ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket No.:	50-382
License No.:	NPF-38
Report No.:	50-382/96-21
Licensee:	Entergy Operations, Inc.
Facility:	Waterford Steam Electric Station, Unit 3
Location:	Hwy. 18 Killona, Louisiana
Dates:	August 26 to September 12, 1996
Inspector:	G. A. Pick, Senior Project Engineer
Approved By:	P. H. Harrell, Chief, Project Branch D

ATTACHMENTS:

Attachment 1: Partial List of Persons Contacted
List of Inspection Procedures Used
List of Items Opened, Closed, and Discussed
List of Acronyms

EXECUTIVE SUMMARY

Waterford Steam Electric Station, Unit 3
NRC Inspection Report 50-382/96-21

Operations

- Operators properly entered and exited the Technical Specification action statements during the period that the system engineer performed troubleshooting and mechanics repaired the normal intake dampers (Section O1.3).

- Operators appropriately implemented the corrective action program by initiating condition reports related to operational concerns with control room air conditioning (CRAC) Train B and the inability of a newly developed test procedure to be performed as written (Sections O1.4 and O3.1).

Maintenance

- Mechanics performed work activities in accordance with plant procedures and work instructions (Section M1.1).

Engineering

- Overall, the system engineers performed well during the troubleshooting and resolution of the identified leakage through the normal intake dampers. The system engineer who noted the change in control room makeup air flow demonstrated good awareness of system conditions and had a questioning attitude. Also, the system engineer performed a thorough, logical evaluation that identified the reason for the failure of CRAC B to meet the pressurization test acceptance criteria (Sections O1.3 and O1.4).

- System engineers provided good support to the operating organization. A system engineer established a proper postmaintenance test for the normal intake dampers, and engineers performed an appropriate safety evaluation that supported placing a blank flange across the normal intake duct. Further, engineers developed a modification to install access panels in the intake duct to ensure easy access for inspection and developed a special test to ensure leak tightness of the dampers after installation (Section M1.1).

- A system engineer recommended a proper action by requesting an administrative limit be established for leakage past the normal intake dampers (Section E1.1).

- The licensee performed a detailed, thorough root cause analysis of the leakage past the control room normal intake dampers. Further, the recommended corrective actions should correct the deficiency (Section E1.2).

- A noncited violation was identified because the licensee identified that lack of preventive maintenance resulted in low leakage dampers that failed to operate properly and an improper test methodology failed to identify the problem. (Section E1.2).

Report Details

Summary of Plant Status

The facility operated at 100 percent power during the period covered by this special, announced inspection.

I. Operations

O1 Conduct of Operations

O1.1 Introduction

On August 20, 1996, the licensee made a 4-hour nonemergency report because of a deficiency identified with the CRAC system on July 28, 1996. Excessive leakage through the normal intake dampers, assuming a single failure, could result in a single individual exceeding the 30 Rem thyroid exposure limit in 10 CFR Part 50, Appendix A, Criterion 19 and Standard Review Plan 6.4, Section II.6. Specifically, design engineers calculated that the exposure to a control room operator using 45 scfm maximum unfiltered inleakage following a design basis accident would be 35.32 Rem to the thyroid. The inspector performed this special inspection to verify the facts and assess the safety and/or regulatory significance of the identified deficiency.

O1.2 System Description and Operation

The CRAC system includes two full-capacity redundant air-handling units, two full-capacity toilet exhaust fans, a kitchen and conference room exhaust fan, two full-capacity redundant control room emergency filtration units, and redundant isolation dampers for the emergency intakes, normal intake, and exhausts. The control room envelope isolates automatically upon receipt of a safety injection, high radiation, or toxic gas actuation signal. On a high radiation or safety injection signal, the normal intake dampers isolate and outside air passes through the emergency filters to provide a clean, fresh air source (pressurization mode) to the control room. On a toxic gas signal, all intakes are isolated and air is recirculated in the control room (isolate mode).

