



Carolina Power & Light Company

August 17, 1979

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SERIAL: GD-79-2101

Office of Nuclear Reactor Regulation
ATTENTION: Mr. T. A. Ippolito, Chief
Operating Reactors Branch No. 3
United States Nuclear Regulatory Commission
Washington, D. C. 20555

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 & 2
DOCKET NOS. 50-325 AND 50-324
LICENSE NOS. DPR-71 AND DPR-62
SEISMIC ANALYSIS OF SAFETY RELATED PIPING

Dear Mr. Ippolito:

On August 16, 1979, Carolina Power & Light Company was informed by the NRC Project Manager for Brunswick of conversations that the NRC staff was having with technical personnel at United Engineers & Constructors (UE&C) concerning a problem with the UE&C seismic pipe stress program, UE&C-ADLPIPE-2. Since that time, we have been in contact with UE&C and the NRC to understand the specifics and the magnitude of the concern. The NRC has requested certain commitments from UE&C and, since these commitments involve Carolina Power & Light Company, we are now forwarding the requested information. This letter documents the technical conversations, concerns and commitments discussed with the NRC during telephone conversations on Thursday, August 16, 1979 (9:00 a.m., 10:30 a.m., and 3:30 p.m.) and on Friday, August 17, 1979 (10:00 a.m.).

BACKGROUND INFORMATION

In response to NRC IE Bulletin 79-07, CP&L was requested to submit a number of computer runs of representative lines (reanalyzed with the UE&C ADLPIPE-2 Program) for verification purposes.

The lines submitted to NRC were, respectively:

- CP&L Brunswick Unit Nos. 1 & 2 — Lines 15B, 121, 122, 125, 237
(One main steam line inside containment with the attached SRV lines)

In the process of duplicating the analytical model to generate input data compatible with the program selected by NRC for verification, it was identified that certain input data associated with the modeling of piping

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sections with elbows was incorrectly applied in the runs performed by UE&C. The resulting discrepancies in the analytical model and the potential effects on the analysis results were brought to the attention of UE&C management on Wednesday, August 15, 1979, approximately 3:30 p.m. An investigation of the problem was initiated immediately. On Thursday, August 16, 1979, a number of telephone calls were exchanged between NRC and UE&C personnel on the subject. Preliminary results of the investigation and an active program were discussed.

EVALUATION RESULTS

The evaluation revealed that two types of problems can be identified:

Problem No. 1 -- In modeling standard elbows, the analyst identifies (in the program input data) the coordinates for Points A, B, C, D, E, and the radius R of the elbow. The program then proceeds to calculate the coordinates for the Points B' and D'. Figure 1.A shows the resulting analytical model for the case $R < L_2$ or L_3 . Should the value for R erroneously be input larger than L_2 (or L_3), the location of the point B' (or D') would be as shown in Figure 1.B. This condition is not presently identified automatically by the UE&C ADLPIPE-2 Program error message features. For projects subsequent to the Brunswick 1 and 2 checkers addressed this problem by verifying the correct relationship L_2/R or L_3/R in the input data image printed out by the computer. Since original decks were used in the reanalysis, checking of the decks prior to the reanalysis was limited to the input data which was changed due to as-built or other current requirements.

Problem No. 2 -- In modeling large radius piping sections, two techniques are used:

(Refer to Fig. 2A and 2B)

- a. The section is divided into a number of subsections, each modeled with elbow elements. Due to an application limitation in the UE&C ADLPIPE-2 Program, which does not accept elbow-to-elbow modeling, short straight sections of pipe are introduced between each curved section (GA, AB, DE, EF in Figure 2A). Elbows between these sections are included as in the standard elbow cases. This condition is, therefore, analogous to the one explained in the Problem No. 1 cases. Here, however, additional calculations are required to identify the coordinates of the short straight section, Point C, and the chances for errors are increased.
- b. The section is divided in a series of straight subsections. This technique requires only that the coordinates of both ends of each section be calculated. The algorithm used internally by the computer to fit an elbow of a given radius R is not used here and, consequently, the problems of the types discussed under (a) above do not exist.

Having recognized these two potential problems, an investigation to identify the extent of isometrics affected by these two problems and a series of computer analyses have been performed. The results of the preliminary investigation are summarized in Table 1.

Computer analyses were performed to address Problem No. 1 and No. 2 cases. Description and results of these analyses are summarized below:

Problem No. 1 -- A typical piping configuration for this problem was (Description and results) reanalyzed with corrected input data. Pipe stresses, support loads, fundamental frequencies showed insignificant change in results.

