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U.S. NUCLEAR REGULATORY COMMISSION
REGION III

Report Nos. 050-186/95004 (DNMS); 24-00513-36E (DNMS)

Docket Nos. 050-186, 030-30162

License Nos. R-103, 24-00513-36E

Licensee: The Curators of the University of Missouri

Facility Name: Missouri University Research Reactor (MURR)

Inspection Conducted: November 1-3, 1995, with continuing review through
November 27, 1995

Inspector: TKozak for 12/27/95
Mark W. Mitchell Date
Radiation Specialist

Approved By: TKozak 12/27/95
Thomas J. Kozak, Chief Date
Nuclear Materials Inspection
Branch 2

Inspection Summary

Inspection on November 1 to 3, 1995 with continuing review through November 27, 1995 (Report Nos. 05-186/95004 (DNMS); 24-00513-36E/95004 (DNMS))

Areas Inspected: This was a special unannounced safety inspection to assess the actions taken by the licensee in response to a Confirmatory Action Letter which was issued to the licensee on October 6, 1995.

Results: One unresolved item concerning the possible transfer of byproduct material to an unauthorized individual was identified. A written response concerning this issue was received in a letter dated November 17, 1995. Acceptable interim control measures were listed in the letter and were implemented to ensure the irradiated topaz was appropriately controlled. In addition, acceptable long term controls were proposed for future implementation.

DETAILS

1.1 Persons Contacted

University of Missouri-Columbia

- *John McCormick, Vice Provost for Research and Graduate Studies
- +James Rhyne, Director, MURR
- +*Charles McKibben, Associate Director, MURR
- +*Jim Schuh, Health Physicist, MURR
- +*Steve Gunn, Service Manager, MURR
- +John Ernst, RSO, Health Physics Manager, MURR
- *Matthew R. Sanford, Reactor Services Project Specialist
- *Ronita Dinger, Information Specialist
- *Tony Schoone, MURR Reactor Operations
- +Walt Meyer, Manager, MURR Reactor Operations
- +Bruce Hoskins, University Counsel
- +Kelly Mescher, University Counsel
- *Clarence Jett, Internal Auditor, University of Missouri

Nuclear Regulatory Commission

- **Cynthia Pederson, Director, Division of Nuclear Materials Safety(DNMS)
- **Jim McCormick-Barger, Chief, Decommissioning Branch
- **Bruce Berson, Regional Counsel, Region III
- **Charles Weil, Enforcement Specialist, Region III
- **Timothy Reidinger, Sr. Inspector, DNMS, Region III
- **Seymour Weiss, NRR
- **Marvin Mendonca, NRR
- **George Pangburn, NMSS
- +*Robert Marsh, Sr. Investigator, Region III Field Office
- +*Harold Walker, Sr. Investigator, Region III Field Office
- +*Mark Mitchell, Radiation Specialist

Additional technical, operational, and administrative personnel were contacted by the inspector during the course of the inspection.

+Denotes those attending the entrance meeting on November 1, 1995.

*Denotes those attending the exit meeting on November 3, 1995.

**Denotes those attending the exit meeting on November 3, 1995 via teleconference.

1.2 Purpose of Inspection

This inspection was conducted to assess the licensee's actions taken as a result of the commitments made to the NRC in the amended letter of September 21, 1995 (Attachment 1) from Mr. S. Gunn, Manager of Service Applications, MURR, to Mr. R. Marsh, Senior Investigator, Chicago Field Office, NRC, and a subsequent Confirmatory Action Letter issued to the licensee on October 6, 1995 (Attachment 2).

The inspection was limited in scope and focused on security and accountability of byproduct material (irradiated topaz) which is stored and processed in Room 267 of the Missouri University Research Reactor facility (MURR). The inspection consisted of interviews with licensee personnel, a review of records and observations of activities conducted in Room 267.

1.3 Topaz Irradiation Program

The University of Missouri Research Reactor (MURR) is a research reactor located in an academic environment at the University of Missouri, Columbia, Missouri. In addition to the academic and research uses for the reactor, the licensee irradiates topaz for commercial distribution. The Service Applications Group is responsible for the topaz irradiation program. The Services Manager reports to the Director, MURR.

