

April 8, 2002

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. 50-193/2002-201

Dear Dr. Tehan:

This letter refers to the inspection conducted on March 11-14, 2002, 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 2.790 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/NRC/ADAMS/index.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  
Operating Reactor Improvements Program  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

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

Enclosure: NRC Inspection Report No. 50-193/2002-201

cc w/enclosure:  
Please see next page

Rhode Island Atomic Energy Commission

Docket No. 50-193

cc:

Dr. Vincent C. Rose, Chairman, RIAEC  
University of Rhode Island  
Chemical Engineering Department  
118 Crawford Hall  
Kingston, RI 02881

Dr. Harry Knickle, Chairman  
Nuclear and Radiation Safety Committee  
University of Rhode Island  
College of Engineering  
102 Bliss Hall  
Kingston, RI 02881

Mr. Charles McMahon  
Supervisor, Radiation Control Specialist  
Rhode Island Department of Health  
Division of Occupational and  
Radiological Health  
3 Capitol Hill Cannon  
Providence, RI 02808-5097

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: 50-193/2002-201

Licensee: Rhode Island Atomic Energy Commission

Facility: Rhode Island Nuclear Science Center  
University of Rhode Island

Location: Reactor Road  
Narragansett, Rhode Island

Dates: March 11-14, 2002

Inspector: Craig Bassett

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

## EXECUTIVE SUMMARY

This routine, announced inspection included onsite review of various aspects of the licensee's programs concerning radiation protection, security, material control and accounting, and transportation of radioactive material as they relate to the licensee's two megawatt Class 1 research reactor. The licensee's programs were 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 remain in compliance with the requirements specified in the Technical Specifications.

### Review and Audit Functions

- Review and oversight functions required by Technical Specifications Section 6.4 were acceptably completed by the Nuclear and Radiation Safety Committee and a subcommittee thereof.
- Annual reviews of the Radiation Protection Program were being completed by the licensee as required by 10 CFR Part 20.

### Procedures

- Radiation Protection procedures developed to date are acceptable and have been reviewed and approved by the Nuclear and Radiation Safety Committee as required.

### Radiation Protection Program

- Surveys were generally being completed and documented acceptably to permit evaluation of the radiation hazards present.
- Postings 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, Bioassay, and ALARA Programs satisfied regulatory requirements.
- The radiation protection training program was being implemented acceptably.

### Effluent and Environmental Monitoring

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

Transportation of Radioactive Materials

- Radioactive material shipments made under the reactor license had been completed in accordance with the applicable regulations and NRC requirements

Safeguards and Security

- Security activities and systems satisfied Physical Security Plan requirements.

Material Control and Accountability

- Special Nuclear Materials were acceptably controlled and inventoried.

## REPORT DETAILS

### **Summary of Plant Status**

The licensee's two megawatt (2 MW) Research and Test Reactor (RTR) continues to be operated in support of laboratory experiments, reactor operator training, and various types of research. During the inspection, the reactor was started-up, operated, and shut down as required to support laboratory experiments and irradiation work.

### **1. RTR Organization, Operations, and Maintenance Activities**

#### a. Inspection Scope (Inspection Procedure [IP] 39745)

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 28, dated August 2, 2001, were being met:

- current organizational structure
- management responsibilities
- staffing requirements for safe operation of the research reactor facility

#### b. Observations and Findings

Through discussions with licensee representatives, the inspector determined that management responsibilities and the organization at the facility had not changed since the last inspection in the area of radiation protection (refer to NRC Inspection Report No. 50-193/2001-201). The organizational structure and staffing at the facility, as reported in the Annual Report, were as required by TS. Qualifications of the staff met TS requirements as well.

It was noted that the person filling the position of Principle Reactor Operator/Health Physics Technician had terminated his employment at the facility. Subsequently the licensee sought, and obtained permission, to hire a person to fill the vacated position. A person was hired in January 2002 and is currently in training to become a Reactor Operator/Health Physics Specialist.

With respect to facility staffing, after reviewing operating records and logs, and after discussing facility operations with licensee personnel, the inspector determined that the staffing at the facility was acceptable to support the ongoing activities. The staffing met the requirements specified in TS Section 6.1.

