

RECORD #2

TITLE: Overexposure of Diver During Work In fuel Storage Pool

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SSINS No.: 6835
IN 82-31

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D. C. 20555

July 28, 1982

IE INFORMATION NOTICE NO. 82-31: OVEREXPOSURE OF DIVER DURING WORK IN FUEL STORAGE POOL

Addressees:

All nuclear power plant facilities holding an operating license (OL) or construction permit (CP).

Purpose:

This information notice is provided as a notification of a significant, whole-body exposure in excess of regulatory limits to a diver engaged in underwater work in a fuel storage pool at a pressurized water reactor. Licensees are using divers for an increasing number of maintenance and inspection tasks and have demonstrated substantial exposure savings by using proper underwater work techniques. However, this incident demonstrates the potential for serious overexposures in very short time periods. Dose rates from LWR spent fuel assemblies and other irradiated components can be extremely high. A single spent fuel bundle can create a 10^4 - 10^6 R/hour radiation field at close proximity. Irradiated objects (e.g., BWR fuel channels) can read from ten to hundreds of R/hour on contact. It is expected that licensees will review the information for applicability to their facilities. No specific action or response is required at this time.

Description of Circumstances:

On June 1, 1982, while installing fuel rack support plates in the Indian Point Unit No. 2 fuel storage pool, a contractor diver received an exposure of about 8.7 rems to the head. A second diver, also working in the pool on June 1, received a whole body dose of about 1.6 rems.

Upon exiting the pool the most highly exposed diver's 500 mR and 5-R pocket dosimeters (worn on the head) were off-scale. The licensee suspended all diving operations, read the multiple TLD's (thermoluminescent dosimeters) worn on other body locations, and initiated an investigation of the incident. The fuel storage pool modification work had been ongoing for about three months, with daily exposures averaging about 50 millirems per diver.

A review of the incident by licensee and NRC personnel found several factors that contributed to the overexposure:

- (1) An irradiated fuel assembly was mistakenly transferred to a location two to four feet from the subsequent divers' work location. A poor-quality copy of the fuel transfer procedures was apparently a factor in the improper fuel transfer. Limited visibility in the pool caused by cloudy

water and a lack of pool underwater lighting may have prevented visual detection of the misplaced fuel assembly. No QA (quality assurance) reviews were required or conducted of the irradiated fuel assemblies locations between fuel movements and the exposure incident.

- (2) The prior-to-work radiation survey of the pool was performed with an underwater ionization chamber connected by a long cable to the detector. These surveys failed to detect the misplaced fuel assembly's radiation field of several hundred R/hr within two feet of the divers work area. Intermittent, erratic underwater survey instrument behavior had been observed during previous dives. The licensee attributed the survey instrument's erratic behavior to a buildup of moisture in the underwater detector chamber housing.
- (3) Radiation monitoring devices used during the underwater operations failed to function properly. Alarming dosimeters, mounted inside the divers' helmets, failed to alarm at the 200 mR set point. These dosimeters were under the control of the diving contractor and were not source checked on the day of the incident. The licensee monitored the dive with the same ionization chamber instrument used for the pre-dive survey, and failed to detect any radiation fields in excess of 1 R/hr in the diver work area.

Discussion:

The licensee increased senior management oversight for the spent fuel pool project and implemented the following corrective actions.

- (1) Whenever fuel movement occurs, QA personnel will independently witness and verify the new locations of the fuel assemblies. Other irradiated objects greater than 1 R/hr on contact will be controlled in a similar manner. After any movement of either fuel or irradiated components (>1 R/hr), an underwater radiation survey will be conducted before any diving operations will resume.
- (2) Daily, before any diving operation, a radiation survey of the diving area will be conducted. This survey will be performed using two independent radiation exposure monitoring devices. A survey map of the pool will be updated to reflect current status of ongoing fuel rack modification.
- (3) Each diver will be equipped with a calibrated, alarming dosimeter; this dosimeter will be checked each day before diving operations begin. Each diver will also be equipped with a remote-readout radiation detector which will be continuously monitored by health physics technicians. The divers will surface and have their dosimetry checked periodically; any significant deviation from the expected dive work pattern or radiation levels will be grounds for dive termination.
- (4) Fuel pool clarity and underwater lighting acceptance criteria have been established to help ensure adequate visibility is maintained.

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No written response to this information notice is required. If you need additional information about this matter, please contact the Regional Administrator of the appropriate NRC Regional Office.

Robert J. Baer

for Edward Jordan, Director
Division of Engineering and
Quality Assurance
Office of Inspection and Enforcement

Technical Contact: J. E. Wigginton
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Attachment:
List of Recently Issued IE Information Notices

LIST OF RECENTLY ISSUED
 IE INFORMATION NOTICES

Information Notice No.	Subject	Date of Issue	Issued to
82-30	Loss of Thermal Sleeves in Reactor Coolant System Piping at Certain Westinghouse PWR Power Plants	7/26/82	All power reactor facilities holding an OL or CP and applicants for operating licensee (NTOL)
82-29	Control Rod Drive (CRD) Guide Tube Support Pin Failures at Westinghouse PWRs	7/23/82	All power reactor facilities holding an OL or CP Westinghouse-designed NSSS
82-28	Hydrogen Explosion While Grinding in the Vicinity of Drained and Open Reactor Coolant System	7/23/82	All power reactor facilities holding an OL or CP
82-27	This number is will be reissued.		
82-26	RCIC and HPCI Turbine Exhaust Check Valve Failures	7/23/82	All BWR power reactor facilities holding and OL or CP
82-25	Failures of Hiller Actuators upon Gradual Loss of Air Pressure	7/22/82	All power reactor facilities holding an OL or CP
82-24	Water Leaking from Uranium Hexafluoride Overpacks	7/20/82	All NRC licensed enriched uranium fuel fabrication plants
81-26, Part 3, Sup. No. 1	Clarification of Placement of Personnel Monitoring Devices for External Radiation	7/20/82	All power reactor facilities holding an OL or CP
82-23	Main Steam Isolation Valve (MSIV) Leakage	7/16/82	All BWR power reactor facilities holding an OL or CP
82-22	Failures in Turbine Exhaust Lines	7/9/82	All power reactor facilities holding an OL or CP

OL = Operating License
 CP = Construction Permit