NRC FORM 366
(7-77)

U. S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT

CONTROL BLOCK: | | | | | | | (1) (PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

0 1 | O H D B S 1 (2) | Ø Ø - Ø Ø Ø Ø Ø - Ø Ø (3) | 4 1 1 1 1 (4) | (5)
LICENSEE CODE 9–14 | LICENSE NUMBER 15–25 | LICENSE TYPE 26–30 | CAT 57–58

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0 1 REPORT SOURCE L (6) | Ø 5 Ø Ø Ø 3 4 6 (7) | 1 2 2 3 8 Ø (8) | Ø 8 1 1 8 1 (9)
DOCKET NUMBER 61–68 | EVENT DATE 69–74 | REPORT DATE 75–80

EVENT DESCRIPTION AND PROBABLE CONSEQUENCES (10)

0 2 (NP-32-80-17) The analysis required by NRC IE Bulletin 80-11 determined that during a
0 3 seismic event the wall between the control room and stairway AB-1, walls 3307, 2047,
0 4 3166, 3187, 2337, 4806, 4817, 4826, 4837, 4847, 4857, 4647, and 2016 would be over-
0 5 stressed. Walls 2167, 2177, 2187, 4107, 4117, 4127, 3447, 3457, 3467, 3.37, and 3287
0 6 would be overstressed by compartment pressurization. The conditions are reportable per
0 7 Technical Specification 6.9.1.8.i.
0 8

	SYSTEM CODE	CAUSE CODE	CAUSE SUBCODE	COMPONENT CODE	COMP. SUBCODE	VALVE SUBCODE
0 9	Z Z (11)	B (12)	A (13)	X X X X X X (14)	Z (15)	Z (16)

(17) LER/RO REPORT NUMBER	EVENT YEAR		SEQUENTIAL REPORT NO.		OCCURRENCE CODE	REPORT TYPE		REVISION NO.
	8 Ø	—	Ø 9 1	/	Ø 1	X	—	9

ACTION TAKEN	FUTURE ACTION	EFFECT ON PLANT	SHUTDOWN METHOD	HOURS (22)	ATTACHMENT SUBMITTED	NPRD-4 FORM SUB.	PRIME COMP. SUPPLIER	COMPONENT MANUFACTURER
X (18)	F (19)	Z (20)	Z (21)	Ø Ø Ø Ø	Y (23)	N (24)	A (25)	Z 9 9 9 (26)

CAUSE DESCRIPTION AND CORRECTIVE ACTIONS (27)

1 0 The cause is a change in the analytical methodology used by the architect/engineer.
1 1 Using the methods applicable in the early 1970s the stresses would be acceptable. How-
1 2 ever, the charge in methods results in a dynamic instead of a static analysis. Facility
1 3 Change Requests 80-277, 81-015, 81-016, 81-018, 81-017, 81-019, 81-020, 81-021, 81-022,
1 4 81-023, and 81-024 have been written to make the necessary modifications.

	FACILITY STATUS	% POWER	OTHER STATUS (30)	METHOD OF DISCOVERY	DISCOVERY DESCRIPTION (32)
1 5	E (28)	Ø 5 5 (29)	NA	D (31)	NRC IE Bulletin 80-11

	ACTIVITY RELEASED	CONTENT OF RELEASE	AMOUNT OF ACTIVITY (35)	LOCATION OF RELEASE (36)
1 6	Z (33)	Z (34)	NA	NA

PERSONNEL EXPOSURES

	NUMBER	TYPE	DESCRIPTION (39)
1 7	Ø Ø Ø (37)	Z (38)	NA

PERSONNEL INJURIES

	NUMBER	DESCRIPTION (41)
1 8	Ø Ø Ø (40)	NA

LOSS OF OR DAMAGE TO FACILITY (43)

	TYPE	DESCRIPTION
1 9	Z (42)	NA

PUBLICITY

	ISSUED	DESCRIPTION (45)	NRC USE ONLY
2 0	N (44)	NA	

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PDR ADOCK 05000346
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DVR 81-102 NAME OF PREPARER Charles Mekbel PHONE: (419) 259-5008

