

December 21, 2006

Dr. Robert G. Flocchini, Director  
UC-Davis McClellan Nuclear Radiation Center  
5335 Price Avenue, Building 258  
McClellan, CA 95652

SUBJECT: NRC INSPECTION REPORT NO. 50-607/2006-202 AND NOTICE OF VIOLATION

Dear Dr. Flocchini:

On November 27-30, 2006, the U.S. Nuclear Regulatory Commission (NRC) conducted an inspection at your University of California-Davis McClellan Nuclear Radiation Center. The enclosed report documents the inspection results which were discussed on November 30, 2006, with W. Steingass, Reactor Supervisor, and D. Reap, Radiation Safety Officer.

The inspection examined activities conducted under your license as they relate to safety and compliance with the NRC's rules and regulations and with the conditions of your license. The inspector reviewed selected procedures and records, observed activities, and interviewed personnel. Based on the results of this inspection, the NRC has identified a violation of NRC requirements. The violation is cited in the enclosed Notice of Violation (Notice). The circumstances surrounding it are described in detail in the subject inspection report. The violation is of concern because it indicates a lack of attention to detail.

You are required to respond to this letter and should follow the instructions specified in the enclosed Notice when preparing your response. The NRC will use your response in accordance with its policies to determine whether further enforcement action is necessary to ensure compliance with regulatory requirements.

In accordance with Section 2.390, "Public Inspections, Exemptions, and Requests for Withholding," of Title 10 of the Code of Federal Regulations (CFR), a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's Agency wide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Should you have any questions concerning this inspection, please contact Craig Bassett at 404-358-6515.

Sincerely,  
**/RA/**  
Michael J. Case, Division Director  
Division of Policy and Rulemaking  
Office of Nuclear Reactor Regulation

Docket No. 50-607  
License No. R-130  
Enclosures: 1. Notice of Violation  
2. NRC Inspection Report No. 50-607/2006-202

cc w/enclosure: See next page

cc:

Dr. Barry Klein, Vice Chancellor  
Office of the Chancellor  
University of California, Davis  
One Shields Avenue  
Davis, CA 95616-8558

Mr. David Reap, Radiation Safety Officer  
5335 Price Avenue, Bldg. 258  
McClellan AFB, CA 95652-2504

Mr. Walter Steingass, Reactor Supervisor  
5335 Price Avenue, Bldg. 258  
McClellan AFB, CA 95652-2504

Test, Research, and Training  
Reactor Newsletter  
University of Florida  
202 Nuclear Sciences Center  
Gainesville, FL 32611

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Docket No. 50-607

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NOTICE OF VIOLATION

University of California-Davis  
University of California-Davis McClellan Nuclear Radiation Center

Docket No. 50-607  
License No. R-130

During an NRC inspection conducted on November 27-30, 2006, a violation of NRC requirements was identified. In accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions," NUREG-1600, the violation is listed below:

10 CFR 71.5(a) requires that each licensee who transports licensed material outside the site of usage, as specified in the NRC license, or where transport is on public highways, or who delivers licensed material to a carrier for transport, shall comply with the applicable requirements of the Department of Transportation (DOT) regulations in 49 CFR parts 171 through 180, appropriate to the mode of transport.

49 CFR 172.202(a)(2) requires that the shipping description of a hazardous material on the shipping paper must include the hazard class or division number prescribed for the material as shown in Column (3) of the §172.101 Table. Subsidiary hazard class(es) or subsidiary division number(s) must be entered in parentheses immediately following the primary hazard class or division number.

49 CFR 172.202(a)(5) requires that the total quantity of hazardous materials covered by the description (of the hazardous material) must be indicated (by mass or volume, or by activity for Class 7 materials) and must include an indication of the applicable unit of measurement.

49 CFR 172.203(d)(5) requires that the description for a shipment of Class 7 (radioactive) material must include the transport index (TI) assigned to each package in the shipment bearing RADIOACTIVE YELLOW-II or RADIOACTIVE YELLOW III labels.