The CRAC system is designed to maintain greater than or equal to 0.125 iwg positive pressure within the control room envelope during normal operations to prevent outside air from bypassing the safety-related toxic and chlorine gas monitoring instruments. Specifically, during routine operations, 2200 scfm enters the normal intake and 2000 scfm is exhausted through the toilet, kitchen, and conference room exhaust fans. The north and south emergency intake provide two sources of control room fresh air for pressurization of the envelope during radiological accident conditions. The north emergency intake is co-located with the normal intake and is provided with safety-related toxic and chlorine gas detection. The south emergency intake is located approximately 260 feet to the west of the normal intake and has no toxic and chlorine gas detectors.

O1.3 Discovery of Unmonitored, Unfiltered Suction Path Into The Control Room Envelope

a. Inspection Scope (93702, 71707)

The inspector reviewed condition reports and control room logs and interviewed the system engineer to verify the circumstances related to the determination of this unmonitored, unfiltered leak path into the control room.

b. Observations and Findings

On July 25, 1996, operators initiated a control room pressurization test in accordance with Procedure OP-903-123, "Control Room Envelope Pressure Test," Revision 0, to verify integrity of the control room envelope following door maintenance. The operators secured from performing the test because the acceptance criteria could not be verified and initiated Condition Report 96-1145 (refer to Section O3.1).

On July 26, operators performed the control room pressurization test in accordance with Procedure PE-005-004, "Control Room Air Conditioning System Surveillance," Revision 6, using CRAC B; however, the operators could not maintain 0.125 iwg positive pressure with 200 scfm makeup flow. The operators initiated Condition Report 96-1147 to identify and correct the root cause of the failure of CRAC B to meet acceptance criteria (refer to Section O1.4). Subsequently, operators successfully performed the test using CRAC A with an adjusted flow rate of 157.5 scfm at 0.125 iwg. The licensee considered the control room envelope operable, as specified in Technical Specification 3.7.6.5, since CRAC A passed the test.

Subsequently, after additional troubleshooting, the system engineer confirmed that CRAC B could not maintain the control room at 0.125 iwg positive pressure with 200 scfm makeup flow. In an attempt to diagnose the root cause, the system engineer had operators swap the main air handling units from Train B to A, which in turn opened Train A Damper HVC-102, normal outside air intake outboard isolation. After the damper opened, control room pressure increased. After discussions with the operators, the system engineer concluded that Train B Damper HVC-101, normal outside air intake inboard isolation, must have leaked past the seat. The system engineer became concerned because this path provided an unmonitored, unfiltered source of air into the control room during a design basis accident.

On July 27, while troubleshooting using Work Authorization 01149688, the system engineer identified 22 scfm leakage through Damper HVC-101. Mechanical maintenance attempted to adjust the damper travel under troubleshooting guidelines but the seat leakage did not stop.

On July 28, operators performed Procedure PE-005-004 to determine the leak tightness of the control room. Specifically, operators monitored changes in the

makeup flow rate with Damper HVC-101 open and Damper HVC-102 closed, with Dampers HVC-101 and -102 closed, and with the normal intake duct blocked by a temporary plate. The system engineer performed the test in this manner to quantify the amount of inleakage. The identified inleakage with both normal intake dampers closed was 9.2 scfm and with Damper HVC-101 open and Damper HVC-102 closed was 45 scfm.

On July 29, the licensee blocked flow through the normal intake with a 3/8-inch steel plate in accordance with Temporary Alteration Request 96-009, "Installation of Blankoff Plate on Control Room Normal Outside Air Intake Duct." After installation of the blankoff plate, operators declared the system operable, as specified in Technical Specification 3.7.6.5.

On September 5, as part of a system walkdown, the system engineer conducted a nonintrusive smoke test of the south emergency intake inboard dampers. The control room was in the pressurization mode with suction through the north emergency intake. The system engineer confirmed that the dampers were, in fact, leak tight and documented the test in his system log book.

