

U. S. NUCLEAR REGULATORY COMMISSION  
REGION I

Report No. 70-938/82-01

Docket No. 70-938

License No. SNM-986 Priority 2 Category A

Licensee: Massachusetts Institute of Technology

138 Albany Avenue

Cambridge, Massachusetts 02139

Facility Name: MIT Nuclear Laboratories

Inspection at: Cambridge, Massachusetts

Inspection conducted: June 17-18, 1982

Inspectors: J. Roth 7/8/82  
J. Roth, Project Inspector date signed

Accompanied by: B. Kosla —  
NMSS Licensing Project Manager date signed

Approved by: R. R. Keimig 7-13-82  
R. R. Keimig, Chief, Projects date signed  
Branch #2, DPRP

Inspection Summary: Inspection on June 17-18, 1982 (Report No. 70-938/82-01)

Areas Inspected: Routine, unannounced inspection by a region based inspector (14 hours) of the facility licensed SNM Programs including: 10 CFR Part 21; organization; facility changes and modifications; internal review and audit; safety committees; training; procedure control; review of operations; nuclear criticality safety; emergency planning; transportation program; non-routine events; licensee action on previously identified enforcement items; and, participation in a licensee/licensing meeting.

Results: Of the 14 areas inspected, no apparent violations were identified in 13 areas. One violation was identified in one area (Failure to maintain spacing of SNM while in storage in the BTF Vault outside the storage racks, paragraph 5a).

## DETAILS

### 1. Persons Contacted

- \* O. K. Harling, Director, Nuclear Reactor Laboratory
- \* H. Bondar, Accountability Representative
- \* J. Bernard, MITR Superintendent
- E. Karaian, MITR Radiation Protection Officer

The inspector also interviewed several other licensee employees during this inspection.

\*denotes those present at the exit interview.

### 2. Licensee Action on Previously Identified Enforcement Items

(Closed) Deficiency (938/79-01-01) Failure to include the Special Nuclear Material, Byproduct and Source Material licenses in 10 CFR 21 procedures. The inspector verified that the licensee modified and reissued established 10 CFR 21.21 procedures and they included references to all radioactive material and were not limited to the reactor operation. Corrective actions were completed.

(Closed) Infraction (938/79-01-02) Failure to post a high radiation area with Caution-High Radiation Area signs in the waste storage room. The inspector verified that all radiation areas and high radiation areas were properly posted. The waste storage room was no longer classified as a high radiation area at the time of this inspection. Corrective actions were completed.

(Closed) Deficiency (938/79-01-04) Failure to maintain records of the 10 CFR 71.54 routine determinations on SNM shipping containers as required by 10 CFR 71.62. The licensee devised and is completing a checklist for each SNM shipping container which includes the results of the routine determination inspections required by 10 CFR Part 71. Corrective actions were completed.

### 3. Organization

Following is the current organization of the MIT Radiation Protection Office as it applied to the research reactor facility and associated SNM licenses.

- M. H. Rodman, Director, Medical Department
- R. I. Chamberlin, Acting Head, Environmental Medical Service
- F. X. Masse, MIT Radiation Protection Officer

M. M. Bolton, Associate Radiation Protection Officer  
 J. Jones, Assistant Radiation Protection Officer  
 P. Black, Assistant Radiation Protection Officer  
 M. Galanek, Assistant Radiation Protection Officer  
 E. Karaian, Reactor Radiation Protection Officer  
 P. Coggio, Radiation Protection Technician  
 H. Scott, Radiation Protection Technician

The current organization responsible for activities conducted under the SNM licenses is:

P. Gray, MIT President  
 K. Smith, MIT Vice President, Research  
 O. K. Harling, Director, Nuclear Reactor Laboratory  
 L. Clark, Director, Reactor Operations  
 L. Clark, MIT Accountability Officer  
 H. Bondar, Accountability Representative  
 L. Cark, Criticality Officer  
 J. Bernard, MIT Reactor Superintendent  
 K. Kwak, MIT Reactor Supervisor

No violations were identified.

4. SNM Material at the MIT Research Reactor

The inspector examined licensee records and determined that the quantity of SNM located at the site was within the license limits specified for License SNM-986.

No violations were identified.