The University leased Room 267 of the MURR facility to a customer of the topaz program. Once the University had determined that the irradiated topaz was releasable for international shipment under 10 CFR Part 110, it was given to the customer in Room 267 for sorting, storage and/or preparation for shipment. Prior to the implementation of the actions listed in the University's amended letter of September 21, 1995, to NRC, the customer signed a document listing the carat weight of the topaz that was received and processed the material independent of the University. Topaz with activity levels above the domestic limit in License No. 24-00513-36E was usually included in the material given to the customer.

When the customer was ready to make an international topaz shipment, the University was informed of the weight and contents of the packages that had been prepared for shipment. The University indicated that they did not perform an independent verification of the actual contents or weight of the packages. In addition, the MURR staff did not have an accurate inventory of the topaz in Room 267 up to September 20, 1995.

The circumstances surrounding the handling and shipping of irradiated topaz indicate that the University may have been transferring byproduct material to an unauthorized individual (the customer). This is an unresolved item (URI No. 050-186/95004-01; 24-00513-36E/95004-01). This concern was initially developed during an investigation September 19-21, 1995. A letter from the University to NRC, as amended on September 21, 1995, listed actions that would be taken to improve the University's control of irradiated topaz. An October 6, 1995, Confirmatory Action Letter (CAL) to the University formalized NRC's understanding of the actions planned to ensure the irradiated topaz was properly controlled.

One Unresolved Item was identified.

1.4 Confirmatory Action Item Review

A review of the actions taken by the licensee to meet the commitments

listed in the CAL was performed. The specific items outlined in the CAL and the licensee's actions are discussed below.

Item 1: Padlock the inner door to the dark room (Room 267) and place two keys to the room under the control of Mr. John Ernst or his designee and Mr. Matt Sanford or his designee.

Discussion: The licensee completed their commitment in this item on September 20, 1995. It appeared that key control was maintained at all times between September 20, 1995 and the date of the inspection. There appeared to be no opportunity for the keys to be duplicated prior to the transfer to the designated individuals. The padlock packages were opened from the manufacturer's packaging in the presence of the controlling individuals.

Item 2: Until further notice the University of Missouri Research Reactor (MURR) will have a MURR employee present in a supervisory role when any work is performed in this space.

Discussion: The space referred to in this item is Room 267. Starting on September 20, 1995, the licensee ensured a MURR employee was present at all times when the customer or employees of the customer were in the room. Through a review of recent shipments and interviews with personnel assigned to oversee activities in Room 267, it was determined that the individuals had no formal guidelines for their duties, kept no formal inventory or log of materials entering and leaving the room, and were not aware of the origin of packages shipped by the customer. One shipment contained eight packages, three of which did not originate from Room 267. However, the oversight personnel thought all of the material originated from Room 267. This indicated that the supervision of the activities in Room 267 was not effective in ensuring that the licensee was in positive control of the transfer of material into and out of the room. This area of concern was adequately addressed in a November 17, 1995, letter (Attachment 3) from the licensee and there are no further questions regarding the supervision of activities in Room 267.

Item 3: The licensee will conduct an audit of the material contained in the room under the direction of Mr. Jim Schuh.

Discussion: The licensee inventory found 26,049.8 carat weight of topaz that was not known to be in the room. The licensee determined that this material should have been in their vault as it was for other MURR customers. The material was apparently placed in the room without following the normal material transfer procedure. The inventory also initially revealed that approximately 1,000,000 carat weight of topaz

was not in the room as expected. Mr. Jett of the University's Internal Auditing Department was contacted to reconcile the inventory. Data transfer errors were found by Mr. Jett and once the reconciliation was complete, the physical inventory was within 3.37 percent of the expected value. This was considered by the licensee to be a reasonable agreement.

Item 4: The licensee will ensure that no material is transferred into or out of this room until the inventory has been reconciled under the oversight of Clarence Jett of the University of Missouri Internal Auditing Department.

Discussion: It appears that no material left the Room 267 until Mr. Jett had reconciled the inventory.