The inspector reviewed the control room logs and found that the operators had properly logged the entry and exit into Technical Specification 3.7.6 limiting conditions for operation action statements.

c. Conclusions

The inspector concluded that the system engineer who noted the change in control room makeup air flow demonstrated good awareness of system conditions and had a questioning attitude. The engineers performed thorough troubleshooting that characterized the quantity of unmonitored, unfiltered leakage into the control room. Operators properly entered and exited Technical Specification action statements and appropriately identified deficiencies with condition reports.

O1.4 Inability of CRAC B to Meet Pressurization Design Requirements

a. Inspection Scope (71707)

The inspector assessed the system engineer's evaluation of the capability of CRAC B to function as designed by review of condition reports, the system description, and the Updated Final Safety Analysis Report (UFSAR), and interviews with the system engineer. As described in Section O1.3, CRAC B could not maintain the 0.125 iwg positive pressure at 200 scfm during postmaintenance testing.

b. Observations and Findings

The system engineer determined from review of plant computer data obtained on July 26, that the reactor auxiliary building (RAB) pressure measured -1.1 iwg instead of the normal -0.7 iwg during the CRAC B pressurization test and measured 0 iwg during the CRAC A pressurization test. The system engineer concluded that Shield Building Ventilation A discharged into the RAB ventilation exhaust, which caused increased negative RAB pressure. Also, the system engineer concluded that RAB doors might have been opened during the CRAC A test, which eliminated the negative pressure because of excessive inleakage. The inspector determined that the licensee had no technical requirement to have the RAB ventilation in service.

The licensee initiated the shield building ventilation because the normal containment purge was out of service so that special testing of containment penetrations could be performed. The inspector determined during accidents that the shield building ventilation initially exhausts to the RAB normal ventilation then begins recirculation when the shield building annulus reaches -8 iwg. The lack of communication between the shield building ventilation and the CRAC systems after the RAB ventilation trips would prevent adverse impact on the ability of the CRAC systems to maintain a positive pressure.

c. Conclusions

The system engineer performed a thorough, logical evaluation that identified the probable cause for the failure of CRAC B to meet the Technical Specification limits.

O3 Operations Procedures and Documentation

O3.1 Evaluation of Adequacy of Procedure OP-903-123

a. Inspection Scope (71707)

The inspector reviewed condition reports and Procedure OP-903-123 to evaluate the ability of the recently developed procedure to ensure that all flows into the control room were incorporated into the acceptance criteria.

b. Observations and Findings

Condition Report 96-1145 documented that Procedure OP-903-123 failed to properly instruct personnel to normalize flow and differential pressure when the measured pressure was between 0.125-0.130 iwg and failed to specify the required actions when the measured differential pressures exceeded the acceptable range. Further, the procedure acceptance criteria failed to explicitly specify that the flow should be less than or equal to 200 scfm at 0.125 iwg positive pressure. The immediate corrective actions included using Procedure PE-005-004.

The inspector confirmed that Procedure OP-903-123 instructed operators to initiate a condition identification whenever they identified flow through the south emergency intake during testing. Operators perform the control room pressurization test using the north emergency intake flow path since this path has toxic and chorine gas monitors; hence, flow is not expected from the south intake path. The inspector found that these procedure requirements resulted from corrective actions identified in Condition Report 96-0374. The inspector identified that the procedure could be enhanced if guidance specified that operators add any flow measured through the south emergency intake to the flow measured from the north emergency intake. The system engineer initiated actions as specified in Condition Report 96-1156 to review Procedure OP-903-123 for any enhancements that could include monitoring for leakage through the standby path.

c. Conclusions

Operators followed their administrative procedures and the corrective action program after identifying that a test procedure could not be implemented as written.