5. Review of Operations

The inspector examined all areas of the Nuclear Engineering Building to observe operations and activities in progress, to inspect the nuclear safety aspects of the facility and to check the general state of cleanliness, housekeeping and adherence to fire protection rules within the various areas.

a. Storage of SNM

During examination of the BTF vault located in room NW-12-103 the inspector noted that several packages containing SNM were stored adjacent to the rack storage array located on the right side of the room and were not separated from the rack storage array by at least 12 inches edge-to-edge. One six inch square package containing 1% enriched U-235 fuel rods was located on the floor in front of the array between the A-7 and A-8 locations. A 5 gallon pail containing uranium dioxide enriched to 1.0999 w/o U-235 was stored within six inches of location A-9. A BTF subassembly containing 1.1% enriched

Uranium dioxide was stored against the rack between columns 8 and 9. In addition, there were several other packages containing SNM which were also stored adjacent to this storage rack. Failure to maintain at least 12 inches edge to edge separation of packages containing SNM was identified as a violation (82-01-01).

The inspector also noted that all other special nuclear material not in use in the facility was properly stored in the fuel vault.

b. Postings

All areas of the Nuclear Engineering building were observed to be adequately posted with the proper "caution" signs as required by 10 CFR Part 20.

No violations were identified.

6. Nuclear Criticality Safety

a. Criticality and Radiation Monitors

There are ten radiation monitors located throughout the facility, nine of which are connected to remote readout meters located in the reactor control room. The tenth unit is a local monitor used in connection with the Blanket Test Facility and was normally operated only during testing operations or while the reactor and/or blanket facility was down for repairs and/or modification. All of the facility radiation monitoring devices appeared to be operating properly. Only one of these units is used specifically for criticality control and is located between the Reactor Fuel Vault, Room NW 12-105A, and the BTF Fuel Vault, Room NW 12-103. This monitor had the trip point set at 5 mr/hr and appeared to be working properly.

No violations were identified.

b. Calibration of the Radiation Monitors

The inspector examined licensee records which indicated that the radiation monitors had been calibrated at least once each quarter and after repair from April 14, 1980 through May 17, 1982. Calibration was conducted as required by procedure QA No. 0-75-2 approved March 17, 1979, "Area and Fuel Vault (Crit) Monitor Calibration." The Co-60 source used for the purposes of calibration was last calibrated on March 28, 1977 using a standard traceable to the National Bureau of Standards. At this time, a Co-60 decay curve as a function of time was also established.

No violations were identified.

c. Internal Audit and Inspections

The licensee established a procedure for internal audits of the facility to assure that license conditions and federal regulations are followed. The audits are conducted by the MIT Accountability Officer during SNM inventories. The inspector examined samples of the results of these audits conducted during the year 1981. Corrective actions have been completed on each item identified during these audits.

No violations were identified.

7. Safety Committees

a. Reactor Safeguards Committee

The Reactor Safeguards Committee operates, as required by MIT Reactor Technical Specifications, under the provisions of a charter dated October 26, 1982. The committee meets at least once each year and is responsible to the Administration of MIT. The committee chairman establishes subcommittees to assist the Committee in discharging its review functions and approval responsibilities. The Committee or an active subcommittee reviews and approves all operating procedures, emergency plans, proposed modifications to the reactor, the use of reactor related experimental facilities and experiments, and all equipment and procedures involving the use of licensed radioactive material in the reactor building.

Current members of the MIT Reactor Safeguards Committee are:

- N. C. Rasmussen, Chairman - Professor, Nuclear Engineering Department, MIT
- J. Bernard - Superintendent, MIT Nuclear Reactor
- H. Brooks - Benjamin Pierce Professor of Technology and Public Policy, Division of Engineering and Applied Physics, Harvard University
- L. Clark, Jr. - Director of Reactor Operations, MIT
- M. J. Driscoll - Associate Professor, Nuclear Engineering Department, MIT
- J. Fresina - Director of Safety Office, MIT
- J. Gosnell - Nuclear Engineer, Boston Edison Co.
- P. Griffith - Professor, Mechanical Engineering Department, MIT
- O. Harling - Director, Nuclear Reactor Laboratory, MIT
- E. Karaian - Radiation Protection Officer, MIT Reactor
- D. Lanning - Professor, Nuclear Engineering Department, MIT
- S. Levin - Consultant on Radiation Protection Practices
- C. J. Maletskos - Consultant Biophysicist
- F. Masse - Radiation Protection Officer, MIT
- W. Ruth - Physician, Medical Department, MIT
- K. Smith - Vice-President for Research, MIT



The inspector examined the records of 3 meetings of the Safeguards Committee and 18 meetings of appointed subcommittees held between August 21, 1979 and May 27, 1982. The Safeguards Committee reviewed and approved or supplemented actions taken by the subcommittees. In each case, review actions and recommendations made by the committee were adequately documented. Included in these records were supporting documents used by the committees to develop the recommendations made.

No violations were identified.

b. Radiation Protection Committee

The Radiation Protection Committee establishes and reviews the radiation protection program at the Institute and its off campus sites. The committee also examines the Institute's compliance with radiation protection regulations promulgated by State, Federal, and local agencies.