Item 5: After the inventory is complete and until further notice, the licensee will ensure that a MURR employee supervises all material transfers into and out of the dark room (Room 267).

Discussion: As of the date of this inspection, a member of the MURR staff continued to be physically present in the room during all operations.

In summary, our review indicated that items 1, 3, 4, and 5 were adequately completed. However, the action taken for item 2 did not alleviate our concern that irradiated topaz was being inappropriately transferred to the customer. The need for positive control of the material was discussed at the exit meeting and, as agreed to at the meeting, a written response to this concern was received in a letter dated November 17, 1995. The letter was discussed with the licensee on November 27, 1995, to ensure the intent of the listed actions was mutually understood. Acceptable interim measures were listed in the letter and were implemented to ensure the University had appropriate control of the irradiated topaz. In addition, acceptable long term control measures were proposed for future implementation. The long term control measures will be reviewed during a future inspection.

1.5 Exit Meeting

On November 3, 1995, an exit meeting was held with licensee personnel listed in Section 1 to discuss the preliminary findings of the inspection. The NRC expressed the concern that MURR did not have positive control of the topaz irradiated at MURR until it was shipped internationally in compliance with 10 CFR 110 or domestically under the requirements of NRC License No. 24-00513-36E for exempt distribution. The licensee agreed to respond to this concern in writing. The response was received on November 17, 1995 and was discussed with the licensee on November 27, 1995. It appeared that acceptable interim measures were implemented to enhance the control of topaz until the proposed procedures containing long term controls were developed.

University of Missouri-Columbia

Research Reactor Center

Research • Education • Service
Columbia, MO 65211

phone (314) 882-5273

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Robert Marsh
Senior Investigator
U.S. Nuclear Regulatory Commission
Office of Investigations
Chicago Field Office

September 20, 1995
Amended September 21, 1995

Dear Mr. Marsh

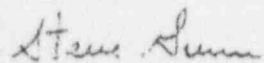
The following actions have been taken to address your concerns regarding our control of Radioactive Topaz in our Non-Licensed Accounts (NLA).

- (1) A padlock was purchased this date at Walmart and placed on the inner door to the dark room. Two keys exist, one under the control of John Ernst, or his designee, and one under the control of Matt Sanford or his designee.
- (2) Until further notice, the Licensee (MURR) will insure that a MURR employee is present in a supervisory role when any work is performed in this space.
- (3) An audit of the material contained in the room has been started under the direction and supervision of Jim Schuh.
- (4) No material will be transferred into or out of this room until the inventory has been reconciled.

9/21/95 Clarence Jett of the University of Missouri Internal Auditing Department will oversee the reconciliation.

- (5) Until further notice, the Licensee (MURR) will insure that a MURR employee supervises all material transfers into and out of this room.

Sincerely,



Steve Gunn
Manager, Service Applications

CC: Jim Rhyne, Charlie McKibben, John Ernst, Walt Meyer, Steve Morris, Jim Schuh, Matt Sanford
9/21/95 Clarence Jett

ATTACHMENT 1

October 6, 1995

CAL No. RIII-95-004

The Curators of the University
of Missouri
ATTN: Jim Rhyne, Ph.D., Director
Research Reactor Center
Columbia, MO 65211

SUBJECT: CONFIRMATORY ACTION LETTER

Dear Dr. Rhyne:

This letter refers to NRC concerns with the control of radioactive topaz at your facility identified by Mr. R. Marsh during an investigation on September 19 and 20, 1995.

Pursuant to Mr. Steve Gunn's letter to Mr. Marsh dated September 20, 1995, as amended on September 21, 1995, it is our understanding that you will:

- (1) padlock the inner door to the dark room and place two keys to the room under the control of Mr. John Ernst or his designee and Mr. Matt Sanford or his designee,
- (2) until further notice, have a University of Missouri Research Reactor (MURR) employee present in a supervisory role when any work is performed in this space,
- (3) conduct an audit of the material contained in the room under the direction of Mr. Jim Schuh,
- (4) ensure no material is transferred into or out of this room until the inventory has been reconciled under the oversight of Clarence Jett of the University of Missouri Internal Auditing Department, and
- (5) once the inventory is complete and until further notice, ensure a MURR employee supervises all material transfers into and out of the dark room.

