ENCLOSURE

SAFETY EVALUATION REPORT SUPPLEMENT
MASONRY WALL DESIGN, IE BULLETIN 80-11
DAVIS-BESSE NUCLEAR POWER STATION UNIT 1
DOCKET NO. 50-346

In the Safety Evaluation Report (SER), the staff concluded that except for 75 walls (out of a total of 169), qualified by the licensee via the use of the energy balance technique to resist the out-of-plane seismic forces, Items 2(b) and 3 of IE Bulletin 80-11 have been fully implemented at the Davis-Besse facility for the remaining walls. The SER also included a staff position on the energy-balance technique and stated that the implementation of this position was required to render the above walls acceptable to the staff. In brief, the staff position required that the use of the energy-balance technique be supplemented by a plant-specific comprehensive test program or, alternatively, the walls should be reanalyzed using the linear working stress criteria. The licensee chose the later option as discussed below.

The licensee met with the staff and its consultant, Franklin Research Center (FRC), on April 25, 1985, to discuss its proposed approach to respond to the staff position. The licensee clarified at the meeting that only 74 walls were qualified using the energy-balance technique. The proposed approach was to reexamine the original seismic analysis of the auxiliary building which contains 73 masonry walls in question and the analysis of the masonry walls themselves to identify existing excessive conservatisms above and beyond the current staff acceptance criteria in the area of the seismic analysis. The intent was, then, to account for these excessive conservatisms in the wall analysis and qualify the walls on the basis of linear elastic (working stress) methodology consistent with the staff acceptance criteria (Appendix A of the

TER attached with the SER). One wall in the control building was also analyzed using the similar approach. Based on the information presented at the meeting the staff found this approach to be acceptable.

By letters dated September 23, 1985 and December 17, 1985, the licensee has now provided the details and results of its evaluation using the above approach. The FRC, as a consultant to the staff, has reviewed these results and prepared a technical evaluation report (TER) (Attachment 1). The staff has reviewed this TER and concurs with its technical findings. These technical findings form the basis for the staff supplement safety evaluation. The following is the summary of major technical findings:

(1) The licensee has examined two sources of excessive conservatisms in the seismic analysis of the auxiliary building, namely seismic input and damping. The original seismic analysis of Davis-Besse Unit 1 was based on the 1935 modified Helena, Montana time history and modified Newmark spectrum. A comparison of the floor spectra from the original analyses with the spectra obtained from using Regulatory Guide 1.60 spectrum (with the peak ground acceleration of 0.2g rather than 0.15g design basis) as input motion and Regulatory Guide 1.61 damping exhibited that peaks of the floor response spectra from RG 1.60 input can be up to 40% less than peaks of the original floor response spectra.

(2) The licensee examined the following four aspects of the masonry wall analysis for further excessive conversatisms:

- Boundary Conditions - In the previous analysis the licensee did not account for the partial restraint which exists at the boundaries of all walls based on the 'as-built' boundary conditions. When this is taken into consideration, the maximum moment at the center of the wall is significantly reduced.

- Material Properties - In the reanalysis, the licensee used the minimum yield strength for the reinforcing steel based on the certified material test results rather than the specified nominal strength.

- Plate Action - The licensee examined the conservative assumption of the one-way action (beam analysis) used in the original analysis versus the two-way (plate action) analysis. The licensee used the results of the two-way analysis to qualify some walls.

- Damping Values - In the reanalysis, the licensee used the damping value of 7% consistent with the staff acceptance criteria rather than the damping value of 4% used in the original analysis.

As discussed in the TER, it is reasonable to account for the above four conservatisms in the wall analysis and the wall analysis approach is consistent with the staff acceptance criteria. A number of other licensees have analyzed walls in their plants using the similar approach.

(3) As discussed on p.11 and p.25 of the TER, the licensee's use of the joint reinforcement as a structural element is acceptable on the basis of the construction of the walls at the Davis-Besse facility and the material test data. The joint reinforcement is well anchored and physical restraint exists all around the walls such that the capacity of the reinforcement can be developed. Figures 8 and 9 of the TER indicate that the joint reinforcement exhibits yield strength in excess of 60 ksi with indication of the ductility.

Based on the above findings, the staff concludes that issues related to the use of the energy-balance at the Davis-Besse facility are satisfactorily resolved and Items 2(b) and 3 of IE Bulletin 80-11 are now considered fully implemented at the Davis-Besse facility.

ATTACHMENT 1

FRANKLIN RESEARCH CENTER

DIVISION OF ARVIN/CALSPAN

TECHNICAL REPORT

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