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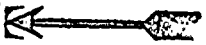
MEETING SUMMARY DISTRIBUTION

Docket File 
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MEMO 9/24/79

SEP 24 1979

Docket No. 50-397

APPLICANT: Washington Public Power Supply System

FACILITY: Washington Nuclear Project No. 2

SUBJECT: SUMMARY OF MEETING HELD ON JULY 16, 1979 TO DISCUSS THE CHUGGING LOADS - IMPROVEMENT DEFINITION AND APPLICATION METHODOLOGY TO MARK II CONTAINMENTS

On March 16, 1979, a meeting was held between representatives of the Washington Public Power Supply System (WPPSS), Burns and Roe, Inc. (B&R) and the NRC staff. The purpose of the meeting was to discuss the chugging loads improved definition and application methodology to be utilized by B&R to establish the chugging loads for the Washington Nuclear Project No. 2 Containment. The attendees list is enclosed as Enclosure 1.

Prior to the meeting, a set of discussion topics (Enclosure 2) were sent to the applicant and the discussion in general centered around these topics.

B&R used about 137 4T test boundary pressure traces to develop a single vent design load specification. The load is impulsive and random in nature. The applicant claims that the load specification is independent of the 4T facility and is applicable to the vent exits in the Mark II Containment. The applicant indicated that when its derived design load is applied at the vent exit in the 4T test tank, the load simulates the impact and trends observed in the 4T tests. The applicant further indicated that its load definition and the associated methodology address the staff concerns related to fluid structure interaction (FSI) effects and extrapolating 4T test results to the Mark II containments (Enclosure 4).

Staff Comments

1. The applicant should coordinate additional studies on the high frequency response (>30 Hz) observed in the 4T facility.

MEMO)

2. The design amplified response spectra used to establish a design source specification was based on a library of 137 chugs selected from 600 chugs observed in the 4T test. The remaining 4T chugs should be analyzed to determine if they would substantially modify the design load response spectra.

3. The applicant's proposed chug load model should be confirmed by applying the model to other related steam chugging tests.

4. The applicant should provide reasons which are more persuasive than those presented to date to justify the statistical analysis of the 4T data which was used to arrive at its proposed load specification.

5. The available multivent test data should be analyzed to verify the applicant's statistical averaging of the 4T data.

6. Questions related to the WNP-2 improved chug load specification will be submitted to WPPSS during the 4th quarter of 1979.

S. Miner, Project Manager
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Division of Project Management

Enclosures:
As Stated

cc: See Next Page

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Enclosure 1

WNP-2 CHUGGING

JULY 16, 1979

WPPSS

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B. Bedrosian
D. Baker

BNL

R. Scanlan
G. Bienkowski
C. Economos
C. Brenner
J. Libner
E. Dowell
A. Sonin

NRC

D. Norris, Jr.
J. Kudrick
C. Anderson
S. Miner
C. Tan

Enclosure 2

DISCUSSION TOPICS FOR

THE JULY 16, 1979, NRC/WPPSS-2 MEETING

REGARDING THE B&R REPORT

"CHUGGING LOADS - IMPROVED DEFINITION

AND APPLICATION METHODOLOGY TO MARK II CONTAINMENTS

1. The B&R single vent design load specification was developed for chugging loads using the 4T data base including a library of 137 chugs selected by General Electric and eight additional representative chug events (See Page 5 of the B&R* report) out of a total of 600 4T chugs. What was the basis for the selection of the 137 + 8 chugs included in the library? What consideration was given to include or exclude condensation oscillation events in the library?

2. The B&R single vent design load specification consists of a triangular pulse at the vent source with a 50 ms duration. Have results been obtained for the other pulse shapes? If so, qualitatively compare the results obtained with the different pulses. What considerations went into the selection of a pulse with a duration of 50 ms?

3. The B&R design level response spectra (See Figure 14) exhibits significant high frequency (i.e., > 30 Hz) content. We are skeptical of this high frequency content. We believe it may be a result of the

*Page and Figure references are to the April 13, 1979 Burns and Roe report.

methodology used to calculate the response spectra. Discuss your understanding of the presence of the large high frequency content.

