

U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-247/82-11

Docket No. 50-247

1 License No. DPR-26 Priority -- Category C

Licensee: Consolidated Edison Company of New York, Inc.

4 Irving Place

New York, New York 10003

Facility Name: Indian Point Nuclear Generating Station, Unit 2

Inspection At: Buchanan, New York

Inspection Conducted: June 1-4, 1982 and July 14-16, 1982

Inspectors: *John R. Plumlee*
K. E. Plumlee for
Radiation Specialist

8/18/82
date

M. H. McBride
M. H. McBride, Ph.D.
Radiation Specialist

8/18/82
date

Approved by: *Edward A. Greenman*
E. G. Greenman, Acting Chief,
Facilities Radiation Protection Section,
Technical Programs Branch

8/18/82
date

Inspection Summary:

Inspection on June 1-4 and July 14-16, 1982

Areas Inspected: Routine unannounced safety inspection (June 1-4) and special announced follow-up (July 14-16) by two region-based inspectors of the Radiation Protection Program including outstanding items and an overexposure which occurred on June 1, 1982, involving divers (contractor) who were installing new fuel racks in the spent fuel pool. The inspection consisted of 62 inspector hours on-site by two NRC region based inspectors.

8209090227 820824
PDR ADDCK 05000247
PDR

Results: Four violations were identified. (Failure to follow procedures for spent fuel movement in the spent fuel pool, Detail 3.2; failure to conduct an adequate radiation survey of the spent fuel pool prior to diving operations, Detail 3.3.1; failure to provide divers in the spent fuel pool with radiation monitoring devices which continuously indicate radiation dose rate, Detail 3.3.2; and failure to limit one individual's quarterly occupational radiation dose to 3 rems, Detail 3.4).

DETAILS

1. Persons Contacted

1.1 Consolidated Edison Company Employees

- **J. Basile, General Manager, Nuclear Power Production
- **M. Blatt, Senior Engineer, Regulatory Affairs
 - K. Burke, Director of Regulatory Affairs
- **J. Cullen, Radiation Protection Manager
 - ? Gaudio, Dosimetry Supervisor
 - J. Higgins, Chemistry Supervisor
 - A. Honiyk, Radiological Engineer
- **C. Jackson, Vice President, Nuclear Power
 - C. Lamoges, Reactor Engineer
- **F. Matra, Resident Construction Manager
 - M. O'Kelly, Radwaste General Supervisor
 - R. Orzo, Senior Watch Supervisor
 - S. Profeta, Chemistry Foreman
 - T. Teague, Radiation Protection Supervisor (ALARA Engineer)
- **T. Walsh, Instruments and Controls Engineer
- *T. Whipple, Construction Engineer
 - S. Wisla, General Manager, Environmental Health and Safety

*Present at exit meeting on June 4, 1982.

**Present at exit meetings on June 4 and July 16, 1982.

1.2 Contractor Employees

- J. Hensche, Site Coordinator, CLEANCO, Inc.
- H. Johnson, Supervisor, Underwater Construction, Nuclear Utility Construction Co.
- R. Naylor, Site Coordinator, CLEANCO, Inc.

Other persons were also contacted.

2. Previous Inspection Item Update

(Closed) Unresolved Item (77-12-01): Review of the tests and evaluation of the containment air particulate monitor. To verify adequacy of monitoring equipment the licensee compared the measurements of activities deposited on the monitor's filter with measurements of containment air particulate activity near the intake nozzle of the sample line. The eight-week averages of gross beta-gamma activity, and also the major isotopic activities, were in a range of $\pm 25\%$ of the measurement of containment air particulate activity.

The licensee concluded that the air flow velocity (99 ft/sec through the 87 ft. long sample line), caused enough turbulence to make heat-tracing unnecessary. The licensee documented this information in two internal memos, R. Spring to W. Bennett, March 31, 1978, and J. Higgins to T. Law, June 27, 1978.

(Closed) Inspector Follow-up Item (80-02-07): Review of Radwaste System modifications. The licensee installed a cement solidification system for disposal of liquid radwaste about January, 1981. The licensee has since concluded that volume reduction was achievable by processing the liquid radwaste through a filter-demineralizer canister system. Dewatering the spent canisters is adequate for transport to a burial site in high integrity containers without solidification. The cement solidification system is no longer in use. The canister system, and the spent resin dewatering operations, will be reviewed routinely during subsequent inspections.

(Closed) Immediate Action Letter Follow-up (IAL-23): The licensee's response to a NRC request letter dated May 7, 1981, to the Senior Vice President, Nuclear and Fossil Generation was reviewed and implementation of the indicated commitments was verified (See Paragraph 4).

3. Diver Overexposure Incident

On June 1, 1982, a diver received a radiation dose to the head of 8.7 rems while installing a fuel rack in the licensee's spent fuel pool. The information presented below is based on interviews with licensee personnel, review of licensee documents and procedures, inspectors' observations, and review of the following licensee letters to Region I:

- 1) Licensee letter to NRC Region I dated June 2, 1982, providing 24-hour 10 CFR 20.403(b) notification.
- 2) Licensee letter to NRC Region I dated June 9, 1982, reviewing preliminary findings and corrective actions.
- 3) Licensee letter to NRC Region I dated July 1, 1982, 30-day 10 CFR 20.405(a) report.

3.1 Sequence of Events

The following chronology shows the sequence of events leading to the diver overexposure in the spent fuel pool:

<u>Date and Time*</u>	<u>Event</u>
May 31, 1982	Irradiated fuel assembly D55 was placed in cell G29 (new rack #4), located two to four feet from the position where new rack #7 was scheduled to

*All times listed are approximate.

