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*Helping Build Mississippi*  
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TEPCA

PRODUCTION DEPARTMENT

May 29, 1979

Office of Inspection & Enforcement  
 U. S. Nuclear Regulatory Commission  
 Region II  
 101 Marietta Street, Suite 3100  
 Atlanta, Georgia 30303

ATTENTION: Mr. J. P. O'Reilly, Director

Gentlemen:

USNRC REGION II  
 ATLANTA, GEORGIA  
 19 MAY 1 9 02

SUBJECT: Grand Gulf Nuclear Station  
 File 0260/15521/15525  
 Evaluation of IE Bulletin 79-07  
 AECM-79/56

The following is in reply to the NRC IE Bulletin No. 79-07 entitled "Seismic Stress Analysis of Safety-Related Piping". This bulletin has four (4) items for which responses are required for Construction Permit Holders; our responses are numbered the same as the bulletin item numbers.

The computer codes that have been used by Bechtel Power Corporation and General Electric in the seismic stress analysis of safety-related piping are as follows:

(i) Bechtel

- (a) ME 632 "Seismic Analysis of Piping Systems"  
Bechtel Power Corporation
- (b) ME 101 "LEAP" - "Linear Elastic Analysis of Pipe"  
Bechtel Power Corporation
- (c) SUPERPIPE

(ii) G. E.

- (a) SAP4G SAP4G, a version of SAP, was originally developed for General Electric by F. A. Peterson and K. J. Bathe of the Engineering Analysis Corporation at Berkeley. The SAP program is a general purpose structure program used to perform static and dynamic analysis of mechanical and piping components by the finite element method.

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- (b) PISYS PISYS is a computer program specializing to analyze piping systems. The PISYS program provides a highly flexible user oriented input format for piping system modeling. The analysis modules of PISYS are taken directly from the SAP4G program.

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1. None of the methods listed in the bulletin were used by either Bechtel or General Electric for their seismic analysis of safety-related piping.

2. Not Applicable.

3. The computer programs listed above have been verified as follows:

(i) Bechtel

(a) ME 632 has been verified using PISOL, PIPESD, and TPIPE

(b) ME 101 has been verified using ME 632, TPIPE, and SUPERPIPE.

(c) SUPERPIPE has been verified using PISOL, NUPIPE, ADLPIPE, PIPESD, and ME 101.

(ii) G. E.

(a) SAP4G has been verified using a special benchmark problem that exercises all the important features of the program. The benchmark problem has been analyzed for the effects of constraint of free end, distributed forces, and is dynamically analyzed to determine mode shapes and natural frequencies using Swanson System's ANSYS program. ANSYS was also used to predict dynamic response of the benchmark problem using the response spectra and time history integration methods. The predicted frequencies, modes shapes, and loads were compared to the corresponding SAP predictions. The SAP program prediction had to be consistent with those of ANSYS before SAP was qualified for production use. In order to test unique features of SAP that cannot be compared to the results of another program, a special problem is devised which has an equivalent computer or manually calculated solution. Before any new version of SAP is verified, for production application, the benchmark problem is reanalyzed to verify that the program changes have not changed predictions or reduced their accuracy.

(b) PISYS has been verified using a SAP analysis of a typical BWR steam piping system is used as a benchmark problem for PISYS verification. The steam line is analyzed for thermal expansion, dead weight, and a variety of dynamic loads in order to exercise all the features of PISYS. PISYS was not verified as a production program until the predictions of SAP and PISYS were shown to be identical for practical purposes.

Before any new version of PISYS is verified for production application, the benchmark problem is reanalyzed to verify that the program changes have not changed the predictions or reduced their accuracy.

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Five NRC benchmark problems will also be analyzed as a further verification of the PISYS code. This analysis is expected to be completed and submitted to the Commission for review by July 13, 1979.

4. Not Applicable

Please note that the above list doesn't include the computer codes utilized by all of the sub-suppliers of Bechtel Power Corporation. To date, we have not been able to obtain information from all sub-suppliers. A supplement will follow as soon as complete information is obtained. We expect to have this supplement ready for you by July 13, 1979.

Yours truly,



L. F. Dale  
Nuclear Project Manager

RTE/EWC:pa

cc: Mr. N. L. Stampley  
Mr. R. B. McGehee  
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