



September 17, 1987
NRC-87-0171

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

- References: 1) Fermi 2
NRC Docket No. 50-341
NRC License No. NPF-43
- 2) IE Inspection Report No. 50-341/87033,
dated August 19, 1987

Subject: Response to Notice of Violation
50-341/87033-01 and -02 A, B, C, & D

Reference 2 identified violations concerning inadequate design control and procedural error. Detroit Edison concurs with the violations as stated. The enclosed response provides the actions taken and those which will be taken to prevent violations of this type from occurring in the future.

We trust this letter satisfactorily responds to your concerns. Please contact Mr. L. Bregni at (313) 586-4072 if you have any further questions.

Sincerely,

F. E. Agosti
Vice President,
Nuclear Engineering and Services

Enclosure

cc: Mr. A. B. Davis
Mr. E. G. Greenman
Mr. W. G. Rogers
Mr. J. J. Stefano
USNRC Region III

RESPONSE TO NRC INSPECTION REPORT 50-341/87033

Statement of Violation 87033-01

10CFR50, Appendix B, Criterion V, requires that activities affecting quality shall be accomplished in accordance with prescribed procedures.

Contrary to the above, Stone and Webster, as a standard practice, has not evaluated expansion anchor spacing violations in accordance with the methodology prescribed in Specification No. 3071-226, Revision G, July 15, 1985.

This is a Severity Level V Violation.

Corrective Action Taken and Results Achieved

A standard methodology for evaluating anchor spacing violations was developed and is contained in Detroit Edison Specification No. 3071-226, Revision G, Appendix C. It was developed based on specific Fermi installation requirements and material properties, and was intended to provide a systematic approach for addressing anchor bolt spacing violations. Design Calculation No. 688, Volume III, Revision O, the original calculation performed by Stone & Webster to address anchor bolt spacing violations did not utilize this standard methodology. DC 688 has since been revised utilizing this standard methodology, including both the design checklist and the violation documentation checklist. The revised calculation, DC 688, Vol. III, Revision A reaffirms the acceptability of the anchor bolt spacing violations evaluated.

As noted in the inspection report, the methodology originally utilized by Stone & Webster to evaluate the anchor spacing violations, although not consistent with Spec. No. 3071-226, was at least as conservative as the standard methodology described in Spec. No. 3071-226.

Corrective Action Taken to Prevent Further Violations

Memorandum NE-PJ-87-0492 was issued to the Nuclear Engineering groups and supporting Architect/Engineering firms involved in concrete anchor design to emphasize the requirements for utilizing the standard design methodology in Specification 3071-226, Appendix C, including the use

Enclosure to
NRC-87-0171
Page 2

Corrective Action Taken to Prevent Further Violations (Continued)

of the design checklist and the spacing violation evaluation checklist, as applicable. This action has been taken to prevent future violations of this type.

In addition, Detroit Edison will reconfirm that the UFSAR is correct with respect to calculational methodologies and computer programs utilized in support of Fermi 2. This review and confirmation will be completed prior to the next annual update of the Fermi 2 UFSAR.

Date of Full Compliance

Full compliance will be achieved prior to submittal of the next annual update of the Fermi 2 UFSAR which is presently scheduled for March 20, 1988.

Statement of Violation 87033-02 (A, B, C & D)

10CFR50, Appendix B, Criterion III, requires that the design bases are to be correctly translated into design documents.

Contrary to the above, the design bases were not correctly translated into design documents in that:

- A) In Calculation DC No. 974, Revision C, the torque requirement for 1 1/4 inch diameter wedge anchors was calculated using the shear capacity of the bolt instead of the tensile capacity.
- B) On Drawing 5C721-2002, Revision I, the minimum edge distance for 1 1/4 inch diameter wedge anchors was incorrectly specified as six inches.
- C) In Specification No. 3071-226, Revision G, Appendix A, the definitions for "manufacturer or supplier" and "seller or distributor" were incorrectly stated.
- D) In Calculation DC No. 4479, Revision A, the following errors were identified:
 - 1) Moment calculations for Masonry Wall Nos. 219 and 234 were incorrect.
 - 2) Bending stress calculations for Masonry Wall Nos. 219 and 234 were incorrect.
 - 3) Design assumptions for Wall No. 219 are acceptable, but justifications must be made so that the calculated moments and stresses reflect the actual boundary condition.
 - 4) The door frame in Masonry Wall No. 219 was assumed to be a simply supported member resisting seismic loads. However, the door frame was not analyzed to assure that it could withstand the calculated seismic loads.
 - 5) Seismic shear stress was not considered in the design evaluation.
 - 6) The ratio of the horizontal to the vertical dimension for Masonry Wall Nos. 216, 218 and 221 was not consistent with the design formula. Accordingly, the calculated natural frequency was incorrect.

