NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Trojan Nuclear Plant	0 5 0 0 0 3 4 4	1 OF 0 7

TITLE (4) Control Room Emergency Ventilation System
Degradation due to Equipment Failure and Design Deficiency

EVENT DATE (5)			LER NUMBER (6)					REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR		SEQUENTIAL NUMBER		REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
											N/A	0 5 0 0 0
0 2	2 4	8 6	8 6	—	0 0 2	—	0 0	0 3	1 8	8 6		0 5 0 0 0

OPERATING MODE (9)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
1	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10)	20.405(a)(1)(i)	50.36(c)(1)	X 50.73(a)(2)(v)	73.71(e)
1 0 0	20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
	20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
	20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
	20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
Scott A. Bauer, Onsite Regulation Engineer	AREA CODE 5 0 3 — 5 5 6 - 3 7 1 3

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	
N/A											

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

During control room heat load testing on January 29, 1986, the NRC identified some discrepancies in the test procedure for the Control Room Emergency Ventilation System (CB-1). These discrepancies were corrected and the heat load test was reconducted demonstrating the system is capable of maintaining the required ambient temperatures in the control room.

During an NRC inspection on February 24, 1986, two sources of unfiltered inleakage into the control room were discovered. Additionally, the flow rate through the filtered makeup air flow path in CB-1B (B train of CB-1) was measured to be three times (approximately 450 cfm) greater than the value assumed in the control room habitability analysis (150 cfm). The cause of the deficiencies was determined to be equipment malfunction, personnel error and design error. Subsequent analysis of these deficiencies led to the determination that CB-1 would meet General Design Criterion (GDC) 19 with reliance on operator action pursuant to approved emergency procedures.

Corrective action has been taken to seal the CB-1 systems to eliminate the unfiltered inleakage and the flowrate in CB-1B makeup air duct has been adjusted to the design flow. Further corrective action is planned to evaluate the control room temperature design basis. Additionally, several inconsistencies noted in the Updated Final Safety Analysis Report will be corrected.

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DESCRIPTION OF EVENT

Significant Findings

On February 24, 1986 at 1615, an improperly secured seam was discovered on the cooling coil housing in the "B" train of the control room emergency ventilation system (CB-1B) during a system walkdown by PGE personnel. The gap in the seam would have allowed an estimated 100 cfm of unfiltered inleakage into the control room when CB-1B was operating.

On February 26, 1986 the outside air makeup flowrate (filtered) intc CB-1B was measured to be approximately 450 cfm. The control room habitability analysis contained in Section 6.4.4.1.2 of the Updated Final Safety Analysis Report (UFSAR) assumed 150 cfm of filtered makeup flow.

On February 27, 1986, the condensate drain lines from the CB-1A and CB-1B cooling coil housings were discovered to be cross-connected and open to the atmosphere. This condition allowed approximately 40 cfm of unfiltered air inleakage into the control room and violated the single failure criteria for CB-1.

The unfiltered air inleakage from the gap in the seam of the cooling coil housing and the condensate drain lines exceeded the unfiltered leakage assumed (10 cfm) in the control room habitability analysis described in the UFSAR.

Consequently, operator action would have been required to limit post-accident doses to control room personnel below those allowed by General Design Criterion (GDC) 19 of Appendix A of 10 CFR 50.

Chronology

NRC personnel visited Trojan on January 28, 1986 to observe the performance of the heat load test performed in accordance with Periodic Operating Test (POT) 20-1, "Control Room Emergency Ventilation Performance". During this test, concerns were raised regarding the correct position of the CB-1 outside air makeup dampers (DM-10251A&B), the operation of the non-safety-related laboratory exhaust (CB-3) and toilet and lunch room exhaust (CB-4) systems and the operation of the charcoal filter preheaters during the test.

The first concern was raised because the CB-1 outside air makeup dampers were normally closed during testing and were not set up to automatically open upon actuation of CB-1 since Section 12.3.3.2.3 of the UFSAR states that "no makeup air is taken in (the control room) for the first eight hours (following a safety injection actuation)". This UFSAR statement, however, conflicted with the control room habitability analysis in Section 6.4.4.1.2 which assumed 150 cfm of filtered makeup air to each train of CB-1. It was subsequently determined that the statement in Section 12.3.3.2.3 of the UFSAR was in error

since the makeup air is required in order to maintain a positive pressure in the control room. Following this determination, the heat load test was modified to require the outside air dampers to be open. Additionally, during normal operation, the damper control switch is now placed in the "automatic after open" position which will result in the dampers being opened upon automatic actuation of the CB-1 system. The correct switch position is now identified in the system operating instruction and the surveillance test procedure, and is administratively controlled by the locked valve list.

