

May 24, 2001

Dr. David K. Wehe, Director  
Phoenix Memorial Laboratory  
Ford Nuclear Reactor  
University of Michigan  
2301 Bonisteel Boulevard  
Ann Arbor, MI 48109-2100

SUBJECT: NRC ROUTINE, ANNOUNCED INSPECTION REPORT NO. 50-02/2001-201

Dear Dr. Wehe:

This refers to the inspection conducted on April 30 - May 4, 2001, at the Ford Nuclear Reactor. 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 or noncompliance to NRC requirements 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/NRC/ADAMS/index.html>.

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

Sincerely,

**/RA/**

Ledyard B. Marsh, Chief  
Events Assessment, Generic Communications  
and Non-Power Reactors Branch  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

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

Enclosure: NRC Inspection Report No. 50-02/2001-201

cc w/enclosure: Please see next page

University of Michigan

Docket No. 50-02

cc:

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U. S. NUCLEAR REGULATORY COMMISSION

Docket No: 50-02

License No: R-28

Report No: 50-02/2001-201

Licensee: University of Michigan

Facility: Ford Nuclear Reactor

Location: Ann Arbor, Michigan

Dates: April 30 - May 4, 2001

Inspector: Thomas F. Dragoun

Approved by: Ledyard B. Marsh, Chief  
Events Assessment, Generic Communications and  
Non-Power Reactors Branch  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

## EXECUTIVE SUMMARY

This routine, announced inspection included onsite review of selected aspects of the radiation protection program, effluent and environmental monitoring program, emergency preparedness program, security program, and transportation program since the last NRC inspection.

The licensee's programs were acceptably directed toward the protection of public health and safety, and in compliance with NRC requirements.

### RADIATION PROTECTION

The radiation protection program satisfied NRC requirements.

### EFFLUENT AND ENVIRONMENTAL MONITORING

The effluent and environmental monitoring program satisfied NRC requirements.

### EMERGENCY PREPAREDNESS

The emergency preparedness program was conducted in accordance with the Emergency Plan.

### SECURITY

Security activities and systems satisfied Physical Protection Plan requirements.

### TRANSPORTATION

The program for transportation of radioactive materials satisfied NRC requirements.

## Report Details

### Summary of Plant Status

During the inspection the reactor was started and operated continuously to support experiments and education.

#### 1. RADIATION PROTECTION

##### a. Scope (IP 83743)

The inspector reviewed selected aspects of:

- radiation protection procedures
- annual program review
- radiological signs and posting
- protective clothing
- exit surveys
- personnel training
- routine surveys and monitoring
- personnel monitoring
- dosimetry records
- dose to embryo/fetus
- maintenance and calibration of radiation monitoring equipment
- As Low As Reasonably Achievable (ALARA) reviews
- laboratory analytical equipment

##### b. Observations and Findings

The procedures that document and implement the radiation protection program had not changed since the last inspection. The inspector noted that detail was lacking in some procedures. For example, the criteria for release of personnel and equipment from a contaminated area was unclear. The Reactor Manager stated that critical procedures (those corresponding to shall regulatory requirements) will be reviewed and revised by April 2002. Review of non-critical procedures will be completed by April 2003. Status of this project will be reported to the Safety Review Committee during regular meetings. This matter will be reviewed in a future inspection (Inspector Follow up Item 50-02/2001-201-01).

The licensee reviewed the radiation protection program content and implementation annually in accordance with 10 CFR 20.1101(c).

Caution signs, postings and controls to radiation areas were as required in 10 CFR 20, Subpart J.

Exit frisking was performed with automatic hand and foot monitors in laboratory building hallways and on the reactor operating floor. In general, there were no manual friskers at the exits from laboratories using contaminated liquids. The

licensee indicated that loose contamination outside the laboratories has not been a problem. However, several manual friskers were being refurbished and will be



placed at laboratory exits. Personnel protective clothing included lab coats and latex gloves were appropriate for the contamination level. Absorbent material was readily available on the reactor operating floor for use under material removed from the reactor pool.

Basic training for radiation workers, including a quiz, was provided by the Radiation Safety Service staff. Additional reactor specific training was provided by the Reactor Health Physicist. A review of training materials indicated that the requirements of 10 CFR 19.12 were satisfied.

