

February 8, 2005

Dr. T. Tehan, Director
Rhode Island Nuclear Science Center
Rhode Island Atomic Energy Commission
Reactor Road
Narragansett, RI 02882-1197

SUBJECT: NRC INSPECTION REPORT NO. 50-193/2005-201

Dear Dr. Tehan:

This letter refers to the inspection conducted on January 24-27, 2005, of the Rhode Island Nuclear Science Center research reactor facility. The inspection included a review of activities authorized for the facility. The enclosed report presents the results of that inspection.

Areas examined during the inspection are identified in the report. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations of activities in progress. Based on the results of this inspection, no safety concerns or noncompliances of NRC requirements were identified. No response to this letter is required.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at (the Public Electronic Reading Room) <http://www.nrc.gov/reading-rm/adams.html>.

Should you have any questions concerning this inspection, please contact Craig Bassett at (404) 562-4712.

Sincerely

/RA/

Patrick M. Madden, Section Chief
Research and Test Reactors Section
New, Research and Test Reactors Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No. 50-193
License No. R-95

Enclosure: NRC Inspection Report No. 50-193/2005-201
cc w/enclosure: Please see next page

Rhode Island Atomic Energy Commission

Docket No. 50-193

cc:

Dr. Vincent C. Rose, Chairman, RIAEC
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Dr. Harry Knickle, Chairman
Nuclear and Radiation Safety Committee
University of Rhode Island
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Mr. Jack Ferruolo
State Radiation Control Officer
Rhode Island Department of Health
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Test, Research, and Training
Reactor Newsletter
University of Florida
202 Nuclear Sciences Center
Gainesville, FL 32611

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U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION

Docket No: 50-193

License No: R-95

Report No: 50-193/2005-201

Licensee: Rhode Island Atomic Energy Commission

Facility: Rhode Island Nuclear Science Center
University of Rhode Island

Location: Narragansett, Rhode Island

Dates: January 24-27, 2005

Inspector: Craig Bassett

Approved by: Patrick M. Madden, Section Chief
Research and Test Reactors Section
New, Research and Test Reactors Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

Rhode Island Atomic Energy Commission
Rhode Island Nuclear Science Center
Report No. 50-193/2005-201

The primary focus of this routine, announced inspection included onsite review of selected aspects of the licensee's Class I Research and Test Reactor (RTR) safety programs including: organization and staffing, review and audit and design change functions, procedures, radiation protection, and transportation of radioactive material since the last NRC inspection in these areas. The licensee's programs were acceptably directed toward the protection of public health and safety and were in compliance with NRC requirements.

Organization and Staffing

- The licensee's organization and staffing remained in compliance with the requirements specified in the Technical Specifications.

Review and Audit and Design Change Functions

- Review, oversight, and audit functions required by Technical Specifications Section 6.4 were acceptably completed by the Nuclear and Radiation Safety Committee.
- The design change program was carried out in accordance with 10 CFR 50.59.

Procedures

- The health physics procedures were found to be acceptable and had been reviewed and approved by the Nuclear and Radiation Safety Committee as required.

Radiation Protection Program

- Surveys were being completed and documented acceptably to permit evaluation of the radiation hazards present.
- Postings and instructions met regulatory requirements.
- Personnel dosimetry was being worn as required and recorded doses were within the licensee's procedural action levels, and NRC's regulatory limits.
- Radiation monitoring equipment was being maintained and calibrated as required.
- The Radiation Protection and ALARA Programs satisfied regulatory requirements.
- The Radiation protection training program was being administered as required.

Effluent and Environmental Monitoring

- Effluent monitoring satisfied license and regulatory requirements and releases were within the regulatory limits.

Transportation of Radioactive Materials

- No radioactive material shipments had been made under the auspices of the reactor license within the past year.

REPORT DETAILS

Summary of Plant Status

The licensee's two megawatt research and test reactor continued to be operated in support of laboratory experiments, reactor operator training, various types of research, and irradiation of samples for various clients. During the inspection, the reactor was started-up, operated, and shut down as required to support laboratory experiments and irradiation work.

