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ENCLOSURES: ACKNOWLEDGED

Mark II Containment-Supporting Program

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PLANT NAME: WPPSS #2.

FOR ACTION/INFORMATION 10-1-75 JGB

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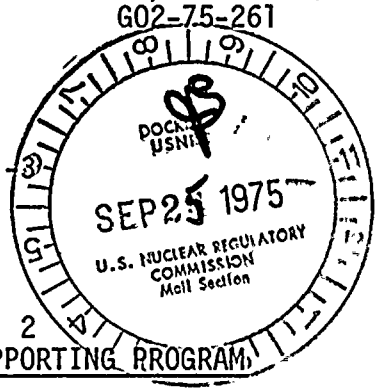
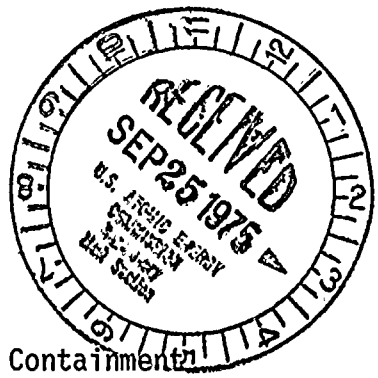
Washington Public Power Supply System
A JOINT OPERATING AGENCY

P. O. Box 968 3000 Geo. Washington Way Richland, Washington 99352 Phone (509) 946-9681

Docket No. 50-397

September 16, 1975
G02-75-261





Mr. Olan D. Parr
Light Water Reactors Project Branch 1-3
Division of Reactor Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: WPPSS NUCLEAR PROJECT NO. 2
MARK II CONTAINMENT - SUPPORTING PROGRAM

Reference: Letter, J. J. Stein to W. R. Butler, BWR Mark II Containment Additional Design Information, dated June 5, 1975.

Dear Mr. Parr:

Attached is a copy of a description of the BWR Mark II Containment "Supporting Program" presented in a meeting with members of the NRC staff on June 30, 1975. The description has been expanded to identify the testing and analytical portions of the program and indicates the purpose and schedule for completion of each portion. Two items, Analysis of Alternate Load Mitigation Design and "SRL-1" Mitigating Fix Testing, have been deleted from the preliminary Supporting Program discussed at the June 30, 1975 meeting. These items are deleted for the present since they would be undertaken strictly on a contingency basis relative to the ramshead and quencher load mitigating devices. Full scale in-plant testing of the ramshead device has been added to the program.

Generally, the Supporting Program is intended to confirm the Preliminary Forcing Function Report which is scheduled to be submitted to you in September 1975 as indicated in the reference letter to you. The Supporting Program, described in the attached outline, is a more detailed schedule for item 5 of the schedule attached to the above referenced letter.

As indicated in the meeting on June 30, 1975, the Preliminary Forcing Function Report will be submitted for your review in September 1975. It is intended

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that this report will be reviewed and approved by the NRC as an acceptable method for handling S/R valve and LOCA hydrodynamic loads for containment design.

Very truly yours,

N. O. STRAND
Assistant Director,
Generation and Technology

NOS:CLF:mcr

Attachment

cc: J. J. Byrnes, Burns and Roe Incorporated, Hempstead, New York
Dorsey Roe, Bonneville Power Administration, Portland, Oregon
H. R. Canter, Burns and Roe Incorporated, Hempstead, New York
Fred A. MacLean, General Electric Company, San Jose, California

MARK II SUPPORTING PROGRAM

MARK II PROGRAM ACTIVITY	ACTIVITY TYPE	TARGET SCHEDULE
A. LOCA RELATED		
1. "4T" Pool Swell Test	Test	1st. Quarter 1976
2. Pool Swell Velocity Breakthrough Model	Analysis	2nd. Quarter 1976
3. Impact Tests on Pool Internal Structures	Test	3rd. Quarter 1975
4. Qualify Impact Model	Analysis	4th. Quarter 1975
B. SAFETY/RELIEF VALVE RELATED		
1. Relief Valve Pipe Clearing Model for Quencher	Analysis	4th Quarter 1976
2. Relief Valve Pipe Clearing Model for Ramshead	Analysis & Test	3rd. Quarter 1975
3. In-Plant Test of S/R Valve Discharge Loads During Consecutive Actuations Ramshead	Test	3rd. Quarter 1976
4. Relief Valve Consecutive Actuation Transient Analysis	Analysis	4th Quarter 1976

MARK II SUPPORTING PROGRAM

A.1 "4T" POOL SWELL TEST

Objective

Evaluate the pool swell phenomena for a typical Mark II containment geometry to determine pool swell velocities, water slug thickness, breakthrough elevations and wet-well pressures in a near full scale vertical vent suppression system using one vent at the General Electric Pressure Suppression Test Facility (PSTF). The information will be used to predict the loading on wetwell structural members and the diaphragm floor between the wetwell and drywell.

