U.J. NUCLEAR REGULATORY COMMISSIO. OFFICE OF INSPECTION AND ENFORCEMENT

Region I

Report No. 50-293/77-31		
Docket No50-293		
License No. DPR-35 Priority	Category	с
Licensee: Boston Edison Company		
800 Boylston Street		
Boston, Massacnusetts 02199		
Facility Name: Pilgrim Nuclear Power Station, Unit 1		
Inspection at: Plymouth, Massachusetts		
Inspection conducted: November 28-30, 1977		
Inspectors: Jahn Hith	1/12/	178
R. White, Radiation Specialist	date	signed
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Section, FF&MS Branch	date	signed

Inspection Summary:

Inspection on November 28-30, 1977 (Report No. 50-293/77-31)

Areas Inspected: Special, unannounced inspection of the Radiation Protection Program, particularly as it relates to the personnel overexposure event on November 23, 1977. The inspection consisted of interviews with personnel, review of procedures, review of records, independent measurements and observations. The initial inspection and area examination was conducted during nonregular hours (November 28, 1977, 5:00 PM - 7:30 PM). The inspection involved 21 inspector-hours on site by two NRC inspectors.

Results: Of the areas inspected, one item of noncompliance was found in each of the following areas: (infraction - failure to maintain personnel exposure in accordance with 10 CFR 20.101, Paragraph 2); (infraction - failure to instruct personnel in accordance with 10 CFR 19.12, Paragraph 3); (infraction - failure to follow procedures in accordance with Technical Specification 6.11, Paragraph 4); (infraction - failure to perform air sampling in accordance with 10 CFR 20.103, Paragraph 5).

Region I Form 12

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DETAILS

1. Persons Contacted

*P. McGuire, Manager, Pilgrim Nuclear Power Station (PNPS)
*R. Swetnam, Senior Radiological Health and Safety Engineer (PNPS)
*M. Naughton, Chief Technical Engineer (PNPS)
*W. Hoey, Health Physics (HP) Engineer (PNPS)
*R. Shult, Health Physics (HP) Engineer (PNPS)
*R. Tis, Public Relations, Boston Edison Company (BECo)
V. Stagliola, Radioactive Waste Coordinator (PNPS)
R. O'Neil, Maintenance Supervisor (PNPS)
A. Richards, Health Physics (HP) Technician (PNPS)
J. Walker, Foreman, Crouse Company

The inspector also talked with and interviewed several other personnel in the course of the inspection including members of the Health Physics (HP) staff and Yankee Nuclear Services - Dosimetry.

 denotes those personnel present at the management exit interview conducted November 30, 1977.

2. Event Description

On November 23, 1977, two contractor personnel (Repairman A; Repairman B) (Crouse Company), were assigned to repair valve CV-13B located in the Clean Waste Process Room (Radwaste Floor, Elevation -1 foot), on the top of Clean Waste Receiver Tank T-301B. The inspector noted that the Clean Waste Process Room was posted as a High Radiation area and locked in accordance with Technical Specification 6.13. A radiological survey performed November 21, 1977, to support the valve repair operation indicated that radiation levels were between 150 and 1000 mrem per hour and surface contamination levels were approximately 100,000 dpm per 100 cm². Entry and work in the area was controlled by Radiological Work Permit (RWF) 77-1204, "Clean Waste Tank Rcom - Repair CV-13B Valve" dated November 21, 1977.

The following details reflect information provided to the inspector from interviews with various personnel who were associated with the job evolution.

Event Chronology

Approximate Time

1045-1110

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Event Description

The personnel associated with this event (Repairmen A and B, Crouse Foreman, Maintenance Supervisor, HP Engineer, and HP Technician) gathered at the step-off pad common to both the Clean Waste Process Room and the Sludge Tank Receiver Room (see Figure 1). Since none of the personnel knew where valve CV-13B was located within the Clean Waste Process Room, directions were solicited from the Rad Waste Coordinator who was in the vicinity. The Coordinator explained the location of the valve using a survey map for reference, and indicated the position of service outlets and the tank configuration. The survey map covered only the area within the dotted lines in the lower right hand corner of Figure 1 The wording appearing on Figure 1 was not present in the survey map shown to the workers. It is apparently at this point that all personnel mistook the entrance to the Sludge Tank Receiver Room for the entrance to the Clean Waste Process Room (the rooms are adjacent to each other but the entrances were not identified). and after the Coordinator left the area the personnel apparently assumed that door "A" (Figure 1) was the access to the Clean Waste Process Room, since it was most visible from the step-off pad.

