



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION II  
101 MARIETTA STREET, N.W.  
ATLANTA, GEORGIA 30323

MAY 29 1992

Report No.: 50-160/92-03

Licensee: Georgia Institute of Technology  
225 North Avenue  
Atlanta, GA 30332

Docket No.: 50-160

License No.: R-97

Facility Name: Georgia Institute of Technology Research Reactor

Inspection Conducted: May 11, 14 & 15, 1992

Inspector: C. H. Bassett  
C. H. Bassett, Sr. Radiation Specialist

5/22/92  
Date Signed

Approved by: E. J. McAlpine  
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5/29/92  
Date Signed

### SUMMARY

#### Scope:

This routine, unannounced inspection involved onsite review of radiation protection program activities including: organization and staffing, radiation control, environmental surveillance and monitoring, and transportation. The inspection also involved review of licensee actions concerning Inspector Followup Items and NRC Information Notices.

#### Results:

Within the areas inspected no violations or deviations were noted. The staffing and current organizational structure were adequate to meet Technical Specification requirements and to implement the licensee's radiation protection program. The position of Manager, Office of Radiation Safety is currently vacant. The Nuclear Safeguards Committee is functioning as required. The licensee has not completed work on revising two procedures in the area of radiation protection, dealing with respirator protection and environmental monitoring. Strengths in

the licensee's program were noted in the areas of external and internal exposure control through maintaining low radioactive contamination levels in the facility and low radiation exposure to personnel.

## REPORT DETAILS

### 1. Persons Contacted

- \*R. Karam, Director, Neely Nuclear Research Center (NNRC)
- J. O'Hara, Acting Manager, Office of Radiation Safety (MORS)
- \*B. Statham, Manager, Reactor Operations
- \*J. Taylor, Manager, Gamma Radiation Operations
- \*E. Jawdeh, Health Physicist

Other licensee employees contacted during this inspection included operators, technicians, and administrative personnel.

\*Attended the exit interview on May 15, 1992.

### 2. Organization and Management Control - Radiation Control (83743)

#### a. Organization, Staffing, and Qualifications

Technical Specification (TS) Section 6.1 details the organizational structure, position responsibilities, the minimum qualifications of key supervisor/ personnel, and the reporting chain of command for safety, safety policy, and radiation control at the Georgia Institute of Technology Research Reactor (GTRR) facility.

The inspector reviewed and discussed, with cognizant licensee personnel, the current staffing at the facility involved in conducting routine and nonroutine radiation protection activities at the GTRR. The inspector noted that the position of Manager, Office of Radiation Safety (MORS) is vacant. The position is temporarily being filled by a consultant. The licensee indicated that the position has been advertised and various applications have been received. A selection on a replacement for the MORS is planned to be made by the end of July.

The inspector determined that the staff performing health physics (HP) duties at the facility and reporting to the MORS consisted of two full-time individuals, a Senior Safety Engineering Assistant and a Health Physicist, and two part-time student technicians. The inspector noted that the current staffing appeared to be adequate to conduct routine and nonroutine radiation protection activities for the facility.

b. Nuclear Safeguards Committee

TS Section 6.2 details the composition of the Nuclear Safeguards Committee (NSC), qualifications of its members, and its responsibilities, and authority. This section also details the meeting frequency of the NSC.

The inspector discussed the composition of the NSC with the Director of the NNRC. The inspector verified that the various members included personnel with a diversity of backgrounds as specified in the TS. All current members of the NSC appeared to be well qualified to serve on the committee.

The inspector also reviewed the minutes of the meetings held by the NSC since the last inspection. The inspector noted that the meetings were being held at the frequency required by the TS. The inspector verified that the committee was functioning as outlined in the TS and that issues reviewed and discussed were appropriate. Some of the issues discussed during NSC meetings included modifications to procedures, experiments to be performed, Emergency Preparedness Plan review, facility modification requests, and approval of the Radiation Safety Manual.

c. Audits

TS Section 6.2.e requires that the NSC audit the safety aspects of reactor facility operations in order to provide management with an independent review of these aspects. This section also requires the NSC to review and approve proposed changes to procedures.

The inspector reviewed the audit conducted by the NSC during 1991. In the areas covered, the audit appeared to be adequate and the auditors found various discrepancies which were outlined for management's attention. The audit findings mainly involved procedural problems and minor non-compliances with the procedures. NNRC management prepared a response which addressed the audit findings and the actions that had been completed to correct the problems found. The audit responses appeared to be adequate.

d. Health Physics Procedure Revision and Review

The inspector discussed, with cognizant licensee personnel, the status of their program to review and revise the HP procedures. Although most HP procedures had already been reviewed and revised as needed, the inspector noted that, since the last inspection at the

facility, little progress had been made in revising Procedure 9300, Respiratory Protection and Procedure 9400, Environmental Monitoring. The inspector reviewed these procedures with the licensee and the licensee agreed that the procedures needed to be revised in terms of both format and content. The Acting MORS agreed to perform this revision for the facility.

