U.S. NUCLEAR REGULATORY COMMISSION OFFICE OF INSPECTION AND ENFORCEMENT

Report No. 50-142/79-04		
50-142 Docket No.	R-71 Licensee No.	Safeguards Group
University of California at Los Angeles		
Los Angeles, California 90024		
Facility Name: UCLA Re	search Reactor (Argonaut-100KW)	
Inspection at: UCLA Ca	mpus	
Inspection Conducted: Se	ptember 27-28, 1979	
Inspectors: J. B. Baird,	Baud Radiation Specialist	10/19/79 Date Signed
		Date Signed
Approved by: 77 A	E. Book	Date Signed
Summary:	book, Chief, Fuel Facility and Materials Branch	Date Signed

<u>Areas Inspected</u>: Special, unannounced inspection to evaluate UCLA based group's concerns of excessive Argon-41 exposures from the stack efficient. The concerns and allegations included: (1) failure to adequately maintain restricted area on the roof around the stack, (2) application of a reactor use factor without considering whether the time of use is during the time of public occupancy of surrounding areas, (3) underestimation of occupancy factor for adjacent areas, and (4) failure to evaluate concentration of Argon-41 inside adjacent building.

The inspection activities involved 13 inspector-hours by one NRC inspector.

Results: No items of noncompliance or deviations were identified.

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DETAILS

1. Persons Contacted

- *N. Ostrander, Manager, Nuclear Energy Laboratory
- *A. Zane, Reactor Supervisor
- *J. Hornor, Reactor Health Physicist
- W. Parker, Asst. Chief Engineer, Physical Plant
- *J. Evraets, UCLA Radiation Safety Officer

The inspector also contacted the Committee to Bridge the Gap and discussed the subject of this inspection with three staff members on September 27, 1979.

*Denotes those attending the exit interview.

2. Background

On September 13, 1979, the NRC Region V office received two letters from representatives of the Committee to Bridge the Gap, a UCLA-based group, expressing concerns about the potential for student and faculty exposure to Argon-41 concentrations from the reactor facility stack effluent. The major points addressed by the two letters included the following:

- a. Failure to adequately maintain a restricted area on the roof around the reactor facility stack. This allegation was primarily based on observations by the Committee staff members that the door to the roof area was open when visited, and that the low wall (about 4 feet high) to the south which separates the stack roof area from an adjacent roof was not considered adequate to prevent persons from gaining access to the restricted area. It was noted also that entry to this area was facilitated by the presence of a stepladder a linst the wall inside the restricted area.
- b. Application of a reactor use factor without considering whether the time of use is during the time of public occupancy of surrounding areas. Amendment 10 to the facility technical specifications, dated February 5, 1976, allows use of a reduction factor of 460 for the concentration of Argon-41 released to the atmosphere. This reduction factor includes (1) a reactor use factor, (2) an occupancy factor, and (3) a dilution factor. The use factor allowed by the NRC is 18.8%.

- c. Underestimation of the occupancy factor for areas adjacent to the roof containing the stack. The reduction factor referred to above includes an occupancy factor of 10% for the roof areas outside of the roof containing the stack. The Committee aff feels that the practice of eating lunches in this area and the presence of a conference room and various classrooms in this area results in higher occupancy than credited in the reduction factor.
- d. Failure to adequately evaluate the concentration of Argon-41 inside of the Math Sciences building. This building is adjacent to the stack in the predominately downwind direction. The roof of this building, which is approximately the same elevation as the top of the stack, has ventilation and air conditioning supply intakes which could introduce Argon-41 into the classrooms and offices. The Committee staff feels that this exposure pathway has not been adequately evaluated, and cites results of a nonradioactive tracer study performed and reported in a master's thesis by a UCLA graduate student in 1976. The thesis concluded that exposures were within NRC limits but that the highest exposure potential could be inside the Math Sciences building.

