TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401

400 Chestnut Street Tower II

August 13, 1985

Director of Nuclear Reactor Regulation
Attention: Ms. E. Adensam, Chief
Licensing Branch No. 4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Ms. Adensam:

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| In the Matter of the | ) | Docket Nos. 50-327 |
| Tennessee Valley Authority | ) | 50-328 |

By my letter dated August 5, 1985, TVA transmitted a request for approval to utilize ASME Code Cases N-411 and N-397 in the analysis of piping systems. Enclosed is a revision to the request which corrects inadvertent errors.

If you have any questions concerning this matter, please get in touch with Jerry Wills at FTS 858-2683.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

J. A. Domer

J. A. Domer, Chief
Nuclear Licensing Branch

Sworn to and subscribed before me
this 13th day of Aug. 1985

Bryant M. Lowery
Notary Public
My Commission Expires 4/8/86

Enclosure
cc: See page 2



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Director of Nuclear Reactor Regulation August 13, 1985

cc (Enclosure):
U.S. Nuclear Regulatory Commission
Region II
Attn: Dr. J. Nelson Grace, Regional Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

Mr. Carl Stahle
Sequoyah Project Manager
U.S.Nuclear Regulatory Commission
7920 Norfolk Avenue
Bethesda, Maryland 20814

ENCLOSURE
SEQUOYAH NUCLEAR PLANT
REQUEST FOR NRC APPROVAL
FOR USE OF HIGHER VARIABLE DAMPING VALUE
FOR THE DYNAMIC ANALYSIS OF PIPING SYSTEMS

The current piping analysis techniques used by TVA in the analysis of the piping at SQN are conservative in the area of dynamic analysis. TVA proposes to utilize the following two developments reported by the Pressure Vessel Research Committee (PVRC) in any future dynamic analysis of the analyzed piping at SQN. These developments by PVRC (with TVA participating) have been submitted by PVRC to NRC for their approval.

Variable Damping Values for Piping Analysis

In the dynamic analysis of class 1, 2, and 3 piping systems, the value of the damping used in the spectral analysis method are 0.5 percent for operating base earthquake, 1 percent for safe shutdown earthquake, and 2 percent for the dynamic loads resulting from the design basis accident. These damping values are very conservative and result in the overdesign of pipe supports. The cost of design and fabrication of these supports add to the plant cost overruns.

The Task Group on Damping Values of the PVRC Technical Committee on Piping Systems has recently completed a review of a significant data base of damping tests. The results of the review clearly indicate the justification for increasing the present damping values for dynamic design of nuclear power plant piping above those in use at SQN. Based upon their evaluations, the current recommendation of the Task Group members is that damping of 5 percent is acceptable to 10 Hz linearly decreasing to 2 percent at 20 Hz and held constant at 2 percent to 33 Hz. Recommendations are independent of pipe diameter.

These higher recommended damping values, also described in ASME Code Case N-411, can translate into substantial savings in time, effort, and cost towards the requalification of the existing piping systems or in the design of new piping systems.

If, as a result of using the damping values in ASME Code Case N-411, piping supports are moved, modified or eliminated, the expected increased piping displacements due to greater piping flexibility will be checked to assure that they can be accommodated and that there will be no adverse interaction with adjacent structures, components and equipment.

Spectra Shifting

Regulatory Guide 1.122 recommends that the calculated dominant peaks of the floor response spectra be broadened to account for uncertainties in the structural frequencies owing to uncertainties in the material properties of the structure and soil and to approximations in the modeling techniques. This method of peak broadening is very conservative. An alternative method of broadening of the structural peaks as described in Code Case N-397 can be based on a probabilistic approach. In the particular case where there is more than one piping frequency located within the frequency range of a

widened spectrum peak, the floor spectrum curve may be more realistically applied in accordance with this code case.

It is obvious that the analysis utilizing spectra peak shifting becomes cumbersome and less efficient for multiple support motion (multiple zones) and if there is more than one peak within a defined frequency range of interest. It is TVA's intent to use spectra peak shifting technique only if relief is required on a particular pipe support or where substantial redesign is required.

Recommendations

The proposed recommendations have been accepted by the PVRC Task Group on Damping, the Technical Committee on Piping Systems, and the Steering Committee on Piping Systems. The proposals have been forwarded to NRC (reference 1) and considered by ASME (reference 2) for review and approval on a generic basis. NRC was represented on the PVRC committees. Dr. S. N. Hou and Dr. W. F. Anderson were on the Technical Committtee on Piping Systems, Task Group on Damping, and R. J. Bosnak participated on the Steering Committee on Piping Systems. The response spectra peak shifting method has been accepted by NRC for inclusion in Standard Review Plan 3.9.2. NRC has accepted the use of higher damping values in Southern California Edison's San Onofre Nuclear Plant unit 1 seismic reevaluation program (reference 3).

We feel that the changes proposed by PVRC for higher damping values and for an alternative to peak broadening are more realistic and constitute a conservative design. Such findings were substantiated by the Lawrence Livermore National Laboratory on three piping systems at Zion Nuclear Plant (reference 4). TVA proposes that these two techniques be used in future analysis efforts at SQN for the requalification of existing design and in the analysis of new systems. Use of these methods could result in more flexible piping systems which, according to current industry thinking, would result in more reliable systems.

References

1. Letter from L. J. Chockie, Chairman of PVRC, to N. J. Palladino, Chairman of NRC, dated June 9, 1983.

2. Minutes of the Special Working Group on Dynamic Analysis of ASME Section III, February 6, 1984.

3. Letter from Harold R. Denton, Director of the Office of Nuclear Reactor Regulation, to K. Baskin, Vice President Nuclear Engineering Licensing and Safety Department of Southern California Edison Company, dated February 8, 1984.

4. "Impact of Changes in Damping and Spectrum Peak Broadening on the Seismic Response of Piping Systems," NUREG/CR-3526, December 1983.