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AUTH. NAME AUTHOR AFFILIATION
CUTTER, A. B. Carolina Power & Light Co.
RECIP. NAME RECIPIENT AFFILIATION
RUBENSTEIN, L. S. PWR Project Directorate 2

SUBJECT: Requests approval to utilize damping curve developed by Pressure Vessel Research Council in ASME Code Case N-411 for piping stress analyses damping values. Changes will be incorporated into next FSAR amend. Fee paid.

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APR 2 4 1986

SERIAL: NLS-85-457

Director of Nuclear Reactor Regulation
Attention: Mr. Lester S. Rubenstein, Director
PWR Project Directorate #2
Division of PWR Licensing - A
United States Nuclear Regulatory Commission
Washington, DC 20555

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261/LICENSE NO. DPR-23
PIPING STRESS ANALYSES DAMPING VALUES

Dear Mr. Rubenstein:

Pursuant to the Code of Federal Regulations, Title 10, Part 50.55a, paragraph (a)(3), Carolina Power & Light Company (CP&L) hereby requests approval to utilize the damping curve developed by the Pressure Vessel Research Council (PVRC) in ASME Code Case N-411. Damping values extracted from the curve will be incorporated into seismic analyses for Operating Basis Earthquake (OBE) and Design Basis Earthquake (DBE) events. The new damping values could be used for current piping modifications and future piping stress analyses as an option to the original damping values presented in the Final Safety Analysis Report (FSAR). The PVRC damping values will be used only for seismic response spectra analyses. They will not be applicable to time-history analyses.

If the PVRC damping values are approved for use at Robinson, the following upgrades will also be incorporated when applying the new values:

1. A three-dimensional square root of the sum of the squares (SRSS) earthquake combination will be used in lieu of a two-dimensional SRSS combination.

2. Regulatory Guide 1.92 modal combinations accounting for closely-spaced modes will be used in lieu of a straight SRSS of all modes.

3. A rigid cutoff value of 33 Hz will be used in lieu of 20 Hz.

4. If, as a result of using the damping value curve presented 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, or equipment.

The original FSAR criteria for piping analyses, including Regulatory Guide 1.61 values, and the proposed PVRC damping with the upgraded criteria presented above will be considered as valid options for pipe stress analyses and modification work at Robinson. When performing an analysis, the damping values taken from the curve presented in Code Case N-411 are only to be used with the upgraded criteria, not with the original FSAR criteria. That is, no analysis will combine damping values and criteria which are not consistent.

ville Street • P. O. Box 1551 • Raleigh, N. C. 27602

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APR 2 4 1986

Marked up copies of the affected FSAR tables and text (to be incorporated into the next FSAR revision) as well as the PVRC figures to be incorporated are attached.

Carolina Power & Light Company has reviewed this request in accordance with 10 CFR 170.12 and a check for $150 in payment of the required fee is enclosed.

Should you have any questions regarding this request, please contact Mr. Sherwood R. Zimmerman at (919) 836-6242.

Yours very truly,

A. B. Cutter - Vice President
Nuclear Engineering & Licensing

ABC/MDM/ljs (3153MDM)

Attachments

cc: Dr. J. Nelson Grace (NRC-RII)
Mr. G. Requa (NRC)
Mr. H. Krug (NRC Resident Inspector - RNP)

International Atomic Energy Agency (IAEA) Panel on "Aseismic Design and Testing of Nuclear Facilities," held in Tokyo, Japan in June 1967, and the World Conference on Earthquake Engineering held in Santiago, Chile, in January, 1969.

The modal analysis was performed utilizing the same damping factors for each mode.

The optional damping values for piping in Table 3.7.2-1 and Figure 3.7.2-7 may be used if the criteria in 3.7.3.2.7.3 is followed.

3.7.2.3 Dynamic Characteristics of Structures Inside Containment

The dynamic characteristics of the concrete inner structures are:

a) Periods of vibration (including rocking)

T_1 = 0.166 sec
T_2 = 0.046 sec
T_3 = 0.018 sec
T_4 = 0.006 sec

b) Absolute accelerations

	0.1g Earthquake	0.2g Earthquake
El 275 (operating floor)	0.3g	0.44g
El 251 (intermediate floor)	0.14g	0.23g
El 226 (base mat)	0.1g	0.2g

c) Relative Displacement

	0.1 g Earthquake	0.2g Earthquake
El 275 (operating floor)	.0007 inches	.001 inches
El 251 (intermediate floor)	.0003 inches	.00048 inches

The dynamic analysis for the internal concrete structure of the reactor containment was performed by the Modal Analysis Method using average damping factors for all modes of vibration, including rocking. The damping factors used were 2 percent of critical for the operational basis earthquake (OBE) (design, 0.1g) and 5 percent for the design basis earthquake (DBE) (hypothetical, 0.2g).

