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

March 28, 1994

NRC INFORMATION NOTICE 94-26: PERSONNEL HAZARDS AND OTHER PROBLEMS FROM SMOLDERING FIRE-RETARDANT MATERIAL IN THE DRYWELL OF 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 licensees to the potential for large amounts of thick, acrid smoke to be produced from smoldering fire-retardant plastic sheeting. 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 December 28, 1993, a fire occurred in the drywell of the Shoreham Nuclear Power Station (Shoreham). Shoreham, a boiling-water reactor with a Mark II containment, is currently undergoing decommissioning. The fire was caused by hot slag that fell from the 137-foot elevation of the drywell where workers were cutting a biological shield wall stabilizer support with an oxyacetylene torch. The hot slag dropped through an opening in the biological shield wall onto paper toweling and a coil of hemp rope at the 102-foot elevation, setting them on fire. The burning rope subsequently dropped to the 78-foot level and landed just below a temporary water collection system in the annulus space between the lower portion of the reactor pressure vessel support pedestal and the shield wall. The collection system was constructed of rope and fire-retardant plastic sheeting (Herculite and Griffolyn) and had been installed to collect the runoff of potentially radioactive water expected from cutting the shield wall. The burning rope made the plastic sheeting smolder, giving off a large quantity of thick, acrid smoke. Because of the smoke, it was difficult for personnel in the area to breathe and to see in which direction to go to leave the drywell.

Workers in the area saw the smoke and alerted the control room to a suspected fire. The control room operators activated the plant fire brigade which entered the drywell wearing self-contained breathing apparatus. However, the fire brigade was unable to locate the source of the smoke because the dense

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smoke blocked their vision. To help locate the source, the fire brigade asked the control room to place the reactor building normal ventilation system on standby. This action was not effective and the fire brigade leader informed the control room that the fire brigade could not find the source of the smoke. The control room operators called the local off-site fire department to help find and suppress the fire.

The plant fire brigade made sure that all personnel had been evacuated from the area and again searched for the source of the smoke. The local fire department entered the drywell to search for the fire and found some burnt paper toweling and charred rope. About this time, the smoke in the drywell began to clear, apparently because the combustible material feeding the fire had been consumed. No flames were observed during the event. The plant fire brigade checked the area for ignition sources and found none. The licensee suspended work inside the drywell and continued to investigate. The licensee determined that the smoke had come from an approximately 5.5-square-meter [60-square-foot] section of the plastic sheeting that made up the collection trough.

The licensee determined that the fire had not harmed station equipment or affected nuclear safety. However, 11 personnel reported to the first aid station suffering from smoke inhalation. The licensee found the following weaknesses in industrial safety practices:

- Openings in the biological shield wall had not been covered to prevent hot slag from passing through.
- Fire protection measures were not adequately understood or were not adequately specified in the fire permit.
- The fire permit did not clearly assign responsibility to check the area for combustible materials before cutting the structural support.
- Workers were not required to look for day-to-day changes in the work area, such as the presence of combustibles in vulnerable locations.

Discussion

The plastic sheeting materials involved in this event are commonly used at many nuclear power stations. Although these materials are fire-retardant, they are capable of generating large amounts of smoke when involved in or exposed to a fire condition. The total amount of material that was burned or smoldered at Shoreham was small; however the smoke from the smoldering plastic created significant hazards for personnel in the drywell and made it impossible for the fire brigade to locate the source of the smoke. Because of the smoke, personnel in the drywell were unable to see in which direction to go to exit the drywell or to avoid the fire. Several of the plant personnel suffered smoke inhalation.

The Material Safety data Sheets for the Herculite and Griffolyn sheeting state that those materials produce hydrogen chloride gas when burned and that self-contained breathing apparatus should be worn when attempting to extinguish fires involving these materials. In addition to the hazard of smoke inhalation, there is a potential for toxic side-effects from these fires.

Because these and similar plastic materials are routinely used at nuclear facilities for contamination control, welding flash shields, and other purposes, it is important to recognize that, if these materials are exposed to or are involved in a fire, they generate a large quantity of smoke that creates hazards for plant workers and may adversely affect plant operations or fire-fighting efforts. These problems are exacerbated in confined spaces or in areas with limited ventilation.

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

Brian K. Grimes, Director
Division of Operating Reactor Support
Office of Nuclear Reactor Regulation

Technical contacts: R. L. Nimitz, RI
(215) 337-5267

F. L. Bower III, RI
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(301) 504-2854

Attachment:
List of Recently Issued NRC Information Notices
Computer Printout/ see Jacket

LIST OF RECENTLY ISSUED NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
93-17, Rev. 1	Safety Systems Response to Loss of Coolant and Loss of Offsite Power	03/25/94	All holders of Ols or CPs for nuclear power.
94-25	Failure of Containment Spray Header Valve to Open due to Excessive Pressure from Inertial Effects of Water	03/25/94	All holders of OLs or CPs for nuclear power reactors.
94-24	Inadequate Maintenance of Uninterruptible Power Supplies and Inverters	03/24/94	All holders of OLs or CPs for nuclear power reactors.
94-23	Guidance to Hazardous, Radioactive and Mixed Waste Generators on the Elements of a Waste Minimization Program	03/25/94	All NRC Licensees.
94-22	Fire Endurance and Ampacity Derating Test Results for 3-Hour Fire-Rated Thermo-Lag 330-1 Fire Barriers	03/16/94	All holders of OLs or CPs for nuclear power reactors.
94-21	Regulatory Requirements when No Operations are being Performed	03/18/94	All fuel cycle and materials licensees.
94-20	Common-Cause Failures due to Inadequate Design Control and Dedication	03/17/94	All holders of OLs or CPs for nuclear power reactors.
94-19	Emergency Diesel Generator Vulnerability to Failure from Cold Fuel Oil	03/16/94	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
CP = Construction Permit

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Original signed by
Brian K. Grimes

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OFFICE	SPLB:DSSA:NRR	SPLB:DSSA:NRR	C/SPLB:DSSA:NRR	D/DSSA:NRR
NAME	PMadden*	SKWest*	CEMcCracken*	MJVirgilio*
DATE	03/01/94	03/01/94	03/03/94	03/07/94

TECH ED	OGCB:DORS:NRR	AC/OGCB:DORS:NRR	D/DORS:NRR
RSanders*	JLBirmingham*	AJKugler*	BKGrimes
03/01/94	03/08/94	03/14/94	03/23/94

OFFFICIAL DOCUMENT NAME: 94-26.IN

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OFFFICIAL DOCUMENT NAME: FIREIN3.JLB

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NAME	PMadden	SKWest	CEMcCracken	MJVirgilio
DATE	03/1/94	03/1/94	03/3/94	03/7/94

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