The issue of potential Argon-41 effluents in excess of 10 CFR 20 limits was first raised by NRC Inspection No. 50-144/75-01, conducted January 23-24, 1975. During this inspection it was noted that the effluent concentration was being underestimated and the stack elevation was less than that specified in the Technical Specifications. UCLA subsequently submitted an application for license amendment, dated May 22 and November 5, 1975, to retain the existing stack elevation and release Argon-41 concentrations in excess of 10 CFR 20.106(a) limits. This was based on a Safety Analysis showing that individual exposures in the environs of the stack would not exceed 10 CFR 20.106(b)(2) requirements. The NRC staff Safety Evaluation, which evaluated the application, concluded that the licensee had already made reasonable efforts to minimize the effluent concentration, and approved use of a reduction factor of 460 consisting of a reactor use factor of 0.188, a dispersion factor of 0.115 and an occupancy factor of 0.10 for adjacent areas. Amendment No. 10 to the UCLA facility license approved the UCLA request and required a two-year survey be conducted with thermoluminescent dosimeters (TLD) placed in the environs of the stack to confirm that radiation exposure from the Argon-41 would not exceed NRC limits.

3. Restricted Area

The roof area containing the facility stack is bounded on the north by the Math Sciences building and on the south by a low wall (approximately 4 feet high), the other side of which is the roof of Boelter Hall. The Technical Specifications do not include this area in the defined restricted area, but it is considered to be restricted since the stack discharges within the area and the only normal occupancy is by maintenance personnel and reactor operations staff. Access to this area is from a locked door leading from the eighth floor of the Math Sciences building.

The inspector visited the roof area three times during the inspection and found the door locked each time. During the first visit, the inspector noted that there was a stepladder placed against the south wall. Licensee representatives stated that they did not know why the ladder was there and subsequently removed it from the area. During these visits, the inspector did not observe any evidence of public occupancy of the area. The inspector also inquired about licensee surveillance of the area. The facility health physicist stated that he looks at the area on a weekly basis at random times during the day and has not noted any unusual occupancy of this area. It was further stated that this observation will be documented in the reactor log in the future.

The inspector noted that there was no posting of the area indicating that occupancy should be limited to authorized personnel only. This was discussed with the licensee and a representative stated that consideration would be given to posting the area in view of the concerns about unauthorized entry into the area.

The inspector also discussed occupancy of the area by maintenance personnel and control of the key to the access door with the Assistant Chief Engineer. The description of routine and special maintenance indicated that maintenance personnel are unlikely to occupy the restricted area more then the annual five percent occupancy estimated by the UCLA Safety Analysis. The inspector found that the access door key is a standard master key which is available to authorized personnel from the Dean's office. A licensee representative stated that attention would be given to providing a lock and key with more limited distribution.

Based on observations during the inspection and discussions with UCLA personnel, the inspector concluded that the licensee's control of occupancy of this area is adequate to insure that nonoccupationally exposed personnel occupancy in excess of five percent in a year would be unlikely.

No items of noncompliance or deviations were identified.

4. Reactor Use Factor

The inspector reviewed the UCLA Safety Analysis and NRC Safety Evaluation to determine if the reactor use factor of 0.188 considers the time of use during the time of most likely public occupancy of surrounding areas. The inspector found that this was based on reactor operation at about five percent of the annual energy capacity all between 8:00 A.M. and 5:00 P.M. during week days. Five percent of annual capacity is approximately 43,800 kwh per year at a maximum power level of 100 kw, or about 8.4 full power hours per week. Since 45 hours per week are available, 8.4 hours of use gives an estimated 0.187 use factor. The NRC staff evaluation made this a use factor of 0.188.

The inspector also reviewed the power-time integral data for reactor use from 1976 up to the time of the inspection. It was noted that the effective full power hours had increased each year from about 131 hours in 1976 to 203 hours in 1978, and about 200 hours already in September at the time of the inspection. Thus it appears that the reactor utilization is steadily increasing but is still well below the 438 full power hours that the 0.188 use factor is based on.

No items of noncompliance or deviations were identified.

5. Occupancy Factor

The inspector reviewed the basis for the 0.10 occupancy factor and discussed the recent occupancy status with licensee representatives. The occupancy factor for all roof areas on the connecting buildings of Math Sciences and Boelter Hall was based on a five percent uncontrolled occupancy during transit to and from the conference room and class facilities. The five percent figure was doubled to 10 percent, or an occupancy factor of 0.10, to take into account possible unpredictable individual behavior.

During the inspection, licensee representatives contacted those departments again and subsequently found that for 1979, there is no indication that occupancy has significantly increased over that upon which the original occupancy estimate was based. The inspector inquired about

the licensee's surveillance of this area to identify changes in occupancy, and licensee representatives stated that additional information will be obtained and documented based on weekly observations by the facilty health physicist.