The concrete inner structure was analyzed as a free standing cantilever beam having no structural connection to the reactor containment above the foundation mat. The effect of the containment structure on the vibration of the concrete inner structure was considered in the multi-mass model by including the mass moment of inertia of the containment with that of the foundation mat to account for its contribution to foundation rocking.

3.7.3.2.7.3 Dynamic Analysis

The damping values given in Figure 3.7.2-7 may be used as an option to the preceding methods only if the following analysis criteria are followed:

a) A response spectrum analysis is performed and not a time-history analysis.

b) The rigid frequency cutoff used is 33 Hz.

c) Closely spaced modes are evaluated per RG 1.92.

d) A 3-D SRSS modal combination is used.

e) For piping system backfit analysis, any increased deflection due to removal or modification of supports shall be evaluated.

f) The alternate damping valves shall not be mixed with the RG 1.61 criteria in the same analysis.

TABLE 3.7.2-1

DAMPING FACTORS

Component	Percent of Critical Damping
Containment Structure	2.0
Concrete Support Structure of Reactor Vessel	2.0
Steel Assemblies:	
(a) Bolted or Riveted	2.5
(b) Welded	1.0
Vital Piping Systems	0.5*
Concrete Structures Above Ground:	
(a) Shear Wall	5.0
(b) Rigid Frame	5.0

* For final reconcilation of pipe stress analysis or piping system backfits, damping values as defined in ASME Code Case N-411 (Figure 3.7.2-7) may be utilized for both OBE and DBE.

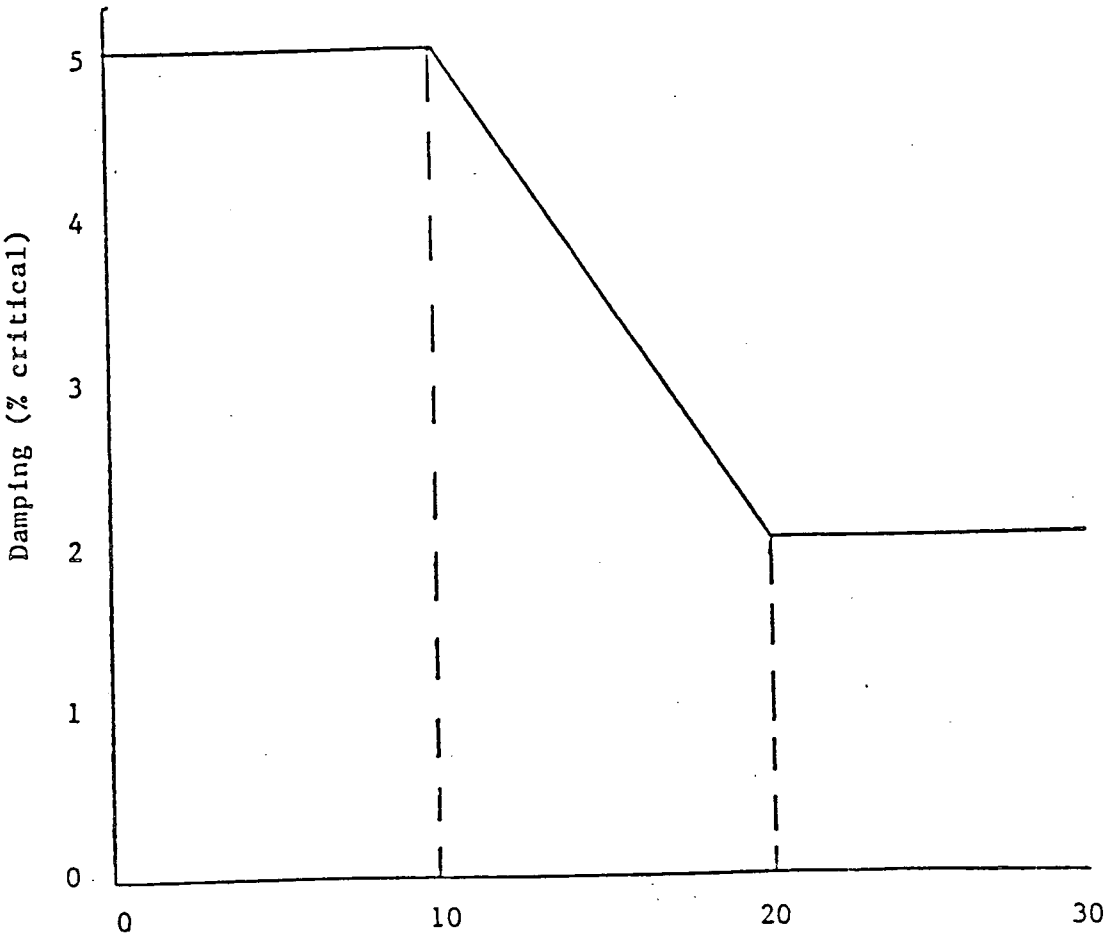

Figure 3.7.2-7

Damping Value for Seismic Analysis of Piping

(Applicable to both OBE & DBE, Independent of Pipe Diameter)