PSE&G

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November 2, 1977

Director of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. Olan D. Parr, Chief
Light Water Reactors Branch 3
Division of Project Management

ADDITIONAL INFORMATION REQUESTED
CONTAINMENT DOME ACCESS SYSTEM
NO. 2 UNIT
SALEM NUCLEAR GENERATING STATION
DOCKET NO. 50-311

Gentlemen:

PSE&G hereby transmits its response to your letter of May 24, 1977 requesting additional information regarding the Salem No. 2 Unit Containment Dome Access System. We believe the attached information provides a satisfactory response to your concerns.

Should you have any further questions in this regard, please do not hesitate to contact us.

Very truly yours,

R. L. Mittl
General Manager -
Licensing and Environment
Engineering and Construction

Attach.

1B1 10

CONTAINMENT DOME ACCESS SYSTEM -
REQUEST FOR ADDITIONAL INFORMATION
SALEM NUCLEAR GENERATING STATION
UNIT NO. 2

The following are the responses to U.S. NRC questions pertaining to evaluation of the containment dome access system at Salem Nuclear Generating Station No. 2 Unit.

Question No. 3.1

Provide the load combination equations used for the design of the dome access system. Include the method used to account for the load on the auxiliary hoist.

Answer No. 3.1

The orbital service bridge, the spray header support or basket and the spray piping were mathematically modeled as a system of node points interconnected by various weightless springs. The springs were assigned the stiffness characteristics of the structural beam and functional pipe elements of the system. All weights and inertias were distributed among the nodes. The degrees of freedom of the nodes were chosen to closely simulate the response of the system to external loading; the materials were assumed to be linearly elastic.

Static analysis was performed to obtain the maximum stresses under dead load and thermal variations.

Using the above mathematical model, a dynamic modal analysis was also performed to determine the modal frequencies and mode shapes. SSE response spectra with 1/2% damping factor at the proper structural elevations were used as the input for the response spectrum analysis. The element stresses of those modes with meaningful participation for a given excitation direction were summed as a square root of the sum of their squares. When mode frequencies occurred within 10% of each other, an absolute summation of stresses was made prior to RMS summation.

The design stresses for the system are the summations of the maximum static and dynamic stresses for the respective members.

The analysis assumed the orbital bridge was locked to the rail in its storage location, the personnel cage was locked in the down (stored) position on the bridge with no load on the hoist and the containment spray piping empty of liquid. This analysis simulates actual conditions during reactor operation.

Question No. 3.2

Provide the structural acceptance criteria including the allowable stress levels for the load combinations.

Answer No. 3.2

The calculations performed on the dome access system indicate that none of the elements are subjected to loads beyond the allowable value of 32.40 ksi, which is 90% of the minimum yield strength of A36 steel. The loads obtained from the calculations for the dome access system were then used to design the dome access system containment interface tie-supports. These tie-supports which are made of A442 Grade 60 steel with an allowable stress of 19 ksi, will be subjected to a stress of only 10.92 ksi.

Question No. 3.3

Outline the procedures you will use to insure that the allowable load on the access system is not exceeded.

Answer No. 3.3

The allowable load on the access system will not be exceeded due to required administrative control.

Question No. 3.4

Provide the method used in performing the dynamic analysis. If an equivalent static method was used, how did you account for dynamic amplification?

Answer No. 3.4

The dome access system, consisting of the orbital service bridge and supporting basket and the spray header piping were analyzed for a Safe Shutdown Earthquake using response spectrum curves at 1/2% damping with the bridge in the storage location. The bridge, basket and piping were mathematically modeled as a multi-degree of freedom system with node points interconnected by various springs. ANSYS, a large scale, general purpose computer program, was used to perform the modal analysis.

Question No. 6.1

Provide a minimum containment pressure analysis that considers the structural steel of the containment dome access system. State the minimum containment pressure that has previously been used and the analysis of the emergency cooling system. Describe the conservatism in the assumptions of initial containment conditions, modeling of the containment heat sinks (including the additional structural steel of the containment dome access system), heat transfer coefficients to the heat sinks, heat sink surface area and any other parameter assumed in the analysis.

Answer No. 6.1

A containment pressure sensitivity analysis has been performed and considers the structural steel of the dome access system. The results of this sensitivity analysis indicate that the minimum containment pressure will decrease by approximately .6 psi due to the extra steel of the containment dome access system. From experience at other nuclear plants of this size, it has been determined that the peak clad temperature will increase by approximately 5° for each psi drop in the containment pressure. Therefore, it is estimated that the peak clad temperature will increase by 3° thus resulting in a new peak clad temperature of approximately $2138^{\circ}F$ rather than the previously calculated value of $2135^{\circ}F$. We are limited in maintaining the peak clad temperature below $2200^{\circ}F$. Therefore, we are well below the maximum limit.

In the analysis, we have used structural heat sinks previously calculated and previously submitted in FSAR Table 14.3-1b and we have supplemented this table by addition of the dome access system and dome access system supports. The dome access system resulted in a net increase in surface area of 15,875 sq. ft. with an average thickness of steel of approximately 3/8" and the dome access system support and grating result in a net increase in surface area of 18,000 sq. ft. with an average thickness of 5/16".

1R1 16/18