

**U. S. NUCLEAR REGULATORY COMMISSION  
OFFICE OF NUCLEAR REACTOR REGULATION**

**Docket No:** 50-607  
**Report No:** 50-607/99-202  
**Licensee:** United States Air Force  
**Facility:** McClellan Nuclear Radiation Center  
**Location:** McClellan Air Force Base  
Sacramento, California  
**Dates:** November 1-4, 1999  
**Inspector:** Stephen W. Holmes, Reactor Inspector  
**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 following: Organizational Structure and Functions, Review and Audit, Radiation Protection, Radiation Protection Postings, Radiation Protection Surveys, Personnel Dosimetry, Calibration of Radiation Monitoring and Equipment, Effluent Monitoring and Release, Environmental Protection, HP Procedures, Security Safeguards, and Transportation Programs since the last NRC inspection in these areas.

### **ORGANIZATIONAL STRUCTURE AND FUNCTION**

Health physics (HP) staffing and organizational structure and functions satisfied technical specification (TS) requirements.

### **REVIEW AND AUDIT**

The review and audit program satisfied TS requirements.

### **RADIATION PROTECTION PROGRAM**

The radiation protection program (RPP) satisfied the requirements of 10 CFR 19.12 and 10 CFR 20.1101.

### **RADIATION PROTECTION POSTINGS**

Radiological postings satisfied regulatory requirements.

### **RADIATION PROTECTION SURVEYS**

Surveys were performed and documented as required by 10 CFR Part 20, TS, and licensee administrative controls.

### **PERSONNEL DOSIMETRY**

The personnel dosimetry program was acceptably implemented and doses were in conformance with licensee and 10 CFR Part 20 limits.

### **CALIBRATION OF RADIATION MONITORING EQUIPMENT**

Portable survey meters, radiation monitoring, and counting lab instruments were being maintained according to TS and industry/equipment manufacturer standards and licensee procedures. Calibrations satisfied TS requirements.

### **EFFLUENT MONITORING AND RELEASE**

The effluent monitoring and release program satisfied NRC requirements.

### **ENVIRONMENTAL PROTECTION**

Environmental monitoring program (EMP) satisfied the radiation protection program requirements.

### **PROCEDURES-HP**

The procedural control and implementation program satisfied TS requirements

### **SECURITY**

Security facilities, equipment, and procedures satisfied PPP requirements.

**SAFEGUARDS**

The licensee was in compliance with the possession and use limits of the research reactor license, acceptably tracked burn-up and production of special nuclear material (SNM), and had effective control of licensed materials as required.

**TRANSPORTATION**

Radioactive material was transferred and disposed of in accordance with licensee procedures, TS, 49 CFR, and 10 CFR Part 20 requirements.

## REPORT DETAILS

### Summary of Plant Status

Reactor operations were continuing with two shifts 16 hours a day. Activities included silicon doping irradiations, operator training, experimental irradiations, and TS inspections and surveillances. No safety concerns were noted.

#### 1. ORGANIZATIONAL STRUCTURE AND FUNCTION

##### a. Inspection Scope (39745)

The inspector reviewed selected aspects of:

- HP organization and staffing
- qualifications
- management responsibilities
- administrative controls

##### b. Observations and Findings

The HP organizational structure had not functionally changed since the last inspection. The reactor HP staff consisted of the health physics supervisor (HPS), a radiochemist, and five technicians. Qualifications of the staff met TS requirements. The HPS reports directly to the facility director. Coordination of HP activities between the staffs was acceptable. Review of records verified that management responsibilities were administered as required by TS and applicable procedures.

The Final Safety Analysis Report stated HP staffing for three-shift operation is a HPS, two health physicists, and eight technicians. Based on this and observations by the inspector, the present staffing is acceptable for a two-shift operation.

The Facility Director and HPS both stated that HP staffing would need to be augmented if three shift operations were started.

##### c. Conclusions

The HP organizational structure and functions were consistent with TS requirements for current shift operations.