Repairmen A and B, in accordance with the provisions of RWP-77-1204 for entering the Clean Waste Process Room, used the key given them by the HP Engineer to unlock the access to the Sludge Tank Receiver Room (door "A").

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NOTE: On December 7, 1977, the Maintenance Supervisor stated to the inspector in a telephone conversation that he knew the distinction between the two rooms but had left the area prior to the Repairmen A and B entering the Sludge Tank Receiver Room (door "A"); and therefore did not observe the error.

Upon entering, Repairmen A and B determined that they could not locate the service outlet and returned to the step-off pad for further information.

The HP technician inquired at the Rad Waste Control Room (Figure 1) as to the location of the outlets and was told that they were located four (4) feet either side of the tank vault access ladder. The technician conveyed this information to Repairmen A and B.

Repairmen A and B, re-entered the Sludge Tank Receiver Room and determined that the service outlets were not located as previously described. Repairman B climbed the tank vault access ladder and found that there was a locked gate (gate "C", Figure 1) on the top of the vault wall. Repairman B noted that there was a service outlet on the other side of the gate. The repairmen returned to the step-off pad to inform personnel of the locked gate.

An apparent short discussion took place between the personnel at the step-off pad concerning the gate (gate "C"), at the conclusion of which the HP technician gave the Repairmen his "Hi-Rad" key to use to open the gate.

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The repairmen re-entered the Sludge Tank Receiver Room; and Repairman B apparently tried the key on the locked gate (gate "C") and found that it did not fit the lock. However, Repairman B found that the chest sigh gate could easily be opened by reaching over and operating the knob from the other side, which he did.

NOTE: The HP Engineer stated to the inspector on November 30 and December 6, 1977, that shortly after the Repairmen re-entered the room he had left the area and did not witness any further actions on the part of the repairmen. At this point, Repairmen A and B contend, upon opening gate "C", Repairman A returned to the step-off pad and informed the personnel there that the "Hi-Rad" key did not fit the lock, but that Repairman B had defeated the locked gate and that they intended to enter; and that the personnel at the control point concurred with this intention and Repairman A returned to the Sludge Tank Receiver Room. On November 29 and December 5. 1977, the HP technician denied to the inspector that he was informed of the fact that the locked gate had been defeated. On December 5, 1977, the Crouse foreman stated that he did not recall such a communication occurring.

Both repairmen explored the tank room and determined that the tank was not as described by the Rad Waste Coordinator; and that there was no valve at the location previously indicated. Both repairmen left the room and returned to the step-off pad.

Upon notifying personnel at the stepoff pad that they could not locate the valve, the HP technician made a routine check of the 0 to 1 Roentgen self-reading dosimeters of both personnel and found them to be offscale. The HP technician then ordered both personnel to exit the area and report to the Yankee Nuclear Services office (onsite) for immediate TLD read-out.

Both repairmen reported to the Yankee Nuclear Services office (onsite) for TLD read-out at 1140. The TLD results were reported as follows:

Repairman A - 2.910 rem, whole body dose, gamma

Repairman B - 3.561 rem, whole body dose, gamma

The inspector noted that 10 CFR 20.101(b)(1) "Exposure of individual to radiation in restricted areas" makes provisions for whole body exposures not to exceed 3 rem per calendar quarter providing the specifications of 10 CFR 20.101 (b)(2) and (3) are met. The inspector verified that the subject specifications were met but noted that contrary to the requirement, Repairman B had exceeded the regulatory limit of 3 rem per calendar quarter: and that this item constituted noncompliance with 10 CFR 20.101(b). (77-31-01)

The inspector further evaluated the TLD dosimeters worn by Repairmen A and B and noted that the devices were the standard type badges developed by the Harshaw Chemical Company. The badges consisted of a plastic holder containing two (2) TLD cards (G-7 and NG-67); each card containing two (2) TLD chips, i.e., the type G-7 card contained two TLD-700 chips and the NG-67 card contained one each of the TLD-600 and TLD-700 chips.

