

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

March 31, 1994

**NRC INFORMATION NOTICE 94-27: FACILITY OPERATING CONCERNS RESULTING FROM LOCAL AREA FLOODING**

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 emergency preparedness, equipment operability and radiological control problems that may result from local area flooding. 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.

Background

The Cooper Nuclear Station is located between Nemaha and Brownville, Nebraska and is adjacent to the Missouri River. The facility floor and plant grade elevations are about 275 meters [903 feet] above mean sea level. The elevation of the area surrounding the plant is about 271.3 meters [890 feet] and the area is protected by a levee to an elevation of 274.9 meters [902 feet]. The normal groundwater table is 267.9 meters [879 feet]. The level for the 1000-year flood and the 10,000-year flood are predicted to be 274.3 and 274.9 meters [900 and 902 feet], respectively. During this event, the Missouri River peaked at 274.6 meters [900.8 feet].

Description of Circumstances

During the months of June and July 1993, the State of Nebraska and several surrounding states experienced record rainfalls that caused flooding over extensive areas. In accordance with plant flood procedures, the licensee for the Cooper Nuclear Station had placed barriers around the entrances to the reactor building, the radwaste building, the turbine building and the diesel generator rooms when the water level in the Missouri River reached 273.4 meters [897 feet]. On July 21, the licensee began a reactor startup from a scheduled refueling and maintenance outage. At that time, the river level was 273.1 meters [896 feet] and decreasing.

On July 22 and 23, the river level rose rapidly and, at 10:35 a.m. on July 23, the licensee decided to shut down the reactor. At 6:19 p.m. on July 23, the

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licensee declared a Notice Of Unusual Event when the water level in the Missouri River reached 274.0 meters [899 feet]. The river level continued to rise and subsequently peaked at 274.6 meters [900.8 feet]. The elevated river level caused the closure of several area roads including a portion of Interstate 29 and Route 136 in the State of Missouri which isolated one of the planned emergency evacuation routes.

Subsequent to the reactor shutdown, the licensee noted increased inleakage. The vital area rooms outside of the radiologically controlled areas were relatively dry with only a minor amount of water leaking in through the concrete walls below ground elevation. However, some of the below-grade rooms inside radiologically controlled areas in the turbine building and the reactor building, had extensive inleakage. In some cases, the inleakage significantly challenged the capacity of the floor drains. Examples of this problem were: (1) a lower hallway in the turbine building where standing water was found and water was leaking in around safety-related cable trays and (2) the turbine-driven feedwater pump rooms where water was dripping on control boxes, and the floor drain system had backed up so that standing water from within areas known to be radiologically contaminated had migrated out into designated clean areas. The NRC inspectors observed that plant personnel had not taken actions to identify the areas where inleakage was occurring and had not established measures to divert the water away from important components. The turbine building inleakage was eventually stopped when the licensee pumped out the underground cable tunnels that encircled the plant. The heavy rains had flooded the cable tunnels and water was covering the manways and storm drains at grade level.

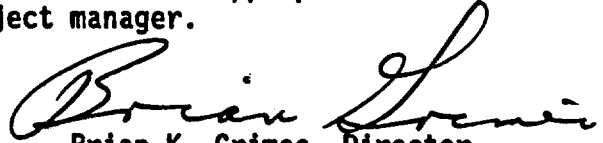
Similar problems were observed in the reactor building quadrant rooms and torus room. Water leaking into the reactor core isolation cooling (RCIC) pump room was impinging on RCIC electrical components. Subsequently, an annunciator lit up indicating a ground in the RCIC 250-V dc circuitry. This ground was apparently caused by water that had entered into some of the RCIC circuitry. The water leaking into the torus room was impinging on junction boxes and other electrical components. The inleakage in these areas was not appreciably reduced when the licensee pumped out the cable tunnels and storm drains. However, the inleakage did decrease as the river level dropped.

### Discussion

This event demonstrates that flooding problems and degradation of equipment may be caused by water inleakage even though flood waters are not above grade elevations. Water leaking through underground walls may impinge on electrical equipment or may enter radiologically controlled areas and spread contamination to other areas. Underground cable and pipe tunnels may become flooded and serve as pathways for water to enter plant buildings. Management and plant personnel attention to these conditions is important to ensure that equipment is protected and unsafe facility conditions are not created. The

NRC previously discussed problems caused by water leakage through conduit seals into plant buildings in NRC Information Notice 92-69, "Water Leakage From Yard Area Through Conduits Into Buildings."

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 (NRR) project manager.



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

Technical contacts: W. B. Jones, RIV  
(817) 860-8147

J. L. Birmingham, NRR  
(301) 504-2829

Attachment:  
List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED  
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
94-26	Personnel Hazards and Other Problems from Smoldering Fire-Retardant Material in the Drywell of a Boiling-Water Reactor	03/28/94	All holders of OLs or CPs for nuclear power reactors.
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.

OL = Operating License  
CP = Construction Permit

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Original signed by  
 Brian K. Grimes  
 Brian K. Grimes, Director  
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 Office of Nuclear Reactor Regulation

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\* See previous concurrence

OFFICE	C/ECGB:DE:NRR	D:DE:NRR
NAME	Ghoutam Bagchi*	WHodges*
DATE	03/16/94	03/16/94

OFFICE	REGION IV	REGION IV	EAB:DORS:NRR	C/OEAB:DORS:NRR
NAME	WBJones*	TWesterman*	NHunemuller*	AChaffee*
DATE	02/23/94	02/23/94	02/23/94	02/24/94

OFFICE	TECHED:RPB	OGCB:DORS:NRR	C/OGCB:DORS:NRR	D/DORS:NRR
NAME	RSanders*	JBirmingham*	AJKugler*	BKGrimes
DATE	02/16/94	02/24/94	03/04/94	03/29/94

Comments from the Emergency Preparedness Branch have been included, they indicated that they did not need to be on concurrence.  
 OFFICIAL DOCUMENT NAME: 94-27.IN

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OFFICIAL DOCUMENT NAME: CNSFLOOD.JLB

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Comments were received and incorporated from the emergency preparedness branch but they asked not to be on concurrence.

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