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SUBJECT: Forwards "Supplemental Rept on Evaluation of Masonary Walls for..." in response to NRC concerns re ability of walls to withstand OBE & SSE. Confirmatory analyses support time history results demonstrating adequacy of walls. *56C*
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Arizona Nuclear Power Project

P.O. BOX 52034 • PHOENIX, ARIZONA 85072-2034

September 19, 1986
ANPP-38366-JGH/RAB/98.05

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
Units 1, 2 and 3
Docket Nos. STN 50-528 (License NPF-41)
STN 50-529 (License NPF-51)
STN 50-530
Masonry Wall Evaluation Confirmatory Data
File: 86-C-056-026; 86-E-056-026; 86-G-056-026

Reference: Letter from E. E. Van Brunt, Jr., ANPP, to G. W. Knighton, NRC,
dated June 19, 1986 (ANPP-37062). Subject: Masonry Walls.

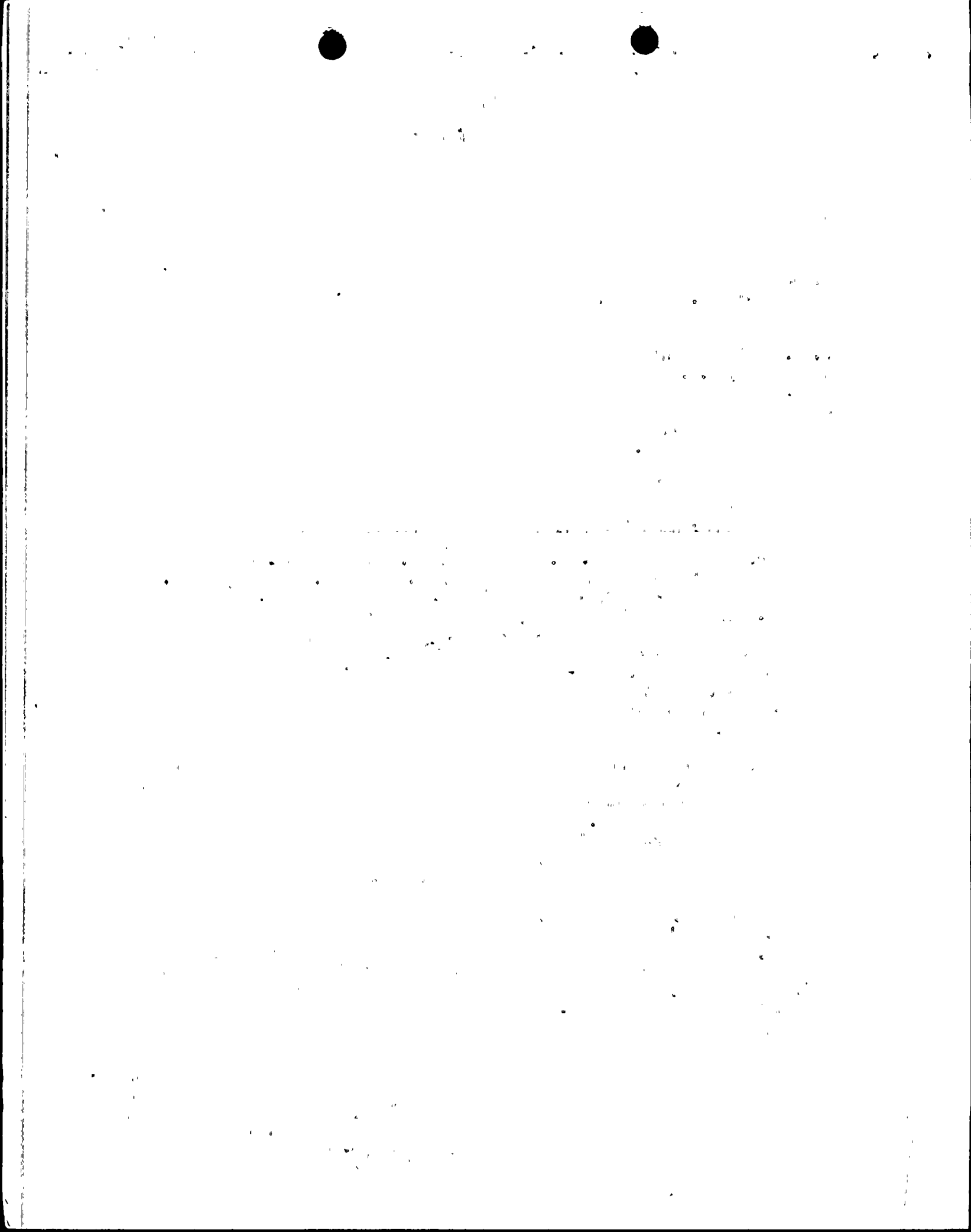
Dear Mr. Knighton:

The referenced letter submitted a report describing the methodology and results of time history (T-H) analyses performed to resolve NRC concerns on the capability of several masonry block walls at PVNGS to withstand OBE and SSE inputs with no loss of intended function. Subsequent to this submittal, phone conversations occurred between the NRC and ANPP on July 17, 1986, in which comments and concerns were expressed by the NRC relative to these analyses. In order to respond to these concerns, additional confirmatory analyses and review of available published test data were undertaken. The results of these additional efforts were presented in meetings with the NRC on August 20 and 28, 1986. The purpose of this submittal is to summarize NRC/ANPP agreements, ANPP's basis for concluding that the existing masonry walls at PVNGS are acceptable, and to formally submit the confirmatory data presented at the August 20 and 28, 1986 meetings.

At the August 20, 1986 meeting, the NRC stated that the Control Building walls at Elevation 100'-0" were acceptable as-is and considered the issue resolved. However, at this same meeting, the NRC stated that concerns still remained relative to the acceptance of the Elevation 74'-0" walls based on the time history analyses, and indicated that ANPP efforts should be directed towards resolution of these concerns.

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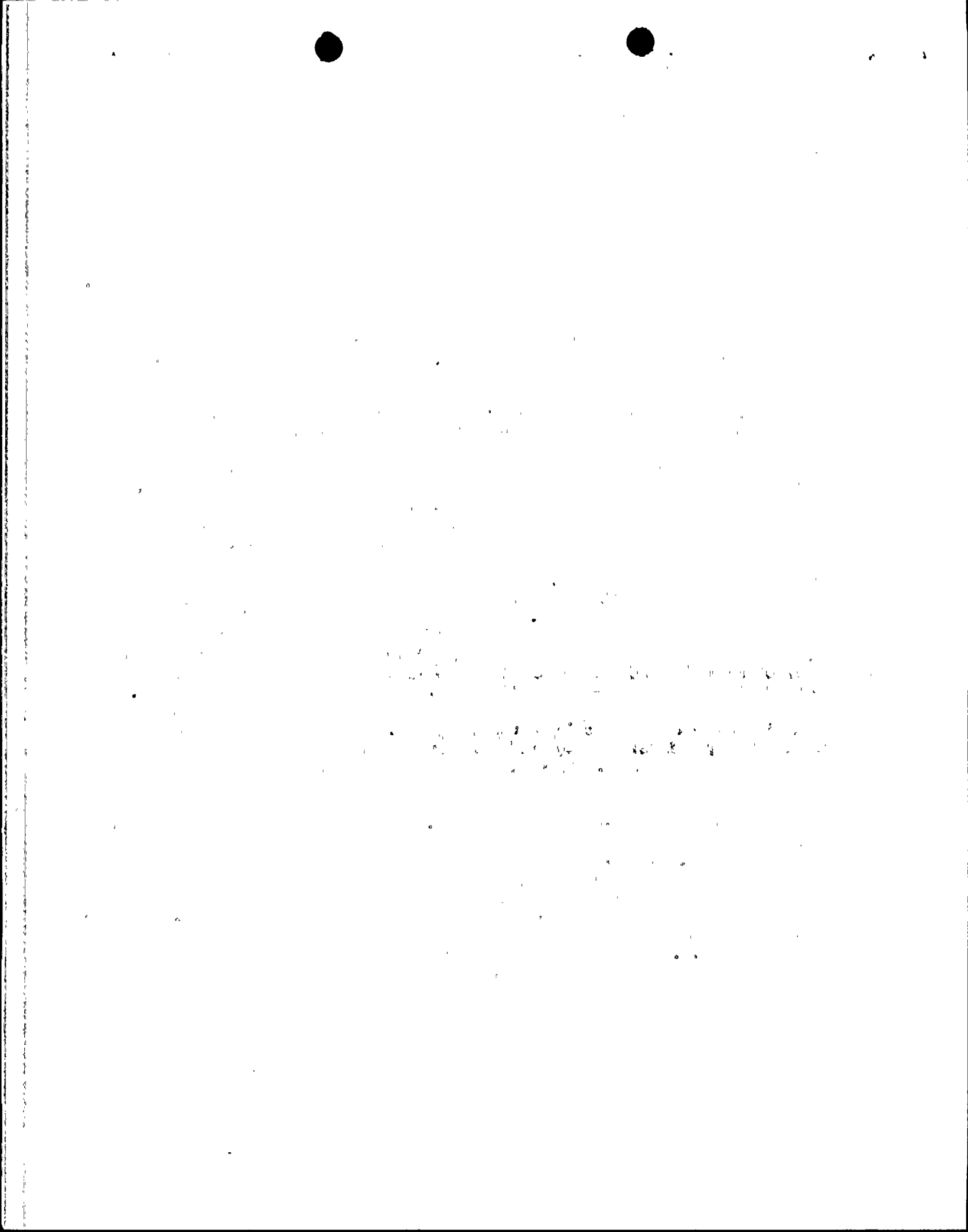
Enclosed is information provided to address the additional NRC concerns. These concerns fall into two general areas:

- 1) The use of time history methodology to demonstrate the adequacy of the walls resulted in removing conservatisms and reducing design margins.
- 2) The lack of test data; to support the design parameters utilized in the analyses, and to support the 3-stage moment of inertia technique used to approximate masonry wall response to seismic inputs.

To address the first concern, ANPP performed confirmatory response spectra analyses using conservatively developed floor response spectra as input. The results of our confirmatory analyses support the original time history results of the referenced letter and demonstrate that masonry, rebar, and bond stresses met the Standard Review Plan (SRP) Section 3.8.4, Appendix A allowables, except for the OBE masonry stress which exceeds the reduced allowable by only 20 percent (SSE masonry stresses remain below allowable). These stresses assure that margins of safety consistent with accepted masonry design practices are maintained.

In response to the second concern, ANPP engaged the consulting firm of Atkinson-Noland & Associates to help establish a realistic modulus of rupture value for the PVNGS 12-inch thick fully grouted masonry block walls. An analysis using a modulus of rupture value based on test data and the ACI effective moment of inertia methodology results in similarly low stress values, as previously calculated, and supports the engineering techniques utilized in our analyses. This information is presented in the enclosure.

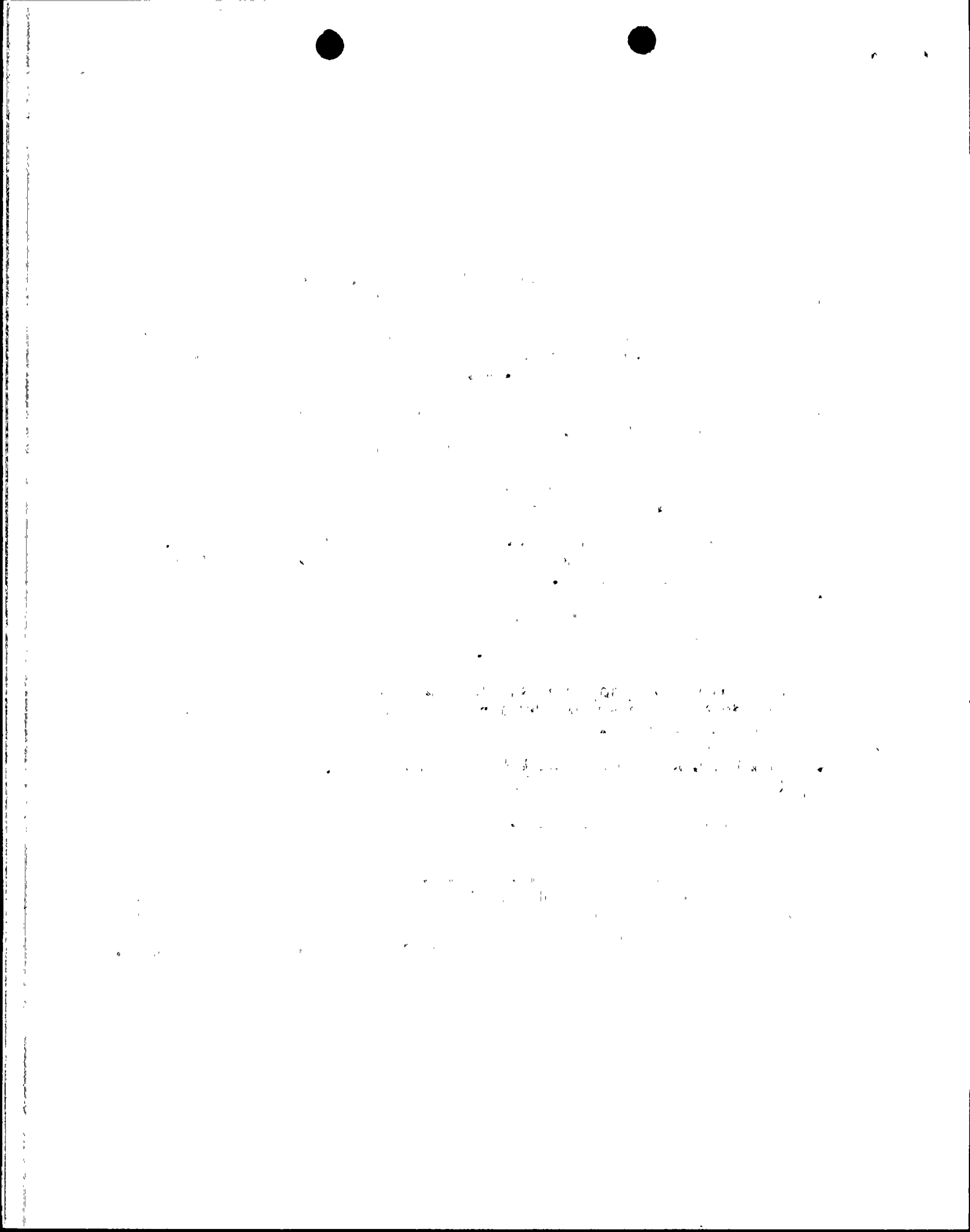
ANPP is concerned that appropriate standards of review are not being utilized in the review of as-built masonry walls. The techniques used to evaluate actual plant features for adequacy tend to differ somewhat from those used in original design. In the issue of masonry block walls, both the SRP and ACI acknowledge that an evaluation, based on sound principles of engineering mechanics, may be performed on a case basis, and that more sophisticated techniques may be utilized in lieu of simplistic code design methods. The use of these simplistic and overly conservative methods coupled with the use of parameters (e.g., modulus of rupture) not representative of the actual as-built walls is not appropriate at this stage of review.