1. Organization and Staffing

a. Inspection Scope (Inspection Procedure [IP] 69006)

The inspector reviewed the following regarding the licensee's organization and staffing to ensure that the requirements in Sections 6.1-6.3 of Technical Specifications (TS), Amendment No. 28, dated August 2, 2001, were being met:

- C current organizational structure for the Rhode Island Nuclear Science Center (RINSC)
- C RINSC Operating Procedures, Section 1, "General Considerations," original version - not yet revised
- C staff qualifications and management responsibilities
- C RINSC Annual Reports for July 1, 2002 through June 30, 2003, and July 1, 2003 through June 30, 2004

b. Observations and Findings

Through discussions with licensee representatives, the inspector determined that management responsibilities, as well as the organizational structure at the facility, had not changed since the last inspection in the area of operations (refer to NRC Inspection Report No. 50-193/2004-201). However, it was noted that the person who had been the Assistant Director for Reactor Operations had retired in August 2004. Since that time a person had been hired as the new Assistant Director for Reactor Operations. The inspector reviewed the qualifications of the new Assistant Director and found that he was highly qualified for the job, having a background in the nuclear navy, possessing a degree in Nuclear Engineering, and having been a qualified reactor operator at another RTR facility.

After discussing facility operations with licensee personnel, the inspector determined that the staffing at the facility was acceptable to support the ongoing activities. The current staffing met the requirements specified in TS Section 6.1.

c. Conclusions

The licensee's organization and staffing remained in compliance with the requirements specified in TS Section 6.

2. Review and Audit and Design Change Functions

a. Inspection Scope (IP 69007)

In order to verify that the licensee had established and conducted reviews and audits as required in TS 6.4 and to determine whether modifications to the facility, if any, were consistent with 10 CFR 50.59, the inspector reviewed:

- C Nuclear and Radiation Safety Committee meeting minutes for 2004 to date
- C Nuclear and Radiation Safety Subcommittee meeting minutes for 2004 to date
- C Audits and reviews documented in the Nuclear and Radiation Safety Committee and subcommittee meeting minutes
- C RINSC Radiation Safety Office Standard Operating Procedure (SOP) 110, "Radiation Protection Review," Revision (Rev.) 0, dated March 23, 2000

b. Observations and Findings

(1) Review and Audit Functions

The inspector reviewed the meeting minutes of the Nuclear and Radiation Safety Committee (NRSC) and the NRSC subcommittee from January 2004 to the present. These meeting minutes showed that the committees met at the required frequency and that a quorum was present for each meeting. The topics considered during the meetings were appropriate and as stipulated in the TS. Review of the committee meeting minutes also indicated that the NRSC provided appropriate guidance and direction for reactor operations, and ensured suitable use and oversight of the reactor.

Audits and reviews were conducted by the subcommittee of the NRSC and/or designated persons as required and the full NRSC reviewed the results. It was noted that audits and reviews of different portions of the radiation protection program were completed every quarter so that the entire program was reviewed each year as required. The inspector noted that the audits and reviews were acceptable and that licensee actions taken in response to the findings were appropriate.

(2) Design Change

The inspector determined that design changes at the facility required an analysis by facility staff followed by an NRSC review and subsequent approval. Two design changes had been processed during the past year. The changes did not deal with radiation protection but involved the control position indication and neutron flux monitor high voltage. The inspector reviewed the records documenting the changes and determined that the licensee analysis had been performed as required and the changes had been reviewed and approved by the NRSC. From the review, the inspector also determined that the licensee's design change reviews and approvals were focused on safety and met the intent of 10 CFR 50.59.

c. Conclusions

Review, oversight, and audit functions required by TS Section 6.4 were acceptably completed by the NRSC. The licensee's design change program was carried out in accordance with 10 CFR 50.59 as required.

3. Procedures

a. Inspection Scope (IP 69008)

To determine whether facility radiation protection procedures met TS Sections 6.4 and 6.5 requirements, the inspector reviewed selected aspects of the following:

- C NRSC meeting minutes for 2004 to date
- C NRSC Subcommittee meeting minutes for 2004 to date
- C RINSC Radiation Safety Office SOP 100, "Standard Operating Procedures," Rev. 0, dated March 23, 2000
- C RINSC Radiation Safety Office SOP 300, "Routine Surveys," Rev. 1, dated February 10, 2004
- C RINSC Radiation Safety Office SOP 512, "BioPAL Wastes," Rev. 1, dated March 26, 2004

b. Observations and Findings

The inspector reviewed selected RINSC Radiation Safety Office procedures. These procedures provided guidance for the administrative and radiation protection functions of the facility. The inspector confirmed that written procedures were available for those tasks and items required by TS Section 6.5. The licensee controlled changes to procedures and the meeting minutes confirmed that the NRSC conducted the required review and approval of any changes made by the licensee.

The inspector interviewed the staff and determined that the training of personnel on procedures and changes to procedures was effective. Personnel were also observed performing operations activities and a weekly survey in accordance with applicable procedures. The inspector determined that use of, and adherence to, procedures was acceptable.