Contrary to the above, to date in 2006, the licensee has made seven shipments of radioactive material without including the required information on the shipping papers. The shipping papers of Shipment Numbers 06-01, 06-02, 06-05, 06-07, and 06-12 did include the subsidiary hazard class or subsidiary division number but not in parenthesis immediately following the primary hazard class or division number, did not include the total quantity of hazardous material in the shipment, and did not include the TI for each package in the shipment bearing a RADIOACTIVE YELLOW III label. Shipment No. 06-04 did include the subsidiary hazard class or subsidiary division number but not in parenthesis immediately following the primary hazard class or division number and did not include the TI for each package in the shipment bearing a RADIOACTIVE YELLOW III label. Shipment No. 06-10 did not include any subsidiary hazard class or subsidiary division number in parenthesis or otherwise and listed the total of all the TIs for the packages in the shipment but did not include the individual TI for each package in the shipment bearing a RADIOACTIVE YELLOW III label.

This is a Severity Level IV violation (Supplement V).

Pursuant to the provisions of 10 CFR 2.201, the University of California-Davis is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555 with a copy to the responsible inspector, within 30 days of the date of the letter transmitting this Notice of Violation (Notice). This reply should be clearly marked as a "Reply to a Notice of Violation" and should include for each violation: (1) the reason for the violation, or, if contested, the basis for

disputing the violation or severity level; (2) the corrective steps that have been taken and the results achieved; (3) the corrective steps that will be taken to avoid further violations; and (4) the date when full compliance will be achieved. Your response may reference or include previous docketed correspondence, if the correspondence adequately addresses the required response. If an adequate reply is not received within the time specified in this Notice, an order or Demand for Information may be issued as to why the license should not be modified, suspended, or revoked, or why such other action as may be proper should not be taken. Where good cause is shown, consideration will be given to extending the response time.

If you contest this enforcement action, you should also provide a copy of your response, with the basis for your denial, to the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, D.C. 20555-0001.

Because your response will be made available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of the NRC's document system (ADAMS), to the extent possible, it should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the public without redaction. ADAMS is accessible from the NRC Web site at (the Public Electronic Reading Room) <http://www.nrc.gov/reading-rm/adams.html>. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request withholding of such material, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If safeguards information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21.

In accordance with 10 CFR 19.11, you may be required to post this Notice within two working days.

Dated at Rockville, Maryland  
this 21st day of December, 2006

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

Docket No: 50-607

Report No: 50-607/2006-202

Licensee: University of California-Davis

Facility: McClellan Nuclear Radiation Center

Location: McClellan Park  
Sacramento, California

Dates: November 27-30, 2006

Inspector: Craig Bassett

Approved by: Michael J. Case, Division Director  
Division of Policy and Rulemaking  
Office of Nuclear Reactor Regulation

## EXECUTIVE SUMMARY

University of California-Davis  
McClellan Nuclear Radiation Center  
Report No: 50-607/2006-202

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the licensee's 2 Megawatt Class I research and test reactor safety programs including: organizational structure and staffing; review and audit and design change functions; procedures; radiation protection; environmental monitoring; and, transportation of radioactive materials since the last NRC inspection of these areas. The licensee's programs were acceptably directed toward the protection of public health and safety and in compliance with NRC requirements.

### Organizational Structure and Functions

- The organizational structure and staffing were generally consistent with Technical Specification requirements.

### Review and Audit and Design Change Functions

- The Nuclear Safety Committee was meeting at the required frequency and reviewing the topics outlined in the Technical Specifications and conducting audits of facility programs as required.
- The review, evaluation, and documentation of changes to the facility generally satisfied NRC requirements.

### Procedures

- The procedure revision, control, and implementation program generally satisfied Technical Specifications requirements.

### Radiation Protection Program

- 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 well within the licensee's procedural action levels and NRC's regulatory limits.
- Radiation monitoring equipment was being maintained and calibrated as required.
- Acceptable radiation protection training was being provided to facility personnel.

Environmental Monitoring

- Effluent monitoring satisfied license and regulatory requirements and releases were within the specified regulatory and Technical Specification limits.

Transportation of Radioactive Materials

- One apparent violation was noted for failure to include all the required information on the shipping papers as required by 49 CFR Part 172.

## REPORT DETAILS

### Summary of Plant Status

The University of California-Davis/McClellan Nuclear Radiation Center research and test reactor, a two megawatt (2 MW) TRIGA reactor, continued to be operated in support of neutron radiography, medical isotope production, neutron tomography, experimental sample irradiation, and reactor operator training. During the inspection, the reactor was operated several hours per day to support laboratory experiments and conduct product irradiation.

