



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
1600 EAST LAMAR BLVD
ARLINGTON, TEXAS 76011-4511

February 22, 2012

Dr. Pamela L. Crowell
Vice President for Research
Idaho State University
921 South 8th Avenue
Stop 8130
Pocatello, Idaho 83209-8130

SUBJECT: NRC INSPECTION REPORT 030-32322/2010-001

Dear Dr. Crowell:

This report refers to a reactive inspection conducted by the NRC in response to a report from Idaho State University (ISU) regarding the loss of two, small plutonium-239 sources at the Idaho Accelerator Center in Idaho Falls, Idaho. The on-site portions of the inspection were conducted on October 5-8, 2010, October 20, 2010, and April 12, 2011, and continued with in-office reviews. ISU reported the sources were missing on September 2, 2010, and reported that the sources were lost on February 3, 2011. On April 6, 2011, ISU notified the NRC that the sources had been found. ISU provided a written report to the NRC on May 10, 2011 (ML111450699), and modified its report on February 3, 2012 (ML12046A884). Preliminary inspection findings were discussed with you and your staff at the conclusion of the onsite portions of the inspection on October 20, 2010, and on April 12, 2011. A final exit briefing was conducted on February 16, 2012, with the following ISU representatives: Dr. Jay Kunze, Radiation Safety Officer; Dr. Doug Wells, Idaho Accelerator Center; and Mr. Peter Farina, proposed new Radiation Safety Officer.

The inspection was an examination of activities conducted under byproduct material license 11-27380-01 as they related to the safe use and handling of licensed material and to determine a cause for the event where ISU did not know the whereabouts of the two Pu-239 sources. Within these areas, the inspection consisted of selected examination of procedures and representative records, observation of activities, and interviews with personnel.

During a routine leak check and inventory in late July 2010, personnel from ISU's Idaho Accelerator Center could not find two Pu-239 sources. In April 2011, the sources were found in the decay-in-storage vault and, fortuitously, the sources had been secured throughout the time their location was unknown. Based on the results of this inspection, no violations were identified. However, our inspection identified several weaknesses in ISU's program for maintaining source accountability as well as less than adequate management oversight for that program. We have also determined that ISU's corrective actions are adequate to correct these weaknesses if implemented in an effective manner.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosures, and your response will be made available electronically for public inspection in the

NRC Public Document Room or from the NRC's Agency wide Documents Access and Management System (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>. To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the Public without redaction.

Should you have any questions concerning this inspection, please contact me at (817) 200-1130.

Sincerely,

/RA/

G. Michael Vasquez, Chief
Nuclear Materials Safety Branch A

Docket No.: 030-32322
License No.: 11-27380-01

Enclosure:
Inspection Report 030-32322/2010-001

cc w/Enclosure:
Idaho Radiation Control Program Director

Bcc:

E.E.Collins
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NMSB-A
 RITS Coordinator
 RIV Materials Docket File (5th Floor)

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U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Inspection No. 030-32322/2010-001

Docket No. 030-32322

License No. 11-27380-01

Licensee: Idaho State University
Technical Safety Office

Locations Inspected: Idaho Accelerator Center
Particle Beam Laboratory, and
Idaho Accelerator Center-Airport Facility

Inspection Dates: October 6, 2010 through
February 16, 2012

Inspector: Rick Muñoz, Health Physicist
Nuclear Materials Safety Branch A

Michelle Hammond, Health Physicist
Nuclear Materials Safety Branch B

Accompanied By: Don Stearns, Health Physicist
Nuclear Materials Safety Branch A

Approved By: G. Michael Vasquez, Chief
Nuclear Materials Safety, Branch A
Division of Nuclear Materials Safety

EXECUTIVE SUMMARY

Idaho State University NRC Inspection Report No. 030-32322/2010-001

The inspection was conducted in response to the licensee's September 2, 2010, notification to the NRC that it was unable to account for two Nuclear Accident Dosimeter (NAD) Pu-239 sources. The missing sources were ultimately located on April 6, 2011, by licensee staff. A follow-up inspection was conducted on April 12, 2011, in response to locating the lost sources. In-office reviews of the inspection results continued until February 16, 2012, after the licensee updated its written report on February 3, 2012 (ML12046A884). This report describes the findings of the inspection.

