

U.S. NUCLEAR REGULATORY COMMISSION
REGION I
CONTROL ROOM VENTILATION SYSTEM INSPECTION

DOCKET/REPORT NO. 50-271/94-04

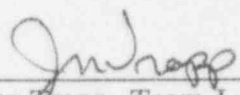
LICENSE NO. DPR-28

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FACILITY: Vermont Yankee Nuclear Power Station
Vernon, Vermont

INSPECTION DATES: January 3-7, 1994

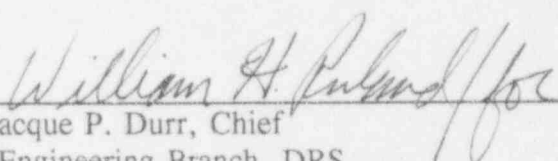
INSPECTORS: Mike Buckley, Reactor Engineer, DRS



James Trapp, Team Leader
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1/27/94
Date

APPROVED BY:



Jacque P. Durr, Chief
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2/10/94
Date

Areas Inspected: The control room ventilation system procedures, test results, modification documentation, and equipment maintenance records were reviewed to verify that the system would perform its intended safety function if called upon to operate. The control room ventilation system is important to safety because it would maintain habitable conditions in the control room, for personnel and safety-related equipment, during a postulated accident.

Results: The operating procedures reviewed were thorough. The inservice testing conducted on chilled water and refrigeration system components was acceptable. A surveillance test to demonstrate that the control room ventilation system would isolate was not routinely conducted. The failure to conduct system testing is a violation of NRC requirements. The modifications and temporary modifications reviewed were detailed and technically sound. The material condition of the control room ventilation system was acceptable with the exception of a missing tubing support on a seismically supported refrigerant line and a tear in a fan exhaust duct boot. The licensee initiated appropriate actions to address these deficiencies.

DETAILS

1.0 INSPECTION SCOPE

The objective of this inspection was to determine if the control room ventilation system was being operated, tested, maintained, and modified in accordance with NRC requirements and the Vermont Yankee licensing basis. The inspection objective was met by conducting interviews with plant personnel, observing the condition of ventilation system equipment, and reviewing selected procedures, records and documents.

2.0 INSPECTION FINDINGS

2.1 Plant Procedures (IM 42700)

Plant procedures were reviewed to verify that they provided detailed instruction for operating the control room ventilation system equipment in accordance with the system design basis. Selected sections of the following procedures were reviewed:

- OP 2192, Heating, Ventilating, and Air Conditioning Systems.
- OP 4192, HVAC Surveillance.
- ON 3153, Excessive Radiation Levels.
- OP 3020, Fire Brigade and Fire Fighting Procedure.
- AP 0164, Operations Department Inservice Testing.
- AP 0150, Conduct of Operations and Operator Rounds.

The procedures provided detailed instructions for operating the control room ventilation system. The procedures were appropriately reviewed and approved by the licensee staff and safety review group. Procedure ON 3153 provided detailed instructions for placing the control room ventilation system in the emergency mode if abnormally high radiation levels are identified. Operating Procedure OP 3020 provided concise instructions for isolating the control room ventilation system in case of a fire. This procedure also provided appropriate instructions for placing the control room ventilation system in emergency mode if the carbon dioxide fire suppression system is activated in the cable vault. This action would prevent the introduction of carbon dioxide into the control room ventilation system when the carbon dioxide is purged from the cable vault. The inspectors concluded that the procedures for operating the control room ventilation system provided appropriate detail and were of high quality.

2.2 Testing (IM 61700)

2.2.1 System Surveillance Testing

Surveillance test procedures were reviewed to verify that the control room ventilation system surveillance tests demonstrated that the system would perform its intended safety function if called upon to operate. The surveillance testing program was discussed with cognizant technical personnel.

The Vermont Yankee technical specifications do not provide specific operability or system functional surveillance test requirements for the control room ventilation system. The requirements that are provided in the technical specifications are limited to the testing of certain chilled water and refrigeration system pumps and valves in accordance with Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code.

