REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:8208060141 DOC.DATE: 82/07/28 NOTARIZED: NO DOCKET #
FACIL:50-397 WPPSS Nuclear Project, Unit 2, Washington Public Powe 05000397
AUTH.NAME AUTHOR AFFILIATION
BOUCHEY,G.D. Washington Public Power Supply System
RECIP.NAME RECIPIENT AFFILIATION
SCHWENCER,A. Licensing Branch 2

SUBJECT: Advises that findings from Mark III containment program to demonstrate that use of square root of sum of squares rule for combining dynamic responses acceptable for facility per SER Section 3.9.3.1.

DISTRIBUTION CODE: B001S COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 5
TITLE: PSAR/FSAR AMDTS and Related Correspondence

NOTES:

	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL
	A/D LICENSNG	1	0	LIC BR #2 BC	1	0
	LIC BR #2 LA	1	0	AULUCK,R. 01	1	1
INTERNAL:	ELD/HDS2	1	0	IE FILE	1	1
	IE/DEP EPDS 35	1	1	IE/DEP/EPLB 36	3	3
	NRR/DE/CEB 11	1	1	NRR/DE/EQB 13	3	3
	NRR/DE/GB 28	2	2	NRR/DE/HGEB 30	2	2
	NRR/DE/MEB 18	1	1	NRR/DE/MTEB 17	1	1
	NRR/DE/QAB 21	1	1	NRR/DE/SAB 24	1	1
	NRR/DE/SEB 25	1	1	NRR/DHFS/HFEB40	1	1
	NRR/DHFS/LQB 32	1	1	NRR/DHFS/OLB 34	1	1
	NRR/DHFS/PTRB20	1	1	NRR/DSI/AEB 26	1	1
	NRR/DSI/ASB 27	1	1	NRR/DSI/CPB 10	1	1
	NRR/DSI/CSB 09	1	1	NRR/DSI/ETSB 12	1	1
	NRR/DSI/ICSB 16	1	1	NRR/DSI/PSB 19	1	1
	NRR/DSI/RAB 22	1	1	NRR/DSI/RSB 23	1	1
	NRR/DST/LGB 33	1	1	REG FILE 04	1	1
	RGN5	2	2	RM/DDAMI/MIB	1	0
EXTERNAL:	ACRS 41	16	16	BNL(AMDTS ONLY)	1	1
	DMB/DSS (AMDTS)	1	1	FEMA-REP DIV 39	1	1
	LPDR 03	1	1	NRC PDR 02	1	1
	NSIC 05	1	1	NTIS	1	1

TOTAL NUMBER OF COPIES REQUIRED: LTTR 64 ENCL 59

Washington Public Power Supply System
P.O. Box 968 3000 George Washington Way Richland, Washington 99352 (509) 372-5000

July 28, 1982
G02-82-630

Docket No. 50-397

Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Schwencer:

Subject: NUCLEAR PROJECT NO. 2
APPLICATION OF SRSS RULE FOR STEEL CONTAINMENT

Section 3.9.3.1 of the Safety Evaluation Report for WNP-2 (NUREG-0892), states that the Supply System has committed to use data from the Mark III Containment Program to demonstrate that the use of SRSS for combining dynamic responses is acceptable for the WNP-2 free-standing steel containment. We have reviewed the studies performed both for Mark II reinforced concrete containments, and for Mark III free-standing steel, and reinforced concrete containments, and have concluded that the findings from both of these studies are applicable to WNP-2, i.e., that use of the SRSS rule for combining responses due to seismic and hydrodynamic loading achieves the 84% nonexceedance probability level for WNP-2.

The basis for this conclusion is provided in the attachment.

Very truly yours,

G D Bouchey

G. D. Bouchey
Deputy Director, Safety and Security

EAF:kjt
Attachment

cc: R. Auluck - NRC
WS Chin - BPA
R. Feil - NRC Site
M. Humm - NRC

B001

APPLICATION OF THE SRSS RULE FOR COMBINING DYNAMIC RESPONSES FOR THE WNP-2 STEEL CONTAINMENT

WNP-2 POSITION

The technical basis for the use of the square root of the sum of squares (SRSS) method for combining dynamic loads for Mark II plants is provided in General Electric topical report NEDE-24010-P, (Reference 1). The impact of the high seismic zone and the free-standing steel containment on the adequacy of using the SRSS rule for application to WNP-2 was further discussed in the response to NRC Mechanical Engineering Branch Question No. 26 (Attachment 1), where it was concluded that the use of the SRSS rule would still be adequate for the WNP-2 plant.

Recently, a study (Reference 2) to demonstrate the generic applicability of the SRSS combination of dynamic responses for Mark III plants has been completed and submitted to NRC by the Mark III Owners Group. In this study, 167 response combinations at a number of locations associated with Nuclear Steam Supply System and Balance-of-plant piping, equipment and components, were considered in order to represent various types of Mark III containment designs, ranging from concrete to free-standing steel containments. In general, the response combinations analyses considered in the study of Reference 2, satisfy the requirement of Newmark-Kennedy Criterion 2 (Reference 3) which provides an approach acceptable to the NRC to statistically demonstrate that the SRSS response value is approximately at, or exceeds, the 84% nonexceedance probability (NEP) value.

