UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555-0001

December 11, 1995

NRC INFORMATION NOTICE 95-56: SHIELDING DEFICIENCY IN SPENT FUEL TRANSFER CANAL AT A BOILING-WATER REACTOR

Addressees

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to an event at a boiling-water reactor where the mishandling of highly activated materials in the flooded spent fuel transfer canal caused unexpectedly high radiation fields in a hallway under the canal. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances

On November 11, 1994, contractors were conducting underwater operations in the Unit 1 spent fuel pool in the cutting tool working area at the Edwin I. Hatch Nuclear Plant (Inspection Report 50-321/95-01 and 50-366/95-01 [Accession Number 9502140081])--cutting coupons out of spent control rod blades containing the upper guide roller bearings (see Attachment 1). The highly activated Stellite bearings (some measured as high as 160 sievert [16,000 rem] per hour at 30 centimeters [12 inches] under water) were being collected adjacent to the Unit 1 work area. Periodically, the coupons containing the upper guide roller bearings were transferred from the collection bucket to a cask liner in the shipping cask storage area in the Unit 2 spent fuel pool. When the workers could not find the tool to open the liner, they decided to transfer the coupons in the collection bucket (about half full, with 160 coupons) into another bucket for temporary storage, so that the cutting process could continue. To facilitate the task, the offload was performed in the transfer canal since the canal was much shallower than the fuel pools. During the transfer, some of the coupons fell to the bottom of the transfer canal. Since the transfer canal was designed and routinely used as a transit area for highly activated material, including spent fuel, the workers were not concerned about dropping the coupons and saw no need to notify the unit shift foreman or the control room of the incident. They recovered the coupons from the bottom of the canal and placed them in the storage bucket resting on the canal floor.

About 30 minutes after the coupons were dropped, a plant equipment operator was walking through the Unit 1 (56.4-meter [185-foot] elevation) hallway directly under the transfer canal (see Attachment 2), when his digital alarm dosimeter alarmed on high dose rate (set at 0.5 msievert [50 mrem] per hour). The plant equipment operator left the area promptly and notified a health physics supervisor, who sent a health physics technician to the area. When the health physics technician also found the elevated radiation levels described above, he secured the area, investigated for the source of the high radiation levels, and informed shift management. The licensee measured radiation levels of up to 1 sievert [100 rem] per hour on contact with the hallway ceiling directly below the bottom of the canal, and 0.05 to 0.1 sievert [5 to 10 rem] per hour in the general area of the hallway. The plant equipment operator received a dose equivalent of about 0.1 msievert [10 mrem] from the event. The licensee has always required that all personnel entering the radiological controlled area be issued dosimeters. Before alarm dosimeters were required, all workers entering the radiologically controlled area were issued personal dosimeters (non-alarm), so any doses to workers from this shielding deficiency would have been detected and accounted for as part of the routine dosimetry program.

In response to the event, Hatch Nuclear Plant management instituted procedural controls to prohibit the use of the transfer canal until doors had been installed, in order to exclude worker access to the affected hallway. Before the transfer gates are allowed to be lifted (allowing use of the transfer canal), the doors at each end of hallway under the canal are locked, and access to the hallway is controlled as a very high radiation area, as defined in 10 CFR 20.1602, "Control of Access to Very High Radiation Areas."

At the Limerick Generating Station recently, the licensee took the initiative to reevaluate the adequacy of its spent fuel pool shielding before commencing the reracking of its Unit 2 fuel pool. A thorough engineering review examined the radiation levels in the accessible areas under the spent fuel pool and associated transfer canals and cask pit area. This review revealed (using conservative shielding assumptions) that a dropped spent fuel bundle could create a high radiation area in areas below the cask wash pit that were accessible to personnel. Before commencing fuel movement, the Limerick staff established precautionary radiological controls (posted as high radiation area/radiation work permit required for entry) and radiation monitoring (portable area radiation monitor) for the affected area.

