

U. S. NUCLEAR REGULATORY COMMISSION  
REGION I

Report No. 50-225/92-01

Docket No. 50-225

License No. CX-22

Licensee: Rensselaer Polytechnic Institute  
Department of Nuclear Engineering and Engineering Physics  
Troy, New York 12180-3590

Facility: L. David Walthousen Critical Experiments Facility

Inspection at: Schenectady, New York and Troy, New York

Inspection Conducted: March 25-26 1992

Inspector: Thomas F. Dragoun 4/14/92  
Thomas F. Dragoun, Project Scientist,  
Effluents Radiation Protection  
Section (ERPS), Facilities Radiological  
Safety and Safeguards Branch (FRSSB) Date

Approved By: Robert J. Bores 4/14/92  
Robert J. Bores, Chief, ERPS, FRSSB,  
Division of Radiation Safety and  
Safeguards Date

**Areas Inspected:** Routine inspection of the radiation safety program including status of previously identified items, organization, personnel monitoring, radiation surveys, postings, effluents, calibration of instruments, and audits.

**Results:** No safety concerns or violations were identified.

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## Details

### 1.0 Individuals Contacted

- \*R. Block, Chairman, Department of Nuclear Engineering and Engineering Physics
- \*D. Harris, Director, Reactor Critical Facility
- \*G. Judd, Vice Provost for Academic Affairs and Dean of the Graduate School
- F. Mastrianni, Assistant Director, Office of Radiation and Nuclear Safety
- E. Muzzy, Associate Engineer
- I. Preiss, Chairman, Radiation Safety Committee
- \*R. Ryan, Director, Office of Radiation and Nuclear Safety

\*Attended the Exit Interview on March 26, 1992.

### 2.0 Status of Previously Identified Items

- 2.1 (Item 90-01-01) Follow-up Item (Closed). Provide a written procedure for the calibration of the area radiation monitors in the Critical Facility. The licensee is now using the written procedure provided by the manufacturer. This matter is closed.
- 2.2 (Item 91-02-02) Follow up Item (Closed). Install additional limit switches to prevent withdrawing control rods beyond the core lattice plate. The switches have been installed and their use has been incorporated into the reactor operating procedures. This matter is closed.

### 3.0 Additional Fuel Pin Storage

The licensee requested NRC approval in a letter dated January 28, 1992, for an increase in the maximum capacity of the reactor fuel storage racks. NRC review is in progress. The inspector toured the fuel vault and observed the additional structural supports that the licensee installed on the fuel racks. The inspector concluded that the bracing appeared to be adequate.

### 4.0 Organization

The licensee's radiation safety program reports to the Office of the Provost and is independent of the reactor operations group. The organization, responsibilities, policies, and procedures for the program are contained in a manual called "Radiation Safety Regulations and Procedures", Revision 2, issued on April 1, 1990. Since the licensee also conducts graduate and undergraduate training in health physics, there are extensive technical resources available to support the reactor program. The radiation safety program significantly exceeds the requirements of Technical Specification 6.1 and will

satisfy the new requirements of 10 CFR 20.1101 due for implementation by January 1, 1994.

### 5.0 Personnel Monitoring

The licensee uses a badge containing four lithium fluoride TLD chips to monitor personnel exposures from beta, gamma, and neutron radiation. The chips are processed monthly using a standard reader and algorithm. Each year several badges are spiked with known exposures and exchanged with two nearby nuclear power plants. Test badge results are then compared to provide a quality control check for the program. The inspector determined that the licensee's program used generally accepted techniques and hardware.

Exposure records are maintained on campus in a computer file and hard copy. The records appeared to be proper with no overexposures indicated. The Radiation Safety Committee reviews all exposure records each semester and checks any anomaly reports which explain any higher than expected exposures.

The licensee's dosimetry system is not NVLAP accredited. On February 22, 1988, the licensee requested an exemption from the accreditation requirement since the equipment and technical expertise on campus could provide adequate exposure monitoring. In a letter dated June 24, 1988, the NRC stated that an exemption was not required provided that the licensee controlled exposures to less than 25% of the quarterly limits specified in 10 CFR 20. The licensee has been controlling exposures to these levels. Within the scope of this review, no safety concerns were identified.

