UNITED STATES DEPARTMENT OF COMMERCE
National Institute of Standards and Technology
Gaithersburg, Maryland 20899-

November 28, 2011

Mr. Roy Caniano
Director, Division of Nuclear Materials Safety
U.S. Nuclear Regulatory Commission, Region IV
612 East Lamar Boulevard, Suite 400
Arlington, TX 76011-4125
Facsimile: 817-860-4125

Subject: Confirmatory Order Item 2)

Dear Mr. Caniano:

Item 2) of the March 1, 2010 Confirmatory Order issued by the NRC to NIST in connection with NRC Inspection Report 030-03732/2008-001 and NRC Investigation Report 4-2008-062 states:

> "For the years 2010 - 2014, NIST shall send a copy of its required annual audit results to the Director, Division of Nuclear Materials Safety, U.S. NRC, Region IV, for licenses SNM-362 and 05-03166-05, within 30 days of receiving the final audit report."

I am submitting herewith, within the required 30 days, the required annual audit results for license SNM-362.

Unless otherwise directed, NIST does not plan to provide the NRC with a copy of the annual audit results for license 05-03166-05 for the following reasons: (1) When NIST requested an amendment of license 05-03166-05 in accordance with Item 5) of the Confirmatory Order, the NRC terminated license 05-03166-05 and issued a new license, 05-03166-06. (2) The requirement above is not a requirement of license 05-03166-06.

If you have any questions or concerns, you may reach me at 301-975-4502 or at richard.kayser@nist.gov.

Sincerely,

Richard F. Kayser
Chief Safety Officer

Attachment

cc: Ms. Vivian Campbell
Chief, Nuclear Materials Safety Branch A
Division of Nuclear Materials Safety
U.S. Nuclear Regulatory Commission, Region IV

Thomas J. O'Brien, Radiation Safety Officer, NIST Gaithersburg
Thomas W. Grove, Radiation Safety Officer, NIST Boulder

NIST

NUREG 1556 Audit of NRC License SNM-362
At the National Institute of Standards and Technology
Gaithersburg, MD

Conducted by:

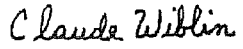
TIDEWATER INC
ENGINEERS / SCIENTISTS / PROGRAM MANAGERS

7161 Columbia Gateway Drive - Suite C
Columbia, MD 21046
phone: 410.997.4458 fax: 410.997.8713
www.tideh2o.net

Prepared by:

Michael S. Davidson, CHP, CHMM
Auditor

November 22, 2011



Claude Wiblin, CHP
Lead Auditor

November 22, 2011

Table of Contents

Attachments

1. OVERVIEW

1.1 Introduction

This audit of the radiation safety program supporting operations under Nuclear Regulatory Commission (NRC) License SNM-362 issued to the National Institute of Standards and Technology (NIST), Gaithersburg, MD was performed on-site from October 24th through 26th with additional document reviews conducted off-site from October 27th through November 16th, 2011. The audit was performed by Claude Wiblin (Lead Auditor) and Michael S. Davidson (Auditor). The audit follows the format recommended in NRC NUREG-1556, Vol. 11, Appendix M and Vol. 6, Appendix K (related to the Part 36 irradiators).

Mr. Wiblin and Mr. Davidson conducted entry and exit briefings with the radiation safety staff and appropriate representatives of the IRSC and NIST management. The entry briefing included representatives of the Gaithersburg Radiation Safety Division (GRSD): Mr. Tom O'Brien, Radiation Safety Officer, Dr. Richard Clement, Senior Health Physicist, Dr. Miles McCord, Radiation Facilities Group Leader, and David Brown, Reactor Facility Group Leader. The exit briefing included: Dr. Richard Kayser, Chief Safety Officer, Mr. Tom O'Brien, Dr. Miles McCord, Ms. Janna Shupe, GRSD Health Physicist, and Tom McGiff, GRSD Health Physicist.

1.2 Audit Purpose and Scope

In accordance with the requirements of 10 Code of Federal Regulations (CFR) 20.1101 and the recommendations of NUREG 1556 volume 11, Appendix M, each Nuclear Regulatory Commission (NRC) licensee is required to conduct an audit of the radiation safety program annually to assess its content and implementation.

This audit included a review of the written radiation safety program at the NIST Gaithersburg site, including License, Implementing Procedures, Ionizing Radiation Safety Committee (IRSC) Minutes, and applicable usage protocols and reviews. Auditors reviewed protocols and processes, including the hazard review process, for approving source acquisition and facility utilization, as well as records of laboratory surveillance, radioactive material inventory control and shipping, personnel monitoring, and personnel training. Follow-up actions of the 2010 annual audit of the SNM-362 license were reviewed, as well as records of response and follow up actions to any inspections/incidents that may have occurred since the 2010 audit. The auditors toured most of the facilities under radiological control and interviewed individuals who were determined to be in positions to materially contribute information for the audit.

1.3 Audit Details

A requirements-based approach was used to achieve audit objectives. During the audit, evidence of conformance to requirements was evaluated through document review and personnel interviews. Facilities and equipment were physically inspected. Audit issues were identified and further investigations conducted as needed. The issues were then classified into findings or observations with recommendations. A finding is defined as any condition or action that deviates from an applicable regulation, standard or procedure or adversely impacts the quality or reliability of any aspect of the radiation-safety program. A recommendation is defined as a suggestion that, when implemented, could improve the performance and effectiveness of a task, process or program. A noteworthy practice is defined as a practice that has resulted in the improvement in the effectiveness or efficiency of the radiation safety program. There were one finding, 16 observations with recommendations, and eight noteworthy practices as a result of this audit. For the audit, the checklist in NUREG-1556 volume 11, Appendix M (Attachment A) was used. A listing of reviewed documents, interviewees, and facilities toured is provided in Attachment A of this report.

1.4 Open Issues

GRSD maintains an Audit Actions Tracking Table which tracks corrective actions to be taken as a result of prior NUREG-1556 audits. There are 20 audit findings which are listed in the action tracking table as either not completed or "N/A" with remarks indicating the "N/A" item is to be completed as part of action on a later audit finding. These audit findings are scheduled for close out by the end of the first quarter of CY 2012 and are being adequately tracked by NIST radiation safety management. The NUREG-1556 Audit Actions Tracking Table is presented in Attachment B.

Fourteen of the 20 audit findings are legacy items related to the status of Radiation Safety Instruction (RSI) procedures that date from the 2007, 2009, and 2010 audits. These issues can be specifically located in the Audit Actions Tracking Table. The importance of finalizing actions on these legacy open issues was emphasized during the audit exit briefing. The NRC typically reviews annual audit results to determine whether appropriate actions have been taken.

The attention to detail taken by GRSD in the action tracking process is recognized as a noteworthy practice.

1.5 Conclusions

Not including the open items discussed above and as detailed in Section 2 of this Report, "Radiation Safety Program Discussion," this audit identified one finding, 16 observations with recommendations, and eight noteworthy practices. Discussions on the audited program appear in Section 2. Specific findings, observations and recommendations, and noteworthy practices are presented in Section 3.

2. RADIATION SAFETY PROGRAM DISCUSSION

2.1 NIST Radiation Safety Program

2.1.1 Program Management

The NIST Director has the ultimate responsibility for establishing and maintaining the ionizing radiation safety program at NIST and provides executive leadership on issues involving compliance with regulatory requirements and the conditions of the license.

The NIST Chief Safety Officer is responsible for:
(1) Overseeing the establishment, implementation, and maintenance of ionizing radiation safety program at NIST supporting the SNM-362 NRC license; and
(2) Submitting applications for renewals of and amendments to NRC License Number SNM-362 pursuant to IRSC review and approval.

The Ionizing Radiation Safety Committee (IRSC) provides oversight of the operations and activities of the NIST radiation safety programs except for those operations and activities conducted under the NRC Test Reactor License (TR-5). The IRSC provides the NIST Radiation Safety Officer (RSO) with independent advice and oversight for the ionizing radiation safety program at NIST Gaithersburg.

Organization: The Director of NIST appoints the IRSC Chair and Vice Chair for indefinite terms at his/her discretion. Members of the Radiation Safety Division staff shall not serve as Chair.

Support: The IRSC Chair appoints a Recorder from the IRSC membership, or an administrative support person under the discretion and oversight of a member of the Committee. The Recorder is responsible to the IRSC Chair for basic administrative support of the IRSC, including notification of meetings, taking and distributing meeting minutes, correspondence, filing, and copying. Quorum Requirements: A quorum consists of the Chair and Vice Chair, the Gaithersburg RSO, and one-half of the remaining assigned members of the committee or their authorized alternates. In the case of the absence of a member and the member's alternate, the member may elect to authorize another member of the committee to vote for them in proxy, thereby satisfying the quorum requirements.

Records of IRSC meeting minutes were reviewed for the CY 2011 meetings. Records of the IRSC indicated continuing oversight and was exercising it responsibilities. The efficient and compliant workings of the IRSC are considered a noteworthy practice considering the scale of the NIST radiological operations.

The NIST Gaithersburg RSO must be certified in the professional practice of Health Physics by the American Board of Health Physics or must have a Bachelor's degree in a science or engineering field and have at least five years of professional-level experience in applied Health Physics. The RSO serves as the SNM-362 license manager and as the point of contact with the NRC. The RSO is responsible for managing the radiation safety program and all aspects of the utilization of ionizing radiation sources. The RSO, or designee, has the authority, as delegated by the NIST Director, necessary to meet his responsibilities and to immediately stop any operations that may (1) compromise the health or safety of NIST employees and non-NIST personnel; (2) have an adverse impact on the environment or public; or (3) result in non-compliance with NRC, State, or local requirements.

The RSO responsibilities are numerous and include (1) establishing and maintaining an effective radiation safety program that allows for the safe and regulatory compliant use of ionizing radiation sources in a manner that conforms to applicable Federal, State, and local regulations and NIST policy and (2) establishing and maintaining a system for hazard analysis, mitigation planning, and emergency response planning integrated into ionizing radiation source use protocols and Radiation Facility authorizations.

The current RSO exceeds the qualifications and experience requirements. He and his staff appear to be fully functional and they are attempting to bring the program to a procedural work process base versus just an historical knowledge base. This is a noteworthy practice.

Personnel considered as potential users of radioactive material and requiring radiological safety training are generally categorized as follows:

(1) Researchers working directly with radiation sources and radioactive materials;
(2) Radiation Safety staff;
(3) Support staff (firemen, security, janitors, electricians, etc.) who must work in areas where licensed material is in use; and
(4) Administrative staff and visitors who frequent areas using licensed materials.

Overall, the management elements of the Radiation Safety Program at NIST (Director, Chief Safety Officer, IRSC, and RSO) are adequately structured and. staffed to exercise their organizational responsibilities. This is recognized as a noteworthy practice. The balance of the GRSD organization appears to be adequately staffed but no formal assessment was done in this regard. About 30 percent of the GRSD staff were newly hired during the past year and bringing new staff up to speed has been a considerable effort for GRSD management.

2.1.2 Audits, Reviews, or Inspections

2.1.2.1 NRC Inspections

An unannounced NRC inspection of NIST's NRC Exempt Quantity Distribution License Number 19-23545-01E and the SNM-362 was conducted in September 2011. A report of findings was not yet available to NIST.

2.1.2.2 NIST Internal Audits

2010 Radiation Safety Program Audit

The annual audit report of the Radiation Safety Program performed by Dade Moeller & Associates, Inc., in November 2010 was reviewed. The report included a review of the following areas: employee radiation doses, work performed by the RSO and Radiation Safety Division, licensing actions, radioactive waste management and disposal issues, radioactive materials inventory, sealed source inventory and leak tests, effluent monitoring, surveys, security of radioactive material, radiation safety training, radiation detection instrumentation, shipping radioactive materials, and areas where radioactive materials are used and/or stored. The audit was reported to follow the format recommended in NRC NUREG-1556, Vol. 11, Appendix M and Vol. 6, Appendix K (related to the Part 36 irradiators).

GRSD has established an Actions Tracking Table (Attachment C) for important issues presented to them. The IRSC assigns each item a number, action, its origin, who corrective action is assigned, date assigned, the due date, whether or not the IRSC must approve the corrective action, remarks, and date completed. This process is recognized as a noteworthy practice.

2010 Radiation Safety Program Report

A copy of the CY 2010 Health Physics Program Report was made available for review. That report provides reviews and documents program actions, surveillance monitoring, dosimetry trends, and other program metrics for the calendar year.

Radiation Facilities Quarterly/Annual Audits

Records indicated that the GRSD conducted the required quarterly audits of those Radiation Facilities approved and posted for use or storage of licensed radiation sources that have significant potential for radiation exposures or effluent releases in excess of 10 percent of the applicable limits. Audits included an assessment of radiological conditions and a review of security, posting, and labeling. Often, the audits included observations and discussions of work practices with Source Custodians and/or Source Users. Identified needs for corrective action found during the audits were transmitted to Source Custodians or other appropriate individuals.

2.1.3 ALARA

The Personnel Dosimetry program monitors external and internal radiation dose received by individuals at NIST. Results for 2010 concluded that NIST maintained radiation exposures to individuals below the maximum allowable annual dose limits established by the NRC including "As Low As Reasonably Achievable" (ALARA). In 2010, personnel monitoring showed that all radiation exposures to individuals were well below all regulatory limits and were, by most measures, lower than individual doses received in 2009. In 2011, personnel monitoring data to date indicates that doses similar to 2010 are anticipated. This condition is recognized as a noteworthy practice.

A previous audit has identified that the NIST radiation safety program has not formally established an investigation level for occupational exposures (sometimes referred to as an ALARA level) which triggers an evaluation by a member of the GRSD staff. As RSI procedures remain in development and are not formally approved, this finding remains open.

When volatile or potentially volatile radioactive materials are received and used, the GRSD performs effluent monitoring. Data for 2010 and 2011 were reviewed. According to the "NIST Gaithersburg Radiation Safety Program 2010 Annual Report" (the "2010 Report"), the primary radioactive material released to the atmosphere was Xe-133. Additionally, an EPA Comply report was prepared for the 2011 releases of I-123, I-125, and I-131. The NRC places a constraint on air emissions of radioactive material to the environment, excluding Radon-222 and its daughters, such that the individual member of the public likely to receive the highest dose will not be expected to receive a total effective dose equivalent in excess of 10 mrem (0.1 mSv) per year from these emissions. Implementing the 10 millirem constraint on annual air emissions is now more complicated as certain naturally-occurring and accelerator produced radioactive material (NARM) came under the jurisdiction of the NRC when the Energy Policy Act of 2005 was signed into law. This change expanded the definition of byproduct material regulated by NRC to include naturally occurring or accelerator-produced radioactive material (NARM), and required action on the part of licensees or NARM possessors. NIST should consider any emissions from linear accelerator activities in a total evaluation. ***See Section 3.2, Observation 1.***

Radioactive material use at NIST under the SNM-362 license is requested and controlled using the Form NIST-364 application and approval process. On June 15, 2011 an approved U-232 sealed source was received and was determined to be leaking when the researcher (authorized to use the source) discovered contamination. Although vinyl gloves were required by the radiological hazard review (as indicated from the applicable NIST-364 form), the gloves were not worn. This is not in compliance with the NIST-364 process. ***See Section 3.2, Observation 2.***

2.2 Amendments and Program Changes

NIST is operating under a timely renewal application submitted to the NRC in 2007. The program has been most recently documented as part of the June 2010 renewal application which is currently pending with NRC.

An additional submittal regarding the IRSC was made to the NRC on March 23, 2011. The revision requests changes to part (4) and the deletion of part (5) under the IRSC section of Item 7 (Individuals Responsible for the Radiation Safety Program). The purpose of the proposed change is to allow the IRSC the flexibility to arrange for a program review conducted by an entity external to NIST or by individuals within the NIST organization.

NIST receives NRC generic communications including the NMSS Newsletter, Regulatory Information Summaries and other types of NRC generic communications. These are reviewed and filed by the RSO. Since the NRC tends to "broadcast" these types of documents only a limited number might be relevant to NIST. Copies were observed in the Radiation Facilities Group Leader's office.

The radiation safety program at NIST is documented via a series of Health Physics Instruction (HPI) documents. The RSO indicated his goal of updating and reintegrating the HPIs into the radiation safety program. Some progress has been made over the past year, as twelve HPIs have been revised, but not yet approved by the RSO. The new procedures may be renamed Radiation Safety Instructions (RSIs).

As indicated in Section 1.3, ten of 37 audit findings from the November 2010 audit related to radiation safety issues remained open. Of these, six relate to updating HPIs: 1-1,1-2, 1-3, 1-4, 2-1, 4-1, 4-2, 4-11, and 4-13, These issues are scheduled for close out by the end of CY 2011 and are being tracked by NIST radiation safety management.

2.3 Facilities

NIST has flexibility and control in the configuration of its facilities because it is a broad scope licensee. Observations of NIST facilities during laboratory tours showed that laboratories were designed to reduce dose to workers through the use of shielding, remote handling/observation, and efficient ventilation systems. Staff do not occupy laboratories in which radiochemistry is performed except when they are actually doing the work. These actions contribute to the low radiation exposures of the staff and are recognized as a noteworthy practice. During the tour of Building 245, only two individuals were observed performing research efforts. One researcher discussed an ongoing calibration of I-125 brachytherapy seeds; see Figure 11, Attachment D.

NIST is authorized to perform work off site but no activities were identified for CY 2011.

NIST Gaithersburg has two beam-type irradiators in use that are subject to the requirements in 10 CFR Part 36 with the exemptions stated in the SNM-362 Amendment 3 (Revised) license issued by the NRC, and one beam-type irradiator head in storage (i.e., not in use). Therefore, the two NIST Gaithersburg irradiators of interest for this 2011 annual audit are:

- One beam-type irradiator which houses a Co-60 source (RS# 99-0119), activity is 2.83E+03 Ci as of 10/18/11; and
- One beam-type irradiator which houses a Co-60 source (RS# 89-0140), activity is 6.69E+02 Ci as of 10/18/11.

The NIST campus contains research laboratory areas, office and administrative areas, and several types of x-ray equipment used for research purposes. Access into areas where radioactive materials are used and stored, including radioactive waste areas, is controlled. All guests or visitors check in with security staff. Radioactive materials are required to be under the control of a Source Custodian.

Several posted laboratories contain chemical fume hoods for work with volatile materials. The air flow through the hood face is checked on a quarterly basis and a marking (or sticker) is provided on each hood to indicate the height for proper air flow. The frequency of the air flow checks and application of fume hoods is a noteworthy ALARA practice which is an aid in the chemical hygiene plan required by OSHA.

NIST requires card key access throughout the facility and also that doors to posted laboratories remain locked. See Figure 14 in Attachment D for a photographic example of this noteworthy practice.