II. Maintenance

M1 Conduct of Maintenance

M1.1 Maintenance Activities Implemented on the Normal Intake Dampers

a. Inspection Scope (62703)

The inspector interviewed the system engineer and reviewed work authorizations, completed test procedures, Temporary Alteration Request 96-009 and supporting safety evaluation, and condition reports to assess the maintenance performed on Dampers HVC-101 and -102.

b. Observations and Findings

On July 27, after determining that Damper HVC-101 leaked by, the licensee initiated Work Authorization 01149688 to troubleshoot the extent and cause of the deficiency and to repair the dampers. During discussions with the inspector, the system engineer indicated that the dampers have always indicated closed during past testing and indicated that he identified 22 scfm leakage through Damper HVC-101.

On July 29, 1996, the licensee implemented Temporary Alteration Request 96-009. The temporary modification isolated the normal intake duct to allow mechanics to inspect and repair Dampers HVC-101 and -102. Specifically, mechanics removed the dampers and their actuators from the system, cleaned the damper internals, replaced the T-rings, and adjusted the damper seating action. The system engineer

specified a bubble test for a postmaintenance test to verify proper seating of the damper blade in the body. From review of ANSI N509-1980, "Nuclear Power Plant Air Cleaning Units and Components," the inspector determined that the bubble test was the appropriate test for this application. Also, mechanics disassembled, cleaned and inspected internal parts, and reassembled the damper operators using new o-rings and seals.

The inspector reviewed the safety analysis that supported the installation of the 3/8-inch thick steel plate over the normal intake duct. The engineers calculated that the maximum plate deflection at 5 iwg (design pressure is 4 iwg) would be 0.025 inches compared to a limit of 0.0625 inches. The engineers calculated that negligible stress was exerted on the hold down bolts for the steel plate. The inspector concluded that the licensee accurately assessed that blocking flow into the normal intake duct did not change the operation of the facility as described in the UFSAR. In fact, by blocking the flow through the degraded normal intake duct, the licensee complied with the system operability requirements of Technical Specification 3.7.6.5.a.

After completing the maintenance on Dampers HVC-101 and -102, the licensee performed Special Test Procedure 01149688, "HVC-101 and HVC-102 Leak Test," Revision 0, to determine, by a smoke test, any further leakage through the dampers. The system engineer identified that Damper HVC-101 still had 5.5 scfm leakage and indicated that the T-rings may need adjustment.

Because of the difficult access to the normal intake duct, the licensee initiated Work Authorization 01150338 to add access panels. The inspector reviewed the modification package, in part, and found the package well planned and the safety evaluation satisfactory. The licensee will maintain Temporary Alteration Request 96-009 in effect until personnel install the access panels and rework Damper HVC-101.

c. Conclusions

Maintenance personnel performed the work activities in accordance with plant procedures and instructions. Administrative controls ensured that safe, generally effective repair of the normal intake dampers. Engineers performed an appropriate 10 CFR 50.59 analysis related to the temporary modification that implemented the blankoff plate at the inlet to the normal intake duct. A system engineer established a proper postmaintenance test for the normal intake dampers prior to installation into the system. Further, engineers developed a modification to install access panels in the intake duct to ensure easy access for inspection and developed a special test to ensure leak tightness of the dampers after installation.

III. Engineering

E1 Conduct of Engineering

E1.1 Potential Overexposure to Personnel Upon Failure a Ventilation Damper

a. Inspection Scope (37551)

The inspector assessed engineering's evaluation of the safety significance of a failure of a single control room normal intake damper by interviewing design engineers, reviewing design calculations, and reviewing licensing and design basis information.

b. Observations and Findings

The system engineer concluded that Dampers HVC-101 and -102 were allowed no leakage. Consequently, the system engineer requested that design engineering calculate the potential exposure to an operator assuming 10 scfm unmonitored, unfiltered inleakage through the normal intake dampers. Design engineering documented the evaluation in Calculation EC-S96-011, "LOCA Offsite and Control Room Radiological Dose Consequences," Revision A. The calculation demonstrated that the operators would not exceed thyroid dose limits. The system engineer planned to use this information to set an 8 scfm administrative limit in a leak test procedure, as part of the corrective actions for this event (refer to Section E1.2).