A series of test problems consisting of a configuration similar to that presented in Fig. 1 were run with a) small error (i.e., BB' small vs. AB), b) large error (i.e., BB' large vs. AB), and c) correct input data. Type a) run showed insignificant difference when compared to the results from type c) run. Results from type b) run showed erratic behavior. Due to the significantly altered configuration and the associate stiffeners of each section, generalization of these results could not be made.

(Conclusion) Based on the above evaluation, it has been concluded that small error in the input data will not affect significantly the results.

Problem No. 2 -- The following lines were reanalyzed with the straight section (Description and results) technique for piping configurations with potential problem No. 2 for Brunswick lines 15B, 121, 122, 125, 237 (one main steam attached SRV lines), 14, 124, 126 (one main steam attached SRV lines), 15C, 120, 123, 187 (one main steam attached SRV lines), 16 (two feed water lines). Due to time considerations, only pipe stresses were evaluated in detail. They were found all within stress allowables.

Only qualitative assessments were done for supports. Support loads showed general variance of the order of ± 20 percent. With this reanalysis, some support loads were double the reanalyzed values, and are under additional evaluation.

(Conclusion) Based on the above results, it is estimated that the pipe stresses will remain within applicable allowable stresses or at worst, within structural integrity limits. No quantitative evaluation has been performed for support loads. However, structural integrity of the piping system is expected to be maintained.

COMMITMENTS

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During the subject telephone conversations, the following was discussed and agreed upon:

- a. By Friday, August 17, 1979, approximately 10:00 a.m., the complete number of lines affected by Problem No. 2 will be telephoned to NRC.

At the 10:00 call on August 17, 12 isometrics were identified as having problem No. 2. These are listed in Table 2.

- b. By Friday, August 17, 1979, approximately 12:00 p.m., a telex summarizing the subject telephone conversation will be transmitted to NRC. This letter meets that commitment.
- c. By Monday, August 20, 1979, approximately 10:00 a.m., the complete list of lines affected by Problem No. 1 will be identified and telephoned to NRC.
- d. By Tuesday, August 21, 1979, a best effort will be made to complete the pipe stress evaluation of the identified lines affected by Problem No. 2. In addition, the number of supports requiring additional analysis will be identified.
- e. On Tuesday, August 21, 1979, the commitment date for completing the evaluation of the pipe supports will be established, but will be no later than Monday, August 27, 1979.
- f. Lines effected by Problem No. 1 will be given secondary priority, but they will be reevaluated in accordance with the priority delineated in our previous responses to NRC IE Bulletin 70-07.
- g. General - Carolina Power & Light Company will formally document the commitments and analyses conducted in response to this concern. The criteria for reporting cases found in excess of the original allowables will comply with the criteria used for our response to NRC IE Bulletin 79-07.

The reevaluation is proceeding in an expeditious manner to meet our commitments to you. The NRC staff will be kept fully informed of the results.

Yours very truly,

E. E. Utley
Executive Vice President
Power Supply & Customer Services

DLB/mf

cc: Mr. J. P. O'Reilly
USNRC, Region II

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TABLE 1

CP&L Brunswick 1 & 2

	Total No. of Isometrics	200
	No. of Isometrics Reviewed	16
PROBLEM 1	No. of Elbows in the above ISOs with Problems	0
	No. of Elbows in the above ISOs without Problems	130
PROBLEM 2	No. of Isometrics Reviewed	170
	No. of Isometrics Analyzed with Elbow-to-Elbow Technique	Verified 6

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TABLE 2

LINES AFFECTED BY PROBLEM NO. 2
(Elbow-to-Elbow Modeling Technique was Originally Used)

<u>ISO NO.</u>	<u>SYSTEM</u>
14 (Line A)	Mainsteam NSS
14A (Line D)	Mainsteam NSS
15 (Line B)	Mainsteam NSS
15 (Line C)	Mainsteam NSS
119	NSS Relief Valve Discharge
124	NSS Relief Valve Discharge
125	NSS Relief Valve Discharge
16	Feedwater
5	RHR (24" return)
32	NSS (2" vent & instr. sensing)
201	Instrument piping (recirc. pump - alarm control)
202	Instrument piping (recirc. pump - flow transmitter)