General housekeeping in radiologically controlled areas was not satisfactory, as radioactive waste containers were observed to be overflowing and radiological work areas were untidy with visible dirt and debris. Some of the bench top areas used by researchers in radiological areas were observed to be messy and cluttered, such as the TLD testing lab (where I-125 brachytherapy seed tests were also being performed). Figures 32 through 42 of Attachment D illustrate some of the housekeeping encountered during site inspection. ***See Section 3.2, Observation 3.***

Often, lead brick stacks are used as engineering controls in laboratories to provide shielding from various radionuclide sources. One arrangement on the floor in Room B142 (see Figure 9 of Attachment D) was not ideal as radiation could be detected as streaming through cracks where a europium source and a RaBe source were stored; this situation was corrected that day with rearrangement of the lead bricks. The particular shielding appeared to have been there a long time and a semi-permanent structure. ***See Section 3.2, Observation 4.***

NIST radiation safety management recognizes that the effort to dispose of as many of the legacy sources for which there is a legal and practical disposal or transfer option should continue. Figures 6, 7, 8, 9, and 10 of Attachment D illustrate the variety of sealed source inventory and storage.

NIST has implemented numerous engineering controls for external radiation. Figures 12 and 13 (Attachment D) illustrate the use of shielding for irradiators while Figure 19 illustrates electronic interlock for access control. Fixed area radiation monitors in the irradiator facilities have trigger

set points to disable the device and were found to be in calibration. There are also visible warning lights at the entrances to the irradiator facilities for when an irradiator is in use; though actuation was not performed the devices appeared to be in good operational and materiel condition.

Environmental dosimetry is analyzed in Building 245 Room B043 which is adjacent to an irradiator room. This room configuration should be evaluated as there appears to be potential that the irradiator could be used at the same time that TLDs are being processed which could cause false positive analyses. It was noted that the wall between was partially shielded with bricks (see Figure 15, Attachment D) and the TLDs are stored in a lead container when not in use. ***See Section 3.2, Observation 5.***

One area inspected was Room C10 of Building 245 which was the location of some Pu contamination in a glove box. The glove box ports are covered with metal foil. As illustrated in Figures 21 and 22 of Appendix D, the area is posted"Caution: Contamination Area" on the outside of plastic curtains which are used for non-radiological dust control purposes). Prior to decontamination activities in the Fall of 2010, a hazard analysis was performed and it was determined that potential inhalation doses were not an issue. As a precaution, a Canberra I-CAM air sampler was run during the operation as well as a separate air filter sample. No Pu activity was detected via the air sampling. All of the lining material inside the glove box was removed and the box internals were wiped down. It is possible that there is residual contamination still inside the glove box. GRSD has advised that further assessment is in progress.

See Section 3.2, Observation 6.

2.4 Equipment and Instrumentation

Calibrated and functional survey instrumentation is maintained to support monitoring needs in each Radiation Facility where external dose rates are likely to reach the criteria for a radiation area as defined in 10 CFR 20 or where surface contamination control limits, as defined in HPI 1-1, are likely to be exceeded. Survey instrumentation was available and on loan from the Radiation Safety office to support required monitoring activities; see Figure 16 of Attachment D for a photo of a typical survey meter on loan. Figure 17 shows an informal sign-in/out sheet for survey meters which is not in proceduralized). The current instrument loan process flexibly provides research customers with needed instrumentation. A standardized instrument sign-out log may be useful to track instruments requiring near-term calibration. ***See Section 3.2, Observation 7.***

Calibrations were performed using sources traceable to NIST primary standards (this is the NIST facility providing calibration standards on a worldwide basis). Any instrument that does not meet the calibration and testing requirements is considered to be "out-of-service" until repair and retesting is performed. All portable survey instruments are calibrated on a six month basis. During the tour, calibration stickers on multiple survey meters were reviewed for calibration

within the last six months; "In-service" portable instrumentation was observed to be labeled to verify calibration.

Portable survey instruments used for dose rate measurements were calibrated every six months or after repairs or modifications that could affect response. Portable survey instruments used for contamination monitoring were calibrated electronically and source response checked every six months or after repairs or modifications that could affect response. Portable radiation survey meters used in laboratories are required to be calibrated at least semi-annually. The calibrations are performed in-house by NIST personnel. Records of meter calibrations are available and were reviewed during the audit. Portable survey instruments were calibrated in accordance with recommendations from the manufacturers or by written procedure. Instruments were reported to be evaluated at approximately 20 percent and 80 percent of each scale or decade as practicable. Instruments were removed from service if they could not be adjusted to within ±20 percent of the expected value.

Records of calibrations and instrument QA were retained for inspection for the required three years.

NIST owns several liquid scintillation counters (LSCs) and gamma counters for counting radiological samples such as wipes and bioassay samples. Maintenance of the LSCs is provided via service contracts with instrument manufacturers. The counters used by the GRSD are subject to daily Quality Assurance/Quality Control procedures which ensure the generation of quality data.

The whole body and hand-and-foot contamination monitors are calibrated by a pulser and the detectors checked for response to a beta emitting radiation source. No operational checks are made with alpha emitting sources. Figures 3 and 4of Attachment D illustrate the types of frisking stations and contamination survey meters which are available to NIST radiation workers.

Pocket ion chambers are calibrated annually and records are maintained. It was reported in the 2009 audit that there is no written NIST procedure for this calibration routine. The procedure performed is based on the staff's interpretation of an appropriate ANSI standard and the application of NIST's calibration range capabilities.

Figure 20 of Attachment D illustrates the noteworthy and ongoing development of a check source template for operational checks of survey meters.

No safety component defects were identified and no notifications were needed to be made per 10 CFR Part 21.21, "Notification of failure to comply or existence of a defect and its evaluation."

2.5 Material Use, Control, and Transfer

GRSD develops and maintains procedures that govern the shipping and receipt of all RAM, develops and provides training programs required by transportation regulations, and performs service functions that include the following.

- Assessing shipments of sources, standards and research materials to determine if they are subject NRC and DOT regulations.
- Preparing outgoing shipments of regulated items for shipment.
- Processing incoming shipments of regulated items.
- Performing clearance surveys of irradiated samples at NCNR.
- Assigning inventory tracking numbers (RS numbers) to incoming samples of RAM.

During CY 2010, there were 144 DOT regulated shipments and 180 receipts of RAM. During CY 2011 through October there were 265 DOT regulated shipments and 170 receipts of RAM.

2.5.1 National Source Tracking System

NIST reported possession of 14 devices having sufficient activity to require reporting via the National Source Tracking System as required by 10CFR § 20.2207 "Reports of transactions involving nationally tracked sources." All reported sources at NIST contain either Cs-137 or Co-60. Control of these sources was found to be adequate and GRSD staff members were aware of the requirements for control of such quantities, including Trustworthy and Reliable personnel requirements.

2.5.2 Receipt and Transfer of Radioactive Material

The NRC Confirmatory Order of March 1, 2010, resulting from the Boulder, CO event in 2008, requires NIST to develop and implement a formal radiation hazard analysis process that confirms that the requirements of the hazard analysis have been addressed prior to the commencement of work. The process must also ensure that guidance, if any, provided by the manufacturer/distributor of radioactive material is appropriately reflected in operating and emergency procedures. The program has been implemented by memos written by the RSO to supplement existing HPIs; however, documentation of legacy process analyses is on-going and its priority should be raised. ***See Section 3.2, Observation 8.***

10 CFR 20.1906 (c) requires procedures for receiving and opening packages and requires radioactive package monitoring as soon as practical after receipt of the package, but not later than 3 hours after the package is received at the licensee's facility if it is received during the licensee's normal working hours, or not later than 3 hours from the beginning of the next working day if it is received after working hours. The primary receipt location for all types of material is Building 301; however, radioactive material is considered in transit until it arrives at Building 245 as the final delivery address is that building. Hazmat training as required by DOT for package handlers is provided for receipt personnel at Building 135 and was verified to be current.

Radioactive material receipt records were reviewed. Radioactive material shipping and transfer records were reviewed. Shipping papers comply with DOT and ICAO regulations. Quality control (QC) checks are to be performed when packages are prepared for shipment. There are checklists used to verify that certain requirements have been met. HPI 4-11 and HPI 4-13

describe procedures to be followed when preparing packages containing radioactive material. Both HPI's have been previously reported as requiring updating because they contain information that is incorrect, such as incorrect shipping names.

Packages are received in and prepared for out-going transport by GRSD staff who have completed the appropriate hazardous materials (HAZMAT) shipping training as required by the U.S. Department of Transportation (DOT). HPI 4-2 contains instructions for package receipt and inspection. This HPI is another example of procedure development considered in progress but reported as deficient during the 2010 audit. There were 170 RAM package receipts in CY 2011 as of the date of this audit.

2.5.3 Inventory and Leak Tests

NIST maintains an inventory of licensed radioactive material in its possession. Efforts are being made to evaluate each laboratory to determine if any legacy sources might not be in inventory.

GRSD maintains an electronic database that documents the arrival, use and disposal of each item as well as the name of the Source Custodian. The accuracy of the database is confirmed annually through a physical inventory performed by Source Custodians. Additionally, the database identifies which sources are subject to license requirements for semi-annual leak testing.

In CY 2010, the total number of sources registered in the inventory database, the number of sealed sources requiring leak testing, and the number of sources designated as special nuclear material were 1311, 201, and 98, respectively. There was an increase (almost double) in the number of items of Special Nuclear Material in 2010 from 2009 which was the result of a comprehensive reconciliation of the NIST radioactive material inventory with respect to the classification of items as Special Nuclear Material. The Semi-Annual CY 2011, Sealed Source Leak Tests indicated that there were 208 sources leak tested.

NIST maintains records of SNM inventory, receipt and transfers. NIST files semi-annual reports in the Nuclear Materials Management and Safeguard System (NMMSS).

A review of all radionuclides on hand relative to the allowed license limits indicated that most radionuclides were <10 percent of the license limit. NIST tracking of license possession limits currently indicates one radionuclide Thorium (any form) at 79 percent of the limit. Considering the high percentage, the potential for exceeding license limits is deemed possible. ***See Section 3.2, Observation 9.***

2.5.4 Security and Control

Accompanied by a GRSD Health Physicist, Audit team members visited about 30 laboratories in Building 245. Access to irradiators in the building is controlled through procedures designed for compliance with the NRC Order for Increased Controls on Quantities of Concern.

In addition to key card access throughout the facility, NIST requires that doors to posted laboratories remain locked. Figure 14 of Appendix D shows a typical electronic entrance control. Included were Rooms B133 where radioactive material is received and Room 132 where a large number of old sources are in storage awaiting disposition. All laboratories were found locked and mostly unoccupied at the time of the visit. For the purposes of source security, certain rooms required carding by authorized users for entry.

Building 245 is posted with the NRC Form 3 as required as well as the information required by 10 CFR Part 19. Laboratories were appropriately posted as required by 10 CFR Part 20. Radiation measurements made by the Auditor were consistent with the postings.

Smaller sources (physical size) were frequently observed in labeled containers such as the one shown in Figure 47, Appendix D or simply labeled on the larger container such as a freezer, Figure 49, Appendix D.

There were no instances of lack of security of radioactive materials observed during the tour of the radioactive material labs. Facility security for radioactive materials was good and is recognized as a noteworthy practice.

2.6 Area Radiation Surveys and Contamination Control

2.6.1 Room Surveys and Records

Survey records for weekly surveillances and quarterly audits are maintained and were reviewed. These include direct radiation and contamination surveys. Direct radiation levels and contamination are very low and practically consistent with background in most locations. Low levels of direct radiation, well within limits, are measurable at the surfaces of self-contained irradiators and source storage areas. Surveys appeared adequate to show compliance with 10 CFR Part 20 public dose limits for direct exposure.

Survey requirements for areas where radioactive materials are used and stored were established per the 1997 license renewal application and the HPIs. Survey frequencies are a function of the category of laboratory, which is based on the type and quantity of radioactive material used. For most posted rooms, the program requires that the GRSD conduct and document a weekly survey and/or a quarterly audit. Material users are trained to perform a daily contamination survey following work with radioisotopes.

Surveys by the radiation safety staff consist of the collection of smear samples and the use of portable radiation detection equipment to assess ambient radiological conditions and those on work surfaces within posted areas. Additionally, exposure rates are measured to ensure compliance with applicable posting requirements. A check of work place classification, radiological facility conditions, security checks, and other compliance related items are performed during each quarterly audit. All findings from both weekly surveys and quarterly audits are documented on the applicable forms. Figures 43, 44, and 45 in Appendix D indicate that both the surveys are being performed and that researchers are aware of the results. It was

noted that survey measurement locations were minimal; one at each laboratory entrance and one to two within the laboratory as indicated on the entrance postings. ***See Section 3.2, Observation 10.***

Quarterly surveys of chemical fume hoods are completed and documented.

2.6.2 Leak Tests and Inventory

The GRSD tracks the inventory of radioisotopes maintained by Source Custodians in the laboratories via an electronic data base. An inventory report was reviewed. The Radiation Safety Division sends out a request to the Source Custodians each year to verify their inventory of radioactive material. The inventory report identified several radium sources in NIST's possession. NIST notified the NRC of their possession of these sources when the initial license renewal application was submitted to NRC in 2007. The RSO has contacted the NRC to determine if a separate action was needed to amend the current license while the renewal application is reviewed; approval of the sources is pending.

Leak testing is performed on a six-month basis and the results of the testing are well documented. Leak test data is recorded in units of net counts per minute which are then converted to microcuries and compared to the limit. Records were reviewed and no deficiencies were noted regarding leak testing.

The process for ordering/receipt of radioactive material via the NIST-364 form is in place but not always complied with by Source Custodians. However, material is not released to the researcher until the NIST Form-364 is completed. However, (1) researchers may order the material without notification to the radiation safety staff or (2) customers such as DOE could ship material for testing and then provide notification. Either of these two types of actions could lead to exceeding the license possession limits and also potentially rush (or delay) the hazard analysis for the protocol. As previously stated, NIST tracking of license possession limits currently indicates thorium (any form) at 79 percent of the license limit. Exceeding license limits is deemed possible.

NIST continues its effort to establish an inventory of all sources – some of which have become significant as naturally occurring and accelerator produced material are now NRC-licensable material. Many sealed sources have been collected, but it appears that more remain in laboratory areas without a designated plan for use. Unnecessary exposure to radioactive material, which could be prevented, could lead to a violation of the 10 CFR Part 20 ALARA principle for making every reasonable effort to maintain exposures to radiation as far below the dose limits in this part as is practical consistent with the purpose for which the licensed activity is undertaken. ***See Section 3.2, Observation 11***

2.7 Training and Instructors to Workers

The required notices per 10 CFR 19.12 Instruction to workers were observed at the primary entrance to Building 245. See Figure 1 of Attachment D which shows the first items observed when entering Building 245. NRC Form 3 was posted nearby.

Training programs are required under both NRC and DOT regulations and by NIST's SNM-362 license. The level of training must be appropriate for the individual's assigned duties and must be provided prior to working with radioactive material and every two years thereafter. The GRSD provides an explanation of NIST's radiation safety training requirements on its web page along with information about the training programs that are available to meet them. GRSD develops and maintains the necessary training materials and provides them in both on-line and instructor-led formats. GRSD also maintains the necessary documentation of attendance. 254 individuals received training as Source Custodians or users during CY 2010. Radiation safety training is a particularly noteworthy practice within NIST's radiation safety program.

To become a Source Custodian or Source User of radioactive materials, NIST employees must sit for initial Radiation Safety training. The course consists of an online module followed by classroom training. Refresher training is required every two years. The NRC Confirmatory Order issued following the Boulder incident required NIST to improve their radiation safety training program. The ten additional program elements noted in the Order are part of the training content.

Training records are maintained in the radiation safety files; relevant records were reviewed. In addition to hard copy records of training courses, records of employee training status are maintained in an electronic database. The GRSD staff quickly produced a list of persons showing their training status. Training records from 2010, including records of DOT HAZMAT training, were reviewed. The RSO indicated that web base training was in development (near completion as evidenced by draft program) for researchers, source custodians, and users.

Very few workers were actually using radioactive materials during the audit. However, two persons identified themselves as Source Custodians and exhibited excellent knowledge of the radiation safety procedures that were relevant to their work. Questions related to material security, survey requirements, and the use of survey meters were answered correctly.

See Section 3.2, Observations 12, 13, and 14.

2.8 Radiation Protection

2.8.1 General

There are numerous radium sources possessed by NIST and leak tests are being performed on those that are in use. Many of the sources were manufactured many years ago (including at least one by Madam Curie). The auditors' direct experience with radium sources is that they will eventually leak (i.e., emanate radon and radon progeny with deposition on surfaces near and far

from the source). Given the above, the potential for occupational internal dose from leaking radium sources may not been fully evaluated as required by 10 CFR 20.1502, Conditions Requiring Individual Monitoring of External and Internal Occupational Dose. This part requires licensees to monitor exposures to radiation and radioactive material at levels sufficient to demonstrate compliance with occupational dose limits.

Figures 7, 9, 10 and 46 found in Attachment D illustrate example locations of radium sources in the laboratories. ***See Section 3.1, Finding 1.***

2.8.2 Dosimetry

External dosimeters are obtained from the U.S. Navy Medical facility in Bethesda, Maryland. Whole body and/or extremity (ring) dosimeters are provided to workers based on the materials (or x-ray generating devices) that they utilize. The decision to provide dose monitoring is part of the hazard assessment done by GRSD upon receipt of a form 364 or 365 application. Dosimeters of record (TLDs) are exchanged on a quarterly basis, and workers are provided with a copy of their dose results if their annual dose exceeds 50 mrem or upon request. Typical doses to workers associated with the SNM-362 license are relatively low, with higher doses associated with reactor personnel and some users of high energy gamma-emitting radionuclides.

Records of radiation doses to radiation workers are maintained by GRSD. Dosimetry records are maintained in both hard copy as well as electronically in the Radiation Safety data base. Data from 2010 and 2011 were reviewed and most exposures were below an annual radiation dose in excess of 10 percent of any applicable NRC occupational dose limit.

NIST performs and tracks internal dose via a bioassay program consisting of thyroid scans following work with radioactive iodine and urinalysis is performed following work with relatively high quantities of radioisotopes (typically H-3). The thyroid scans are performed typically at one point each year following an annual campaign of work with iodine. Tritium bioassays are more frequent and are documented on Tritium Bioassay Review Pre-Post Report forms. A maximum internal dose of 5.5 mrem has been received by one individual in 2010. Individuals using radioiodine in 2011 were reported as having no thyroid uptake.

There were no declared pregnant workers for the past year according to the GRSD staff. Training is provided on this topic in the radiation safety training program.