The inspector observed from the record (Form MC-5.1) of the licensee's contracted dosimetry service (Yankee Nuclear Services) that the following values were generated from the individual's TLD dosimeters:

	Card Type		Chip	Chip 1		Chip 2	
Repairman	A	G-7 NG-67	3.156 3.181	rem	2.910 3.029	rem rem	
Repairman	В	G-7 NG-67	3.651 3.563	rem	3.561 3.354	rem rem	

Upon reviewing Yankee Nuclear Services' procedure MC-4 "TLD Manual System 2000 - Evaluation of TLD Readout Results" the inspector found that providing certain specifications are met, the whole body dose to be assigned to an individual is taken from the value exhibited by Card G-7, Chip 2. The inspector examined the dosimetry records of other individuals at the station and found that the specifications of this procedure appeared to be consistently applied.

In the case of Repairman A, the inspector noted that the Card G-7, Chip 2 exhibited the only value that did not exceed the regulatory limit as set forth in 10 CFR 20.101.

Upon interviewing representatives of the licensee, Yankee Nuclear Services, and Harshaw Chemical Company on December 5, 6 and 7, 1977, the inspector found that excluding policy and procedural practices, and considering also the shielding configurations that are presented by the TLD dosimeter holder (badge) and the overlapping TLD cards, there appeared to be no sound technical basis supporting the contention that the Card G-7, Chip 2 provides the best measurement of an individual's whole body exposure.

The inspector noted from these conversations that all four chips appear to be capable of exhibiting equally valid measurements of the dose received from the particular type of radiation involved, i.e., gamma; and observed in the application of statistical analysis, that these measurements are indicative of a center of a distribution (the central tendency) which provides the best estimate of the dose received and is expressed by the arithmetic mean of the measurements, i.e., 3.069 rem, which exceeds the applicable regulatory limit as set forth in 10 CFR 20.101.

The inspector indicated that pending re-evaluation by the licensee, Repairman A's dose estimate would be considered unresolved. (77-31-02)

20/3 119

3. Instructions to Workers

The inspector noted that 10 CFR 19.12, "Instructions to Workers," requires the licensee to inform all individuals working in restricted areas of the location and presence of radioactive material and radiation; and to instruct such individuals of the health protection problems associated with exposure to such material and radiation, including precautions and procedures to minimize exposure.

Through interviews with the personnel involved in the overexposure event of November 23, 1977, the inspector learned that Repairmen A and B were not instructed as to the location of the entry to the Clean Waste Process Room nor were they instructed to avoid the adjacent, similar entry to the Sludge Tank Receiver Room. In addition, the entries to the two rooms were not marked in a manner that would permit a distinction between them.

The inspector noted that such instruction was necessary to minimize exposure in view of the fact that the rooms, though similar in arrangement, had distinct differences in radiation levels (i.e., Clean Waste Process Room: approximately 0.3 rem per hour general area and approximately 1 rem per hour at certain contact points, Sludge Tank Receiver Room: 15 rem per hour general area and approximately 200 rem per hour at certain contact points).

The inspector further observed that the Rad Waste Coordinator, in explaining the arrangement of the Clean Waste Process Room (See Paragraph 2), used a survey map entitled "Radwaste EL-1', Clean Waste Area" which depicts only the Clean Waste Process Room, neglecting entirely the adjacent Sludge Tank Receiver Room. Therefore, Repairmen A and B did not have the opportunity to become aware of the presence of the Sludge Tank Receiver Room and its location relative to the Clean Waste Process Room. The Repairmen were not informed of the radiation intensities within the Sludge Tank Receiver Room.

