

NP-33-98-007

Docket No. 50-346

License No. NPF-3

September 22, 1998

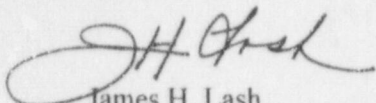
United States Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Ladies and Gentlemen:

LER 1998-007
Davis-Besse Nuclear Power Station, Unit No. 1
Date of Occurrence - August 24, 1998

Enclosed please find Licensee Event Report 1998-007, which is being submitted to provide 30 days written notification of the subject occurrence. This LER is being submitted in accordance with 10CFR50.73(a)(2)(i)(B) and 10CFR50.73(a)(2)(v)(D).

Very truly yours,



James H. Lash
Plant Manager
Davis-Besse Nuclear Power Station

GMW/dlc

Enclosure

cc: Mr. J. L. Caldwell
Acting Regional Administrator
USNRC Region III

Mr. Stephen J. Campbell
DB-1 NRC Senior Resident Inspector

Utility Radiological Safety Board

9809290024 980922
PDR ADDCK 05000346
S PDR

1/7

Jerr

LICENSEE EVENT REPORT (LER)

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

Estimated burden per response to comply with this mandatory information collection request: 50.0 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) Davis-Besse Unit Number 1		DOCKET NUMBER (2) 05000346	PAGE (3) 1 OF 5
------------------------------------------------	--	-------------------------------	--------------------

TITLE (4)
Control Room Humidifier Ductwork Failure Caused Excessive Opening in Positive Pressure Boundary

EVENT DATE (5)			LER NUMBER (6)			REPORT NUMBER			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
08	24	1998	1998	-- 007 --	00	09	22	1998	FACILITY NAME	DOCKET NUMBER 05000
									FACILITY NAME	DOCKET NUMBER 05000

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

LICENSEE CONTACT FOR THIS LER (12)

NAME Gerald M. Wolf, Engineer - Licensing	TELEPHONE NUMBER (Include Area Code) (419) 321-8114
----------------------------------------------	--------------------------------------------------------

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)	<input checked="" type="checkbox"/>	NO					

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

At 1445 hours on August 24, 1998, with the unit in Mode 1 at approximately 100 percent power, a flanged connection for the number 2 control room humidifier was found separated. This created an opening in the control room positive pressure boundary to the control room ventilation equipment room of approximately 35 square inches, which is greater than the allowable opening size of three square inches with the control room equipment room ventilation supply fan operating. This opening rendered both trains of the Control Room Emergency Ventilation System unable to perform their designated function of mitigating dose to the control room operators in the event of a design basis accident. Therefore both Control Room Emergency Ventilation Systems were declared inoperable, and Technical Specification 3.0.3 was entered. At 1446 hours, the control room equipment room ventilation supply fan was shutdown to reduce the driving force through the opening, and Technical Specification 3.0.3 was exited. The ductwork was repaired at 1535 hours. The NRC was notified at 1607 hours, via the Emergency Notification System in accordance with 10CFR50.72(b)(1)(iii)(D) that this event could have prevented the fulfillment of the safety function of the CREVS to mitigate dose to the control room operators. This report is being submitted in accordance with 10CFR50.73(a)(2)(i)(B) as a condition prohibited by the plant's Technical Specifications and in accordance with 10CFR50.73(a)(2)(v)(D) as a condition that alone could prevent fulfillment of a safety function. A modification has been initiated to remove the existing control room humidifiers and install new humidifiers outside of the non-isolable portion of the control room pressure boundary.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Davis-Besse Unit Number 1	05000346	1998	-- 007 --	00	2 OF 5

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

Description of Occurrence:

On August 24, 1998, at 1445 hours, with the unit in Mode 1 at approximately 100 percent power, an operator performing a plant tour discovered an opening in the number 2 control room humidifier ductwork. A flanged connection had separated, creating an opening between the control room positive pressure boundary and the control room ventilation equipment room of approximately 35 square inches. This opening was greater than the procedurally controlled allowable opening size of three square inches with the control room equipment room ventilation supply fan operating. This opening rendered both trains of the Control Room Emergency Ventilation System (CREVS) [Energy Industry Identification System Identifier VI] unable to perform their designated safety function of mitigating dose to the control room operators in the event of a design basis accident.