4. A statistical study was conducted of the 4T chug traces as a part of the development of a design load at the source. The peak amplitude of recorded pressure traces and the Fourier spectrum of recorded pressure traces were considered and rejected as the random parameter for statistical evaluation. The response spectrum of recorded pressure traces was used. We believe further consideration should be given to the use of the Fourier spectrum of recorded pressure traces for the statistical evaluation. Discuss in more detail your reason for rejecting the Fourier spectrum approach.

   In addition, compare vent source specifications derived by a statistical evaluation of the response spectrum versus the Fourier spectrum approach. Does the response spectrum approach bound the Fourier spectrum approach?

5. Describe how the response spectrum plateaus shown in the Design Load Envelope of Figure 15 were obtained.

6. It is our understanding that the B&R approach utilizes 3 distinct analytical models to evaluate the WNP-2 containment for steam loads. These models include: 1) a model of the 4T facility; 2) a 3D model of the WNP-2 pool (this model was used to obtain the appropriate stiff wall response and mass matrix); and 3) an axisymmetric model of the reactor building and soil foundation. Information has been supplied on the 4T and the axisymmetric model (i.e., models 1 and 3).

but not on the second model. Describe in detail this second 3D model which was used to derive the WNP-2 stiff wall response.

7. The B&R computer program that was used to model the 4T facility and the WNP-2 plant is an important element in the B&R improved steam chugging load definition and application methodology. Benchmark calculations serve an important role in the qualification of complex programs of this type. Describe benchmark comparisons you have performed to check out this computer program. In addition describe your plans to confirm your methodology by utilizing the results of the extended 4T tests (i.e., tests with short downcomer) or other applicable tests (i.e., JAERI full scale, DKSS and CREARE).

8. Provide the rigid wall pressure trace used as input to the asymmetric model of the WHP-2 facility. Compare this pressure trace to the corresponding WHP-2 flexible wall pressure trace.

9. Provide the basis for the selection of the .005 damping factor utilized in the comparative studies shown in Figures 25 through 28.

10. We are attempting to understand the relative role of the source specification versus the role of structural natural frequencies on the response of the structures shown in Figures 25 through 28. Provide the natural frequencies and the mode shapes associated with these structures.

11. In the model of the 4T system used in the report an increase of the sonic velocity in water by 58% resulted in a negligible increase in

fundamental system frequency. What would be the effect of a comparable decrease in sonic velocity?

12. Why does the effect of pile support flexibility on 4T response depend on the location of application of the chugging load?

