

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

November 22, 1988

NRC INFORMATION NOTICE NO. 88-92: POTENTIAL FOR SPENT FUEL POOL DRAINDOWN

Addressees:

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

Purpose:

This information notice is being provided to alert addressees to potential problems resulting from the failure of the fuel transfer canal door seal. 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 do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

On October 2, 1988, with Surry Unit 1 in cold shutdown, the licensee was preparing to test the fuel transfer system (see attached figure) before fuel off-load. The transfer canal door was in place and the single door seal was inflated. The fuel transfer canal was dry. The fuel transfer tube was open, the blind flange was removed on the containment side, and the gate valve was open on the spent fuel pool side. The refueling cavity seal was not in place. An accidental pinhole puncture of the single air supply line to the transfer canal door pneumatic seal was promptly detected and the air leak quickly stopped before it could lead to a loss of seal integrity.

Discussion:

A review of this event by the licensee showed that, given the configuration of the transfer canal, the transfer tube, and the refueling cavity existing at the time of the event, an inadvertent draindown of the spent fuel pool could occur to a height of only 13" above the top of the fuel assemblies (see attached figure). This postulated draindown assumes no operator action and a loss of instrument air or pneumatic seal failure. Increased radiation levels in the spent fuel pool building would have limited stay time in the building and impeded recovery. The licensee estimated that the dose rate, based on the spent fuel inventory at the time of the event, could have reached 50 R/hour on the operating deck. The licensee also calculated that with the refueling cavity seal assembly in place, the spent fuel pool could only draindown to 14 feet above the top of the fuel assemblies.

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If newly discharged fuel had been placed in the spent fuel pool, a postulated draindown of the spent fuel pool could have led to even higher radiation levels in the spent fuel pool building than the radiation levels postulated by the licensee. If a seal failed and spent fuel pool water were lost while a fuel assembly was lifted, fuel could be uncovered and fuel cladding could fail.

The licensee is considering several actions based on the review of this event. The short-term actions include: (1) revising procedures to require that the refueling cavity seal assembly be installed before opening the transfer tube gate valve for dry testing the fuel transfer system, (2) reviewing and upgrading a procedure for the loss of spent fuel pool inventory, (3) upgrading the material of the plastic air hose in which the pinhole occurred, and (4) providing an emergency escape system for personnel in the transfer canal. The long-term actions include: (1) evaluating the canal door and seal design including the need for a backup air supply, a low air pressure alarm, and a backup seal, (2) evaluating other pneumatic seals used at Surry, (3) developing a procedure for installing, inspecting, and testing the seals in accordance with the manufacturer's recommendations, (4) revising procedures to ensure the transfer tube blind flange is installed whenever the transfer canal is drained for maintenance on the transfer tube gate valve, and (5) reviewing further the procedures for loss of spent fuel pool and refueling cavity water level, after the short-term modifications to these procedures.

In 1981, a related event occurred at Arkansas Nuclear One, Unit 2. At the end of a refueling outage with the transfer canal door closed and the door seal inflated, the transfer canal was drained in preparation for performing maintenance on the fuel upender. Concurrent maintenance on the air system resulted in a loss of air pressure to the seal, and water leaked from the spent fuel pool into the fuel upender pit. The transfer gate valve was closed and acted as a barrier to the flow. The leakage stopped when the water levels equalized. The spent fuel pool level had decreased by 7 feet. If the seal had leaked while the maintenance on the upender was in progress with the fuel transfer tube gate valve open and the fuel transfer tube blind flange removed, the spent fuel pool could have drained down to a level just above the top of the fuel assemblies.

Pneumatic seals are also used in the refueling cavity seal assembly. In many cases, the failure modes of the refueling cavity seals (IE Bulletin 84-03, "Refueling Cavity Water Seal" and Information Notice 84-93, "Potential for Loss of Water From the Refueling Cavity") apply to the spent fuel pool gate seals.

These events show that a door equipped with a single seal and/or a single air supply is subject to complete loss of function from a single failure. Therefore, the seal must be properly installed, and the seal and air supply system must be carefully maintained. The scenarios discussed also point out the need for carefully coordinating such activities as maintenance and testing to avoid undesirable interactions between systems which could result in fuel uncover, personnel injury, and personnel contamination.

No specific action or written response is required by this information notice. If you have any questions about this matter, please contact the technical contact listed below or the Regional Administrator of the appropriate regional office.