Date and Time	Event
May 31, 1982 (continued)	be installed (Figure 1). The licensee later determined that this fuel assembly created radiation fields of 300 to 600 R/hr two to three feet from the northeast corner of rack #7. The shielding effect of the water decreased the radiation field from 600 to 2 R/hr in two feet of pool water (spatial attenuation accounted for a factor of 2 decrease, at most).
June 1, 1982 - 0600	A health physics technician conducted a radiation survey of the spent fuel pool with a Technical Associates CPMU survey instrument in preparation for the installation of new rack #7. The maximum radiation field detected in the dive work area near rack #7 was 1 R/hr.
0800	A Radiation Work Authorization for Radiation Work Permit 5122, reauthorizing the diving operation, was issued.
1000	A second radiation survey of the dive work area was conducted. In this survey, Diver A placed the survey probe at various underwater locations and Diver B, a health physics technician, and a diving supervisor monitored a remote survey meter readout. The maximum exposure rate detected in the dive area was said to be approximately 1 R/hr. The survey results were not recorded.
1100	Diver B entered the spent fuel pool. New fuel rack #7 was then lowered into the pool. During the next two hours, Divers A and B guided the fuel rack into the proper location and adjusted the rack level. Diver B spent approximately 30 minutes of the two hours at the NE corner of new rack #7, laying on the bottom of the pool. During this time Diver B's head was approximately two to four feet from fuel assembly D55. Diver A did not spend an appreciable period of time at the NE corner of rack #7 during the dive.
1240	A third radiation survey of the dive area was conducted with Diver A placing the survey probe at various underwater locations and a health physics technician monitoring a remote survey meter readout. The survey results were said to be consistent with the 0600 and 1000 surveys (approximately 1 R/hr maximum exposure rate). The survey results were not recorded.

<u>Date and Time</u>	<u>Event</u>
June 1, 1982 - 1310	Diver A exits pool.
1320	Diver B exits pool. The self-reading dosimeters on both divers were immediately read by a health physics technician. Both the low range (0 to 500 mR) and high range (0 to 5 R) head dosimeters worn by Diver B were offscale.
1400	An NRC Regional Specialist Inspector was notified of a possible overexposure while onsite conducting a routine safety inspection.
1638	The licensee notified the NRC Operations Center of the incident, after the diver TLD dosimeters had been processed. Diver B had received a head dose of 8.7 rems (accumulated quarterly whole body dose of 9.5 rems). Diver A had received a whole body dose of 1.6 rems (accumulated quarterly whole body dose of 2.5 rems).

3.2 Operational Control of Fuel Movement in the Spent Fuel Pool

On May 31, 1982, two operators moved spent fuel assembly D55 into cell G29 in new rack #4 during a fuel shuffle in the spent fuel pool (see Figure 1).

Fuel movement in the spent fuel pool is controlled by Procedure SOP 17.24, "Fuel Storage Building - Fuel Assembly and Component Relocation." Attachment 3 to SOP 17.24, Revision 3, modified by Temporary Procedure Change 82-51, May 28, 1982, contained handwritten, sequential fuel movement instructions for the operators. Fuel move step 231 stated that fuel assembly D55 was to be moved from old rack location Q23 (old rack #9) to new rack location B29 (new rack #4). This step was initialed as complete and dated May 31, 1982. Fuel movement steps in Attachment 3 which would have moved fuel into the clear area of rack #4 (including cell G29) were lined out and marked "delay."

Additional instructions were given in Temporary Procedure Change 82-51, which stated that fuel was not to be moved into the six rows of rack #4 containing cell G29, adjacent to the June 1 diving area. The fuel pool diagram in Attachment 4-3-B, "Status Following Fuel Transfer 3;" of this procedure also indicated that fuel was not to be transferred to these six rows.

The licensee stated that the operators apparently worked from a poor quality copy of Attachment 3 during the May 31 fuel shuffle. While the operators did discuss the fuel move with the Senior Watch Supervisor

prior to the fuel move, they apparently took only Attachment 3 with them to the Fuel Storage Building for the move. The licensee stated that the copy of Attachment 3 used by the operators was of such poor quality that it had to be touched up prior to the move. The licensee further stated that in the operator's copy, location B29 could have appeared to be G29. This copy was discarded after the fuel move and could not be reviewed by licensee management or the NRC.

The licensee did not require or conduct QA verification of the fuel assembly locations in the spent fuel pool prior to the dive. Failure to control the movement of spent fuel assembly D55 in the spent fuel pool on May 31, 1982, is a violation of Technical Specification 6.8.1 and Procedure SOP 17.24, Revision 3 (247/82-11-01).

During the July 14 to 16 inspection, the licensee stated that the following informal corrective actions had been taken to preclude the future use of illegible copies of Attachment 3 to SOP 17.24:

- 1) The instructions in Attachment 3 were no longer hand written, but typed.
- 2) Multiple copies of SOP 17.24 were supplied to the Watch Supervisor, so that additional working copies should not be required.

The inspector noted that Attachment 3 to SOP 17.24 (Revision 4) used for a fuel shuffle following the overexposure incident was hand written, but that the subsequent fuel shuffle (SOP 17.24, Revision 5) used a typed Attachment 3. In response to the inspector's findings, the licensee committed to formally incorporating the two corrective actions outlined above in SOP 17.24 (247/82-11-02).

3.3 Health Physics Activities Associated with the Diving Incident

On June 1, 1982, health physics personnel conducted two surveys of the dive work area near rack #7 in the spent fuel pool, prior to the diving operation. One or more health physics technicians supplied continuous coverage during the dive. A third survey of the dive work area was conducted near the completion of the dive.

In spite of this effort, a 600 R/hr radiation field two to four feet from the dive work area near the northeast corner of new rack #7 was not detected. The radiation field was not homogeneous, and decreased from 624 R/hr to 2 R/hr over a two foot radial distance from a point one foot west of rack #4. The radiation levels one foot above the pool floor were approximately an order of magnitude less than levels three feet above the floor.

