

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report No. 50-326/82-04

Docket No. 50-326 License No. R-116 Safeguards Group _____

Licensee: University of California
Irvine, California 92717

Facility Name: Research Reactor - TRIGA Mark 1

Inspection at: Irvine, California

Inspection conducted: December 14-16, 1982

Inspectors: F. A. Wenslawski
for M. Cillis, Radiation Specialist 1/4/83
Date Signed

Approved by: F. A. Wenslawski 1/4/83
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H. E. Book, Chief, Radiological Safety Branch Date Signed

Date Signed

Summary:

Inspection on December 14-16, 1982 (Report No. 50-326/82-04)

Areas Inspected: Routine unannounced inspection of the radiation protection program including organization, personnel monitoring, posting and labeling, surveys, procedures, effluent releases, instrument calibration, records/reports, administrative controls; emergency preparedness program, radioactive material transportation activities, environmental monitoring program; followup on an item of noncompliance and a tour of the licensee's facilities. The inspection involved 22 hours onsite by one NRC inspector.

Results: Of the 15 areas examined, two items of noncompliance concerning administrative controls were identified in one area (See Section 2.e).

1. Persons Contacted

- *Professor G. Miller, Reactor Supervisor
- *Mr. W. Smirl, Environmental Health and Safety (EH&S) Officer, UCI
- *Mr. J. Tripodes, Radiation Safety Officer, UCI
- *Mr. F. Dekeyser, Graduate Student
- *Mr. H. Bair, Radiation Safety Technician
- Mr. W. Nabar, Health Physicist
- Sgt. W. Sharks, Campus Security Department, UCI

2. Organization, Logs and Records

a. General

The inspection disclosed that the Assistant Reactor Supervisor, Mr. P. Jerebek, has terminated his services. Mr. Jerebek held a Senior Reactor Operators License. The licensee has recently acquired the services of two additional reactor operator trainee's. The remaining organization, structure and personnel responsible for operation and administration of the Irvine TRIGA reactor facility were essentially unchanged from that previously reported.

Plant operations since January 1981 were reviewed by the inspector. This examination included discussions with licensee representatives and an examination of facility procedures, records and logs. Selected portions of the following were examined:

- o Operations Log Book
- o Radiation Survey Log
- o Maintenance Log
- o Daily Reactor Checklists - Startup/Shutdown
- o Reactor Operations Manual
- o Personnel Exposure Records
- o Training Records
- o Reactor Operation Committee (ROC) Minutes
- o Quarterly Audit and Inspection Reports
- o Technical Specifications
- o Annual Report
- o Reactor Operations Manual
- o Procedures for Calibration of the Constant Air Monitor (CAM)
- o Visitors Records
- o Radiation and Contamination Survey Records

b. Instrument Calibration

The examination of records associated with the calibration of portable survey instruments, pocket dosimeters, area radiation monitors, constant air monitor (CAM), personnel portal monitor and a gas proportional counter revealed:

1. The inspector observed that the CAMs and gas proportional counter's efficiency during the past two years appeared to be erratic. The average efficiency during the period ranged from approximately 13 percent to 25 percent. The maximum spread noted was 18 percent. Discussion with the reactor supervisor revealed that the proportional counter is used to check the sources used to calibrate the CAM. It was subsequently concluded that the proportional counter detector was the most probable cause for the inspector's observation. The reactor supervisor stated that the proportional counter's detector will be replaced.
2. It was observed that all portable instruments were in current calibration.
3. The records for the calibration of pocket dosimeters conducted on April 28, 1982 were incompleated. The calibration was not conducted in accordance with paragraph 5.5.6.c of the operation manual nor were the results recorded as required by the manual.
4. The electronic calibration and plateau checks for the CAM were not performed at the frequency specified in paragraph 5.5.2 of the operation manual.
5. The gas proportional counter is located in an area where it is exposed to changing background levels and where it may become inaccessible for use should an incident resulting in the spread of loose surface contamination occur.
6. The CAM calibration curves for the previous two years were erroneously plotted and the activity levels listed on the CAM calibration curve for the period of August 1982 through November of 1982 were in error. The listed activity levels were off by a factor of ten.