Pursuant to Section 182 of the Atomic Energy Act, 42 U.S.C. 2232, you are required to:

1. Notify me immediately if your understanding differs from that set forth above;

ATTACHMENT 2

- 2) Notify me if for any reason you cannot complete the actions within the specified schedule and advise me in writing of your modified schedule in advance of the change; and
- 3) Notify me in writing when you have completed the actions addressed in this Confirmatory Action Letter.

Issuance of this Confirmatory Action Letter does not preclude issuance of an order formalizing the above commitments or requiring other actions on the part of the licensee; nor does it preclude the NRC from taking enforcement action for violations of NRC requirements that may have prompted the issuance of this letter. In addition, failure to take the actions addressed in this Confirmatory Action Letter may result in enforcement action.

The responses directed by this letter are not subject to the clearance procedures of the Office of Management and Budget as required by the Paperwork Reduction Act of 1980, Pub. L. No. 96-511.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter, and your response will be placed in the NRC Public Document Room (PDR). To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information so that it can be placed in the PDR without redaction. However, if you find it necessary to include such information, you should clearly indicate the specific information that you desire not to be placed in the PDR, and provide the legal basis to support your request for withholding the information from the public.

Sincerely,

Cynthia D. Pederson, Director
Division of Nuclear Materials Safety

Docket No.: 030-30162
License No.: 24-00513-36E

cc w/ltr dated 9/20/95: H. Thompson, OEDO
J. Lieberman, OE
J. Goldberg, OGC
D. Cool, NMSS
C. Jones, NMSS
H. Miller, RIII
State of Missouri, SLO



UNIVERSITY OF MISSOURI-COLUMBIA

November 17, 1995

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Cynthia D. Pederson, Director
Division of Nuclear Materials Safety
U.S. Nuclear Regulatory Commission, Region III
801 Warrenville Road
Lisle, Illinois 60532-4351

Subject: Reply to Confirmatory Action Letter CAL No. RIII-95-04 and Concerns Raised During Exit Interview November 3, 1995

Dear Ms. Pederson:

This letter is our notification to you that we have completed the actions addressed in your Confirmatory Action Letter CAL-RIII-95-004. Specifically:

- (1) On September 20, 1995, the inner door of Room 267 (Dark Room) was padlocked and the two keys were placed under the control of Mr. John Ernst or his designee and Mr. Matt Sanford or his designee.
- (2) Since September 20, 1995, a University of Missouri Research Reactor (MURR) employee has been present in a supervisory role when any work is performed in Room 267.
- (3) Conducted on the evening of September 20, 1995, an audit of the byproduct material contained in Room 267 was conducted under the direction of Mr. Jim Schuh.
- (4) The inventory was reconciled under the oversight of Mr. Clarence Jett of the University of Missouri Internal Auditing Department on September 21, 1995. No material was transferred into or out of Room 267 until September 22, 1995.
- (5) A University of Missouri Research Reactor employee has supervised all byproduct material transfers into and out of Room 267. The first transfer of byproduct material was a transfer into Room 267 on September 22, 1995. The first transfer out was a shipment on September 25, 1995.

During the investigation conducted on September 20-21, 1995, we understood Mr. Robert Marsh had major concerns about how we were handling the byproduct material in Room 267. We do not believe that the University violated any regulations regarding the possession and use of the byproduct material in Room 267. When we asked Mr. Marsh what NRC regulation he felt we were not in compliance with concerning Room 267, no specific answer was given. Therefore in an attempt to



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ATTACHMENT 3

continue to meet appropriate program needs while alleviating nonspecific concerns, Mr. Steve Gunn committed to take the actions in his September 20, 1995 letter (amended September 21, 1995). MURR is in compliance with CAL-RIII-95-004.