3.3.1 Pre-Dive Radiation Surveys

A health physics technician conducted the first pre-dive radiation survey of the spent fuel pool at 0600 on June 1 (Figure 2). The technician stated that prior to the survey, the survey instrument was source checked

by placing it in a 500 R/hr field in the pool and noting the instrument response. The instrument, a Technical Associates CPMU ionization chamber, appeared to respond normally.

The technician recalled that the instrument also registered expected radiation levels of 200 to 800 R/hr when the survey probe was suspended over known locations of spent fuel in the fuel pool during the survey. The technician stated that he had experienced occasional erratic instrument readout problems prior to June 1, but recalled no such behavior during the June 1, 0600 survey.

The 0600 survey of the spent fuel pool indicates the maximum radiation field in the general dive work area was 1 R/hr (Figure 2). However, the exact location of the 1 R/hr field cannot be determined because the 0600 survey map does not accurately depict the spent fuel pool layout on June 1. The locations of the new fuel racks which were installed in the pool prior to the dive as well as open pool areas where old fuel racks had been removed, are not shown on the 0600 survey map. Additionally, the pool depths corresponding to the survey points and the pool location of the June 1 dive work area are not shown. While the 0600 survey map indicated general pool radiation levels, it was not sufficiently detailed to document survey results for the June 1 dive work area, given the localized nature of radiation fields in the pool. The 0600 survey was subsequently used by a health physics supervisor to document the pool radiation fields for a Radiation Work Authorization covering the June 1 diving operations.

The technician who conducted the 0600 survey stated that the maximum radiation field in the dive work area, 1 R/hr, was detected just west of new rack #4, three feet above the pool floor. He stated that this field was in the general area of, but not adjacent to, fuel assembly D55. The technician said he saw the D55 fuel assembly in new rack #4 as his utility light passed over the rack cell during the 0600 survey. He said he reported the assembly to his supervisor and to two diving contractor supervisors, prior to the day's dives. The technician further stated that he did not survey the D55 fuel assembly or record its presence on the 0600 survey because he felt the appropriate supervisors had been notified.

The three supervisors stated that the technician did not notify them of the out of place fuel assembly. One supervisor recalled the technician's concerns, but stated that he thought the technician was referring to dummy fuel assemblies in the corner of rack #4, visible in the cloudy pool due to their proximity to pool lights.

Prior to the dive, discussions were held between contractor and licensee supervisors on whether any fuel had been placed in new rack #4. The 0600 survey showed radiation levels of only a few hundred millirem over the eastern part of new rack #4, where two rows of fuel assemblies were supposed to be located. As a result of the discussions, the east side of

rack #4 was resurveyed prior to the dive, and showed radiation levels of 10 R/hr. The discrepancy between the 0600 survey and the resurvey results was attributed to inadequate survey probe placement during the 0600 survey. A visual inspection of the fuel in new rack #4 was not conducted. At this time, pool lighting and clarity was limited.

The licensee's letter to Region I, dated July 1, 1982, attributes the failure of the 0600 survey to detect the D55 fuel assembly to a survey instrument malfunction. The instrument in question read erratically on the afternoon of June 1, after the dive. Additionally, the instrument had repeatedly failed during previous diving work. However, two health physics technicians who used the equipment on the morning of June 1 to survey the spent fuel pool stated that they did not recall any survey instrument problems, either prior to or during diving. Both technicians were aware of the failure history of the survey instrument on June 1.

At approximately 10:00 am, a second pre-dive survey of the diver work area was conducted. In this survey, Diver A entered the pool and placed the survey probe at various locations in the dive work area, while a health physics technician, Diver B, and a diving supervisor observed a remote meter readout. The survey results were not recorded, but were said to have confirmed the 0600 survey. Rack #7 was not in the pool at the time of the survey. The maximum radiation field found in the diver work area was approximately 1 R/hr.

In summary, the following factors, listed in order of apparent importance, limited the effectiveness of the pre-dive radiation surveys of the spent fuel on June 1:

- 1) Inaccurate pool survey map.
- 2) Limited pool visibility due to cloudy pool water and limited pool lighting.
- 3) Use, without verification, of a potentially unreliable survey instrument.

10 CFR 20.201(b)(2) requires that the licensee conduct surveys necessary to comply with 20.101(b). 10 CFR 20.101(b) limits an individual's occupational whole body radiation dose in any calendar quarter to 3 rems. 10 CFR 20.201(a) defines a "survey" to mean an evaluation of radiation hazards including a physical survey of the location of radioactive materials and measurements of radiation.

Failure to detect the presence of fuel assembly D55 with an associated radiation field of more than 600 R/hr near the dive work area in the spent fuel pool on June 1, 1982, contributed to a diver receiving a quarterly occupational whole body radiation dose of 9.5 rems. Failure to conduct an adequate survey of the spent fuel pool is a violation of 10 CFR 20.201(b) (247/82-11-03).

3.3.2 Health Physics Coverage During the Dive

Continuous health physics coverage was provided during the dive by one or more health physics technicians, stationed on a movable bridge over the spent fuel pool. Two types of radiation detection instruments were used to monitor the dive: 1) an underwater survey instrument (used in the pre-dive surveys) and 2) contractor controlled, alarming dosimeters placed in the helmet of each diver.

The probe from the underwater survey instrument was suspended in the work area during most of the dive, with a health physics technician monitoring the remote readout. At approximately 1240, near the end of the dive, Diver A used the instrument probe to survey the dive work area near rack #7. The maximum radiation field detected during the survey was approximately 1 R/hr. The survey results were not recorded.

The licensee stated in the July 1, 1982 letter to Region I that the failure of the health physics technician to detect the presence of the fuel element during the diving operation may have also been due to erratic survey instrument readings. However, two of the health physics technicians who covered the dive (including the technician who conducted the 1240 survey) stated that the instrument seemed stable during the dive (see section 3.3.1).