Current members of the MIT Radiation Protection Committee are:

- A. Davidson, Chairman
- M. M. Bolton, Executive Secretary
- E. Karaian, Reactor Radiation Protection Officer
- F. X. Masse, MIT Radiation Protection Officer
- P. Black, Assistant Radiation Protection Officer
- M. S. Galanek, Assistant Radiation Protection Officer
- J. L. Jones, Assistant Radiation Protection Officer
- J. L. Ryan, Staff, Lincoln Laboratory
- C. E. Newcomer, Division of Comparative Medicine
- P. C. Powell, Office of Sponsored Programs
- H. Brunengraber
- J. G. King
- Vacant, Representative of Medical Department
- C. D. LuBien, Student Member

The inspector examined the records of six meetings of the Radiation Protection Committee held between June 3, 1980 and March 16, 1982. In each case, review actions and recommendations made by the committee were adequately documented.

No violations were identified.

8. Facility Changes and Modifications

The inspector observed that no significant facility changes or modifications were made since the last inspection. Several of the fuel storage racks were removed from the BTF vault, however, this modification did not affect the nuclear safety evaluation of the remaining storage facility. SNM storage safes formerly located in "General Set-up Room" have been moved and properly located in the BTF Vault.

No violations were identified.

9. 10 CFR Part 19 and 21 Postings

The inspector verified that the licensee had posted current information as required by 10 CFR 19.11 and 10 CFR 21.6 at applicable locations throughout the facilities. The licensee also established the applicable procedures for the review, evaluation and reporting of defects as required by 10 CFR 21.21.

No violations were identified.

10. Non Routine Events

The inspector determined that no nonroutine reportable or nonreportable events, within the scope of this inspection, occurred at this facility since the last inspection.

No violations were identified.

11. Emergency Procedures and Drills

The facility emergency procedures for personnel who work with radioactive material, including those who work at the research reactor, are contained in a document "MIT Required Procedures for Radiation Protection." Copies of this document are given to each person who works with or around radioactive material. Evacuation drills are held annually. A checklist is used to check out the conduct of the drill and the operability of facility alarms, horns and signs. Documentation examined by the inspector indicated that annual drills were conducted as required on August 20, 1979, August 28, 1980, and August 21, 1981. Each drill was critiqued immediately thereafter and corrective actions were taken and completed on problem areas identified.

No violations were identified.

12. Emergency Plan

The facility emergency plan was not examined in detail since the plan for the Nuclear Laboratories was an integral part of the Research Reactor emergency plan. The licensee is currently revising the Research Reactor emergency plan in accordance with an order issued by NRC-NRR. During discussions with NRC-NMSS personnel subsequent to this inspection it was determined that the licensee was not issued an order by NRC-NMSS to prepare an Emergency Contingency Plan as required of other licensees. MIT also should have been required to prepare this plan, which may be an integral part of the reactor plan if authorized by NMSS, since criticality monitors are required at the facility and the facility is authorized by license to handle unencapsulated plutonium. This was identified as an unresolved item which will be transmitted to NMSS for resolution. (82-01-02)

### 13. Training

All new students and personnel who will be working or have classes in the Nuclear Engineering Buildings receive a package of documents and are required to familiarize themselves with the contents of this package. Included in the package are:

1. The MIT Required Procedures for Radiation Protection
2. The facility emergency evaluation procedure
3. The facility film badge classification procedure
4. A blank registration and radiation exposure record application
5. 10 CFR Part 19
6. 10 CFR Part 20
7. Tables from 10 CFR Parts 20 and 30
8. USNRC Regulatory Guide 8.13
9. An exclusion area entry permit application
10. A document area Information for Experimenters
11. An information sheet describing Maximum Permissible Doses

Each person is given about 3 days to read the package described above. Then, if an individual or small group of 3 or less, a 1 to 1½ hour lecture is given on the same material followed by an intensive question/ answer session to determine knowledge of exposure limits and working restrictions. Larger groups are given classroom instruction amounting to up to 20 hours of lectures and/or testing prior to allowing each person to work or attend classes in the building.

Retraining is given annually to person who handle or receive radioactive materials. This retraining includes but is not limited to the following topics:

1. Permissible radiation doses
2. Facility organization
3. Biological effects of radiation
4. The facility evacuation plan

Specific training was given to all members of the campus patrol who may be required to respond to an incident at the Nuclear Engineering Building. The training was conducted for 1982 during March, April and May, was given by the Reactor Assistant Supervisor and the Reactor Radiation Protection Officer and was given to 3 to 6 campus policemen at a time. The training consisted of: restricted area inspection procedures, intrusion alarm response procedures, vault alarm procedures, emergency procedures (i.e., medical, fire, radiation), radiation protection procedures, use of radiation detectors, and operation of air samplers.