Data from the NIST Gaithersburg Radiation Safety Program 2010 Annual Report indicates:

- Of the 1090 workers monitored during 2010, 650 received a measurable whole body dose. Of these only 60 workers exceeded 50 mrem (1 percent of the annual whole body exposure limit) and no workers exceeded 500 mrem (10 percent of the exposure limit). Aside from the fact that no worker received a whole body dose exceeding 500 mrem, the distribution of workers in each dose range category during 2010 remained largely unchanged compared to the previous years.

- In addition to monitoring workers for external whole body exposures, a number of workers were monitored for extremity exposures using finger ring TLDs. Of the 52 individuals monitored in 2010 for extremity dose, 50 received measurable dose, and of these only two workers exceeded 10 percent of the regulatory limit. Their doses were 8.8 and 10.3 rem.

No deficiencies in the dosimetry program were noted during this audit. Records of individual dose for 2011 were not yet completed as the CY has not ended.

2.9 Radioactive Waste Management

NIST generates a variety of radioactive waste from operations associated with the SNM-362 license. The types of wastes include contaminated solids, liquids, activated materials, liquid scintillation counting vials, smoke detectors, and discrete sources. Figures 8 and 48 of Attachment D show how dry waste is stored prior to transfer to Building H100.

Wastes that are to be transferred to other licensed waste processors and disposal facilities are collected and delivered to Building H100 for storage and preparation for offsite shipment. Wastes generated from operations under license SNM-362 are kept separate from waste generated under other licenses. Liquid wastes generated under license SNM-362 are held in two holding tanks (see Figure 5 of Attachment D) for storage prior to release to the sanitary sewer system.

The content of radioactive waste items was identified with a "tag" which contains information on the radionuclide(s) present and an estimate of the activity. During the tour of Building H100 it appeared that all waste items contained a tag with the necessary information. Currently, of the radioactive waste generated at NIST, approximately 95 percent by volume and 99.9 percent by activity is generated from reactor facility operations.

Solid radioactive wastes are compacted into 55-gallon drums prior to shipment to authorized burial sites offsite. Contracted waste brokers mark and label the packages, and prepare the shipping papers based on information provided by NIST. NIST staff survey the drums to determine external dose rates and contamination levels on the outer surface of each container. Swipe samples are analyzed with a Tennelec 5E detector to measure alpha, beta and gamma emitting contaminants. Calibration stickers on all meters located in the waste storage area indicated calibration within the past year.

Radiation dose rates within the H100 building were found to be in accordance with Postings on the outside and inside of the Building H-100 were consistent with radiological conditions. Contamination surveys are performed after wastes are processed in the Building H100.

Air effluent releases, which consist primarily of radioactive iodine, are filtered through charcoal filters. See Figure 8 of Attachment D which shows some used air particulate filters and boxed filters awaiting disposition.

The liquid radiological waste system operations in Building 245 were reviewed. Currently all sink drains are connected to the two-tank waste system and there is a policy of no radioactive liquid disposal via sinks or drains. When tanks are filled a sample is collected and analyzed using liquid scintillation counting, gamma spectroscopy, and gross alpha-beta analysis. The last tank release was in January 2011. Analyses of the radiological contents of the tank were provided. A review of that release data showed the appropriate analysis was performed and that there was no detectable activity present.

Laboratory liquid wastes are collected in chemical containers and moved with the solid waste to Building H100. Instruction for transfer of radioactive waste from a building to the Waste Holding Area in H100 is provided in HPI 8-3; however, this procedure does not account for provision of absorbent material for potential spills. ***See Section 3.2, Observation 15.***

NIST does not dispose of radioactive waste through decay-in-storage at this time.

NIST does not perform incineration of radioactive waste.

2.10 Decommissioning

A contractor produced a Decommissioning Cost Estimate report for NIST in June 2009. The methodology implemented followed the guidance provided by NRC in NUREG 1757 Volume 3. It also included a scoping survey of the accelerator facility to provide the basis of decommissioning that area. There are documents related to this topic on the NRC ADAMS web site which indicate acceptability to the NRC.

Records are maintained of every isotope used in every laboratory by room number under this license. These records include a listing of every isotope ever used and whether or not the laboratory is currently active or not. GRSD staff is not aware of any upset conditions, spills or releases outside the buildings or on-site burials, which were once permitted by the 10 CFR Part 20 up to the early 1980's.

2.11 Transportation

GRSD develops and maintains NIST procedures that govern the shipping and receipt of all RAM, develops and provides training programs required by transportation regulations, and performs service functions that include the following.

- Assessing shipments of sources, standards and research materials to determine if they are subject NRC and DOT regulations.
- Preparing outgoing shipments of regulated items for shipment.
- Processing incoming shipments of regulated items.
- Performing clearance surveys of irradiated samples at NCNR.
- Assigning inventory tracking numbers (RS numbers) to incoming samples of RAM.

Documentation of radioactive material shipments was well maintained and included the required radiological surveys, package marking, and labeling assessments.

NIST ships out many packages of radioactive material each year. Some materials are shipped in Type A packages, others are shipped in excepted packages as limited quantities or instruments or articles, and some packages contain radioactive materials that do not qualify as hazardous materials under DOT regulations. A review of some records of radioactive material shipments to other facilities was performed.

NIST has an ongoing action to retrieve material from licensees which received radioactive material from them prior to NIST having a copy of their license. NIST also has a program in place to assure that NIST has a copy of the recipient's license prior to shipment or transfer.

2.12 Notifications and Reports

Compliance with NRC requirements was determined by conversations with the RSO and GRSD staff. NIST had no events involving stolen or lost material, incidents, overexposures, or high radiation levels under this license that required reporting to the NRC. Reports to individual radiation workers were provided as required, but most workers had exposures below 100 mrem/yr and automatic reports are not required by 10 CFR Part 19 unless requested by the worker.

There has been no radioactive material theft, loss, or overexposure at NIST requiring notification of NRC.

GRSD presented documentation of a contamination issue in 2011 related to a leaking U-232 source. The documentation included descriptions of the event and response actions. The follow-up activities and corrective actions implemented were also described. This was not an NRC reportable event.

2.13 Posting and Labeling

While touring many areas and labs posted for radioactive materials, observations were made regarding proper use of radioactive material and radiation area postings.

- The NRC Form 3 "Notice to Employees" was found posted appropriately.
- All rooms approved for work with radioactive materials were properly labeled.

- Several rooms and pieces of equipment were posted with "CAUTION RADIATION AREA" as appropriate, based on the external exposure rates observed in these areas.

However, several observations related to incorrect posting and labeling were noted and are illustrated in Figures 23 through 31 in Attachment D. The figures are considered to be self-explanatory (antiquated, partial obliterations, non-specific, etc.) from their captions. One practice in particular s a cardboard box (see Figure 44) that is dedicated to contain radioactive waste; apparently it is reused but plastic might be considered for proper containment and radioactive waste volume reduction. This box was identified in the 2010 audit without the radioactive material tape. ***See Section 3.2, Observation 16.***

2.14 Independent and Confirmatory Action Measurements

Surveys performed by the Auditor during lab tours showed radiation levels consistent with area postings. The Bicron micro-rem meter, S/N A273X was used by the Auditor. It was in calibration and was operationally checked before issuance.

No food, drinks, or tobacco use were observed in any of the radiological laboratories.

3. AUDIT RESULTS

There were one finding, 16 observations, and eight noteworthy practices relevant to the content and implementation of the Radiation Safety Program as a result of this audit, notwithstanding remaining open radiation safety issues as discussed in Section 1.4 of this report.

3.1 Findings

Finding 1:
The potential for occupational internal dose from radon and radon progeny due to leaking radium sources may not been fully evaluated as required by 10 CFR 20.1502, Conditions Requiring Individual Monitoring of External and Internal Occupational Dose

Finding 1 Discussion/Recommendations:
The audit team recommends that NIST take steps to fully evaluate the potential for occupational internal dose from radon and radon progeny from the radium sources in their possession.

E-Perm equipment for measurement of radon was observed in Room A010 which could be calibrated and used to perform the surveys, or alternate measurements may be employed such as alpha-track detectors. Procedures should be updated to include evaluation in the event of source breech and periodic routine surveillance. Training of radiation safety staff in both the conduct of the survey and the new procedural requirements should be performed.

3.2 Observations

Observation 1:
NIST is implementing NRC's 10CFR 20.1101(d) for the constraint on air emissions of radioactive material to the environment, excluding Radon-222 and its daughters, of 10 mrem per year; however, there does not appear to be a trigger procedure to perform an evaluation.

Observation 1 Discussion/Recommendations:
Known emissions for radionuclides such as xenon-133 and radioiodine are monitored and release concentrations or dose implications are evaluated. Implementing the constraint on air emissions is now more complicated as certain naturally-occurring and accelerator produced radioactive material (NARM) came under the jurisdiction of the NRC when the Energy Policy Act of 2005 was signed into law. This change expanded the definition of byproduct material regulated by NRC to include NARM, and required action on the part of licensees or NARM possessors. NIST should also consider any emissions from linear accelerator activities in a total evaluation.

Licensed material included in reviews for the last two years included known (or potential) releases of xenon and iodine. A procedural technique should be developed to trigger the staff to monitor and what data to collect for entry into the EPA's COMPLY software program. It was unclear whether high efficiency particulate air (HEPA) filtration for ventilation and air effluent pathways is quantitatively verified. If effluent calculations take credit for filtration, then the efficiencies of these systems should be monitored and verified.

Observation 2:

On June 15, 2011 a U-232 sealed source was received and was determined to be leaking when the researcher (authorized to use the source) discovered contamination. Although vinyl gloves were required by the radiological hazard review (as indicated from the applicable NIST-364 form), the gloves were not worn. This is not in compliance with the NIST-364 process.

Observation 2 Discussion/Recommendations:

Compliance by Source Users and Source Custodians with the NIST-364 process and hazard review requirements is critical to radiological controls and regulatory compliance. Compliance with the NIST-364 process may be reinforced through retraining and/or temporary suspension of radiological worker status, and potentially incorporated as a metric for personnel performance reviews by the Operating Unit.

Observation 3:

Housekeeping in Building 245 was considered poor as two radiological waste containers were observed to be overflowing in separate laboratories. General housekeeping was also poor as general trash and debris was observed on unswept floors. Several rooms appeared to be cluttered with tools, glassware, out of date apparatus, etc., which could be stored or disposed. General housekeeping is often an indicator used by regulators for the effectiveness of a radiological controls program.

Observation 3 Discussion/Recommendations:

Signs were observed indicating that housekeeping staff were not allowed to enter several laboratories. This absence of maintenance/housekeeping is probably the reason for this condition. Other facilities include training for housekeeping staff and permit them in hazardous work areas. Such access should be considered in part for this facility, or housekeeping duties in radiological areas could be assigned to members of the radiation safety staff. Ideally, this should be the responsibility of the designated Source Custodian of the specific work area.

Researchers need to be reminded that maintaining neat and orderly workspaces in radiologically controlled areas is their responsibility. This accountability could be reinforced through a retraining requirement if degrading conditions are identified during room surveys by the radiological staff. Retraining is now conducted every two years but the time period interval could be shortened by the RSO depending upon the frequency of recurrence, with authorization for the Source Custodian or Source User suspended for poor housekeeping practices.

Observation 4:

HPI 4-15 defines the requirements for a hazard analysis of new protocols; however, existing and perhaps once temporary engineering controls are in place for which the formal review and ALARA analysis might not be available. For example in Building 245, several stacks of lead bricks were observed for shielding sealed sources but the actual source use, hazard analysis, and time period were not readily available. One stack of lead shield bricks was noted to not be uniformly stacked permitting low level streaming of gamma radiation; this was corrected that day by the Radiation Safety staff by reconfiguring the shield bricks.

Observation 4 Discussion/Recommendations:

NIST has recognized that a legacy process hazard analysis is required and is in process. There are several outstanding items that NIST is tracking at this time. This should receive a high priority and made part of the procedure development, inventory and control of radioactive material, and housekeeping initiatives.

Observation 5:

Environmental dosimetry is analyzed in Building 245/Room B043 which is adjacent to an irradiator room. This room setup is questionable as there appears potential that the irradiator could be used at the same time that TLDs are being processed which could cause false positive data. It was noted that the wall between the rooms was partially shielded with bricks (type was unconfirmed) and the TLDs are stored in a lead container when not in use.

Observation 5 Discussion/Recommendations:

It is recommended that the irradiator be confirmed as not in use (1) prior to removing TLDs from the shielded container and (2) for all TLD processing evolutions. Alternately, the environmental dosimetry processing laboratory could be relocated.

Observation 6:

Room C10 of Building 245 was inspected, which was the location of some Pu contamination in a glove box. Decontamination was described to be completed at some time in the future As illustrated in Figures 21 and 22 of Appendix D, the area is screened off with plastic curtains. The area was posted "Caution: Contamination Area" on the outside of the plastic curtains. The glove ports on glove box in the area only appear to be covered with foil, which may not provide a complete seal and can deteriorate.

Observation 6 Discussion/Recommendations:

The area described in Room C10 is a legacy Pu contamination area, and is is in need of a final verification of its decontamination status. Airflow in the room and integrity of the glove box should be verified. Contamination control measures and air monitoring would likely be important to this campaign.

Observation 7:
There is no formal sign-out or assignment system for radiation survey instruments on loan to the various laboratories. If the instrument is not located near its recalibration date, there is an increased potential for use of a health and safety instrument past its calibration time frame, though no such condition was noted during this audit.

Observation 7 Discussion/Recommendations:
The current instrument loan process flexibly provides research customers with needed instrumentation. A standardized instrument sign-out log may be useful to track instruments requiring near-term calibration. A tracking system should be established for location of the various survey meters on loan.

Observation 8:
The NRC Confirmatory Order requires NIST to develop and implement a formal radiation hazard analysis process that confirms that the requirements of the hazard analysis have been addressed prior to the commencement of work. The process must also ensure that guidance, if any, provided by the manufacturer/distributor of radioactive material is appropriately reflected in operating and emergency procedures. The program has been implemented by memos written by the RSO to supplement existing HPIs; however, documentation of legacy source storage and use processes is on-going.

Observation 8 Discussion/Recommendations:
Documentation of all legacy source storage and use processes will provide further assurance that the appropriate level of hazard review has been performed. One goal of the current inventory update effort is to identify such legacy sources. Priority for this action should be raised.

Observation 9:
The process for ordering/receipt of radioactive material via the NIST-364 form is in place but not absolutely enforced. That is, researchers may order the material without notification to, or knowledge by, the radiation safety staff. This could lead to exceeding the license possession limits and also potentially rush (or delay) the hazard analysis for the protocol.

Observation 9 Discussion/Recommendations:
NIST tracking of license possession limits currently indicates one radionuclide thorium (any form) at 79 percent of the limit. Exceeding license limits is deemed possible. Researchers need to be reminded, through recurrent training and immediate notification, of the consequences of violating NIST license possession limits and the required use of NIST-364 process and form. In the event that GRSD recognizes that an incoming delivery will cause exceedance of a possession limit, acceptance of the package may be refused.

Observation 10:

Most toured laboratories had a recent survey posted on their entrances indicating that usually only two contamination measurements were performed; one measurement at the door entrance and one elsewhere in the laboratory. This abbreviated survey affords indication that contamination is not spreading from the laboratory but a more detailed survey could provide additional information regarding the overall contamination status of the laboratory.

Observation 10 Discussion/Recommendations:

More than two smears (nominally five) per laboratory should be taken. Survey technicians should be instructed to assess contamination in known potential areas such as drains, cracks in floors, chemical fume hoods, source storage areas, and wall-to- floor interfaces. Consideration should be made for use of wide area wipes (industrial broom size) which would provide some of the needed housekeeping discussed in Observation 2 and minimize the spread of undetected contamination.

Observation 11:

NIST has instituted a continuing effort to establish an accurate inventory of all sources, some of which have become more significant as naturally occurring and accelerator produced radioactive material (NARM) are now NRC licensable. Many sealed sources have been collected but it appears that more remain in laboratory areas without a designated plan for use. Unwarranted exposure to radioactive material which could be prevented could lead to a violation of the 10 CFR Part 20 ALARA principle (as low as is reasonably achievable) for making every reasonable effort to maintain exposures to radiation as far below the dose limits as is practical consistent with the purpose for which the licensed activity is undertaken.

Observation 11 Discussion/Recommendations:

An immediate campaign should be planned to remove and securely store sealed sources (and any other radioactive material) from the various laboratories for which a planned use cannot be identified.

Observation 12:

Training and qualification of Physical Science Technicians is performed and documented with a check list showing dates of demonstration and completion of required tasks However, this training process and maintenance of training records and certificate updates is not in a procedure. Also, the tasks for which the technician is evaluated are not cross-referenced to the applicable procedure. Required (current) training certificates for training regarding receipt of air delivered packages containing radioactive material were not immediately available, though that training had been conducted. .

Observation 12 Discussion/Recommendations:

As part of the HPI upgrade initiative, a training procedure should be developed to include a records requirement and maintenance section. The OJT checklist for training of Physical Science Technicians should be revised to include a cross-reference to each applicable procedure. The training procedure should include training and qualification requirements for OJT evaluators.

Observation 13:
Visitors are escorted by radiation workers who are qualified and trained to do so; however, only a minimal briefing regarding radiological hazards or emergencies was provided to the audit team.

Observation 13 Discussion/Recommendations:
Most industrial and radiological facilities require a general safety and radiological hazards briefing prior to facility entry. NIST should consider development of a short briefing form with an indication that it has been read and understood by visitors entering radiological areas.

Observation 14:
The training exam for radiation workers was described as "take-home" (soon to be computer on-line based) and is used repeatedly without change of questions or question order.

Observation 14 Discussion/Recommendations:
Multiple exam questions per learning objective is recommended to assure that examination validity and reliability is maintained. Random generation of individual questions per objective on each exam will help to avoid duplicative exams that can be memorized. A signature could be required indicating that the work is only that of the student, though that issue should be resolved through the computer-based system using access codes or passwords.

Observation 15:
Instruction for transfer of radioactive waste from a building to the Waste Holding Area in H100 is provided in HPI 8-3. This procedure does not account for provision of absorbent material for potential spills.

