NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Virgil C. Summer Nuclear Station	0 5 0 0 0 3 9 5	1 OF 0 3

TITLE (4)
Instrument Air Supply to Control Room Ventilation Intake Dampers

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)
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0 7	3 0	8 7	8 7	– 0 1 9	– 0 1	1 0	2 8	8 7		0 5 0 0 0

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	1 0 0	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
		20.405(a)(1)(i)	50.36(c)(1)	X 50.73(a)(2)(v)	73.71(c)
		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
	AREA CODE
W. R. Higgins - Associate Manager, Regulatory Compliance	8 0 3 — 3 4 5 - 4 0 4 2

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							

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)

On July 30, 1987, at 1045 hours, the Licensee discovered a design deficiency in the instrument air system which could have caused the failure of control room ventilation on a loss of instrument air. The cause of this event was attributed to the misapplication of two check valves which are installed in the air supply to the outside air intake dampers. A check valve and an air accumulator for each train of ventilation ensure that the associated intake dampers remain in the open position to perform their design function on a loss of instrument air event. This condition could have rendered both trains of ventilation inoperable, so action was initiated in accordance with the limiting conditions for operation in Technical Specifications Section 3.0.3. A one hour notification was made by the Licensee on July 30, 1987, at 1143 hours, in conjunction with a reduction in power to comply with Technical Specifications. The control circuitry interlocks between the control room ventilation fans and the outside air intake dampers were temporarily jumpered until a permanent modification of the system could be performed. At 1330 hours on July 30, 1987, a Justification for Continued Operation was approved based on the temporary modification of the control circuitry and the training of operations personnel on manual actions necessary to restore an air supply to the outside air intake dampers.

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

PLANT IDENTIFICATION:

Westinghouse - Pressurized Water Reactor

EQUIPMENT IDENTIFICATION:

Instrument Air System - IA
Outside Air Dampers (Butterfly Valves) - XVB-003A, B; XVB-004A, B

IDENTIFICATION OF EVENT:

Instrument air check valves were found to be improperly designed which could prevent the control room ventilation from performing its design function.

EVENT DATE: 07/30/87

REPORT DATE: 10/28/87

This report was initiated by Off-Normal Occurrence Number 87-076.

CONDITIONS PRIOR TO EVENT:

Mode 1 - Reactor Power 100%

DESCRIPTION OF EVENT:

On July 30, 1987, at 1045 hours, the Licensee identified a design deficiency in the instrument air system which could cause loss of control room ventilation on a loss of instrument air. The air supply to each inlet damper actuator is provided with an air accumulator and check valve to ensure that the dampers remain in the open position to perform their safety-related function in the event of a loss of the instrument air system. While evaluating the system design, it was determined that the instrument air supply check valve for each train of outside air inlet dampers was not designed to provide a leak tight seat under the system air pressure. The check valves were designed to fully seat under a much greater pressure tnan that of the instrument air system. Without air tight seating of the check valve, the air accumulator pressure may not be maintained to keep the inlet dampers open. The system design requires the outside air inlet dampers to be open in order for the normal and emergency fans to operate. Failure of check valves to properly seat and inlet dampers to open may render both trains of ventilation inoperable. Action was initiated in accordance with the limiting conditions for operation in Technical Specifications Section 3.0.3. A one hour notification was made at 1143 hours by the Licensee in conjunction with a reduction in power to meet the limiting conditions for operation. At 1230 hours the Licensee completed a temporary modification to the control circuitry for both normal ventilation fans allowing fan operation regardless of the associated outside air intake damper position. The modification

consisted of jumpering the outside air damper position interlocks with the normal fan control circuitry. Supplemental procedures were implemented and training was given describing the manual actions to be taken to restore the air supply during a loss of offsite power and LOCA design basis event. At 1330 hours on July 30, 1987, a Justification for Continued Operation (JCO) was presented to Region II by the Licensee in a telephone conference call. The JCO was approved provided certain actions were taken. These have been addressed under corrective actions in accordance with the attached Safety Evaluation which includes the JCO.

CAUSE OF EVENT:

The event was caused by two improperly designed instrument air check valves installed in the IA system which may not have seated properly at the line pressure within the instrument air system.

ANALYSIS OF EVENT:

There were no adverse consequences due to this event. The event resulted from an insufficient design which was discovered during an engineering design review of the control room ventilation system.