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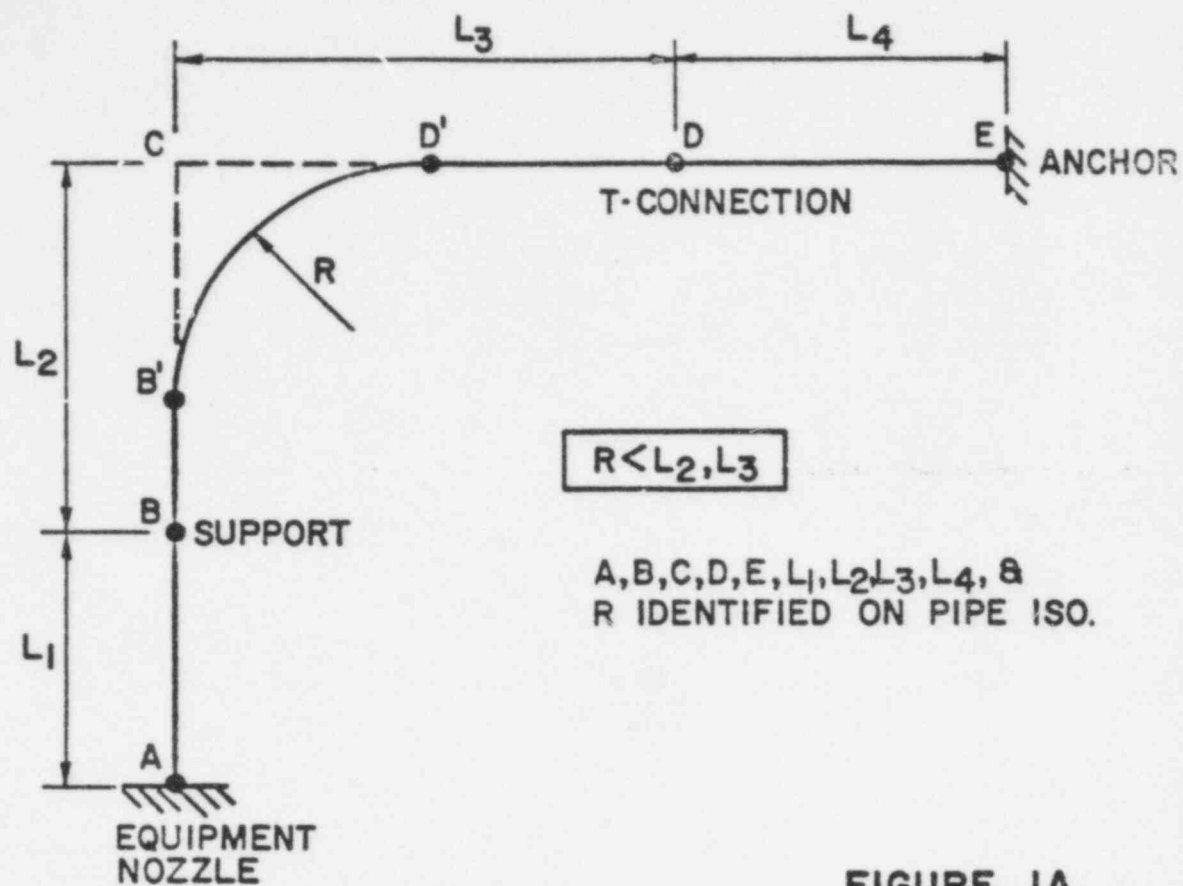
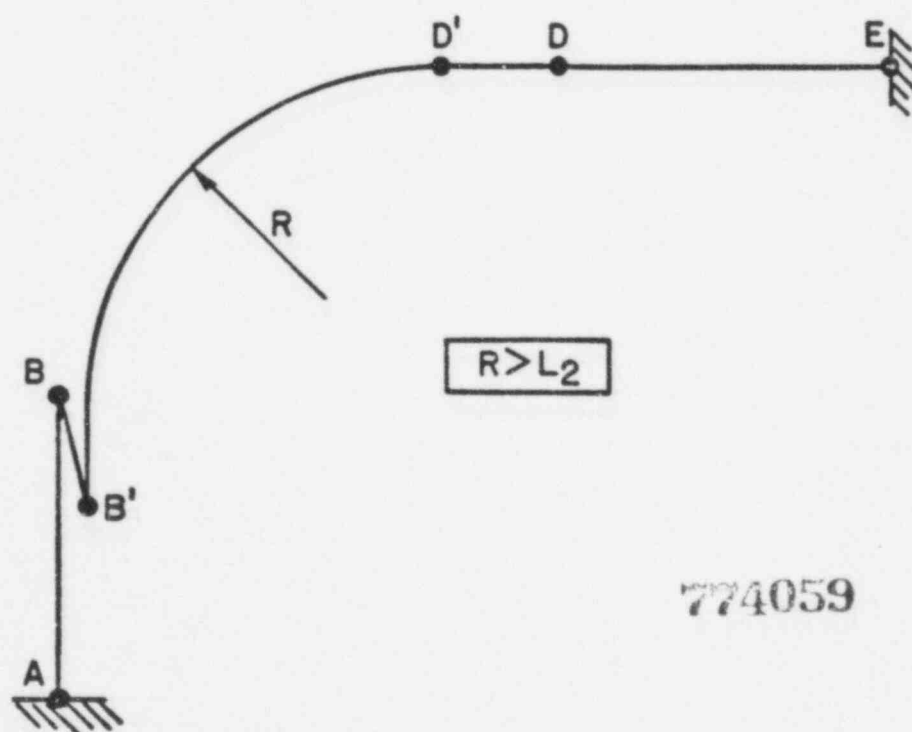