### 1. Organization and Staffing

#### a. Inspection Scope (Inspection Procedure [IP] 69006)

The inspector reviewed the following regarding the University of California-Davis/McClellan Nuclear Radiation Center (UCD/MNRC) organization, staffing, and responsibilities to ensure that the requirements of Technical Specification (TS) Section 6.1, Revision (Rev.) 13, dated November 25, 2003, were being met:

- management responsibilities
- qualifications of facility personnel
- UCD/MNRC organizational structure and staffing
- staffing requirements for safe operation of the research reactor facility
- selected UCD/MNRC Startup Checklists for 2006 documenting shift staffing
- Annual Report for University of California-Davis/McClellan Nuclear Radiation Center for 2003, 2004, and 2005
- Facility Procedure UCD/MNRC-0045-DOC-01, "Quality Assurance Program for McClellan Nuclear Radiation Center (MNRC)," Rev. 1, approval dated November 22, 1999
- American Nuclear Society Standard 15.4 - 1988, "Selection and Training of Personnel for Research Reactor"

#### b. Observations and Findings

As noted in NRC Inspection Report No. 50-607/2006-201, the licensee's organizational chart for the UCD/MNRC indicated that the chain of command included an Operations Manager who was to be in charge of reactor operations. The chart also indicated a staff position of HP Supervisor. These two positions were no longer part of the facility organizational structure and the licensee was preparing a TS change to be submitted to reflect the current structure. This TS change was still pending.

Also during previous NRC inspections of the facility, it was noted that the Health Physics (HP) organization had changed dramatically. All the former HP personnel had left the facility, including the HP Supervisor, and one Senior Reactor Operator (SRO), who had substantial HP experience, had subsequently been appointed as the Radiation Safety Officer (RSO). The inspector noted that the Reactor Supervisor had written a Memorandum for personnel at the facility indicating that the RSO was responsible for all HP functions at the MNRC. The memorandum also stated that all the procedures that were formerly performed by HP technicians were to be performed by "knowledgeable individuals." This was meant to include SROs and radiographers

who were to perform surveys and instrumentation maintenance on a case-by-case basis. During this inspection, the inspector noted that one person had been hired to assist the RSO. The person was working part-time as an HP Technician and part-time as a radiographer. This allowed the RSO some additional time to concentrate on revising the radiation protection program and procedures used at the facility and to ensure that the program, as well as the security program, was functioning properly. The inspector noted that this appeared to be adequate for the current level of operations but that more full time personnel would be needed to support operations if activities were to increase.

Except as noted above, the organization and staffing at the facility, required for reactor operation, were as specified in the TS. Qualifications of the staff met program requirements. Review of records verified that management responsibilities were discharged as required by applicable procedures.

c. Conclusions

The licensee's organization and staffing remain in general compliance with the requirements specified in the TS Section 6.

**2. Review and Audit and Design Change Functions**

a. Inspection Scope (IP 69007)

To verify that the required reviews and audits were being completed and that facility changes were reviewed and approved as required by TS Section 6.2, the inspector reviewed selected aspects of:

- 2005 Annual Audit completed September 9, 2005
- Nuclear Safety Committee meeting minutes for July 2005 through the present
- UCD/MNRC "Facility Modification" Notebook containing the "Facility Modification Log" forms
- selected "Facility Modification Installation Authorization Forms" and associated "Facility Modification Checklist" forms processed during 2005 and 2006
- Annual Report for University of California-Davis/McClellan Nuclear Radiation Center for 2003, 2004, and 2005
- Facility Procedure UCD/MNRC-0043-DOC-03, "Facility Modification Procedure," Rev. 3, approval dated June 30, 2000
- Facility Procedure UCD/MNRC-0045-DOC-01, "Quality Assurance Program for McClellan Nuclear Radiation Center (MNRC)," Rev. 1, approval dated November 22, 1999

b. Observations and Findings

(1) Review and Audit Functions

Composition of the Nuclear Safety Committee (NSC) and qualifications NSC members were as specified in TS Section 6.2.1. Minutes of NSC meetings

demonstrated that the committee met semiannually as required by TS Section 6.2.2 and provided the reviews and oversight specified in TS Section 6.2.3. Through records review the inspector determined that safety reviews were conducted by the NSC or a designated representative. Topics of those reviews were as required by the TS and provided sufficient guidance, direction, and oversight to ensure acceptable use of the reactor.

