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AUTH.NAME AUTHOR AFFILIATION
TUCKER,H.B. Duke Power Co.
RECIP.NAME RECIPIENT AFFILIATION
DENTON,H.R. Office of Nuclear Reactor Regulation, Director
STOLZ,J.F. Operating Reactors Branch 4

SUBJECT: Forwards response to Action Item 3 of IE Bulletin 80-11, "Masoning Wall Design." Design assumptions appropriate considering physical condition of boundary joints.

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DUKE POWER COMPANY
P.O. BOX 33189
CHARLOTTE, N.C. 28242

HAL B. TUCKER
VICE PRESIDENT
NUCLEAR PRODUCTION

TELEPHONE
(704) 373-4531

October 20, 1983

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. John F. Stolz, Chief
Operating Reactors Branch No. 4

Subject: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287

Dear Sir:

A letter dated July 20, 1983 from J. F. Stolz transmitted a request for additional information concerning the on-going review of Oconee Nuclear Station's response to IE Bulletin 80-11. The request for additional information was a result of a May 25-27, 1983 site visit and corporate headquarters meeting by members of your staff and Franklin Research Center (NRC consultants). My letter of September 7, 1983 had transmitted our response to seven of the eight action items requested in J. F. Stolz's July 20, 1983 letter.

My letter of August 10, 1983 addressed our concern with Action Item 3, which required confirmation and clarification in regard to the validation question by your staff. Based upon subsequent discussion with your staff, our response to Action Item 3 is attached.

Very truly yours,

H. B. Tucker /lbb

Hal B. Tucker

PFG/php

Attachment

cc: Mr. James P. O'Reilly, Regional Administrator
U. S. Nuclear Regulatory Commission
Region II
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30303

Mr. J. C. Bryant
NRC Resident Inspector
Oconee Nuclear Station

Mr. John F. Suermann
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

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ITEM 3

Duke commits to provide positive shear transfer to the boundaries of walls qualified based on stress allowables as stated in the Staff criteria, or to demonstrate to the Staff's satisfaction that the existing boundary joint is capable of transferring the design load. If arching action is validated and demonstrates shear transfer, this can be extrapolated to walls qualified using stress allowables. If arching action validation is not considered, Duke shall submit an implementation scheduled by August 31, 1983, for Staff approval.

RESPONSE 3

The computation of the boundary shear stress is based upon the face shell thickness and the maximum support reaction. The resulting maximum shear stress for this rectangular area is calculated using the relationship:

$$fv_{max} = \frac{3V}{2A}$$

where:

fv_{max} is the maximum shear stress

V is the maximum support reaction per unit length

A is the support area per unit length

The normal allowable shear stress, in accordance with ACI 531-79, Table 10.1 is $1.1\sqrt{f'm}$. Using the inplace f'm and the SGEB criteria seismic increase factor of 1.3, the allowable shear stress would be 61.7 psi. The allowable shear stress per the Duke Power criteria, based on the assumed lower material properties, is 58.1 psi.

Using the method described above the worst case maximum shear stress is calculated to be 23.7 psi. Typically, the calculated shear stresses are less than 15 psi. The maximum calculated shear stresses are considerably less by factors of at least 2.4 and typically by 4 or greater than the allowable permitted in either the SGEB criteria or the Duke Power criteria.

The boundary shear for all eight inch hollow core masonry was computed based upon the face shell thickness of regular block (t_f = 1 1/4"). This results in a conservative area for the firerated blocks which have a minimum face shell thickness of 1 3/4".

In the reevaluation program an assumed value of f'm was used for the analysis. Subsequent testing of masonry samples removed from Oconee indicates that the value of f'm is considerably higher than the assumed value of 1000 psi. The testing also indicated that the actual mass of the masonry is appreciably lower than that which was assumed. Neither of these facts was considered in the analysis. This would result in higher allowables and lower support reactions, thereby, increasing the overall factor of safety.

During the recent field surveillance, conducted in response to item 2, the masonry wall boundaries were inspected with respect to the design assumptions. This inspection was for the purpose of insuring that the boundary condition assumed in the analysis was appropriate and/or conservative. The masonry walls in question are in-fill panels, built into and confined between relatively rigid reinforced concrete support frames with well constructed mortar joints. Some mortar joints at the boundaries were identifed as having hairline cracking between the concrete face and masonry. These mortar joints were examined closely for looseness or poor construction. The cracking in the mortar was extremely fine. All joints were found to have solid mortar. It was concluded the design assumptions are appropriate considering the physical condition of the boundary joints.

Duke has reviewed the support conditions and found them to be acceptable of transferring the masonry wall boundary reaction loads. A further conservatism that may be considered when evaluating the utlimate capacity of the wall is arching action.