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NP-33-03-006-00

Docket No. 50-346

License No. NPF-3

July 21, 2003

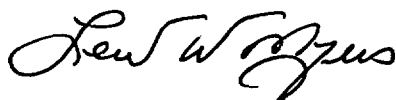
United States Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Ladies and Gentlemen:

LER 2003-006
Davis-Besse Nuclear Power Station, Unit No. 1
Date of Occurrence – May 21, 2003

Enclosed please find Licensee Event Report (LER) 2003-006, which is being submitted to provide written notification of an issue regarding potential errors in the structural analysis of block walls associated with combined seismic and high energy line break loads. This LER is being submitted in accordance with 10CFR50.73(a)(2)(i)(B) and 10CFR50.73(a)(2)(ii)(B).

Very truly yours,



PSJ/s

Attachments

cc: Regional Administrator, USNRC Region III
DB-1 Project Manager, USNRC
DB-1 NRC Senior Resident Inspector
Utility Radiological Safety Board

JE22

Docket Number 50-346
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Attachment
Page 1 of 1

COMMITMENT LIST

The following list identifies those actions committed to by the Davis-Besse Nuclear Power Station in this document. Any other actions discussed in the submittal represent intended or planned actions by Davis-Besse. They are described only as information and are not regulatory commitments. Please notify the Manager - Regulatory Affairs (419-321-8450) at Davis-Besse of any questions regarding this document or associated regulatory commitments.

