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SUBJECT: Forwards evaluation of adequacy of nonstructural, nonload
 bearing masonry walls used in auxiliary & control bldgs &
 subj to lateral seismic inertial loads, per concerns raised
 during recent audit & 860320-21 & 0411 meetings.

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Arizona Nuclear Power Project

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April 16, 1986
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Director of Nuclear Reactor Regulation
Attention: Mr. George W. Knighton, Project Director
PWR Project Directorate #7
Division of Pressurized Water Reactor Licensing - B
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Units 1, 2 and 3
Docket Nos. STN 50-528 (License NPF-41)
STN 50-529 (License NPF-46)
STN 50-530
Evaluation of Masonry Walls
File: 86-056-026

Dear Mr. Knighton:

A limited number of non-structural, non-load bearing masonry walls have been used in the PVNGS Auxiliary and Control buildings. These walls are subject to lateral seismic inertial loads due to their own weight and the weight of light attachments.

Several questions were raised regarding the adequacy of these walls as a result of a recent NRC audit. Meetings have been held with the NRC to discuss these issues on March 20-21 and April 11, 1986. There have been telephone calls to provide additional data on the evaluation performed and to obtain the perspective of the Chairman of the ACI 531 Code Committee.

Specific issues related to the design of the masonry walls have been discussed during the meetings and subsequent telephone conversations. The enclosure to this letter is provided to summarize the significant attributes of the issues involved, describe the extensive documentation review and field investigations of the as-built condition of the masonry walls, and present the results of the evaluations performed.

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As background, the masonry walls were designed in October, 1975. In April, 1980, a letter was issued by the NRC to all Construction Permit and Operating license Applicants requesting information on Category I masonry walls employed by plants under CP and OL review. In August, 1980, ANPP responded to the NRC request that only non-structural concrete masonry walls were used and noted that at a few locations, conduits, instrumentation tubing and small electrical panels were attached to the masonry walls. A composite record of all these attachments have been kept to assure that wall integrity has not been jeopardized. This information was incorporated into the FSAR in May, 1981. Subsequently, Appendix A to SRP Section 3.8.4 "Interim Criteria For Safety-Related Masonry Wall Evaluation" was issued in July, 1981. No further action was taken until the recent evaluation performed as a result of the NRC audit findings.

Three questions were raised by the NRC regarding the adequacy of this evaluation: Use of full allowable stresses, adequacy of splicing in adjacent cells, and adequacy of available lap lengths. With regards to the first question, there are sufficient data based on recent investigations and review of available construction documentation to justify the use of special inspection values since the significant structural attributes of the wall are known.

Staggered splices are adequate to transfer the rebar forces as evidenced by the available test data and as inferred from the applicable ACI code. Finally, less than minimum splice lengths are acceptable provided the average bond stress does not exceed appropriate allowable levels.

Attachment C of the enclosure presents the critical stresses in the walls, under the SSE conditions. The calculated flexural stresses are compared with the allowable values based on the ACI 531-79 Code, as modified by the SRP 3.8.4. The calculated bond stresses, are compared with the allowable values based on the ACI 318-63. Review of these results indicate the following:

A. Walls at Elevation 100'

All the masonry, reinforcement and bond stresses are within their allowable values. The maximum flexural compression fiber stresses in the masonry exceeds the reduced allowable by only about 5%. This is considered acceptable since the significant structural attributes of the wall are known, fulfilling the purpose of the special inspection.

B. Walls at Elevation 74'

Similar to walls at elevation 100', all masonry, reinforcement and bond stresses are within their allowable values. The maximum flexural compression fibre stress in the masonry exceeds the reduced allowable value by 16%. This is considered acceptable because the significant structural attributes of the wall are known, fulfilling the purpose of special inspection.

Attachment C of the enclosure also includes the critical stresses in the walls, under the OBE conditions.

A. Walls at Elevation 100'

At elevation 100', all the stresses are less than the full allowable values. The calculated maximum flexural compression stresses exceed the reduced allowable by 5%. This is considered acceptable as noted for the SSE case.

B. Walls at Elevation 74'

The bond stresses are within the values allowed by the ACI 318-63 Code for working stress design. The rebar stress exceeds the allowable stress by approximately 8%, but is well below the minimum yield stress. The masonry stress exceeds the reduced and the full allowable values, however, it is only 53% of the ultimate strength of the masonry and therefore will remain well within the elastic range. Conservatisms in the analysis are discussed in Attachment C.

The out-of-plane wall deflection for the OBE is small while vertical deflections are negligible. Calculated differential displacements of small magnitudes are acceptable with no adverse impact on the conduits, instrumentation tubing, or small electrical panels, and their supports.

Therefore, the wall is structurally capable of resisting the loads from the OBE and the light Category I attachments will perform all their intended functions.

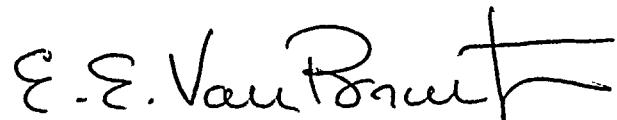
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Our meetings with the NRC have been constructive in identifying certain results of testing and Code changes in the period since the PVNGS masonry walls were designed and constructed. This discussion and supporting information provide the basis to conclude that the walls are of sufficient strength so as not to cause a failure of any safety equipment. We believe that this information provides confidence so that licensing of PVNGS Unit 2 may proceed. At the same time, we recognize that in order to fully resolve this issue, some confirmatory items exist which require further resolution. These include the following:

1. The intent of the Code definition for "special inspection" of the installation of masonry walls with respect to allowable stresses.
2. The applicability of industry tests to determine bond strength of reinforcing steel.
3. The capability of reinforcing steel splices in adjacent masonry block cells to resist the design loads.
4. Use of ACI 318-63 for bond stress allowables.

As a result ANPP will continue to work with the NRC Staff to accomplish a timely resolution of the items described. In the event total agreement on these issues is not reached, ANPP will perform appropriate additional calculations, testing and modifications to the masonry walls in question. Additionally, while these issues are being resolved, ANPP will agree to inspect the units to assure there has been no sustained damage to the the masonry walls and safety related attachments following an OBE.

Very truly yours,



E. E. Van Brunt, Jr.
Executive Vice President
Project Director

EEVB/RMB/dk
Enclosure

cc: E. A. Licitra
R. P. Zimmerman
A. C. Gehr