Another concern was raised due to the fact that non-safety-related exhaust systems CB-3 and CB-4 were in operation during the monthly test and resulted in a negative pressure in the control room. Even though it is not required by the Technical Specifications to verify that a positive pressure is maintained in the control room during the monthly surveillance test, it was determined the operation of CB-3 and CB-4 could reduce the heat load on CB-1 such that the test results may not be representative of actual post-accident conditions with only CB-1 in operation. Consequently, the test procedure was revised to require CB-3 and CB-4 to be shut down during the test. Subsequent tests with CB-3 and CB-4 shut down demonstrated a negligible impact on control room temperatures.

A concern was also raised because the preheater humidistat was set at 100% relative humidity during the January 29 test to prevent the heaters from energizing. This practice resulted from an informal interpretation of a Technical Specification in 1979. Technical Specification 4.7.6.1 requires a test be run on each train of CB-1 to "verify that the train operates for at least 10 hours with the preheaters on and maintains the control room air temperatures less than or equal to 110 degrees F". Clarification of this Technical Specification was received in 1979 from the Trojan NRC Project Manager which stipulated the preheaters were required to be on for 10 hours for the purpose of drying out the charcoal filters in accordance with Regulatory Guide 1.52, "Design, Testing and Maintenance Criteria for Post-Accident Engineered Safety Feature Atmosphere Cleanup System Air Filtration and Adsorption Units of Light Water Cooled Nuclear Power Plants." This clarification further stipulated the preheaters did not have to be on during the heat load test. Based on this clarification, two separate 10-hour tests have subsequently been performed at Trojan. The first 10-hour test is the heat load test and was being performed with the preheater humidistat set at 100% relative humidity to prevent energizing the heaters. The second 10-hour test is performed with the humidistat set at 20% relative humidity in order to continuously energize the heaters to dry out the charcoal filters. During the second 10-hour test, the normal control room ventilation system (CB-2) is in operation to compensate for the abnormal condition of the heaters being continuously energized.

During normal operation, the humidistat for the heaters had been set at 85% relative humidity such that in the event of an automatic actuation of CB-1, the control room humidity would be maintained at 85% or below. Following

discussions with NRC personnel, PGE agreed the heat load test should be performed with the humidistat at its normal setting. POT 20-1 was, therefore, modified to require the heater control to be set at 85% relative humidity. It has been since been determined 85% relative humidity was an incorrect value. A change to the UFSAR was made in 1982 to incorporate the Regulatory Guide 1.52 relative humidity value of 70%, however, only one of two locations in the UFSAR (Section 9.4.1.2.1) which previously stipulated the 85% relative humidity setting was revised. The second UFSAR location, Figure 9.4-3, was not changed and plant procedures were not updated. POT 20-1 and the applicable operating instructions have now been revised to require a humidistat setting of 70% during the heat load test as well as during normal operation.

On February 24, 1986 NRC personnel returned to Trojan to verify implementation of the actions described above and to further evaluate CB-1. On this same date, the gap in the CB-1B cooler housing seam was discovered by PGE personnel and repairs to the housing were completed. POT 20-1 was performed as a post-repair test. During the performance of POT 20-1 it was discovered that the CB-3 exhaust fan was running despite the fact that the discharge damper was closed which should have automatically stopped the fan. The fan is operated by a limit switch on the discharge damper. The limit switch was found to be improperly installed. The limit switch was repositioned and verified operable by ensuring the CB-3 exhaust fan stopped when the discharge damper closed. In light of this occurrence, and subsequent problems with this limit switch, operations personnel have been directed to verify CB-3 and CB-4 are shut down whenever CB-1 automatically actuates. A procedure deviation to require this action is in place and design changes are being evaluated for the long-term. This design evaluation of CB-3 and CB-4 will be completed by July 1, 1986.

While evaluating the monthly surveillance test, it was determined there may not be any toxic gas protection for the control room while CB-1 is running for the 20 hours of the test. In view of this, the test is now being run with the dampers closed until this situation can be further evaluated as part of the control room temperature design basis review.

On February 26, 1986 flow measurements were taken with NRC instruments at various locations in Control Building ventilation systems CB-1B, CB-2, CB-3, CB-4, and CB-12 (Control Room Special Exhaust System) while CB-1B was operating. The CB-1B outside air makeup flowrate was measured to be approximately 450 cfm while the UFSAR analysis assumed this flow to be 150 cfm. The flowrate through the CB-1B makeup duct was lowered to the design value of 150 cfm on February 28, 1986. On March 3, 1986 with CB-1A in operation with the outside air makeup damper open, PGE personnel measured the makeup flow rate to be approximately 125 cfm with the control room pressure being maintained at a positive 0.322 inches of water relative to outside air pressure. This flowrate is acceptable with regard to the UFSAR analysis of control room habitability.

