August 26, 2003

Dr. Anthony H. Francis, Director
Phoenix Memorial Laboratory
Ford Nuclear Reactor
University of Michigan
2301 Bonisteel Boulevard
Ann Arbor, MI 48109-2100

SUBJECT: NRC ANNOUNCED INSPECTION REPORT NO. 50-02/2003-202

Dear Dr. Francis:

This letter refers to the inspection conducted on May 5 - 8, 2003, at the Ford Nuclear Reactor. The inspection included a review of activities authorized for your 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 concern was 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/reading-rm/adams.html.

Should you have any questions concerning this inspection, please contact Mr. Thomas Dragoun in King of Prussia, PA at 610-337-5373.

Sincerely,

/RA/

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

Docket No. 50-02
License No. R-28

Enclosure: NRC Inspection Report No. 50-02/2003-202

cc w/enclosure: Please see next page

cc:

Special Assistant to the Governor
Office of the Governor
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Lansing, MI 48909

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Michigan Department of Environmental Quality
Drinking Water and Radiological
Protection Division
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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:	50-02
License No:	R-28
Report No:	50-02/2003-202
Licensee:	University of Michigan
Facility:	Ford Nuclear Reactor
Location:	Ann Arbor, Michigan
Dates:	May 5-8, 2003
Inspector:	Thomas F. Dragoun
Approved by:	Patrick M. Madden, Section Chief Research and Test Reactors Section New, Research and Test Reactors Program (RNRP) Division of Regulatory Improvement Programs Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

University of Michigan
Report No: 50-02/2003-202

The primary focus of this routine, announced inspection was the on-site review of selected aspects of the licensee's Class 1 research reactor programs including: organization and staffing, radiation protection, effluent control and environmental monitoring, and transportation activities.

Organization and Staffing

- The organization and staffing of the radiation safety program remain in compliance with the requirements in Technical Specifications Section 6.

Radiation Protection

- Annual reviews of the Radiation Protection Program were being completed by the licensee as required by 10 CFR 20.
- Licensee Health Physics procedures and changes thereto were being reviewed and approved by the Safety Review Committee as required.
- Surveys were being completed and documented acceptably to permit evaluation of the radiation hazards present.
- Postings met the regulatory requirements specified in 10 CFR Parts 19 and 20.
- Personnel dosimetry was being worn as required and 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 being implemented by the licensee satisfied regulatory requirements.

Effluent Control and Environmental Monitoring

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

Transportation Activities

- Radioactive material and waste was packaged and shipped in accordance with regulatory and procedural requirements.

REPORT DETAILS

Summary of Plant Status

The licensee's Ford Nuclear Reactor was operated at 2 megawatts to support completion of laboratory experiments, reactor operator requalification training, and research. A major housekeeping effort was in progress to dispose of radioactive and non-radioactive waste in anticipation of a shutdown directive from the university administration. A contractor (CH2MHILL) recently completed a characterization of the facility and identified the radioactive material to be removed during decommissioning. The licensee stated that the operational program improvements discussed with the NRC during previous inspections will not be completed due to the anticipated permanent shut down.

1. Organization and Staffing

a. Inspection Scope (Inspection Procedure [IP] 83743)

The inspector reviewed the following regarding the licensee's radiation protection organization and staffing to ensure that the requirements of Technical Specification (TS) Section 6.1.5 and Figure 6.1, Amendment 45, dated September 17, 1998 were being met:

- organizational structure
- management responsibilities
- personnel qualifications

b. Observations and Findings

The Reactor Health Physicist position, vacant since June 2002, was filled. The inspector and the Radiation Safety Director discussed the training and experience criteria that management applied to the position. Besides oversight of the reactor radiation safety program, this position includes the responsibility for classroom lectures and calibration of all university-owned portable radiation detection equipment. A review of the qualifications of the newly appointed Health Physicist confirmed that management's criteria were satisfied.

Discussions with the Nuclear Reactor Laboratory Manager and the Radiation Safety Director indicated that the management structure and the responsibility for specific elements of the radiation safety program that were assigned to the reactor operations staff and the radiation safety staff were unchanged since the last inspection.

c. Conclusions

The organization and staffing of the radiation safety program remain in compliance with the requirements in TS Section 6.