One of the principal safety functions of the control room ventilation system is to isolate the control room from the outside environment so that the control room remains habitable during a postulated accident. The control room is isolated from the environment by manually placing the system in the emergency mode which closes 4 normally open isolation dampers. Operational tests of the control room ventilation system's emergency mode are not routinely performed. However, a functional test of the system was successfully performed in March 1992 as part of a post-modification test following a temporary modification. An evaluation of the proper test measures to demonstrate that the system will function as designed was not available during this inspection. The failure of the isolation dampers to operate would have an adverse effect on the control room habitability during a postulated accident.

Licensees are required to establish test programs to demonstrate that safety-related systems will perform satisfactorily in service. It does not appear that a testing program or testing requirements for the control room ventilation system were thoroughly evaluated. The failure to evaluate and establish a test program that demonstrates that the control room ventilation system would perform its intended safety function is a violation of NRC requirements (NRC Violation 50-271/94-04-01).

2.2.1 Equipment Inservice Testing

Inservice testing of the control room ventilation system pumps and valves was reviewed to verify that the testing was in accordance with the technical specifications and the ASME B&PV Code requirements. The inservice test program scope is not required to include the dampers which isolates the control room ventilation system. Test procedures and results were reviewed by the inspectors.

The inspectors reviewed the inservice test program scope, procedures, and test frequency for the control room ventilation system equipment. The scope of control room ventilation system pumps and valves included in the inservice test program was appropriate. The inservice test procedures were detailed and technically sound. The inservice tests were performed at a frequency consistent with the ASME B&PV Code requirements. The test results satisfied the pre-determined acceptance criteria and were clearly documented.

In reviewing test results, the inspectors noted that the chilled water system demineralized water makeup isolation valve failed its inservice leak test and was declared inoperable on July 7, 1993. The valve was appropriately removed from the inservice test schedule. The licensee stated that they are planning to replace this valve during the first quarter of 1994.

The ASME B&PV Code requires, in part, that check valves be exercised to the position required to fulfill their safety function. The chilled water pump discharge check valve was tested in the open direction at a flow rate of 89 gallons per minute (gpm). The system drawing indicated that the system design flow rate is 120 gpm. The licensee stated that operational history has demonstrated that a chilled water flow of 89 gpm adequately maintains control room temperature. While the assumption that an 89 gpm chilled water flow rate appears technically sound, the design basis for this assumption was not documented.

The inspectors verified that the test equipment used to conduct inservice tests of control room ventilation system equipment was appropriate. The ASME B&PV Code provides specific requirements for the accuracy and range of test equipment used in conducting inservice testing. The test equipment used to conduct inservice testing on control room ventilation equipment satisfied the ASME B&PV Code requirements. The inspectors noted that the licensee had conducted a review of test equipment adequacy and had replaced a chilled water pump suction pressure gage that did not conform with the ASME B&PV Code requirements.

The methodology used to conduct full flow testing of the chiller refrigerant system check valves was reviewed. The acceptance criteria for full flow testing of chiller refrigerant system check valves was to observe, by touch, a temperature difference between the condenser inlet and outlet lines. Indirect methods of flow determination are acceptable when a known level of flow or performance can be implied. The licensee has not directly established a correlation between the condenser temperature difference and refrigeration system performance; however, routine system operation during summer months has demonstrated that this assumption is reasonable. The inspectors concluded that the current test method for these valves was adequate.

The inservice test program conducted for the control room ventilation system was acceptable. The program scope was comprehensive and the tests were conducted at appropriate intervals. The methods used to conduct the test were generally acceptable. However, the required chilled water system flow rate was not well documented.

2.3 Plant Design Changes (IM 37700)

Plant Design Change Request

Selected plant design changes were reviewed to verify that modifications made to the control room ventilation system were in accordance with station administrative procedures and regulatory requirements. The following plant design change documents were reviewed:

- PDCR 90-010, V10-89B Control Power & Bus 8E/9D Load Shedding.
- PDCR 92-001, Control Room HVAC Condenser (SACC-1B) replacement.

PDCR 90-010 corrected a licensee-identified logic discrepancy. The discrepancy was that a loss of power on motor control center (MCC) 9D would cause an inappropriate lock-out of control room ventilation equipment powered from MCC 8E. PDCR 92-001 replaced a control room cooling unit condenser and installed two relief valves on the SACC-1A condenser. The condenser was replaced because excessive moisture intrusion, caused by a leak in the SCH-1 cooler, had rendered the condenser unusable.