| <u>Commitment</u> | <u>DUE DATE</u> |
|---|---|
| Modify Door 209 in Auxiliary Building to provide venting of Room 240 | Prior to Mode 4 |
| Review licensee response to IEB 80-11 (Serial 1219) and revise as necessary | Within 60 days following revision of calculations |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| NRC FORM 366 (7-2001) | | U.S. NUCLEAR REGULATORY COMMISSION | | | APPROVED BY OMB NO. 3150-0104 | | | EXPIRES 7-31-2004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LICENSEE EVENT REPORT (LER) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (See reverse for required number of digits/characters for each block) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. FACILITY NAME Davis-Besse Unit Number 1 | | | | | 2. DOCKET NUMBER 05000346 | | | 3. PAGE 1 OF 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. TITLE Potential Errors in Analysis of Block Walls Regarding HELB Differential Pressure and Seismic Events | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. EVENT DATE | | | 6. LER NUMBER | | | 7. REPORT DATE | | | 8. OTHER FACILITIES INVOLVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MO | DAY | YEAR | YEAR | SEQUENTIAL NUMBER | REV NO | MO | DAY | YEAR | FACILITY NAME | DOCKET NUMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 21 | 03 | 2003 | 006 | 00 | 7 | 21 | 2003 | FACILITY NAME | DOCKET NUMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:15%;">9. OPERATING MODE</td> <td style="width:15%;">5</td> <td colspan="8">11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)</td> </tr> <tr> <td rowspan="8">10. POWER LEVEL</td> <td rowspan="8">000</td> <td>20.2201(b)</td> <td>20.2203(a)(3)(ii)</td> <td><input checked="" type="checkbox"/></td> <td>50.73(a)(2)(ii)(B)</td> <td>50.73(a)(2)(ix)(A)</td> </tr> <tr> <td>20.2201(d)</td> <td>20.2203(a)(4)</td> <td></td> <td>50.73(a)(2)(iii)</td> <td>50.73(a)(2)(x)</td> </tr> <tr> <td>20.2203(a)(1)</td> <td>50.36(c)(1)(i)(A)</td> <td></td> <td>50.73(a)(2)(iv)(A)</td> <td>73.71(a)(4)</td> </tr> <tr> <td>20.2203(a)(2)(i)</td> <td>50.36(c)(1)(ii)(A)</td> <td></td> <td>50.73(a)(2)(v)(A)</td> <td>73.71(a)(5)</td> </tr> <tr> <td>20.2203(a)(2)(ii)</td> <td>50.36(c)(2)</td> <td></td> <td>50.73(a)(2)(v)(B)</td> <td rowspan="5">OTHER Specify in Abstract below or in NRC Form 366A</td> </tr> <tr> <td>20.2203(a)(2)(iii)</td> <td>50.46(a)(3)(ii)</td> <td></td> <td>50.73(a)(2)(v)(C)</td> </tr> <tr> <td>20.2203(a)(2)(iv)</td> <td>50.73(a)(2)(i)(A)</td> <td></td> <td>50.73(a)(2)(v)(D)</td> </tr> <tr> <td>20.2203(a)(2)(v)</td> <td><input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)</td> <td></td> <td>50.73(a)(2)(v)(E)</td> </tr> <tr> <td>20.2203(a)(2)(vi)</td> <td>50.73(a)(2)(i)(C)</td> <td></td> <td>50.73(a)(2)(vii)(A)</td> </tr> <tr> <td>20.2203(a)(3)(i)</td> <td>50.73(a)(2)(ii)(A)</td> <td></td> <td>50.73(a)(2)(viii)(B)</td> </tr> </table> | | | | | | | | | | 9. OPERATING MODE | 5 | 11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) | | | | | | | | 10. POWER LEVEL | 000 | 20.2201(b) | 20.2203(a)(3)(ii) | <input checked="" type="checkbox"/> | 50.73(a)(2)(ii)(B) | 50.73(a)(2)(ix)(A) | 20.2201(d) | 20.2203(a)(4) | | 50.73(a)(2)(iii) | 50.73(a)(2)(x) | 20.2203(a)(1) | 50.36(c)(1)(i)(A) | | 50.73(a)(2)(iv)(A) | 73.71(a)(4) | 20.2203(a)(2)(i) | 50.36(c)(1)(ii)(A) | | 50.73(a)(2)(v)(A) | 73.71(a)(5) | 20.2203(a)(2)(ii) | 50.36(c)(2) | | 50.73(a)(2)(v)(B) | OTHER Specify in Abstract below or in NRC Form 366A | 20.2203(a)(2)(iii) | 50.46(a)(3)(ii) | | 50.73(a)(2)(v)(C) | 20.2203(a)(2)(iv) | 50.73(a)(2)(i)(A) | | 50.73(a)(2)(v)(D) | 20.2203(a)(2)(v) | <input checked="" type="checkbox"/> 50.73(a)(2)(i)(B) | | 50.73(a)(2)(v)(E) | 20.2203(a)(2)(vi) | 50.73(a)(2)(i)(C) | | 50.73(a)(2)(vii)(A) | 20.2203(a)(3)(i) | 50.73(a)(2)(ii)(A) | | 50.73(a)(2)(viii)(B) |
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| 10. POWER LEVEL | 000 | 20.2201(b) | 20.2203(a)(3)(ii) | <input checked="" type="checkbox"/> | 50.73(a)(2)(ii)(B) | 50.73(a)(2)(ix)(A) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 20.2201(d) | 20.2203(a)(4) | | 50.73(a)(2)(iii) | 50.73(a)(2)(x) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 20.2203(a)(1) | 50.36(c)(1)(i)(A) | | 50.73(a)(2)(iv)(A) | 73.71(a)(4) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 20.2203(a)(2)(i) | 50.36(c)(1)(ii)(A) | | 50.73(a)(2)(v)(A) | 73.71(a)(5) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 20.2203(a)(2)(ii) | 50.36(c)(2) | | 50.73(a)(2)(v)(B) | OTHER Specify in Abstract below or in NRC Form 366A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| | | 20.2203(a)(2)(iv) | 50.73(a)(2)(i)(A) | | 50.73(a)(2)(v)(D) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 20.2203(a)(2)(v) | <input checked="" type="checkbox"/> 50.73(a)(2)(i)(B) | | 50.73(a)(2)(v)(E) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 12. LICENSEE CONTACT FOR THIS LER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NAME Peter S. Jordan – Regulatory Affairs | | | | | | | TELEPHONE NUMBER (Include Area Code) (419) 321-8260 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CAUSE | SYSTEM | COMPONENT | MANU-FACTURER | REPORTABLE TO EPIX | CAUSE | SYSTEM | COMPONENT | MANU-FACTURER | REPORTABLE TO EPIX | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 14. SUPPLEMENTAL REPORT EXPECTED | | | | | | 15. EXPECTED SUBMISSION DATE | | MONTH | DAY | YEAR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| YES (If yes, complete EXPECTED SUBMISSION DATE). | | | | | | <input checked="" type="checkbox"/> | No | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16. ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>In the fall of 2002, a review of Auxiliary Building structural analysis was initiated. The focus of this review was on masonry walls. During this review, discrepancies were identified with the seismic analyses of these walls. The review of safety-related masonry walls determined that calculations performed in response to IE Bulletin 80-11, "Masonry Wall Design," did not apply High Energy Line Break (HELB) loads in all applicable cases. However, only one wall, No. 2257, was determined to not remain operable when subjected to combined seismic and high energy line break loads. Failure of this wall could potentially damage Boric Acid System components and safety-related components. This condition will be corrected by a modification to the entrance to the affected room to reduce HELB pressure loads on the wall to an acceptable level. This condition was caused by less than adequate communications between engineering groups and inadequate control of calculations which have been addressed by the recently instituted Design Interface Evaluation process. The discrepant condition in the structural analysis of masonry wall 2257 is being reported as a condition resulting in an unanalyzed condition pursuant to 50.73(a)(2)(ii)(B) and a condition prohibited by Technical Specifications pursuant to 50.73(a)(2)(i)(B).</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