The above observations were discussed at the exit interview. The reactor supervisor agreed with the substance of the findings discussed at the exit interview, indicating that appropriate corrective action will be taken.

No items of noncompliance or deviations were identified.

c. Radiation and Contamination Surveys

The licensee's reactor health physics technician conducts periodic radiation and contamination surveys. The surveys are performed at the frequencies specified in paragraph 5.1.3 of the operations manual. Additional wipe surveys are also performed by the EH&S group on a quarterly basis. Discussions

with the health physics technician revealed that special surveys are also performed. The special surveys are conducted for each removal of an irradiated sample, removal of tools and equipment from the reactor facility, of newly initiated experiments and of certain experimenters. A followup contamination survey is performed whenever contamination levels are greater than two times background.

Radiation survey results for normal reactor operations at 250KW were low and in the expected range of 0 to 15 mrem/hr. The highest radiation levels recorded are during the retrieval of irradiated samples. Generally irradiated sample levels are on the order of several hundred mrem/hr. Occasionally, an irradiated sample reading in excess of 1000 mrem/hr (on contact) is obtained.

Contamination levels are generally low 0 to 250 cpm above background. The higher contamination levels are normally found on surfaces such as normal retrieval tubes where it is expected and controlled. The inspector noted that levels ranging up to 116,000 cpm were found in the reactor room on one occasion during the past year. An investigation conducted by the licensee's radiation protection staff revealed that an experimenter had used poor radiological control practices. The experimenter had also contaminated his clothing. All of the contamination was contained within the reactor room. The experimenter's clothing and the reactor room were decontaminated to less than two times background. The reactor health physics technician has provided almost continuous surveillance of subsequent activities by the involved experimenter. The inspector noted that this incident was discussed at a Reactor Operations Committee meeting.

No items of noncompliance or deviations were identified.

d. Personnel Monitoring

The licensee maintains a monthly film badge and TLD finger ring personnel monitoring program. The program is administered by the EH&S group and coordinated by the reactor health physics technician. The film badges and finger ring TLD's are changed and processed on a monthly basis. The licensee contracts this service from Radiation Detection Company. All personnel, with the exception of visitors, are monitored with the use of film badges and finger rings. Visitors entering the reactor facility are monitored using pocket dosimeters. All visitors are required to sign in on the visitors log and must be constantly escorted by a qualified licensee representatives.

The review of exposures received by visitors did not reveal any unexpected exposures. The review of the visitor's log revealed several instances where personnel failed to log "out". The need to enforce this was discussed with the licensee's staff.

The maximum 1982 yearly whole body exposure observed was 80 millirems. The maximum finger exposure for 1982 was 1500 millirem (non penetrating). The inspector noted that the health physics technician assigned to the reactor on a half time basis had a life time exposure of 5 millirem. The 5 millirem was received during 1981. The technician's life time exposure had been accumulated during the past year and a half. The exposure appears to be unusually low for an individual assigned to monitor reactor operations. A review of the logs discussed in Section 2.a above revealed that the technician had performed numerous assignments (such as instrument calibrations, performing radiation surveys and surveying of irradiated samples) for which a higher exposure might be expected. This observation was discussed at the exit interview. The RSO and reactor supervisor stated that the film badge supplier would be evaluated.

No items of noncompliance or deviations were identified.

e. Administrative Controls

The reactor supervisor informed the NRC inspector that the meeting frequency for the Reactor Operations Committee (ROC) prescribed in Section 6.2.f of the TS was not fully complied with during 1982. The ROC met in April and December of 1982 but failed to meet during the summer quarter as scheduled in June 1982. The reactor supervisor stated that he was in the process of preparing a report of notification to the NRC. This item of noncompliance was first identified to the NRC by the licensee at the time of this inspection in December of 1982.