Observation 15 Discussion/Recommendations:
Although the roads traveled are deemed as private roads and not subject to DOT regulations, certain practices should be employed to provide additional assurance that any release of material will be prevented. Routinely, this requires using sufficient absorbent material to absorb twice the total volume of the liquid in the package. Advice regarding this topic was found on the Illinois web site: https://tier2.iema.state.il.us/LLRWSurvey/Glossary.aspx. "Absorbent materials such as diatomaceous earth or vermiculite are currently added to several institutional waste streams to minimize potential transportation impacts. These streams include liquid scintillation vial (LSV) waste, absorbed liquid waste, and biowaste. Existing commercial disposal facility operators require that these wastes be packaged with specified proportions of waste to

absorbent material before they are accepted for disposal. For example, LSV waste is required to be packaged using sufficient absorbent material to absorb twice the total volume of the liquid in the package. Lime is frequently added to the biowaste stream. Double packaging of these waste streams is also used for additional safety. For the liquid scintillation vial and the absorbed liquid waste streams, a volume increase factor of 3.0 assumed. NOTE: Absorbents such as vermiculite and diatomaceous earth are not considered to be solidification agents since they do not chemically or physically bind the wastes."

An excellent reference regarding sorbent material was written for Westinghouse Savannah River Company, Evaluation of Absorbents for Compatibility with Site Generated Hazardous and Mixed Liquid Wastes, WSRC-RP-2001-00966, Rev. 0, November 25, 2001.

It is recommended that NIST provide specific instructions for this precaution in HPI 8-3.

Observation 16:

Certain areas were improperly or inconsistently posted with notices and postings. Informed radiation workers who understand radiological postings may become complacent or distrustful of these important postings if the posting and labeling program is inconsistent. Certain signage observed during the audit included:

- Partial (yet readable) Radiation Area Postings were observed on two Gamma Cell Irradiators during the audit.
- Several legacy labels were observed on various devices indicating results of leak tests from 10 years ago or more.
- "Radiation area at demarcation line - Film badge required" where no demarcation line existed and film badges are not used.

Observation 16 Discussion/Recommendations:

All postings should conform to 10 CFR 20.1902, Posting requirements, to the extent possible. Although it is appropriate to provide warranted instructions, clearly the references listed above indicate a need for a site-wide evaluation of current practices with removal of unneeded postings and labels. Legacy expired or non-applicable labels or postings that are not removed when updated can confound worker awareness and lead to complacency in the observance of radiological labels and postings.

3.3 Noteworthy Practices

The following Noteworthy Practices identified during the audit are presented:

- The management elements of the Radiation Safety Program at NIST (Director, Chief Safety Officer, IRSC, and RSO) are adequately structured and staffed to exercise their

organizational responsibilities. About 30 percent of the GRSD staff was newly hired during the past year and bringing new staff up to speed has been a considerable effort for GRSD management.

- The attention to detail taken by GRSD in the action tracking process is comprehensive. GRSD has established an Actions Tracking Table (Attachment C) for important issues presented to them. The IRSC assigns each item a number, action, its origin, who corrective action is assigned, date assigned, the due date, whether or not the IRSC must approve the corrective action, remarks, and date completed.
- The workings of the IRSC are efficient and compliant considering the scale of NIST radiological operations.
- The current RSO exceeds the qualifications and experience requirements. He and his staff appear to be fully functional and they are attempting to bring the program to a procedural work process base versus just an historical knowledge base.
- In 2010, personnel monitoring showed that all radiation exposures to individuals were well below all regulatory limits and were, by most measures, lower than individual doses received in 2009. In 2011, personnel monitoring data to date indicates that doses similar to 2010 are anticipated.
- NIST laboratories are designed to reduce dose to workers through the use of shielding, remote handling/observation, and efficient ventilation systems. Staff do not occupy laboratories in which radiochemistry is performed except when they are actually performing the work. These actions contribute to the low radiation exposures of the staff.
- Facility security for radioactive materials was good. NIST requires card key access throughout the facility and also that doors to posted laboratories remain locked. There were no instances of lack of security of radioactive materials observed during the tour of the radioactive material labs.
- GRSD provides an explanation of NIST radiation safety training requirements on its web page along with information about the training programs that are available to meet them. GRSD develops and maintains the necessary training materials and provides them in both on-line and instructor-led formats. GRSD also maintains the necessary documentation of attendance. Two-hundred fifty-four individuals received training as Source Custodians or Users during CY 2010.

END OF REPORT

ATTACHMENT A

DOCUMENTS REVIEWED, INTERVIEWEES, AND FACILITIES TOURED

DOCUMENTS CONSIDERED IN REVIEW

Policies, Regulations and Requirements

a) NIST Administrative Manual, Subchapter 12.03, Ionizing Radiation Safety, Effective date of 9/17/2010
b) NRC Confirmatory Order dated March 1, 2010
c) Applicable portions of Title 10 of the Code of Federal Regulations
d) NRC License NumberSNM-362 Amendment 3 (Revised), April 27, 2001
e) Ionizing Radiation Safety Committee Charter, Feb 3, 2010
f) 1997 License Renewal Application; June 19, 1997

Procedures

a) IPI, Radioactive SRM Transfers, 05/11
b) HPI 1-0, Health Physics Policies, 03/01
c) HPI 1-1, Health Physics Action Levels, 01/94
d) HPI 1-2, Health Physics Skills, Duties and Audits, 03/01
e) HPI 1-3, Emergency Response – Materials License, 07/97
f) HPI 1-4, Radiation Safety Training, 12/93
g) HPI 1-5, Special Nuclear Material Accountability, 03/01
h) HPI 1-7, Personnel Decontamination, 12/93
i) HPI 2-1, Personnel Monitoring Notification, 12/93
j) HPI 2-2, Personnel Monitoring Issuance and Return, 12/93
k) HPI 2-3, External Dosimetry, 12/93
l) HPI 2-4, Dosimetry Quality Assurance, 12/93
m) HPI 2-5, Internal Dose Assessment, 12/93
n) HPI 2-7, Visitor Dosimetry, 12/93
o) HPI 3-1, Reactor In-Plant Monitoring Summary, 12/93
p) RSI 3-2, Radiation Work Permit, 03/01
q) RSI 3-3, Reactor Survey Operations, 03/01
r) RSI 3-5, Coolant Sampling, 12/93
s) HPI 3-8, Contaminated Materials at NBSR, 03/01
t) HPI 4-1, Laboratory Monitoring, 12/93
u) HPI 4-2 Receiving of Radioactive Material, 12/94
v) HPI 4-3, Large Source Usage, 12/93
w) HPI 4-4, Radioactive Material Accountability and Control, 12/93
x) HPI 4-5, Source leak Testing12/93
y) HPI 4-7, Air Sampling, 06/97
z) HPI 4-8, Source Receiving and Storage Facility B131 Controls, 12/93
aa) HPI 4-9, Exempt Quantity Transfer, 09/04
bb) HPI 4-10, Special Nuclear Material Security Requirements, 07/91
cc) HPI 4-11, DOT 7A Type A Reuse Safety Analysis, 08/82
dd) HPI 4-13, Shipping Radioactive Material, 03/96
ee) HPI 4-15, Source Hazard Assessment, 09/10
ff) HPI 5-1, Diffraction & Fluorescence *X-Ray* (Surveys) 08/81
gg) HPI 5-6, Water Well Facility, 06/02
hh) HPI 5-7, Hood Filter Surveys, 03/07
ii) HPI 6-4, Counting Statistics, 01/00
jj) HPI 6-6, Tritium Dose Calculation, 12/93
kk) HPI 7-0, Quality Assurance, 11/00

ll) HPI 7-1, Beckman Liquid Scintillation Spectrometer, 03/89
mm) HPI 7-3, Hand and Shoe Monitors, 11/08
nn) HPI 7-4, Survey Instrument Calibration (beta/gamma), 10/95
oo) HPI 7-5 Survey Instrument Calibration (neutron), 01/90
pp) HPI 7-6, Survey Instrument Calibration (alpha), 01/90
qq) HPI 7-7, Low Level Alpha/Bets Smear Counting, 03/89
rr) HPI 7-8, Operation of MCA, 02/91
ss) HPI 7-10, Air Mover Calibration, 11/81
tt) HPI 7-11, Pulser Calibration of Survey Instruments. 03/96
uu) HPI 7-12, Packard LS Counter, 09/92
vv) HPI 7-13, Packard LS Counter, 09/92
ww) HPI 8-1, Liquid Radioeffluent Release, 11/00
xx) HPI 8-2, Environmental Sampling, 12/93
yy) HPI 8-3, Radioactive Waste Disposal, 12/93
zz) HPI 8-4, Reactor Stack Monitoring, 12/93
aaa) HPI 8-5, Environmental TLD, 12/93
bbb) HPI 8-6, Environs Radiation survey, 12/93
ccc) HPI 8-7, Bldg. 245 Liquid Waste System, 03/96

Internal Communications

a) SNM-362 License Compliance of RAM, 10/25/2011
b) NSTS 2011 Annual Inventory Reconciliation, 2/22/11
c) NIST Inventory, 10/25/11 (electronic spreadsheet)
d) Semi-Annual CY 11 LHP Sealed Source Leak Tests (1/2) 3/8/11
e) NIST Gaithersburg Radiation Safety Program 2010 Annual Report
f) Radiation Safety Program (GRSD) – NUREG 1556 Audit Actions Tracking Table 10/11/11
g) MEMO 7/18/11, To: T. O'Brien from T. McGiff; Radiological Incident Involving Leaking U-232 Source (245/C11 and 245/C25) on June 15, 2011.
h) MEMO To: Incident Report File From: John Zometsky: $^{220}Rn/^{232}U$ Hand Contamination Incident in 245/C25
i) Radiation Safety – Training and Reference Information, September 2011 (Training Course Manual)
j) Memo: From Miles McCord Subject: Training for Shipping Receiving Personnel, April 21, 2010
k) RAM Source Custodians by Division, Oct. 25, 2011 (Also with listing of 2010 Refresher Training [`250 trained] and 2011 Initial Training [37 trained].) 66 Source Custodians
l) Comply Report 7/6/2011 for Iodine Releases.
m) Comply Report and Memo 10/7/2011 for 2010 Xe-133 Releases form Room C11, Building 245.
n) LHP Group Hood Surveys CY 2008 – 2011
o) Emergency Response Personnel NIST Fire Protection Group, Radiation Safety Training – Practical Exercise, 3/16/11
p) Gamma Spectrum Analysis 1/15/2011 and 1/19/2011 w LSC analysis 1/14/11
q) Memo: Radiological Incident Involving Leaking U-232 source (245/C11 and 245/C25) on June 15 2011; from T. Obrien to T. McGriff
r) Quarterly Audit Files for CY 2011 (1^{st}, 2^{nd}, and 3^{rd}).

s) NIST IRSC meeting Agendas; (9/1/11, 7/21/11, 6/2/11, 4/26/11, 3/3/11, and 1/20/11) All minutes were provided except for the 9/1/11 meeting).

INTERVIEWEES

The following personnel were interviewed as part of this audit:

Thomas O'Brien, Radiation Safety Officer, Gaithersburg Radiation Safety Division (GRSD)
Richard Clement, Senior Health Physicist (GRSD)
Miles McCord, Radiation Facilities Group Leader
Janna Shupe, Radiation Facilities Group Health Physicist
Sarah Yu, Radiation Facilities Group Physical Science Technician
David Brown, Reactor Facility Group Leader
James Clark, Reactor Facility Group Health Physicist
Ron Tosh, Physicist (Source User)
Jason Walia, Physicist (Source Custodian)

FACILITIES

The following physical facilities and areas and were inspected or visited as part of the audit:

Building 245

A10 HP Calibration Room
A010 Rad Waste Storage Area

B002 Dosimetry Group
B008 Dosimetry Group
B014 Calibration Range
B019 Gamma Calibration
B034 Co-60 Vertical Beam
B036 Co-60 and Cs-137 Beam
B043 Environmental dosimetry Process
B045 Liquid Waste Tanks
B046 Source Preparation
B050 HP Count Room
B131 RAM Receiving
B132 Legacy Room
B133 RAM Receiving
B140 Gamma Cell Room
B142 Storage area for Madam Curie Sources
B156 Legacy Sources
B157 Laboratory Area
C010 Thermal Ionization Mass Spectrometry

C011 Gas Counting
C013 Low Level counting
C017 FUJI Systems
F101 Co-60 pool source

Building 235

Building H100 Radioactive Waste Annex

ATTACHMENT B

NIST NUREG-1556 AUDIT ACTION TRACKING TABLE

Radiation Safety Program (GRSD) - NUREG 1556 Audit Actions Tracking Table

10/11/11

Number	Recommendation/Finding	Assigned To	Due Date	Remarks (red text reflects remarks made prior to 8/2009)	Date Completed
2007-01	Facility audits and surveillance. Facility audits need to be standardized and there is a backlog of unresolved items.	McCord	6/30/2011	Recommendation Increasing the scope and depth of lab audits, along with formalization of the program (e.g., tracking and follow up of findings) was initiated in late 2010. GRSD is currently in the process of formalizing how audit findings shall be documented and tracked with respect to corrective actions taken by responsible individuals. The program will be subjected to an IRSC assessment beginning 6/30/2011.	
2007-02	Written procedures are inadequate and out of date. A process for a cycle of ongoing review should be established. Items need to be scheduled and tracked.	O'Brien	N/A	Recommendation This recommendation is being addressed by the actions taken in response to 2009-03.	N/A
2009-01	The NIST ALARA program is minimally documented	O'Brien	6/30/2011	Recommendation ***1. Dosimetry results are analyzed quarterly and summarized with analysis annually as part of the Health Physics annual report. As noted by the audit team all doses are low. Few exceed doses to members of the public. In 2008 none of the individuals covered by the materials license exceeded 10% of the occupational exposure limits. The maximum TEDE was 82 mrem.*** ***2. Potential dose and dose rate estimates are generated as part of the hazard analysis for approval of acquisitions of sources (364) and the protocol review processes. Hazards mitigation planning is integrated into this approval process.*** ***3. Any unexpected or elevated dosimetry readings are analyzed for causes and where appropriate corrective measures.*** ***Under these conditions it is unclear what benefits would be achieved by an additional formalized procedure.*** This issue is being addressed by the actions taken in response to 2010-18.	N/A
2009-02	No use of formal tracking systems at NIST or in the Radiation Safety Program	O'Brien	9/2/2011	Recommendation ***1. We have implemented tracking of action items in the IRSC minutes.*** ***2. We will review document control practices and attempt to formalize them as part of the HPI update plans.*** GRSD has implemented a tracking system for all submitted NIST Forms 364 and 365 and for all individuals receiving radiation safety training. GRSD has also developed a tracking system for the revision of existing and creation of new GRSD HPIs. GRSD is continuing to develop a task management system which will also provide automatic notification of tasks that are coming due. This system may be integrated with the replacement (or revisions to the existing) GRSD database.	
2009-03	NIST's written Radiation Safety Program is not well documented	O'Brien	N/A	Recommendation ***The fundamental metrics of performance are well documented. The fundamental monitoring and surveillance program results are well documented.*** ***1. Acquisitions approvals, source receipts, and source shipments are well documented.*** ***2. Dosimetry monitoring is well documented.*** ***3. Instrument QA and calibration is well documented.*** ***4. Facility surveillance is well documented.*** ***The governing license has been updated and is pending NRC approval following resolution of the D&D funding RAI. Most of the authorizing administrative document the program (IRSC Charter, Admin Manual and Lab Safety Manual are in process of being updated.*** ***The implementing Health Physics Instructions and the associated work practice guidance are in need of review and updating. While many have not been reviewed and updated since the 1993 implementation of the revised 10CFR20, they are still valid and used. Others that are obsolete are not used and should be modified or terminated. There are other areas where new HPI level procedures should be written. We have addressed most of these areas with work processed that have not been documented in HPIs but satisfy the regulatory requirements.*** Revisions to Subchapter 12.03 have clearly defined the requirements of the NIST Radiation Safety Program and the responsibilities of individuals subject to the program. Implementation of the NIST Radiation Safety Program is accomplished, in part, by carrying out written procedures (HPIs). Most of these HPIs are out dated (see finding 2009-07) and there is a need to develop new HPIs to document current program activities. The revision to, or creation of, HPIs specifically identified in audits are being tracked within this Audit Actions Tracking Table. All other HPIs are being tracked separately.	N/A

Radiation Safety Program (GRSD) - NUREG 1556 Audit Actions Tracking Table

10/11/11

Number	Recommendation/Finding	Assigned To	Due Date	Remarks (red text reflects remarks made prior to 8/2009)	Date Completed
2009-04	Evaluate and document the implications of the recently discovered issue that only some sink drains in the radioactive material labs are connected to the waste tank.	McCord	5/6/2011	Recommendation ***It has been a long standing policy and practice that all radioactive liquids be collected for proper waste disposal. The laboratory sinks are not to be used for release of radioactive materials. As such HP is confident that no unmonitored releases have occurred.*** ***Efforts are underway with NIST Facilities Services to have the piping modified. At that time HP will use contamination control practices and perform confirmatory measurements inside the piping to verify this conclusion.*** ***Scheduling is uncertain as Facilities Services is awaiting clearance from other safety groups regarding other potential chemical hazards.*** Plant has completed re-piping of designated rooms/areas . During the re-piping process, pieces of piping that were removed from the system were surveyed (smear and open window GM) for contamination. No detectable activity above background was observed. An updated listing of rooms/areas having drains that lead to the waste tanks has been completed.	5/2/2011
2009-05	Clarify the meaning of an automatically applied retention factor referenced on gaseous effluents date for various isotopes of Iodine	McCord	4/22/2011	Recommendation It was clarified that the retention factor is a efficiency value for filters used in taking air samples and is provided by the filter's manufacturer with each batch of filters. The retention factor is a value input into the Gamma Spectrum Analysis APEX software.	4/22/2011
2009-06	Evaluate the need for H-P approval for the afterhours shipping of radioactive materials	McCord	4/22/2011	Recommendation ***After hours shipping most commonly occurs with short half life standards production. Efforts to assure the packages are prepared before the end of the normal working day have not been successful. However overnight delay in shipping would reduce the viability of the standards. To date HP has allowed lab staff (non-HP) with proper DOT training to perform the checks. HP will work with the radioactive materials group to assure appropriate checks are performed by appropriately trained and knowledgeable staff and properly documented. A review the staffing schedules and potential overtime will be required if HP is to perform these checks.*** ***We will review this policy and make any necessary modifications by 7/30/09.*** RSD has approved two individuals to perform after-hours shipping of radioactive materials. These individuals have the necessary training and have demonstrated to RSD that they are knowledgeable of the requirements specific to the type of materials they are shipping. Therefore, RSD approval of shipments (during normal or after-hours) is not required.	4/22/2011
2009-07	Health Physics Instructions are old and should be routinely reviewed for updating.	O'Brien	4/20/2011	Recommendation ***A schedule and plan will be developed by 9/30/09. See response to audit finding 2009-03.*** The HPIs have been reorganized into specific Radiation Safety program areas . Revisions to HPIs have been prioritized into High, Medium, and Low categories. Those HPIs designated a High priority have been assigned to specific individuals. Draft due and final due dates for high priority HPIs have been designated. Specific assignments of Medium and Low priority HPIs are in progress. An HPI Revision tracking table has been developed and shall be used to track completion of this recommendation.	4/20/2011
2009-08	Develop an overall management plan that clearly delineates the purpose and applicability of HPI's	O'Brien	9/17/2010	Recommendation ***Health Physics will prepare a prioritization plan for review and updating the HPIs by 9/30/09. HP will then proceed in accordance with that plan.*** Revisions to Subchapter 12.03 have been made to delineate the applicability of HPIs to the Radiation Safety Program.	9/17/2010