2. Radiation Protection

a. Inspection Scope (IP 83743)

The inspector reviewed selected aspects of:

- Health Physics Procedure (HPP) 101, "Facility Contamination Survey", revision 4 dated August 5, 1998. Data for April 16 &11; March 18,13,7; February 26, 21, 13, 6; and January 29 & 16, 2003
- HPP 102, "FNR-PML Area Radiation Surveys", revision 4 dated August 12, 1998. Monthly data for January through December 2002.
- HPP 203, "Calibration of Portable Ionization Chamber Instruments",revision3 dated July 9, 1998. Data for September 4, 2002, and February 25, 2003.
- HPP 204, "Neutron Detector Calibration", revision 6 dated July 28, 1998. Data for April 16, 2003, October 20, 2002, August 9, 2001, and July 24, 2000.
- HPP 206, "Gamma Spectrometry Equipment Calibration Check", revision 6 dated August 11, 1998. Data for October 23 and October 17, 2002.
- HPP 208, "MAP Monitor Calibration Procedure", revision 7 dated July 29, 1998. Data for December 12, 2002 and June 10, 1994.
- HPP 209, "GAD Calibration", revision 11 dated July 29, 1995. Data for March 6, 2003, January 31, 2003, and September 26, 2002.
- HPP 211, "Gas Proportional Counter Calibration", revision 3 dated August 7, 1998. Gas flow data for March 18, 2003.
- Licensee letter to NRC, "Reported Occupational Dose in Excess of 10 CFR 20.1201(a)(2)(ii) Limits" dated March 1, 2002.
- Licensee letter to Landauer, "Dose Adjustment" dated September 3, 2002
- Licensee form,"Annual Radiation Safety Program Review" conducted April 16, 18, and 19, 2002 and May 6-8, 2003.

b. Observations and Findings

(1) Surveys

The inspector reviewed the weekly general area contamination surveys and monthly general area radiation surveys. The surveys had been completed by the Reactor Health Physics technician in accordance with Health Physics Procedures (HPP) and the results were documented on the appropriate forms. General area surveys are completed more often than the periodicity specified in the procedure. Records of the surveys were maintained as required by 10 CFR 20.2103 and TS 6.5.1(g). Survey results are reviewed by the Reactor Health Physicist (RHP) and posted at the entrances to the areas. This information was previously also made available on the local area computer network but was removed due to increased security concern.

(2) Postings and Notices

The inspector reviewed the postings at the entrances to various controlled areas including the Control Room level of the reactor building, the reactor equipment areas, laboratories, and radioactive material storage areas. The postings were acceptable and indicated the radiation and contamination hazards present. The facility's radioactive material storage areas were noted to be properly posted. No unmarked radioactive material was found in the facility. Copies of current notices to workers required by 10 CFR Part 19 were posted on various bulletin boards inside and outside of the controlled area.

(3) Dosimetry

The licensee used a National Voluntary Laboratory Accreditation Program (NVLAP) accredited vendor (Landauer) to process personnel dosimetry. An examination of the records for calender year 2002 showed that reactor staff badges are processed monthly and exposures were well within NRC limits and within licensee action levels. However, one person on the nuclear medicine staff working under a broad scope license in an adjacent laboratory received 40280 mrem dose. Reactor management was aware of the situation. Through direct observation, the inspector determined that dosimetry was acceptably used by facility personnel.

In February 2002, the RSO received a report that indicated that an individual on the reactor staff received an extremity dose of 72,640 mrem during the Fall of 2001 which exceeds the 50,000 mrem limit specified in 10 CFR 20.1201(a)(1). The RSO and the RHP investigated the situation and concluded from the TLD chip glow curve data that the chip was not properly annealed prior to issuance. Using historical dose data and time and motion studies, the RSO assigned an adjusted dose of 280 mrem to the individual and recorded the supporting information in accordance with 10 CFR 20.2103(b)(1).