The inspector reviewed the most recent annual audit conducted at the facility. The audit was comprehensive and reviewed the activities specified in TS Section 6.2.4, including various aspects of the reactor facility operations and programs for calendar year 2005. There were two recommendations made as a result of the audit. The major item of concern expressed by the committee was the completion of TS changes to be submitted to the NRC. It was noted that the next audit is scheduled for December 2006.

(2) Design Change Functions

The regulatory requirements stipulated in Section 50.59 of Title 10 of the Code of Federal Regulations, "Changes, tests, and experiments," were implemented at the facility through Facility Procedure UCD/MNRC-0043-DOC-03, "Facility Modification Procedure." The procedure was developed to address activities that affected changes to the facility as described in the Safety Analysis Report (SAR), changes to MNRC procedures, and changes to or development of new tests or experiments not described in the SAR. The procedure adequately incorporated criteria provided by the regulations with additional requirements mandated by local conditions.

The inspector reviewed selected "Facility Modification Installation Authorization Forms" and the associated "Facility Modification Checklist" forms processed during 2005 and to-date in 2006. The completed forms showed that the proposed modifications were acceptably reviewed in accordance with the procedure. It was noted that no 50.59 Evaluations were required to be completed during 2005 or to-date in 2006. Also, none of the changes or modifications were determined to constitute a safety question or concern and none required a license or TS amendment.

As noted in NRC Inspection Report No. 50-607/2006-201, many of the recent facility modification packages had not been closed out. The licensee indicated that this was because the modifications required a change to specific facility drawings and that work had not been completed. The inspector noted that this issue was still pending.

c. Conclusions

The NSC was meeting as required and reviewing the topics outlined in the TS. Audits of various reactor operations and programs were being conducted. The design change program generally satisfied NRC requirements.

### 3. Procedures

#### a. Inspection Scope (IP 69008)

To verify compliance with TS Section 6.4, the inspector reviewed selected portions of the following:

- “Document Review” forms completed by staff members
- “MNRC Document List” listing all the licensee’s current procedures
- “UCD/MNRC Controlled Document Review and Approval Reference List”
- various memoranda from the Reactor Supervisor to the staff indicating document review assignments and responsibilities
- Facility Procedure UCD/MNRC-0005-DOC, “Document Control Plan,” Rev. 7, approval dated August 28, 2003
- Facility Procedure UCD/MNRC-0029-DOC-16, “UCD/MNRC Radiation Protection Procedures,” Rev. 16, approval dated April 12, 2006

#### b. Observations and Findings

Technical Specification Section 6.4 required that procedures be prepared and approved for the activities listed in that section. The procedures were required to be approved by the UCD/MNRC Director. The UCD/MNRC staff was required to perform a periodic review of the procedures to assure that they were current. Operations and maintenance procedures were required to be reviewed annually while other procedures were reviewed biennially. Changes to the procedures required the approval of the UCD/MNRC Director and all changes were required to be documented. The inspector noted that the UCD/MNRC procedures were generally being reviewed at the required frequencies, that procedures had been approved by the Director, and that changes had also been approved as well.

#### c. Conclusions

The current procedure review, revision, control, and implementation program satisfied TS requirements.

### 4. Radiation Protection

#### a. Inspection Scope (IP 69012)

The inspector reviewed the following regarding the licensee's radiation protection program to ensure that the requirements of 10 CFR Part 20 and TS Sections 4.7 and 6.4.2 were being met:

- Calibration of selected radiation monitoring instruments
- The “Self Inspection Checklist” completed by the RSO for 2005
- Personal monthly dosimetry results for 2004, 2005, and through September 2006
- Safety Analysis Report, Rev. 4, dated December 1999, Chapter 11, “Radiation Protection and Waste Management Program” Revision 2, dated April 3, 1998

