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MEMORANDUM FOR: Walter R. Butler, Chief, Containment Systems Branch, DSI

FROM: Farouk Eltawila, Containment Systems Branch, DSI

APPLICANT: Washington Public Power Supply Systems (WPPSS)

SUBJECT: MEETING WITH WPPSS TO DISCUSS THE SRV DISCHARGE LOAD, IMPROVED DEFINITION AND APPLICATION METHOD (Chicago, Illinois, August 5, 1980)

The purpose of the subject meeting was to present the WPPSS-2 plant unique SRV discharge load specification based on observations from available Caorso in-plant SRV test results. Due to time limitations, the staff and its consultants were unable to have detailed discussions with the applicant regarding the proposed method. Based on our preliminary review of the proposed method, the staff and its consultants find it is important to review the Caorso data to establish the adequacy of the proposed method.

The staff and its consultants are currently reviewing the Caorso test data and the WPPSS-2 proposed method and will forward its questions following completion of the review.

An attendance list and a copy of the meeting handouts are enclosed.

Summary

WPPSS-2 utilizes the General Electric cross quencher device to reduce the hydrodynamic loads generated due to SRV actuation to relieve the reactor pressure vessel (RPV) during certain operation conditions.

After SRV actuation, steam from the RPV forces the water and air initially in the SRV discharge line to be ducted into the suppression pool. Steam then flows through the quencher holes and condenses in the suppression pool. The WPPSS-2 containment must be able to withstand the pool dynamic loads induced by this process.

The initial load specification for the cross quencher described in DFFR-Rev. 3 was judged by the applicant to be overly conservative. Therefore, the WPPSS-2 applicant undertook a program to establish a realistic and yet conservative load specification for the SRV discharge to be applied for WPPSS-2. The objective of this program is to provide improved SRV discharge load definitions and to develop an improved analytical procedure for structural modeling.

Improved SRV Discharge Load Definition

The improved SRV load definition is based on statistical and engineering evaluation of pressure traces that were measured at the Caorso (Italy) suppression pool boundary during SRV discharge tests. Test data from Tokai-2 power plant (Japan) are used to confirm the load specification derived from Caorso.

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A confidence level of 90% with a non-exceedance probability of 90% has been used to develop the design basis pressure. A factor of 1.2, to account for differences between WPPSS-2 design conditions and Caorso test conditions, is then applied to determine the design maximum pressure amplitude. To account for possible variations in frequency content, the selected time histories are compacted and expanded so that the characteristic frequency cover the range of 4.0 to 12.0 Hz.

The vertical spatial distribution derived from Caorso is confirmed with the Tokai-2 data and with acoustic pool analysis.

The circumferential distribution is similar to the distribution recommended in DFFR-Rev. 3.

Having established the load specification for SRV discharge, structural modeling methods, verified by application to Caorso and comparison to Caorso test results, is developed.

Development of Improved Structural Analytical Model

This model is an axisymmetric water-structure-soil coupled system that uses finite element method of analysis to obtain solution in the frequency domain.

Actual pressure traces from Caorso SRV tests were used as externally applied forces to determine the structure response spectrum which in turn compared to actual measurements from Caorso tests.

If both results are comparable, then the building modeling and analysis procedure is qualified. If they are not comparable to test measurements, the building modeling and the analysis procedures are revised and the procedure is repeated. The above process is done for several pressure traces to assure that the methodology is adequate for calculating responses of a Mark II containment structure subject to SRV discharge loads.

Conclusion

The applicant indicated that the improved SRV discharge load definition is conservative since it is based on subsequent actuation pressures (pressure amplitude is higher than initial actuation) and confirmed by in-plant SRV discharge tests at both Caorso and Tokai-2.

In addition, the applicant stated that the structural modeling is adequate for calculating responses based on comparing the results predicted in the model to actual data from the Caorso test.

Furthermore, when the improved load is applied to WPPSS-2 (steel containment), the predicted response is comparable to the Tokai-2 steel containment measured response.

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Staff Comment

The staff indicated that review of the SRV loads improved definition and application methodology for Mark II containment should involve, in addition to the Containment Systems, the Structural Engineering Branch (SEB) and the Mechanical Engineering Branch (MEB) that were not participating in that meeting. By copy of this memorandum, the Project Manager should request the SEB and MEB to review the applicant's methodology.

The staff also indicated that our questions will be forwarded to them as soon as the staff completes its review of the method.

Farouk Eltawila
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Enclosure:
As stated

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WPPSS-2 MEETING

August 5, 1980

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