TOLEDO EDISON COMPANY
DAVIS-BESSE NUCLEAR POWER STATION UNIT ONE
SUPPLEMENTAL INFORMATION FOR LER NP-32-80-17

DATE OF EVENT: December 23, 1980, February 17, March 10, March 27, April 21, May 7, May 13, June 11, June 12, June 29, and July 29, 1981

FACILITY: Davis-Besse Unit 1

IDENTIFICATION OF OCCURRENCE: Floor beam at the top of concrete block wall 5107, the floor beam at the top of concrete block wall 3307, the connection between concrete block wall 2047 and the floor, the connection between wall 2337 and the floor, and floor beams at the top of walls 3167 and 3187 would be overstressed during a design basis seismic event. Walls 3167, 3177 and 3187, and walls 4107, 4117 and 4127 would be overstressed during a compartment pressurization. Walls 3447, 3457 and 3467 could fail during a seismic event or experience masonry overstress following pressure loadings resulting from compartment pressurization. Walls 4806, 4817, 4826, 4837, 4847 and 4857 could fail and wall 4647 could experience localized wall overstress during a seismic event. The stresses in the masonry and in the top and bottom connections in wall 4016 could exceed design allowable stresses during a seismic event. Connections of walls 3237 and 3287 could become overstressed when subjected to pressure loading resulting from a main feedwater line break.

CONDITIONS PRIOR TO OCCURRENCE: The unit was in Mode 1 with Power (MWT) = 1525 and Load (Gross MWE) = 289.

DESCRIPTION OF OCCURRENCE: While performing the analysis of concrete block walls required by NRC IE Bulletin 80-11, it was determined that during a seismic event the block wall between the control room and stair AB-1 would cause the floor beam above to be overstressed. This floor beam is attached to the wall and supports a portion of the floor above the control room.

It was determined that this condition was less conservative than assumed in the Final Safety Analysis Report (FSAR) and is being reported under Technical Specification 6.9.1.8.i. The NRC On-Site Inspector was notified at 0925 hours on December 23, 1980.

Additional analysis per NRC IE Bulletin 80-11 determined that during a seismic event the block wall between component cooling water heat exchanger and pump room (#328) and elevator number 2 would cause the floor beam above to be overstressed. This floor beam is attached to the wall and supports a portion of the floor above the component cooling water exchanger and pump room.

It was also determined that this condition was less conservative than assumed in the FSAR and is being reported under Technical Specification 6.9.1.8.i. The NRC On-Site Inspector was notified at 0935 hours on February 18, 1981.

Additional analysis per NRC IE Bulletin 80-11 determined that during a seismic event, the loads on block wall 2047 (between the two makeup pumps) from the attached piping systems would cause the stresses in the connection between the wall and the floor to be greater than code allowables.

It was determined that this condition was less conservative than assumed in the FSAR and is being reported under Technical Specification 6.9.1.8.i. The NRC On-Site Inspector was notified at 1221 hours on March 11, 1981.

Analysis of additional walls per NRC IE Bulletin 80-11 determined that during a seismic event, walls 3167 and 3187 would cause the floor beams attached to the tops of these walls to become overstressed. It was also determined that the concrete masonry in block walls 3167, 3177 and 3187 would be overstressed when subjected to compartment pressurization originating from a pipe break. These walls form a cable chase in Mechanical Penetration Room #4 (Room 314) on the 585 foot elevation.

This condition was less conservative than assumed in the FSAR and is being reported under Technical Specification 6.9.8.1.i. The NRC On-Site Inspector was notified at 1325 hours on March 30, 1981.

Additional analysis per NRC IE Bulletin 80-11 determined that during a design basis seismic event, the connection between wall 2337 and the floor could become overstressed. This wall is located in Mechanical Penetration Room #2 on the 565 foot elevation.

It was determined that this condition was less conservative than assumed in the FSAR and is being reported under Technical Specification 6.9.1.8.i. The NRC On-Site Inspector was notified at 1214 hours on April 22, 1981.