2. **REVIEW AND AUDIT**

a. **Inspection Scope (40745)**

The inspector reviewed selected aspects of:

- NSC minutes
- safety review records
- audit records
- responses to safety reviews and audits
- review and audit personnel qualifications

b. **Observations and Findings**

The NSC meeting schedule and membership satisfied TS requirements and the Committee's procedural rules. Review of the minutes indicated that NSC provided guidance, direction, and HP oversight of the reactor.

Records showed that the safety reviews were conducted at the TS required frequency. Topics of these reviews were also consistent with TS requirements to provide guidance, direction, and oversight and to ensure satisfactory use of the reactor.

The audit records showed that reviews had been completed in those areas outlined in the TS and at the required frequency.

The inspector noted that the safety reviews and audits and associated findings were acceptably detailed and that the licensee responded and took corrective actions as needed. The safety review and audit personnel qualifications were consistent with licensee administrative controls.

c. **Conclusions**

The review and audit program satisfied TS requirements.

3. **RADIATION PROTECTION PROGRAM**

a. **Inspection Scope (83743)**

The inspector reviewed selected aspects of:

- the RPP
- ALARA reviews
- Radiation Protection Training

b. Observations and Findings

Although individual procedures had been altered, the RPP had not appreciably changed since the last inspection. The licensee reviewed the RPP at least annually in accordance with 10 CFR 20.1101(c). This review and oversight was provided by the NSC as required by TS and licensee procedures.

Records confirmed that the HPS specifically reviewed and approved RPP changes, experiments, and radiation protection related events/conditions as required by TS and licensee procedures.

Training records showed that personnel were acceptably trained in radiation protection practices commensurate for the facility and their work.

c. Conclusions

The RPP satisfied the requirements of 10 CFR 19.12 and 10 CFR 20.1101.

4. RADIATION PROTECTION POSTINGS

a. Inspection Scope (83743)

The inspector reviewed selected aspects of:

- radiological signs and posting
- facility and equipment during tours

b. Observations and Findings

Caution signs, postings, and controls to radiation areas at the McClellan Nuclear Radiation Center (MNRC) were acceptable for the hazards involved and were as required in 10 CFR Part 20, Subpart J. Licensee personnel observed the indicated precautions for access to the radiation areas. Current copies of NRC Form-3 were posted in appropriate areas in the facility as were current notices to workers required by 10 CFR Part 19.

c. Conclusions

Radiological postings satisfied regulatory requirements.

5. RADIATION PROTECTION SURVEYS

a. Inspection Scope (83743)

The inspector reviewed selected aspects of:

- routine surveys and monitoring
- survey and monitoring procedures

b. Observations and Findings

Daily, weekly, monthly, quarterly, and other periodic contamination and radiation surveys, including pool water analyses, were performed and documented as required by TS and MNRC procedures. HP surveys required for specific reactor operations such as exposure door openings, silicon ingot handling, etc. were also performed and documented as needed or required. Results were evaluated and corrective actions taken and documented when readings/results exceeded set action levels.

Survey results verified that contamination in the facility was infrequent and that both identified contamination and radiation levels were well below NRC and facility limits. Surveys were adequate to evaluate the magnitude, concentration, quantities, and potential hazard of radiation levels or radioactive materials present.

Surveys were tracked in the HP log which included a comments section to annotate non-routine items or to provide additional or clarification information on HP activities. Some non-compulsory surveys were also documented in this log. The licensee stated that they were going to specifically identify the TS and licensee required surveys in this log.

c. Conclusions

Surveys were performed and documented as required by 10 CFR Part 20, TS, and licensee administrative controls.

6. PERSONNEL DOSIMETRY

a. Inspection Scope (83743)

The inspector reviewed selected aspects of:

- licensee procedures
- dosimetry records

b. Observations and Findings

The use of dosimeters and exit frisking practices were in accordance with radiation protection requirements.