LICENSEE EVENT REPORT (LER)

| FACILITY NAME (1) | DOCKET (2) | LER NUMBER (6) | | | PAGE (3) |
|---------------------------|------------|----------------|-------------------|-----------------|----------|
| | | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER | |
| Davis-Besse Unit Number 1 | 05000346 | 2003 | -- 006 -- | 00 | 2 OF 4 |
| | | | | | |

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

DESCRIPTION OF OCCURRENCE:

In the fall of 2002, a review of Auxiliary Building [NF] structural analysis was initiated with respect to tornado differential pressure loading. The focus area of this review was on masonry walls. During the review of masonry wall calculations, unrelated discrepancies were identified with the seismic analyses of these walls. A review of 127 safety related masonry walls was conducted for all applicable loading conditions, including compartment pressurization and seismic. This review determined that some calculations performed in response to IE Bulletin (IEB) 80-11, "Masonry Wall Design," did not apply High Energy Line Break (HELB) pressure loads in all applicable cases. In addition, discrepancies found in these calculations included: 1) failure to apply a dynamic load factor for the pipe break pressure load on the masonry walls and 2) incorrect application of the factors to account for material properties, seismic, and model boundary conditions.

This condition resulted from inconsistencies introduced into the analyses prepared in support of the final response to IEB 80-11. During operability assessments of these walls, only one masonry wall, No. 2257, was found on May 21, 2003, to not remain operable when compartment pressurization loads from a postulated HELB are combined with seismic loads. Wall 2257 forms the boundary between Room 241 (passageway) and Room 240 (Boric Acid Addition Tank [BK-TK] room). Safety-related components that could be adversely affected by the collapse of wall 2257 include Component Cooling Water System [CC] valves CC2649 and CC2645 located on the outlet of the two essential return headers, Service Water (SW) System [BI] piping which provides SW to Containment Air Cooler [BK] 1-1, and the Boric Acid Addition System [CA]. Based on a walkdown of the applicable area, no safety related cable trays or conduits were identified in the vicinity that could be adversely affected by the failure of wall 2257.

This condition is being reported as a condition resulting in an unanalyzed condition pursuant to 10 CFR 50.73(a)(2)(ii)(B) and as a condition prohibited by Technical Specifications 3.1.2.2, Boric Acid injection flow path; 3.1.2.7, Boric Acid Pump operability; 3.6.2.2, Containment Air Cooler operability; and 3.7.3.1, Component Cooling Water System operability pursuant to 10 CFR 50.73(a)(2)(i)(B).

APPARENT CAUSE OF OCCURRENCE:

The calculations found to have discrepancies were performed in response to IEB 80-11. In Davis Besse Nuclear Power Station's (DBNPS) effort to respond to the IEB 80-11, a very conservative elastic stress analysis method was used to qualify the majority of the plant's walls, and an inelastic method was used to qualify the remaining walls. This inelastic method was subsequently not accepted by the NRC. The final response by DBNPS to the IEB 80-11 was provided on December 17, 1985 (Serial 1219). In this response, DBNPS applied the elastic stress analysis for the walls in question and applied specific reduction factors to recover some of the identified conservatisms which resulted in the introduction of inconsistencies into the analyses.

LICENSEE EVENT REPORT (LER)

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|---------------------------|------------|----------------|-------------------|-----------------|----------|
| Davis-Besse Unit Number 1 | 05000346 | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER | 3 OF 4 |
| | | 2003 | -- 006 -- | 00 | |

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

APPARENT CAUSE OF OCCURRENCE (continued):

The causes associated with this condition was the misapplication of the HELB model resulting from lack of communication between design engineering groups performing different sets of calculations and inadequate development and maintenance of calculations in the 1980's.