The shielding characteristics of spent fuel pool water were such that radiation levels were reduced from 624 to 2 R/hr over a radial distance of two feet. Spatial attenuation reduced the radiation level over this radial distance by a factor of 2, at most. Consequently, the licensee could not adequately monitor two divers separated by more than a few feet with only one radiation survey instrument. Failure to monitor the radiation levels near each diver with a monitoring device which continuously indicates dose rate is a violation of Technical Specification 6.12.1. (247/82-11-04).

The alarming dosimeters worn by the divers did not alarm at the 200 mrem set point during the dive. In the July 1, 1982 letter to Region I, the licensee stated that one of the dosimeters was found to be inoperable, when checked after the dive. The other dosimeter appeared to function normally after the dive. The dosimeters were not source checked immediately prior to the dive and were controlled by contractor personnel.

Subsequent to the June 1 incident, the licensee revised diving procedure MTH-80-0004 (Revision 3, June 9, 1982) to require that:

- 1) A radiation detector with a remote readout will be attached to each diver (step 7.2.5). Constant voice contact between the diver and the surface will keep the divers apprised of the dose rate in his immediate area.

- 2) The licensee will control and issue alarming or chirping dosimeters to each diver. These dosimeters will be checked for operability prior to each dive (step 7.2.3).
- 3) Approximately ten minutes into a dive, the divers will surface and have their self-reading dosimeters checked. After two hours in the pool, the divers must come out of the water to have their diving suits decontaminated and their self-reading dosimeters checked (step 7.2.7).

3.4 Summary of Diver Radiation Exposure

A summary of radiation dosimetry data for each diver is shown on Table 1. Diver A received a whole body dose from the dive of 1.6 rems (2.5 rems accumulated quarterly whole body dose). Diver B received a dose of 8.7 rems to the head from the dive (9.5 rems accumulated quarterly whole body dose).

The licensee determined that Diver B had spent approximately 30 minutes of the two-hour dive laying on the pool floor near the northeast corner of rack #7, adjusting the rack position. This position could have placed Diver B's head close enough to fuel assembly D55 to have received the recorded dose during the half hour. Alternatively, the radiation fields near the fuel assembly were high enough (greater than 600 R/hr) that Diver B could have received the bulk of his head dose in less than one minute if he momentarily drifted close to row 29 in rack #4.

The quarterly occupational whole body radiation limit for both divers, based on completed Form NRC-4's, was 3 rems. Exceeding the quarterly radiation limit to the head of Diver B is a violation of 10 CFR 20.101(b)(2) (247/82-11-05).

3.5 Licensee Commitments for Corrective Actions

In letters dated June 9, 1982, and July 1, 1982, the licensee provided a summary of corrective actions involving fuel movement and diving operations which would be implemented to prevent recurrence of personnel overexposure or improper movement of fuel.

Of the commitments made, the following were reviewed:

June 9 Commitments

- 1) A senior Nuclear Power Generation Manager has been assigned full-time responsibility for the fuel rack project.
- 2) Quality Assurance personnel will be present during fuel movement in the spent fuel pool and will independently verify the proper location of the fuel assemblies.

- 3) Movement of potentially highly radioactive objects (>1 R/hr) will be controlled by written procedure and independently verified by Quality Assurance personnel.
- 4) An extensive radiation survey of the spent fuel pool will be conducted following the movement of any fuel assembly or potentially highly radioactive object, prior to any diving operations.
- 5) Prior to daily diving operations, health physics supervision and a diving contractor representative will verify that fuel storage locations adjacent to diving areas are empty.
- 6) Prior to daily diving operations, health physics personnel will conduct a radiation survey of the diving areas using two independent types of radiation exposure monitoring equipment. Survey forms will be designed to reflect the current status of racks in the fuel pool.
- 7) Each diver will be equipped with an alarming dosimeter. These instruments will be calibrated and controlled by station personnel, and will be checked daily, prior to diving operations.

The licensee's intention to implement all corrective actions presented in the June 9 letter prior to further diving was confirmed in a June 11, 1982 telephone conversation between Mr. C. Jackson, Vice President - Nuclear Generation, and members of his staff, and Mr. J. Joyner, Chief, Technical Programs Branch, NRC Region I, and members of his staff.

In addition to the commitments provided in the June 9 letter, the licensee committed in the June 11 telephone conversation to establish procedural guidance for resolution of survey discrepancies. At that time it was verified that the licensee's procedures require checking the operability of alarming dosimeters between dives.

July 1 Commitments

- 1) June 9 commitments were restated.
- 2) In response to a telephone conversation on June 16 between S. Wisla, General Manager, Environmental Health and Safety, and J. White of Region I, the June 9 commitment to equip each diver with alarming dosimeters was broadened to allow substitution of chirping dosimeters. The use of the chirping dosimeters was contingent upon the following:
 - A complete survey of the area to be entered was to be performed prior to entry into the area.
 - The diver was to be provided with a survey meter which provided a continuously indicating dose rate reading.

- 3) The divers will frisk every 30 minutes at the job location to identify any loose radioactive "crud." The frisk will be performed under the direct observation of a Health Physics Technician.

3.6 Additional Inspector Findings During the July 14 to 16 Inspection

3.6.1 Spent Fuel Pool Lighting

On July 14, 1982, the inspector observed that limited spent fuel pool lighting made it difficult to see the divers installing new rack #11 in the northwest pool corner from the health physics observation area over the pool. The regular pool lighting system was not operational at that time and most of the pool was in total darkness. Utility lights were suspended in the dive work area, but illuminated only portions of rack #11. When asked, the health physics technician stated he knew the general diver location by occasional glimpses of diver equipment. He could not point out the exact location of either diver to the inspector. Health physics personnel later stated that both divers were clearly visible during the dive from a viewing location a few feet away from the inspector.