Statement of Violation 87C33-02 (A, B, C & D) (Continued)

- 7) The use of the zero period acceleration (ZPA), based on the calculated frequency of 12.91 HZ, was inappropriate.
- 8) Section 6-6 on Drawing 6C721-2608 was not deleted on Revision H as stated in Revision G and DCN 10831.

This is a Severity Level IV Violation.

Corrective Action Taken and Results Achieved

- A) The installation torque requirements in DC No. 974 were calculated to ensure that, under the maximum allowable tension load, no anchor slippage would occur. The torque range specified was utilized for both Hilti Kwik bolt and Phillips wedge anchors.

Design calculation No. 974, Revision C, has been revised for 1 1/4 inch diameter wedge anchors utilizing the allowable tension load of 9450 lbs. rather than the allowable shear load of 8920 lbs. Substituting the tension load value (9450 lbs.) for the shear load value (8920) in DC No. 974 Revision D yielded no change in the specified allowable range of torque values for 1 1/4 inch diameter wedge anchors.

- B&C) As Built Notice (ABN) No. 7719-1 was issued August 17, 1987 to correct the minimum edge distance requirement for 1 1/4 inch diameter wedge anchors, on drawing 5C721-2002, to 6 1/4 inches, and to correct the definitions in Specification No. 3071-226, Appendix A, related to "Manufacturer or Supplier" and "Seller or Distributor."

Additionally, an evaluation was made in Revision D of Design Calculation No. 974, dated August 11, 1987, to support the generic acceptance of 1 1/4 inch diameter wedge anchor installation with 6 inch minimum edge distance to account for those bolts for which 6 inch minimum edge distance may have been utilized.

- D) Design Calculation No. 4479, Revision A, was generated in April, 1987 to evaluate the masonry wall non-conformances identified in Deviation Event Report No. 86-167, and to assess the walls' susceptibility to failure in the interim until all non-conformances had been corrected. These non-conformances

Corrective Action Taken and Results Achieved (Continued)

have since been corrected via EDPs 6816 and 7784. Three As-Built Notices have also been issued to document the field condition of these walls (ABNs 6719-1, 7714-1 and 7871-1). Fermi 2 is in conformance with the design bases as described in the UFSAR.

Design Calculation No. 4479, Revision A, has been revised to correct the specific errors identified in the inspection report as follows:

- 1) Moment calculations for Wall No. 234 have been revised to correct the moment directions (page E-6 of DC 4479, Rev. B).

Wall No. 219 has been reevaluated in a different manner in which the relative stiffness of all the connecting elements at the top of the wall are considered. The reevaluation demonstrated that the Forway anchors used for these connections are able to absorb the anticipated vertical movement and therefore, the connection at the top of the wall is assumed to be maintained. Using this approach, calculation of bending moments and stresses is no longer necessary since the original design boundary conditions do not change.

- 2) Stress calculations for Wall No. 234 have been revised to correct the errors noted (page E-6 of DC 4479, Rev. B).

As noted in 1) above, bending moment and stress calculations for Wall No. 219 are no longer necessary, since the reevaluation of Wall No. 219 shows that the original design boundary conditions have not changed.

- 3) Additional explanations have been added on pages 7, 7a, 8 and 8a of DC 4479, Rev. B to substantiate the acceptability of the boundary conditions assumed for Wall No. 219.
- 4) The revised evaluation of Wall No. 219 has shown that the top connection will not be lost during an earthquake, and therefore, the original boundary conditions assumed in DC No. 841 are valid. These original boundary conditions did not utilize the door frame for lateral load support.

