

SAFETY EVALUATION BY THE  
OFFICE OF NUCLEAR REACTOR REGULATION  
MASONRY WALL DESIGN, IE BULLETIN 80-11  
OCONEE NUCLEAR STATION, UNITS 1, 2 AND 3  
DOCKETS NOS. 50-269, 50-270 AND 50-287

The findings reported in this Safety Evaluation Report (SER) are based on the attached Technical Evaluation Report (TER) (Attachment 1) prepared by Franklin Research Center (FRC) as a contractor to NRC. This TER contains the details of construction techniques used, technical information reviewed, acceptance criteria, and technical findings with respect to masonry wall construction at Oconee units. The staff has reviewed this TER and concurs with its technical findings. The following is our summary of major technical findings.

- (1) The criteria used by the licensee in the re-evaluation of the masonry wall, in general, comply with the staff acceptance criteria. There are two major differences between the staff and the licensee's criteria. The first difference pertains to the licensee's use of the arching action theory to qualify eighty-two unreinforced walls. This issue is further discussed in Item (2) below. The second difference pertains to the licensee's allowable value for tension normal to the bed joint for the extreme environmental load conditions (for the walls qualified by the working stress design method). The staff criteria specifies that the allowable tension normal to the bed joint for the extreme environmental load condition is obtained by increasing the allowable tension for the service load conditions by a factor of 1.3. The licensee's criteria specifies a factor of 1.67 for this purpose. However, as discussed on p. 15 of the TER, the actually calculated tensile stress in all but 41 walls is less than the allowable value obtained by the application of the staff increase factor of 1.3. For the 41 walls, the survey of the actually calculated stresses indicate that the increase factor ranges between 1.47 to 1.67 (as opposed to 1.3 of the staff criteria). However, the licensee's allowable stresses for service load conditions are based upon assumed material strength values (compressive strength of masonry,  $f'_m$ , and compressive strength of mortar,  $m_0$ ) rather than those based on the test data of the field samples removed from walls. As noted on p. 12 of the TER, the test results indicate that the assumed material strength values are quite conservative. If the allowable stresses were based upon the test results, the actually calculated tensile stresses in the above 41 walls for the extreme environmental load conditions would be less than the allowable value obtained by the application of the staff increase factor of 1.3. Therefore, the staff concludes that, in actual application to evaluate Oconee walls, the portions of the licensee's criteria which are based on the working stress design method meet the intent of the staff acceptance criteria.

- (2) The licensee has qualified eighty-two walls by the use of the arching action theory (see p. 11 of the TER for detail). The staff's position on the use of the arching action theory is attached as Attachment 2. This position states that the use of the arching action theory to qualify the unreinforced masonry walls is not acceptable and these walls should be repaired such that they can be qualified based on the staff acceptance criteria. Normally, the implementation of the staff position is required to render the above walls acceptable to the staff. However, by a letter dated October 5, 1984, the licensee has proposed a confirmatory test program on the arching action methodology. The staff has reviewed this program and found it acceptable. The staff will evaluate the results of the test program when completed and address the eighty-two walls qualified by the arching action theory in a separate safety evaluation.

Based on the above findings, the staff concludes that, with the exception of the eighty-two walls requiring the staff review of the results of the confirmatory test program on the arching action theory, the Items 2(b) and 3 of the IE Bulletin 80-11 have been fully implemented at Oconee units and that there is reasonable assurance that the safety-related masonry walls at Oconee units will withstand the specified design load conditions without impairment of (a) wall integrity or (b) the performance of required safety functions.

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