The inspector determined that the design engineers performed no formal calculation of the potential increased operator exposure resulting from the excessive inleakage. However, the design engineers used the methodology as specified in Calculation EC-S96-011 with 45 scfm substituted for 10 scfm inleakage. The calculation resulted in 35.32 Rem thyroid exposure to an operator following the analysis guidelines in UFSAR Chapter 15. In addition, the design engineers calculated potential exposure to an individual but used realistic estimates for occupation of the control room other than the time periods assumed in UFSAR Table 15.6-18, "Parameters Used in Evaluating The Radiological Consequences of a Loss of Coolant Accident." The estimate used 13-hour shifts and a rotation of 4 days onshift, 3 days offshift, 3 days onshift, and 5 days offshift for the first 15 days. For the last 15 days, the engineer assumed 50 percent occupancy. The thyroid exposure to an operator under these conditions would be 27.22 Rem.

c. Conclusions

The inspector considered the system engineer's request for an allowable leakage limit through the CRAC normal intake duct without resulting in an overexposure to the control room operators to be proper. The inspector concluded that the licensee used an appropriate evaluation methodology, with and without realistic estimates,

to identify the operator exposure that could have resulted in the event of unfiltered inleakage into the control room.

E1.2 Corrective Actions to Resolve Leakage Through The Normal Intake Dampers

a. Inspection Scope (93702, 37551)

From discussions with the system engineer and review of the root cause analysis for Condition Report 96-1156, the inspector evaluated the thoroughness of the root cause evaluation and relevance of the proposed corrective actions related to the leakage identified through the normal intake dampers. In addition, the inspector reviewed the system design documents, system descriptions, the UFSAR, and plant procedures and interviewed the system engineer to evaluate the appropriateness of the pressurization test.

b. Observations and Findings

The root cause analysis for Condition Report 96-1156 documented the event sequence, the root cause assessment, similarity to previous occurrences, and recommended short-term and long-term corrective actions. Also, the root cause analysis described in detail the consequences that might result from other potential leak paths, the root cause of the inability of CRAC B to maintain a positive pressure, and the failure of Dampers HVC-101 and -102 to close. The licensee identified no impact from other leakage paths; however, the system engineer indicated that the test methodology would be reviewed to ensure that it confirms the integrity of the various paths. The licensee established the root cause as dirt and debris found under the valve seat that prevented full closure of the disk.

The short-term corrective actions included: (1) establishing access panels in the normal intake duct for inspecting Dampers HVC-101 and -102, (2) initiating repetitive tasks to inspect the 10 of 14 control room dampers that did not have tasks to inspect, clean, and replace the soft seats, and (3) calculating the personnel exposure resulting from a 10 scfm leak rate through the normal intake.

The long-term corrective actions included: (1) establishing an 18-month frequency for leak rate checking the isolation dampers (Note: initially the licensee will perform quarterly testing to establish a trend), (2) developing a procedure with an administrative limit of 8 scfm to leak rate test Dampers HVC-101 and -102 , and (3) reviewing by December 31, 1996, the testing configuration for the control room pressure test to ensure compliance with all licensing documents. Also, the licensee determined that the inaccuracies for the flow measuring loop in the emergency intake lines could be as high as 36 scfm at the lower portion of the indicating range. The inspector expressed concern and the licensee recognized the potential for undetected leakage through the idle emergency intake loop. The test performed by the system engineer on September 5, eliminated any immediate concerns since the inboard dampers were found to be leak tight and testing is performed from the north

emergency intakes. The system engineer indicated that the review would identify methods to eliminate air inleakage that could mask test results.