Radiation Safety Program (GRSD) - NUREG 1556 Audit Actions Tracking Table

10/11/11

Number	Recommendation/Finding	Assigned To	Due Date	Remarks (red text reflects remarks made prior to 8/2009)	Date Completed
2009-09	Progress in disposal of legacy sources	O'Brien	TBD	Recommendation ***This is an ongoing process. HP has been working with the DOE orphan source recovery program to reduce this inventory. Two PuBe sources were transferred in early 2009. HP has also transferred several density gauge sources back to the manufacturers. HP acquired funding to address this issue in 2008 but due to staffing and Boulder response commitments we were not able to make more significant progress. Many of the legacy sources predate or lack the documentation for special form and sealed source registry to satisfy the orphan source program requirements. HP will continue to characterize and perform historic document reviews where possible of these older sources. If new information is obtained, we would proceed with transfer or disposal wherever such options can be identified.*** Although some funding was available, FTE resources were not available to process the legacy sources in preparation for disposal. GRSD is communicating with NNSA with respect to transfer and disposal option for a few selected sources. This process is on-going and dependent on GRSD FTE and budget resources and NNSA's availability to accept such sources.	
2009-11	Two separate and inconsistent Emergency Procedures (One dated Sept. 1982) and the other the NIST Occupant Emergency Plan issued in 2006. This inconsistency should be addressed.	O'Brien	12/31/2011	Recommendation ***After license inventory reductions in the 1980s the materials license dropped below the levels requiring an exercised emergency response plan. Many of the practices of this old plan remained in place but were not reviewed, updated, or exercised. Instead they were supplanted by more appropriate HPIs and good work practice guidance for minor spill response and similar instructions provided in training to the users. Those instructions and training are still valid and have been used appropriately for various small personnel or facility contamination incidents. These may not be sufficient for a larger scale situation. The NIST Occupant Emergency Plan is written and maintained by the Emergency Services Division who maintains the emergency call back and dispatcher system. HP has worked with ESD to assure our contact information remains current and has provided training to ESD personnel to assure that HP is contacted for any issues related to posted radiation facilities.*** ***HP will incorporate emergency response instructions into updates to the HPIs and good work practice guides in a manner that is consistent with the current Occupant Emergency Plan.*** ***HP will review major incident response and work with ESD to assure proper response.*** ***HP will evaluate the need for emergency response drills or exercises.*** This recommendation will be addressed along with other issues currently being addressed by	
2009-12	There appears to be no HPI describing how decommissioning records should be maintained to assure compliance with 10CFR Part 30.35	O'Brien	12/31/2011	Recommendation ***Data on source utilization and facility posting is maintained and searchable within our electronic data base. In addition we have a hard copy files on incidents and responses.*** ***HP will enhance this record with a specific hard copy file of the historic facility utilizations.*** ***HP will consider the need for an HPI regarding Decommissioning record keeping.*** This recommendation will be addressed via creation of a new RSI or revision to an existing RSI.	
2010-01	Building 245, Room B133; September 2009 quarterly audit form missing.	McCord	TBD	Finding The missing document was located and placed into the appropriate file.	12/15/2010
2010-02	Building 245, Room A018; March 2010 quarterly audit form missing.	McCord	TBD	Finding The missing document was located and placed into the appropriate file.	12/15/2010
2010-03	Hood surveys reports for June 2009 missing.	McCord	TBD	Finding The missing document was located and placed into the appropriate file.	12/15/2010
2010-04	NIST did not have evidence to verify that transfers of licensed radioactive materials to other organizations was authorized under the recipient's license indicating the type, form, and quantity of byproduct material to be transferred.	IRD	TBD	Finding IRD is researching the scope of the issue and in the process of attempting to obtain the needed documentation. This action is being tracked via the IRSC Action Tracking Table.	N/A

Radiation Safety Program (GRSD) - NUREG 1556 Audit Actions Tracking Table

10/11/11

Number	Recommendation/Finding	Assigned To	Due Date	Remarks (red text reflects remarks made prior to 8/2009)	Date Completed
2010-05	All containers of radioactive materials, including waste, must be labeled with appropriate "CAUTION RADIOACTIVE MATERIALS" tape or labels.	O'Brien	4/21/11	Finding Non concur with use of the term "All". Per 10 CFR 20.1905, containers holding licensed material in quantities less than the quantities listed in appendix C or containers holding licensed material in concentrations less than those specified in table 3 of appendix B need not be labeled. Proper labeling practices will be emphasized in initial and refresher training and in the revision to the Radiation Safety Manual.	4/21/11
2010-06	NIST should prepare summaries for annual IRSC focused reviews of one or more parts of the Radiation Safety Program	O'Brien	4/26/11	Recommendation - The RSO will recommend (at the April 2011 meeting) that the IRSC review the effectiveness of the Laboratory audit program after the second quarter audits are completed. Review guidelines will be provided to the IRSC at that time. RSO recommendation was requested to be expanded (by IRSC Chair) to include several program areas. The RSO will present at the 6/2/11 meeting. A draft plan was discussed at the 7/21/11 IRSC meeting. This action is being tracked via the IRSC Action Tracking Table.	7/21/11
2010-07	NIST submit a license amendment to the NRC modifying the statement in the Materials License Document to eliminate the need for the IRSC to perform an annual audit of the Radiation Safety Program	O'Brien	3/23/11	Recommendation The IRSC approved a revision to the license renewal application which was submitted to the NRC. The revision modified the statement in the Materials License Document to eliminate the need for the IRSC to perform an annual audit of the Radiation Safety Program	3/23/11
2010-08	NIST develop an implementing procedure regarding the inventory spot checks and provide training and instructions to the Radiation Safety Division staff on performing and documenting these spot checks.	O'Brien	6/30/11	Recommendation - This procedure will be part of the HPI developed in response to recommendation # 2010-16. Spot checks were iniated in the 2nd quarter lab audits.	6/30/2011
2010-09	A table of action items is maintained with some, but not all, of the IRSC meeting minutes. This table should be updated following each meeting so that the status of open items can be easily tracked.	O'Brien	4/26/11	Recommendation The IRSC Action Tracking table has been revised and shall be submitted for IRSC review at each meeting of the IRSC	4/26/2011
2010-10	Establish a frequency for radioactive material protocol reviews; 2, 3 or 5 yr intervals	O'Brien	6/30/2011	Recommendation Since June 2010, all new, and changes to existing, radioactive material protocols have been reviewed under the revised Hazard Review process. These protocols shall be subject to a 3 year cycle. This requirement shall be specified in a revision to HPI 1-0 and may be changed once decision factors for the frequency of reviews have been delineated. A GRSD focus for CY 2011 is to ensure that all radioactive material in use and in storage (regardless of whether an RS# has been designated or not) has a documented protocol and a corresponding Hazard Review with appropriate authorizations and approvals.	6/30/2011
2010-11	Update HPI 4-4 to specify that all radioactive material sources to be acquired require the submission of a NIST-364 Form.	O'Brien	5/31/11	Recommendation HPI 4-4 will be revised to reflect the current instructional requirements associated with NIST Forms 364/5. A memo from the RSO was issued that includes the procedure (as a replacement for Enclosure 1 to HPI 4-4) for submitting NIST Forms 364/5	5/31/11
2010-12	Update HPI 4-2 to state that inspection is required for all radioactive material packages received and specify the minimum area to be wiped.	O'Brien	6/30/11	Recommendation HPI 4-2 will be revised accordingly	
2010-13	Staff should be instructed to fill out all checklists when performing packaging shipping quality control inspections.	O'Brien	TBD	Recommendation - In December 2010, staff involved with this process were reminded to complete the appropriate checklists. On 4/14/11, the RSO sent an email to GRSD Group Leaders (GL) that identified all of the administrative issues in the 2010 audit of the Radiation Safety program. The email, in part, directed the GLs to review the recommendations with staff and emphasize that they apply to all GRSD and NIST forms used within the Radiation Safety program.	4/14/2011
2010-14	Update HPI 4-11 to bring it into conformance with current regulations regarding shipping radioactive material.	Shupe	6/30/11	Recommendation HPI 4-11 will be revised accordingly	
2010-15	Update HPI 4-13 to bring it into conformance with current regulations regarding shipping radioactive material.	Shupe	6/30/11	Recommendation HPI 4-13 will be revised accordingly	
2010-16	Recommend the development of an updated HPI that all surveyors (auditors) are to follow while completing the weekly surveys and quarterly audits	O'Brien	6/30/11	Recommendation HPIs 1-2 and 4-1 will be revised accordingly	

Radiation Safety Program (GRSD) - NUREG 1556 Audit Actions Tracking Table

10/11/11

Number	Recommendation/Finding	Assigned To	Due Date	Remarks (red text reflects remarks made prior to 8/2009)	Date Completed
2010-17	The training program written description (HPI 1-4) is inadequate. It appears that much of the implementation of the program is based on the practices developed by Ms. Shupe. Should she be reassigned, it is not likely that her replacement would be able to gain a firm understanding of the program without having continued access to Ms. Shupe. The future revision of HPI 1-4 should specify the training requirements for each category of personnel identified in Subchapter 12.03.	O'Brien	9/2/11	Recommendation Modules and their content (in outline form) will be developed and reflected in the revision to HPI 1-4. The content of the modules shall included that needed for NCNR Radiation Safety training support.	
2010-18	Revise the HPI on the dosimetry program. Establish an ALARA investigation level (100 mrem per quarter?) whereby an investigation is required from Radiation Safety Division whenever a dose exceeds the level. Each of these investigations must be documented, with maintenance of the records in the Radiation Safety Division files.	O'Brien	6/30/11	Recommendation - HPIs 1-1 and 2-1 address ALARA investigation levels. However, these HPIs will be revised to be more explicit on how investigations shall be documented.	
2010-19	File instrument calibration records by instrument make, model and S/N with tabbed separators.	McCord	TBD	Recommendation - GRSD used tabs in the records to separate the data for survey instruments based on their model and serial number.	4/14/2011
2010-20	Recommend collecting more samples to assess the radiological conditions of work surfaces within the posted areas, particularly bench top work areas, floors, and sinks not designated for radioactive material disposal.	O'Brien	TBD	Recommendation - Additional radiological sampling is being performed for both weekly surveys and quarterly audits. The revision to HPI 4-1 shall include the requirement to take several representative samples appropriate for the area being surveyed.	3/30/2011
2010-21	Ensure each survey/audit form is completed on time and in its entirety. Unused areas should be noted as N/A rather than left blank	O'Brien	TBD	Recommendation - In December 2010, staff involved with this process were reminded to complete the appropriate survey/audit form(s). On 4/14/11, the RSO sent an email to GRSD Group Leaders (GL) that identified all of the administrative issues in the audit of our Radiation Safety program. The email, in part, directed the GLs to review the recommendations with staff and emphasize that they apply to all GRSD and NIST forms used within the Radiation Safety program.	4/14/2011
2010-22	Ensure approval signatures are included on the weekly surveys, quarterly audits, and raw data reviews as applicable.	O'Brien	TBD	Recommendation - In December 2010, staff involved with this process were reminded to ensure approval signatures are included on the weekly surveys, quarterly audits, and raw data reviews as applicable. On 4/14/11, the RSO sent an email to GRSD Group Leaders (GL) that identified all of the administrative issues in the audit of our Radiation Safety program. The email, in part, directed the GLs to review the recommendations with staff and emphasize that they apply to all GRSD and NIST forms used within the Radiation Safety program.	4/14/2011
2010-23	Ensure all instruments used to complete the weekly surveys and/or quarterly audits are detailed on the respective forms(s)	O'Brien	TBD	Recommendation - In December 2010, staff involved with this process were reminded to ensure all instruments used to complete the weekly surveys and/or quarterly audits are detailed on the respective forms(s). On 4/14/11, the RSO sent an email to GRSD Group Leaders (GL) that identified all of the administrative issues in the audit of our Radiation Safety program. The email, in part, directed the GLs to review the recommendations with staff and emphasize that they apply to all GRSD and NIST forms used within the Radiation Safety program.	4/14/2011
2010-24	Ensure that the location of smear samples that are taken in each area during the weekly surveys and quarterly audits is accurately transposed into the raw data sheet	O'Brien	TBD	Recommendation - In December 2010, staff involved with this process were reminded to smear data accurately transposed. On 4/14/11, the RSO sent an email to GRSD Group Leaders (GL) that identified all of the administrative issues in the audit of our Radiation Safety program. The email, in part, directed the GLs to review the recommendations with staff and emphasize that they apply to all GRSD and NIST forms used within the Radiation Safety program.	4/14/2011
2010-25	Ensure that areas exhibiting >5mR/hr at 30cm are labeled as "Caution-Radiation area" or that the room is posted with a "Caution - Radiation Area" posting.	McCord	TBD	Recommendation - Non-concur This comment was made with respect to quarterly audits. A review of these audits indicate that areas are posted correctly.	3/30/2011
2010-26	Ensure that problems or items of non compliance are documented on the quarterly audits and that appropriate corrective actions are implemented to correct the problem(s)	McCord	6/30/11	Recommendation - Pertinent staff have been briefed on this recommendation for implementation in this current quarter. Written instructions as a revision to an HPI are forthcoming . This issue will also be addressed in response to recommendation # 2010-16.	6/30/11
2010-27	Consider a mandatory requirement that containers of liquid Rad waste and potentially contaminated pieces of equipment be placed on a secondary liner rather than directly on a bench top, cabinet surface or floor.	McCord	6/30/11	Recommendation - This issue is being addressed in training, hazard mitigation plans, and will be in the revision to the Radiation Safety Manual.	8/25/2011

Radiation Safety Program (GRSD) - NUREG 1556 Audit Actions Tracking Table

10/11/11

Number	Recommendation/Finding	Assigned To	Due Date	Remarks (red text reflects remarks made prior to 8/2009)	Date Completed
2010-28	During initial and refresher training be sure to emphasize to all radioactive material users that daily contamination checks must be conducted whenever work is done with unsealed radioisotopes. During quarterly lab audits, RSD personnel should confirm that all lab personnel are aware and compliant with this requirement.	McCord	TBD	Recommendation - Partially non-concur The performance of contamination checks whenever work is done with unsealed radioisotopes shall be discussed in the initial and refresher training. Specific needs for contamination checks are delineated in Hazard Mitigation plans developed form the Hazard Review process. Where documentation of such checks is required, GRSD shall confirm such documentation during the quarterly lab audits.	4/21/2011
2010-29	Create a cover page to track all the leak tests by RS during a specific time interval. The cover sheet should list each source tested by its RS number and should summarize the results. (Example: All sources within this packet were tested for leakage and passed. All results were < 0.005uCi). This systems would be independent of the source location and or custodian and will provide a quick reference to whether a test was completed or not, without requiring a search through the data for particular custodians and or usage storage locations.	McCord	5/11/11	Recommendation A summary of the leak tests performed on required sources has been developed and is currently being implemented. Full implementation is expected 5/11/2011.	
2010-30	Maintain a report that shows all airborne effluent releases each year that indicates the estimated amount of radioactive material released and annual concentration.	McCord	TBD	Recommendation The 2009 effluent release report has been corrected to reflect the Xenon release.	4/19/2011
2010-31	It is recommended that all effluent release records be collected and filed in a single location to facilitate their availability to regulatory authorities when requested.	McCord	N/A	Recommendation - Non concur. Records are currently retrievable on an as needed basis.	N/A
2010-32	It is recommended that NIST repair the pitot tube inserted into duct E-50 and seal the remaining hole in the duct.	McCord	4/30/11	Recommendation - A work order has been submitted to repair the pitot tube and seal the remaining hole in the duct.	
2010-33	It is recommended that NIST conduct a complete inventory of all licensed radioactive material sources and update the database with the information to help assure that the amount of radioactive material possessed complies with the limits specified in license SNM-362.	McCord	12/31/11	Recommendation - GRSD is working closely with Source Custodians with respect to the inventory of licensed radioactive material sources. In the past, GRSD did not track (for inventory purposes) sources having activity of less than 10 uCi. Tracking of such sources was the responsibility of Source Custodians. In early 2010, GRSD initiated tracking all Pu sources. GRSD is in the process of evaluating the best approach to document a complete inventory of all licensed radioactive material sources. A goal of the 2011 inventory effort is to complete an inventory of all licensed radioactive material sources.	
2010-34	Establish consistency in how training is documented. For example, each quiz should have a title on the front page, clearly identifying the course that it was a part of and/or the training topics covered.	McCord	6/30/11	Recommendation - This recommendation is being implemented where possible (e.g., it is not possible to modify the quiz page without being hand-written). Formalization of training documentation will be part of the HPI developed in response to recommendation # 2010-17.	
2010-35	It is recommended that all sewer disposal records be collected and filed in a single location to facilitate their availability to regulatory authorities when requested.	McCord	N/A	Recommendation - Non concur. Records are currently retrievable on an as needed basis.	N/A
2010-36	It is recommended that all staff observe and abide by the practice to initial each transportation checklist item when conducting a review of radioactive material shipments.	McCord	6/30/11	Recommendation - Staff have been reminded to complete appropriate checklists. This issue will be further addressed in the revision to HPI 4-13 in response to recommendation # 2010-15.	
2010-37	RSD personnel should be instructed to fully document incidents involving radioactive material and/or radiation. Documentation should include statements emails are acceptable from all persons involved, describing what happened and what was done in response. Any follow up activities and corrective actions implemented should also be described. The documentation should be reviewed and approved by the RSO before placing the materials in the incident files.	McCord	9/2/11	Recommendation - HPI 1-3 will be revised to reflect the recommendation	