Additional analysis per NRC IE Bulletin 80-11 determined that after a main feedwater pipe break, the increase in pressure created could develop an overstressed masonry condition in block walls 4107, 4117 and 4127. These walls located on elevation 603'-0" form a pipe chase in corridor 404.

It was determined that this condition was less conservative than assumed in the FSAR and is being reported under Technical Specification 6.9.1.8.i. The NRC On-Site Inspector was notified at 1530 hours on May 7, 1981.

Additional analysis per NRC Bulletin 80-11 determined that during a seismic event, loadings are imposed on walls 3447, 3457 and 3467 which could cause localized wall failure. It was also determined that these walls, which separate corridor 304 from corridor 310 and room 313 on floor elevation 585'-0" could also become overstressed when subjected to compartment pressurization originating from a main feedwater line break.

It was determined that this condition was less conservative than assumed in the FSAR and is being reported under Technical Specification 6.9.1.8.i. The NRC Region III office was notified at 1040 hours on May 14, 1981.

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Additional analysis received June 11, 1981 per NRC Bulletin 80-11 determined that during a seismic event, loadings are imposed on walls 4806, 4817, 4826, 4837, 4847 and 4857 which could cause the walls to fail (fall over). These walls serve as fireproofing for building columns located in Electrical Penetration Room No. 2 (room 427, elevation 603').

It was determined that this condition was less conservative than assumed in the FSAR and is being reported under Technical Specification 6.9.1.8.i. The NRC On-Site Inspector was notified at 1400 hours on June 12, 1981.

Additional analysis received June 12, 1981 per NRC IE Bulletin 80-11 determined that during a seismic event, loadings are imposed on wall 4647 which could create a localized masonry overstressed condition. This wall is a firewall and part of the negative pressure boundary separating the cable spreading room at elevation 613'-6" from corridor 404 at elevation 603'-0".

It was determined that this condition was less conservative than assumed in the FSAR and is being reported under Technical Specification 6.9.1.8.i. The NRC On-Site Inspector was notified at 1530 hours on June 15, 1981.

Additional analysis per NRC Bulletin 80-11 determined that during a seismic event, the masonry and wall connections in wall 4016 could become overstressed. This wall separates the low voltage switchgear room (No. 428) from Battery Room B (No. 428A) on Elevation 603 in the Auxiliary Building. It was determined that this condition was less conservative than assumed in the FSAR and is being reported under Technical Specification 6.9.1.8.i. The NRC On-Site Inspector was notified at 1500 hours on June 30, 1981.

Additional analysis per NRC I.E. Bulletin 80-11 determined that after a crack in the main feedwater line located in Room 313, the increase in pressure created could develop overstressed conditions in the expansion anchors in the connections at the south end of wall 3287 and the north end of wall 3237. Additionally, the floor beam at elevation 603'-0" to which the top of wall 3237 is connected could be overstressed in torsion when the wall is subjected to such a loading. Wall 3237 separates elevator No. 3 from Passage 310 and wall 3287 separates stairway AB-2 from Passage 310, on elevation 585'-0". 9

It was determined that this condition was less conservative than assumed in the F.S.A.R. and is being reported under Technical Specification 6.9.1.8.i. The NRC On-Site Inspector was notified at 1330 hours on July 30, 1981.

DESIGNATION OF APPARENT CAUSE OF OCCURRENCE: This finding is due to a change in the analytical methodology used by the architect/engineer since the walls were designed in the early 1970's. Using the methods applicable at that time, the floor beam would be acceptable as built. However, the change in the method treats wall section properties and seismic floor response inputs differently and is a dynamic instead of static analysis. Under the new methods, the floor beam design and the wall to floor connection is deficient.

For the seventh finding, the cause of the occurrence resulted from architect/engineer design error. Wall to lintel (support beam over door 309) connection associated with walls 3447, 3457 and 3467 was originally deficient in design when subjected to seismic loading.

Compartment pressures generated by postulated pipe breaks were not originally considered when the architect/engineer designed the walls. Re-analysis of these walls with the additional loading has resulted in the overstressed masonry condition.