### 5.0 Radiation Surveys

Radiation surveys are performed monthly by the Office of Radiation and Nuclear Safety (ORNS) when the facility is in use. An independent survey is done annually by a member of the Radiation Safety Committee. The surveys included measurement of loose surface contamination (smears) and radiation levels due to beta, gamma, and neutrons. Data were recorded on floor plan maps. Records were readily available for the period 1977 to 1992. The surveys appeared to be thorough.

Smears were counted in a gas flow proportional counter which detects alpha and beta radiation with good sensitivity. Gamma, beta and neutron radiation levels were measured with portable survey meters. The gamma meters are calibrated using a 5-Curie cesium-137 source with lead attenuators to obtain the desired radiation levels. Beta meters were calibrated using strontium-90 sources of varying strengths. Neutron meters were calibrated against a PuBe source. The licensee used PuBe rather than a moderated californium neutron source since the licensee's studies indicate that the former spectrum

moderated californium neutron source since the licensee's studies indicate that the former spectrum is closer to the reactor's neutron spectrum.

A portable gamma meter, neutron meter, and frisker were available at the Critical Facility for use by operations personnel. These are maintained by the Associate Engineer. They were found to be in good operating condition with up-to-date calibrations.

Four area radiation monitors (ARM) were installed as required by Technical Specification 3.3. To calibrate this equipment, the Associate Engineer removes the detectors from their mountings and removes the associated power supply/ readout modules from the reactor console. They are then transported to the cesium-137 calibration facility and reconnected to the power supply/readout module using a patch cord. The ARMs were calibrated over the range of 0.5 to 50 mR/hr using the manufacturer's procedure and then returned to the Critical Facility. This is a good calibration technique.

Airborne activity is monitored during reactor operation as required by Technical Specification 3.3(c). The licensee replaced the original air pump and detector chamber with newer equipment. The inspector noted that the sample line was originally connected to the exhaust vent but now takes suction close to the floor in the reactor room. The sample point may not be representative of particulate activity but would be adequate for gaseous activity. In addition, the detector is checked for operation using a source known to cause an alarm. However, the licensee had no calibration procedure for this instrument. The licensee stated that the use of this equipment would be evaluated and an appropriate calibration procedure would be developed. This matter will be reviewed in a future inspection (50-225/92-01-01).

## 7.0 Postings

Postings were reviewed with respect to criteria in 10 CFR 20.203. No deficiencies were observed. All radioactive material was properly labeled and stored in the fuel locker.

## 8.0 Training

Radiation worker training was reviewed with respect to criteria in 10 CFR 19.12. Training was provided annually to graduate students, public safety (campus police), and the janitorial staff. Training consisted of lectures and video tape presentations. Undergraduate nuclear engineers are required to take health physics courses. No deficiencies were observed.

## 9.0 Audits

The oversight and auditing of the radiation safety program by the Radiation and Nuclear Safety Committee was determined from discussions with the committee chairman and through the review of minutes of meetings. Meetings were held bi-monthly during the academic year to review changes to procedures, policies and facilities. An annual walk-through inspection of facilities was conducted for compliance with the safety manual requirements. The Committee does not review the experiments at the Critical Facility. These reviews were performed by the Nuclear Safety Review Board in accordance with TS 6.3. The inspector determined that the Committee was effective.

## 10.0 Effluents

All liquid effluents are collected in the reactor room sump. Samples from the sump are analyzed by the ORNS for gamma, beta and alpha emitters using state-of-the-art techniques. Calibration factors for various isotopic mixes were available for each liquid sample configuration. The Associate Engineer empties the sump after oral approval from the ORNS. The licensee stated that in the future this approval will be logged in the console recordbook.

During this inspection maintenance personnel were making plans to capture "condensation" from the ceiling and to direct it to the sump. Operations personnel reviewed these plans and recommended that condensation from the ceiling be collected in a separate container since a high sump level is used as an indication of a leak of reactor water. This demonstrated good initiative and insight by operations personnel.

## 11.0 Exit Interview

The inspector met with the licensee representatives indicated in Section 1.0 on March 26, 1992 and summarized the scope and findings of this inspection.