ATTACHMENT C

IRSC ACTIONS TRACKING TABLE

IRSC Actions Tracking Table

Updated Oct 13 2011

Action Number	Action	Action Origin	Assigned To	Date Assigned	Due Date	IRSC Approval Required	Remarks	Date Completed
2009-007	Review Lab Safety Manual and send comments to T. O'Brien	IRSC Meeting	T. O'Brien	2/26/09	TBD ONGOING	No	The manual will be revised and expanded (in part to include the forthcoming revision to 12.03) and submitted as an information item	
2009-010	Develop template for internal assessment of radiation safety program	IRSC Meeting	T. O'Brien	3/26/09	N/A	No	This action is superseded by the action taken in response to recommendation 2010-06 in the Audits Tracking table. The RSO will recommend (at the April 2011 meeting) that the IRSC review the effectiveness of the Laboratory audit program after the second quarter audits are completed. Review guidelines will be provided to the IRSC in June 2011.	N/A
2009-036	Write up rules to implement a Boulder radiation safety program, including limitations for exempt quantity sources, generally licensed sources, and x-ray systems.	IRSC Meeting	T. Grove	6/25/09	TBD ONGOING	Yes	Six procedures approved by IRSC 6/2010; New license was issued 12/27/2010. Additional procedures in progress.	
2009-055	Revise HPI's at Boulder as necessary for the program (2009 audit deficiency).	Boulder Audit 2009	T. Grove	11/30/09	TBD ONGOING	Yes	In progress. Will also be addressed via 2009-036 .	
2009-063	Write procedure for document control indicating which records are maintained, who is responsible for maintaining them, and where they are to be found (2009 audit recommendation).	Boulder Audit 2009	T. Grove	11/30/09	TBD ONGOING	Yes	In progress, see 2009-0036	
2011-001	Develop a response plan for the Boulder 2010 Audit	IRSC Meeting	T. Grove	1/20/11	3/3/11	No	Completed and submitted to IRSC	3/3/11
2011-002	Develop a response plan for the Gaithersburg 2010 Audit	IRSC Meeting	T. O'Brien	1/20/11	4/18/11	No	A response plan in the form of an Audit Actions Table was created. It will be provided to the IRSC as an information item at the April 2011 meeting.	4/18/11
2011-003	Provide a follow up communication to the NRC stating that the findings and self identified violations in the Gaithersburg audit report are being addressed.	IRSC Meeting	T. O'Brien	1/20/11	TBD	No	Due to a delay in following up on this action and per conversation with the IRSC Chair, it was decided not to provide such a communication at this time.	4/18/11
2011-004	When future Gaithersburg annual audit reports are submitted to the NRC, provide communication, if needed, that addresses any findings or self identified violations that have been identified	IRSC Meeting	T. O'Brien	1/20/11	12/1/11	Yes	Due date is approximate and dependent on the date the final audit report is issued.	
2011-005	Obtain the applicable information in the IRD quality system manual and the needed information from B. Watters, ensure that MSD has a procedure and their procedure references the IRD requirements.	IRSC Meeting	L. Mackey L. Karam	1/20/11	4/30/11	No	Procedure was drafted on 3/7. Now being revised to reflect recently approve Interim Procedure on SRMs. This Action Item is now covered by the new interim SOP for SRMs. L. Mackey to confirm with B. Watters that he concurs with the MSD requirements in the new interim SOP prior to closing out	7/21/11
2011-010	Evaluate the x2222 emergency call process with the Emergency Services Division	IRSC Meeting	T. O'Brien	1/20/11	3/18/11	No	Meeting held with ESD and NCNR. A Call down list with instructions was developed and issued to NCNR, ESD, and GRSD.	3/22/11
2011-011	Contact the NRC to determine whether a revision to the license renewal should be submitted to clarify what is meant by IRSC assessment and to remove the redundancy of an external audit and IRSC assessment.	IRSC Meeting	T. O'Brien	1/20/11	3/3/11	Yes, if letter to NRC is needed	NRC contacted 2/16/11. Draft letter presented to IRSC 3/3/11. Letter to NRC sent 3/23/2011	2/16/11
2011-008	Work with Bob Watters to update the SRM requirements in NIST Administrative Manual Subchapter 5.19	IRSC Meeting	L. Karam B. Watters	1/20/11	4/30/11	No	This Action Item is closed as of 6/2/11. The new interim SOP describes the SRM transfer requirements. The revision of Administrative Manual Subchapter 5.19 is beyond the purview of the IRSC.	6/2/11
2011-013	Verify whether any of the 5 remaining sources (from the 2010 inventory process) are above the NRC reporting requirements.	IRSC Meeting	M. McCord	1/20/11	1/28/11	No	The Source Custodian located the remaining 5 sources. Therefore, no assessment, with respect to NRC reporting requirements, is needed.	1/28/11
2011-015	R. Kayser to post the most recent IRSC Member/Alternate Member roster on the OSHE website.	IRSC Meeting	R. Kayser	1/20/11	5/13/11	No		6/14/11
2011-009	Propose changes to 12.03 that address responsibilities associated with the SRM program	IRSC Meeting	T. O'Brien	1/20/11	TBD	Yes	Changes that address responsibilities associated with the SRM program will be made along with other needed revisions to 12.03 June 2, 2011 In progress.	
2011-017	Develop an interim SOP for the shipment of radioactive SRMs outside of NIST, including the verification process of licenses/certifications.	IRSC Meeting	T. O'Brien, in conjunction with the IRD	4/26/11	6/2/11	No		5/17/11
2011-018	Send an official communication as IRSC Chairperson announcing the moratorium on all radioactive SRM shipments until completion and approval of the interim SRM SOP.	IRSC Meeting	R. Kayser	4/26/11	4/29/11	No		4/29/11
2011-019	Provide a written summary of the Subchapter 12.03 restructuring proposal to the IRSC.	IRSC Meeting	R. Kayser	4/26/11	4/27/11	No		4/27/11
2011-020	Submit draft of SubChapter 12.03 (SNM & EQD licenses) to the Committee via RFK	IRSC Meeting	T. O'Brien	4/26/11	TBD	Yes	Comments to Tom O'Brien by 7/6 for IRSC discussion 7/21	

2011-021	Submit draft of SubChapter 12.03 (Boulder license) to the Committee via RFK	IRSC Meeting	T. Grove	4/26/11	TBD	Yes	Comments to Tom O'Brien by 7/6 for IRSC discussion 7/22	
2011-022	Submit draft of SubChapter 12.03 (TR-5 license) to the Committee via RFK	IRSC Meeting	R. Dimeo	4/26/11	TBD	Yes	Comments to Tom O'Brien by 7/6 for IRSC discussion 7/23	
2011-023	Submit draft of SubChapter 12.03 (Ionizing Rad Producing Machines -GRSD) to the Committee via RFK	IRSC Meeting	T. O'Brien	4/26/11	TBD	Yes	Comments to Tom O'Brien by 8/17 for IRSC discussion 9/1	
2011-024	Submit draft of SubChapter 12.03 (Ionizing Rad Producing Machines -BSHED) to the Committee via RFK	IRSC Meeting	T. Grove	4/26/11	TBD	Yes	Comments to Tom O'Brien by 8/17 for IRSC discussion 9/2	
2011-025	R. Kayser to identify an individual from the NCNR to act as the secondary (alternate) member for S. O'Kelly	IRSC Meeting	R. Kayser	6/2/11	TBD	Yes	Completed	6/14/11
2011-026	Revise the IRSC Roster list in accordance with the IRSC Charter requirements and provide to the IRSC for an E-vote or submit as an agenda item for the next IRSC meeting. This revision will include determining secondary (alternate) members for the five ex officio positions.	IRSC Meeting	R. Kayser	6/2/11	TBD	Yes	Completed	6/14/11
2011-027	Follow up with R. Minnili to confirm with the vendor (Hopewell) the key is captured and cannot be removed from the control panel during irradiator operation.	IRSC Meeting	L. Karam	6/2/11	7/21/11	No	Completed	6/3/11
2011-028	Contact the two customers who received SRMs that they were not licensed to possess and advise them of that fact.	IRSC Meeting	T. O'Brien	6/2/11	7/21/11	No	Customers were notified that they were not licensed to possess material. Return of the material is in-progress. ***10/13/2011*** ***Five facilities had licenses that did not authorize the material sent by NIST. Two of these (Civatech Oncology and NC DHHS Public Health Lab) have returned the material, two (Dartmouth Coll. And Villanova U.) will keep the material and one (Tulane U.) will return it. Two facilities did not have a license. S. Carolina St. will return the material and St. John's U. will keep it under their agreement state general license .***	
Completed Items								
2011-029	Advise customers who have not responded to our calls that if we are unable to obtain the necessary information from them, we will be contacting their licensing authority.	IRSC Meeting	M. Unterweger	6/2/11	7/31/11	No	State agencies of unresponsive customers were contacted and informed about the material sent to the customer and the customer's lack of response.	7/19/11
2011-030	Revise IRSC Action Item 2011-012 to include the six (6) remaining license/certification verifications.	IRSC Meeting	M. Unterweger	6/2/11	7/31/11	No	Completed	7/15/11
2011-031	T. O'Brien to discuss the broad meaning of the language related to "measurement services" of SRM in the current and renewal license with the NRC to determine if the	IRSC Meeting	T. O'Brien	6/2/11	TBD	No	Discussed with NRC (John Kinneman) on 6/28/11. He is aware of our concern and will follow-up on the concern as part of the renewal review process.	6/28/11
2011-033	Follow-up with B. Waters regarding the process for facilities to return SRMs back to NIST and ensure that B. Waters knows MSD is the lead for the SRM returns.	IRSC Meeting	L. Mackey	7/21/11		No	***MSD took the lead and has contacted those customers to return materials. One material has been returned to Larry Lucas. Three facilities were not able to return the soils as they had been used.***	
2011-032	*Compile a more detailed description of a assessment audit of the laboratory audit program for discussion at the next IRSC meeting that will include an estimate of the time commitment for Committee members*	IRSC Meeting	T. O'Brien	6/2/11	7/21/11	Yes	***Provided to the IRSC for discussion at meeting on 9/1/11***	*9/1/11*
2011-034	Inform P. Gallagher of the SRM investigation results prior to self-identification of the violations to the NRC	IRSC Meeting	T. O'Brien	7/21/11		No	***On 9/13/11, NRC came on-site for a routine unannounced inspection of our SNM-362 license. T. O'Brien advised the NRC inspector of our SIVs. He appreciated the information and stated that he would discuss it with Region I management as part of the current inspection. P. Gallagher was advised on this on 9/14/11.***	*9/14/11*
2011-035	Make a courtesy call to the NRC informing them of the SIVs steming from the investigation into SRM transfers	IRSC Meeting	T. O'Brien	7/21/11		No	***On 9/13/11, NRC came on-site for a routine unannounced inspection of our SNM-362 license. T. O'Brien advised the NRC inspector of our SIVs. He appreciated the information and stated that he would discuss it with Region I management as part of the current inspection. P. Gallagher was advised on this on 9/14/11.***	*9/13/11*
2011-036	Provide an electronic copy of the Proposal for IRSC Assessment of Program Area Operations to the committee for review.	IRSC Meeting	T. O'Brien	7/21/11		No	***Completed***	*8/2/11*
2011-012	Determine license compliance status of SRM shipments made under SNM-362 and 19-23454-01E M.	IRSC Meeting	M. Unterweger	3/3/11	3/18/11	No	At the beginning of May, thirty-seven customers still needed to provide NIST with documentation that they were licensed to receive the SRM. By the end of May, the number was reduced to six, all of whom have been contacted multiple times without responses. ***9/1/2011*** ***As of 9/1, the number of unreachable facilities was reduced to three (Aries Industrial TX, Spectron Scientific CA, GPL Labs AL). Their state regulatory agencies have been informed.***	*9/1/11*

2011-014	Verify that the Radioactive Material Transportation Security Plan is in compliance with the security order that came out from the NRC Security and Transportation Order	IRSC Meeting	T. O'Brien	1/20/11	6/13/11	No	The Radioactive Material Transportation Security Plan (RAMTSP) was verified to be in compliance with the NRC's security Order [EA-06-249]. This Order will be referenced in the RAMTSP. Further compliance with NRC	6/13/11
2011-016	Prepare a summary list (e.g., Excel spreadsheet) of all SRM investigation actions to date, e.g., the total number of SRM shipments being investigated, what licenses/certifications have been verified, what SRM investigations remain, etc. Include all 2009 and 2010 investigations in the summary.	IRSC Meeting	M. McCord, L. Karam, and M. Unterweger (w/ M. Unterweger taking the lead).	4/26/11	5/6/11	No	*A final status of the SRM investigation was provided to the IRSC for discussion at meeting on 9/1/11*	*9/1/11*
2011-037	Provide any feedback regarding the Proposal for IRSC Assessment of Program Area Operations to T. O'Brien within two weeks.	IRSC Meeting	Committee	7/21/11	8/4/11	No	*Received*	*9/1/11*
2011-038	Determine volunteers for the IRSC assessment team (T. O'Brien).	IRSC Meeting	T. O'Brien	7/21/11		No	*The IRSC Chair (R. Kayser) officially appointed the team of D. Jacobson, S. O'Kelly and R. Dimeo to perform the 2011 IRSC Assessment.*	*9/1/11*
2011-039	Send copy of NCNR portion of the revisions for Subchapter 12.03 to the IRSC	IRSC Meeting	R. Kayser	7/21/11		No	*Completed*	*8/15/11*
2011-040	Send comments on NCNR portion of the revisions for Subchapter 12.03 to Kayser	IRSC Meeting	Committee	7/21/11	3 weeks from receipt	No	*Received*	*9/1/11*
2011-041	Decide internally who will perform the 1556 Annual Audit in CY 2011 for Boulder	IRSC Meeting	R. Kayser	7/21/11		No	*T. Grove will conduct the annual review.*	*9/1/11*
2011-042	*Complete the process to ensure that orders for the I-129 sources are distributed under the exempt distribution license.*	*IRSC Meeting*	*T. O'Brien*	*9/1/11*		*No*	*The I-129 SRM 3231 is now physically in possession of IRD (Building 245). MSD and IRD personnel have been notified of the change and that this SRM is to be handled as a radioactive SRM under the interim procedure.*	*10/5/11*
2011-043	*SRM status Action Item - Ensure completion of all corrective actions for the open items on the Self-Identified Violations related to SRM Domestic Sales summary table*	*IRSC Meeting*	*T. O'Brien*	*9/1/11*		*No*	*Disposition of material for three customers is still in progress. Material from one customer has been returned. One facility (Dartmouth College) is not interested in returning the material. They will amend their license and provide a copy of the updated license.*	*9/1/11*
2011-044	*Complete a new document listing all self-identified violations related to SRM transfers prior to presenting the violations to P. Gallagher and making the courtesy call to NRC*	*IRSC Meeting*	*T. O'Brien*	*9/1/11*		*No*	*On 9/13/11, NRC came on-site yesterday for a routine unannounced inspection of our SNM-362 license and was advised the NRC inspector of our SIVs. He appreciated the information and stated that he would discuss it with Region I management as part of the current inspection. P. Gallagher was advised on this on 9/14/11.*	*9/13/11*
2011-045	*Complete the revisions and updates to Table 4 (page 9) and Figures 8a, 8b, and 8c (pages 17, 18) and submit the revised 2010 Annual Report to the IRSC for review and comment. Identify location of significant changes made to the report in the cover email. IRSC members will respond with any comments within two weeks*	*IRSC Meeting*	*T. O'Brien, T. McGiff*	*9/1/11*		*No*	*Update to the 2010 Annual Report completed. Distributed to IRSC on 10/13/11*	*10/13/11*
2011-046	*Decide internally how the results from the 2010 Annual Report will be communicated to P. Gallagher*	*IRSC Meeting*	*R. Kayser, T. O'Brien*	*9/1/11*		*No*	*Rich Kayser (in discussion with Tom O'Brien) will make this decision.*	*9/1/11*
2011-047	*Distribute an electronic version of the report of the AmBe source incident that took place on 5/27/11to the Committee*	*IRSC Meeting*	*T. O'Brien*	*9/1/11*		*No*	*This document was distributed at the 10/13/11 IRSC meeting.*	*10/13/11*
2011-048	*Distribute the updated Gaithersburg Audit Action Items Tracking Table to the IRSC electronically*	*IRSC Meeting*	*T. O'Brien*	*9/1/11*		*No*	*This document was distributed at the 10/13/11 IRSC meeting.*	*10/13/11*
2011-006	*Contact B. Walters (MSD) in reference to progress on SRM certifications*	*IRSC Meeting*	*R. Kayser*	*1/20/11*	*1/27/11*	*No*	*Contact made. Completed*	*1/26/11*
2011-007	*Review what procedural changes are needed in the Radiation Safety Division with respect to the review of licenses and certification.*	*IRSC Meeting*	*M. McCord*	*1/20/11*	*4/30/11*	*No*	*To better understand the current SRM operations of the Radioactivity Group, numerous questions and issues concerning the program were identified and transmitted to them on 4/6. A response was received on 4/15 and is currently being reviewed. Interim Procedure 1-1 was developed and IRSC approved.*	*5/18/11*
2011-049	*Send the revised MOU from 1989 to the IRSC as an information item.*	*IRSC Meeting*	*R. Kayser*	*9/1/11*		*No*	*This document was distributed at the 10/13/11 IRSC meeting.*	*10/13/11*

ATTACHMENT D

FIGURES (PHOTOGRAPHS)