Discussions with the staff and a review of ROC minutes and previous NRC inspection reports revealed the following:

- . ROC quarterly meetings were held in April and December 1982. The summer meeting scheduled for June 1982 had not been conducted.
- . A review of NRC Inspection Reports 50-326/73-01, 50-326/77-03 and 50-326/80-01 established that similar items of noncompliance have occurred in the past. Two of the three previous occurrences were identified by the NRC, the other was identified by the licensee.

The inspector informed the licensee that failure to conduct a ROC meeting at the frequency specified in Section 6.2.f of the TS would be considered an item of noncompliance. The inspector added that normally an item of noncompliance would not be issued for violations of this nature that are identified by the licensee. However, since the matter was not promptly reported and due to the repetitive nature of the violation an item of noncompliance would be issued. The inspector emphasized the importance of implementing effective corrective action to eliminate violations of a similar nature (82-04-01).

f. Ventilation System

The inspector verified, through the review of records and logs that the facility exhaust ventilation system was operated during reactor operations. The inspection disclosed that the licensee had verified the operability of the reactor facility ventilation system at the frequency specified in Section 3.6 of the TS.

No items of noncompliance or deviations were identified.

g. Procedures

The inspector reviewed procedures related to radiological protection during the inspection. The procedures are provided in the UCI Nuclear Reactor Facility Operations Manual pursuant to Technical Specifications, Section 6.3 "Operating Procedures." The review disclosed that the manual is well organized and provides detailed instructions for normal and emergency reactor operations.

The inspection disclosed that periodic reviews of the manual are performed. Changes to the manual are accomplished in accordance with Section 6.3 of the TS.

The inspector did note two instances where personnel failed to comply with the procedures. The inspector discussed these findings with the reactor and EH&S staff emphasizing the importance for compliance with procedures.

The inspector commended the licensee for the well prepared operations manual.

No items of noncompliance or deviations were identified.

h. General Observation

The review and examination of the various logs, records, etc. identified in Section 2(a) above disclosed a well documented and chronological sequence of events as they relate to reactor operations. The logs and reports were neat, legible and easy to follow and evaluate. The licensee staff responsible for maintaining the logs and records were commended for this at the exit interview.

3. Tour of Facility

The inspector conducted a tour of the licensee's facility. The licensee's posting and labeling practices were observed and an independent radiation survey was performed during the tour. The independent radiation survey was conducted with a Model 31600 Keithley X-ray/gamma radiation survey meter. The survey meter (serial number is 10444) is a NRC instrument which was calibrated on October 19, 1982.

An old edition of Form NRC-3 was observed at the entrance to the reactor's control room. The inspector provided the licensee with the latest version of the form.

The licensee's labeling and posting practices appeared to be consistent with 10 CFR 20.105 and 10 CFR 20.203 regulatory requirements. The independent measurements confirmed the licensee's posting and labeling practices. General area radiation levels ranged from less than 0.1 millirem per hour (mrem/hr) to approximately 1 mrem/hr. The tour included an inspection of the normal and emergency ventilation exhaust systems.

No items of noncompliance or deviations were identified.

4. Solid Radioactive Waste

An examination of the licensee's solid radioactive waste records was conducted. The examination revealed that ten cubic feet of solid waste had been generated during 1982. The waste was transferred to the EH&S office for subsequent disposal under a State of California radioactive materials license.

No items of noncompliance or deviations were identified.

5. Liquid Waste Releases

The licensee does not release liquid waste to the sewer system. All liquid wastes are collected in appropriate receptacles and transferred to the EH&S office for subsequent disposal to a licensed disposal facility. An examination of radioactive liquid waste disposal records for 1982 to date was conducted. The records revealed that nine gallons of radioactive liquid waste was transferred to the EH&S office for disposal during this period.

No items of noncompliance or deviations were identified.

6. Radioactive Material Transfers

The inspector examined records associated with irradiations and transfers of radioactive materials. The examination revealed that all transfers are made to or through the University's state license. Transfer records were well documented and appeared to be consistent with 10 CFR 20, 10 CFR 71 and 49 CFR 173 regulatory requirements.