During subsequent discussions, the health physics technician stated that divers may be out of view for periods of time while the pool utility lights were adjusted.

Licensee procedure MTH-80-0004, "Procedure for Underwater Diving Work Associated with Contaminated Water," Revision 3, June 9, 1982, states that a health physics technician will order a diver out of the pool if the technician can not see the diver.

Considering the procedural requirement for diver visibility, the role of poor pool visibility in the June 1 diver overexposure, and the scheduled installation of a new fuel rack in proximity to irradiated fuel on the east side of the spent fuel pool, the licensee was asked at noon on July 15, 1982, to suspend diving operations pending a review of spent fuel pool lighting and diver visibility criteria.

As a result of the review, the licensee agreed to: 1) install general pool lighting, and 2) revise procedure MTH-80-0004 to define diver visibility and pool clarity criteria prior to resuming diving operations. On the morning of July 16, the inspector verified that general pool lighting had been installed, but noted that lighting had not been installed on the east side of the pool, near the planned dive work area. The licensee stated that pool lighting would be installed on the east side of the spent fuel pool, prior to resuming diving operations.

The inspector subsequently verified that criteria for diver visibility and pool clarity were included in a revision to procedure MTH-80-0004. The licensee stated that the health physics technicians covering diving operations would be trained in the revised diving procedure prior to

resuming diving. Two of four health physics technicians covering the diving operation had received this training, prior to the exit interview on July 16.

3.6.2 Dive Area Designations on Spent Fuel Pool Survey Maps

The inspector reviewed the licensee radiation survey maps of the spent fuel pool and noted that dive work locations were not clearly marked on the maps. The licensee was then using the most recent full-size blueprints of the spent fuel pool as survey maps. The survey maps were used to inform workers of dive area radiation levels during pre-dive briefings and during the actual dives.

Dotted red pen lines (often faint) on the maps indicated diver work locations. These lines sometimes enclosed dive work areas and sometimes nonwork areas. However, no notes or explanations on dive work areas or diver surface transit areas were included on the maps.

In response to the review, the licensee stated that dive work areas and diver surface transit areas will be clearly marked on radiation survey maps of the spent fuel pool and will be accompanied by appropriate explanatory notes. The inspector verified that the survey map for the dive scheduled for July 16 had been appropriately clarified.

3.6.3 Use of Two Independent Instruments During Pre-Dive Surveys of the Spent Fuel Pool

The inspector observed that only one radiation survey instrument was being used to survey the spent fuel pool on July 17, 1982. A second survey instrument, while located in the pool area, was not routinely used to check the response of the first instrument. The licensee stated that no procedural guidance specified the number of instrument comparison points, but that technicians typically compared the instrument readings at a minimum of three points during the survey. The licensee further stated that the three instrument comparison points could be chosen at the beginning or end of a pool survey.

This comparison technique would not reasonably assure that an intermittent instrument problem, such as the problem postulated by the licensee for the June 1 dive, would be detected during a pre-dive pool survey. In light of this, the licensee was not adequately fulfilling the commitment to use two independent survey instruments to conduct daily pre-dive surveys of the spent fuel pool, made in the June 9 and July 1 letters to Region I.

The licensee stated at the exit meeting on July 16, 1982, that two independent survey instruments will be used to measure radiation at each survey point in the spent fuel pool during the daily pre-dive survey.

In a related commitment, the licensee stated that the CPMU Instrument would not be used as a primary survey instrument during diving operations.

3.6.4 Diver B Exit Whole Body Count

The licensee stated that Diver B had not been given a whole body count prior to termination after the June 1 incident. Step 5.4 of licensee procedure MTH-80-0004, Revision 1, March 15, 1982, requires that divers have a body burden analysis prior to leaving the site after a job is completed. Since the diver used a "dry" diving suit while in the spent fuel pool, the potential for receiving a body burden during diving was minimal. This appears to have been an isolated event.

3.6.5 Review of June 13, 1982 Diver Incident

On June 12, 1982, the licensee resumed diving operations in the spent fuel pool. During the initial dive, a diver's ascension air system malfunctioned. As a result, the individual was pulled to the surface by a tender using a lifeline attached to the diver. While being pulled up, the diver apparently drifted in the vicinity of the fuel racks which caused an unexpected exposure to his right leg of 1.3 rems.

The inspector reviewed this unplanned exposure. No performance errors or procedural violations were noted. However, licensee modified certain procedures and practices related to abnormal ascents and tender positioning to mitigate exposure to divers if the condition recurred.

4. Licensee Control of Contractor Personnel Dosimetry Practices and Access to Controlled Areas

Licensee commitments relative to IE Investigation No. 50-247/81-10 were described in a letter from the Director, NRC Region I, IAL 81-23, dated May 7, 1981, and in a licensee letter dated July 31, 1981, addressing the following three areas.

4.1 Controls Exercised By Custodians of Dosimetry Badge Racks, and by Health Physics Personnel Present Inside Controlled Areas

Observation on June 2 and 3, 1982, verified that the dosimetry badge racks in the Security Room and in the M.O. Building were enclosed and the doors to these spaces were locked, preventing any self-service in obtaining dosimetry equipment. The custodians verified that these devices were issued only to the individuals to whom assigned.

Observations during tours of controlled areas verified that health physics technicians checked dosimetry device use, misuse, and loss.

The inspector reviewed procedures HPI No. 2.28 Revision 2, issued December 18, 1981, "Instructions to H.P. Technician Assigned to V.C. Control Point;" HPI No. 2.26, Revision 2, issued September 2 1981, "Instructions to Personnel Assigned to Guard Temporary High Radiation Areas;" and HPP No. 2.2, Revision 10, issued September 2, 1981, "Access Control."

No examples of deviations from these procedures were identified. The licensee appeared to have completed the commitments in this area. No violations of regulatory requirements were identified.