Listing of Figures

Listing of Figures - Continued

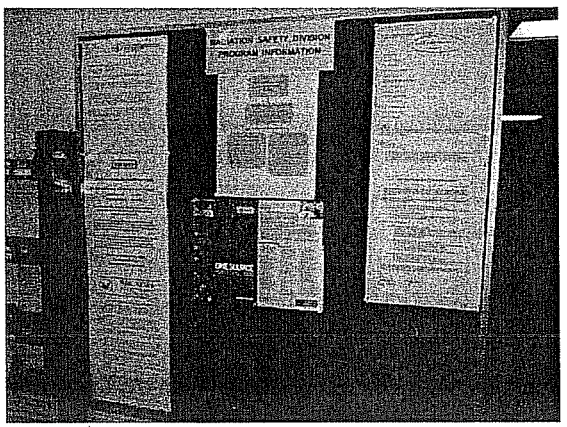


Figure 1, General Info at Entrance to Building 245

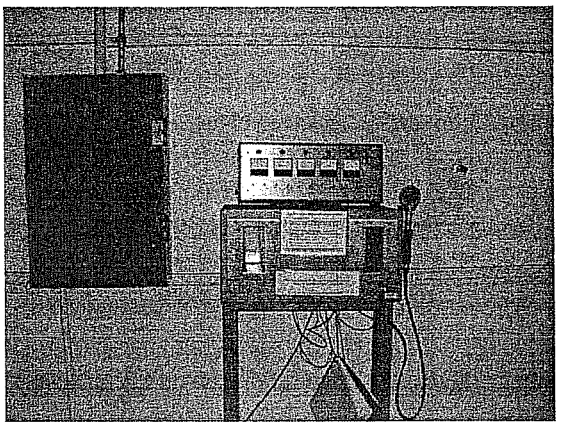


Figure 4, Hand and Foot Monitoring Station

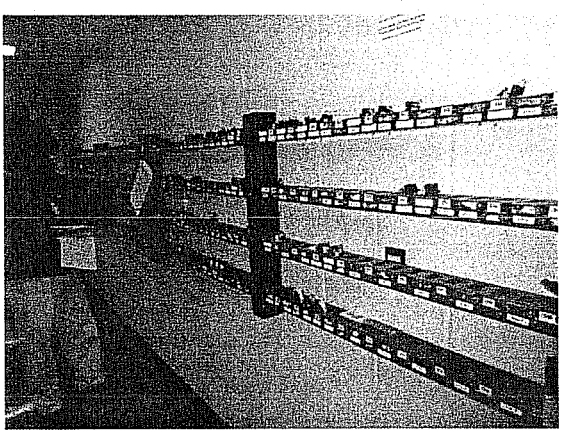


Figure 2, Dosimetry Rack

Figure 5, Two Waste Tanks in Room B045

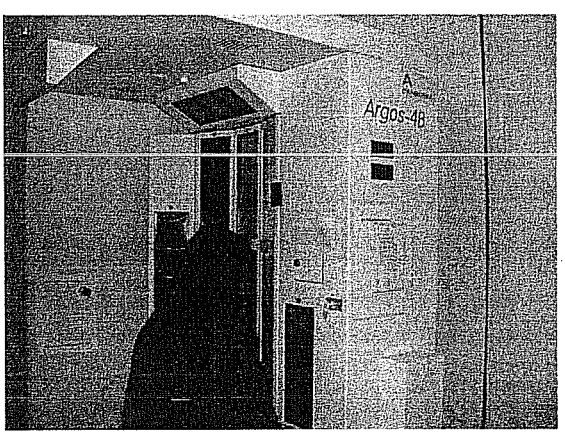


Figure 3, Whole Body Frisking Station

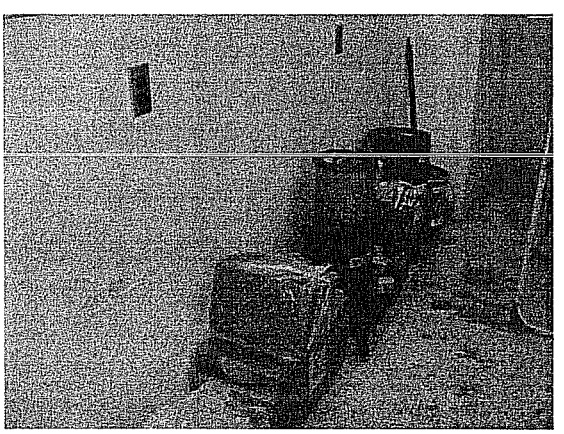


Figure 6, Long Term Storage in Room B132

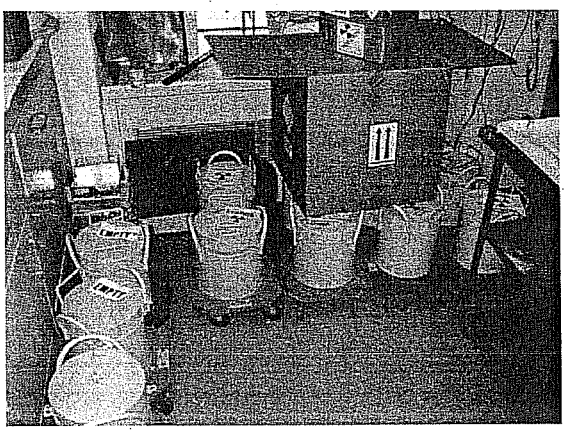


Figure 7, Source Storage Containers

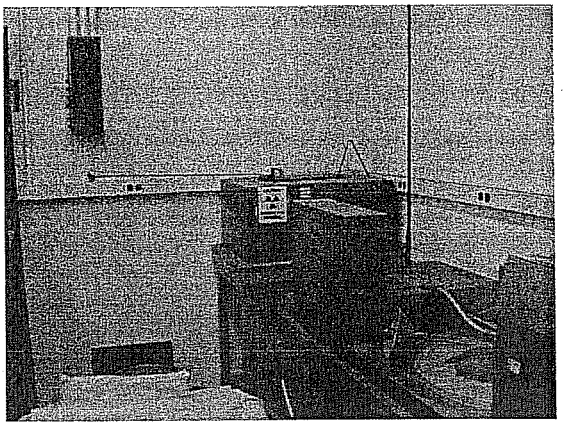


Figure 10, Laboratory Storage of Radium Sources

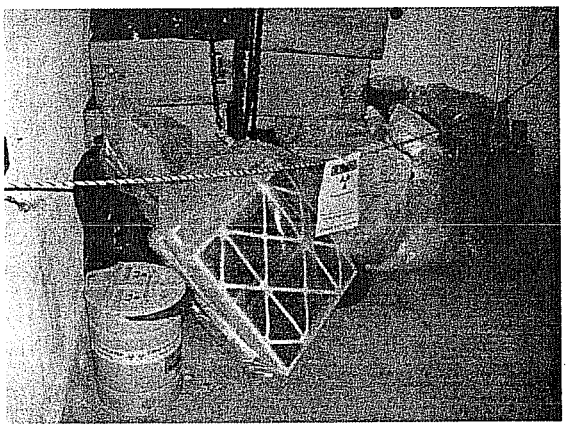


Figure 8, Building 245 Waste Storage

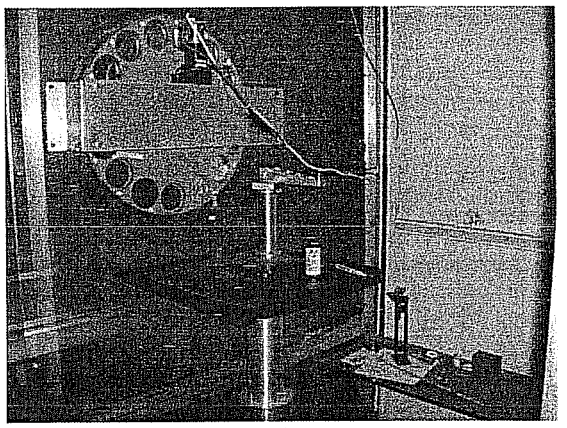


Figure 11, I-125 Brachytherapy Seed Calibration

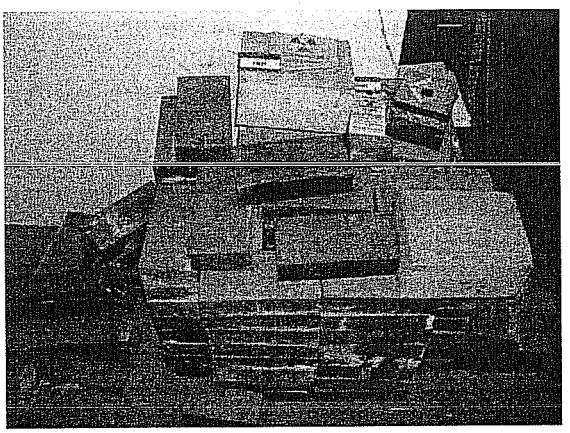


Figure 9, Shielding

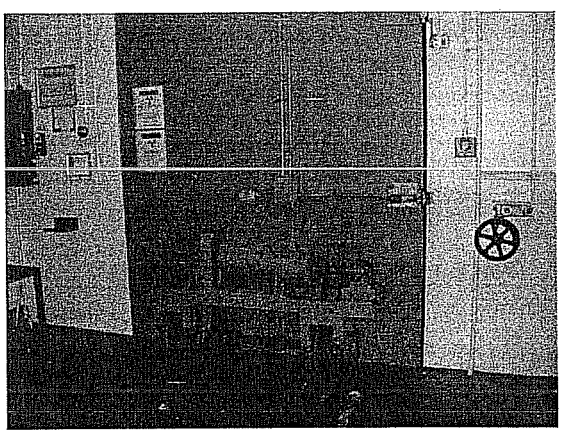


Figure 12, Irradiator Shield Door (Closed Position)

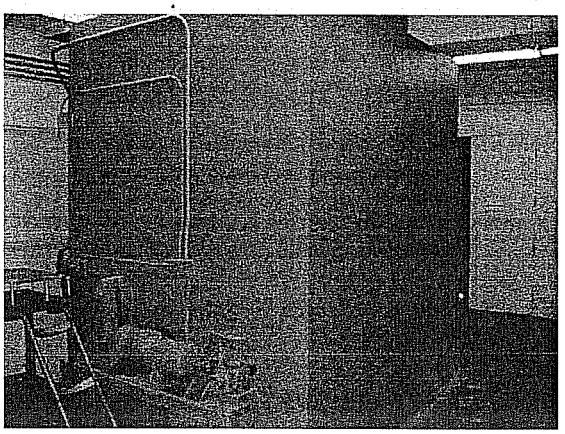


Figure 13, Irradiator Shield Door (Not in use)

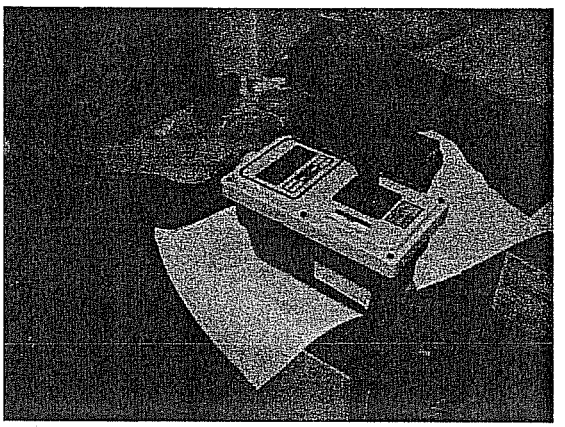


Figure 16, Typical Survey Meter Loaned for Researcher Use

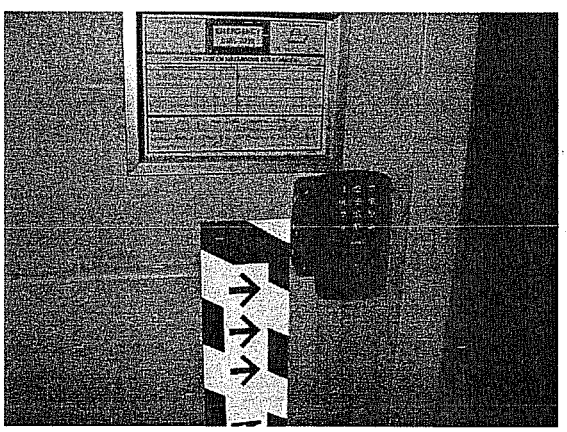


Figure 14, Typical Entry Control

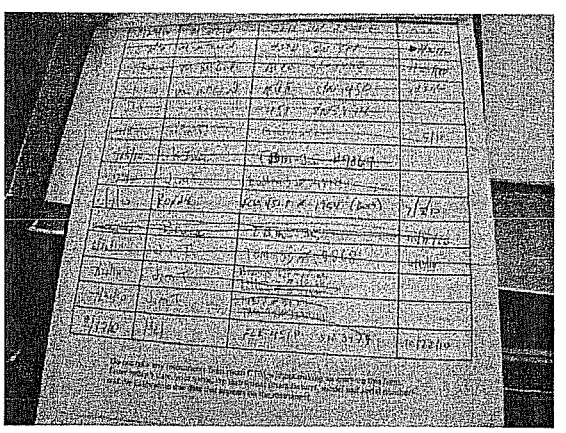


Figure 17, Ad Hoc Instrument Sign/Out Sheet

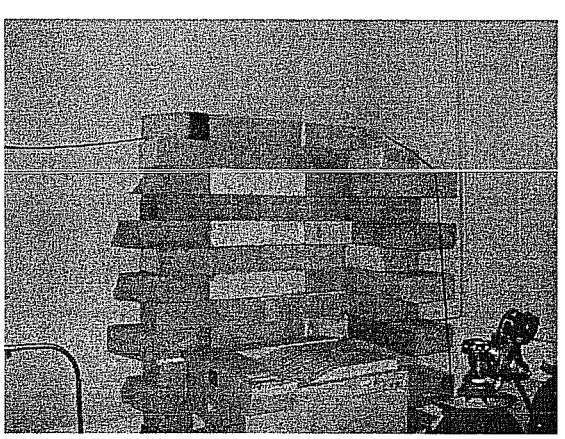


Figure 15, Shielding from Irradiator Within Environmental Dosimetry Analysis Room