Records showed that routine radiation and contamination surveys were completed as required by licensee procedures. Observation of a contamination survey confirmed that the procedure (HP-101) was followed and generally accepted survey techniques were used.

Whole body and finger ring dosimeters were properly used. The licensee used a National Voluntary Laboratory Accreditation Program (NVLAP)-accredited vendor to process dosimetry. Selected staff were also provided with neutron dosimetry. Reactor staff dosimetry was processed monthly, the remainder were done quarterly. No CEDE doses were recorded. Occupational doses were within 10 CFR Part 20 limitations. A program to limit exposures to an embryo/fetus was available.

Portable beta-gamma meters were calibrated on site at 6 month intervals. Records were satisfactory. An adequate supply of calibrated meters was available for use. Campus meters were also serviced at the reactor facility. Permanently installed area radiation monitors were calibrated by the reactor operators. Acceptable calibration technique was used.

An ALARA evaluation was in progress to study doses received during loading of silicon wafer irradiation samples. Other high dose activities, such as calibration of area radiation monitors, were identified for future evaluation. Administrative flags at certain dose levels are used to trigger management reviews. The inspector observed that the pneumatic rabbit system relied on compressed air which increased the discharge of argon 41. Alternate gases, such as nitrogen were recommended and will be considered. The ALARA program was satisfactory.

Analytical laboratory equipment consisted of a high efficiency intrinsic germanium detector, liquid scintillation detector, and a gas flow proportional counter. All equipment was the latest vintage, was properly maintained, and used the latest manufacturer's operating software. Properly configured and NIST traceable standards were used for calibration. Use of this equipment represents a program strength.

c. Conclusions

The radiation protection program satisfied NRC requirements.

2. EFFLUENT AND ENVIRONMENTAL MONITORING

a. Scope (69004)

The inspector reviewed selected aspects of:

- the environmental monitoring program
- environmental monitoring results
- effluent control and monitoring
- release records

b. Observations and Findings

The environmental monitoring program consisted of six TLD dosimeters and six air particulate grab sampling at various distances and locations around the reactor. TLD and grab samples were not co-located. Data in Annual Reports indicated that doses to the public were below limits specified in 10 CFR 20.1301 and below the constraint specified in 10 CFR 20.1101(d). The Reactor Manager indicated that the technical basis for determining the sampling locations could not be fully reconstructed. However, this will be corrected during the revision of the environmental monitoring procedures as a high priority item as discussed in Section 1 above.

Airborne effluent monitors required by TS 3.5 were installed and operable. The HP technician supplements the daily operability checks required by TS 4.5 with a more thorough weekly check. This check verifies the trip set points for the radiation monitor that cause a ventilation system isolation. The Reactor HP also used the data recorded during this check to calculate the airborne releases. Because this effluent discharge point includes effluent from the Phoenix Memorial Laboratory and the reactor facility, the calculation represent both sources of effluent.

Information regarding the exhaust stack sampling probes was not available. The Reactor Manager indicated that the sampling system flow exceeded the requirements for isokinetic sampling and provided conservative results. Sampling system technical information will be included in the revised procedure.

There was no liquid effluent. All drain and sump water was stored, processed through H-OH form resin, and then re-used as makeup for reactor pool evaporative losses. The discharge system was permanently disconnected from the public sewer. However, a spool piece was available to reconnect the system in an emergency. The procedure to discharge water (HP-115) was detailed and ensured that regulatory requirements would be met.

c. Conclusions

The effluent and environmental monitoring program satisfied NRC requirements.

3. EMERGENCY PREPAREDNESS

a. Scope (IP 82745)

The inspector reviewed selected aspects of:

- the Emergency Plan
- implementing procedures
- emergency response facilities, supplies, equipment and instrumentation
- offsite support agreements
- emergency drills

b. Observations and Findings

The Emergency Plan (E-Plan) revision 16, dated 1997, was in effect. The inspector noted that the emergency procedures required minor updating. The Reactor Manager stated that the entire E-Plan will be revised by April 2002 to address issues identified during annual audits, problem reports, and drills. This matter will be reviewed in a future inspection (Inspector Follow up Item 50-02/2001-201-02).

Inventories of emergency response supplies were completed and documented as required. Emergency notification phone numbers were verified.

Agreements for offsite ambulance and fire fighting assistance were in affect until November 2001.