(4) Radiation Monitoring Equipment

The calibration of portable survey meters was typically completed by personnel from the reactor Radiation Safety Service (RSS) group. This service includes all instruments used in campus laboratories. Calibration of friskers, fixed radiation detectors, and air monitoring instruments was completed by the RSS. The calibration records of selected portable survey meters, friskers, fixed radiation detectors, and air monitoring equipment in use at the facility were reviewed. Calibration frequency met the requirements established in HPP and records were being maintained as required.

(5) Radiation Protection Program

The annual reviews of the radiation protection program required by 10 CFR 20.1101 were completed on April 19, 2002, and May 8, 2003. No programmatic weaknesses were reported.

The HPP procedures and checklists reviewed during this inspection had been reviewed and approved by the Safety Review Committee as required by TS 6.4.

(6) ALARA

The inspector discussed an ALARA project completed by a staff SRO. The SRO noticed a high radiation level (7 R/hr) was present at the open end of an 8 inch in-pool flux trap ("rifle") used to irradiate silicon wafers. The source of the radiation was determined to be from traces of antimony in the lead weight used to adjust the buoyancy of the rifle. A new rifle was fabricated using bismuth weight. The radiation level was reduced to about 1 R/hr that rapidly decayed. The source of this field was determined to be from short lived sodium 24 produced by a neutron-proton reaction in the aluminum wall of the rifle. This level was determined to be acceptable.

The inspector observed the unloading and drying of the resin used to purify the reactor pool water. The resin is contained in cylindrical tanks weighing several hundred pounds each with contact radiation levels up to 100 millirem/hour. Protective clothing provided control of personnel contamination. Additional dosimetry for both hands was provided. The individual stated that resins with elevated dose rates were stored behind the other containers which were used as shielding. When the "hot" tanks are emptied, the operator indicated that the speed of the process is increased to reduce the exposure time. This was a good application of ALARA principles.

(7) Facility Tours

The inspector toured the Control Room, the third floor operating level, and selected support laboratories and offices. Control of radioactive material and control of access to radiation and high radiation areas were acceptable. As noted earlier, the postings and signs for these areas were appropriate.

c. Conclusions

The inspector determined that, because: 1) surveys were being completed and documented acceptably to permit evaluation of the radiation hazards that might exist; 2) postings met regulatory requirements; 3) personnel dosimetry was being worn as required and doses were well within the licensee's procedural action

levels and the NRC's regulatory limits; and, 4) radiation monitoring equipment was being maintained and calibrated as required, and the Radiation Protection Program being implemented by the licensee satisfied regulatory requirements.

3. Effluent and Environmental Monitoring

a. Inspection Scope (IP 69004)

The inspector reviewed the following to verify compliance with the requirements of 10 CFR 20 Subpart D and TS Sections 3.5, 3.6, 4.5, and 4.6:

- HPP 108, "Environmental Dosimeter Annual Report" revision 3, dated July 22, 1998. Quarterly data for the 6 deployed TLD for 2002.
- HPP 207, "Effluent Activity Calculation" revision 10, dated August 6, 1998
- HPP 208, "MAP Monitor Calibration Procedure" revision 7, dated July 29, 1998. Data for December 12, 2002, and June 10, 1994
- HPP 209, "GAD Calibration" revision 11, dated July 29, 1995. Data for March 6, 2003, January 31, 2003, September 26, 2002.
- Procedure CP-219, "Ludlum 395 Area Monitoring Calibration Procedure" revision 2 dated July 31,1998. Data for April 28, 2003, October 14 and April 29, 2002, and October 29, 2001.
- Weekly environmental air grab samples data for December 10, 2002, January 16, January 20, January 22, January 23, January 30, February 4, and February 18, 2003
- Annual Report for calender year 2002
- EPA COMPLY computer code run at Level 4 dated May 6, 2003

b. Observation and Findings

The liquid waste piping to the public sewer system remains disconnected so no discharges occurred. The inspector observed that water from a washing machine used to clean protective clothing was evaporated and the residue treated as solid waste.

The inspector reviewed the calibration records for the stack monitoring systems and determined that they performed in accordance with requirements in TS 4.5. Airborne effluent was properly controlled and no alarm set points were reached. Data from the monitors was reported by the reactor staff to the RSS staff who calculate the dose to the public. The releases were determined to be well within the annual dose constraints of 10 CFR 20.1101 (d), 10 CFR Part 20 Appendix B concentrations, and TS 3.5 limits.