#### c. Conclusions

Organization and staffing remain in compliance with the requirements specified in TS Section 6.

## 2. RTR Review and Audit and Design Change Functions

### a. Inspection Scope (IP 40745)

In order to verify that the licensee had established and conducted reviews and audits as required in TS 6.4, the inspector reviewed:

- Nuclear and Radiation Safety Committee meeting minutes for the past two years
- Nuclear and Radiation Safety Subcommittee meeting minutes for the past two years
- audits and reviews documented in the Nuclear and Radiation Safety Committee and subcommittee meeting minutes

### b. Observations and Findings

The inspector reviewed the meeting minutes of the Nuclear and Radiation Safety Committee (NRSC) and the NRSC subcommittee from March 2000 to the present. These meeting minutes showed that the committee met at the required frequency and that a quorum was present. The topics considered during the meetings were appropriate and as stipulated in the TS. A subcommittee of the NRSC and/or persons from other institutions conducted audits and reviews as required and the full NRSC reviewed the results.

It was noted that the subcommittee completed audits and reviews of different portions of the safety program every quarter such that the Radiation Protection Program was reviewed each year as required by 10 CFR 20.1101(c). The inspector noted that the audits and reviews and the resulting findings were acceptable. Problems or any deficiencies noted during the audits were discussed and recommendations for improvement were made. The licensee responded and took corrective actions as necessary.

### c. Conclusions

Review and oversight functions required by TS 6.4 were acceptably completed by the NRSC. Annual reviews of the Radiation Protection Program were being completed by the licensee as required by 10 CFR Part 20.

## 3. RTR Procedures

### a. Inspection Scope (IP 42745)

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

- Radiation Safety Office Standard Operating Procedure (SOP) 100, "Standard Operating Procedures," Revision 0, dated March 23, 2000
- Radiation Safety Office SOP 101, "Radiation Safety Training," Revision 0, dated March 23, 2000

- Radiation Safety Office SOP 201, "External Monitoring," Revision 0, dated March 23, 2000
- Radiation Safety Office SOP 202, "Bioassay," Revision 0, dated March 23, 2000
- Radiation Safety Office SOP 203, "Determining TEDE and TODE," Revision 0, dated March 23, 2000
- Radiation Safety Office SOP 204, "Skin Exposures," Revision 0, dated March 23, 2000
- Radiation Safety Office SOP 205, "Possible Overexposures," Revision 0, dated March 23, 2000
- Radiation Safety Office SOP 206, "Pregnancies," Revision 0, dated March 23, 2000
- Radiation Safety Office SOP 300, "Routine Surveys," Revision 0, dated June 21, 2001
- Radiation Safety Office SOP 501, "Radioactive Waste Packaging," Revision 0, dated November 6, 2000
- Radiation Safety Office SOP 801, "Instrument Calibration," Revision 0, dated November 6, 2000
- Radiation Safety Office SOP 802, "Pocket Dosimeter Calibration," Revision 0, dated November 6, 2000

b. Observations and Findings

During an inspection in 1999, the licensee acknowledged that the existing radiation protection procedures needed to be revised and upgraded and various other procedures needed to be written. As a result, the licensee began an initiative to develop, and submit for approval, various procedures to establish the basis for the facility's radiation protection program. The inspector noted during this inspection that continued progress has been made in this project. A number of procedures have been upgraded and/or developed and have been through the complete review and approval cycle. As indicated by the procedure titles listed above and reviewed by the inspector, the procedures developed to date deal with such subjects as how to write procedures, radiological safety training, personal radiation safety, routine surveys, radioactive waste packaging, and instrument calibration. These have all been approved by the NRSC and the inspector found the procedures to be acceptable.

c. Conclusions

Radiation Protection Program procedures developed to date are acceptable and have been reviewed and approved by the NRSC as required.

