CP&L
Carolina Power & Light Company

SERIAL: NLS-85-106

MAY 2 2 1985

Director of Nuclear Reactor Regulation
Attention: Mr. D. B. Vassallo, Chief
Operating Reactors Branch No. 2
Division of Licensing
United States Nuclear Regulatory Commission
Washington, DC 20555

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 & 50-324/LICENSE NOS. DPR-71 & DPR-62
PIPING STRESS ANALYSES DAMPING VALUES

Dear Mr. Vassallo:

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 Safe Shutdown Earthquake (SSE) 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 Brunswick, 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 Brunswick. 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.

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

Carolina Power & Light Company has reviewed this request in accordance with 10CFR170.12, 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/RWS/mf (1339RWS)
Attachment
cc: Mr. L. W. Garner (NRC-BNP)
Dr. J. Nelson Grace (NRC-RII)
Mr. M. Grotenhuis (NRC)

TABLE 3.7.1-1

DAMPING FACTORS

ITEM	PERCENT OF CRITICAL DAMPING	
	OBE	DBE
Reinforced Concrete:		
(a) Primary Containment Structure	4	7
(b) Reactor Building and other Class I Structures	4	7
Steel Structures and Assemblies:		
(Reactor Building & other Class I structures)		
(a) Bolted or Riveted	5	10
(b) Welded	2	5
Vital Piping	0.5*	2*
Equipment	1	2
Soil - Structure Interaction Damping	4	7

* For final reconciliation of pipe stress analysis or piping system backfits, damping values as defined in ASME Code Case N-411 (Figure 3.7.1.5) may be utilized for both OBE and DBE.

TABLE 3.7.3-1

CRITICAL DAMPING FOR STRUCTURES, PIPING, AND EQUIPMENT

Item	PERCENT OF CRITICAL DAMPING	
	OBE	DBE
1. Concrete Structures	4%	7%
2. Piping	1/2 %*	2% *
3. Equipment		
a. Pumps		
b. Motors	1%	2%
c. Switchgear		
d. Exchangers		
e. Tanks		
f. Batteries and Racks		
g. Cable Tray Systems		
h. Diesel Generator Units		
i. Others		
4. Cranes	4%	7%

* For final reconciliation of pipe stress analysis or piping system backfits, damping values as defined in ASME Code Case N-411 (Figure 3.7.1.5) may be utilized for both OBE and DBE.

3.9.2.1.3 Piping Seismic Analysis

The piping systems were dynamically analyzed using the "lumped mass response spectrum method" of analysis. For each of the piping systems, a mathematical model consisting of lumped masses at discrete joints connected together by weightless elastic elements was constructed. Valves were also considered as lumped masses in the pipe, and valve operators eccentricity was considered (Reference 3.9.1-1). Stiffness matrix and mass matrix were generated and natural periods of vibration and corresponding mode shapes were determined. Input to the dynamic analyses were the applicable 0.5 percent damped acceleration response spectra.

Increased damping values may have been applied for final stress reconciliation or piping system backfits in accordance with ASME Code Case N-411 (Figure 3.7.1.5). If so, the following criteria were also used:

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

b) Regulatory Guide 1.92 modal combinations accounting for closely-spaced modes in lieu of a straight SRSS of all modes.

c) A rigid cut off value of 33 Hz in lieu of 20 Hz.

d) A pipe displacement check performed if existing pipe supports were moved, modified, or eliminated.

The increased flexibility of the curved segments of the piping systems was considered. The results for earthquakes acting in the X and Y (vertical) directions simultaneously and Z and Y directions simultaneously were computed separately. The maximum responses of each mode were calculated and combined by the absolute sum. The response thus obtained was combined with the results produced by other loading conditions to computer the resultant stresses.

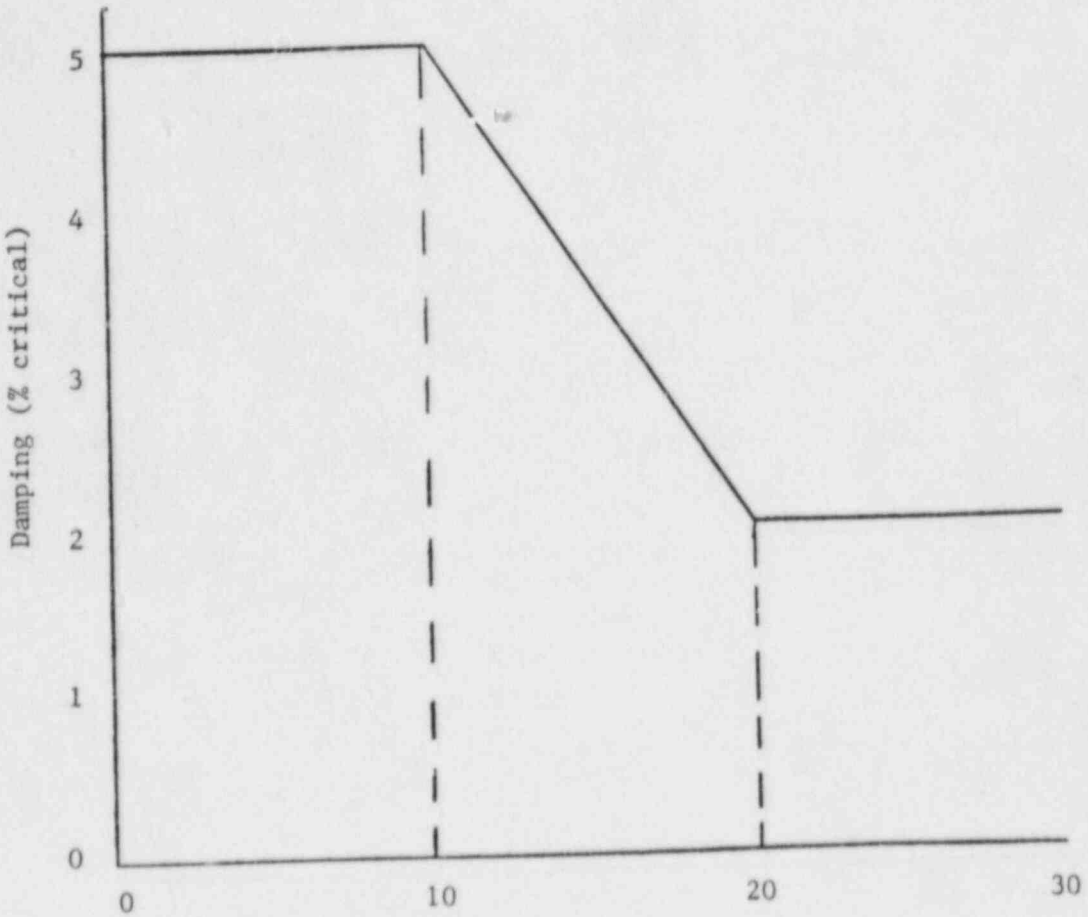

Figure 3.7.1.5

Damping Value for Seismic Analysis of Piping

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