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AUG 30 1982

Docket No. 50-271

Mr. J. B. Sinclair
Licensing Engineer
Vermont Yankee Nuclear Power
Corporation
1671 Worcester Road
Farmingham, Massachusetts 01701

Dear Mr. Sinclair:

Re: Vermont Yankee Masonry Wall Design

We have reviewed your letters dated July 7, 1980 and November 10, 1980, responding to IE Bulletin 80-11 dealing with masonry wall design, and find that additional information is needed in order to complete our review.

Please provide the information listed by our contractor in the enclosure to this letter by October 4, 1982.

If you have any questions, please contact the assigned Project Manager.

The request for information contained in this letter affects fewer than ten respondents; therefore, OMB clearance is not required under P.L. 96-511.

Sincerely,

ORIGINAL SIGNED BY

Domenic B. Vassallo, Chief
Operating Reactors Branch #2
Division of Licensing

Enclosure: As stated

cc: See next page

OFFICE	ORB#2 DL	DL:ORB#2	DL:ORB#2				
SURNAME	S. Norris	V.Rooney:pr	D.B.Vassallo				
DATE	8/30/82	8/30/82	8/30/82				

Mr. J. B. Sinclair

cc:

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TECHNICAL EVALUATION

A technical evaluation of the Licensee's reevaluation criteria and proposed modifications raised the following concerns: the Licensee's responses to IE Bulletin 80-11 were not sufficiently complete to permit proper evaluation; a more detailed discussion of the Licensee's reevaluation criteria is required; insufficient information was provided to justify the increase factors for allowable stresses at Vermont Yankee; and more information is needed on the seismic analysis method, the results of the reevaluation, and proposed modifications, if any. Before a final technical evaluation report can be issued, the Licensee should provide the following information:

1. Explain and justify the difference (if any) between the load combinations provided in the plant FSAR and the load combinations used in the reevaluation of the masonry walls. The SEB Criteria [4] indicate that the load combinations provided in the plant FSAR should be used in the reevaluation of masonry walls in an operating plant.

2. Provide the boundary conditions and modeling techniques used in the reevaluation of masonry walls at the Vermont Yankee plant.

3. Justify the assumption that the design earthquake stresses are 1/2 of the maximum hypothetical earthquake (SSE) stresses, as summarized in the analytical procedure given in Reference 3.

4. With reference to Table 2 of Reference 3, justify the allowable stresses in the collar joint by any existing test data.

5. With reference to Table 1 and Table 2 of References 3, for abnormal environmental loading combinations, justify the increase factor of 1.67 applied to allowable shear stress in reinforced masonry and tensile stresses normal and parallel to bed joints; also justify the increase factor of 1.5 applied to allowable shear stress in flexural members. The SEB criteria [4] allow an increase factor of 1.5 for tension parallel to the bed joint and for shear in the reinforcement, and a factor of 1.3 for tension normal to the bed joint and for masonry shear. If any existing test data is to be used to justify this increase factor, the Licensee is required to discuss the applicability of these tests to the masonry walls at the plant, with particular emphasis on the following areas: boundary conditions, type of loads, size of wall, and type of masonry construction (block type, grouted, or ungrouted). In addition, the Licensee is requested to indicate whether these walls can be qualified if the increase factors of the SEB criteria were to be used.

6. In Reference 3, the Licensee indicates that the arching theory has been used to qualify some masonry walls. The NRC, at present, does not accept the application of this technique to masonry walls in nuclear power plants in the absence of conclusive evidence to justify this application. The Licensee is requested to indicate the number of walls which have been analyzed by this technique and to provide resulting stresses and displacements.

   The following areas need technical verification before any conclusion can be made about the arching theory:

   - Explain how the arching theory handles cyclic loading, especially when the load is reversed.

   - Provide justification and test data (if available) to validate the applicability of the arching theory to the masonry structures at Vermont Yankee, with particular emphasis on the following areas:

     a. nature of the load

     b. boundary conditions

     c. material strength

     d. size of the test wall

   - If hinges are formed in the walls, the capability of the structures to resist in-plane shear force would be diminished, and shear failure might take place. This in-plane shear force would also reduce the out-of-plane stiffness. Explain how the effect of this phenomenon can be accurately determined.

7. Provide sample calculations illustrating the analysis of a typical multiple-wythe and a typical single-wythe wall.

8. Provide the results of the analysis for the walls that did not qualify under the working stress criteria, indicating the failure mode. Present the results of the analysis in terms of actual and allowable stresses.

9. Provide the details of proposed wall modifications (if any) with sketches, and give sample calculations to indicate how these modifications will correct the wall deficiencies. Also provide a legible copy of Attachment A and Figure 8 in Reference 3.

REFERENCES

1. Masonry Wall Design
   NRC, 08-May-80
   IE Bulletin 80-11

2. L. H. Heider
   Letter to B. H. Grier, NRC. Subject: Response to IE Bulletin 80-11, Masonry Wall Design
   Vermont Yankee Nuclear Power Station, 07-Jul-80
   WVY 80-97

3. L. H. Heider
   Letter to B. H. Grier, NRC. Subject: Submittal of Information Required by IE Bulletin 80-11
   Vermont Yankee Nuclear Power Station, 10-Nov-80
   WVY 80-157

4. Criteria for Safety-Related Masonry Wall Evaluation
   NRC, 00-Jul-81
   Standard Review Plan, Section 3.8.4., Appendix A

5. Uniform Building Code
   International Conference of Building Officials, 1979

6. Building Code Requirements for Concrete Masonry Structures
   Detroit: American Concrete Institute, 1979
   ACI 531-79 and ACI 531-R-79