Next, we wish to address the issues raised in the November 3, 1995 exit interview of the CAL compliance inspection. We understand that you are concerned that our supervision of non-University employees working with byproduct material is insufficient to preclude the possibility of unauthorized release in the United States. Specifically, that allowing non-University employees unrestricted access to byproduct topaz material in Room 267 and being involved jointly with MU employees in delivering the material to the carrier in St. Louis does not provide a sufficient barrier to prevent this topaz from being switched with nonbyproduct topaz. You suggest that this provides an opportunity for byproduct topaz to be released in the U.S. without going through the appropriate controls of an exempt gemstone license.

We have implemented the following controls to provide the barrier and documentation for inspection to validate that the byproduct topaz is only released in compliance with 10CFR regulations:

- (1) We have restricted the activities in Room 267 to storage, cleaning, heat treating and sorting of MURR irradiated byproduct material that has been approved by the Gemstone QA program for non-U.S. release. No nonbyproduct topaz will be allowed in Room 267.
- (2) All transfers into and out of the Room 267 are documented by MURR employees who log the date, type of transfer and mass of the transfer.
- (3) MURR employees will package all shipments of byproduct topaz leaving the Center after weighing and documenting the weights. The packages will be sealed and marked to clearly differentiate them from any other packages and make unauthorized opening easily detectable.
- (4) MURR employees will keep packages in their custody during the transfer to the air carrier and will obtain documentation of this transfer. Only MURR irradiated byproduct material will be allowed in these shipments.

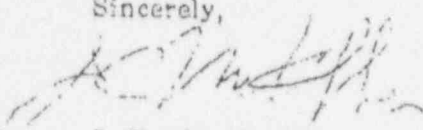
It is our position that properly trained radiation workers can be relied on to follow procedures and obey regulations. The gemstone material being handled in Room 267 has all been analyzed by an extensive QA program to ensure that each individual stone does not exceed a concentration of 74 Bq/g (2 nCi/g). In practice the concentrations are significantly below the 74 Bq/g limit. Small batches of gemstones having these very low radioactive concentrations can be surveyed with a typical GM survey instrument with no increase in count rate detected. We believe that the hazard level of byproduct material that has been certified to have a specific activity of less than 74 Bq/g including beta activity does not justify constant surveillance or physical search of trained personnel.

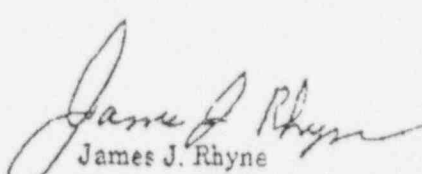
We propose implementing the following controls governing the activities in Room 267 to address the issues raised during the inspection November 1-3, 1995. These controls will be in place December 18, 1995 and will replace the controls given in the CAL-RIII-95-004:

- (1) Limit by procedure the activities in Room 267 to the storage, cleaning, heat treating, sorting and handling of byproduct material that has been certified for non-domestic release by the MURR Gemstone QA program.
- (2) By procedure, require that all transfers of byproduct material into and out of Room 267 will be supervised by a MURR employee.
- (3) By procedure, require that the date, type of transfer and mass of all transfers of byproduct material into and out of Room 267 be logged by a MURR employee.
- (4) By procedure, require that MURR employees perform or supervise the packaging of all topaz byproduct topaz leaving the center.
- (5) By procedure, require that shipments of byproduct material from Room 267 will be restricted to byproduct material only, and that MURR employees will keep the packages in their custody during transfer to the air carrier and will obtain documentation of this transfer.
- (6) Compliance with the control procedures will be documented by conducting an annual audit of the physical inventory and records of the material balance in Room 267.

These steps will enhance the level of control over byproduct material located in Room 267 of MURR. We believe that this enhanced level of control will address the issues you raised and more than adequately protect the public from any potential hazards associated with this byproduct material. No shipments of byproduct topaz have been made since the November 3, 1995 exit. We will make shipments as needed meeting the above policies, but do not anticipate shipping until after November 26, 1995. If there are any additional questions, please call John Ernst (314-882-5226) or Charles McKibben (314-882-5204).

Sincerely,


J. Charles McKibben
Associate Director


James J. Rhyne
Director, MU Research Reactor
and Professor of Physics

cc: J. McCormick
E. Weiss, NRC/NRR/ONDB
J. Ernst