- American National Standard ANSI/ANS-15.11-1993, "Radiation Protection at Research Reactor Facilities"
- Lesson plans, training objectives, and qualification cards for training of personnel by the RSO
- selected daily, weekly, and quarterly contamination and radiation survey results for the past two years
- Annual Report for University of California-Davis/McClellan Nuclear Radiation Center for 2003, 2004, and 2005
- Facility Procedure UCD/MNRC-0029-DOC-16, "UCD/MNRC Radiation Protection Procedures," Rev. 16, approval dated April 12, 2006
- Facility Procedure UCD/MNRC-0042-DOC-09, "MNRC Health Physics Instrumentation Calibration and Test Procedures," Rev. 9, approval dated June 6, 2006
  - Addendum No. 29, "Ludlum Model 177 Calibration Procedure," Rev. 3, dated February 22, 1999
  - Addendum No. 30, "Ludlum Model 177-54 Calibration Procedure," Rev. 3, dated February 22, 1999
  - Addendum No. 31, "Ludlum Model 3 Calibration Procedure," Rev. 4, dated October 27, 2005
  - Addendum No. 34, "RAM Calibration Procedure," Rev. 3, dated May 10, 1999
  - Addendum No. 48, "Stack CAM Calibration Procedure," Rev. 1, dated June 6, 2005
  - Addendum No. 49, "Reactor CAM Calibration Procedure," Rev. 0, dated January 22, 2002
  - Addendum No. 50, "Bay CAM Calibration Procedure," Rev. 0, dated January 22, 2002
  - Addendum No. 51, "Iodine CAM Calibration Procedure," Rev. 1, dated June 6, 2005

The inspector also toured the facility, conducted a radiation survey of selected areas, and observed the use of dosimetry and radiation monitoring equipment. In addition, licensee personnel were interviewed and radiological signs and postings were observed.

b. Observations and Findings

(1) Surveys

Daily, monthly, and other periodic contamination and radiation surveys, outlined in the licensee's "UCD/MNRC Radiation Protection Procedures," were completed by the RSO, the HP technician, or other qualified staff members. Any contamination detected in concentrations above established action levels was noted and the areas were decontaminated (see paragraph below). Results of the surveys were typically documented on survey maps and posted at the entrances of the various areas surveyed so that facility workers would be knowledgeable of the radiological conditions that existed therein.

(2) Stairwell Contamination

The licensee conducted their annual drill in October 2006. It involved the simulated removal of a fuel element by unauthorized personnel. As the drill was concluding, in accordance with the drill scenario, licensee personnel were conducting direct (frisk) surveys of the south stairwell that leads from the Equipment Room (located on the second level) to the main level of the facility. During this survey, a small amount of contamination was found on the upper portion of the stairwell. The contamination measured approximately 5,000 counts per minute (cpm) on the survey meter/frisker. It was subsequently removed using tape. An isotopic analysis was conducted which indicated that the material consisted of 0.022 microCuries ( $\mu\text{Ci}$ ) of Cobalt-60 (Co-60). An investigation was performed and it was concluded that the source of the contamination had apparently been some item or material in the Equipment Room. Follow-up surveys in the stairwell, Equipment Room, and of personnel, indicated no further contamination present. The inspector noted that personnel are routinely required to frisk after entering and/or working in the Equipment Room. As corrective actions, the licensee reiterated the need for proper work practices in the Equipment Room to prevent the spread of contamination. Also, the weekly contamination survey of the facility was expanded to include a direct frisk of selected areas in the stairwell.

During this inspection the inspector accompanied an HP technician on a routine weekly radiation and contamination survey of facility. The radiation levels noted by the inspector using an NRC survey meter were similar to those detected by the licensee and listed on survey maps of the areas. No anomalies were noted. However, during a direct frisk of some of the steps in the stairwell, a spot of contamination was found. The contamination measured approximately 1,500 cpm on the survey meter/frisker. It was subsequently removed using tape. An isotopic analysis was conducted which indicated that the material consisted of 0.0014  $\mu\text{Ci}$  of Co-60. Extensive follow-up surveys in the stairwell were completed and one other area of contamination was detected. The localized area was decontaminated, this time using sand paper because the contamination was embedded in the flooring surface of the step.

In these last instances of detecting contamination in the stairwell, the licensee placed the contamination (contained in a plastic bag) that was removed from the stairwell on the Hand and Foot Monitor that is positioned next to the door at the Equipment Room exit. The amount of activity was insufficient to cause the Hand and Foot Monitor to alarm. The licensee concluded that the contamination came from an unknown source from the Equipment Room but the amount was low level and may not have been picked up by the Hand and Foot Monitor. The radioactivity was fixed and had apparently existed in the stairwell for an undetermined amount of time. There was no spread of contamination from the stairwell and it had been detected on a routine survey. The added requirement to survey/frisk the stairwell was beneficial and was to be continued.