The inspector informed licensee management that Inspector Followup Item (IFI) 50-160/91-03-01 would be closed. However, licensee action in response to the issue of reviewing and revising the two K<sup>1</sup> procedures, 9300 and 9400, would be tracked as an IFI and would be reviewed by the NRC during a subsequent inspection at the facility (IFI 50-160/92-03-01)

No violations or deviations were identified.

3. External Exposure Review - Radiation Control (83,43)

a. Exposure Control

10 CFR 20.101 delineates the quarterly radiation exposure limits to the whole body, skin of the whole body and the extremities for individuals in restricted areas.

10 CFR 20.202 requires that appropriate personnel monitoring devices be worn by personnel.

The inspector reviewed and discussed with licensee representatives the exposure records for persons assigned to work at the NNRC for the period from July 1, 1991 through December 31, 1991, and from January 1, 1992 through March 31, 1992. It was noted that the licensee uses film badges supplied by a National Voluntary Laboratory Accreditation Program (NVLAP) approved vendor for measuring official whole body dose and thermoluminescent dosimeters (TLDs) to measure extremity exposure. Vendor specifications reported a detection limit of 10 millirem (mrem) for the dosimetry supplied.

The highest quarterly dose received during any quarter in 1991 was 70 mrem and during 1992 (to date) the highest quarterly dose was 50 mrem. The highest accumulated individual exposure for the year 1991 was 200 mrem. So far during 1992, the highest total accumulated individual exposure was 50 mrem. The licensee indicated that the majority of this exposure was attributable to the handling of experiments and to the work involved in the irradiation of specimens.

b. Exposure Problem

The inspector noted that, for 1991, an accumulated whole body exposure of 550 mrem and an accumulated extremity exposure of 950 mrem had been received by one individual. In discussing this with the licensee, it was noted that this person was the same person that had been discussed in Inspection Report No. 50-160/91-03.

The individual had been a part-time student technician who had worked at the NNRC facility. Because of what appeared to be abnormally high whole body and extremity exposures received during April and May of 1991, the licensee had investigated the problem. The licensee had determined that the person had not left her film badge and finger ring TLD at the NNRC facility but had taken it with her to Emory University. There the film badge and finger ring TLD had been worn or left near a cobalt teletherapy unit during operation of the unit.

Following the investigation, the licensee instructed the individual to comply with NNRC rules and leave her NNRC-issued Gosimetry at the NNRC facility when she left work for the day. However, the problem continued. Because of this and other NNRC rule violations, the individual's employment at the facility was terminated. The inspector noted that the other highest accumulated extremity exposure for any quarter 1991 was 170 mrem with a total annual extremity exposure of 240 mrem.

c. Tours of the Facility

During tours of the facility, the inspector observed personnel performing various tasks including removal of an experiment from one of the vertical beam ports in the top of the reactor. The individuals were noted to be practicing good ALARA techniques and were observed wearing monitoring devices as required. The inspector noted that good contamination control practices were also used during the job as well.

d. Radiation Work Permit (RWP) Program

The inspector reviewed selected RWPs used during 1991 and to date during 1992. The RWPs dealt with various activities including insertion and removal of experiments from beam ports, changing resin beds, verification of Emergency Core Cooling System flow, and radioactive waste compaction in the NNRC "Barn". Through review and discussions with licensee representatives and observation of work governed by an

RWP, the inspector determined that the RWPs used were appropriate to control work, keep exposures as low as reasonable, and eliminate or control contamination.

The radiation protection requirements specified by the RWPs, including dosimetry, surveys, protective clothing, air sampling, and HP coverage of the jobs, appeared to be adequate.

No violations or deviations were identified.

4. Internal Exposure Review - Radiation Control (83743)

10 CFR 20.103 establishes the limits for exposure of individuals to concentrations of radioactive materials in air in restricted areas. Section 20.103 also requires that suitable measurements of concentrations of radioactive material in air be performed to detect and evaluate the airborne radioactivity in restricted areas and that appropriate bioassays be performed to detect and assess individual intakes of radioactivity.

a. Bioassay Program

The inspector reviewed selected results of the bioassay analyses that had been performed to date during 1992. All the results had been reviewed by the individual assigned oversight responsibility, as well as by the acting MORS. During that period the highest intake for a seven consecutive day period was calculated to have been 0.62 microcuries (uCi) of tritium. This exposure had occurred during compaction of contaminated waste.