**4. RTR Health Physics**

a. Inspection Scope (IP 83743)

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

- radiation and contamination survey records documented on survey form NSC-4

- radiological signs and postings in the Reactor Room and basement level of the facility
- Rhode Island Nuclear Science Center (RINSC) dosimetry records (personnel and environmental) for 2000 through the last quarter of 2001 (results not yet available for 2002)
- calibration and periodic check records for radiation monitoring instruments documented on the applicable form NSC-17
- Radiation Protection Program as documented in the "Rhode Island Nuclear Science Center Radiation Safety Guide," Revision 1999
- ALARA Program as documented in the "Rhode Island Nuclear Science Center Radiation Safety Guide," Revision 1999
- Bioassay Program as outlined in Radiation Safety Office SOP 202, "Bioassay," Revision 0, dated March 23, 2000
- Radiation Protection Training Program as outlined in Radiation Safety Office SOP 101, "Radiation Safety Training," Revision 0, dated March 23, 2000

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

b. Observations and Findings

(1) Surveys

The inspector reviewed the weekly, monthly, quarterly, and annual contamination and radiation surveys for the past 12 months. The survey records were generally being completed as required by 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 set action levels. During the inspection, the inspector conducted a radiation survey of the Reactor Room and compared the readings noted with those found by the licensee. The results were comparable and no anomalies were found.

(2) Postings and Notices

The inspector reviewed the postings at the entrances to various controlled areas within the facility including the entrance to the Reactor Room, areas inside the Reactor Room, and areas in the basement of the facility. Copies of NRC Form 3, "Notice to Employees," were posted in the main hallway and the lunch room in accordance with 10 CFR 19.11. Caution signs, postings, and control of radiation areas were as required in 10 CFR 20, Subpart J. Radioactive material storage areas were noted to be properly posted. No unmarked radioactive material was found in the facility. Licensee personnel observed the indicated precautions for access the radiation areas.

(3) Dosimetry

The inspector determined that the licensee uses optically stimulated luminescence dosimetry supplied and processed by a National Voluntary Laboratory Accreditation

Program accredited vendor. An examination of the records of radiological exposures at the facility for the past two years through the end of 2001 showed that the highest occupational doses, as well as doses to the public, were well 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. No dosimetry records were available for the first two months of 2002. Through direct observation the inspector determined that dosimetry was acceptably used by facility and contractor personnel.

(4) Radiation Monitoring Equipment

Selected items of radiation monitoring equipment, including survey meters and area radiation monitors (ARMs), were examined by the inspector and each was found to have the appropriate up-to-date calibration sticker or certification attached. The calibration of portable survey meters and ARMs was typically completed by on-site personnel. Radiation monitoring and survey activities were as required. The calibration records of the selected items of equipment indicated that the instruments were being maintained, calibrated, and operated acceptably. Calibration frequency met the requirements established in Radiation Safety Office SOP 801 and records were being maintained as required.

(5) Radiation Protection Program

The licensee indicated that 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 has been approved by the NRSC. It is currently being reviewed by the State of Rhode Island Department of Health. The inspector noted that the Guide contained acceptable instructions concerning audits, personnel responsibilities, and ALARA.

(6) Bioassay Program

Although not used to date, the licensee has developed an effective bioassay program for use at the facility. The program is outlined in Radiation Safety Office SOP 202 and should enable the licensee to determine the kinds, quantities, or concentrations of radioactive material in the human body. The program was determined to be acceptable by the inspector.

(7) ALARA Program

The ALARA Program was outlined and established in the "Rhode Island Nuclear Science Center Radiation Safety Guide," Revision 1999. The ALARA program provided guidance for keeping doses as low as reasonably achievable and was consistent with the guidance in 10 CFR Part 20.

(8) Radiation Protection Training

The training program has been revised and upgraded so that authorized radioisotope users and all radiation workers, including RINSC staff, receive the

same type training. The inspector noted that individuals who require unescorted access to the research reactor facility must complete a Radiation Safety Principles course or provide evidence that they have received such training at another facility. The training program was determined to be acceptable. Currently all staff members, except the individual hired in January 2002, have received all the required training. The newly hired staff member will receive the required formal radiation protection training in April.

#### (9) Facility Tours

The inspector toured the control room, reactor room, selected laboratories, the basement area, and other support areas of the facility with a licensee representative. As noted above, during the inspection, the inspector conducted a radiation survey of the Reactor Room and compared the readings noted with those found by the licensee. The results detected by the inspector were comparable to those found by the licensee. No discrepancies were noted.