Corrective Action Taken and Results Achieved (Continued)

- 5) A generic shear stress evaluation was added on page E-12, of DC No. 4479, Rev. B for the two (2) different types of mortar used in the block walls. The evaluation shows that shear stress in the worst case will not exceed 21.5% of the shear strength.
- 6) The ratio of the horizontal to the vertical dimensions of the walls has been corrected on pages E-8 and E-9 of DC No. 4479, Rev. B for Walls 216, 218, 221.
- 7) The provisions of IEEE standard 344-1975 specify a factor of 1.5 to be used to account for multifrequency excitation and multimode response when utilizing Static Coefficient Analysis. The same standard allows Zero Period Accelerations (ZPAs) to be used if dynamic analysis shows that an item is rigid, with no resonances in the response spectrum amplification range.

Design Calculation, No. 4479, Revision B, utilizing dynamic analysis, concludes that all walls are rigid with no resonances in the response spectrum amplification range, with the exception of Wall No. 216. Therefore, ZPAs were used for all walls except Wall No. 216 which has been determined to have a natural frequency of 19.8 CPS (page E-9). A factor of 1.2 is justified for this wall since its natural frequency is very close to the ZPA plateau of the response spectrum. It should be noted that the use of a different factor, in this case, does not alter the conclusion of the analysis for Wall No. 216.

- 8) As-Built Notice No. 7714-1 has been issued to remove the section mark 6-6 from drawing 6C721-2608.

An independent third party review of DC 4479, Revision B, has been performed by an outside consultant. The review, which utilized alternate methods to evaluate the masonry walls, confirmed the conclusions in DC 4479, Revision B. All walls analyzed in DC 4479, Revision B, have been shown to be able to withstand the Fermi design basis earthquake with the exception of Wall No. 216, which could not be analytically proven to be able to survive the design basis earthquake. However, it is the Consultant's opinion that Wall No. 216 would not collapse as a result of the design basis earthquake. This independent third party review is documented in report No.

Corrective Action Taken and Results Achieved (Continued)

HA-08/87-610, Revision 1 which has been transmitted along with Design Calculation, DC No. 4479, Rev. B to Mr. Liu of your staff.

Finally, Detroit Edison verified that no safety-related components have ever existed within the failure zone of influence for Wall No. 216. Engineering Design Package No. 7784, which was implemented in August 1987, brought this wall up to its original design condition by the addition of external steel angle reinforcement.

Corrective Actions Taken to Prevent Further Violation

- A) Nuclear Engineering procedure No. 2.5.2 "Design Calculations" Revision 1, dated July 10, 1986, incorporates a verification checklist requirement for all design calculations. The checklist requires that the verifier answer specific detailed questions related to design calculations.

This revised design verification process, currently in effect, should prevent oversight errors such as the one described in the inspection report.

- B&C) These errors occurred during the incorporation of Engineering Design Package No. 2356 onto drawing 5C721-2002 and Specification No. 3071-226 prior to November of 1985. As of November 1985, all change paper incorporation work has been performed by Stone & Webster, the on-site Architect/Engineering firm, in accordance with procedures No. NE-2.14 and NDP-21.

Audits are performed periodically by Detroit Edison's Quality Assurance personnel to assure that the task is being performed properly and in conformance with the specified procedures, e.g., Audit No. A-EA-S86-41.

- D) Deviation Event Report (DER) No. 87-228 was written to document the errors identified in DC 4479, Revision A. Corrective action required for disposition of the DER includes preparation of a list of design calculations prepared by the originator of DC 4479, and all design calculations prepared, checked or verified by the verifier of DC 4479, Revision A, since March 1, 1985.

Corrective Actions Taken to Prevent Further Violation (Continued)

A representative sample of this list will be reviewed by a third cognizant Engineer in the Arch/Civil group of Plant Engineering or by an outside consultant. Based on the results of this review, additional reviews, checks or other appropriate actions will be taken, as needed.

A memorandum will be issued to appropriate Nuclear Engineering personnel stressing the importance of careful and accurate engineering design and verification efforts. The memorandum will emphasize attention to detail and the importance of not compromising quality for expediency.

Date of Full Compliance

- A) Full compliance has been achieved.
- B&C) Full compliance has been achieved.
- D) Corrective actions identified in "Corrective Actions Taken and Results Achieved" above, have been completed. Corrective actions to prevent further violations will be completed by December 31, 1987.