4.2 Control of Dosimeter Badges Used Outside the Existing Radiologically Controlled Area

The inspector noted that the commitments stated in the July 31, 1981, letter on control of dosimeter badge use remained in effect, including posted signs at the exit points from the controlled areas, use of green labeled badges by personnel authorized to wear dosimetry outside the controlled area, and surveillance of such use.

The licensee issued revised procedure HPI No. 4.17, Revision 3, on March 5, 1982, "Lost, Damaged, or Off-scale Dosimetric Device Investigation." Review of the records of recent investigations did not identify any failures to adhere to this procedure.

4.3 Radiation Work Permits/Authorizations

The inspector verified the licensee's commitment to revise procedure HPP No. 2.1, Revision 4, "Radiation Work Permits and Radiation Work Authorizations." The procedure was revised and reissued September 2, 1981.

4.4 Review of Exposures Received by Certain Personnel

The licensee's letter dated July 31, 1981, transmitted a report of their review of certain contractor personnel exposures.

The licensee's documentation of this information, and correction of dosimetry records, was reviewed. No overexposures were identified.

4.5 Report to the Director, NRC Region I

The licensee was committed to provide a report by July 31, 1981, of the information discussed above (reference subparagraph 4.4). Review of this report did not identify any problems.

4.6 Contractor's Corrective Actions

In connection with the licensee's corrective actions, described in paragraph 4 of this report, a contractor committed in a letter dated January 26, 1982, to make the improvements itemized 4.6.1 through 4.6.12 below.

4.6.1 Improved Employee Screening Procedure

The contractor's representative stated, and documentation supported, that each employee is required (before assignment to a nuclear facility) to provide personal references, addresses, and five-year work histories as appropriate. The inspector noted that an independent investigator performed background investigations of each individual.

4.6.2 Standards of Education and Experience

Discussions with the Site Coordinators and two workers, and a review of records, verified the contractor maintained minimum requirements of high-school graduation or equivalency, and six months nuclear plant experience in accordance with the commitment.

4.6.3 Instructions on Adherence to Procedures

The contractor maintained rosters of the initial training and periodic retraining of personnel. The inspector reviewed the rosters and training topics for the following dates: January 22 and 29, February 3, 19, and 26, March 3 and 8, and April 1 and 12, 1982. The training topics covered respiratory protection, licensee procedures, transportation, radiation protection, decontamination procedures, hydrolasing procedures, and ALARA requirements, as well as general matters. Review of attendance rosters verified training and retraining was in accordance with the commitment.

4.6.4 Inclusion of Qualified Health Physicists in Staff

The contractor representative stated three or four qualified health physicists were hired to support the project requirements. The inspector verified that the health physics personnel were available.

4.6.5 Radiation Safety Courses and Quizzes will be Given Monthly

Review of the contractor's records verified this commitment was met. Typical quizzes covered 20 items, and a minimum passing grade was specified.

4.6.6 Increased Ratio of Supervisors to Workers

The contractor stated there was at least one supervisor or foreman for every seven workers. Review showed there were six supervisors and foremen, and 21 workers, on site on June 3, 1982.

4.6.7 Rotation of Site Coordinators

The contractor's representative stated the Site Coordinators rotated about every 5 months and there was at least a week allowed for transition. One was in the transition period during this inspection.

4.6.8 Monthly Training for Field Supervisors and Site Coordinators

The Site Coordinators stated they met for training purposes offsite, at least monthly.

4.6.9 Corporate Management Inspections of the Site

A contractor Vice President stated during a telephone conversation on June 3, 1982, that a Field Supervisor performs a monthly site visit and inspection of the contractor's operations.

4.6.10 Instructions to Contractor Employees to Adhere to Procedures and Regulations

The inspector noted this requirement was stated in a memorandum addressed to the contractor's supervisors and in training handouts.

4.6.11 Use of a Centralized Dosimetry Record System

The contractor records included information based on the contractor's computer analysis of dosimetry records and trends verifying the commitment was met.

4.6.12 Availability of Non-Radiation Jobs for All Contractor Employees

The contractor representative stated there were optional openings available to each worker in the event of a problem with exposure limits. Several employees had opted out of the nuclear plant though none were near their radiation exposure limits.

Review of the above information did not identify any problems.

5. Gaseous Radwaste Releases

The inspector reviewed records of recent licensee releases of gaseous radwaste, with respect to the FSAR description that 45 days decay is provided prior to planned releases. Specifically the inspector noted there were releases of primarily fairly short half-lived isotopes, itemized below.

Isotope	Half-life	Curies/% of Total		Curies/% of Total		Curies/% of Total	
		March 1982	April 1982	April 1982	May 1982		
Kr 85m	4.5 hr	0.33Ci	>0.1%	0.90Ci	0.1%	0.46ci	0.1%
Kr 85	10.7 yr	4.19	0.7%	6.37	0.7	4.27	1.2
Kr 87	76 min	0.01	0.0	0.08	0.0	0.00	0.0
Kr 88	2.8 hr	0.17	0.0	0.73	0.1	0.31	>0.1
Xe 131m	11.9 dy	0.53	0.1	1.43	0.2	2.71	0.8
Xe 133m	2.2 dy	7.72	1.2	10.04	1.1	2.12	0.8
Xe 133	5.25 dy	618.	96.8	872.63	96.6	324.2	94.7
Xe 135m	15.3 min	0.01	0.0	0.12	0.0	0.00	0.0
Xe 135	9.1 hr	7.45	1.2	11.25	1.2	8.26	2.4
Monthly Totals		638.41		903.55		342.33	

The licensee documents indicated the release rate during April was less than half the action level requiring notification to NRC. The licensee representative stated that corrective actions were being taken, nevertheless, to repair the volume control tank relief valve, which was the principle cause of the released activity. In addition, the waste gas compressor was repaired to operate at rated pressure.