Inspection Findings

In July 2010, the licensee could not locate two plutonium-239 sources which had been stored at the Idaho Accelerator Center (IAC) facility's source storage vault. The licensee notified the NRC on September 2, 2010, that it could not locate the two sources, and after extensive searches, the licensee notified the NRC that the sources were considered lost on February 11, 2011. The licensee's investigation and the NRC's inspection identified numerous deficiencies in the licensee's accountability and control over licensed material. Ultimately, the licensee found the two NAD sources on April 6, 2011. The NAD sources had been accidentally placed in the radioactive waste trash which was being held in a secure location for decay in storage. The sources were found during a radiation survey prior to disposing of the trash. As such, it was fortuitous that the sources had been secured throughout the time the sources could not be located. And, as a result, no violations of NRC requirements occurred. (Section 4)

ISU's February 3, 2012, report stated that the basic cause that led to the incident was that a glass container of resin material was not secure on the top shelf of a metal storage array. When the glass container fell, the two Pu-239 sources also fell and were swept up with the debris, placed in a bag, and placed in the decay-in-storage vault. The sources were discovered on April 6, 2011, when ISU staff surveyed the bag in preparation for disposal. When radiation levels were higher than expected, ISU staff opened the bag and found the two sources. (Section 4)

The NRC concluded that there were several program weaknesses that, although did not directly contribute to the event, indicated a lack of disciplined source accountability. The NRC also found less than adequate management oversight for accountability of these sources. (Section 4)

Corrective Actions

- ISU purchased three safes for the sealed sources on September 7, 2010; one for each of the Idaho Accelerator Center laboratories. These were for storage of all plutonium, uranium, thorium sources, target materials and activated material. (Section 5)
- ISU implemented a new procedure, "Idaho Accelerator Center Source Sign-Out Procedure", requiring two-person verification for both check-in and check-out of all sources designated as "two barrier" sources, and one person must be an authorized user. Separate sign-out logs were being maintained for all three safes. All researchers were trained on the enhanced procedure. (Section 5)

- ISU administration stated it has given attention to improving written procedures and meticulous attention to procedure compliance and documentation; particularly with respect to source to source movement and control procedures. (Section 5)
- The ISU radiation safety committee took an active role in reviewing and approving the corrective actions for this event, making good comments about Accelerator Center's corrective actions. (Section 5)

REPORT DETAILS

1 Organization and Scope of the Program (87126)

1.1 Inspection Scope

On October 6, 2010, the NRC commenced an inspection to review the licensee's September 2, 2010, report, that it could not locate two sources. The inspector reviewed the scope of licensed activities with the radiation safety officer and other licensee representatives.

1.2 Observations and Findings

Idaho State University (ISU) is an academic Type-A broad scope license authorized to possess and use sealed and unsealed radioactive material for research and training in academic research programs. ISU has multiple locations of use in Pocatello, the main campus, and other field offices in southeast Idaho. The licensee had 30 "responsible users," (primary investigators) and approximately 130 personnel using or authorized to use byproduct material in laboratories under research projects authorized by the radiation safety committee. The radiation safety committee reviewed and approved users and use of radioactive material protocols. The radiation safety committee also reviewed the radiation safety officer's (RSO's) quarterly report of licensed activities at each radiation safety committee meeting.

Locations inspected included the Physical Science Building #3, Lillibridge Engineering Lab, Idaho Accelerator Center (Alvin Ricken Dr.), and the Idaho Accelerator Center (airport facility). ISU had an active radiation safety program led by the radiation safety committee chairman, and the RSO who reported to the Vice President of Research. The Technical Safety Office was staffed by two health physicist and two health physics technicians who perform the day-to-day radiation safety activities and report to the RSO. The technical safety office health physics technicians were part time graduate students.

2 Background (87126, 87103)

ISU initially obtained 14-NAD (Nuclear Accident Dosimeter) sources from the Idaho National Laboratory several years ago. These sources are described as flat metallic disks about the size of a quarter. These 14 sources each contained an approximate mass of about 1-gram of Pu-239 with an activity of approximately 60 mCi. These sources were inventoried and leak tested every six months. Several years ago one of these sources indicated removable contamination on its surface. This source was properly disposed of at that time leaving 13-NAD sources in inventory. Ten of the sources were normally stored in a secure location at the Idaho Accelerator Center's main facility on Alvin Ricken Drive; three of the sources were stored in the Physical Sciences building on the main lower-campus of Idaho State University in the Physical Sciences Building.