Discussion

A portion of the shielding directly under the transfer canal at Hatch Nuclear Plant is inadequate to prevent unacceptable external dose rates in the hallway below, should a highly activated component be placed near, or in contact with, the canal floor (with attendant loss of water shielding). Therefore, even with a successful bucket-to-bucket transfer (no dropped coupons), with the loaded bucket stored and resting on the canal floor, the hallway radiation levels would have been essentially the same as for the actual event.

Many licensees perform spent fuel pool modifications and major cleanup activities involving handling and moving large quantities of highly activated

materials, including spent fuel. In general, the industry has significantly improved its awareness of and controls for potentially high and very high radiation areas caused by operational mishaps (e.g., dropping a spent fuel bundle in the transfer canal directly over the upper drywell in a boiling-water reactor, and the hazards of withdrawn incore thimbles under the reactor vessel at pressurized-water reactors). Initiatives such as those taken by the Limerick Station should help prevent unexpected, uncontrolled worker exposures with the potential for exceeding the regulatory limits. A thorough prejob evaluation of activities involving highly activated (or potentially highly activated) components can help identify challenges to existing plant shielding.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation project manager.

Dennis M. Crutchfield, Director
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Office of Nuclear Reactor Regulation

Technical contacts: Jim Wigginton, NRR
(301) 415-1059

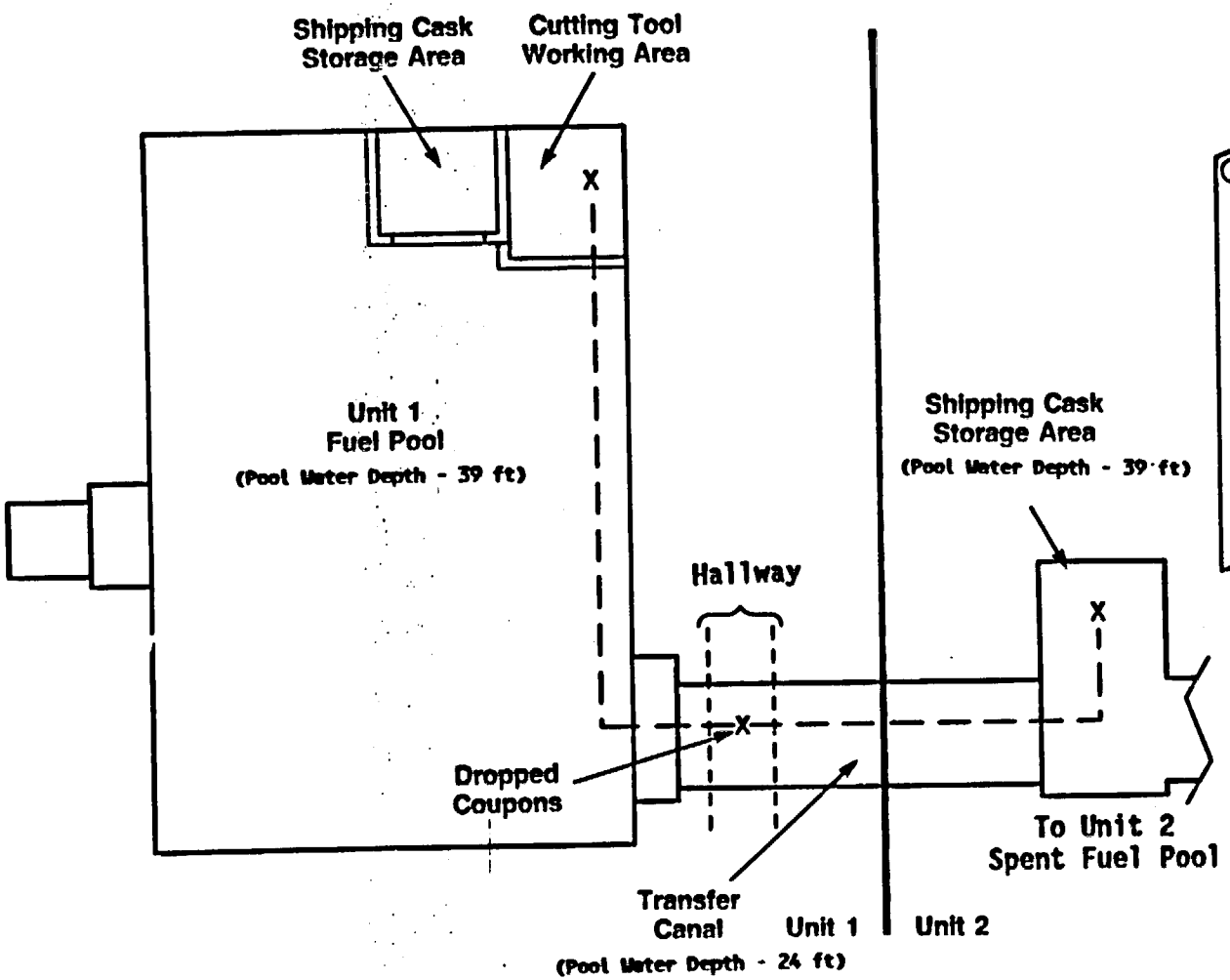
Roger Pedersen, NRR
(301) 415-3162

Wade Loo, RII
(404) 331-2831

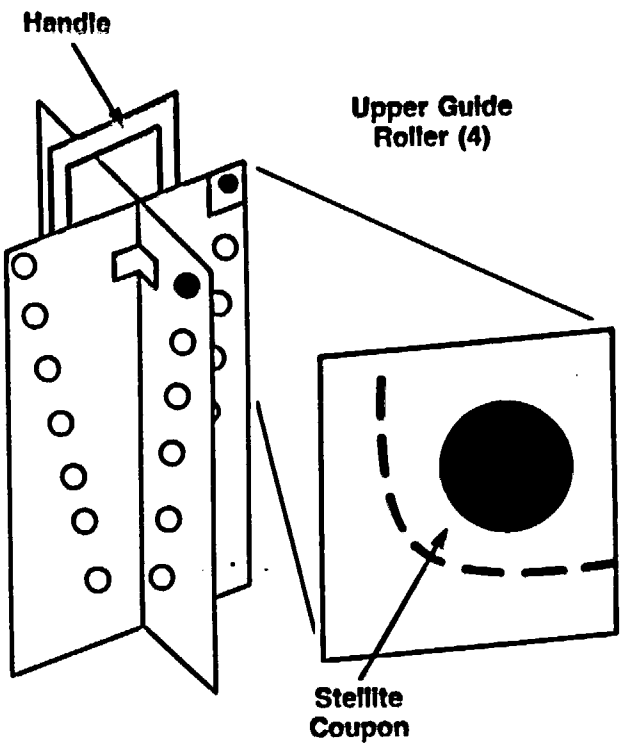
Attachments:
1. Under Water Operations Event in the Spent Fuel Pool At Hatch
2. Unexpected High Radiation Area at Hatch
3. List of Recently Issued NRC Information Notices

