector reviewed the licensee's characterization survey of Rooms 243, 244, 301, 302, 330, and 331, the remediation work plan (ML17033A244), and the final remediation report (ML17032A532). The inspector observed the remediation to determine if the remediation activities were conducted in accordance with the approved work plan.

2.2 Observations and Findings

Based on the characterization survey prior to remediation, the highest contamination, all-fixed, was identified in Room 330, with elevated areas up to 14×10^6 dpm/100 cm² on the surface of concrete floor and the total activity in the room of about 56 μ Ci of Sr-90. No removable contamination was identified. The removable fraction of the contamination could have been removed prior to the 1985 remodeling and might have had contributed dose to the general public accessing the rooms. No licensee records from this time period were available during the current inspection. The inspector noted that the contamination of all the rooms was above the limit in the recently withdrawn Regulatory Guide 1.86, used as guidance to inspectors for the criteria of close-out surveys.

The inspector noted that the recent remediation activities were conducted in accordance with the approved work plan and that the licensee had remediated the contaminations in Rooms 243, 244, 301, 302, 330, and 331 to well below the screening values stated in the current guidance, NUREG-1757, Consolidated Decommissioning Guidance. All the contaminated drain piping associated with Rooms 243, 244, 301, 302, 330, and 331 had been removed down to the sub-basement floor.

2.3 Conclusions

The inspector determined that the NRC has no regulatory concerns and the licensee could proceed with demolition and remodeling of the Swain Hall West without radiological controls, except for the sub-basement, where radiological controls would still need to be maintained.

3.0 Dose Assessment (IP 87104)

3.1 Inspection Scope

The inspector reviewed the current characterization survey of Rooms 243, 244, 301, 302, 330, and 331, and the previous records of radioactive materials use from the late 1950s through the late 1970s. The review was performed to assess the potential maximum dose received by the general public who might have accessed the above rooms.

b. Observations and Findings

During the 1985 remodeling to convert these rooms for office use, tile had been placed on the concrete floor that had fixed contamination of Sr-90 in localized areas. Because of that, the inspector made an assessment of the dose that a hypothetical member of the public might have received had that person accessed these rooms between the late 1970s when active use of radioactive material ceased and the 1985 remodeling. Among the above rooms, the most contaminated room was Room 330. Based on the current characterization survey, the contamination in Room 330 was about 56 μCi of Sr-90, a beta-emitter radionuclide with a half-life of 28.6 years.

Assuming the contamination of Room 330 was about 112 μCi , which was based on the decay correction of current activity back to 1985, and the dose assessment is based on the following:

The air concentration in a one-room air quality model under equilibrium conditions for a surface source with long-lived radionuclide contamination can be given as:

$$C = (A_s \times f_R \times f_a) / (T_R \times \lambda_a \times V)$$

where

A_s = total surface activity of the source in the room,

f_R = removable fraction of source,

f_a = fraction of removable source that becomes airborne and respirable,

T_R = time to remove the removable fraction of the source,

λ_a = air exchange rate of the room,

V = volume of the room.

The person will receive the maximum dose when the time staying in the room is the same as the time to remove the removable fraction of the source. Based on derived airborne concentration $\text{DAC} = 2 \times 10^{-9} \text{ uCi/ml}$, $V = 63 \text{ m}^3$ (Room 330) and reasonable

assumptions used by NRC computer software of $f_R = 10\%$, $f_a = 10\%$ and $\lambda_a = 0.8 \text{ hr}^{-1}$, the maximum total dose between the dates specified above that could have been received was about 30 mrem.

c. Conclusions

The inspector determined that the general public accessing the contaminated rooms between the late 1970s when active use of radioactive materials ceased and the 1985 remodeling could have received a total dose of less than 30 mrem, well below the current annual dose limit of 25 mrem per year in 10 CFR 20.1402. This hypothetical dose is not a health and safety or regulatory concern.

4.0 Transportation of Radioactive Materials (IP 86750)

4.1 Inspection Scope

The inspectors reviewed radioactive waste shipping documents and conducted interviews of the responsible individual to ensure compliance with NRC and DOT regulations.

b. Observations and Findings

The licensee's shipping manifest showed that personnel labeled and marked each shipping container according to the DOT and 10 CFR Part 71 transportation requirements. The licensee verified that the results of radiation and removable contamination levels were within applicable limits. The waste manifest included all required information.

c. Conclusions

The inspector determined that the licensee had complied with NRC and DOT regulations for shipping radioactive waste.

5.0 Exit Meeting

The inspector presented the inspection results to Mr. Gregory Crouch, the licensee's radiation safety officer, at a telephone exit meeting on February 1, 2017. He did not identify any of the documents or processes reviewed by the inspector as proprietary.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

* Gregory Crouch, Radiation Safety Officer
Tim Pratt, Ameriphysics LLC

* Indicates individual present during the exit meeting on February 1, 2017.

INSPECTION PROCEDURE USED

IP 87104: Decommissioning Inspection Procedure for Materials Licensees
IP 86750: Transportation of Radioactive Materials