The plant design changes were documented in accordance with Administrative Procedure AP-6000, "Plant Design Change Requests." Both design changes were detailed and technically sound. The design changes were appropriately reviewed and approved by the licensee. PDCR 90-010 corrected a long-term design discrepancy to enhance system performance. The inspectors verified that selected parts of the design changes were installed in accordance with the installation instruction.

The safety evaluations associated with these design changes were thorough and provided an adequate basis for determining that these design changes did not involve an unreviewed safety question. The safety evaluation for PDCR 92-001 stated that the safety code for mechanical refrigeration (ANSI/ASHRAE-15) requires that safety valves for refrigerant system be located outdoors, such that the refrigerant would be dispersed into the air. The code also stated that safety valves, such as those installed in the control room chiller system, shall be located not less than 20 feet from any ventilation opening. The control room ventilation system fresh air intake is located approximately 30 feet from the relief valves. However, the relief valves and fresh air intake are located in an area that is partially closed on two sides by the walls of a building. The inspectors requested that the licensee demonstrate that the discharge of refrigerant through the relief valves would not adversely affect the control room environment. The licensee performed a preliminary calculation that concluded that the current relief valve configuration would not adversely affect the control room environment. The licensee stated that a more detailed calculation would be completed in the first quarter of 1994. The inspectors concluded that the action taken by the licensee was appropriate.

One-For-One Replacements

The one-for-one evaluation for the replacement of the control room chiller, SCH-1, was reviewed to verify that it was consistent with the guidance provided in Administrative Procedure AP-008, "One-For-One Evaluations." The vendor manual and plant drawings were reviewed to verify that these documents were updated to reflect the new control room chiller.

The control room chiller was replaced in 1991. An NRC review of the control room chiller replacement was conducted during the Operational Safety Team Inspection (NRC Inspection Report 50-271/93-80). The team concluded that the one-for-one replacement of the control room chiller was acceptable. At the time of the January 1994 inspection, the vendor manual VYEM 0113 had not been updated to incorporate the information regarding the new control

room chiller. However, the plant maintenance staff was in the process of updating the manual. The chilled water system drawing 191237 had been revised to reflect this one-for-one change. Additional attention is necessary to ensure that vendor manuals are updated in a timely manner for one-for-one replacements.

Temporary Modifications

Selected temporary modifications were reviewed to verify that changes made to the control room ventilation system were in accordance with station procedures and regulatory requirements. The following plant design change documents were reviewed:

- TM 92-001, Removal of the Toxic Gas Monitoring System.
- TM 92-041, Removal of Toxic Gas Monitoring Relays 76A-K14 and 76A-K24.

The removal of the toxic gas monitoring system was approved by the NRC as documented in Technical Specification Amendment 132. Temporary Modification TM 92-001 provided detailed instructions for removal of this system from service. The inspectors verified selected instructions had been appropriately completed. Temporary Modification TM 92-041 removed two toxic gas monitoring system relays. The elementary wiring diagrams were reviewed to verify that this temporary modification would not adversely affect the function to the control room ventilation system. Selected aspects of each temporary modification were verified to be in conformance with Administrative Procedure (AP) 0020, "Control of Temporary Modification." The reviewed temporary modifications were well documented and appropriately installed.

Plant Drawings

Control room ventilation system drawings were reviewed to verify that the drawings correctly reflected the installed plant equipment configuration. The control room ventilation system flow diagram and selected elementary electrical wiring diagrams were also reviewed.

Several minor discrepancies were identified with the depiction of the control room ventilation chilled water system in drawing 191237. The inspectors noted that a flow switch located in the chilled water system near the inlet to refrigeration unit SCH-1 was not identified on the drawing. The relative location of certain temperature and pressure indicators was also incorrect. The licensee's technical staff conducted a detailed review of this drawing and identified additional drawing discrepancies. The inspectors also identified several discrepancies in the elementary electrical wiring diagrams for drawings B191301, sheets 1366 and 1366A. These discrepancies consisted primarily of mislabeled contacts and relays. The licensee's technical staff completed a drawing change requests for drawings 191237 and B191301 in accordance with Administrative Procedure AP 6802, "Drawings and Aperture Cards," to correct these discrepancies. Several additional elementary electrical wiring

diagrams were reviewed for other control room ventilation equipment and no discrepancies were identified. While the errors identified had minor safety significance and appear to be isolated to the drawings reviewed, the number of errors indicated a weakness in the licensee's effort to ensure the accuracy of plant drawings.