As a result of this exposure, a total of 0.1 Maximum Permissible Concentration-hours (MPC-hrs) were assigned to the individual. The licensee indicated that MPC-hrs were not tracked formally but were tracked informally by those reviewing the results of the analyses and that any problems would be noted by those responsible for the program.

b. Air Sampling

The inspector discussed the air sampling program with licensee representatives. The program involves continuous air sampling performed by air samplers located on top of the reactor, on the main floor of the reactor building, and in the basement or the ground floor of the reactor building. The filters from each of these air samplers are changed weekly and analyzed to determine the concentration of alpha and beta-gamma radioactivity in the air.

The program also includes air sampling performed as required by RWP during specific work evolutions. The filters collected as a result of these jobs are also analyzed to determine airborne radioactive contamination and MPC-hrs assigned as needed.

The inspector reviewed the results of selected air sample analyses since the last inspection. The results indicated that the airborne concentration had seldom been above 25% of the MPC of the radionuclides specified in 10 CFR 20, Appendix B, Table 1, Column 1. When airborne activity exceeded such a concentration, decay counting of the sample and/or isotopic analysis showed that the activity was attributable to Radon. Airborne concentrations were generally in the range of  $1 \text{ E-}11$  to  $1 \text{ E-}12$  microcuries per milliliter beta-gamma and lower for alpha.

No violations or deviations were identified.

5. Surveys, Posting and Contamination Control - Radiation Control (83743)

a. Surveys

10 CFR 20.201(b) requires that the licensee perform such surveys as may be necessary and are reasonable under the circumstances to evaluate the extent of radiation hazards that may be present.

Procedure 9250, Facility Contamination Surveys, Rev. 2, dated June 28, 1990 and Procedure 9304, Routine Facility Radiation Surveys, Rev. 1, dated June 28, 1990, specify the frequency and location of the surveys to be performed. A Memorandum, dated March 27, 1991, from the Associate Director of the facility and Acting MORS further delineated the frequencies of the surveys and specified longer intervals between certain surveys due to the decreased usage of the facility.

The inspector reviewed selected records of twice weekly, weekly, and monthly contamination and radiation surveys performed in the Reactor Control Zone (RCZ). The survey results were discussed with licensee representatives. All the radiation and most of the contamination survey results were below any action points specified by the procedures. The inspector verified that, when the contamination levels detected by the licensee were above the action point, the areas had been decontaminated and resurveyed to verify that the contamination levels were acceptable.

The inspector also performed radiation level surveys of various areas in the reactor building using NRC instrumentation. The inspector verified that the radiation levels indicated on licensee surveys were representative.

b. Posting

10 CFR 20.203 specifies the requirements for posting radiation areas, high radiation areas, and radioactive material areas.

Posting of entrances into the controlled area and labeling of containers were observed and discussed with licensee representatives. The postings appeared to be adequate. The labeling of radioactive material also appeared to be in compliance with the regulations.

c. Contamination Control

Procedure 9280, Personnel Monitoring, Revision 1, dated October 21, 1988, requires in Part 6.2 that, at the exit to the Reactor Control Zone or when exiting a potentially contaminated area as designated by the presence of a step-off pad, hands and feet, at a minimum, shall be monitored.

Following tours of the RCZ, including the containment building, and after observing work activities, the inspector noted that all personnel observed performed an adequate personal survey.

No violations or deviations were identified.

6. Environmental Protection (80745)

10 CFR 20.106(a) requires that the licensee not possess, use, or transfer licensed material so as to release to an unrestricted area radioactive material in concentrations which exceed the limits specified in 10 CFR 20, Appendix B, Table II, except as authorized pursuant to 20.302 or 20.106(b).

Technical Specification 6.7.a requires the licensee to submit an annual operating report covering the previous year to the NRC which outlines the quantities of radioactive effluents released from the plant and provides estimates of the likely resultant exposure to individuals and population groups in areas surrounding the facility.

a. Gaseous Effluents

The inspector reviewed the licensee's Annual Operating Report covering the period from January 1, 1991 through December 31, 1991, to ascertain whether releases of liquid and gaseous radioactive material to the environment were within regulatory limits. The licensee's only measurable gaseous waste release was argon-41 (Ar-41).

The following table summarizes the amount of Ar-41 released during 1991:

<u>Quarter</u>	<u>Total Release (Ci)</u>	<u>Average Release Concentration (uCi/cc)</u>	<u>Maximum Instantaneous Release Rate (uCi/sec)</u>	<u>%Tech Spec*</u>
1	5.37	3.84E-8	190	32
2	11.04	7.89E-8	106	18
3	17.50	1.25E-7	171	29
4	25.30	1.81E-7	285	49

\*TS 3.5.b.(1) The Maximum Instantaneous Release Rate limit equals 585 uCi/sec.