#### c. Conclusions

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

### 5. RTR Environmental Protection

#### a. Inspection Scope (IP 80745)

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

- the licensee's environmental monitoring program
- annual effluent monitoring and environmental surveillance program reports for July 1999 through June 2000 and for July 2000 through June 2001
- counting and analysis records associated with airborne releases
- radioassay results for liquid releases documented on Form NSC-9b
- sewer disposal authorizations documented on Form NSC-52

#### b. Observation and Findings

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 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. Also, the airborne concentrations of the gaseous releases were well within the concentrations stipulated in 10 CFR Part 20, Appendix B, Table 2, and TS limits.

There had been no liquid releases from the facility to the sanitary sewer within the past year. The previous release, in December 2000, was within the limits specified in 10 CFR 20, Appendix B, Table 3.

c. Conclusion

Effluent monitoring satisfied license and regulatory requirements and releases were within the specified regulatory and TS 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:

- RINSC Shipments, ID Numbers D-129, D-133, D-136, D-140 and D-141
- Federal Express booklet entitled, "Procedures for Shipping Dangerous Goods by Air"
- International Air Transport Association (IATA) publication, "Dangerous Goods Regulations," 42 Edition, effective January 1, 2001

b. Observations and Findings

The licensee has not completed development of a procedure for use in shipping radioactive material. The licensee currently uses the reference materials noted above and a data base developed by the Radiation Safety Officer.

The inspector reviewed the shipping records of various shipments made since the previous inspection. Records showed that the radioisotope type and quantities were calculated and dose rates were measured. All radioactive material shipments reviewed by the inspector had been completed in accordance with DOT and NRC requirements. Some minor discrepancies were noted with the shipping papers but they were discussed with the licensee and will be corrected. The discrepancies were administrative in nature and were not safety significant.

c. Conclusions

The radioactive material shipments made under the auspices of the reactor license had been completed in accordance with the applicable regulations and NRC requirements.

**7. Physical Security**

a. Inspection Scope (IP 81401, 81402, 81431)

To verify compliance with the licensee's NRC-approved Physical Security Plan, the inspector reviewed:



- security systems and equipment
- the list of individuals authorized unescorted access to the facility Security Area (SA)
- completed alarm testing documented on Form NSC-48
- the list of individuals authorized to possess security keys and lock combinations
- Check sheets of physical inventories of locks and keys documented on Form NSC-86
- Safeguards Event Logbook
- Seals Records Logbook

The inspector also observed a functional test of all the intrusion detection alarms in the facility.

b. Observations and Findings

The Physical Security Plan (PSP), Revision 7, dated August 22, 1994, was the same as the latest revision approved by the NRC. The PSP implementing procedures, entitled "Security Plan Response Procedures," dated October 31, 1994, were consistent with and detailed the requirements of the PSP. The inspector determined that the PSP was being reviewed annually as required. Acceptable security response and support in accordance with procedures and training were demonstrated through alarm response records.

The offsite support letter of agreement with the local police department was current. The physical protection system, including barriers, alarms and, equipment was as required by the PSP. Testing of the system was being completed quarterly as required and the appropriate inventory control over locks and keys was being maintained. An up-to-date list of persons authorized entry into the SA was being maintained as well. The access controls implemented at the facility for the SA, the Controlled Access Area, the Vital Area and the remainder of the facility were acceptable and as required.

A test of all the intrusion detection alarms during the inspection indicated that they were functioning properly and would provide adequate protection for the facility.

c. Conclusions

Security activities and systems satisfied Physical Security Plan requirements.

**8. Material Control and Accounting**

a. Inspection Scope (IP 85102)

To verify compliance with 10 CFR Part 70, the inspector reviewed:

- nuclear material inventories (DOE/NRC Forms 741 and 742) for the past 18 months
- accountability records and fuel storage locations
- physical inventory data documented on Form NSC-85
- Megawatt hours of operation data documented on Form NSC-78

The inspector also observed a physical inventory of the unirradiated fuel in storage.

b. Observations and Findings

The inspector noted that no formal procedure for calculating fuel burn-up had been written to date. The licensee was using an historically established protocol that has been used for many years. The calculations appeared to be correct.