During the inspection the inspector noted that some procedures, which had been initiated in 1999, were still being developed, revised, and reviewed. The licensee was encouraged to complete this process and finalize the applicable procedures.

c. Conclusions

The health physics procedures were found to be acceptable and had been reviewed and approved by the NRSC as required.

4. Radiation Protection

a. Inspection Scope (IP 69012)

The inspector reviewed the following to verify compliance with 10 CFR Parts 19 and 20, and the requirements outlined in TS Table 3.2 and Sections 3.7, 4.2, and 4.7:

- C radiation and contamination survey records documented on survey form, RINSC Form NSC-4
- C radiological signs and postings in the Reactor Room and basement level of the facility
- C RINSC dosimetry records (personnel and environmental) for 2003 and 2004
- C calibration and periodic check records for selected radiation monitoring instruments documented on the applicable form, RINSC Form NSC-17
- C Radiation Protection and ALARA Programs documented in the "Rhode Island Nuclear Science Center Radiation Safety Guide," Rev. 0
- C RINSC Radiation Safety Office SOP 101, "Radiation Safety Training," Rev. 0, dated March 23, 2000
- C RINSC Radiation Safety Office SOP 110, "Radiation Protection Audits," Rev. 0, dated March 23, 2000
- C RINSC Radiation Safety Office SOP 201, "External Monitoring," Rev. 0, dated March 23, 2000
- C RINSC Radiation Safety Office SOP 202, "Bioassay," Rev. 0, dated March 23, 2000
- C RINSC Radiation Safety Office SOP 203, "Determining TEDE and TODE," Rev. 0, dated March 23, 2000
- C RINSC Radiation Safety Office SOP 204, "Skin Exposures," Rev. 1, dated April 29, 2002
- C RINSC Radiation Safety Office SOP 220, "Pocket Dosimeter Calibration," Rev. 0, dated March 28, 2003
- C RINSC Radiation Safety Office SOP 300, "Routine Surveys," Rev. 1, dated February 10, 2004
- C RINSC Radiation Safety Office SOP 801, "Instrument Calibration," Rev. 0, dated November 6, 2000
- C RINSC Radiation Safety Office SOP 802, "Pocket Dosimeter Calibration," Rev. 0, dated November 6, 2000

The inspector also toured the licensee's facility, observed the use of dosimetry and radiation monitoring equipment, conducted a radiation survey of the Control Room and Reactor Bay with an NRC instrument, and interviewed licensee personnel.

b. Observations and Findings

(1) Surveys

The inspector reviewed selected weekly, monthly, quarterly, and annual radiation and contamination surveys for the past 18 months. The survey records were being completed as required by RINSC Radiation Safety Office SOP 300 and documented

on the appropriate forms. Results of the surveys were evaluated and corrective actions taken when readings or results exceeded established licensee action levels.

As indicated above, during the inspection, the inspector also accompanied a licensee representative during a weekly survey and conducted a radiation survey of the Control Room and Reactor Bay. The readings noted by the inspector were comparable to those found by the licensee. No problems or discrepancies were noted.

(2) Postings and Notices

During tours, the inspector observed that caution signs, postings, and barriers in the controlled areas were acceptable for the hazards involving radiation, high radiation, and contaminated areas and were implemented as required by 10 CFR 20, Subpart J and licensee procedures. Through observations of and interviews with licensee staff, the inspector confirmed that personnel complied with the signs, postings, and controls. The facility's radioactive material storage areas were noted to be properly posted. No unmarked radioactive material was detected in the facility.

Copies of current notices and instructions to workers were posted in appropriate areas in the facility. Radiological signs were typically posted at the entrances to controlled areas. Other postings also showed the industrial hygiene hazards that were present in the areas as well. Copies of NRC Form-3, "Notice to Employees," noted at the facility were the latest issue, as required by 10 CFR Part 19.11, and were posted in various areas throughout the facility. These locations included a bulletin board in the main hallway of the facility and in the lunch room.

(3) Occupational Exposure

The inspector determined that the licensee monitored whole body and extremity occupational exposures using optically stimulated luminescent (OSL) and finger ring dosimeters respectively. The dosimetry was supplied and processed by a National Voluntary Laboratory Accreditation Program accredited vendor (Landauer). An examination of the OSL and finger ring results for the past two years indicated that the highest occupational doses recorded were within 10 CFR Part 20 limitations. The records showed that most of the licensee personnel received occupational exposures of only a few millirem above background. The records revealed that the highest annual whole body exposure received by an individual RINSC staff member for 2003 was 81 millirem (mr) deep dose equivalent (DDE). The highest annual extremity exposure for that year was 50 mr shallow dose equivalent (SDE). For 2004, the highest annual whole body exposure received by a RINSC staff member was 114 mr DDE and the highest annual extremity exposure was 50 mr SDE.