For the eighth and ninth findings, the cause was an architect/engineer design error which resulted in the construction of walls 4806, 4826 and 4647 across a seismic joint leading to wall strength deficiencies when subjected to seismic loadings. Additionally, when walls 4806 and 4826 were originally designed, the loads from wall attachments were not considered. Subsequent analysis using dynamic instead of static methods and including wall attachment loadings resulted in an overstressed wall condition during a seismic event.

The finding on wall 4016 is the result of a change in the analytical methodology used by the architect/engineer since the wall was originally designed. Additionally the loads from wall attachments were not originally considered. Subsequent analysis using dynamic instead of static methods and wall attachment loadings resulted in an overstressed wall condition during a seismic event.

For walls 3237 and 3287 compartment pressures generated by a main feedwater line break were not originally considered when Architect/Engineer designed the walls.

ANALYSIS OF OCCURRENCE: There was no danger to the health and safety of the public or station personnel. The floor beams and wall to floor connection in question are only overstressed during a maximum probable earthquake. During all other postulated unit operating conditions, the stresses are within allowables.

A preliminary review of the portion of the floor above the control room supported by this beam has been made. The results are not conclusive but indicate there is a potential that a portion of the floor above may undergo some structural distress. A more detailed analysis would take three months to perform. The modification to correct this condition consists of two small struts which could be installed in about two weeks. Therefore, in the interest of taking the most expeditious approach, Toledo Edison has decided to make the modification at this time without proceeding with further analytical effort.

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Similarly, a preliminary review of the portion of the floor above the component cooling water heat exchanger and pump room supported by the beam has been made. The results are not conclusive but indicate there is a potential that a portion of the floor above may undergo some structural distress. A more detailed analysis would take three months to perform. The modification to correct this condition consists of the installation of three plate stiffeners between the web of the floor beam and the floor above. This modification can be made in a shorter time than it would take to complete the detailed analysis of the floor. Therefore, in the interest of taking the most expeditious approach, Toledo Edison has decided to make the modification at this time without proceeding with the detailed floor analysis.

Pipe supports 31-HCC-5H5, 31-HCC-5H6, 31-HCC-5H7 and 31-HCC-5H9 are attached to wall 2047. During a maximum probable earthquake these pipe supports impart loads to wall 2047 which causes the stresses in portion of the connection between wall 2047 and the floor to be greater than allowed by the Uniform Building Code (UBC) and American Concrete Institute (ACI) Code. The wall was analyzed as five wall strips. The stresses in the connection between the wall and the floor in only two of the wall strips were greater than allowable. However, even in these two strips, the factors of safety are greater than one, demonstrating that these strips are still stable.

There is also an inherent conservatism in our analysis since the interaction between wall strips is not considered.

The piping systems attached to the wall have been reanalyzed assuming that there will be deflection in wall 2047. The resulting piping and support stress are all within the interim allowable stresses developed for IE Bulletin 79-14.

Overstress of the masonry comprising block walls 3167, 3177 and 3187 is due to the postulated compartment pressure resulting from a break in the main feedwater line in room 314. During all other operating conditions, the stresses are within allowables. However, such a break in this room has a low probability of occurring. The portion of the pipe meets most of the criteria established by NRC Branch Technical Position MEB 3-1 to qualify as a "no break zone", the exception being that the piping was designed to ANSI B31.1 instead of ASME Section III, Class 2. However, the Toledo Edison procurement and installation specifications required the same material and installation documentation as is required under ASME Section III, Class 2.

The effects of the wall deflection caused by the seismic loads on nuclear safety related conduit attached to these walls have been investigated and failure of the conduit will not occur. Additional analysis to determine if yielding of the floor beams would cause structural distress in a portion of the floor above would take approximately six months to perform, while a modification to ensure the condition is conservative can be made in a shorter time.

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In the case of wall 2337, the stresses created in the wall to the floor connection are greater than criteria allowables per the Uniform Building Code (UBC) and the American Concrete Institute (ACI) Code. However, the factor of safety on the connection was still greater than 1, thus demonstrating wall stability during a seismic event.

The stresses in the piping and conduit systems attached to this wall have been reviewed assuming the wall would deflect during a seismic event, and found to be within allowable limits.

