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August 31, 2000

5928-00-20257

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Dear Sir or Madam:

SUBJECT: THREE MILE ISLAND NUCLEAR STATION, UNIT 1 (TMI-1)
OPERATING LICENSE NO. DPR-50
DOCKET NO. 50-289
LER NO. 2000-003-00, "DISCOVERY OF A CONDITION OUTSIDE THE UPDATED FSAR (UFSAR) DESIGN BASIS FOR THE CONTROL BUILDING ENVELOPE (CBE) DUE TO CLOSED VOLUME DAMPERS"

This letter transmits Licensee Event Report (LER) number 2000-003-00, regarding the discovery of a condition in the Control Building Envelope, which is outside the design basis as described in the UFSAR. For a complete description of the evaluated condition, refer to the text of the report provided on Forms 366 and 366A.

This condition did not adversely affect the health and safety of the public. For additional information regarding this LER contact Mr. Adam Miller of the TMI Unit 1 Regulatory Engineering Department at (717) 948-8128.

Sincerely,

Mark E. Warner
Vice President, TMI Unit 1

MEW/awm

cc: TMI Senior Resident Inspector
Administrator, Region I
TMI-1 Senior Project Manager
File No. 00100

IE22

NRC FORM 366 (6-1998) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001

Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Records Management Branch (T-6 F33), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to the Paperwork Reduction Project (3150-0104), Office of Management and Budget, Washington, DC 20503. If an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
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TITLE (4)

Discovery of a Condition Outside the Updated FSAR (UFSAR) Design Basis for the Control Building Envelope (CBE) Due to Closed Volume 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 NAME	DOCKET NUMBER
08	05	2000	2000	-- 003 --	00	08	31	2000	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)			
POWER LEVEL (10)	100	20.2201(b)	20.2203(a)(2)(v)	50.73(a)(2)(i)	50.73(a)(2)(viii)
		20.2203(a)(1)	20.2203(a)(3)(i)	X 50.73(a)(2)(ii)	50.73(a)(2)(x)
		20.2203(a)(2)(i)	20.2203(a)(3)(ii)	50.73(a)(2)(iii)	73.71
		20.2203(a)(2)(ii)	20.2203(a)(4)	50.73(a)(2)(iv)	OTHER
		20.2203(a)(2)(iii)	50.36(c)(1)	50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 366A
		20.2203(a)(2)(iv)	50.36(c)(2)	50.73(a)(2)(vii)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Adam W.Miller, TMI Regulatory Engineer	(717) 948-8128

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

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

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) **(16)**

On August 5, 2000, each train of the Control Building Emergency Ventilation System was tested to determine if each room in the Control Building Envelope (CBE) is maintained at a positive pressure with respect to adjacent areas outside the envelope. The test identified a negative pressure in Room 301, with respect to its adjacent area, which is in conflict with the design basis specified in the UFSAR. Closed volume dampers located in the supply diffusers in Room 301 caused the negative pressure. The date and reason that the volume dampers were closed could not be determined conclusively, however the most likely explanation is that the dampers were closed several years ago to improve pressure or temperature in other areas of the CBE. Sufficient makeup air is now provided to the room to provide positive pressure. Nearby rooms were checked to verify that air balance was not affected to the extent that negative pressure would occur in those rooms. Corrective actions will include restoration of the appropriate airflow from the diffusers in Room 301, posting of warning tags in this and similar diffuser locations in the Control Building Ventilation System, as well as the verification of the ventilation configuration in all safety related plant zones. There were no adverse safety consequences from this event, and the event did not affect the health and safety of the public.

I. Plant Operating Conditions Before The Event:

TMI Unit 1 was operating at 100% power at the time of the event.

II. Status of Structures, Components, or Systems That Were Inoperable At The Start Of The Event And That Contributed To The Event:

The volume dampers, *[FCO], associated with the two ventilation supply diffusers to the cubicle containing the 1D 4160 kV Switchgear located in the Control Building Tower (within the Control Room Habitability envelope) were closed.