The inspector also noted that, during 2003, the highest annual whole body exposure received by an authorized Reactor User, who was not a RINSC staff member, was 238 mr DDE. The highest annual extremity exposure for a Reactor User was 290 mr SDE. For 2004, the highest annual whole body exposure received by an authorized Reactor User, who was not a RINSC staff member, was 168 mr DDE and the

highest annual extremity exposure was 200 mr SDE. All of these doses were also within the NRC regulatory limits.

Through direct observation the inspector determined that dosimetry was acceptably used by facility personnel and exit frisking practices were in accordance with facility radiation protection protocol.

(4) Radiation Monitoring Equipment

The calibration of portable survey meters, friskers, fixed radiation detectors, and air monitoring instruments was completed by licensee personnel or the instruments were sent off site to a vendor. The calibrations were tracked and controlled using a Microsoft Access database. The inspector confirmed that the licensee's calibration procedures and the frequencies of the calibrations satisfied the requirements established in the TS Section 4.2.3 and 10 CFR 20.1501(b). The inspector also verified that the calibration and check sources were traceable to the National Institute of Standards and Technology.

The calibration records of selected meters, friskers, detectors, and air monitoring equipment in use at the facility were reviewed. The portable meters were calibrated semiannually and records were being maintained as required. Area Radiation Monitors were being calibrated annually as required by TS Section 4.2.3. Air monitoring equipment was being calibrated annually as well. All the instruments checked by the inspector had current calibration stickers attached.

(5) Radiation Protection Program

The Radiation Protection Program was established and described in a document entitled "Rhode Island Nuclear Science Center Radiation Safety Guide." This document was revised in 2000 and was approved by the NRSC. It was also reviewed and approved by the State of Rhode Island Department of Health. The inspector noted that the Guide contained acceptable instructions concerning audits and personnel responsibilities. The inspector noted that the ALARA Program was also outlined and established in the RINSC Radiation Safety Guide. The ALARA program provided guidance for keeping doses as low as reasonably achievable (ALARA) and was consistent with the guidance in 10 CFR Part 20.

The inspector verified that the Radiation Protection Program was reviewed each year in accordance with RINSC Radiation Safety Office SOP 110 and as required by 10 CFR 20.1101(c). Shortcomings in the program noted in the past had been reviewed by the licensee and/or the RIAEC.

(6) Radiation Protection Training

The radiation protection training program required that authorized radioisotope users and all radiation workers, including RINSC staff, receive the same type training. The inspector noted that individuals who required unescorted access to the research reactor facility and/or who worked with radioactive material had completed a Radiation Safety Principles course or had provided evidence that they had received

such training at another facility. The training, if necessary, was conducted by the University of Rhode Island. The inspector verified through records review, test results, and licensee interviews that all staff members had received the required training.

(7) Facility Tours

The inspector toured the Control Room, Reactor Bay, selected laboratories, the basement area, and other support areas of the facility with a licensee representative. No uncontrolled radioactive material was found in the facility. Licensee personnel followed the indicated precautions for access to controlled areas. No discrepancies were noted.

c. Conclusions

The inspector determined that the Radiation Protection Program being implemented at the facility satisfied regulatory requirements because: 1) surveys were being completed and documented as required, 2) postings met regulatory requirements, 3) personnel dosimetry was being worn and recorded doses were within the NRC's regulatory limits, 4) radiation monitoring equipment was being maintained and calibrated as required, 5) the Radiation Protection Program satisfied regulatory requirements, and 6) the radiation protection training program was being administered as required.

5. Effluent and Environmental Monitoring

a. Inspection Scope (IP 69004)

The inspector reviewed the following to verify compliance with the requirements of 10 CFR Part 20 and TS Sections 3.7.2, 4.7, and 6.8.4:

- C the licensee's environmental monitoring program
- C counting and analysis records associated with airborne releases
- C Stack Monitor Air Particulate Detector Efficiency Check Forms
- C Stack Monitor Channel Tests documented on RINSC Form NSC-46
- C Stack Gas Monitor - Argon-41 Calibration Factor Calculation Form, RINSC Form NSC-13, Rev. 6/04
- C RINSC Stack Monitor Air Monitor Data Sheet, RINSC Form NSC-21B, Rev. 1
- C RINSC dosimetry records (personnel and environmental) for 2003 and 2004
- C RINSC Annual Reports for July 1, 2002 through June 30, 2003, and July 1, 2003 through June 30, 2004, indicating the effluent monitoring and environmental surveillance program results for that period

b. Observation and Findings

Gamma radiation monitoring outside the reactor building was completed using three environmental monitoring OSL badges and the appropriate occupancy factors were applied in accordance with the applicable procedures. Data indicated that there were no measurable doses above the regulatory limits.