When a break in the main feedwater line in corridor 404, including the portion within the pipe chase is postulated, the masonry in walls 4107, 4117 and 4127, and all wall connections, could become overstressed due to the pressure loading. During all other postulated unit operating conditions, the stresses are within allowable limits.

The above postulated event (a main feedwater pipe break in corridor 404) has a low probability of occurrence. The affected portion of the main feedwater line has been reviewed against current design criteria. Our review indicates that this piping meets the requirements of Branch Technical Position MEB 3-1 (Section B.1.b) for Fluid System Piping in containment penetration areas where break need not be postulated, with the following exceptions: 1) the piping system was designed to ANSI B31.1 instead of ASME Section III, Class 2. However, the Toledo Edison procurement and installation specifications required the same material and installation documentation as is required under ASME Section III, Class 2; and , 2) this portion of the piping does not comply with Section B1.1b(4) which requires that the length of the section of pipe for which breaks are not postulated be kept to a minimum.

During a seismic event, walls 3447, 3457 and 3467 could experience localized wall failure. Sections of these walls, if allowed to fail, could possibly impact the safety related conduits penetrating the walls, although further analysis would be required to analyze how the conduits would be affected. A partial modification to correct this condition has been designed and can be implemented more expeditously than the time required for further analysis.

Additionally, the masonry comprising block walls 3447, 3457 and 3467 could become overstressed following the postulated compartment pressure resulting from a break in the main feedwater line in either room 313 or corridor 304. During all other operating conditions, the stresses are within allowable. However, such a break in this room has a low probability of occurrence. The portion of the pipe meets most of the criteria established by NRC Branch Technical Position MEB 3-1 to qualify as a "no break zone" with the exceptions being: 1) the piping was designed to ANSI B31.1 instead of ASME Section III, Class 2. However, the Toledo Edison procurement and installation specifications required the same material and isntallation documentation as is required under ASME Section III, Class 2; 3) the piping in room 313 or corridor 304 does not comply with Section B1.1B(4) which requires that the length of the section of pipe for which breaks are not postulated be kept to a minimum.

Following a maximum probable earthquake, walls 4806, 4817, 4826, 4837, 4847 and 4857 could experience loss of structural strength due to wall attachment loadings and potential differential movement between seismic zones #6 and #7. Failure to construct a seismic joint in walls 4806, 4826, 4837 and 4857 between these zones contributes to their failure and that of walls 4817 and 4847.

A potential consequence of wall failure could be damage to the safety related conduits attached to these walls and possible damage to safety related items in the room adjacent to these walls. The degree of damage to these conduits has not conclusively been determined. However, if the circuits contained within the damaged conduits are affected such that they cannot perform their designed function, safe shutdown of the plant could still be provided by alternate systems not affected.

Failure to provide a seismic joint at the south end of masonry wall 4647 could create a localized overstressed masonry condition in this wall. The masonry is overstressed in compression due to in-plane seismic loads generated by the absence of this joint. Localized crushing of the masonry in the vicinity where the joint should have been constructed, could occur as a result. This localized masonry crushing should not result in the loss of function of the safety related circuits contained within the conduits penetrating this wall for the following reasons: 1) the loadings on the steel conduits are reduced due to energy dissipation when localized masonry crushing occurs; 2) radial compressive strength of the steel conduits is greater than the compressive strength of the masonry; and, 3) support for safety related conduits which penetrate the wall will not be affected.

When wall 4016 is subjected to a seismic loading, the masonry stresses in the wall and the stresses in the top and bottom wall connections exceed design allowables. Additionally deflection during a seismic event of the wall would cause attached conduits, some of which contain nuclear safety related circuits, to exceed the acceptance criteria for the conduit deflection. Failure of the entire wall or circuits contained within the affected conduits has not been confirmed even though the allowable stress has been exceeded. The present analysis uses average material strengths and does not take any credit for load reductions attributable to localized failure (crushing) of masonry. If, however, in the unlikely event that the nuclear safety related circuits contained within the affected conduits cannot perform their intended safety function, safe plant shutdown could still be provided by alternate systems not affected.