The licensee used Brook AFB, a National Voluntary Laboratory Accreditation Program-accredited vendor, to process personnel thermoluminescent dosimetry. The licensee's dosimetry program for declared pregnant women satisfied 10 CFR 20.1208 requirements. Records were reviewed by the HPS and doses above set administrative limits investigated or referred to the NSC as required. Radiological exposure records showed that occupational doses and doses to the public were within 10 CFR Part 20 limitations.

c. Conclusions

The personnel dosimetry program was acceptably implemented and doses were in conformance with licensee and 10 CFR Part 20 limits.

7. CALIBRATION OF RADIATION MONITORING EQUIPMENT

a. Inspection Scope (83743)

The inspector reviewed selected aspects of:

- maintenance and calibration of radiation monitoring equipment
- periodic checks, quality control, and test source certification records

b. Observations and Findings

The calibration and periodic checks of the portable survey meters, radiation monitoring, and counting lab instruments were performed in-house by the licensee's staff, through Air Force system, or offsite by certified contractors. Calibration frequencies and procedures were consistent with TS requirements and American National Standards Institute or the manufacturers' recommendations and licensee procedures. Calibration and check sources were traceable to the National Institute of Standards and Technology. The sources' geometry matched those used in actual analyses.

All instruments checked were in calibration. Calibration records were in order.

c. Conclusions

Portable survey meters, radiation monitoring, and counting lab instruments were being maintained according to TS, industry/equipment manufacturer standards, and licensee procedures. Calibrations satisfied TS requirements.

8. EFFLUENT MONITORING AND RELEASE

a. Inspection Scope (69004)

The inspector reviewed selected aspects of:

- release records
- counting and analysis program
- maintenance and calibration records
- annual reports

b. Observations and Findings

The program for the monitoring, storage, and release of radioactive liquid and gases was consistent with applicable regulatory requirements. Gaseous releases were calculated from integrated power using the CAP 88-PC Code authorized in the facility

Final Safety Analysis Report. Releases were acceptably documented, well within the annual dose constraint of 10 CFR 20.1101(d), Appendix B concentrations, and TS limits.

Radioactive liquid releases were infrequent and were analyzed and released when below acceptable limits.

Records confirmed that releases met 10 CFR 20.2003 and Appendix B limits. ALARA principles were acceptably implemented to minimize radioactive releases. Monitoring equipment was acceptably maintained and calibrated. Records were current and acceptably maintained.

c. Conclusions

The effluent monitoring and release program satisfied NRC requirements.

9. ENVIRONMENTAL PROTECTION

a. Inspection Scope (69004)

The inspector reviewed selected aspects of:

- the EMP
- environmental records
- procedures
- periodic reports

b. Observations and Findings

The EMP consists of direct quarterly radiation measurements at selected locations adjacent to the MNRC and periodic vegetation, soil, and water sample analyses.

Direct radiation measurement results in unrestricted areas were not statistically different from background readings. Results of vegetation, soil, and water sample analyses also showed no statistically difference from background.

The frequency and depth of the EMP exceed that required by TS, regulatory requirements, or those normally implemented by comparable NPR's.

The HPS stated that this was done to meet Air Force requirements and when the facility was transferred to University of California Davis control, they would evaluate and modify the frequency and content of the EMP as appropriate.

c. Conclusions

The EMP satisfied the radiation protection program requirements.

## 10. PROCEDURES

### a. Inspection Scope (42745)

The inspector reviewed selected aspects of:

- administrative controls
- records for changes and temporary changes
- procedural implementation
- logs and records

### b. Observations and Findings

HP procedures were available for those tasks and items required by the TS, license, and facility directives. Administrative controls of changes and temporary changes to procedures, and associated review and approval processes were as required.

Training of personnel on procedures and changes was acceptable. Personnel conducted activities in accordance with applicable procedures. Records showed that procedures for potential malfunctions (e.g., radioactive releases and contaminations, and reactor equipment problems) were implemented as required.

Coordination between operation and HP staffs on procedures was acceptable.

### c. Conclusions

The procedural control and implementation program satisfied TS requirements.