CORRECTIVE ACTION:

The following actions have been initiated to correct the effects of the design deficiency:

1. Bypass Authorization Request 87-11 installed jumpers around the interlocks from the outside air intake dampers to the control circuit of the ventilation fans. This allows the ventilation fans to operate when the outside air intake dampers are closed.

2. Operations personnel have been trained regarding the effects of the loss of the instrument air on control room ventilation, and operations group Special Instruction 87-18 was issued to provide guidance on manual actions required in order to satisfy the Justification for Continued Operation. A change has been initiated to the instrument air operating procedure (SOP-220) in order to address temporary cooling of the instrument air compressors with fire service water as directed in the Special Instruction.

3. A complete evaluation of the air supply and control system for the outside air intake dampers is being performed and necessary permanent modifications are scheduled for implementation by November 27, 1987.

ATTACHMENT
Safety Evaluation
Control Room Ventilation System - Air Intake Dampers

I. Background

The Control Room Ventilation System is provided with four air-operated outside air inlet dampers, two on each of the redundant *sub*systems, which are required to open for normal and emergency operation to ensure positive pressurization of the control room. Additionally, the outside air intake dampers associated with an idle Control Room Ventilation Train are required to be closed to prohibit outleakage from the operating train, thereby allowing positive pressure control. The dampers that are being utilized are fail closed dampers on loss of air to the actuator or loss of control power to the respective control solenoids. The dampers are provided with a local air accumulator, a regulator, and a check valve isolation device to maintain required air pressure to the damper actuator for both normal and emergency plant operating conditions.

II. Design Basis

A. Control Room Ventilation System

The control room ventilation system is required to be operable for all normal and design basis accidents. It is required to perform three functions:

Provide cooling for Control Room equipment and personnel for all modes of plant operations.

Provide filtering of outside air through charcoal filters as a result of a LOCA.

Maintain a positive pressure in the Control Room to prevent any inleakage of unfiltered air as a result of a LOCA.

The Control Room Ventilation System must only provide a positive pressure to prevent air infiltration as a result of a LOCA release; therefore, it is possible to address two distinct operating modes which have different functional requirements. These requirements are:

The cooling requirement of the system which exists for all plant modes.

The pressurization and filtering requirements which exist only for a LOCA with releases. This would indicate that the worst case design basis accident for the pressurization function of the Control Room Ventilation System is a loss of offsite power coincident with a Loss of Coolant Accident.

B. Control Room Ventilation Air Intake Damper Design Basis Requirements

These dampers are required to be open for normal plant operation of the aligned train to allow a mixture of a small amount of fresh outside air with the recirculated air inside the Control Room.

The dampers are required to be open in response to an ESF signal to ensure that makeup air is admitted through the outside air intake damper and through the charcoal filters for cleanup, thereby maintaining a positive pressure in the main control room. This precludes entrance of unfiltered outside air into the control room.

The dampers are required to be closed if their associated train fans are not operating to seal a leakage path which would exist through the non-operating train. This must be considered when taking a single active failure within a single train which could maintain the outside air intake dampers open and at that same time prevent the associated normal fan from running. If the idle loop dampers are not closed, pressurization of the control room is compromised.

C. Control Air System Requirements

All components from and including the check valve in the air supply header to the valve actuator are required to be classified as Nuclear Safety Related.

This requirement is based upon the logic interlocks between the dampers and the normal and emergency ventilation fans. The control logic is such that both outside air intake dampers must be open for the normal air supply fan to operate. Additionally, this fan operates for both normal and accident plant modes. For emergency plant operation, the emergency ventilation fans must be operating and they are interlocked to run only if the normal ventilation fans are running. Since the dampers in question are fail closed on loss of control air, a failure of the air supply to these dampers would result in the inoperability of the normal air supply fans which in turn renders the emergency fans inoperable. Thus, a failure of a single air intake damper prevents that train of ventilation from operating.

D. Component Design Requirements

The components within the air supply system which must function to prevent damper closure are the check valve, regulator, accumulator and solenoid valve. These components are required to ensure that the dampers remain open for all plant conditions and design basis events. These dampers must be maintained in the open position for an extended period of time to assure pressure control of the Control Room. These components should be qualified nuclear safety related, seismic category I and be capable of operating in their worst case environment.