No items of noncompliance or deviations were identified.

6. Math Sciences Building Exposure Evaluation

The inspector reviewed the UCLA Safety Analysis and NRC Safety Evaluation in regard to potential exposure inside the Math Sciences Building from intake by the ventilation and air conditioning systems. It was noted that neither document addresses this problem. However, it was subsequently found that UCLA had analyzed this potential exposure pathway in response to an NRC request and submitted the information to NRC-DOR by letter dated November 5, 1975. In this response, UCLA described the ventilation intake-systems parameters and calculated the Argon-41 concentration at the intakes based on a stack effluent of 1.6 x 10^{-5} uCi/ml.

The most critical intake by this analysis was the intake northeast of the stack on the roof of the Math Sciences building. The average annual concentration calculated here was 2.5×10^{-5} uCi/ml, compared to the 10 CFR 20.106(a) limit of 4 x 10^{-8} uCi/ml.

The building exposure potential was estimated by subdividing it into 13 cells and calculating the radiation exposure rate by a volume equivalent sphere model. The maximum average dose per individual was estimated to be 5.3 mRem/yr when a reactor use factor of 0.188 and an occupancy factor of 100% were utilized.

Since the NRC staff Safety Evaluation does not address the licensee's analysis of this matter, this item has been referred to the Division of Operating Reactors, NRR, by the office of Inspection and Enforcement to ascertain whether additional evaluation is necessary.

No action by the licensee is required on this item at this time because this is not considered to be a significant health and safety issue. The licensee's TLD survey (see paragraph 7.b.) supports this assessment by demonstrating that areas within the highest potential concentrations on the roofs adjacent to the stack have measured dose rates well within the 10 CFR Part 20 limit for individuals in unrestricted areas.

7. Radiation Monitoring

a. Gaseous Effluent Monitoring

A gas sample from the ventilation exhaust is continuously drawn through an ionization chamber detector and the signal output is recorded in millivolts on a strip chart recorder. A calibration curve based on the detector response to a known concentration of Argon-41 is used to determine the concentration and total quantity of Argon-41 in the stack effluent.

The inspector reviewed the Argon-41 release date for 1979 and noted that approximately 42 curies had been released through August. This compares with 58 curies in 1978 and 47 curies in 1977. The inspector examined the strip chart record for June, July and August 1979 and noted that the maximum effluent concentration at full power is about 1×10^{-5} uCi/ml. The technical specification limit is 1.8×10^{-5} uCi/ml.

b. Thermoluminescent Dosimeter (TLD) Survey

The licensee's two-year TLD program required by Part 2.c.(3) of Amendment No. 10 to License R-71 was completed on March 4, 1978. TLD's were exposed at 20 locations in the environs of the stack for quarterly periods starting in March 1976. The TLDs were deployed at various distances in each direction from the stack, with several locations on roof areas north and south of the restricted area, as well as one TLD actually located on the wire screen covering the stack opening. The TLDs continuously measured the radiation from the Argon-41 effluent in addition to background radiation at the location of each dosimeter. The inspector reviewed the TLD results, summarized below, and noted that al! locations, including the stack, had received radiation doses well below the 10 CFR Part 20 limit of 500 mRem/yr. The total body dose to individuals occupying any of those areas would no doubt be less due to lower occupancy of those areas.

Exposure Period	Background, mRem	Net Dose, mRem
3/5/76 - 6/4/76	22.4	0 to 17
6/5/76 - 9/4/76	29.2	0 to 15
9/5/76 - 12/4/76	25.8	0 to 11
12/5/76-3/4/77	30.4	0 to 16
3/9/77 - 6/7/77	31.9	0 to 14
6/5/77 - 9/4/77	19.6	0 to 18
9/5/77 - 12/4/77	25.5	6 to 17
12/5/77- 3/4/78	29.5	0 to 10

No items of noncompliance or deviations were identified.

8. Exit Interview

An exit interview was weld with those individuals denoted in Paragraph 1 at the conclusion of the inspection on September 28, 1979. The inspector summarized the scope and findings of the inspection. The licensee was informed that no items of noncompliance or deviations were identified.