III. Event Description:

Test Results: During performance of Functional Test Procedure 826.04, both trains of the Control Building Emergency Ventilation System were tested to determine if all rooms inside the Control Building Envelope (CBE) could be maintained at a positive pressure with respect to adjacent areas outside the CBE. All rooms were at a positive pressure with the exception of 1D 4160-Volt Bus Room (Room 301). Room 301 was –0.044 inches water column with respect to the Turbine Building and the Turbine Building was negative, -0.06 inches water column, with respect to the environment external to the building. The Turbine Building shares the east wall of Room 301. The negative pressure condition conflicts with the design basis as described by TMI-1 UFSAR, Update 15 section 7.4.5.2.1. Maintaining the rooms in the CBE at a positive pressure limits infiltration into the envelope by paths other than the planned path from the air intake.

Background: Modifications and testing are in progress to update the Control Building Habitability Analysis to current standards. The modifications included blocking the exhaust from the system, removing the recirculation damper, and placing the makeup damper in a fixed position. In March 2000, Functional Test 826.03 simulated the ventilation system conditions as they would be after the modification with the objective of avoiding conditions outside design basis. Room 301 was +0.05 inches of water column with respect to the Turbine Building during that test. During Functional Test 826.03, the relative pressure of the Turbine Building to outside pressure was not measured. Functional Test 826.04 measured the pressure differential between the Turbine Building and outdoors in order to determine the CBE to Turbine Building differential pressure in the event of a Loss of Offsite Power (LOOP). During a LOOP, Turbine Building ventilation would be off and it is assumed that pressure would equalize with outdoor pressure.

After modifications, Functional Test 826.04 was performed to document post modification conditions to verify that positive pressure was maintained in the CBE with respect to adjacent areas outside the envelope, and to measure the makeup air flow rate to the CBE. Makeup air is an input to the Dose Calculation for Control Building Habitability and the positive pressure provides assurance that there is no other inflow pathway. The modification described above had little, if any, effect on Room 301 being at a negative pressure during this recent test. The relative pressures are affected by many conditions including operation of the Turbine Building ventilation system.

Event Sequence: Functional Test Procedure 826.04 was in progress to document relative pressure in each room of the CBE. When the negative pressure was observed in Room 301, the test equipment setup was verified to be correct and the reading was verified. The makeup damper was opened further from its throttled position to determine whether providing more air would correct the condition but the pressure in Room 301 remained negative. The makeup damper was returned to its original test position. Supply and return air ducts in the room were checked. The return air duct was temporarily blocked. Room 301 became slightly positive with return air blocked, but blocking off all return air is not recommended and the return register was reopened.

The two supply diffusers were more difficult to access because of their location in the overhead above the 4160 V bus. When maintenance personnel reached the supply diffusers, air supply to the room was found to be very low. Inspection revealed that the diffusers have built in volume dampers directly above the diffuser vanes. The volume dampers were closed in both diffusers.

The volume damper was very difficult to operate so the diffuser damper assembly on the south end of the room was removed from the duct and brought down to floor level. The damper section was removed and the diffuser was reinstalled. Differential pressure was then measured to be +0.065 inches water column with respect to the Turbine Building. The pressure in the surrounding rooms was checked and was verified to have remained acceptable.

IV. Assessment of Safety Consequences & Implications of the Event:

There were no direct adverse effects from the condition. The effect of the negative pressure during a postulated accident would be to provide an additional pathway for air makeup into the CBE. This additional pathway could potentially increase the dose to the Control Room Operator depending on the pathway, airflow rate and the X/Q for that pathway. The effect of this event is minimal because:

1) The differential pressure was very small
2) There are limited potential air passages from the Turbine Building to Room 301
3) At a negative differential pressure of 0.1 inches water column, it is estimated that 30 square inches of pathway would be required to admit 200 cubic feet per minute (cfm) into the envelope.
4) All rooms adjacent to Room 301 other than the turbine building are within the CBE and those adjacent were at a positive pressure with respect to outside the envelope
5) Air leaking into the CBE by this path would be filtered before it reaches the Control Room.

