

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

January 22, 1993

NRC INFORMATION NOTICE 93-06: POTENTIAL BYPASS LEAKAGE PATHS AROUND  
FILTERS INSTALLED IN VENTILATION SYSTEMS

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 potential problems resulting from missing or deteriorated seals around shafts that penetrate fan or filter housings and inadequately sealed ducting seams used in engineered safety feature (ESF) ventilation systems. 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

As a result of a review of a nonconforming condition involving the standby gas treatment system (SGTS), the licensee for Grand Gulf identified leakage paths associated with ventilation system ducting and housings, including fan plenums. These leakage paths resulted in reduction of the removal capability for radioactive material of the standby gas treatment and control room air systems which are engineered safety features. The affected ventilation system ducting serves as either part of the secondary containment boundary or an extension of the control room environment. The effect of such bypass leakage and the associated radiation doses was not considered as part of the facility design or the licensing review. As a result of these findings in June 1992, the licensee determined that the facility had been operating in a condition outside the facility design basis.

The licensee assessment of the safety significance of bypassing the SGTS radioactivity removal function (both adsorption and filtration), based on estimated inleakage rates and licensing methodology, initially indicated that potential calculated accident exposures could exceed the guidelines of 10 CFR Part 100 and the values in General Design Criterion (GDC) 19 of Appendix A to 10 CFR Part 50. The licensee did a second assessment, characterized as conservative but more realistic, which indicated that the potential exposures would be within the guidelines of Part 100 and within GDC 19 values.

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## Discussion

With respect to the SGTS, the licensee determined that an opening, or gap, between the fan hub and the hole in the fan housing could result in air being drawn into the suction plenum of the SGTS downstream of the charcoal adsorber and filter (HEPA). The paths were around a motor shaft, through a slotted opening to an actuator for a damper, and at a transition piece of ducting. These paths could allow radioactive gases that may have leaked from containment following a design-basis accident to be sucked into the ducting and discharged to the environment without the anticipated adsorption and filtration assumed in the design-basis analyses for the SGTS. Bypass leakage associated with the SGTS affects all calculated dose consequences that involve the use of the SGTS to mitigate the consequences of an accident. If the actual inleakage is not within the amounts assumed in the design-basis analyses, the facility may not be operating as intended and may be operating outside of the design basis with calculated accident exposures exceeding either 10 CFR Part 100 guideline values or GDC 19 values or both.

A subsequent investigation by the licensee of other filter trains at Grand Gulf disclosed that the ventilation system for the control room also had bypass paths. Air from the area around the fan plenum would be sucked into the ducting and discharged directly into the control room. This deficiency would result in unfiltered, potentially contaminated air being supplied to the control room. This supply source of potentially contaminated air was not incorporated in the design-basis analyses for the facility.

The licensee reported that the apparent root cause for these deficiencies, which included missing seals, was a failure to specify a leak-tight construction for the fan housings. At Grand Gulf, shaft seals were installed and other leak paths were reworked to reduce bypass flow and consequent potential release of radioactive materials.

Many licensees have designed these types of systems to the standards in the American National Standards Institute and American Society of Mechanical Engineers (ANSI/ASME) N509 and have committed to testing to the standards in ANSI/ASME N510. Testing in accordance with N510 can identify bypass leakage if the leakage is a significant fraction of system flow. Testing using tracer chemicals, such as SF<sub>6</sub>, can determine small inleakage rates such as those identified at Grand Gulf.

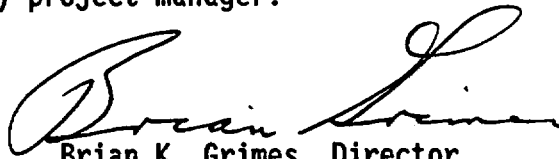
The spread of contamination and potential for exposure of individuals can occur from outleakage as well as inleakage. There have been instances where the circulation of contaminated air through ducting located in a clean area has resulted in unfiltered leakage into the clean area. In addition, deficiencies identified in engineered safety feature ventilation systems may also be present in those systems used to limit normal effluents.

Related Generic Communications

IN No. 86-76, "Problems Noted in Control Room Emergency Ventilation Systems,"  
August 28, 1986.

IN No. 90-02, "Potential Degradation of Secondary Containment,"  
January 22, 1990.

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: J. Hayes, NRR  
(301) 504-3167

J. Carter, NRR  
(301) 504-1153

Attachment: List of Recently Issued NRC Information Notices

*See file jacket*

Attachment  
IN 93-06  
January 22, 1993  
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LIST OF RECENTLY ISSUED  
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
93-05	Locking of Radiography Exposure Devices	01/14/93	All Nuclear Regulatory Commission industrial radiography licensees.
93-04	Investigation and Reporting of Misadministrations by the Radiation Safety Officer	01/07/93	All U.S. Nuclear Regulatory Commission medical licensees.
93-03	Recent Revision to 10 CFR Part 20 and Change of Implementation Date to January 1, 1994	01/05/93	All byproduct, source, and special nuclear material licensees.
93-02	Malfunction of A Pressurizer Code Safety Valve	01/04/93	All holders of OLs or CPs for nuclear power reactors.
93-01	Accuracy of Motor-Operated Valve Diagnostic Equipment Manufactures by Liberty Technologies	01/04/93	All holders of OLs or CPs for nuclear power reactors.
92-86	Unexpected Restriction to Thermal Growth of Reactor Coolant Piping	12/24/92	All holders of OLs or CPs for nuclear power reactors.
92-85	Potential Failures of Emergency Core Cooling Systems Caused by Foreign Material Blockage	12/23/92	All holders of OLs or CPs for nuclear power reactors.
92-84	Release of Patients Treated with Temporary Implants	12/17/92	All Nuclear Regulatory Commission Medical Licensees

OL = Operating License  
CP = Construction Permit

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\*SEE PREVIOUS CONCURRENCE

OFC	OEAB:DORS	ADM:RPB	SC/OEAB:DORS	C/OEAB:DORS
NAME	JCarter*	DGable*	RDennig*	AChaffee*
DATE	11/20/92	11/18/92	11/23/92	12/07/92

OFC	C/PRPB:DRSS	C/OGCB:DORS	D/DORS	
NAME	LCunningham*	GMarcus*	BGrimes	
DATE	12/02/92	12/30/92	01/19/93	

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DATE	12/2/92	1/92 <i>MKM</i>	1/92	

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