SEP 28 1973

Mr. John A. Hinds, Manager
Safety & Licensing, APED
Nuclear Energy Division
General Electric Company
175 Curtner Avenue
San Jose, California 95114

Dear Mr. Hinds.

We have completed our preliminary review of Report NEDO-10859, Steam Vent Clearing Phenomena and Structural Response of the BWR Torus, submitted by your letter dated May 10, 1973. Based on this review, we have concluded that the report does not provide adequate information to determine with reasonable assurance that the integrity of the existing containment structures can be maintained over the life of the plants. Consequently, it is requested that the additional information listed on the enclosed pages be submitted to us within thirty days of the date of this letter.

Provide one signed original and 125 copies of your submittal as a supplement to NEDO-10859.

Sincerely,

Original signed by
Dennis L. Ziemann

Dennis L. Ziemann, Chief
Operating Reactors Branch #2
Directorate of Licensing

Enclosure:
Request for Additional
Information

Distribution

Docket File	DLZiemann, L:ORB #2
RP Reading	JIRiesland, L:ORB #2
Branch Reading	RMDiggs, L:ORB #2
JRBuchanan, ORNL	RMaccary, L:E
DJSkovholt, L:OR	RTedesco, L:CS
TJCarter, L:OR	
RO (3)	
OGC	

PAGE 2

OFFICE ▶	L:ORB #2	L:ORB #2	L:ORB #2	L:E	L:CS	
	X7403					
SURNAME ▶	JIRiesland:sjh	RMDiggs	DLZiemann	RMaccary	RTedesco	
DATE ▶	9/25/73	9/27/73	9/27/73	9/26/73	9/27/73	

Form AEC-318 (Rev. 9-53) AECM 0240 GPO 883-16-81465-1 443-678

(1.)

REQUEST FOR ADDITIONAL INFORMATION

GE REPORT NEDO-10859

1. Provide a summary of analytical results of the torus-ring header system and its component parts, including natural frequencies and mode shapes of all vibrating modes under 20 Hz and dynamic responses such as displacements, acceleration forces, moments and stresses at locations of penetrations and supports.

2. Supply missing information such as units for the vertical scale of Figures 5-9 through 5-21 and Figures 5-30 through 5-132, locations of joint numbers 253, 256, 325, 341, 348, and bar load numbers 1, 61, 135, 210, 211, etc.

3. In analytical modeling, only one segment of the torus is represented by a finite element mesh scheme while other segments are treated as bars. Explain why those shell segments could be replaced by bars and provide the theoretical basis for this replacement.

4. At the vertical hanger strap adjacent to relief valve B, the load calculated from maximum strain gauge reading is 46,200 lb while the corresponding load from dynamic analysis is 10,200 lb (p. 5-167). In another strap, the strain gauge reading gives a load of 16,800 lb and the dynamic analysis shows 3,400 lb. Explain the large discrepancy between measured and analytical loads and provide justification for using either as design load for hanger or for shell analysis.

5. Describe the method of stress analysis used for the torus wall in the vicinity of pipe penetrations and pipe hanger supports and summarize the analytical results. The analysis should use hanger loads obtained from strain gauge readings included with the effects obtained from dynamic analysis. The analysis should also consider fatigue life and cyclic stress effects.

6. Eight out of fourteen strain gauges in the experiment failed to yield any readings. Advise the degree of reliability you place on data obtained from the remaining six gauges and the basis for your conclusions.

OFFICE ▶						
SURNAME ▶						
DATE ▶						

7. Calculated stresses on the torus shell above and below the X204A nozzle attachment have exceeded the allowable 1.5 S_m. It is stated that the strain gauge readings are in doubt because of failure of many gauges to yield readings (p. 5-168). Since errors can go either way, explain the basis of your judgment that the actual stresses are less than those observed.

8. Discuss and justify the method used to compute the steady state mass flow rate from the relief valve. Also specify the value used for the "Base Case".

9. Discuss and justify the heat transfer model used between the steam and air within the discharge piping.

10. Within Appendix B several figures and tables which are referred to within the text are missing. These missing figures and tables should be supplied.