## 11. SECURITY

### a. Scope (81401 AND 81421)

The inspector reviewed selected aspects of:

- the Physical Protection Plan
- security systems, equipment and instrumentations
- implementation of the Physical Protection Plan
- audits

### b. Observations and Findings

The Physical Protection Plan (PPP) was the same as the latest revision approved by the NRC. Physical protection systems (barriers and alarms), equipment, and instrumentation were as required by the PPP. Security checks, tests, verifications, and periodic audits were performed and tracked as required by the PPP. Corrective actions were taken when required. Access control was implemented as required by the PPP and licensee procedures. Acceptable security response and training were demonstrated

through alarm response and drill response in accordance with procedures. Response rosters were current and posted as required.

c. Conclusions

Security facilities, equipment, and procedures satisfied PPP requirements.

12. SAFEGUARDS

a. Inspection Scope (85102)

The inspector reviewed selected aspects of:

- nuclear material accountability program
- nuclear material inventory and locations
- accountability records and reports

b. Observations and Findings

The semiannual inventory of material was reviewed and verified. The material control and accountability program tracked locations and content of fuel and other SNM under the research reactor license. Fuel burn-up and related measurements/calculations were acceptably performed and documented. The possession and use of SNM were limited to the locations and purposes authorized under the license. The material control and accountability forms (DOE/NRC Forms 741 and 742) were prepared and transmitted as required. Fuel inventory and movement records were cross referenced and matched.

c. Conclusions

The licensee was in compliance with the possession and use limits of the research reactor license, acceptably tracked burn-up and production of SNM, and had effective control of licensed materials as required.

13. TRANSPORTATION

a. Inspection Scope (86740)

The inspector reviewed selected aspects of:

- radioactive materials shipping procedures
- radioactive materials transportation and transfer records

b. Observations and Findings

Production of solid radioactive waste at the facility was minimal. All transfers were recorded on the applicable forms. Transfer documentation was kept on file as required.

Materials transferred to other licensees were documented, and were in accordance with appropriate requirements.

c. Conclusions

Radioactive material was transferred and disposed of in accordance with licensee procedures, TS, 49 CFR, and 10 CFR Part 20 requirements.

14. EXIT MEETING SUMMARY

The inspector presented the inspection results to members of licensee management at the conclusion of the inspection on November 4, 1999. The licensee acknowledged the findings presented and did not identify as proprietary any of the material provided to or reviewed by the inspector during the inspection.

## PARTIAL LIST OF PERSONS CONTACTED

### Licensee

* J. Ching	Health Physics Supervisor
B. Hasslett	Radiochemist
* C. Heidel	Reactor Operations Supervisor
* T. Majchrowski	Science Applications International Corporation Site Manager
D. Newell	Nuclear Engineer/SRO
D. Reap	HP Technician
* W. Richards	Reactor Director
G. Stoddard	HP Technician

(\*Attended Exit Meeting)

## INSPECTION PROCEDURE (IP) USED

39745	Class I Non-Power Reactors Organization and Operations and Maintenance Activities
40745	Class I Non-Power Reactor Review and Audit and Design Change Functions
42745	Class I Non-Power Reactor Procedures Environmental Protection and Effluents
81401	Plans, Procedures, and Reviews
81421	Fixed Site Physical Protection of MSNM
83743	Class I Non-Power Reactors Radiation Protection
85102	Material Control and Accounting - Reactors
86740	Transportation Activities
69004	Class I Non-Power Reactor Effluent and Environmental Monitoring

## ITEMS OPENED, CLOSED, AND DISCUSSED

### Opened

NONE

### Closed

NONE

## PARTIAL LIST OF ACRONYMS USED

ALARA	As Low As Reasonably Achievable
EMP	Environmental Monitoring Program
HP	Health Physics
HPS	Health Physics Supervisor
MNRC	McClellan Nuclear Radiation Center
NRC	Nuclear Regulatory Commission
NSC	Nuclear Safety Committee
PPP	Physical Protection Plan
RPP	Radiation Protection Program
SNM	Special Nuclear Material
TS	Technical Specifications

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