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UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

August 28, 1986

IE INFORMATION NOTICE NO. 86-76: PROBLEMS NOTED IN CONTROL ROOM
EMERGENCY VENTILATION SYSTEMS

Addressees:

All nuclear power reactor facilities holding an operating license or a construction permit.

Purpose:

This notice is provided to alert recipients to problems noted in the operation of control room emergency ventilation systems during recent plant visits by an NRC review team. It is expected that recipients will review this information for applicability to their facilities and consider actions, if appropriate, to preclude a similar problem occurring at their facilities. However, suggestions contained in this notice do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:


During a recent visit to the Trojan Nuclear Plant, the NRC review team observed the licensee perform a monthly surveillance test of the cooling capability of the control room emergency ventilation system. The NRC review team terminated its involvement shortly after the surveillance test began because the licensee's procedure was deemed inadequate and the test would not produce any meaningful results. Specifically, the team noted that the emergency ventilation system was initiated with the supply dampers left shut; these dampers were designed to provide 150 standard cubic feet per minute (cfm) of outside makeup air in the radiological emergency mode. The toilet and laboratory exhaust fans (4050 and 3740 cfm capacity, respectively) were left running. This condition resulted in a slight vacuum in the control room, although the system is designed to maintain 1/8-inch H₂O positive pressure in the emergency mode. In addition, the humidity control had been adjusted to 100 percent (thus the heaters would remain off for any humidity less than 100 percent) even though the Technical Specifications require the system to be tested with the heaters on.

When the makeup air dampers were opened, it was determined that 460 cfm of filtered outside air was being supplied instead of the designed 150 cfm. In addition, it was discovered that a 2-inch drain pipe on the cooling units down stream of the filter housing was drawing 41 cfm of unfiltered outside air into the system. The drain pipe was connected by a drain line header to both trains

of the emergency ventilation systems. This drain arrangement constituted a common-mode failure and a lack of train separation of an engineered safety feature. On the basis of these findings, Region V inspectors asked Trojan to recalculate the operator doses expected during an accident. The licensee calculated 1.7 rem whole body, 195 rem to the thyroid, and 30.6 rem to the skin. The general design criteria (GDC 19) in Appendix A of 10 CFR Part 50 specifies that the control room be designed to allow occupancy through the course of an accident without exceeding 5 rem whole body or its equivalent to any part of the body. Because 30 rem to any organ (skin or thyroid) is equivalent to a 5 rem whole-body dose, a violation resulted. The violation was categorized as a Severity Level II violation because both trains of the system were inoperable for a long period of time and a civil penalty resulted.

The NRC has made several plant visits to review control room ventilation systems as part of the resolution of the generic issue on control room habitability (Item III D.3.4 of NUREG-0737). Although Trojan has been the only plant visit to date with problems severe enough to result in an enforcement action, several similar problems have been noted at other facilities visited. Attachment 1 provides a discussion of these common problems noted. Currently the NRC is scheduled to visit six more facilities in response to the generic issue.

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


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Attachments:

1. Summary of Control Room Habitability Reviews
2. List of Recently Issued IE Information Notices

SUMMARY OF CONTROL ROOM HABITABILITY REVIEWS

The following is a summary of the common problems noted in control room emergency ventilation systems during recent NRC plant visits to gather information on Control Room Habitability (Generic Issue 83). Items discussed were noted at two or more facilities visited.

System Understanding

The NRC review team noted that there appeared to be no individual or group designated as responsible for the ventilation systems at the plant visited. This appears to lead to a lack of understanding of the systems and their operation. Most of the systems reviewed to date do not accurately reflect the system descriptions provided by the licensees in their submittals required by item III D.3.4 of TMI Action Plan (NUREG-0737). In addition, the following concerns were noted in the way surveillance testing is being performed on these systems.

1. Most plants measured control room temperature in the center of the room. However, the basis of the requirement is to ensure operability of solid-state electrical equipment, not operator comfort. Therefore, measuring the air temperature at the instrument panels is more appropriate (see IE IN 85-89 for additional information on the effects of control room cooling on solid-state instrumentation).
2. The purpose of maintaining a positive pressure in the control room during emergency operation is to ensure any leakage is out of (rather than into) the control room. Several licensees show compliance with their technical specifications by comparing control room pressure to the outside atmospheric pressure. Because areas adjacent to the control room envelope (CRE) can be at higher-than-atmospheric pressure, a relative negative control room pressure may exist across the CRE boundary, providing a motive force for inleakage. This is also a concern where the control room ventilation system is routed through adjacent areas. Clearly it is appropriate to measure the differential pressure relative to the highest pressure adjacent to the CRE boundary or ventilation system.
3. Laboratory testing of charcoal efficiency is being performed at temperatures much higher than any temperature expected during the course of an accident. This can result in an erroneously high efficiency measurements. Retention efficiencies as low as 70% were noted when samples of charcoal that had just passed its surveillance tests (greater than 90% efficient) were retested at 30°C.

Excessive Unfiltered Inleakage

The general condition of some of the ventilation systems reviewed was poor. Many of the following conditions were discovered that resulted in leakage of unfiltered air into the systems reviewed.

1. Holes and openings: Many holes left from construction and unplugged openings were found in the system duct work and in the air handling units themselves.
2. Drains: Uncapped drains (or drains improperly left open to the atmosphere) were found that allow the air handling units to draw air into the system. In addition, water loop seals in some drains were found dry.
3. CRE penetrations: Some control rooms were found with "numerous" unsealed penetrations across the CRE.

Many of these problems were not discovered until the NRC review team performed flow balance and differential pressure measurements on the control room ventilation systems.

LIST OF RECENTLY ISSUED
 IE INFORMATION NOTICES

Information Notice No.	Subject	Date of Issue	Issued to
86-75	Incorrect Maintenance Procedure On Traversing Incore Probe Lines	8/21/86	All power reactor facilities holding an OL or CP
86-74	Reduction Of Reactor Coolant Inventory Because Of Misalignment Of RHR Valves	8/20/86	All BWR facilities holding an OL or CP
86-73	Recent Emergency Diesel Generator Problems	8/20/86	All power reactor facilities holding an OL or CP
86-72	Failure 17-7 PH Stainless Steel Springs In Valcor Valves Due to Hydrogen Embrittlement	8/19/86	All power reactor facilities holding an OL or CP
86-71	Recent Identified Problems With Limitorque Motor Operators	8/19/86	All power reactor facilities holding an OL or CP
86-70	Spurious System Isolation Caused By The Panalarm Model 86 Thermocouple Monitor	8/18/86	All GE BWR facilities holding an OL or CP
86-69	Scram Solenoid Pilot Valve (SSPV) Rebuild Kit Problems	8/18/86	All BWR facilities holding an OL or CP
86-68	Stuck Control Rod	8/15/86	All BWR facilities holding an OL or CP
86-67	Portable Moisture/Density Gauges: Recent Incidents And Common Violations Of Requirements For Use, Transportation, And Storage	8/15/86	All NRC licensees authorized to possess, use, transport, and store sealed sources
86-66	Potential For Failure Of Replacement AC Coils Supplied By The Westinghouse Electric Corporation For Use In Class 1E Motor Starters And Contractors	8/15/86	All power reactor facilities holding an OL or CP

OL = Operating License
 CP = Construction Permit