III. Analysis Conclusion

Based upon the above defined design basis requirements and as-built component configuration, the following deficiencies were found:

A. The instrument air supply check valve for each train of outside air inlet dampers was not designed to provide a leak tight seat under the system air pressure. Failure of the check valve to properly seat may render both trains of ventilation inoperable.

B. The system design requires the outside air inlet dampers to be open in order for the normal and emergency fans to operate. A loss of air due to a leaky check valve would cause the damper to close, preventing both normal and emergency fans from operating. Failure of the check valve to seat and inlet damper to open may render both trains of ventilation inoperable.

C. A postulated single failure in combination with a failure of the air supply system to the outside air dampers could result in the inability of the Control Room Ventilation Train from maintaining positive pressure control.

D. Existing plant design drawings and procurement requirements for portions of the air supply system have not been designated as nuclear safety related and were not procured under safety related specification requirements.

Since it is uncertain that the control room ventilation system is capable of performing its design basis function (maintaining control room temperature and pressure) and meeting the single failure criteria, the following plant temporary modifications and supplemental operating procedures shall be implemented. A complete evaluation of the air supply and control system for the outside air intake dampers is being performed and necessary permanent modifications are scheduled for implementation by October 28, 1987, barring constraints associated with parts availability or plant conditions.

IV. Justification for Continued Operation

1. **Jumper Procedure of the Control Room outside air intake dampers interlocks with the ventilation fans to assure control room cooling.**

   The two functions of the Control Room Ventilation system which must be maintained are to provide cooling during all modes of plant operation, and to provide filtration and positive pressure control under emergency conditions.

Installation of the bypass jumpers around the interlocks from the outside air intake dampers to the control of the ventilation fans provides increased reliability of the system operation under all modes and further assures that the control room cooling function will be maintained regardless of the outside air intake damper position.

Therefore, with the outside air intake damper interlocks with the fans bypassed, no failures of the Control Room Ventilation system can be postulated which will defeat the design basis function of the system to provide its cooling function.

2. **Manual Action to restore the air supply to the Outside Air intake dampers during a loss of offsite power and LOCA Design Basis Event.**

A design calculation has been made which demonstrates that the dose to the operator does not exceed 30 rems in 30 days if the outside air intake dampers are closed (i.e. no positive pressure control) for a period of 8 hours following a loss of coolant accident.

Manual actions can be taken to restore the air supply to these dampers within the 8 hours by one of the following methods:

A. **Supplemental (Breathing) Air Compressor**

Align and utilize the breathing air compressor to supply the portion of the instrument air system required to serve the air intake dampers. The capacity of the breathing air system will be adequate to supply these dampers when non-essential air loads are isolated (i.e. Turbine Room, Service Building, Aux Boiler House, Reactor Building backup services,. Reference Procedure SOP-220)

B. **Diesel Air Compressor**

The diesel air compressor is an alternate source of backup instrument air which is independent of electrical power. (Battery Started, Air Cooled). This compressor can be started with in-place procedures in a very short period of time, well within the 8 hours. (Reference Procedure SOP-220)

C. **Restore Instrument Air Compressor**

The A train instrument air compressor is powered from safety related power source and can be started from the control board. However, it is water cooled and temporary cooling must be provided if offsite power is not available but can be done within the 8 hours using fire service as a source of water.

D. **Air Bottles to the Valve Actuators**

By installing temporary air bottles to the outside air intake dampers, the valves can be maintained in the open position without any plant air source.

3. **Manual Action to remove the air supply from the Outside Air intake dampers during an event which prevents de-energizing the solenoids of an inoperative train of Control Room Ventilation**

A calculation has been performed to determine the response time available to the operator to open the Control Room outside air intake dampers on an operable train and to close the intake dampers on an idle train in order to limit operator dose to 30 rem in 30 days. This calculation demonstrates that if operator action is taken within 4 hours to restore air to the operable loop, an additional 20 hours are available to close one of the two inlet dampers in the idle loop prior to exceeding the 30 rem/ 30 day operator maximum dose.

On this basis, the following action should be taken:

Manual actions must be taken within 4 hours to open the outside air inlet dampers on an operating train using one of the previously identified procedures. After opening the dampers on the operable train, action must be taken within the next 20 hours to remove the air supply to one of the outside air intake dampers on an idle loop as follows:

Disconnect the air supply from the inlet of the control solenoid.