In order to assess the applicability of the Mark III study for WNP-2, the data in Reference 2 pertaining to the free-standing steel containment were reviewed. Out of the 167 response combinations, 26 of the response combinations were considered from a plant utilizing a free-standing steel containment vessel. The results of the statistical evaluation of these 26 dynamic response combinations are contained in Tables 3-6, 3-9, and 3-13 of Reference 2. A review of these tables indicates that except for one response combination, the ratio of the 85% NEP value (R_{85}) to the SRSS value was always less than the acceptance criteria of $R_{85}/SRSS = 1.2$, and the maximum value for the combination which exceeded the acceptance limit was only 1.216. The ratio of the 50% NEP value (R_{50}) to the SRSS value was found to vary from 0.894 to 1.095 and in few instances, exceeded the acceptance limit of $R_{50}/SRSS = 1.0$. However, it should be recognized that the study performed in Reference 2 utilized very conservative assumptions concerning the definition of earthquake strong motion duration (e.g., the strong motion portion of the earthquake amplitude reached 50% of the peak value) and the time phasing between the response time histories. Since the statistical analysis of the data subset pertaining to a free-standing steel containment similar to the WNP-2 containment meets the Newmark-Kennedy Criterion 2 and shows no significantly different trend from the results of

the entire data base used in the Mark III study, it can be concluded that the use of the SRSS rule for dynamic response combination is adequate for both concrete and steel containments utilizing Mark III design.

Since both the Mark II and Mark III studies (References 1 and 2) encompassed several response time histories which exhibited a relatively wide range of frequency contents and represented a number of BWR plants utilizing both steel and concrete containments, it is judged that the use of the SRSS method for application to WNP-2 is adequate. It is recognized that the response of a particular component in the WNP-2 containment or the response of some specific locations not considered in the Mark II and Mark III studies may vary somewhat from the response time histories selected for the studies in References 1 and 2. However, the effect of these variances is expected to fall within the same general range considered in the studies because of the similarities in systems, types of structural configuration and construction material, characteristics of the seismic and hydrodynamic loads, and massiveness of structures.

References

1. General Electric topical report NEDE-24010-P
2. Study to Demonstrate the Generic Applicability of SRSS Combination of Dynamic Responses for Mark III Nuclear Steam Supply System and Balance-of-Plant Piping and Equipment Components, Report No. SMA 12109.01-R001.
3. General Electric Report NEDO 24010-2.

QUESTION No. 26
(3.9.3.1)

The methods of combining responses to all of the loads requested in (a) above is required. Our position in this issue for Mark II plants is outlined in NUREG-0484, Revision 1, "Methodology for Combining Dynamic Responses". However, since the primary containment for the WNP-2 plant is a free-standing steel pressure vessel and the plant is in a higher seismic zone, the staff will require that the criteria in Section 4 of NUREG-0484, Rev. 1, "Criteria for Combination of Dynamic Responses other than those of SSE and LOCA" be satisfied if the square root of the sum of the squares method of combining these responses is used. (Reference Regulatory Position E (2) in the enclosure to a letter from J. R. Miller, NRC to Dr. G. G. Sherwood, GE, "Review of General Electric Topical Report NEDE-24010-P", dated June 19, 1980). The conclusions of NUREG-0484, Rev. 1 are based on the studies performed by GE in NEDE-24010-P and BNL in NUREG/CR-1330. The applicant must demonstrate that an SRSS combination of dynamic responses achieves the 84% nonexceedance probability level because of the difference in containment and seismic level which were not included in the earlier studies.

RESPONSE

When a seismic response from a high seismic input, like that from Hanford, is combined with another dynamic response (e.g. SRV discharge loads), depending on the relative magnitudes of the two responses being combined, the shape of the cumulative Distribution Function (CDF) of the combined response will change. If the maximum magnitude of one of the responses is very large compared to the other response being combined, the CDF curve will almost be vertical and it is immaterial if these two responses are combined using the SRSS or the Absolute Sum (ABS) rule. However, if the maximum magnitudes of the two responses are about equal, use of SRSS vs. ABS rule to combine the responses with cause significant difference in the combined response. In addition, in this case, the CDF curve will be more like S-shaped with the non-exceedance probability (NEP) of SRSS being close to 84%. In the generic Mark II study, examples from both such cases were considered with more examples from the case with responses of comparable magnitudes. This study showed that all these Mark II cases meet the requirements of the NUREG-0484. Hence, the GE topical report NEDE-24010-P, "Technical Bases for the Use of SRSS Method for Combining Dynamic Loads for Mark II Plants" is also applicable to WNP-2 with high seismic input.

The impact of the free-standing steel primary containment is discussed in the areas as follows:

(1) Vessel and Internals are not attached to and not affected by the steel containment.

(2) Piping Systems and Floor Mounted Equipment

The dynamic input to these components at their containment support locations may be affected by the steel containment response to the dynamic loads under consideration and hence, may be different from that obtained from concrete containment. However, the frequencies contributing to the responses of major structures and components in both types of plants will not be significantly different but will fall into the same general range.

The structural frequencies will only determine the magnitude of amplification or attenuation of the response. For multi-frequency random-type dynamic loads, the components of input loads whose frequencies coincide with the structural natural frequencies will be amplified and these components will dominate the response. Although the predominant response of a particular structural component may vary somewhat in frequency between the concrete and steel containment configuration, the variances are expected to be small for the range of frequencies of interest for major structures because of the similarities in systems, types of structural configurations, construction materials and massiveness of buildings. Therefore, key characteristics of the responses (duration of strong response motion and number of peaks) are primarily determined by the input component loads to the structure, and because of the similarity of the dynamic nature of the input loads due to earthquake, SRV and LOCA for both types of containment, their structural responses will have similar dynamic characteristics. Hence, the response of the mechanical components and piping systems supported from the two types of containments will also be similar. Hence, the use of SRSS combinations for combining the dynamic responses for the WNP-2 application will be demonstrated to meet the 84% non-exceedance probability level.

Summation:- This item is closed.