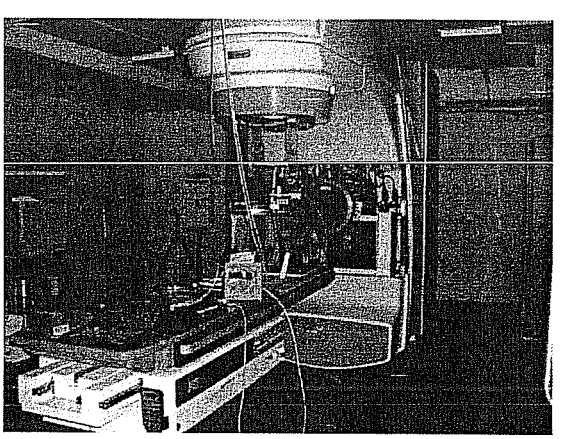


Figure 18, CLINAC With On-going Study

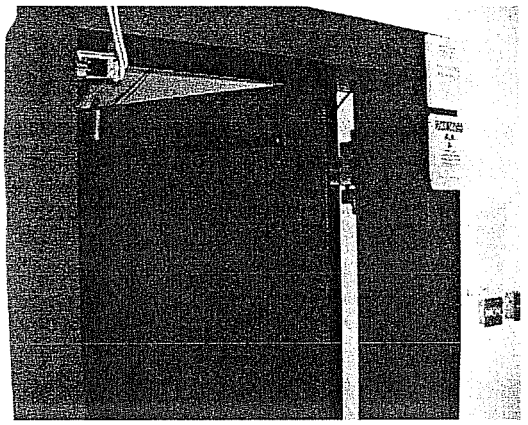


Figure 19, Engineering Controls for Horizontal Beam

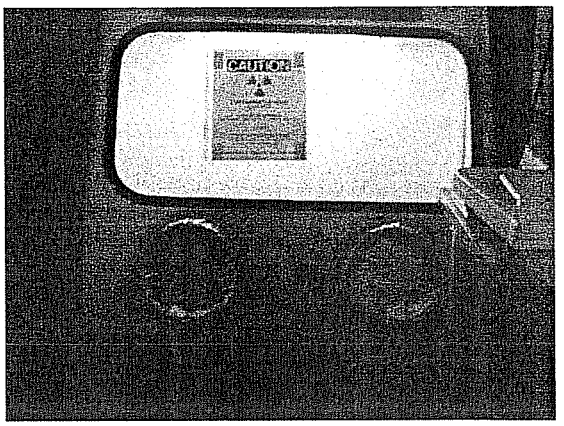


Figure 22, Contaminated Glove Box in PU Area

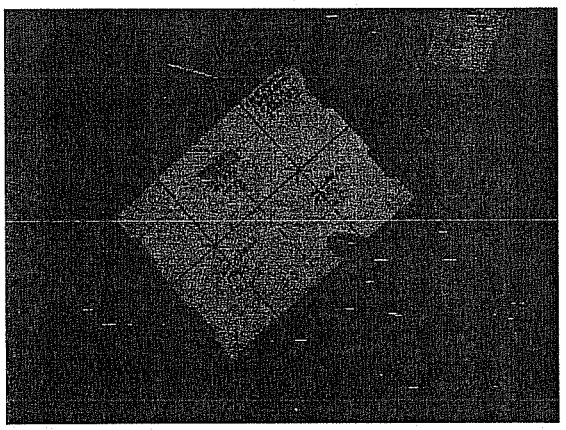


Figure 20, Design Instrument Operability Template

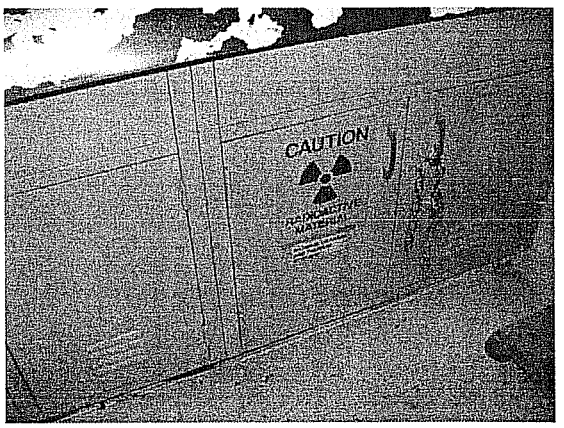


Figure 23, Marked for Th & U But Not Present

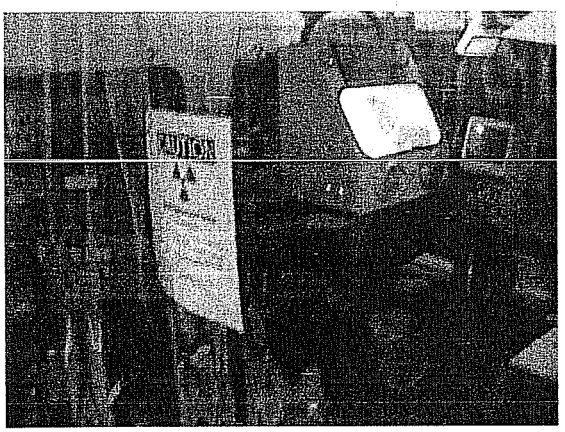


Figure 21, Curtained Pu Contaminated Area

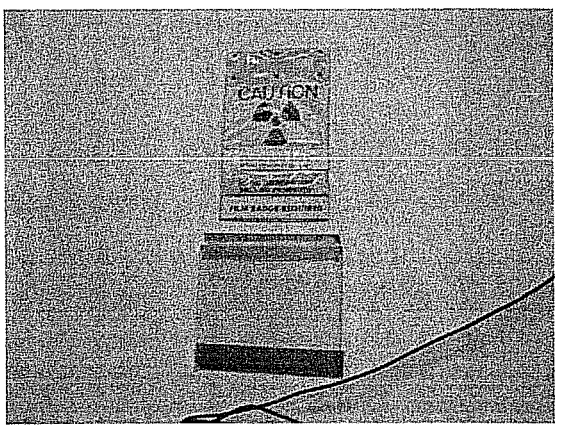


Figure 24, No Demarcation Line As Indicated

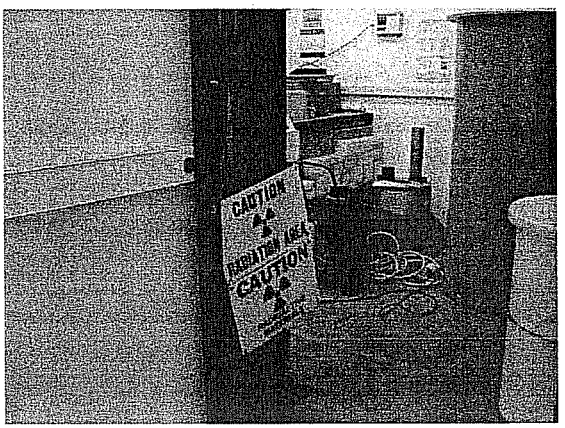


Figure 25, Entry Posted Backwards

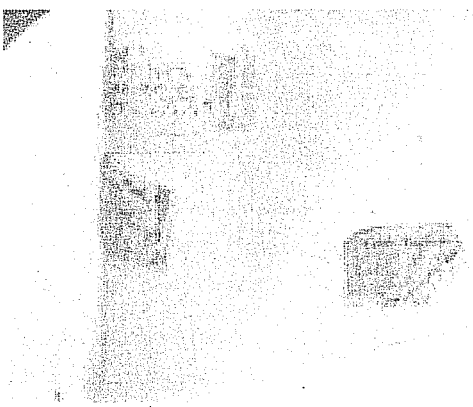


Figure 26, Gamma Cell with Legacy Leak Test

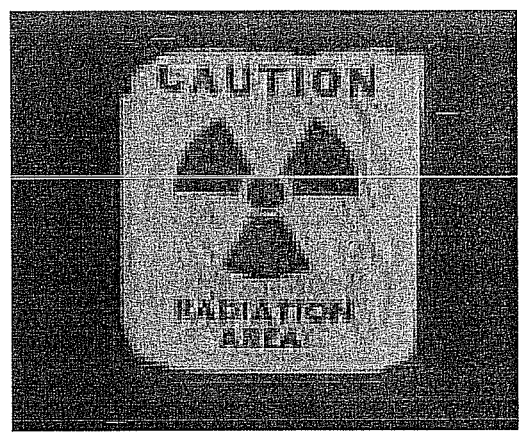


Figure 27, Partially Obliterated Posting

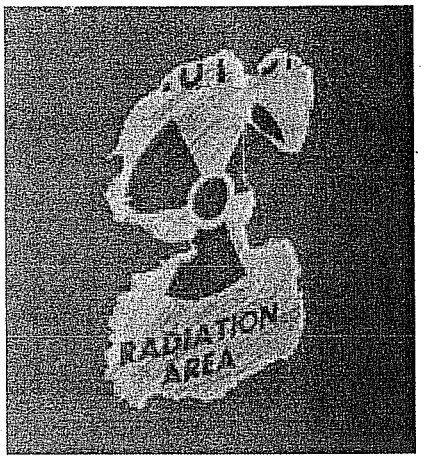


Figure 28, 2nd Partially Obliterated Posting

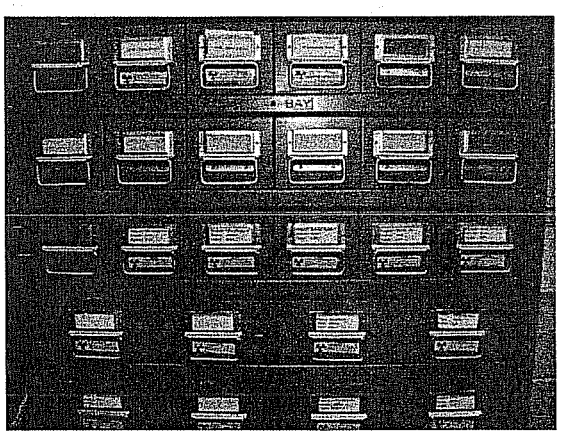


Figure 29, Non-specific Posting

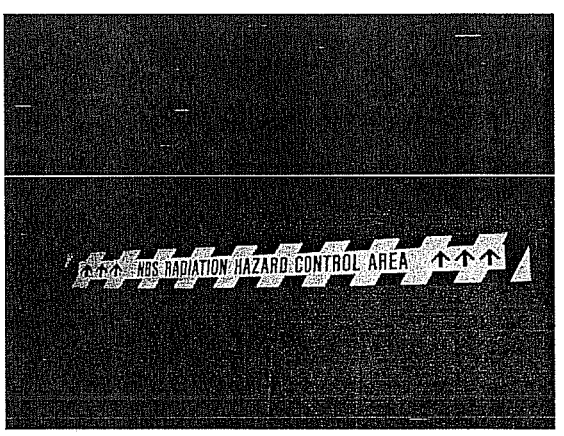


Figure 30, Antiquated NBS Posting

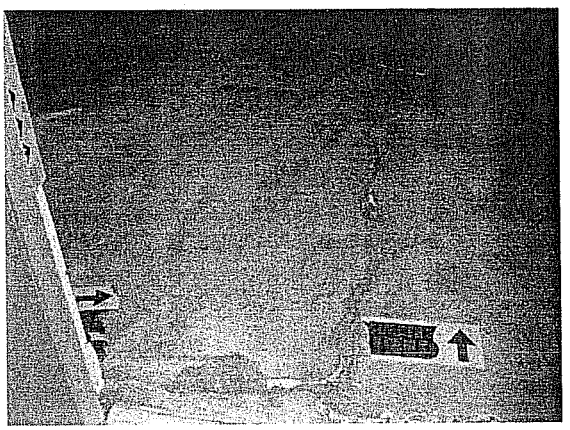


Figure 31, Partially Removed Sign

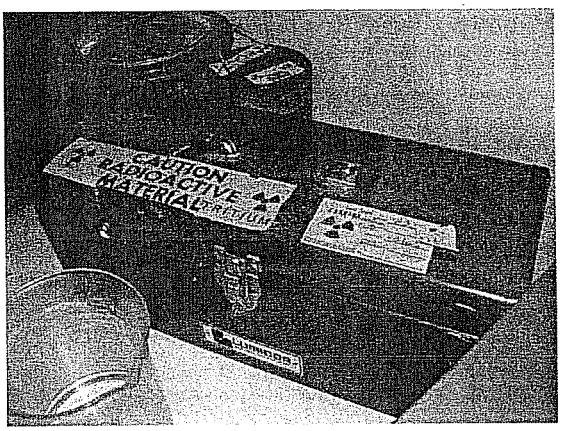


Figure 34, Contaminated Tool Box

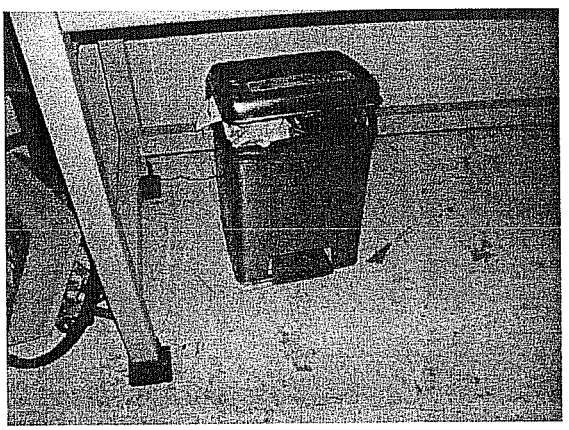


Figure 32, Overfilled Rad Trash Can

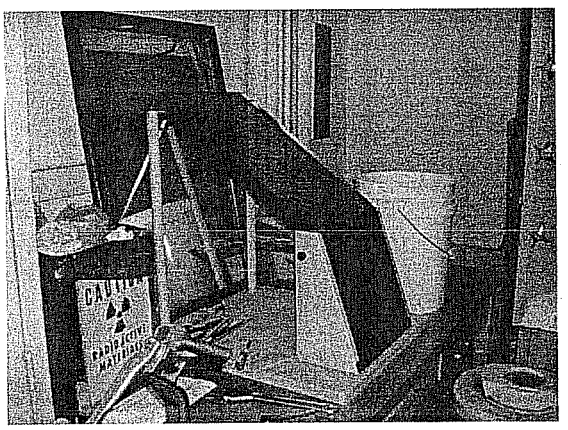


Figure 34, Overfilled Rad Trash Can

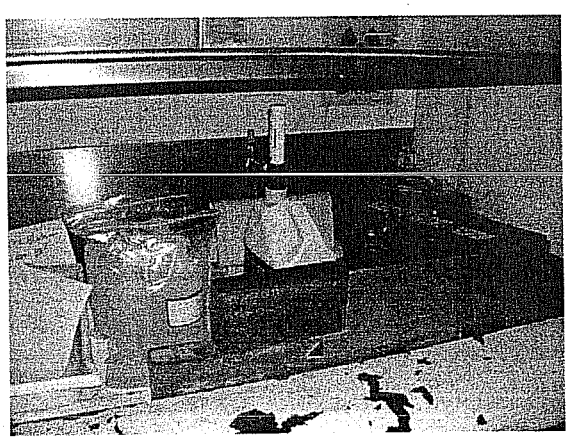


Figure 33, Containers in Rad Work Area

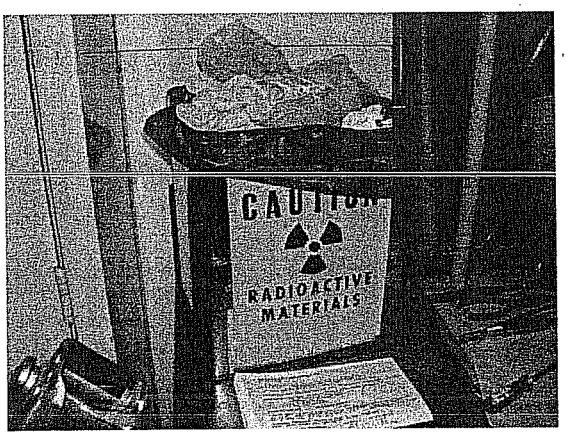


Figure 36, Close-up of Overfilled Trash Can

Figure 37, Third Example of Overfilled Rad Trash Can

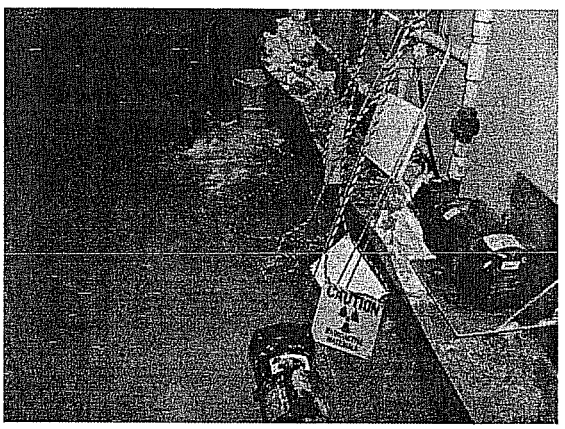


Figure 38, Example General Housekeeping Issue

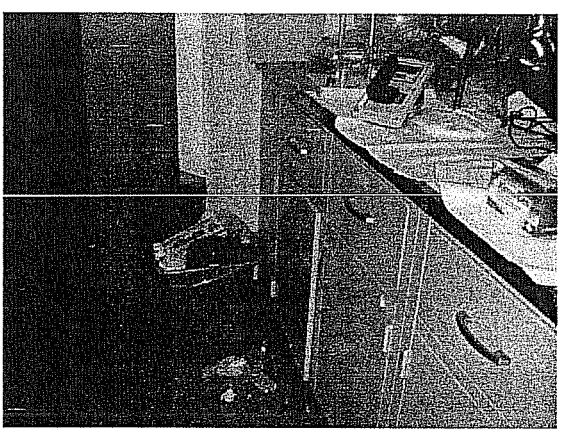


Figure 39, Example 2-General Housekeeping

Figure 40, Example 3-General Housekeeping

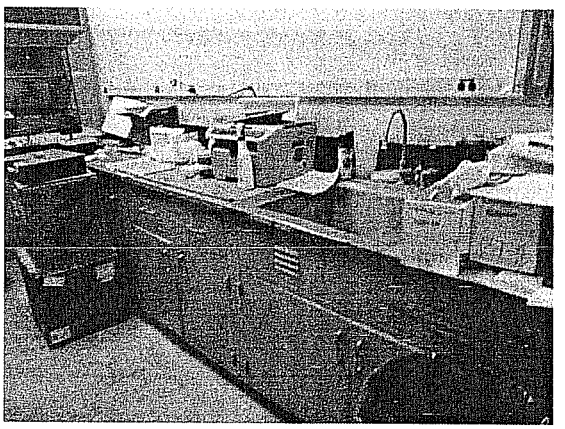


Figure 41, Example4-General Housekeeping

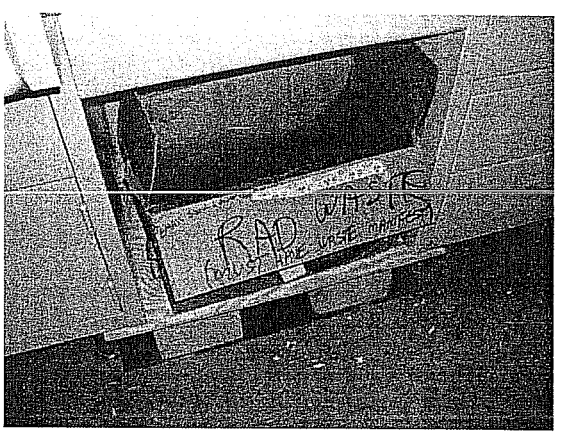


Figure 42, Example 5- Radiological Housekeeping Issue

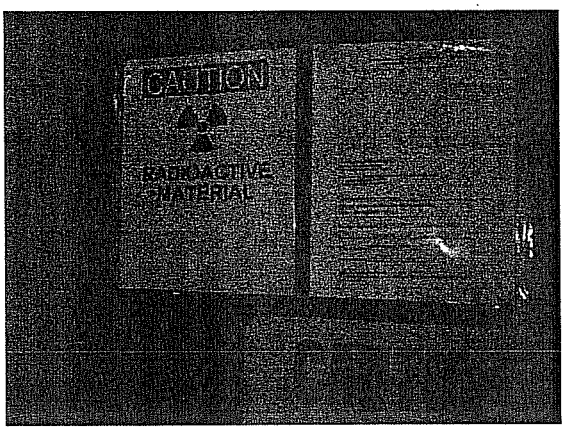


Figure 43, Typical Entrance Posting

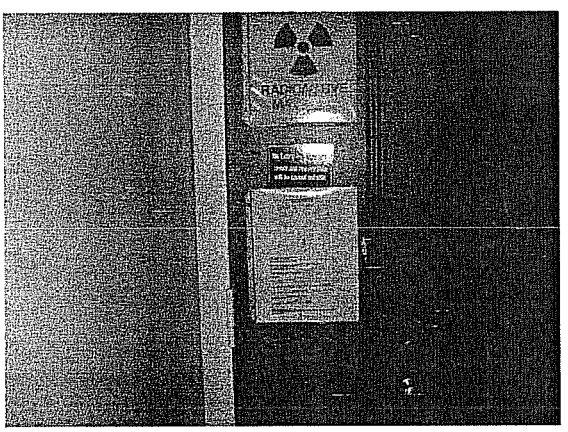


Figure 44, 2nd Example Entrance Posting

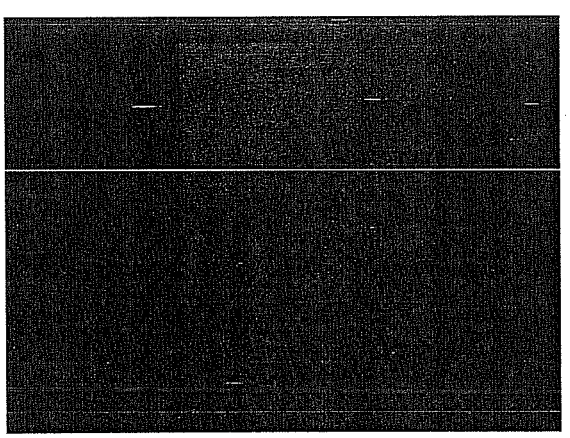


Figure 45, Example of Survey Posting

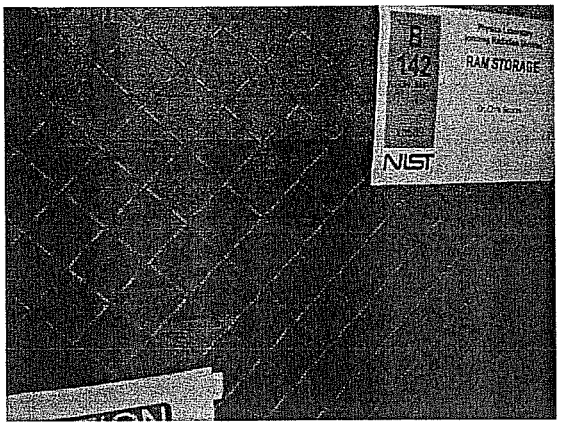


Figure 46, Multiple Radium Sources

Figure 47, Kr-85, Sr90 & Pm-147 Storage Box

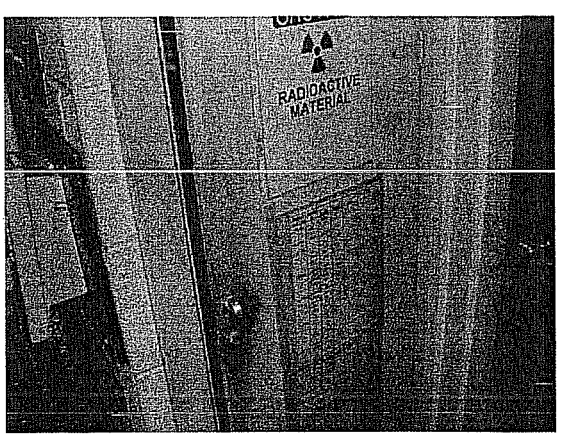


Figure 48, Waste Storage Locker

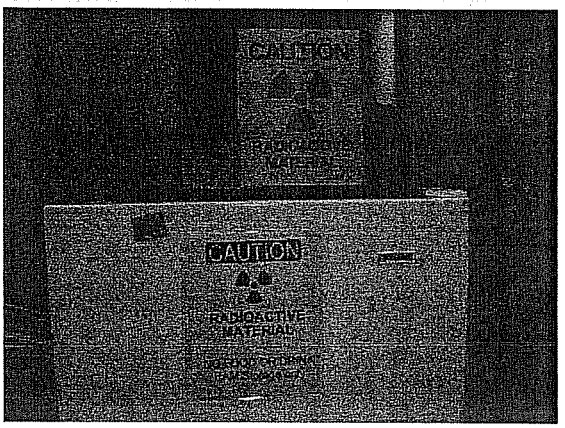


Figure 49, Posted Freezer