Environmental TLD data demonstrated that the direct shine radiation dose to the public was well below the limits specified in 10 CFR 20.

c. Conclusion

Airborne effluent monitoring satisfied license and regulatory requirements and releases were within the specified regulatory and TS limits.

4. Transportation

a. Inspection Scope (IP 86740)

The inspector reviewed the following to verify compliance with procedural and regulatory requirements in 10 CFR Parts 20 and 71 and 49 CFR Parts 171 - 178 for transfer and shipment of licensed material:

- HPP 110, “Radioactive material Receipt and Opening” revision 4 dated July 25, 1998
- HPP 111, “Radioactive Material Shipment” revision 10 dated June 21, 2000. Completed Package Checklist dated January 28, 17, and 14, and May 5, and March 17, 2003
- Attendance list of personnel at the University of Findlay DOT training held in October 2002
- Type A package certification records:
  - ORNL Sugarman Cask dated June 24, 1982
  - FBF Nuclear Containers, specification UN1A2/X500/s/95 dated June 24, 1982
  - Phoenix Memorial Laboratory cardboard box with insert dated April 2, 1997
- Bills of Lading dated January 14 and 28, and March 11, 2003
- Records regarding a waste shipment to a waste broker (Duratek) on December 10, 2002:
  - NRC Form 40 for shipper T024931 dated December 10, 2002
  - NRC Form 541 manifest No. 2502-19 by shipper T04931
  - Duratek form “Shipment Release Checklist”
  - Licensee form “Full Vehicle Survey Form” data for December 10, 2002
  - Inventories of isotopes and curie content in the waste from sample analysis conducted between November 4 and December 6, 2002
  - A receipt letter as required by 10 CFR 20 Appendix G, Section III.C.1 sent to the licensee by the waste broker on December 12, 2002

b. Observations and Findings

Records indicated that personnel involved in preparing and shipping packages of radioactive material were trained as required by 49 CFR 172.700. Solid waste was characterized and packaged by the reactor staff, then transferred to the campus RSS group for disposal. Irradiated experimental specimens were packaged and shipped directly by the reactor staff. Through records reviews and the discussions with licensee personnel, the inspector determined that the licensee used appropriate packaging, properly marked and labeled the package, completed the required radiation surveys, and maintained the required records and reports as required by 49 CFR 172. Waste manifests were prepared in accordance with 10 CFR 20 Appendix G.

c. Conclusions

Radioactive material and waste was packaged and shipped in accordance with regulatory and procedural requirements.

5. Exit Interview

The inspection scope and results were summarized on May 8, 2003, 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

C. Becker, Ford Nuclear Reactor Manager
M. Driscoll, Director, Radiation Safety
B. DuChamp, Assistant Manager, Reactor Operations
P. Keavy, Health Physics Technician
T. O'Donnell, Reactor Health Physicist
P. Simpson, Assistant Manager, Research

INSPECTION PROCEDURES USED

IP 69004	CLASS I NON-POWER REACTOR EFFLUENT AND ENVIRONMENTAL MONITORING
IP 83743	CLASS I NON-POWER REACTORS RADIATION PROTECTION
IP 86740	INSPECTION OF TRANSPORTATION ACTIVITIES

ITEMS OPENED, CLOSED, AND DISCUSSED

Updated

50-02/2001-201-01	IFI	Update health physics procedures. The University administration announced a permanent shutdown of the facility. No further action on procedures related to reactor operation will be taken.

Opened

none

Closed

none

LIST OF ACRONYMS USED

CFR	Code of Federal Regulations
HP	Health Physics
IFI	Inspector Follow up Item
IP	Inspection procedure
NRC	Nuclear Regulatory Commission
NRLM	Nuclear Reactor Laboratory Manager
NVLAP	National Voluntary Laboratory Accreditation Program
RSO	Radiation Safety Officer
RSS	Radiation Safety Service
TLD	Thermoluminescent Dosimeter
TS	Technical Specifications