The material control and accountability protocol established by the license tracked locations and content of fuel and fission detectors under the research reactor license. Possession and use of special nuclear material (SNM) were limited to the locations and purposes authorized under the license. The material control and accountability forms (DOE/NRC Forms 741 and 742) had been prepared semiannually and transmitted within the time frame specified as required.

The inspector noted that a physical inventory of all SNM on site was conducted semiannually by the licensee. An inventory of the unirradiated fuel on site during the inspection demonstrated that the fuel was present and in the locations specified.

c. Conclusions

Special Nuclear Materials were acceptably controlled and inventoried.

**9. Follow-up on Previous Inspection Items**

a. Inspection Scope

The inspector reviewed the licensee's actions taken in response to previously identified Inspector Follow-up Items.

b. Observation and Findings

(Closed) VIO 50-193/2001-201-02 - During an inspection in March 2001, the inspector determined that the licensee was not completing a physical inventory of locks, cores, and keys at least once every 90 days as required by the PSP. The licensee indicated that, due to a change in responsibility, the person that had been newly assigned to complete the inventory had adjusted the schedule by one month (later than the scheduled inventory). Subsequent to identification of the problem, the licensee added the physical inventory activity to the newly developed "Maintenance Board" which lists the various surveillances and activities that are required be completed periodically at the facility. The inspector verified that the "Maintenance Board" did reflect the requirement to conduct an inventory and that the physical inventory has been completed every 90 days as required. This item is considered closed.

c. Conclusions

One violation identified during a previous inspection was reviewed and closed during this inspection.



**10. Exit Interview**

The inspection scope and results were summarized on March 14, 2002, 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. The licensee's Physical Security Program was identified as proprietary information.

## **PARTIAL LIST OF PERSONS CONTACTED**

### Licensee

H. Bicehouse, Radiation Protection Officer and Assistant Director for Reactor Safety  
J. Davis, Reactor Supervisor  
D. Johnson, Health Physicist  
M. Ryan, Reactor Operator/Health Physics Technician-in-training  
W. Simoneau, Assistant Director for Reactor Operations  
T. Tehan, Director, Rhode Island Nuclear Science Center

### Other Personnel

V. Rose, Chairman, Rhode Island Atomic Energy Commission

## **INSPECTION PROCEDURES USED**

IP 39745: Class 1 Research and Test Reactor Organization, Operations, and Maintenance Activities  
IP 40745: Class 1 Research and Test Reactor Review and Audit and Design Change Functions  
IP 42745: Class 1 Research and Test Reactor Procedures  
IP 80745: Class 1 Research and Test Reactor Environmental Protection  
IP 83743: Class 1 Research and Test Reactor Health Physics  
IP 81401: Plans, Procedures, and Reviews  
IP 81402: Reports of Safeguards Events  
IP 81431: Fixed Site Physical Protection of Special Nuclear Material of Low Strategic Significance  
IP 85102: Material Control and Accounting - Reactors  
IP 86740: Inspection of Transportation Activities

## **ITEMS OPENED, CLOSED, AND DISCUSSED**

### Opened

None

### Closed

50-193/2001-201-02                      VIO      Failure to complete physical inventories of the locks and keys at the facility once every 90 days as required.

## **LIST OF ACRONYMS USED**

ALARA	As low as reasonably achievable
ARM	Area Radiation Monitor
CFR	Code of Federal Regulations
IATA	International Air Transport Association
IFI	Inspector Follow-up Item
IP	Inspection Procedure
MW	Megawatt
NRC	Nuclear Regulatory Commission
NRSC	Nuclear and Radiation Safety Committee
PSP	Physical Security Plan
RIAEC	Rhode Island Atomic Energy Commission
RINSC	Rhode Island Nuclear Science Center
RTR	Research and Test Reactor
SA	Security Area
SNM	Special Nuclear Material
SOP	Standard Operating Procedure
TS	Technical Specification
VIO	Violation