Attachments filed in Jacket

Stellite Coupon Movement

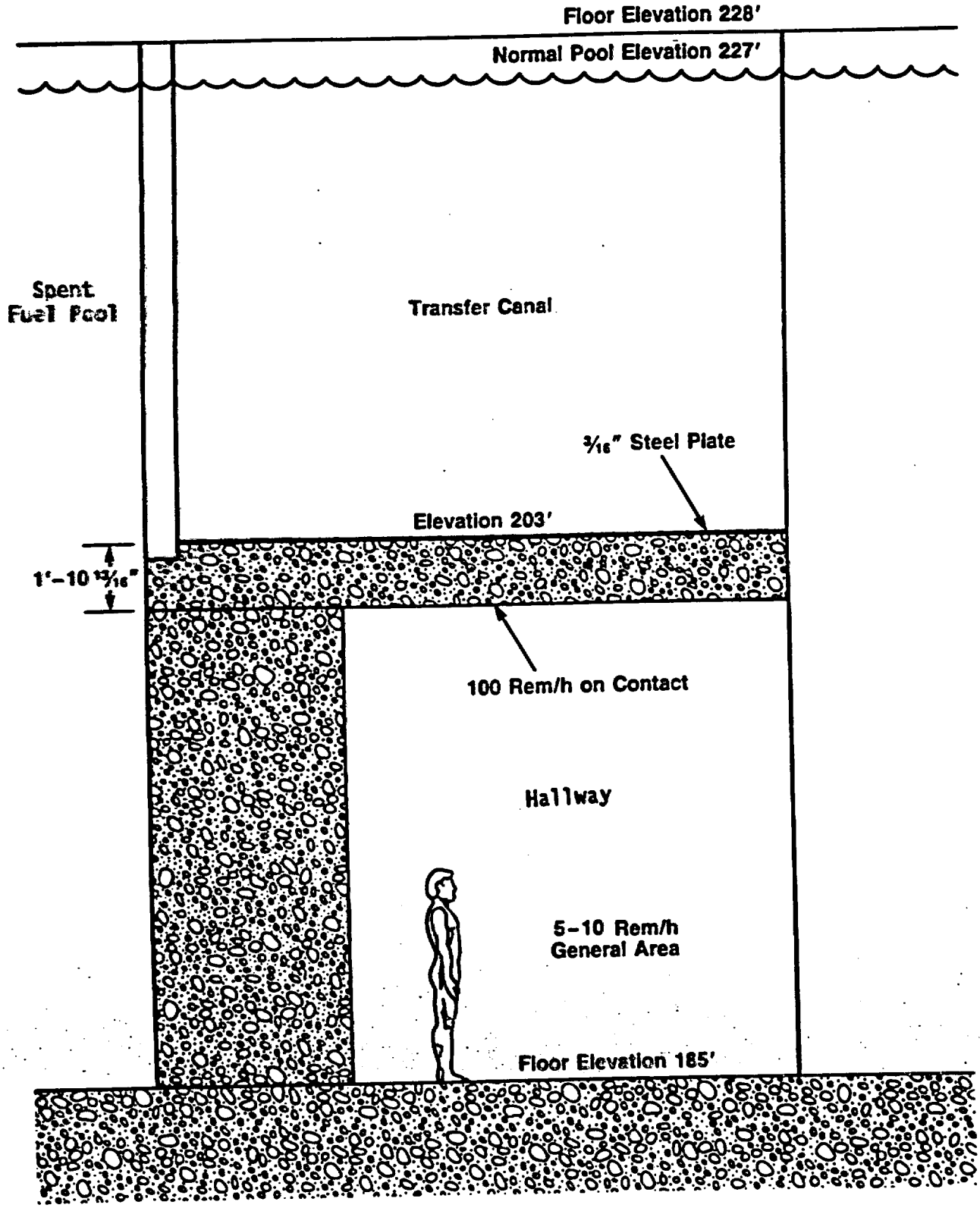


Top of Typical Control Rod



Coupon is About 1.25" on Edge.
Stellite Ball is About ⅜" Dia.

Underwater Operations Event in the Spent Fuel Pool at Hatch



Unexpected High Radiation Area at Hatch

LIST OF RECENTLY ISSUED NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
95-55	Handling Uncontained Yellowcake Outside of a Facility Processing Circuit	12/06/95	All Uranium Recovery Licensees.
95-54	Decay Heat Management Practices during Refueling Outages	12/01/95	All holders of OLs or CPs for nuclear power reactors.
95-53	Failures of Main Steam Isolation Valves as a Result of Sticking Solenoid Pilot Valves	12/01/95	All holders of OLs or CPs for nuclear power reactors.
95-47, Rev. 1	Unexpected Opening of a Safety/Relief Valve and Complications Involving Suppression Pool Cooling Strainer Blockage	11/30/95	All holders of OLs or CPs for nuclear power reactors.
94-13, Supp. 2	Control and Oversight of Contractors during Refueling Activities and Clarificaiton of Applicability of Section 50.120 of Title 10 of The Code of Federal Regulations to Contractor Personnel	11/28/95	All holders of OLs or CPs for nuclear power reactors.
95-13, Supp. 1	Potential for Data Collection Equipment to Affect Protection System Performance	11/22/95	All holders of OLs or CPs for nuclear power reactors.
91-29, Supp. 3	Deficiencies Identified during Electrical Distribution System Functional Inspections	11/22/95	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
CP = Construction Permit

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