Evaluations were made to determine the effect of leakage into the CBE. Leakage into Room 301 is assumed to be filtered before it reaches the Control Room since the return air from Room 301 goes through the charcoal filters prior to being re-circulated to the Control Room. The evaluations used the assumptions in Calculation C-1101-900-E000-072, Rev 2, as listed in Appendix 4 of that calculation. Those assumptions reflect the current operation of the system. The only assumption changed was that 200 cfm of air was drawn in from an adjoining area west of the CBE reducing the intake flow from the intake tunnel by the same 200 cfm. Atmospheric dispersion to this area was conservatively assumed to be the same dispersion used for unfiltered ingress/egress leakage in the calculation. The results of the evaluation show that even if the leakage into the CBE was as high as 200 cfm, the thyroid dose to the control room operator (the limiting type of dose) would increase by less than 10%.

V. Previous Events & Extent of Condition:

The pressure differential in Room 301 for the August 2000 test was slight, -0.044 inches water column, and the potential for in-leakage was small. There are four penetrations in the shared wall; one for cable tray 935 and three for 4160 V bus ducts. The cable tray penetration is sealed with a foam type fire barrier and the bus ducts have foam fire barrier outside the duct and a "fume tight seal assembly" inside the duct.

Following discovery of the volume dampers attached to the supply diffusers in Room 301, design documentation and component databases were checked to determine if this configuration exists in the Control Building and other Safety Related Ventilation Systems. The Functional Test documents satisfactory performance of the Control Building Ventilation. Reactor Building Ventilation Flow was measured during a refueling outage in September 1999. Other safety related ventilation systems were walked down to verify presence of flow.

As part of the investigation of this event, Preventive Maintenance Task T9824, which was initiated in November 1999 to record air flows and differential pressures, was reviewed. This task is on a two-year interval with first performance scheduled for May 2001. Review of the task indicated apparent lack of detailed instructions or acceptance criteria.

Two similar occurrences were found during the review for similar events in our corrective action process (CAP) :

- CAP T1998-0735 - AH-D-270 was found approximately 50% open
- CAP T1999-0235 - LER 1999-003-00 and Supplement –01 Manual Damper upstream of AH-D-39 found closed

In the 1998 event, damper AH-D-270 was found secured in a partially open position. It had been mispositioned for a maximum of 54 days. In the 1999 event, a manual balancing damper failed closed due to lack of maintenance. The damper had no tag number and was not in the preventive maintenance program.

VI. Identification of Root Cause

The Root Cause was found to be a lack of adequate equipment controls to assure configuration was maintained.

A. DISCUSSION

The root cause team evaluated potential causes and concluded that the volume dampers in Room 301 had been intentionally closed at some time since 1986 but was not able to ascertain specifically why they were closed. The probable reason was in an attempt to improve pressure or temperature in another area of the Control Building. The volume dampers lacked component identification and are not controlled or verified.

The investigating team examined the manual volume damper. It was noted that the design of this damper is such that the air flow would tend to force the damper back to full open whenever the vanes

are positioned other than full open. There are no springs or weights to bias the damper in any particular position. The damper is in a difficult to access location above the 4160 V Bus. It is hard to see the damper inside the diffuser section unless looking right into the diffuser. Additionally, there are no external linkages or actuating arms visible outside the duct. Repositioning the damper requires someone to reach in through the diffuser. These factors eliminated the possibility that the damper was inadvertently repositioned such as may occur when workmen bump the component or linkages are pushed out of position. The damper was coated with dust and the damper sliding mechanism was stuck in the full closed position. The dampers appeared to be closed for a considerable period of time.

Based on these observations, it was concluded that the damper did not reposition itself closed over time due to vibration, wear, gravity, air flow or pressure surges. It is also improbable, due to the difficult to access location, that anyone repositioned this damper unintentionally. The condition of the damper and previous test data indicates that the damper was probably repositioned several years ago but after the 1986 balancing.

The investigating team concluded that closing this damper was not a credible target of sabotage or willful misconduct. This is based on both the degree of difficulty in gaining access to the component, as well as the negligible impact on the plant's nuclear safety or generation reliability. The most likely cause of the damper being repositioned was either closing the damper during efforts to optimize building room temperatures or to obtain the required differential pressure in another area without confirming pressure in Room 301. Measurement of differential pressure between Room 301 and the turbine building was not typically done in the past.