9 During a postulated break in the main feedwater line in Room 313 the expansion anchors in the connections in walls 3237 and 3287 and the floor beam attached to the top of wall 3237 could become overstressed. A potential consequence could be structural distress in a portion of the floor above the beam at elevation 603'-0". Further analysis would be

required to determine if this portion of the floor would become overstressed if yielding of the beam did occur. A modification to correct this condition can be designed and implemented more expeditiously than the 2 to 3 months required for a detailed analysis of the floor system.

Also, failure of the wall connections is not likely even though the factors of safety for the expansion anchors in the connections are less than the acceptance criteria. However, this factor of safety is greater than 2, specified as acceptable for short term operability by I.E. Bulletin 79-02. 9

Additionally, a pipe break of this nature in Room 313 has a low probability of occurring. The portion of the pipe meets most of the criteria established by NRC Branch Technical Position MEB 3-1 to quality as a "no-break zone" with the exceptions being: 1) the piping was designed to ANSI B31.1 instead of ASME Section III, Class 2. However, the Toledo Edison procurement and installation specifications required the same material and installation documentation as is required under ASME Section III, Class 2; 2) the piping in Room 313 does not comply with Section B.1.b (4), which requires that the length of the section of pipe for which breaks are not postulated be kept to a minimum.

CORRECTIVE ACTION: Under Facility Change Request 80-277, two struts were added to the floor beam above the wall between the control room and stairway AB-1. This work was completed March 6, 1981.

For the second finding, three plate stiffeners will be installed between the beam and floor above, under Facility Change Request 81-015.

For the third finding, the condition will be corrected by removing the pipe supports from wall 2047 and attaching them to the makeup pump room ceiling. This relocation work will be done under Facility Change Request 81-016 when station operating conditions permit.

For the fourth finding, the condition will be corrected by the addition of a two-layered internal bracing system to the cable chase formed by walls 3167, 3177 and 3187. The top layer of bracing will lower the floor beam stresses to allowable limits by reducing the wall deflections. The lower level internal bracing will reduce the masonry wall stresses (these caused by compartment pressurization) to within allowables. These modifications will be made under Facility Change Request 81-018 when station operating conditions permit.

For the fifth finding, the condition will be corrected by reinforcing the connection of the base of wall 2337 by adding steel angles connected to the wall and floor with thru-bolts and expansion anchors. This modification will be made under FCR 81-017 when station operating conditions permit.

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For the sixth finding, the condition will be corrected by the removal of walls 4117 and 4127, and replacement of wall 4117 with a steel jet impingement shield. Wall 4107 will be reinforced with a steel post anchored to the floor. This modification will be made under Facility Change Request 81-020 when station operating conditions permit.

For the seventh finding, Facility Change Request 81-019 has been issued for immediate implementation. This FCR will reduce the stress in the wall caused by a seismic event and compartment pressurization to within allowable limits. The initial portion of this FCR work will reduce the stresses caused by a seismic event. A supplement will be issued to also reduce the stresses caused by compartment pressurization and further refine the seismic portion of the modification.

For the eighth finding, the condition will be corrected by removing walls 4806, 4817, 4826, 4837, 4847 and 4857, fireproofing the building columns which were surrounded by the walls and relocating the existing wall attachments to satisfactory supports. This modification will be made under Facility Change Request 81-021 when station operating conditions permit.

The condition of wall 4647 will be corrected by constructing the required seismic joint in this wall per Facility Change Request 81-022 when station operating conditions permit.

The condition of wall 4016 will be corrected by removing 16" wide block sections at six locations for the full height of the wall and replacing them with steel box sections fastened to the floor below and floor beams above this wall. This modification will be made under Facility Change Request 81-023.

The condition of walls 3237 and 3287 will be corrected by bracing the floor beam to resist the loading from wall 3237 and reinforcing the south end connection of wall 3287 and the north end connection of wall 3237 with angles and expansion anchors. This modification will be made under Facility Change Request 81-024.

Failure Data: There have been no previously similar reported occurrences.

TC 15A

LER #80-091