(3) Postings and Notices

Copies of current notices to workers were posted in appropriate areas in the facility. Radiological signs and survey maps were typically posted at the entrances to controlled areas. Other postings also showed the industrial hygiene hazards that were present in the areas as well. The copy of NRC Form-3 noted at the facility was the latest issue, as required by 10 CFR Part 19, and was posted on a bulletin board near the main entrance to the facility where visitors are required to sign the visitors' log.

(4) Dosimetry

Personnel were observed properly wearing extremity and whole body dosimetry in the controlled areas. The dosimeters being used were 4 chip thermoluminescent dosimeters (TLDs) processed monthly by a NVLAP certified vendor (Global Dosimetry Solutions). The TLDs were used for whole body monitoring and TLD finger rings were used for extremity monitoring. An examination of the TLD results indicating radiological exposures at the facility for the past two years showed that the highest occupational doses, as well as doses to the public, were within 10 CFR Part 20 limits. The highest annual whole body exposure received by a single licensee employee for 2004 was 793 millirem deep dose equivalent (DDE). The highest annual extremity exposure for 2004 was 3,736 millirem shallow dose equivalent (SDE). The highest annual whole body exposure received by a single person for 2005 was 507 millirem DDE and the highest annual extremity exposure for 2005 was 1,194 millirem SDE. Through September 2006, the highest individual whole body exposure that had been received was 309 millirem DDE and the highest extremity exposure was 743 millirem SDE.

(5) Radiation Monitoring Equipment

The calibration records of portable survey meters, friskers, fixed radiation detectors, and air monitoring instruments in use at the facility were reviewed. The records showed that the calibrations were completed by either reactor staff or sent off site to be calibrated by contractor personnel. The calibrations were documented, tracked, and controlled as required. The inspector confirmed that the frequencies of the calibrations satisfied the requirements established in the TS Section 4.7 and 10 CFR 20.1501(b). All instruments checked by the inspector had a current calibration sticker attached.

(6) Radiation Protection Program

The radiation protection program was described and controlled by procedures and policies that were well documented as required by TS Section 6.4.2 and 10 CFR 20.1101(a). Annual audits were completed by the RSO on June 6, 2006, and by a member of the Nuclear Safety Committee on September 9, 2005, which satisfied the periodic program review required by 10 CFR 20.1101©. No problems were identified and a few recommended improvements were suggested.

(7) Personnel Training

Personnel training required by 10 CFR 19.12, "Instruction to Workers" was provided by the RSO. In a graded approach, there were five "levels" of training, designated as "A" to "E", which depended on the type of work to be performed and/or which controlled areas would be entered. The training for staff members and persons required to work in a radiation area included a written exam. Annual refresher training was given covering ALARA, safety, and security.

(8) Radiation Work Permit Program

The inspector reviewed the Radiation Work Permits (RWPs) that had been written, used, and closed out during 2005 and those issued to date in 2006. It was noted that the instructions specified in the "Radiation Work Permit Procedure," section of the Radiation Safety Procedures had been adequately followed. Appropriate review by the RSO had been completed as required. The controls specified in the RWPs were acceptable and applicable for the type of work being done.

(9) Facility Tours

The inspector toured the main Staging or Set-Up area, the Equipment Room, Bay 2, and the Reactor Room with licensee representatives on various occasions and observed on-going activities. The inspector noted that facility radioactive material storage areas were properly posted. No unmarked radioactive material was noted. Radiation and High Radiation Areas were posted as required and properly controlled.

c. Conclusions

The inspector determined that the Radiation Protection and ALARA Programs, as implemented by the licensee, satisfied regulatory requirements because: 1) surveys were completed and documented acceptably to permit evaluation of the radiation hazards present; 2) postings met regulatory requirements; 3) personnel dosimetry was being worn as required and recorded doses were within the NRC's regulatory limits; 4) radiation survey and monitoring equipment was being maintained and calibrated as required; 5) the Radiation Protection Program was acceptable and was being reviewed annually as required; and, 6) the radiation protection training program was acceptable.

