



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

10/14/83

OCT 14 1983

MEMORANDUM FOR: William Paton, Attorney
Office of the Executive Legal Director

FROM: George Lear, Chief
Structural and Geotechnical Engineering Branch
Division of Engineering

SUBJECT: MIDLAND REVIEW EVALUATION OF FINDINGS FOR
REMEDIAL ISSUES (100% STRUCTURAL REVIEW)

We have completed the structural review of the document "Applicant's Proposed Findings of Facts and Conclusions of Law on Remedial Soil Issues," along with related information. The 30% review addressed Seismic Models and the Borated Water Storage Tanks and the 60% review addressed the Auxiliary Building and the Service Water Pump Structure. The final phase of the structural review addresses the Diesel Generator Building, the Diesel Fuel Oil Tanks, and the Duct Banks and Conduits.

The structural evaluation of the Diesel Generator Building, the Diesel Fuel Oil Tanks and the Duct Bank and Conduits concludes that these structures will perform their intended safety functions throughout the operating life of the plant. The Diesel Generator Building, due to the observed cracks, needs to be monitored to assure that the stress limits for the reinforcing bars will not be exceeded. In addition, we are enclosing comments on some sections of the subject document. The sections that have been reviewed include 79 thru 205, 300 thru 311, and 399 thru 421.

The final phase of the structural engineering review has been performed by Frank Rinaldi of my staff and John Matra and Gunnar Harstead, staff consultants.

Lynmar W. Hellock
for George Lear, Chief
Structural and Geotechnical
Engineering Branch
Division of Engineering

Enclosure: As stated

- cc: D. Eisenhut
- R. Vollmer
- E. Adensam
- D. Hood
- [REDACTED]
- P. Kub
- G. Harstead
- J. Matra
- F. Rinaldi
- G. Lear

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Enclosure

Comments on Applicant's Proposed Findings of Fact and Conclusions
of Law on Remedial Issues (Sections: 79-205; 300-311; 399-421)

- Section 163 Provide clarification to the first full sentence on page 131. This clarification can be accomplished by stating that the structural reviewers found the general approach acceptable for establishing the boundary conditions of the structural analyses. However, the structural reviewers did not fully rely on these analyses for settlement effects because of the limitations of the available settlement data (Section 166 elaborates on this issue). Instead, the staff evaluated crack patterns and sizes to determine the current stress in the reinforcing bars and will rely on the crack monitoring program to assure continued adherence to design code requirements. Also, footnote 328 should be modified for two references, as follows:
- 11093 to be modified 11093 - 11094
11096 to be modified 11096 - 11097
- Section 166 Add after the first full sentence in page 134 the following:
In addition, Mr. Matra stated in his report (Applicant's Ex. 30) that additional settlement data as well as finer modeling details and material data must be obtained and used in the type of analyses that utilize exact measured and/or predicted settlements, in order to produce reliable results. The completed structure

(DGB) has not been exposed to all of the settlement values used in Ex. 30. Therefore it has not been subjected to the high stresses reported in Ex. 30. Mr. Matra agreed, only for academic purpose to perform the analyses using the available and/or predicted settlement values. The use of these settlement data for the evaluation of the DGB for the construction stages reported in Ex. 30 can lead to large and fictitious errors if one does not exercise proper engineering judgement.

Section 172 Correct the footnote at the end of this Section. It should read 361.

Section 174 The first paragraph on page 142 needs modification. The final staff position was reached as a result of discussions between the geotechnical and structural staff and consultants on the use of the settlement measurements. No vetos were cast by any reviewers. The staff determined that they could not fully rely on the results of the finite element analyses for the effects of differential settlement. Therefore, the staff estimated the stresses due to differential settlement in the reinforcing bar from the available crack patterns and sizes.

- Section 175 The first two sentences need modifications. The statements referenced in footnote 372 provide clear structural staff positions on which reviewer (geotechnical or structural) provides and evaluates the settlement data and which one evaluates the structure for that data. The conclusions identified in the findings do not reflect the records. Also, add Harstead to 11101-11102 in footnote 372.
- Section 176 Delete the second sentence because it does not present a complete and true picture of the proceedings. Specifically, it does not state what engineering discipline is charged with the review responsibility. As an alternative to deleting the subject sentence, a new sentence should be inserted to reflect the above concern. The references, supporting the above concern, are numerous (see December 10, 1982, transcripts).
- Section 178 Modify the second sentence to reflect only the opinion of Mr. Wiedner and Dr. Sozen as supported by the footnote. The transcript references for footnote 377 apply only to Mr. Wiedner and Dr. Sozen. Also, we like to emphasize the clarification identified for Section 163. The statement in Section 163, "The structural reviewers found.....adherence to design code requirements" should be included in this section to reflect the opinion of the NRC structural witnesses. Footnotes 328 and 376 can be used in support of this statement.

Section 179 Replace the phrase at the top of page 146, "an unnecessary pessimistic" with, "a conservative". Also delete, "too pessimistic" and the parenthesis around the word conservative in footnote 380. The records do not indicate these words, including the official staff testimony prepared by the structural witnesses that is referenced in footnote 380.

In addition, the last sentence needs to be revised to reflect the records. The NRC staff structural reviewers used the same formulation for estimating the existing stresses of the reinforcing bars, based on available crack patterns and sizes, as used by Dr. Sozen (December 10, 1982 p. 11052-11053). However, the staff added these stresses to those calculated by the applicant using finite element model. This direct addition of these stresses provides some conservatism as stated in footnote 371, but provides the best estimate of potential total stresses. This conservatism is warranted due to the uncertainties in calculating stresses due to differential soil settlements.

Section 180 There is a need to insert, after the third sentence, another basis for Board acceptance of the DGB based on NRC structural staff recommendations. We suggest: In addition, the Board is cognizant of the NRC structural reviewers written supplemental testimony and oral testimony by the structural reviewers and of the official staff position. The staff position is developed

based on all available and useful information and contains some degree of conservatism in the determination of existing stresses and potential stresses in the structure. Based on the fact that all stresses meet the design code requirements for present and postulated design conditions, and that the monitoring and repair programs follow sound engineering principals, the staff concluded that the DGB is a structurally acceptable structure, subject to the outcome of the Seismic Margins Review.