The licensee also stated it is planning to connect to the Indian Point 1 waste gas decay tanks in order to lengthen the decay time.

The inspector noted that an additional week of decay time of the planned releases would reduce the quantity of radioactive noble gases released by about a factor of two.

The licensee's completion of the tie-in to additional waste gas storage tanks will be reviewed on a subsequent inspection (82-11-07).

6. Exit Meeting

The inspectors met with licensee representatives (denoted in paragraph 1) at the conclusion of the inspections on June 4, and July 16, 1982. The inspectors summarized the purpose and scope of the inspection and inspection findings. Inspection findings were further discussed by telephone on July 23, 1982.

Table 1. Thermoluminescent dosimeter results from June 1, 1982 dive.

<u>TLD</u> <u>Location</u>	<u>Diver A</u>		<u>Diver B</u>	
	<u>Con. Ed.</u> <u>Processed</u>	<u>Vendor</u> <u>Processed</u>	<u>Con. Ed.</u> <u>Processed</u>	<u>Vendor</u> <u>Processed</u>
Head	1.50 rems	1.53	8.60	8.70*
Chest	0.83	0.85	0.76	0.84
Back	1.58	1.63*	1.55	1.61
L. Wrist	2.49	2.70	8.10	7.82
R. Wrist	1.49	1.48	1.22	1.16
Groin	0.45	0.47	.35	0.37
L. Knee	0.78	0.80	.00	0.90
L. Ankle	0.47	0.48	0.26	0.21
R. Knee	0.20	0.32	0.24	0.23
R. Ankle	0.25	0.26	1.50	1.57

*Value used as whole body dose.

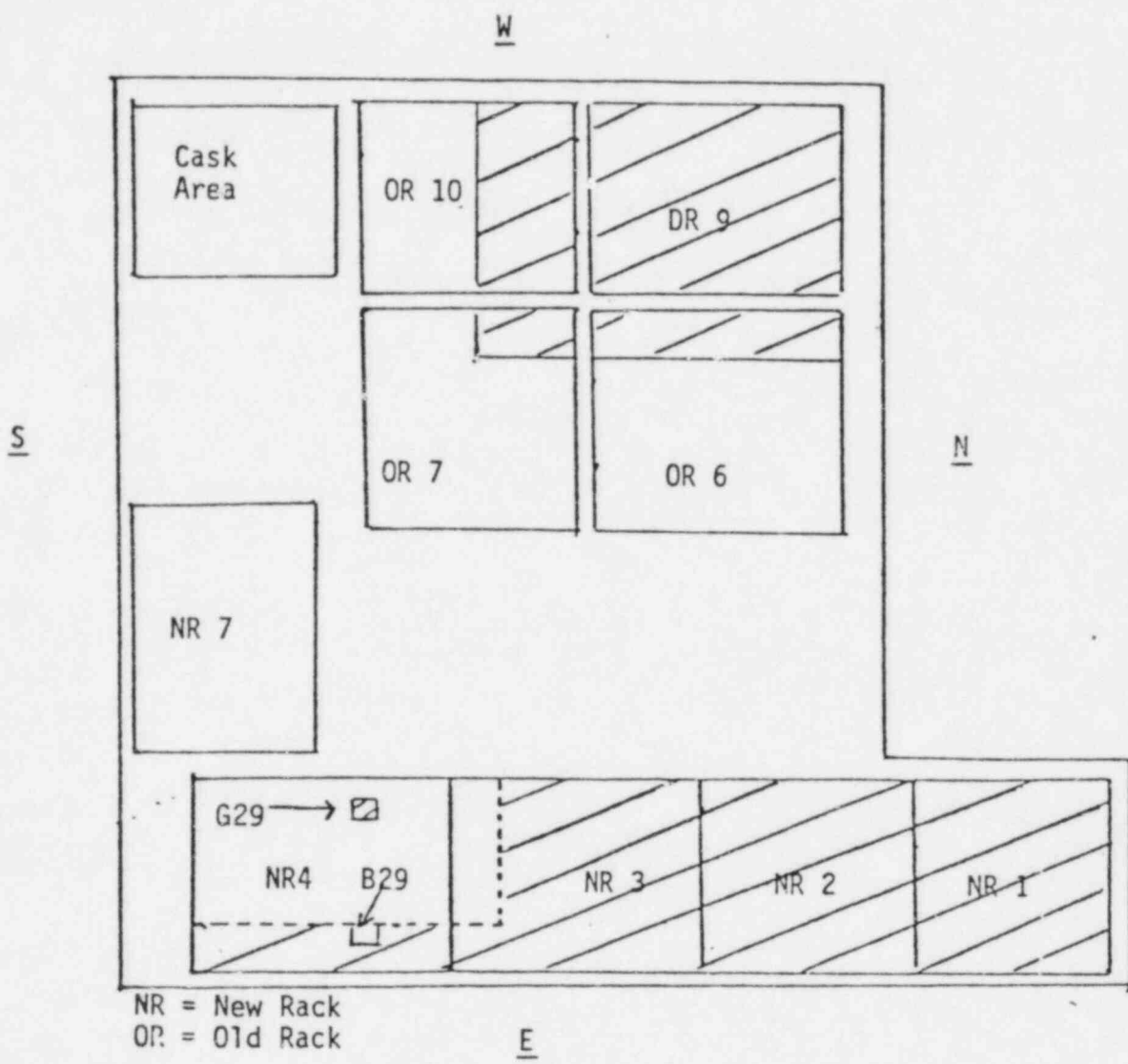


Figure 1. Configuration of spent fuel pool during installation of new fuel rack seven on June 1, 1982. Irradiated fuel is indicated by shaded area.