A.2 POOL SWELL VELOCITY BREAKTHROUGH MODEL

Objective

Develop an analytical model for predicting water slug velocity, pool swell breakthrough and froth characteristics. Impact loads on structures above the pool are dependent on these parameters. An analytical model is desired to bridge the gap between test results and actual containment geometry. This activity complements the "4T" test program as its analytical counter-part.

A.3 IMPACT TESTS ON POOL INTERNAL STRUCTURES

Objective

Conduct pool swell testing on various structural shapes of pool internals to estimate impact loadings on internal structures. This activity involves one third scale shapes in the Pressure Suppression Test Facility (PSTF). The shapes include circular pipes and I-beams of various sizes plus steel grating. Test results will be used to preduct impact loads.

A.4 QUALIFY IMPACT MODEL

Objective

Confirm applicability of PSTF data to Mark II geometry and structures. Evaluate impact test data for design application and analytical model verification. If necessary modify current analytical models. Confirm design adequacy of analytical methods with pool swell data. Document analytical methods, assumptions, experimental verification of analytical methods, and experimental basis for specified loads. This activity provides analytical modeling of the impact tests on pool internal structures and components.

MARK II SUPPORTING PROGRAM

B.1 RELIEF VALVE PIPE CLEARING MODEL FOR QUENCHER

Objective

Develop an analytical model of this phenomenon to provide an improved technical basis for design and greater flexibility on design details. Compare this analytical model to current test data. This model will not include prediction of internal pipe pressure effects since they are being developed in activity B.2.

B.2 RELIEF VALVE PIPE CLEARING MODEL FOR RAMSHEAD

Objective

Document the Safety/Relief Valve Pipe Clearing Analytical Model in a supplement to the Quad Cities Topical Report (NEDO-10859). This activity includes documentation of the Safety/Relief Valve Pipe Clearing Analytical Model for a ramshead including assumptions, justification of analytical methods, and description of the experimental basis for the analytical models. This will also include the development of analytical models to predict internal pipe pressures applicable to both the ramshead and the quencher.

B.3 IN-PLANT TEST OF SAFETY/RELIEF VALVE DISCHARGE LOADS DURING CONSECUTIVE ACTUATIONS

Objective

Measure the effect of consecutive Safety/Relief Valve discharges on suppression pool pressures and internal pipe pressure. Test data will be used to verify pipe internal pressure and water level for consecutive Safety/Relief Valve actuations. Measurements will be made of strains imposed on a pressure suppression containment torus during consecutive valve actuations with varying delay times (i.e., time between valve closure and re-opening) in order to determine maximum strain and variation of strain with delay time. Additional data will be obtained to aid in defining the phenomena causing load changes. Internal pipe pressure data and pipe reaction forces will be obtained for verification of analytical model. Pressure measurements at various locations in the pressure suppression pool will be taken. This testing is being conducted by the Mark I Group, however, the Mark II group is participating in order to obtain additional test data on pipe internal pressures, pipe reaction forces and pressure attenuation in the suppression pool.

B.4 RELIEF VALVE CONSECUTIVE ACTUATION TRANSIENT ANALYSIS

Objective

Develop analytical methods for predicting Safety/Relief valve discharge pipe pressures for both ramshead and quencher devices and containment loads associated with consecutive Safety/Relief valve actuations. This analytical model includes the effects of a vacuum breaker and reflooding due to rapid steam condensation. Both internal pipe pressures and pressures in the suppression pool will be predicted. Current test data will be evaluated and analytical models will be verified. If necessary analytical models will be modified. Verified analytical

models for first and subsequent Safety/Relief valve actuations will be documented. This activity provides the analytical modeling of the testing done in Item B-3 in order to correlate its applicability to the Mark II Containment geometry.