The inspector determined that gaseous releases continued to be monitored as required, were calculated according to established protocol, and were acceptably documented in the annual reports. The airborne concentrations of the gaseous releases were within the concentrations stipulated in 10 CFR Part 20, Appendix B, Table 2. Also, the dose rate to the public, as a result of the gaseous releases, was well below the dose constraint specified in 10 CFR 20.1101 (d) of 10 millirem per year (mr/yr). This was acceptably demonstrated by the licensee through COMPLY code calculations. These calculations indicated an effective dose equivalent to the public of 1.4 mr/yr for the year 2003 and 1.6 mr/yr for the year 2004. Observation of the facility by the inspector indicated no new potential release paths.

There was one liquid release from the facility during the past year. The release occurred in December 2004 and was approved as required after analyses indicated that the release would meet regulatory requirements for discharge into the sanitary sewer as specified in 10 CFR 20, Appendix B, Table 3.

c. Conclusion

Effluent monitoring satisfied license and regulatory requirements and releases were within the regulatory limits.

6. Inspection of Transportation Activities

a. Inspection Scope (IP 86740)

The inspector interviewed licensee personnel and reviewed the following records to verify compliance with regulatory and procedural requirements for shipping licensed material:

- C RINSC Radiation Safety Office SOP 501, "Radioactive Waste Packaging," Rev. 0, dated November 6, 2000
- C RINSC Radiation Safety Office SOP 512, "BioPAL Wastes," Rev. 1, dated March 26, 2004
- C Federal Express (FedEx) booklet entitled, "Procedures for Shipping Dangerous Goods by Air"
- C International Air Transport Association (IATA) publication, "Dangerous Goods Regulations," 42 Edition, effective January 1, 2001

b. Observations and Findings

The licensee continued to work on, but had not completed, development of a procedure for use in shipping radioactive material. However, the licensee used the reference materials from FedEx and IATA noted above and a data base developed by the Radiation Safety Officer when radioactive material needed to be shipped offsite.

The inspector verified that no shipments of radioactive material had been made under the authority of the reactor license since the previous inspection. Records showed that the radioactive material produced in the reactor that was shipped offsite was typically

transferred to the RINSC Broad Scope Materials License and shipped under that license (that license was Broad Scope Materials License No. RI 3K-063-01, Amendment No.19, with an expiration date of March 31, 2006).

c. Conclusions

No radioactive material shipments had been made under the auspices of the reactor license during the past year.

7. Exit Interview

The inspection scope and results were summarized on January 27, 2005, with members of licensee management. The inspector described the areas inspected and discussed in detail the inspection findings. No dissenting comments were received from the licensee.

PARTIAL LIST OF PERSONS CONTACTED

Licensee Personnel

H. Bicehouse, Radiation Protection Officer and Assistant Director for Reactor Safety
M. Damato, Health Physics Technician and Reactor Operator trainee
J. Davis, Reactor Supervisor
D. Johnson, Health Physicist
B. Macgregor, Facility Engineer and Reactor Operator
M. Middleton, Assistant Director for Reactor Operations
T. Tehan, Director, Rhode Island Nuclear Science Center

Other Personnel

H. Knickle, Chairman, Nuclear and Radiation Safety Committee
V. Rose, Chairman, Rhode Island Atomic Energy Commission

INSPECTION PROCEDURES USED

IP 69004: Class 1 Research and Test Reactor Effluent and Environmental Monitoring
IP 69006: Class 1 Research and Test Reactor Organization, Operations, and Maintenance Activities
IP 69007: Class 1 Research and Test Reactor Review and Audit and Design Change Functions
IP 69008: Class 1 Research and Test Reactor Procedures
IP 69012: Class 1 Research and Test Reactor Radiation Protection
IP 86740: Inspection of Transportation Activities

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

None

LIST OF ACRONYMS USED

ALARA	As low as reasonably achievable
CFR	Code of Federal Regulations
DDE	Deep dose equivalent
FedEx	Federal Express
IATA	International Air Transport Association
IP	Inspection Procedure
mr	Millirem

mr/yr	Millirem per year
NRC	Nuclear Regulatory Commission
NRSC	Nuclear and Radiation Safety Committee
OSL	Optically stimulated luminescent (dosimeter)
Rev.	Revision
RIAEC	Rhode Island Atomic Energy Commission
RINSC	Rhode Island Nuclear Science Center
SDE	Shallow dose equivalent
SOP	Standard Operating Procedure
TS	Technical Specification