**5. Effluent and Environmental Monitoring**

a. Inspection Scope (IP 69004)

The inspector reviewed the following to verify compliance with the requirements of 10 CFR Part 20 and TS Section 6.4.2(d) :

- Liquid Release Review Forms for 2005 and 2006

- Environmental Effluent Release Forms for 2005 and 2006
- Quarterly Environmental TLD Reports for 2005 and 2006
- Annual Report for University of California-Davis/McClellan Nuclear Radiation Center for 2003, 2004, and 2005

b. Observations and Findings

The inspector determined that gaseous releases continued to be monitored as required, were acceptably analyzed, and were documented in the annual operating reports. Airborne concentrations of gaseous releases were well within the concentrations stipulated in 10 CFR 20, Appendix B, Table 2, and TS limits. The dose rate to the public, as a result of the gaseous releases, was below the dose constraint specified in 10 CFR 20.1101(d) of 10 millirem per year. Using the EPA computer code, CAP88-PC, Version 3, the licensee calculated the dose to a member of the public as the result of reactor operations. The results indicated an annual dose to the public of 0.07 millirem for 2004 and 0.05 millirem for 2005.

There were no liquid releases from the facility during 2004, 2005 and to-date in 2006. Environmental water samples were collected, prepared, and sent to a vendor for analysis consistent with procedural requirements. The results of these analyses were all within regulatory limits. On-site and off-site gamma radiation monitoring was completed using various environmental TLDs in accordance with the applicable procedures as well. The review of data indicated that there were no measurable doses above any regulatory limits. The highest unrestricted area dose measured by an environmental TLD was 14 millirem for 2004 and 18 millirem for 2005.

c. Conclusion

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

## 6. **Transportation**

a. Inspection Scope (IP 86740)

To verify compliance with regulatory and procedural requirements for transferring or shipping licensed radioactive material, the inspector reviewed the following:

- selected licenses of various consignees
- selected records of various types of radioactive material shipments
- selected training records for staff personnel authorized to ship hazardous material in accordance with the regulations specified by the Department of Transportation (DOT)

b. Observations and Findings

10 CFR 71.5(a) requires that each licensee who transports licensed material outside the site of usage, as specified in the NRC license, or where transport is on public

highways, or who delivers licensed material to a carrier for transport, shall comply with the applicable requirements of the Department of Transportation regulations in 49 CFR parts 171 through 180, appropriate to the mode of transport.

49 CFR 172.202(a)(2) requires that the shipping description of a hazardous material on the shipping paper must include the hazard class or division number prescribed for the material as shown in Column (3) of the §172.101 Table. Subsidiary hazard class(es) or subsidiary division number(s) must be entered in parentheses immediately following the primary hazard class or division number.

49 CFR 172.202(a)(5) requires that the total quantity of hazardous materials covered by the description (of the hazardous material) must be indicated (by mass or volume, or by activity for Class 7 materials) and must include an indication of the applicable unit of measurement.

49 CFR 172.203(d)(5) requires that the description for a shipment of Class 7 (radioactive) material must include the transport index (TI) assigned to each package in the shipment bearing RADIOACTIVE YELLOW-II or RADIOACTIVE YELLOW III labels.

The inspector reviewed the shipments made by the licensee to date in 2006. It was noted that of the thirteen shipments made, the licensee had made seven shipments of radioactive material consisting of containers of Argon-41 and/or Sodium-24. However, further review of the shipments indicated that they were made without including the required information on the shipping papers. Specifically, the shipping papers of Shipment Number (No.) 06-01, made on January 26, 2006, Shipment No. 06-02, made on January 27, 2006, Shipment No. 06-05, made on March 24, 2006, Shipment No. 06-07, made on April 21, 2006, and Shipment No. 06-12, made on November 2, 2006, did include the subsidiary hazard class or subsidiary division number but not in parenthesis immediately following the primary hazard class or division number, did not include the total quantity of hazardous material in the shipment, and did not include the TI for each package in the shipment bearing a RADIOACTIVE YELLOW III label. Also, Shipment No. 06-04, made on March 21, 2006, did include the subsidiary hazard class or subsidiary division number but not in parenthesis immediately following the primary hazard class or division number and did not include the TI for each package in the shipment bearing a RADIOACTIVE YELLOW III label. Additionally, Shipment No. 06-10, made on September 7, 2006, did not include any subsidiary hazard class or subsidiary division number in parenthesis or otherwise and listed the total of all the TIs for the packages in the shipment but did not include the individual TI for each package in the shipment bearing a RADIOACTIVE YELLOW III label.