There were no measurable amounts of gaseous tritium released and no measurable amounts of iodine or particulates released.

b. Liquid Effluents

The predominant nuclides released via the licensee's liquid effluent pathway included tritium (H-3) and cobalt-60 (Co-60). (The presence of Co-60 was not due to reactor operations but was attributable to material stored in the spent fuel storage pool that falls under the State of Georgia Radioactive Materials License No. 147-1.) There were no fission products released via the liquid effluent pathway. In addition, there were no measurable quantities of dissolved and entrained gases nor gross alpha radioactivity reported by the licensee.

The quantities of radioactive material released via the liquid effluent pathway are summarized below:

## (1) Cobalt-60

Quarter	Total Release (Ci)	Average Release Concentration (uCi/cc)*	%Tech Spec
1	0.000015	7.50E-11	< 1
2	0.000066	3.37E-11	< 1
3	0.000100	5.00E-11	< 1
4	0.000014	7.00E-11	< 1

## (2) Tritium

Quarter	Total Release (Ci)	Average Release Concentration (uCi/cc)*	%Tech Spec
1	0.00231	4.16E-8	< 1
2	0.00515	2.58E-8	< 1
3	0.00804	4.02E-8	< 1
4	0.01617	8.09E-8	< 1

\*Average release values were based on a Georgia Tech campus water discharge rate of 1.99E11 cc/quarter.

## c. Environmental Monitoring

The licensee's environmental monitoring program consisted of measuring direct radiation from the facility and from gaseous effluents via a system of 30 film badges positioned around the perimeter fence and at other locations on campus. The film badges used for this purpose have a lower limit of detection of approximately 10 mrem.

A review of the exposures of the 30 environmental film badges indicated that none showed radiation exposure above background due to reactor operations during 1991. Nevertheless, several badges showed radiation exposure above background levels. One such badge was located on the roof of the laboratory building of the NNRC and another was on the roof over the Hot Cell. However, the licensee determined that exposures registered on these badges were attributable to environmental damage, e.g. rain or excess heat.

The highest, lowest, and annual average levels of radiation for the sampling point with the highest average radiation exposure due to reactor operations were all less than 10 mrem.

d. Annual Report Review

During the review of the licensee's annual report for 1991, the inspector noted some areas where a portion of the data specified to be included in the report by the Technical Specifications was not present.

Specifically, the results of surveillance tests and inspections of the facility required by TS 6.7.a.(1)(d) were to be reported in the annual report. Although the report indicated that the tests and inspection required by the TS were performed, the results were not given. When this was discussed with licensee management, they indicated that this information would be included in future reports.

TS 6.7.a.(1)(f) requires that changes in Plant Staff and (NSC) Committee Membership be reported in the annual report. One position specifically mentioned was that of Reactor Engineer. However, no mention is made of this position in the 1991 Annual Report. Upon discussing this issue, the NNRC Director indicated that he was the Reactor Engineer but that that fact had not been included in the report. This oversight will be corrected in the future.

TS 6.7.a.(7)(e) requires that the maximum cumulative radiation dose from direct radiation and gaseous and liquid effluent which could have been received by an individual continuously present in an unrestricted area during reactor operation be reported. When this lack of information was pointed out to licensee management, they indicated that this was an oversight and that an amendment to the 1991 Annual Report would be issued to comply with this requirement. The amendment was to be issued on May 18, 1992.

No violations or deviations were identified.

7. Transportation (86740)

10 CFR 71.5 requires each licensee who transports licensed material outside the confines of its plant or other place of use to comply with the applicable requirements of the Department of Transportation (DOT) in 49 CFR Parts 170 through 189.

The inspector discussed the transportation of radioactive material with the licensee. The licensee indicated that radioactive waste is generally compacted and then transferred to a waste broker for ultimate shipment and

disposal. Other types of radioactive material shipments are handled on a case-by-case basis. All the radioactive materials are transferred to the State of Georgia license prior to shipment.

No violations or deviations were identified.

8. Exit Interview (30703)

The inspection scope and results were summarized on May 15, 1992, with the licensee representatives indicated in Paragraph 1 above. The inspector discussed the findings for each area reviewed. The licensee's organizational controls and staffing in the area of radiation protection appeared to be adequate. Internal and external exposure controls employed by the licensee have been effective in maintaining exposures to individuals as low as practicable. Posting, surveys and labeling of radioactive material throughout the facility appeared to be adequate. The environmental protection program also appeared to be effective in maintaining releases to the environment below required limits.

The licensee did not identify as proprietary any of the material provided to or reviewed by the inspector during this inspection.

<u>Item Number</u>	<u>Description and Reference</u>
50-160/92-03-01	Inspector Followup Item - review the licensee's revisions to Procedure 9300, Respiratory Protection and Procedure 9400, Environmental Monitoring (Paragraph 2.d).