In summary, we reiterate that the evaluation of the block walls demonstrates them to be safe with considerable margin because:

1. Realistic time history analyses using proven engineering principles and NRC accepted techniques demonstrates that masonry, rebar, and bond stresses are all within SRP 3.8.4, Appendix A allowables.
2. Confirmatory response spectra analyses, based on the use of conservative floor response spectra, also result in acceptable stresses and confirm the conclusion of the time history analyses.
3. Both time history and response spectra analyses conservatively address uncertainties, seismic input, and material properties.
4. Review of available test data shows that the 12-inch fully grouted PVNGS walls have seismic resistance (modulus of rupture) greater than the UBC modulus of rupture value.
5. Use of realistic stiffness/cracking properties for the PVNGS walls demonstrates that the walls will not crack under SSE loads and that high margins of safety are maintained.
6. To account for variabilities, substantial margin exists (approximately 65%) in the stiffness of the as-built walls such that no increase in wall response will occur.
7. In the low seismic area of PVNGS the block walls are not seriously loaded (OBE deflections less than 0.25 inch).
8. SRP 3.8.4 allowables are conservative in nature and result in high margins of safety.

ANPP has proceeded, in good faith, to address and resolve all NRC concerns on this issue and to achieve resolution in accordance with our December 22, 1986 commitment. We request that you review the referenced submittal and all of the confirmatory information documented in the enclosure to this letter, to establish the adequacy of the Elevation 74'-0" masonry block walls at PVNGS.




Mr. George W. Knighton
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We are providing two of the referenced documents to Enclosure #1 to assist your staff in performing their review.

Your response is requested by October 10, 1986.

Very truly yours,


for J. G. Haynes
Vice President
Nuclear Production

JGH/RAB/dlm

- Enclosure 1: "Supplemental Report on the Evaluation of Masonry Walls for the Arizona Nuclear Power Project, Palo Verde Nuclear Generating Station Units 1, 2 and 3".
- Enclosure 2: "Factors Influencing Deflections in Grouted Hollow Unit Concrete Masonry Walls" (Reference #8 to Enclosure 1).
- Enclosure 3: "Test Report on Slender Walls" (Reference #9 to Enclosure 1).

cc: O. M. DeMichele (all w/enclosure)
E. E. Van Brunt, Jr.
E. A. Licitra
R. P. Zimmerman
A. C. Gehr