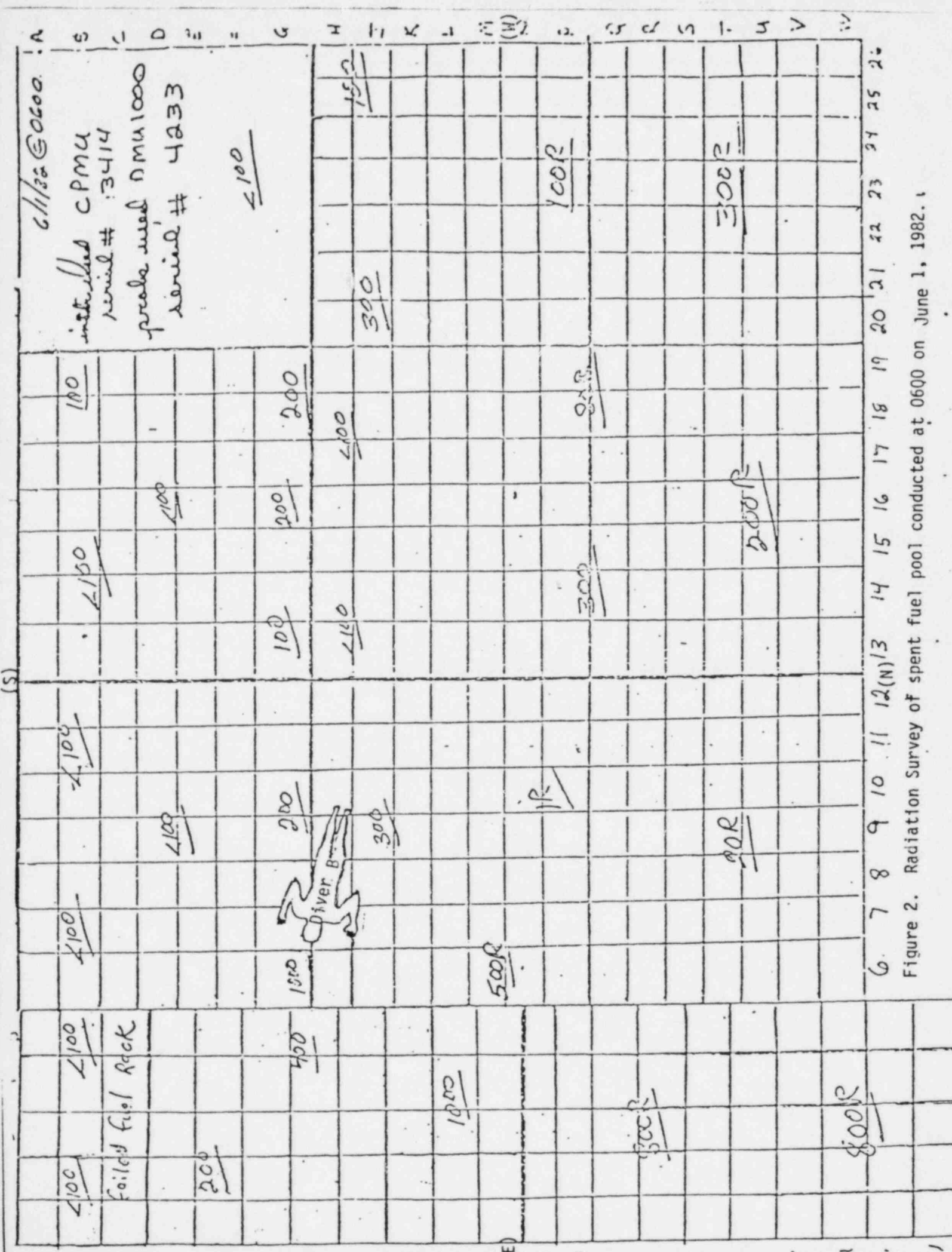


Figure 2. Radiation Survey of spent fuel pool conducted at 0600 on June 1, 1982.

Notes on Figure 2.

- 1) Values are in units of mR/hr, unless followed by "R". Values followed by "R" are in units of R/hr.
- 2) The approximate position of Diver B during 30 minutes of the installation of new rack #7 is shown.
- 3) The old fuel rack numbering system is shown on Figure 2.

Transaction Type

H-3

NRC:1 Form 6 Rev. Oct 80 (Side 1)

- New Item
- Modify
- Delete

OUTSTANDING ITEMS FILE
SINGLE DOCKET ENTRY FORM

Docket #

050247

W. MADDEN
Originator

A. GODY
Reviewing Supervisor Name

Item Number	Type	Module #	Area	Resp	Action Due Date	Updt/Clsout Rpt #	Date O/M/Clsd
82-07-01	WC3	81170	SAP	SAP	- - - -	- - - -	- - - -
Originator					Modifier/Closer		Descriptive Title
MADDEN							FAILURE TO MAINTAIN EFFECTIVE PROTECTED AREA ACCESS CONTROLS

Item Number	Type	Module #	Area	Resp	Action Due Date	Updt/Clsout Rpt #	Date O/M/Clsd
82-07-02	AC4	81170	SIC	SIC	- - - -	- - - -	- - - -
Originator					Modifier/Closer		Descriptive Title
MADDEN							FAILURE TO MAINTAIN EFFECTIVE PROTECTED AREA ACCESS CONTROLS

Item Number	Type	Module #	Area	Resp	Action Due Date	Updt/Clsout Rpt #	Date O/M/Clsd
- - - -					- - - -	- - - -	- - - -
Originator					Modifier/Closer		Descriptive Title

Item Number	Type	Module #	Area	Resp	Action Due Date	Updt/Clsout Rpt #	Date O/M/Clsd
- - - -					- - - -	- - - -	- - - -
Originator					Modifier/Closer		Descriptive Title

Item Number	Type	Module #	Area	Resp	Action Due Date	Updt/Clsout Rpt #	Date O/M/Clsd
- - - -					- - - -	- - - -	- - - -
Originator					Modifier/Closer		Descriptive Title