No items of noncompliance or deviations were identified.

7. Audits and Reports

A formal audit is performed by the campus RSO of the reactor safety program. Additional audits are performed by a Health Physicist assigned to the EH&S organization. Audits are also performed by the Reactor Operation Committee members, Campus Fire Marshal and reactor supervisor. The audit findings are discussed with the reactor supervisor and at the quarterly ROC meetings. A review of the audit findings for 1982 to date was conducted during the inspection.

The review revealed that the audits were very informative; however, it lacked a formal method for verification of the completion of assigned corrective actions. This observation was discussed at the exit interview.

The "Annual Report" for 1981 which was submitted pursuant to Section 6.7.f of the TS was reviewed as part of this inspection. All of the data in the report was acceptable and no trends were observed.

No items of noncompliance or deviations were identified.

8. Environmental Monitoring

The licensee's environmental monitoring program was examined during the inspection. The licensee maintains an array of four Thermo-luminescent Dosimeters (TLDs) at various locations within and adjacent to the reactor. TLDs are also located in both the normal and emergency ventilation air flow exhaust plenum from the reactor room and four more TLDs are located at more remote campus or off-site locations to monitor any effect resulting from reactor operations. The environmental TLDs are processed on a quarterly basis. The radiation levels reported in unrestricted areas and in the ventilation exhaust plenum for the past two years were reviewed. Results were well within the 10 CFR 20 limits for unrestricted areas and no upward trend was indicated.

No items of noncompliance or deviations were identified.

9. Licensee Action on Previous Inspection Findings

a. (Closed) Noncompliance (50-326/80-02-01)

The inspector reviewed the licensee's timely response dated December 24, 1980 to this item of noncompliance. The item of noncompliance identified inadequacies associated with the licensee's training program which is provided pursuant to 10 CFR 19.12, "Instruction to Workers" requirements. The licensee's corrective actions discussed in the response to the item of noncompliance and in Section 11 of Region V Inspection Report 50-326/81-03 were verified during the inspection. Training

records related to this item were also reviewed. The inspector concluded that the licensee's actions were satisfactory. This matter is considered closed (80-02-01).

No items of noncompliance or deviations were identified.

10. Emergency Planning

The inspector:

- a. Reviewed available records and Emergency Operating Procedures
- b. Met with the campus Security Department
- c. Observed a licensee familiarization tour provided for the local fire department stations responsible for responding to a fire at UC Irvine
- d. Observed the licensee's emergency equipment identified in the licensee's emergency plan
- e. Met with the reactor and EH&S staff to discuss the existing emergency plan and to determine the status of the revised plan required by 10 CFR 50.54(r)

The observations, discussions and review disclosed: (1) the licensee maintains close liaison with the campus security and the City of Irvine Fire Department, (2) conducts a periodic inspection of emergency equipment identified in the existing emergency plan, (3) the campus security, reactor staff and EH&S staff were knowledgeable of the current emergency plan, (4) the licensee periodically verifies the emergency call out list of telephone numbers and (5) the licensee submitted a revised emergency plan (pursuant to 10 CFR 50.54(r) requirements) to the NRC in October of 1982 which the licensee expects to implement by April 1, 1983.

The licensee is currently in the process of preparing revised emergency procedures to augment the revised emergency plan. Training of personnel in the revised plan is expected to commence upon completion of the Emergency Plan implementing procedures.

No items of noncompliance or deviations were identified.

11. Effluents

a. Gaseous Releases

Annual Argon-41 gaseous releases are determined by calculations based on the production of Argon-41 during reactor operations. The calculations are based on values derived from Argon-41 content of air released from the pool surface and from the irradiated air circulated through the pneumatic transfer system. The basis and parameters for Argon-41 releases is discussed in Section 8.4, "Production and Release of Radioactive Gases" of the UC Irvine Safety Analysis Report of 1968. The calculations are considered to provide conservative values.