The licensee was informed that failure to include all the required information on the shipping papers as required by 49 CFR §172.202(a)(2), §172.202(a)(5), and §172.203(d)(5) was an apparent violation (VIO) of the transportation regulations (VIO 50-607/2006-202-01).

c. Conclusions

One apparent violation was noted in the area of transportation of radioactive material for failure to include all the required information on the shipping papers as required by 49 CFR Part 172.

**7. Follow-up on Previously Identified Items**

a. Inspection Scope (IP 92701)

The inspector reviewed actions concerning an Inspector Follow-up Item (IFI) identified during an inspection in 2004.

b. Observations and Findings

(Closed) IFI 50-607/2004-202-01 - Review changes to licensee's radiation protection program.

During the NRC inspection at the facility in November 2004, the inspector noted that, the RSO was revising the HP procedures and policies to reflect the changes initiated by the Director in charge at the time. He also was developing and delivering the training to the reactor operators and radiographers to perform surveys previously done by technicians. This transfer of responsibility for radiation surveys to the workers was anticipated to reduce the workload on the RSO. The changes were also to provide improved radiation protection of the workers and the public.

During this inspection, the inspector reviewed the revised HP procedures and the changes made to the radiation protection program. It was noted that, as indicated in Section 1 of this report, one person had been hired to assist the RSO. The person was working part-time as an HP Technician and part-time as a radiographer. Training had been given to the reactor operators and radiographers so that they could help perform surveys previously done by HP technicians. This allowed the RSO some time to revise the radiation protection program and procedures used at the facility and to ensure that the program was functioning properly. This appeared to be adequate for the current level of operations. This item is considered closed.

c. Conclusions

One IFI from a previous inspection was reviewed and closed during this inspection.

**8. Exit Interview**

The inspection scope and results were summarized on November 30, 2006, with members of licensee management and staff. The inspector described the areas inspected and discussed in detail the inspection findings. 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. No dissenting comments were received from the licensee.

## **PARTIAL LIST OF PERSONS CONTACTED**

### Licensee Personnel

H. Bollman	Facility Supervisor and SRO
M. Boussoufi	Experiment Coordinator
H. Egbert	Radiography Supervisor and SRO
R. Miller	Level II Radiographer and SRO
D. Reap	Radiation Safety Officer and SRO
W. Steingass	Reactor Supervisor and SRO

## **INSPECTION PROCEDURES USED**

IP 69004:	Class I Research and Test Reactor Effluent and Environmental Monitoring
IP 69006:	Class I Research and Test Reactor Organization, Operations, and Maintenance Activities
IP 69007:	Class I Research and Test Reactor Review and Audit and Design Change Functions
IP 69008:	Class I Research and Test Reactor Procedures
IP 69012:	Class I Research and Test Reactor Radiation Protection
IP 86740:	Inspection of Transportation Activities
IP 92701	Followup

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

### Opened

50-607/2006-202-01	VIO	Failure to include all the required information on the shipping papers as required by 49 CFR §172.202(a)(2), §172.202(a)(5), and §172.203(d)(5)
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### Closed

50-607/2004-202-01	IFI	Follow-up on changes to the licensee's radiation protection program.
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## **PARTIAL LIST OF ACRONYMS USED**

ARM	Area Radiation Monitor
ALARA	As low as reasonably achievable
CFR	Code of Federal Regulations
cpm	counts per minute
DDE	Deep dose equivalent
DOT	Department of Transportation
HP	Health Physics
IFI	Inspector Follow-up Item
IP	Inspection procedure
MNRC	McClellan Nuclear Radiation Center
NRC	Nuclear Regulatory Commission
NSC	Nuclear Safety Committee

PDR	Public Document Room
Rev.	Revision
RSO	Radiation Safety Officer
SRO	Senior Reactor Operator
RWP	Radiation Work Permit
SDE	Shallow dose equivalent
TLD	Thermoluminescent dosimeter
TS	Technical Specifications
UCD	University of California-Davis
UCD/MNRC	University of California-Davis/McClellan Nuclear Radiation Center
μCi	Microcurie