Typical contact dose equivalent rates from a similar source was measured at 14 mRem per hour at 1 meter. Independent NRC radiological surveys verified these dose rates.

3 Event Chronology (87126, 87103)

July 2010 - During a routine leak test and inventory procedure evolution in late July and early August, health physics technicians from the Technical Safety Office could not locate two Pu-239 NAD sources and one 10.83 μ Ci Am-241 source at the Idaho Accelerator Center. The two NAD sources in question were designated as numbers AP-229 and AP-243.

August 19-27, 2010 – After conducting searches, the Idaho Accelerator Center was formally notified by the technical safety office that the two Pu-239 NAD sources and one Am-241 source could not be located. A complete source inventory of the Idaho Accelerator Center was performed and the Am-241 source was located. Extensive searches for the plutonium sources continued, but they were not found.

September 2, 2010 – ISU notified the NRC that the sources could not be located.

October 5 - 20, 2011 - NRC conducted a reactive inspection at ISU in response to the notification from ISU. As a result of weaknesses identified by the inspector, ISU conducted additional searches after conducting additional training of its staff.

February 11, 2011 - ISU notified the NRC that the two NAD sources were lost. Event report number 46225 was updated to reflect this reporting date.

April 6, 2011 - Both NAD sources were discovered by a student employee searching the decay-in-storage (DIS) trash in the vault. Because the sources had been accidentally placed in the decay-in-storage trash vault, the sources had been secured throughout the entire time they were lost.

April 12, 2011 – An NRC inspection confirmed that the sources had been located.

May 11, 2011 - ISU submitted to the NRC an investigation event report (ML111450699).

February 3, 2012 – After a telephone conference call with ISU, ISU updated its report (ML12046A884) with a different cause for the event as well as additional corrective actions.

4 Inspection Findings (87126)

4.1 Inspection Scope

The inspector conducted interviews with licensee personnel, the licensee's investigation report, and reviewed licensee procedures and records related to the missing sources. The inspector also reviewed the results of ISU facility safety program audits conducted during 2008 and 2009.

4.2 Observations and Findings

Prior to September 2010, the accountability and responsibility for entering information on the utilization log when using these sources was based on the "honor system." Based on reviews of the utilization logs, the inspector determined that the correct and accurate data entry of the utilization log began to deteriorate in 2007. For example, in early 2007,

sources were identified by their unique serial number then slowly evolved to entries such as “Pu-238 and friends,” and “all discs.” Later, entries deteriorated to the point where some entries included: “ham sandwich,” and “eat me.” These deficiencies indicated a lack of disciplined source accountability, and although these deficiencies did not directly contribute to the event, they did represent vulnerabilities that could have caused the sources to be lost.

Regarding management oversight of source accountability, the inspector found:

- The Idaho Accelerator Center Radiation Safety Engineer, who stated he was responsible for ensuring that the NAD sources were checked in/out and used according to established protocols, was not reviewing the logs effectively, if at all.
- The inspector identified one instance when the Idaho Accelerator Center Radiation Safety Engineer had not checked the sources out/in, in August 2010.
- During the October 5-8, 2010, onsite inspection, the inspector found a locked safe had the key still in the lock at the particle beam laboratory (the door to the lab was locked).

The NRC concluded that these circumstances indicated less than adequate management oversight for accountability of these sources.

During the October 5-8, 2010, inspection, the inspector identified weaknesses in ISU’s search techniques. For example, although some searchers had been shown what the NAD sources looked like, others had not. Also, survey records did not demonstrate a complete search. Based on the inspector’s observations, the RSO determined that a more comprehensive second round of visual and radiological searches should be conducted.

The licensee conducted additional searches through February 4, 2011. On February 11, 2011, ISU called the NRC’s Headquarters Operations Office to formally report the two NAD sources as lost. On April 6, 2011, a student employee searched the decay-in-storage trash located in the storage vault of the IAC. The student observed a corner of a small plastic bag that appeared to be the same size as the plastic bags that the NAD sources are placed in for storage. NAD sources AP-243 and AP-229 were discovered in the bag and the Radiation Safety Engineer was immediately notified, and ISU notified the NRC.

ISU found that in about April 2010 a glass container of resin material fell off the top shelf of a whole metal storage shelf. The sources also fell and were swept in to a bag along with the broken glass and resin material. The bag was placed in the decay-in-storage vault and was secured throughout the time they could be found. During ISU searches, the bag was never opened.