Davis-Besse Nuclear Power Station (DBNPS) Technical Specification 3.7.6.1 specifies that two independent trains of the CREVS shall be operable in Modes 1-4. With one train inoperable, the inoperable train shall be restored to operable within 7 days. Since no provisions exist for both trains to be inoperable while in Modes 1-4, Technical Specification 3.0.3 was entered as a result of this condition. At 1446 hours, based on the guidance contained in procedure DB-OP-00018, Inoperable Equipment Tracking Log, the control room equipment room ventilation supply fan was shutdown to reduce the driving force through the opening. With this fan shutdown, the allowable opening size is 40 square inches, therefore Technical Specification 3.0.3 was exited. The ductwork was temporarily repaired at 1535 hours.

Prior to the discovery of the separated ductwork connection, maintenance personnel removed the insulation from this section of ductwork on August 21, 1998, in preparation for work the following week. This planned work entailed disassembly of this ductwork to install new gasketing material and installation of additional bolting as necessary to reduce the amount of leakage from the humidifier ductwork. Interviews with the maintenance worker who removed the insulation revealed that the ductwork flanged connection may have separated when the insulation was removed, resulting in a breach of the Control Room pressure boundary that potentially existed for approximately three days until it was discovered and repaired.

This event could have prevented the fulfillment of the safety function of the CREVS to mitigate dose to the control room operators. Therefore, at 1607 hours, notification to the NRC was made via the Emergency Notification System (ENS) in accordance with 10CFR50.72(b)(1)(iii)(D). This report is being submitted as a Licensee Event Report (LER) in accordance with 10CFR50.73(a)(2)(i)(B) as a condition prohibited by the plant's Technical Specifications, and in accordance with 10CFR50.73(a)(2)(v)(D) as a condition that alone could prevent fulfillment of a safety function.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Davis-Besse Unit Number 1	05000346	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	3 OF 5
		1998	-- 007 --	00	

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

Apparent Cause of Occurrence:

The two control room humidifiers were originally installed outside the control room pressure boundary. In 1981, the humidifiers and associated ductwork were relocated inside the control room pressure boundary to prevent excessive condensation from accumulating on the control room pressure boundary dampers and causing operational problems. The new ductwork was fabricated from stainless steel to prevent accelerated rates of corrosion occurring due to excess moisture in the area of the humidifier.

The flanged connection described in the description of occurrence was apparently fabricated from square ductwork by making a one-inch slit at the corners and folding the ends up 90 degrees to form a flange. A one and one-half inch square piece of stainless steel was then fitted in each missing corner of the flange and soldered to the two adjacent flange pieces as well as the ductwork corner. A few of the corner closure pieces were spot welded to the adjacent flange pieces. Two ductwork sections were then connected by bolting through each of the four corner pieces. The flange joints separated due to the flange corner pieces separating from the ductwork at the solder and spot weld connections.

The control room humidifiers do not operate as part of the CREVS and therefore are not safety-related equipment. However, the ductwork associated with the humidifiers is required to remain intact during a seismic event because it forms a part of the control room pressure boundary. No design documents were located that provide detailed connection requirements for the seismic connection. In addition, the relocation of the humidifiers in 1981 did not invoke the DBNPS Specification for Heating, Ventilating, and Air Conditioning (HVAC), which requires ductwork joints to be in accordance with Sheet Metal and Air Condition National Association (SMACNA) Standards. The ductwork connection used during fabrication is not described in the current SMACNA HVAC Duct Construction Standards. The humidifier ductwork has historically not been air tight, and the ductwork joints are not as robust as the rest of the CREVS ductwork. The number 2 control room humidifier has not been in operation since February, 1996, because of other equipment problems. Efforts to fix the humidifier as well as to reduce system leakage have been undertaken over the years and these efforts may have affected the adequacy of the connection. The ductwork was reviewed in 1996 and determined to be seismically acceptable. This 1996 review was independent of any issue described in this LER.

The apparent cause of this event is less than adequate fabrication and less than adequate original design. In 1996 the allowable opening between the control room and the control room ventilation equipment room was reduced from a maximum of 216 square inches to three square inches with the control room equipment room ventilation fan operating, when errors were found in a design basis calculation (reference DBNPS LER 96-007).

**LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION**

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Davis-Besse Unit Number 1	05000346	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	4 OF 5
		1998	-- 007 --	00	

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

Analysis of Occurrence:

The control room ventilation equipment room where the humidifier is located has its own non-safety related ventilation system which maintains the equipment room slightly pressurized. Any radioactive release could be brought into this room, where it could then infiltrate into the control room through an opening in the control room ceiling or in the ventilation system. Historically, the process for using the CREVS at the DBNPS was to manually start it in the recirculation mode following a loss of coolant accident (LOCA), but not use it to pressurize the control room until four days after the accident. With the CREVS either not operating or operating in recirculation mode, a total opening larger than three square inches between the control room and the control room ventilation equipment room may result in increased dose to the control room operators with the equipment room supply fan operating. Because of a design calculation discrepancy discovered in 1996 (reference DBNPS LER 96-007) procedures were changed to manually start the CREVS in the pressurization mode in the event of a LOCA to reduce the amount of air inleakage to the control room. Once the control room is pressurized (within 10 minutes following a LOCA) the unfiltered inleakage will remain less than the Updated Safety Analysis Report (USAR) assumed value of 10 cubic feet per minute (cfm) if the total opening in the control room pressure boundary is less than 40 square inches. The total opening in the control room boundary as a result of this issue was approximately 35 square inches.

An opening in the control room boundary larger than the allowable opening size with the control room not pressurized affects only calculated thyroid doses and does not have any impact on whole body or skin doses in the control room. Only if the control room is not pressurized until four days following a LOCA, and the control room inleakage significantly exceeds the USAR assumed limit of 25 cfm, will the thyroid doses exceed 30 REM, which exceeds the 10CFR50 Appendix A General Design Criteria (GDC) 19 guideline of 5 REM whole body, or its equivalent to any part of the body. Based on the tested integrity of the control room pressure boundary and on the capacity of the ventilation equipment room fan, the maximum air flow into the unpressurized control room from the ventilation equipment room would have been approximately 206 cfm. This maximum leakage during the first 10 minutes following a LOCA would have resulted in only a minor increase in the calculated thyroid dose specified in the USAR, which would not exceed the GDC 19 limit of 30 REM. These evaluations assume that the control room operators manually start the CREVS in recirculation mode at 10 minutes following a LOCA, and assume the design basis source terms and atmospheric conditions for thyroid dose.

Since the maximum possible dose to the control room operators would not have exceeded the 30 REM GDC 19 value, it is concluded that this condition would not have impacted the ability of control room operators to respond to emergencies.

**LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION**

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Davis-Besse Unit Number 1	05000346	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	5 OF 5
		1998	-- 007 --	00	

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

Corrective Actions:

At 1446 hours on August 24, 1998, the control room equipment room ventilation fan was shutdown to reduce the potential amount of air leakage into the control room to within design basis limits. At 1535 hours on August 24, the ductwork flanged connection was temporarily repaired. On September 8, 1998, all of the flanged connections for the number 2 control room humidifier ductwork were reworked by using a capped flange joint similar to that described in the SMACNA HVAC Duct Construction Standards. All of the flanged connections for the number 1 control room humidifier ductwork will be similarly reworked using a capped flange joint by December 4, 1998, to ensure the structural integrity of the system.

As described in the corrective actions for DBNPS LER 1998-004, an evaluation of the control room humidifiers has been conducted to determine a course of action to improve the installation and operation of the humidifiers. This evaluation considered past humidifier maintenance problems, equipment obsolescence, system requirements due to the allowable opening size, and the consequences of potential future problems. This evaluation determined the existing humidifiers and ductwork should be removed and the duct penetrations sealed. New humidification units will be installed into the control room normal ventilation system, outside of the non-isolable portion of the control room pressure boundary. Request for Modification 98-0036 has been initiated to implement this course of action by the end of the thirteenth operating cycle, which is scheduled for Spring, 2002.

Failure Data:

LER 96-007 documents the discovery of a design calculation error involving the control room boundary and allowable leakage. The CREVS design basis was re-evaluated as a result of these events, which resulted in the current control room pressure boundary opening size restrictions. The corrective actions taken in response to that event did not address the structural integrity of the ductwork associated with the control room pressure boundary, and would not have been expected to have prevented this event.

LER 1998-004 documents a similar failure in the number 2 control room humidifier ductwork on June 1, 1998. The corrective actions proposed as a result of that event, namely to conduct an evaluation of the control room humidifiers to determine a course of action to improve the installation and operation of the humidifiers, were in progress at the time of the current event.

NP-33-98-007-0

PCAQR 1998-1601