The licensee had no flow indication for the normal intake path and had no requirement to leak test the tightness of the low leakage dampers. The inspector verified from review of design specifications and the valve manufacturer's vendor manual that the normal intake dampers were low leakage dampers. The inspector concluded that the test procedure under development for the normal intake dampers addresses the test concerns. Further, the system engineer selected an appropriate 18-month test frequency since that is the Technical Specification required frequency for performing the control room pressurization test.

Technical Specification 6.8.1.c specifies that procedures shall be implemented for surveillance and test activities of safety-related equipment. Procedure PE-005-004, Revision 5, provided instructions to test the integrity of the control room envelope. The licensee reviewed Procedure PE-005-004 and determined that the procedure failed to test the normal intake leak path into the control room. The inspector concluded that the failure to perform appropriate testing to ensure that low leakage ventilation dampers remained in good operating condition was a violation identified by the licensee. The licensee implemented immediate actions to correct the deficiency and established a root cause evaluation to propose long-term corrective actions. Further, previous actions related to the control room envelope would not have prevented this deficiency and the deficiency did not result from any willful act. Consequently, this licensee-identified and corrected violation is being treated as a noncited violation consistent with Section VII.B.1 of the NRC Enforcement Policy (382/9621-01).

c. Conclusions

The system engineer performed a detailed thorough evaluation to identify the root cause for the normal intake control room dampers' failure to fully seat. The system engineer recommended appropriate corrective actions. The inspector determined that the licensee identified and corrected deficiency of the control room normal intake dampers to remain leak tight was a noncited violation.

E2 Engineering Support of Facilities and Equipment

E2.1 Review of Facility and Equipment Conformance to UFSAR Description

A recent discovery of a licensee operating a facility in a manner contrary to the UFSAR description highlighted the need for a special focused review that compares plant practices, procedures and/or parameters to the UFSAR descriptions. While performing the inspections discussed in this report, the inspector reviewed the applicable portions of the UFSAR that related to the areas inspected. The following inconsistency was noted between the wording of the UFSAR and the plant practices, procedures and/or procedures observed by the inspector.

UFSAR Section 6.4.2.2, "Control Room Air Conditioning System Design," specifies, in part, makeup air for pressurization is filtered before entering the control room envelope. The inspector concluded from information obtained during this inspection that the statement is not totally accurate. The licensee discovered that an unfiltered suction path can occur if the low leakage dampers leak by because of poor testing or inadequate maintenance. The corrective actions described in E1.2b, of this report address this condition.

V. Management Meetings

X1 Exit Meeting Summary

The inspector telephonically presented the inspection results to members of licensee management at the conclusion of the inspection on September 12, 1996. The licensee acknowledged the findings presented.

The inspector asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

ATTACHMENT 1

PARTIAL LIST OF PERSONS CONTACTED

Licensee

C. M. Dugger, General Manager, Plant Operations
J. J. Fisicaro, Director, Nuclear Safety
C. Fugate, Assistant Operations Superintendent
T. J. Gaudet, Manager, Licensing
R. T. Kullman, Licensing Engineer
N. Pazooki, Senior Engineer, Safety and Engineering Analysis
C. P. Talazac, Senior Engineer, System Engineering
D. W. Vinci, Superintendent, System Engineering
A. J. Wrape, Director, Design Engineering

NRC

L. A. Keller, Senior Resident Inspector
T. W. Pruett, Resident Inspector

INSPECTION PROCEDURES USED

37551	Onsite Engineering
62703	Maintenance Observation
71707	Plant Operations
93702	Prompt Onsite Response to Events at Operating Power Reactors

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-382/9621-01	NCV	Failure to establish repetitive tasks to inspect and refurbish safety-related control room ventilation dampers (Section E1.2).

Closed

50-382/9621-01	NCV	Failure to establish repetitive tasks to inspect and refurbish safety-related control room ventilation dampers (Section E1.2).

Discussed

None

LIST OF ACRONYMS USED

CRAC	control room air conditioning
iwg	inches water gauge
RAB	reactor auxiliary building
scfm	standard cubic feet per minute
UFSAR	Updated Final Safety Analysis Report