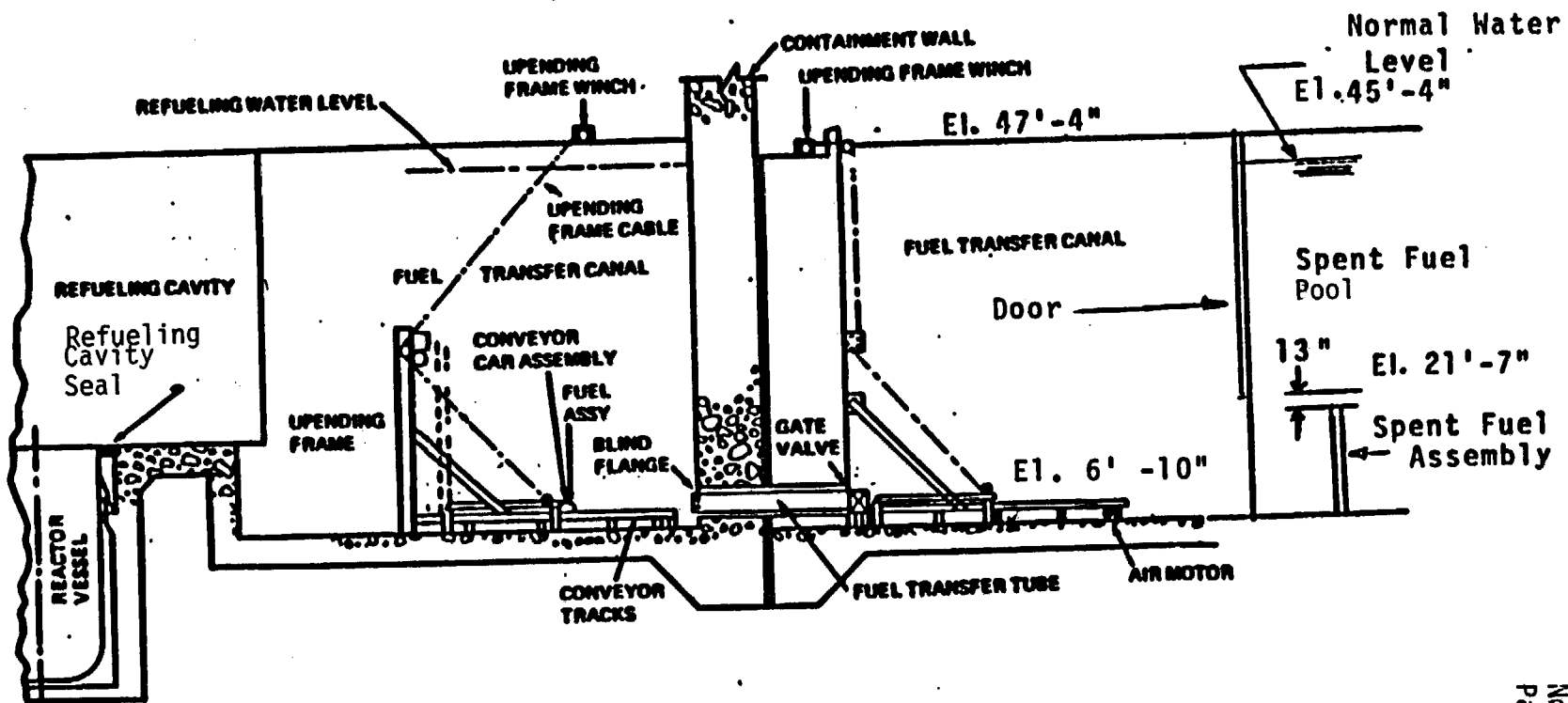


Charles E. Rossi, Director
Division of Operational Events Assessment
Office of Nuclear Reactor Regulation

Technical Contact: Daniele Oudinot, NRR
(301) 492-1174

Attachments:

1. Figure of Fuel Transfer System
2. List of Recently Issued NRC Information Notices



FUEL TRANSFER SYSTEM

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

| Information Notice No. | Subject | Date of Issuance | Issued to |
|---------------------------|--|---------------------|---|
| 88-91 | Improper Administration and Control of Psychological Tests | 11/22/88 | All holders of OLs or CPs for nuclear power reactors and all fuel cycle facility licensees who possess, use, import, export, or transport formula quantities of strategic special nuclear material. |
| 88-90 | Unauthorized Removal of Industrial Nuclear Gauges | 11/22/88 | All NRC licensees authorized to possess, use, manufacture, or distribute industrial nuclear gauges. |
| 88-89 | Degradation of Kapton Electrical Insulation | 11/21/88 | All holders of OLs or CPs for nuclear power reactors. |
| 88-88 | Degradation of Westinghouse ARD Relays | 11/16/88 | All holders of OLs or CPs for nuclear power reactors. |
| 88-87 | Pump Wear and Foreign Objects in Plant Piping Systems | 11/16/88 | All holders of OLs or CPs for nuclear power reactors. |
| 86-106, Supp. 3 | Feedwater Line Break | 11/10/88 | All holders of OLs or CPs for nuclear power reactors. |
| 88-86 | Operating with Multiple Grounds in Direct Current Distribution Systems | 10/21/88 | All holders of OLs or CPs for nuclear power reactors. |
| 88-85 | Broken Retaining Block Studs on Anchor Darling Check Valves | 10/14/88 | All holders of OLs or CPs for nuclear power reactors. |

OL = Operating License
CP = Construction Permit

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*SEE PREVIOUS PAGE FOR CONCURRENCE

*Tech Ed
11/7/88

Final draft
EAB:NRR
DOudinot:db
11/17/88

Final Draft
EAB:NRR
RLobel *RL*
11/17/88

*C:EAB:NRR
WLanning
11/10/88

*C:OGCB:NRR
CHBerlinger
11/10/88

D. DOEA:NRR
CERossi
11/17/88

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*SEE PREVIOUS PAGE FOR CONCURRENCE

*Tech Ed
11/7/88

RL
EAB:NRR
Doudinot:db
11/9/88

EAB:NRR
RLobel
11/10/88

MB
EAB:NRR
Wanning
11/11/88

with copy
CHB
C:OGCB:NRR
CHBerlinger
11/10/88

D:DOEA:NRR
CERossi
11/ /88

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Figure of Fuel Transfer System
List of Recently Issued NRC Information Notices

Tech 2d RS
11/1/88

~~EAB:NRR~~
DOudinot:db
11/17/88

EAB:NRR
RLobel
/ /88

~~WHL:BN22~~
~~CPatel~~
~~1/1/88~~

C:EAB:NRR
WLanning
/ /88

C:OGCB:NRR
CHBerlinger
/ /88

D:DOEA:NRR
CERossi
/ /88