No violations were identified.



#### 14. Procedure Control

The licensee document "MIT Required Procedures for Radiation Protection" specifies the required procedures to be followed pertaining to the procurement, use, storage and handling of radioactive materials. The applicable forms are completed by the proposed user of the material. These forms are then reviewed and approved by the applicable facility Radiation Protection Officer and overviewed as required by the MIT Radiation Protection Committee. If the radioactive material is to be used at the MIT Nuclear laboratories, the forms and procedures are also reviewed by the MIT Reactor Safeguards Committee and/or applicable subcommittee. The forms used by the licensee include but are not limited to the following:

RP-01, Revised July 1981, "Application for Authorization to Possess and Use Radioactive Material".

RP-50, revised November 1977, "User Registration and Radiation Record".

RRPO-2010, revised August 1978, "Application for Authorization to Possess and Use Radioactive Material within the Reactor Facility".

-- MITR "Irradiation Request Form SR-0-80-32, dated October 21, 1980,

MITR "Safety Review Form"

-- "MITR Irradiation Information for Approved Samples"

-- "Part I Review Sheet"

-- "Radiation Survey Record"

No violations were identified.

#### 15. Source Wipe Tests

##### a. Plutonium Sources

The inspector verified that all Plutonium bearing sources held by the licensee had been wipe tested quarterly for activity as required by license conditions between January 1981 and May 1982.

No violations were identified.

##### b. Other Sources

The inspector verified that other sources and foils held by the licensee (Pu-239, Cf-252, Co-60, AM-241, etc.) were wipe tested every six months as required by license conditions between December, 1979 and June, 1982.

No violations were identified.

16. Transportation Program

a. Quality Assurance Program

The NRC approved the facility "Quality Assurance Program for Radioactive Material Packages" (71-0164, Revision 0) on March 16, 1981 for implementation after June 1, 1981. The licensee incorporated this program into the MIT-NRL Quality Assurance Program in Section 1.13.9.

The inspector verified that the licensee conducted an annual audit of the procurement and use of DOT/NRC approved containers for the shipment of radioactive material. The latest audit was conducted on December 14, 1981. Corrective actions were completed on each item identified as requiring correction during the audit.

No violations were identified.

b. Shipping Containers

The licensee uses Specification 17-H/17-C containers for the shipment of waste, single and double high Specification 6M containers for the shipment of SNM and Model CNS-8-120 (C of C 6601) and Model CNS-1-13C; CNS-1600 (C of C 9081) containers for the shipment of activated reactor components, byproduct material and dewatered resins. The licensee maintained a file of all the documents and drawings referenced in the certificates of compliance.

No violations were identified.

c. Receipt of Radioactive Material

The inspector verified that the licensee surveyed each package of radioactive material received for external contamination and radiation level. The surveys were conducted as required upon receipt during the time period January 22, 1980 and March 15, 1982.

No violations were identified.

d. Shipment of Radioactive Material

Licensee records relating to the packaging and shipment of Special Nuclear Material from April 16, 1980 through February 7, 1982 were examined by the inspector. These records documented results of radiation surveys, container inspection results, labeling, marking, and placarding of vehicles and/or containers as required by license conditions and federal regulations. It was noted that in two cases (CCP-FVA 4&5) the NRC 741 forms were not completed in that the MIT-facility license number was not recorded in the required block. This was discussed at the exit interview. The licensee was reminded that the transaction could not be recorded properly at the Oak Ridge, Tennessee facility if this information is not provided.

No violations were identified.

17. Licensing/Licensee Meeting

The NRC-NMSS licensing project manager accompanied the inspector during this inspection. As part of the exit interview, discussions were held concerning the pending submittal of the License No. SNM-986 renewal application which was due prior to July 31, 1982. Information with respect to the renewal application format and content was provided to the licensee.

18. Unresolved Items

Unresolved items are matters about which more information is required in order to ascertain whether they are acceptable items, items of noncompliance, or deviations. An unresolved item disclosed during this inspection is discussed in Paragraph 12.

19. Exit Interview

The inspector met with the licensee representatives (denoted in Paragraph 1) at the conclusion of the inspection. The inspector summarized the scope and findings of the inspection. Discussions were also held pertaining to the pending license renewal application (Paragraph 17). The licensee (Mr. L. Clark) was notified of the unresolved item discussed in Paragraph 12 by telephone on June 23, 1982.