ANALYSIS OF OCCURRENCE:

Wall 2257 has been analyzed for the postulated combined seismic and compartment pressurization loads. The wall is adequate for seismic loads, but the combined loading associated with compartment pressurization overstresses the wall resulting in an apparent failure. The compartment pressure is due to the postulated HELB in either the Main Feedwater [SJ] lines or the Auxiliary Steam [SA] lines to the boric acid evaporators [CA-EVP]. This high energy piping is located in Room 227 which is open to Room 241 (passageway leading to Room 240).

In the HELB model for adjoining Room 227 that existed at the time of the masonry wall calculation for wall 2257, the specified HELB area did not extend into the passageway (Room 241) even though there was no physical barrier to prevent compartment pressure surge resulting from a HELB. This passageway contained no HELB related equipment. For most of the individual masonry walls in this passageway and connected rooms, the HELB pressurization would apply to both sides of the wall, and thus there would be no more than negligible differential pressure across the wall. Room 240 is the Boric Acid Addition Tank room which needs to be maintained at an elevated temperature. To reduce heat loss, the entry to Room 240 has a solid door which is kept closed to prevent HELB pressurization from entering Room 240. This would result in seven walls between Room 240 and the other rooms connected to Room 241 (passageway) experiencing differential pressure caused by the HELB. The calculations for these seven masonry walls should have analyzed for compartment pressurization loads but did not. Only one wall, 2257, was determined not to meet operability criteria because it was determined that it would fail under the combined seismic plus compartment pressurization loads.

In the current mode of operation, this condition does not create an operability issue. However, since the plant previously operated with the existence of this condition in modes 1 through 4, it represents a condition prohibited by Technical Specifications with respect to operability of the Boric Acid Addition System, the Component Cooling Water System, and the Containment Air Coolers. Also, this condition represents an unanalyzed plant condition.

The frequency of a seismic event of a magnitude large enough to be a credible initiator of the masonry wall failure described in this report is very small. For the masonry wall failure described in this report to occur, the seismic event must be combined with a pipe failure in either the Main Feedwater or

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|---------------------------|------------|----------------|-------------------|-----------------|----------|
| Davis-Besse Unit Number 1 | 05000346 | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER | 4 OF 4 |
| | | 2003 | -- 006 -- | 00 | |

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

ANALYSIS OF OCCURRENCE (continued):

Auxiliary Steam piping. The probability of coincident failure of this piping is not credible based on the failure rates presented in Electric Power Research Institute (EPRI) TR-102266, "Pipe Failure Study Update." Therefore, the piping failure would have to be seismically induced. The probability of seismically induced failure of this piping would be very low. The combination of the low initiating event frequency for seismic events and the low probability of failure for piping results in a very low frequency for the failure of the masonry wall due to seismic and HELB loads. Additionally, the probability that the wall failure would lead to the loss of any equipment required to mitigate the event would be combined with the initiating event frequency. Based on these considerations, it can be concluded that the contribution to core damage frequency from the failure of this masonry wall is very small.

CORRECTIVE ACTIONS:

Engineering Change Request 03-0297 has been initiated to modify door 209 which is the entrance to Room 240, to allow for venting and reducing the differential compartment pressure acting on wall 2257 to an acceptable level. This modification will be completed prior to entering Mode 4.

With respect to the lack of communication among design engineering groups and inadequate control of calculations, DBNPS has recently instituted a Design Interface Evaluation process which requires review and approval by all affected plant organizations of engineering products that interface with those organizations. This process is expected to prevent a recurrence of these types of issues. Because this is a recently instituted process, it would not have prevented this latent issue from the 1980's from occurring.

FAILURE DATA:

In the previous two years, two plant conditions were identified that were LERs involving inadequate structural analysis issues. LER 2002-006 identified inadequate tornado shielding of Emergency Diesel Generator exhaust stacks and Main Steam Safety Valves. LER 2002-010 identified inadequate restraint of the Intake Structure Gantry Crane for tornado-generated winds. Because this masonry wall condition was a latent issue(s), the corrective action for the previous two conditions would not have prevented occurrence of the masonry wall condition.

Energy Industry Identification System (EIIS) codes are identified in the text as [XX].

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|-----------------|-------------|-------------|-------------|
| NP-33-03-006-00 | CR 02-07989 | CR 03-01132 | CR 03-02564 |
| | CR 03-02910 | CR 03-03860 | CR 03-03937 |
| | CR 03-04676 | CR 03-05399 | |