The Reactor Manager broke with tradition and conducted the first unannounced annual drill in November 2000. The status of corrective actions for the identified weaknesses was monitored by the Safety Review Committee.

c. Conclusions

The emergency preparedness program was conducted in accordance with the Emergency Plan.

4. SECURITY

a. Scope (IP 81431)

The inspector reviewed selected aspects of:

- Physical Protection Plan
- security systems and equipment

- alarm response

b. Observations and Findings

The 1997 revision of the security plan was in effect. The reactor Manager stated that a new revision was drafted and under review.

Locks, barriers, access controls, and intruder detection systems were as described in the plan. Reactor facility access required a magnetic card and keypad code. Access approval was granted by the Reactor Manager. Accountability of magnetic cards and changes to access codes was satisfactory.

At the inspectors request, a security alarm to the campus police was intentionally tripped. Alarm identification was satisfactory.

The inspector noted that 13 fission chambers were added to the inventory for holdings under the special nuclear materials license. Licensee action for Inspector Follow up Item 50-02/2000-202-01 concerning accountability of fission chambers was complete and satisfactory.

c. Conclusions

Security activities and systems satisfied Physical Protection Plan requirements.

5. TRANSPORTATION

a. Scope (86740)

The inspector reviewed selected aspects of:

- radioactive waste shipping manifest
- radioactive materials receipt

b. Observations and Findings

All radioactive material for disposal was transferred to a waste broker for processing (Duratek). No waste was shipped for direct burial. Records showed that packaging and labeling were satisfactory for non-exclusive use transport. Uniform manifest records were completed as required by 10 CFR 20, Appendix G.

A package containing radioactive sample holders was delivered during this inspection. The package was receipt inspected and opened in accordance with the licensee's procedure (HP-110), DOT, and NRC requirements.

c. Conclusions

The program for transportation of radioactive materials satisfied NRC requirements.

6. EXIT INTERVIEW

The inspector presented the inspection results to members of licensee management at the conclusion of the inspection on May 4, 2001. The licensee acknowledged the findings presented.

## **PARTIAL LIST OF PERSONS CONTACTED**

### **Licensee**

C. Becker, Ford Nuclear Reactor Manager  
R. Blackburn, Manager, Phoenix Memorial Laboratory  
C. Brannon, Electrical Engineer  
A. Cook, Reactor Engineer  
H. Downey, Reactor Health Physicist  
M. Driscoll, Director, Radiation Safety  
B. DuChamp, Assistant Manager, Reactor Operations  
D. Jowers, Health Physics Technician  
J. King, Member, Safety Review Committee  
J. Lee, Chair, Safety Review Committee  
J. Martin, Member, Safety Review Committee  
L. Mink, Senior Research Associate  
R. Nichols, Chair, Radiation Policy Committee  
J. Penner-Hahn, Associate Vice President for Research  
R. Robertson, Member, Safety Review Committee  
P. Simpson, Assistant Manager, Research  
D. Wehe, Director, Michigan Memorial Phoenix Project  
D. Wood, Member, Safety Review Committee

## **INSPECTION PROCEDURES USED**

IP 69004	CLASS I NON-POWER REACTOR EFFLUENT AND ENVIRONMENTAL MONITORING
IP 81431	FIXED SITE PHYSICAL PROTECTION OF SPECIAL NUCLEAR MATERIAL OF LOW STRATEGIC SIGNIFICANCE
IP 82745	CLASS I NON-POWER REACTOR EMERGENCY PREPAREDNESS
IP 83743	CLASS I NON-POWER REACTORS RADIATION PROTECTION
IP 86740	INSPECTION OF TRANSPORTATION ACTIVITIES

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

### **Opened**

50-02/2001-201-01	IFI	Update health physics procedures
50-02/2001-201-02	IFI	Update Emergency Plan

### **Closed**

50-02/2000-202-01	IFI	Establish accountability for fission chambers
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### **LIST OF ACRONYMS USED**

ALARA	As Low As Reasonably Achievable
CEDE	committed effective dose equivalent
CFR	Code of Federal Regulations
DOT	US Department of Transportation
HP	Health Physics
IFI	Inspector Follow up Item
IP	Inspection procedure
NRC	Nuclear Regulatory Commission
SNM	Special Nuclear Material
TS	Technical Specifications