On April 12, 2011, the NRC conducted an additional inspection and verified that ISU had found the two sources. The inspectors verified the serial numbers on the sources. By report dated May 11, 2011, the licensee stated the root cause involved “a casual attitude concerning radiation handling accountability.” After questions from the NRC, ISU modified its basic cause of the event by letter dated February 3, 2012. ISU stated that

the basic cause involved the storage of the glass container of resin material on the top shelf of a tall metal storage shelf array in a manner that was not secured.

ISU also stated that the RSO and TSO staff did not identify any fundamental errors in the radiation safety program. However, the inspector found that sources were not always checked out and that log entries were so poor it was obvious that logs were not be checked by management. Nevertheless, ISU took appropriate corrective actions to address these weaknesses.

4.3 Conclusions

Although several deficiencies had been identified in the licensee's source control and accountability program, the sources had been secured by the licensee during the time they were missing. As a result, no violations of NRC requirements occurred.

5 **Corrective Actions (87126)**

- ISU purchased three safes for the sealed sources on September 7, 2010, one for each of the Idaho Accelerator Center laboratories in order to store all plutonium, uranium, thorium sources, target materials and activated material.
- ISU implemented a new procedure, "Idaho Accelerator Center Source Sign-Out Procedure," requiring two-person verification for both check-in and check-out of all sources designated as "two barrier," sources, and one person must be an authorized user. Separate sign-out logs were being maintained for all three safes. All researchers were trained on the enhanced procedure.
- ISU administration stated it has given attention to improving written procedures and meticulous attention to procedure compliance and documentation; particularly with respect to source to source movement and control procedures
- The ISU radiation safety committee took an active role in reviewing and approving the corrective actions for this event, making good comments about Accelerator Center's corrective actions.

6 **Exit Meeting Summary**

A preliminary exit briefing was conducted at the conclusion of the on-site inspection on October 20, 2010, with the Vice President of Research, the Director of the Idaho Accelerator Center, the Radiation Safety Committee Chairman, and the Radiation Safety Officer, to discuss initial inspection findings. Follow-up inspection findings were discussed with the Radiation Safety Officer and the Director of the Idaho Accelerator Center at the conclusion of the follow-up inspection on April 12, 2011. A final telephonic exit briefing was conducted with representatives of Idaho State University on February 16, 2011. Licensee representatives acknowledged the inspection findings. No proprietary information was identified.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

- *α#+ Pamela Crowell, PhD, VP for Research
- *α# Richard R. Brey, PhD, Radiation Safety Officer
- α#+ Malcolm Shields, PhD, radiation safety committee Chairman
- *α# Doug Wells, PhD, Director Idaho Accelerator Center
- *α Alan Hunt PhD, Associate Director. IAC
- *α#@ Mark Balzer, Idaho Accelerator Center Radiation Safety Engineer
- α Khalid Chouffani, PhD, Primary Researcher, IAC
- α* Tyson Harker, technical safety office Technician
- α* Robert Heha, technical safety office Technician
- α* Erika Shelton, technical safety office Technician
- α* Kevin Folkman, Head Engineer, Beam Laboratory
- α Brian Fairchild, Student Employee
- @ Jay Kunze, PhD, Radiation Safety Officer (since September 23, 2011)
- @ Peter Farina, Proposed Radiation Safety officer

- *Individuals contacted during the on-site entrance meeting on October 6, 2010
- #Individuals contacted for preliminary exit meeting on October 20, 2010
- αIndividuals contacted during the follow-up inspection on April 12, 2011
- +Individuals contacted by telephone for final exit meeting conducted November 30, 2011.
- @Individuals present at Exit Briefing conducted on February 16, 2012

INSPECTION PROCEDURES USED

IP 87126	Industrial/Academic/Research Programs
IP 87103	Inspection of Materials Licensees Involved in an Incident or Bankruptcy
IP 84101	Radioactive Waste Management
IP 92701	Follow-up

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

None

Discussed

None

LIST OF ACRONYMS AND ABBREVIATIONS USED

ISU	Idaho State University
IAC	Idaho Accelerator Center
CFR	<i>Code of Federal Regulations</i>
EA	enforcement action
NAD	Nuclear Accident Dosimeter
NRC	Nuclear Regulatory Commission
RSO	radiation safety officer