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April 24, 1979

Mr. Karl V. Seyfrit, Director U.S. Nuclear Regulatory Commission Office of Inspection and Enforcement Region IV 611 Ryan Plaza - Suite #1000 Arlington, TX 76011

Subject: IE Bulletin No. 79-07 Seismic Stress Analysis of Safety Related Piping

Dear Mr. Seyfrit:

This letter is written in response to your letter dated April 14, 1979, transmitting the subject IE Bulletin.

None of the methods specified in Item 1 of the subject Bulletin were used in the computer codes for the seismic analysis of the original safety related piping systems at Cooper Nuclear Station. However, modifications to the as-built Safety/Relief Valve (SRV) discharge piping within the torus resulted in the computer program ADLPIPE, (option zero) being used to analyze the seismic stresses in the piping. In response to a telephone survey by the NRC, the Staff was notified of this fact April 5, 1979. As a result of the investigation performed for the subject Bulletin, it has been determined that the SRV piping within the torus and drywell was analyzed by ADLPIPE (option zero). A preliminary review of the SRV discharge piping system indicates that when comparing SRSS (square root of the sum of the squares) combination for response spectrum analysis with the original design analysis, in some instances stress and load values based on SRSS are slightly The preliminary review determined that these load higher. changes should be well within the capability of the current pipe support structure and the pipe stress should be well within the allowables. A complete re-evaluation of the SRV discharge piping will be completed by approximately May 21, 1979.

Item 3 of the subject Bulletin requested identification of the methodology verification programs utilized for all seismic analyses. EDS Nuclear Inc. performed the seismic stress analyses for both the Architect-Engineer and Vendor on Cooper Nuclear Station. Attached is a summary of the verification program performed.

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If you have any questions or require additional information regarding this concern, please do not hesitate to contact me.

Sincerely yours,

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J. M. Pilant Director of Licensing and Quality Assurance

JMP:bas24/3 Attachment

cc: Mr. John G. Davis, Director Office of Inspection and Enforcement Division of Reactor Operations Inspection Washington, DC 20555

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STATE OF NEBRASKA)) ss PLATTE COUNTY)

Jay M. Pilant, being first duly sworn, deposes and says that he is an authorized representative of the Nebraska Public Power District, a public corporation and political subdivision of the State of Nebraska; that he is duly authorized to submit this information on behalf of Nebraska Public Power District; and that the statements in said application are true to the best of his knowledge and belief.



Subscribed in my presence and sworn to before me this 24^{44} day of April, 1979.

Marilyn R. Hohndorf NOTARY PUBLIC

My Commission expires Dat. 14. 1980



Attachment

SUMMARY OF PIPING BENCHMARK PROBLEMS FOR EDS SEISMIC PIPING PROGRAMS

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INTRODUCTION

EDS has utilized the EDS proprietary programs PISOL and SUPERPIPE for the seismic analysis of safety related piping systems. The PISOL and SUPERPIPE programs analyze arbitrary, three-dimensional piping systems for seismic excitation using the dynamic analysis technique know as the response spectrum mode superposition method. In this technique, the 2-D or 3-D earthquake excitation is characterized by acceleration response spectra, and the total response of the system is evaluated as a square root sum of the squares and/or absolute summation combination of the response of the significant natural modes of vibration of the system. These procedures and therefore the seismic analyses performed by EDS are in compliance with NRC requirements for these analyses.

In addition, SUPERPIPE has time history analysis capability. To date, this option has not been used for the seismic piping analysis of any safety related piping systems on operating plants or plants under construction.

PROGRAM VERIFICATON METHODS

EDS has performed extensive program verification for both piping programs. This verification is a combination of any or all of the following methods:

- 1. Comparison to ASME Benchmark Problems
- Benchmark Problems Utilizing EDS Programs and Other Industry Programs
- 3. Comparison to Hand Calculations
- 4. Comparison Between FDS Programs and Versions

A partial summary of work performed in each of these four methods is provided below:

1. Comparison to ASME Benchmark Problems

EDS has benchmarked both PISOL and SUPERPIPE against the ASME Benchmark Problem 1. This problem is described in the ASME publication, "Pressure Vessel and Piping 1972, Computer Programs Verification." This publication utilized the ANSYS and WESTDYN programs. The PISOL comparison as submitted for the ASME Committee on Computer Technology titled, "ASML BENCHMARK PROBLEM NO. 1 - PISOL VERIFICATION" is available for NRC review if required.

2. Benchmark Problems Utilizing EDS Programs and Other Industry Programs

EDS has benchmarked both PISOL and SUPERPIPE against other programs available to the industry. Several such studies have been performed. In our most recent effort, a series of benchmark tests were conducted to compare SUPERPIPE against the following piping analysis programs: PISOL, NUPIPE, PIPESD, and ADLPIPE. Prior to this, EDS performed benchmarks against John Blume's PIPESD and the Bechtel Power Corporation's ME-101 program. In addition, PISOL has been verified by independent analysis by the Bechtel Power Corporation of San Francisco utilizing their proprietary program.

Examples of such benchmarks are available for NRC review if required entitled, "PISOL/PIPESD COMPARISON," "PISOL/ME-101 COMPARISON," and "SUPERPIPE/ME-101 COMPARISON."

3. Comparison to Hand Calculations

For certain seismic options, hand calculations have been performed and compared to computer results. In the seismic area, the simplified models are typically cantilever and single span configurations.

4. Comparison Between EDS Programs and Versions

The most common benchmark method utilized by EDS is to compare results from one version to another. Such comparisons are used to show program modifications are properly performing while not impacting other options within the program. These comparisons are described and maintained within the quality assurance files of the program.

Benchmarks are also made between the PISOL and SUPERPIPE programs. An example of this; "SUPERPIPE VERIFICATION AND COMPARISON SUMMARY", is available for NRC review if required.