Argon-41 releases calculated for approximately 101 hours of full power (250KW) reactor operations during 1981 were estimated to be 6×10^4 microcuries. The 6×10^4 microcuries represents a concentration (averaged over 12 months) of less than 1×10^{-9} uCi/ml. This is lower than the MPC (4×10^{-8} uCi/ml) allowed by 10 CFR 20, Appendix B.

The licensee's environmental monitoring program discussed in Section 8 of this report also monitors Argon-41 releases from reactor operations. Thermoluminescent (TLDs) dosimeters are placed in the main exhaust air flow path from the reactor room and fume hood exhaust. Both TLDs for 1981 showed no detectable dose, above background, in the exhaust stacks from the facility. Discussions were held with the licensee to ascertain how the TLDs are calibrated for the purpose of determining if they are capable of detecting Argon-41 releases and if any studies have been accomplished to verify their capabilities for measuring Argon-41 releases. The licensee was confident that the TLDs were capable of detecting Argon-41 releases even though they had not conducted studies to verify their capability to do so. This was based on the calibration data provided by the TLD supplier.

A review of Region V Inspection Report 50-326/81-03, Section 7 indicated that a Argon-41 stack monitor had been designed and was in the final stages of assembly. The report, dated March, 1981, indicated that this monitor was to be installed in the near future. The licensee had anticipated that once installed, the monitor would improve the measurement and evaluation of gaseous releases from the facility. As of this inspection the monitor was not yet installed. Discussions with the reactor supervisor and EH&S group revealed that the funds allocated for installing the monitoring system had been expended. An estimated five-hundred dollars (\$500.00) was required to complete the installation. The reactor supervisor stated he was not certain when additional funding could be obtained. The inspector encouraged the licensee to install the stack monitor. The reactor supervisor stated they would see what could be done to acquire the additional funds to complete the installation.

No items of noncompliance or deviations were identified.

b. Particulates

A continuous air monitor (CAM) operating along side the reactor was verified to be in operation pursuant to Technical Specifications, Section 3.3 "Reactor Instrumentation" requirements. The CAM is set to alarm at a pre-determined level, based on the amount of radioactivity resulting from leakage of fission products from a failed fuel element. The CAM draws a sample from a location over the reactor pool.

The emergency exhaust ventilation system is activated anytime the CAMs predetermined alarm set point has been reached. The CAM also provides an audio-visual alert and alarm at the unit and in the control room. Reactor operators are instructed to secure reactor operations when ever the CAM alarms. A graph readout calibrated in total detectable activity (in nanocuries) is provided on the CAM and at the reactor's control panel. A low level and high level alarm light for the CAM is also provided on the reactor control console.

The inspection disclosed that the control console graph readout was not calibrated to agree with the CAMs readout; however, the high and low level alarm lights appeared to operate satisfactory. The inspector emphasized the need to calibrate the reactor control console CAM graph readout at the exit interview. The licensee staff in attendance agreed to check the calibration of the CAM control console readout.

No items of noncompliance or deviations were identified.

12. Exit Interview

The inspector met with the licensee representatives (denoted in Paragraph 1) at the conclusion of the inspection on December 16, 1982. The inspector summarized the scope and findings of the inspection. The licensee was informed of the item of noncompliance discussed in Appendix A and Section 2.e of this report. The inspector emphasized the importance of corrective actions that will eliminate recurring items of noncompliance. Also discussed was the need to:

- a. Evaluate the findings with respect to instrument calibration(s) discussed in Section 2.(b) and 11(b).
- b. Develop a system for tracking the status of Audit/Inspection findings.
- c. Verifying the adequacy of results obtained from the personnel monitoring/environmental monitoring film badge and TLD suppliers.
- d. Enforce the need for compliance with procedures.
- e. Re-location of the gas proportional counter discussed in Section 2(b).

The licensee was encouraged to expedite the installation of the Argon-41 stack monitor discussed in Section 11(a). The licensee was commended for the quality of procedures and the maintenance of logs and records.