

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

June 27, 1991

**NRC INFORMATION NOTICE NO. 91-41: POTENTIAL PROBLEMS WITH
THE USE OF FREEZE SEALS**

Addressees:

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

Purpose:

This information notice is intended to alert addressees to the potential consequences associated with failure of freeze seals used to perform maintenance in piping systems. Of particular concern would be a failure when used in a portion of the reactor coolant system pressure boundary where failure could lead to core uncover. 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 April 19, 1989, at the River Bend Station, a freeze seal failed on a 6-inch service water line. The freeze seal was used to allow inspection and repair of manual isolation valves to a safety-related auxiliary building cooler. The bonnet of one manually operated valve was off the valve and the service water system was in operation at the time of the event. The failure of the freeze seal resulted in the flooding of portions of the auxiliary building. Approximately 15,000 gallons of service water were discharged through the disassembled isolation valve, covering portions of the floor at the 141-foot level of the auxiliary building. A portion of the water flowed through holes in the floor under safety-related 480-Vac motor control centers onto nonsafety-related cabinets on the 114-foot level containing disconnect links and a 13.8-kV/480-Vac transformer. As the cabinets were not designed to shed water, they allowed the water to enter, shorting circuits and causing a fire that damaged one cabinet and its components. A 13.8-kV supply breaker opened and deenergized the cabinet and two others, causing the loss of the operating residual heat removal (RHR) system, normal spent fuel cooling, and normal lighting in the auxiliary building, the control building, and the reactor building. The operators isolated the service water system in 15 minutes and restarted the RHR system in 17 minutes. Further details may be found in NRC Augmented Inspection Team Inspection Report No. 50-458/89-20 and Licensee Event Report 50-458/89-020.

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Updated on 7/15/91
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PDR I&E Notice 91-041 910627

While the Oconee Nuclear Station, Unit 1, was shut down for a refueling outage in 1987, the licensee used a freeze seal to enable plant personnel to replace a 3-inch-diameter section of low-pressure injection piping because no valves were available to isolate the affected piping. The freeze seal was in a line connected to the borated water storage tank, which supplies borated water for the low-pressure injection system. The freeze seal failed, and approximately 30,000 gallons of slightly radioactively contaminated water leaked into various areas of the auxiliary building. A portion of the water from the borated water storage tank drained through the station yard drainage system and flowed past the site boundary before the leak was brought under control 8 hours after the freeze seal failed. Further information may be found in NRC Inspection Report No. 50-269/87-51.

Discussion:

Freeze seals are used to isolate components (such as inboard isolation valves) for maintenance in locations that cannot otherwise be isolated. The seal is created and maintained by applying a cooling agent such as liquid nitrogen to the exterior of the pipe. The cooling agent freezes the water within the pipe section, thus sealing the pipe. When used in the reactor coolant system (RCS) pressure boundary, these freeze seals become a temporary part of the pressure boundary. Therefore, if a freeze seal fails, it can result in an immediate loss of primary coolant. Of particular concern would be a failure of a freeze seal in a system connecting to the vessel's lower plenum region, such as the reactor water cleanup (RWCU) system at boiling water reactor (BWR) facilities. The staff has estimated that the reactor core could be uncovered in less than 1 hour if the freeze seal failed completely in the RWCU system.

Freeze seal failures in secondary systems can also be significant because of the potential for consequential failures, such as the loss of decay heat removal in the River Bend event. The licensee for the River Bend Station attributed the causes of the event to procedural inadequacies that resulted in a failure to install and monitor a temperature detection device, and to a lack of personnel training in the use of freeze seals.

Some licensees have used piping mockups to thoroughly evaluate freeze seal applications prior to their use on reactor system piping. Important considerations include examining training, procedures, and contingency plans associated with the use of freeze seals, and evaluating the need for and availability of additional water makeup systems and their associated support systems.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact the technical contact listed below or the appropriate NRR project manager.

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

Technical Contact: Amy E. Almond, NRR
(301) 492-0875

Attachment: List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
88-63, Supp. 2	High Radiation Hazards from Irradiated In-core Detectors and Cables	06/25/91	All holders of OLs or CPs for nuclear power reactors, research reactors, and test reactors.
91-40	Contamination of Non-radioactive System and Resulting Possibility for Unmonitored, Uncontrolled Release to the Environment	06/19/91	All holders of OLs or CPs for nuclear power reactors.
91-39	Compliance with 10 CFR Part 21, "Reporting of Defects and Noncompliance"	06/17/91	All Nuclear Regulatory Commission (NRC) material licensees.
91-38	Thermal Stratification in Feedwater System Piping	06/13/91	All holders of OLs or CPs for nuclear power reactors.
91-37	Compressed Gas Cylinder Missile Hazards	06/10/91	All holders of OLs or CPs for nuclear power reactors.
91-36	Nuclear Plant Staff Working Hours	06/10/91	All holders of OLs or CPs for nuclear power reactors.
91-35	Labeling Requirements for Transporting Multi-Hazard Radioactive Materials	06/07/91	All U.S. Nuclear Regulatory Commission (NRC) licensees.
91-34	Potential Problems in Identifying Causes of Emergency Diesel Generator Malfunctions	06/03/91	All holders of OLs or CPs for nuclear power reactors.
91-33	Reactor Safety Information for States During Exercises and Emergencies	05/31/91	All holders of OLs or CPs for nuclear power reactors.
91-32	Possible Flaws in Certain Piping Systems Fabricated by Associated Piping and Engineering	05/15/91	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
CP = Construction Permit

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Original Signed by
Charles E. Rossi

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

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*SEE PREVIOUS CONCURRENCES

D/DOEA-NRR CERose 06/24/91	*C/OGCB:DOEA:NRR CHBerlinger 06/14/91	*RPB:ADM TechEd 06/14/91	*C/RII DMVerrelli 06/14/91
*OGCB:DOEA:NRR*SRXB:DST:NRR PCWen 06/07/91	AEAlmond 06/11/91	*SC/SRXB:DST:NRR TECollins 06/11/91	*D/DST:NRR ATHadani 06/14/91

DOCUMENT NAME: IN 91-41

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Document Name: FREEZE SEAL FAILURE

*SEE PREVIOUS CONCURRENCES

D/DOEA:NRR

CERossi *for*

06/ /91

*OGCB:DOEA:NRR*SRXB:DST:NRR

PCWen

06/07/91

AEAlmond

06/11/91

NPK
C/OGCB:DOEA:NRR

CHBerlinger

06/14/91

*SC/SRXB:DST:NRR

TECollins

06/11/91

*RPB:ADM

TechEd

06/14/91

*C/SRXB:DST:NRR

RCJones

06/11/91

*C/RII

DMVerrelli

06/14/91

*D/DST:NRR

ATHadani

06/14/91

their use on reactor system piping. - Licensees may wish to consider the use of such training.

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<i>PCW</i>	D/DOEA:NRR	C/OGCB:DOEA:NRR	RPB:ADM	<i>PCW</i>	PER TEL CON WITH
OGCB:DOEA:NRR	CERossi	CHBerlinger	TechEd JMain 970	C/RII	DAVE VERRELLI ON
PCWen	06/ /91	06/ /91	06/14/91	<i>for</i> DMVerrelli	6/14/91
06/7/91	SRXB:DST:NRR	SC/SRXB:DST:NRR	C/SRXB-DST:NRR	D/DST:NRR	6/12
	AEAmond	TECollins	RCJones	ATHadan	30.1
	06/11/91 <i>PCW</i>	06/11/91	06/11/91	06/14/91	