2.4 System Material Condition (IM 71710)

The inspectors conducted a walkdown of the control room ventilation system to verify that the equipment was being properly maintained. The system valve lineup was also verified to be in accordance with Operation Procedure OP-2192.

The condition of the control room ventilation system equipment was acceptable. The control room cooler unit and one of the condensers were recently replaced and were in good condition. However, the inspectors observed a tear in the exhaust duct expansion boot for control room ventilation fan SAC-1A that had not been identified with a work order. The licensee's technical staff initiated a work order to repair the tear in the exhaust duct boot. The chilled water system valves were properly aligned in accordance with Operation Procedure OP-2192.

The inspectors observed that a support was missing on the refrigerant piping associated with the SCH-1 chiller. This section of tubing is safety class 3. The licensee's technical staff stated that they were aware of the missing support and recalled analyzing this section of pipe with the support removed. The missing support was identified by the licensee in work order 91-01747-00 in 1991. This work order was subsequently closed in 1992, when a walkdown of the line erroneously revealed there were no missing supports. The licensee was unable to retrieve the calculation that determined that the condition of the line with the missing support was acceptable. The licensee technical staff prepared a preliminary calculation that determined that the current configuration was acceptable. The preliminary calculation conclusion was verified by calculation VYC-1250 that was prepared on January 7, 1994. The calculations were acceptable and the support was not identified on controlled plant drawings. The inspectors verified that the other tubing supports on this system were properly installed and concluded that the missing support on this line was an isolated situation. The inspectors considered the safety significance of this support not being installed was low. In accordance with NRC requirements, design changes shall be subject to design control measures commensurate with those applied to the original design. The removal of the tubing support was not subject to design control measures commensurate with those applied to the original design. The NRC has determined that the criteria in Section VII.B.2 of the NRC Enforcement Policy was satisfied and no notice of violation would be issued. However, additional attention is required to thoroughly document changes made to safety-related systems.

3.0 CONCLUSION

The inspectors concluded that the operating procedures reviewed were of good quality. The inservice testing conducted on chilled water system components was acceptable. However, a system surveillance test to verify that the system would isolate was not routinely performed. The failure to evaluate and to establish a test program which demonstrates the safety function of safety-related equipment is a violation of NRC requirements. The modifications and temporary modifications reviewed were detailed and technically sound. Several minor drawing errors were identified in the control room ventilation chilled water system flow diagram and in control room ventilation system equipment elementary electrical wiring diagrams. The accuracy of the control room ventilation system drawings was a weakness. The material condition of the control room ventilation system was acceptable with the exception of a missing tubing support on a seismically-supported refrigerant line and a tear in a fan exhaust duct boot. A work order was written to repair the fan exhaust duct boot and a calculation was prepared to address the missing tubing support. While the calculation established that the safety significance of the missing support was low, additional attention is required to thoroughly document changes made to safety-related systems.

4.0 MANAGEMENT MEETING

The inspectors met with those individuals denoted in Attachment 1, on January 7, 1994, to discuss the preliminary inspection findings which are detailed in this report. The Vermont Yankee staff present at the exit meeting acknowledged the inspectors findings and discussed with the inspectors the requirement to test the control room ventilation system.

ATTACHMENT 1

Persons Contacted

Vermont Yankee Nuclear Power Corporation

- * B. Buteau, Engineering Director
- * G. Cappuccio, VY ME&C
- * L. Doane, Operations Manager
- * R. Grippardi, QA
- * S. Jefferson, Asst. to Plant Manager
- P. McKenney, Engineer
- T. Osterhoudt, Engineer
- * R. Pagodin, Operations Superintendent

U. S. Nuclear Regulatory Commission

- * H. Eichenholz, Sr. Resident Inspector - Vermont Yankee

Asterisk (*) denotes those present at the exit meeting.