The inspector identified this failure to instruct the Repairmen sufficiently to assure that they entered the area where they were assigned to work (an area which had been surveyed and for which an RWP had imposed appropriate protective measures) represented noncompliance with 10 CFR 19.12. (77-31-05)

2073 120

4. Radiological Procedures

During the course of this inspection, the inspector reviewed the following procedures that were applicable to the work evolution permitted by RWP 77-1204, "Clean Waste Tank Room . . ."

6.1-012, "Access to High Radiation Areas"
6.1-020, "Health Physics Guidelines"
6.1-022, "Radiation Work Permit"
6.1-110, "Health Physics Training Program"
6.2-010, "Radiological Incident Investigation"

Except as noted below, the operation appeared to have been conducted in accordance with these procedures.

The inspector noted that Technical Specification 6.11, "Radiation Protection" states, "Procedures for personnel radiation protection shall be prepared consistent with the requirements of 10 CFR Part 20, and shall be approved, maintained and adhered to for all operations involving personnel radiation exposure".

Procedure 6.1-012 "Access to High Radiation Areas" states the following:

Section F.2- Areas greater than 1000 mrem per hour shall be locked as required by Technical Specification 6.13 "High Radiation Areas."

Section F.4 - Areas greater than 10,000 mrem per hour shall be locked with an additional padlock.

The inspector determined that on November 23, 1977, the Sludge Receiver Tank Room, an area which the radiation intensity was at least as high as 15,000 mrem per hour (general area) was not padlocked in accordance with procedure 6.1-012.

The inspector noted that failure to follow this procedure contributed to the overexposure of personnel noted in Paragraph 2, in that had a padlock been used to secure the Sludge Tank Receiver Room, the potential for overexposure would have been significantly reduced.

The inspector identified this item as noncompliance with Technical Specification 6.11. (77-31-03)

On November 28, 1977, the inspector observed that the licensee had secured the Sludge Tank Receiver Room with a padlock pursuant to procedure 6.1-012.

5. Surveys

During the course of this review, the inspector noted that after the overexposure event associated with the work permitted by RWP 77-1204, the licensee continued efforts on the repair of valve CV-13B. On November 23, 1977, at 1530, personnel entered the Clean Waste Process Room and completed the operation permitted by RWP 77-1204.

The inspector noted that the survey conducted at 1530 on November 23, 1977, in the Clean Waste Process Room, indicated loose surface contamination levels of 120,000 dpm per 100 cm²; and radiation levels as high as 1000 mrem per hour at contact with valve CV-13B. It was observed by the inspector such measurements were indicative of levels sufficient to create the potential for airborne radio-activity.

The inspector noted that 10 CFR 20.103, "Exposure of individuals to concentrations of radioactive material in a restricted area", requires, in part, that suitable measurements of concentrations of radioactive materials in air be used for detecting and evaluating airborne radioactivity in restricted areas.

Contrary to this requirement, the inspector determined that the licensee did not perform any measurements to detect or evaluate radioactive materials in the air of the Clean Waste Process Room on November 23, 1977 during the period of time that personnel were working to repair CV-138.

The inspector identified this item as noncompliance with 10 CFR 20.103. (77-31-04)

The inspector noted that the personnel involved in the operation were wearing respiratory protection equipment pursuant to 10 CFR 20.103, and that air samples taken in the room subsequent to this finding indicated activity to be less than values listed in 10 CFR 20, Appendix B, Table I, Column I.

6. Exit Interview

The inspector met with the licensee representatives (denoted in paragraph 1) at the conclusion of the inspection on November 30, 1977. The inspector summarized the scope and findings of the inspection as presented in this report with the exception of the item of noncompliance pertaining to the failure to instruct personnel in accordance with 10 CFR 19.12, which was brought to the licensee's attention on January 14, 1978.

In a telephone conversation on December 5, 1977, NRC Region I management discussed the findings of this report with Boston Edison Company corporate management.

20/3 123

