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July 8, 1982

Docket Nos. 50-348
50-364

Mr. S. A. Varga
Director, Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Joseph M. Farley Nuclear Plant - Units 1 and 2
I. E. Bulletin 80-11 Masonry Walls

Gentlemen:

Based upon a telephone conference June 10, 1982 between Alabama Power Company and members of the Nuclear Regulatory Commission staff, Franklin Research Institute, and Bechtel Power Corporation, the attached information is submitted as additional clarification of our April 22, 1982 response to your letter of March 4, 1982 on I. E. Bulletin 80-11.

If you have any questions, please advise.

Yours very truly,

R B McDonald
for F. L. Clayton, Jr.

FLCJr/CLB:lsh-D16
Attachment
cc: Mr. R. A. Thomas (w/attachment)
Mr. G. F. Trowbridge (w/attachment)
Mr. J. P. O'Reilly (w/attachment)
Mr. E. A. Reeves (w/attachment)
Mr. W. H. Bradford (w/attachment)

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ATTACHMENT

Question 1)

For severe loading conditions, the SEB criteria suggest factors of 1.5 and 1.3, respectively, for shear reinforcement and shear carried by masonry and factors of 1.5 and 1.3, respectively, for masonry tension parallel and perpendicular to the bed joint. In the original submittal the licensee used a factor fo 1.67 for all of these cases. In response to the request for additional information, the Licensee clarified that the factor of 1.67 was never used but did not indicate what factor was really used. The Licensee is requested to provide this factor. If this factor is greater than those specified in the SEB criteria, the Licensee should justify its use. It should be noted that the factor of safety of 3 in Chapter 10.1 of ACI 531-79 of the code commentary is applicable to the axial stress case only.

Response

This question relates to Alabama Power Company's April 22, 1982 response to questions 4 and 5 of the March 4, 1982 letter. It was agreed during the telephone conversation that Alabama Power Company's response of April 22, 1982 adequately answered this concern since computed shear and bond stresses for masonry walls are less than ACI code allowable.

Of the six masonry walls analyzed as uncracked, ACI code allowables for masonry tension are exceeded in one case, only. For this one exception a factor of 1.3 is used for masonry tension parallel to the bed joint.

Question 2)

With respect to the Energy Balance technique the Licensee is requested to provide the resulting stresses and displacements of the walls being analyzed by this technique. In addition, the Licensee is requested to discuss the applicability of the references cited in the response (works of Degenkolb, Sheppard and Scrivener) to the masonry walls at Farley 1 and 2, with particular emphasis on the following areas:

A. Nature of the load

B. Boundary conditions

C. Materials used

D. Size of test walls

E. Amount and distribution of reinforcement

Response

This question relates to Alabama Power Company's response to question 15 of the March 4, 1982 letter. The applicability of the references cited will be discussed by Bechtel and the NRC at a later date on a generic basis. However, the following particulars concerning the energy balance analysis performed for the masonry walls at Farley are notewothy:

A. For conservatism peak floor response accelerations were used in the analysis, though the computed natural frequency of the walls are generally between 3 and 5 HZ., and the peak response range of the response spectra is between 7 and 10 HZ.

B. Energy balance analysis performed for I.E. Bulletin 80-11 used worst case envelope loadings and maximum spans. The results satisfied the criteria adopted for I.E. Bulletin 80-11 analysis. Recently completed reanalysis of all reinforced masonry walls using more realistic loadings and actual spans demonstrates that based on 7% damping wall stresses remain in the elastic range for OBE and SSE loading, though working stress allowables are exceeded for approximately 65% of the reinforced masonry walls for seismic loadings.

Question 3)

The Licensee is requested to justify the use of 7% damping for the OBE. Technical verification (existing test data and literature) should be given as to why 7% damping will be applicable beyond the elastic range.

Response

This question relates to Alabama Power Company's response to question 6 of the March 4, 1982 letter. Damping is proportional to the level of stress in the wall. When the stresses in a reinforced masonry wall approach the elastic limits of the masonry and reinforcing steel, cracking will occur, regardless of whether an OBE or SSE is the cause of the stressing. A damping level of 7% for a reinforced masonry wall provides a conservative measure of the energy dissipated by the cracking of the wall.

Seven percent damping has been used in the analysis of reinforced masonry walls when the analysis indicates stresses approach the elastic limit, and is therefore, appropriate. It is acceptable to allow the stresses in these walls to exceed

normal working stress allowables under seismic loadings because the walls are all nonstructural elements; therefore, the analysis need only demonstrate that the response of the wall to seismic loading will not impair the function of safety related equipment. This is demonstrated by the energy balance analysis.

For the north-south direction Farley's peak floor response accelerations based on 7% damping for the OBE are greater than or equal to those for the SSE (see table below). For conservatism OBE accelerations were used for north-south seismic analysis. For the east-west seismic analysis the SSE accelerations were used.

AUXILIARY BUILDING - PEAK SEISMIC ACCELERATIONS - 7% DAMPING (Gs)

FLOOR ELEV.	NORTH - SOUTH		EAST - WEST	
	OBE	SSE	OBE	SSE
83 ft	0.39	0.39	0.25	0.33
100 ft	0.60	0.56	0.42	0.48
121 ft	0.80	0.73	0.61	0.68
139 ft	0.94	0.85	0.76	0.84
155 ft	1.02	0.95	0.91	1.00