FIGURE 1A



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FIGURE 1B

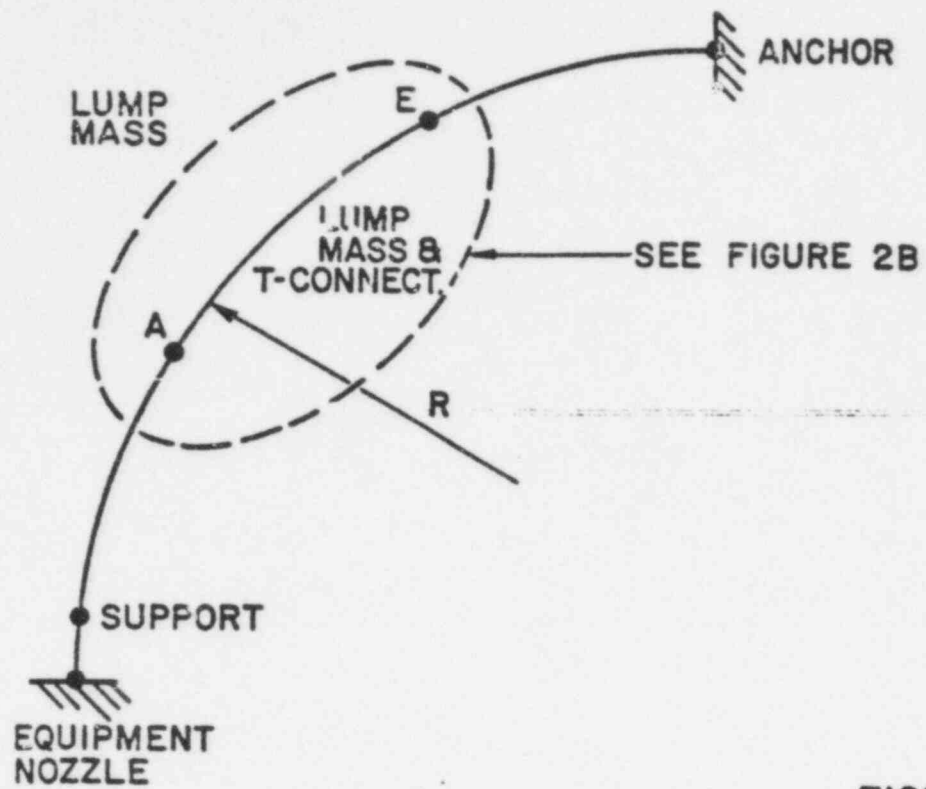
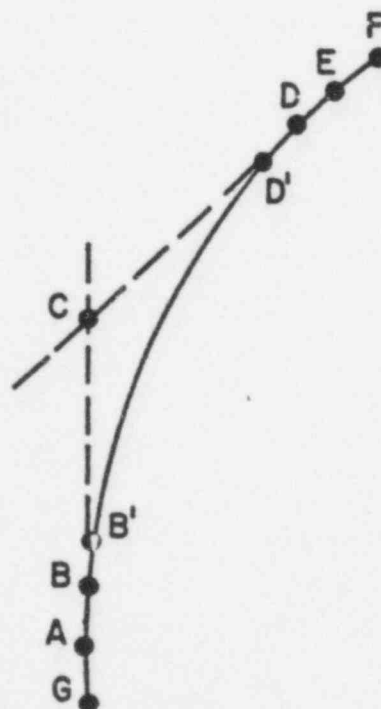


FIGURE 2A



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FIGURE 2B