Other causes for the room to fail differential pressure testing were considered by the team, but ruled out, included:

- problems with the test equipment or test conditions
- changes to fire barriers or door seals
- modification activities
- Ventilation flow path supply or return path impairments, other components out of position, fan problems, clogged filters, etc.
- Wear, vibration, pressure surges

B. TECHNIQUES APPLIED

Change Analysis

Changes identified include the differences from the flow balance tests performed in the 1986 and the current test results that indicate the damper was repositioned during this interval. The modifications performed between March and August of 2000 may have contributed to the event but are not believed to be the cause.

Barrier Analysis

- One of the missing barriers that contributed to this event is that these dampers are not labeled, not listed on P&I drawings, and they are not on any periodic surveillance or maintenance lists. Corrective actions will include labeling these dampers with a warning label to prevent someone from repositioning them without recognizing that their position is controlled to meet a design basis requirement.

- A second barrier that would not have prevented the event, but could have helped identify the condition at an earlier date, was corrective action from the previous event where an unnumbered balancing damper failed closed (reference CAP T1999-0235 and LER 1999-003).

One of the corrective actions from LER 1999-003 was to perform a walk down of safety related ventilation systems to assure there were no other manual balancing dampers not included in the PM Program. These dampers are a different type and the engineer performing this task overlooked these dampers in the diffuser when completing that walkdown. The engineer was unaware the dampers existed, the dampers are not shown on the flow diagram, and the dampers are not easily visible. A corrective action from this event will include checking the configuration of ventilation diffuser dampers on all safety related ventilation systems.

C. ROOT CAUSE

The direct cause for the negative pressure in Room 301 was that the dampers were incorrectly positioned fully closed. When and why the dampers were placed in the closed position could not be identified due to the elapsed time and absence of detailed records for this damper position other than flow balance measurements (last done in 1986). The root cause has been concluded to be that there were inadequate administrative controls. Additional controls or monitoring would have prevented this event or detected it earlier.

There is inadequate documentation of the volume dampers in that the dampers are not shown on the flow diagram and do not have a component tag number. The volume damper located in the diffuser is shown on the mechanical drawings.

D. CONTRIBUTING CAUSES

1. There was a missed opportunity in that actions taken in response to the event reported on LER 1999-003 were not broad enough to identify these closed volume dampers. The actions taken on Control Building Ventilation after the last event focused primarily on the negative pressure portion of the system. Earlier discovery would not have prevented the event but would have reduced the amount of time that the condition existed.

VII. Corrective Actions:

Immediate & Short Term Actions:

1. The volume damper was removed from the diffuser at the south end of the room and the differential pressure for Room 301 was verified to be positive with respect to the turbine building. This action was completed on August 5, 2000, and restored the plant to design basis conditions.

2. Adjacent rooms were confirmed to be positive indicating that the ventilation balance was not adversely affected.

3. Other safety-related systems were evaluated for a potential of similar problems. The Reactor Building Ventilation flow was measured during the last refueling outage and monitoring is in place to detect degradation. Other safety-related systems were walked down to verify the presence of flow.

Long Term Corrective Actions:

1. Permanently configure the volume dampers in Room 301 to design basis conditions. This action will be completed by 12/31/00.

2. Determine the flow status of the volume dampers for each diffuser in the Control Building Ventilation and other safety related systems. This action will be completed by 12/31/00.

3. Provide input to the Training Department on Lessons Learned from this event. Training will evaluate the input and place appropriate information into lesson materials. This action will be completed by 12/31/00.

4. Establish component tag numbers and hang identification tags for the diffuser / volume dampers on all Safety Related ventilation systems. This action will be completed by 12/31/00, except for the Reactor Building Ventilation System. Component identification tags for accessible Reactor Building Ventilation System components will be hung during the next refueling outage currently scheduled to start in September 2001.

5. Place a sign or tag on the diffusers/volume dampers of the Control Building Ventilation System, stating that adjustment of the damper requires approved procedure. This action will be completed by 12/31/00.

6. Establish specific guidance and acceptance criteria for Preventive Maintenance Task T9824. Task T9824 is to record air flow and differential pressure measurements on Control Building Ventilation. This periodic test will prevent future long term existence of similar flow degradation. This action will be completed by 12/31/00.

* The Energy Industry Identification System (EIIS), System Identification (SI) and Component Function Identification (CFI) Codes are included in brackets, [SI/CFI] where applicable, as required by 10 CFR 50.73 (b)(2)(ii)(F).