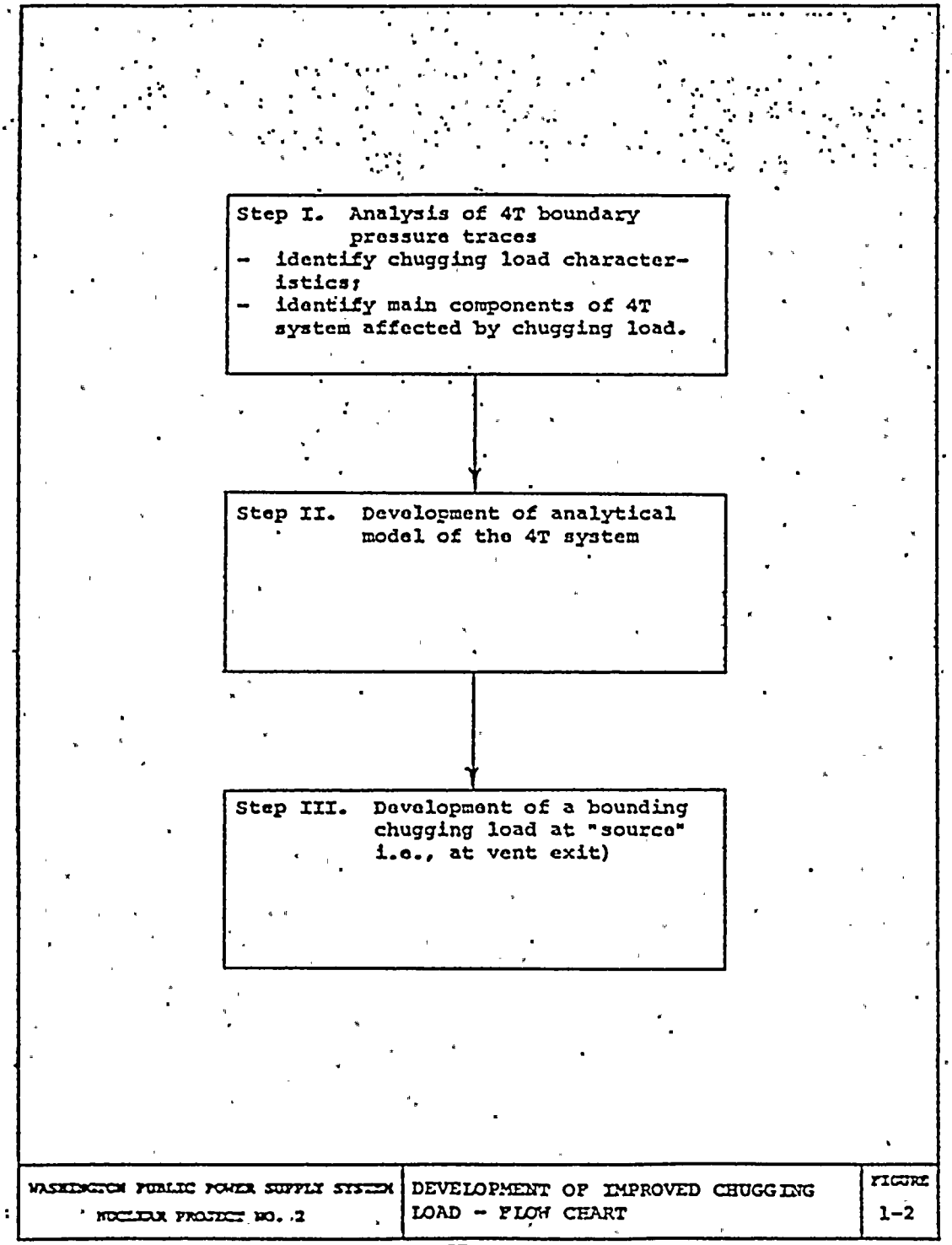
13. What is the physical justification for specifying a chug pulse load at the steam-water interface and in the water pool simultaneously to simulate the damped chugs?

14. Elaborate on the statement that the damped pressure traces simulated were found not to govern the Mark II containment design. Is this the reason why the chugging load applied to bound the design level response spectra is applied only at the vent and has no sinusoidal content?

15. Justify why a design level load corresponding to a 50% probability of non-exceedence is used as a design condition for WNP-2?

16. The non-symmetric loading specified for WNP-2 facility, using a forcing function at a level of 84.1% probability of non-exceedence at 3 radially located downcomer, seems nominally non-symmetric. Why is this considered a bounding non-symmetric case?

ENCLOSURE 3



WASHINGTON PUBLIC POWER SUPPLY SYSTEM NUCLEAR PROJECT NO. 2	DEVELOPMENT OF IMPROVED CHUGGING LOAD - FLOW CHART	FIGURE 1-2

4x

ENCLOSURE 4

SUMMARY

c. THE LOAD DEFINITION AND APPLICATION METHODOLOGY TO MARK II CONTAINMENTS ADDRESSES CONCERNS IDENTIFIED WITH CHUGGING LOADS:

- FSI EFFECTS ARE ACCOUNTED FOR IN REDUCING 4T DATA;
- CONSERVATISM IS USED WHEN INTERPRETING 4T DATA AND DEVELOPING THE DESIGN LOAD SPECIFICATION;
- CHUGGING LOAD IS DEFINED AT "SOURCE" (I.E., AT STEAM-WATER INTERFACE) THUS MAKING POSSIBLE EXTRAPOLATION TO MARK II GEOMETRY AND ADEQUATE DETERMINATION OF RELATIVE VENT AND POOL PARTICIPATION IN THE INCIDENT PRESSURE WAVE IN MARK II GEOMETRY;

SUMMARY

C. THE LOAD DEFINITION AND APPLICATION METHODOLOGY TO MARK II CONTAINMENTS ADDRESSES CONCERNS IDENTIFIED WITH CHUGGING LOADS: (CONTINUED)

- CONSERVATISM IS USED IN DEFINING LOADING CONDITION FOR MARK II GEOMETRY;
- FSI EFFECTS ARE ACCOUNTED FOR WHEN ANALYZING MARK II CONTAINMENTS.