On February 27, 1986 an NRC inspector discovered the condensate drain lines from the CB-1A and CB-1B coolers were cross-connected and open to the atmosphere. Flow measurements with CB-1B in operation indicated an unfiltered flow into the drain line of approximately 40 cfm. Both trains of CB-1 were declared inoperable until a cap was installed on the end of the drain line to stop the inleakage of unfiltered air. This action was completed within one hour as required by Technical Specification 3.0.3. The condensate drain lines were then separated and valves were installed to prevent unfiltered inleakage and permit periodic drainage of condensate. This action was completed on February 27, 1986.

CAUSE OF OCCURRENCE

The cause of the gap in the cooler housing seam in CB-1B was a cognitive personnel error in that the duct casting was broken and was improperly repaired using duct tape. The duct tape did not provide an air tight boundary.

The cause of the high outside makeup flowrate in CB-1B is presumed to be due to the flow balancing damper position having been incorrectly set during preoperational testing. The balancing damper is hard cast in position and no repairs to this section of ducting have been made.

The cause of the condensate line cross-connect was a design deficiency from initial construction. The work instructions during initial construction were not detailed enough to ensure the drains were separated and were equipped with valves and/or drain traps.

The cause of the CB-3 fan failing to shut off when the discharge damper was closed was mechanical interference with the limit switch installation.

CORRECTIVE ACTION

In addition to the corrective actions described above, a review of the control room temperature design basis will be performed by July 1, 1986. Additionally, the discrepancies identified in the UFSAR will be corrected in the next UFSAR amendment (July 1986).

SIGNIFICANCE OF OCCURRENCE

The CB-1 system is required to provide adequate cooling of the control room and limit the dose to control room personnel following a design basis accident, and to protect control room personnel from any toxic gas releases

which may occur on site or in the close proximity to the site. With the heat load test being performed with the outside air makeup dampers closed, CB-3 and CB-4 exhaust systems operating and the filter preheaters off, the capability of CB-1 to provide adequate cooling to the control room was not being conclusively demonstrated. Subsequent tests were conducted with the makeup air dampers open, CB-3 and CB-4 systems secured and the heater controls set at 70% relative humidity. These tests demonstrated the previous procedural deficiencies had a negligible impact on control room temperatures. The test is now being performed with the outside air makeup dampers closed because of toxic gas considerations and the impact on the control room heat load will be further evaluated.

The effect of the high makeup flowrate (approximately 450 cfm) into CB-1B and the unfiltered flow through both the gap in the CB-1B cooler seam and the condensate drain line (conservatively estimated to be 160 cfm) were analyzed using "Nuclear Power Plant Control Room Ventilation System Design for Meeting General Design Criterion 19" by K. G. Murphy and Dr. K. M. Campe and was determined to be an increase in the calculated thyroid dose presented in the UFSAR. However, Trojan Emergency Procedure (EP) 30, "Protective Action Recommendations", requires potassium iodide (KI) be administered or self-contained breathing apparatuses (SCBA) donned if airborne iodine concentrations exceed 100 MPC. The administering of KI provides a protection factor of 100 and the use of SCBAs provides a protection factor of 10,000 for radioiodine. Therefore, by the administration of KI or the donning of SCBAs in accordance with plant procedures, personnel occupying the control room would not have received thyroid doses in excess of the specified limits.

The calculated whole body dose would not have exceeded 5 rem. Under Murphy-Campe assumptions, calculated skin doses would not have increased as a result of the increased flows into the control room. However, the original dose calculations were performed by the Trojan architect-engineer and a modified Murphy-Campe analysis was used. The architect-engineer has been requested to reanalyze the doses using the as-found conditions. Nevertheless, skin doses would not have exceeded the limits of Section 6.4 of the Standard Review Plan considering anticontamination protective clothing was available to the operators.

The incorrect setting of the makeup damper in CB-1B would have had no effect during a toxic gas release because the system is operated with these dampers closed under such conditions. Additionally, the immediate actions in the control room following a toxic gas release are to ensure the normal ventilation system, CB-2, has shut down and then to don SCBAs. If CB-1 were then started on recirculation with the outside air dampers shut, toxic gas could have entered the control room through the identified unfiltered inleakage paths. In this case, the operators would have been protected by the SCBAs.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

Notwithstanding these deficiencies, operation of CB-1 was not required as a result of a design basis accident or toxic gas release. If such operation would have been required, procedures existed to provide the level of protection specified by GDC 19. Finally, the sources of unfiltered inleakage have been sealed and the excess filtered makeup air has been returned to the analyzed value thus returning the system to its analyzed condition.

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March 18, 1986
WSO-101-86

US Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Gentlemen:

Licensee Event Report No. 86-02 is attached.

Sincerely,

W. S. Orser
General Manager
Trojan Nuclear P ant

Attachment
c: Mr. John B. Martin
Regional Administrator, Region V
US Nuclear Regulatory Commission

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