11. On page B-4, the air outflow boundary condition is specified as sonic flow. Justify this assumption throughout the time period of air release.

12. The air bubble growth behavior is based upon negligible gas kinetic energy. Since sonic exit velocity is approximately 1100 ft/sec, justify this assumption. Also indicate the sensitivity of the pressure pulse if the gas kinetic energy was considered.

13. The report concludes that the results of the dynamic analysis show good agreement with the experimentally measured deflections during the relief valve testing at Quad Cities Unit 2. Table 5-1 shows experimental average maximum amplitudes compared against maximum amplitudes obtained from analysis. One can conclude that experimental maximum amplitudes would be considerably higher than the average shown in the table. Furthermore, the experimental average maximum displacements are shown to be up to 240% higher than the maximum displacements obtained analytically. Provide your justification for concluding that there is good agreement between experimental and analytical results as the basis for accepting the analytical model.

14. Provide your analysis for the capability of the vent tube walls in the vicinity of the relief valve discharge line penetrations to retain integrity during the life of the plant considering the walls are subjected to periodic dynamic loads due to relief valve discharges.

OFFICE ▶						
SURNAME ▶						
DATE ▶						

15. Explain how the data in Table 4-1, page 4-5, compares with the measured values of these parameters. Describe the degree of conservatism used in choosing the values of these parameters for analysis and how they relate to measured data that gave the highest stress.

16. Determine the dynamic wave effects on pipe submergence depth and the subsequent results on maximum deflections and stresses when several relief valves exhaust in series.

17. Explain the relationship between deflection gauge 5, Figures 4-12 and 4-14, and the sensors shown in Table 5-1 and the discrepancy between the amplitudes shown in the figures and the table.

18. Explain the basis for location of the structural response sensors. Advise how the results obtained from these sensors would apply to other areas of the torus.

19. Explain the basis for and conservatism in applying a relief valve opening time of 0.188 sec in the analytical model.

20. Explain what tests were performed in June 1972 and provide a comparison of these data with those obtained from the October 1972 tests.

21. Explain your basis for considering there was adequate experimental data to compare with analytical results. On page A-4 it is stated that at the end of the test only 19 recorder channels (out of 42) were still functioning. Advise which parameters were being recorded on the 19 remaining channels and the sequence of failure of the other channels identified by location and measured parameter. If you consider adequate test data were not obtained during the tests to verify your analytical model for determining maximum stresses in the torus, provide your plans to supplement the test data.

22. Explain for Figures 5-9 through 5-21 the relationship of the forcing function numbers to the actual test conditions. Also identify the structural component for which amplitude applies in each figure. Explain the physical significance of time zero in these figures.

23. Typical traces shown in Figures 5-22 through 5-27 indicate peak amplitudes greater than those shown in the comparison Table 5-1 where average maximum amplitudes are shown. For each sensor location, provide the trace which shows maximum amplitudes obtained during the tests.

24. Explain if the quadrilateral elements shown in Figure 5 28 and 29 identify elements in the vicinity of pipe penetrations and how the data in Figures 5-30 through 5-89 show the effect of the penetrations on wall displacements and stresses. Advise which elements in the analysis correspond to the points instrumented for displacement or stress. Also advise which structural members were not factored into the analytical model.

25. On page 5-166 it stated that the maximum stresses from dynamic analysis for relief valve blowdown are +7770 psi and -6100 psi and occur in the torus shell near the upper attachment to the suction header. Provide the maximum stress based on measurements of maximum amplitude.

26. Figure 1-9-1 (Design Fatigue Curves for Carbon, Low Alloy, and High Tensile Steels) is mentioned on page 5-166 but is not included in the report. Provide this figure and its source and advise what weld rods were used for the torus shell (the plate material is stated in the FSAR to be SA212 Grade B). If materials used for other plants are different from those used for the Quad-Cities plants, list the plants and materials used and describe the affect on stress limitations.

27. On page 5-166 it is stated that the average allowable actuations of a relief valve per year over a 40-year plant life are 23. Explain how many actuations per year would be allowed if the stresses were based on measured rather than analytical data.