

PUBLIC SERVICE COMPANY OF OKLAHOMA

A CENTRAL AND SOUTH WEST COMPANY

P.O. BOX 201 / TULSA, OKLAHOMA 74102 / (918) 583-3611



Public Service Company of Oklahoma
 Black Fox Station
 Transmittal of Omitted Material
 From Previous Correspondence
 Docket STN 50-556 and STN 50-557

December 29, 1978
 File 6212.125.3500.21L

Office of Nuclear Reactor Regulation
 Division of Project Management
 Light Water Reactors Branch No. 4
 U.S. Nuclear Regulatory Commission
 Washington, D. C. 20555

Attention: Steven A. Varga, Chief

Gentlemen:

Please find enclosed the two page document entitled "Criteria for Combinations of Earthquake and/or Other Transient Responses" referred to as the "Newmark - Kennedy Criteria". The second page of this document was inadvertently left out of some copies of the transmittal of December 20, 1978 from Martin Fate to Steven A. Varga on "Methodology for Combining Dynamic Responses of Structures Systems and Components Important to Safety".

Please include this information with the above correspondence.

Very truly yours,

A handwritten signature in cursive script, appearing to read 'V. L. Conrad'.

V. L. Conrad, Manager
 Licensing & Compliance

VLC:SAB:fd
 Attachment
 cc: Black Fox Service List

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Boo!
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CENTRAL AND SOUTH WEST SYSTEM

Central Power and Light
 Corpus Christi, Texas

Public Service Company of Oklahoma
 Tulsa, Oklahoma

Southwestern Electric Power
 Shreveport, Louisiana

West Texas Utilities
 Abilene, Texas

2 October 1978

CRITERIA FOR COMBINATIONS OF EARTHQUAKE
AND/OR OTHER TRANSIENT RESPONSES

Preamble.

The intent of the methods proposed for combinations of transient, dynamic responses is to achieve a non-exceedance probability of approximately 84 percent for the peak combined response of the system, component, or element considered. This goal is achieved by compliance with any one of the following criteria, or any alternative method that meets the intent stated above, provided that the intensity of loads or accelerations for each input are conservatively represented (approximately at the level of the 84th percentile, or the mean plus one standard deviation, of the expected input intensity).

1. Criterion.

Dynamic or transient responses of structures, components and equipment arising from combinations of dynamic loading or motions may be combined by SRSS provided that each of the dynamic inputs or responses has characteristics similar to those of earthquake ground motions, and that the individual component inputs can be considered to be relatively uncorrelated; i.e., the individual dynamic inputs or responses considered are either from independent events or have random peak phasing. This similarity involves a limited number of peaks of force or acceleration (not more than 5 exceeding 75 percent of the maximum, or not more than 10 exceeding 60 percent of the maximum), with approximately zero mean and a total duration of strong motion (i.e., exceeding 50 percent of the maximum) of 10 seconds or less.

Explanation.

Since earthquake motions in various directions produce responses which are combined conservatively by the use of SRSS, the descriptions of dynamic or transient inputs are based on those applicable to earthquake

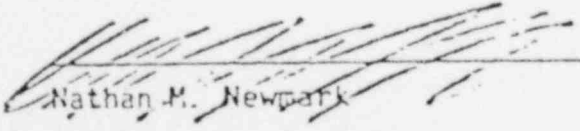
motions. The coefficient of correlation for these is less than 0.4, and the pattern of peaks is based on Table 2 of Circular 672 of the USGS describing earthquake ground motions for use in the design of the Alaska Oil Pipeline. The probability distribution for the responses to earthquake motions is based on the concepts underlying U. S. NRC Regulatory Guide 1.60, where the standard deviation is 30 to 40 percent of the median value.

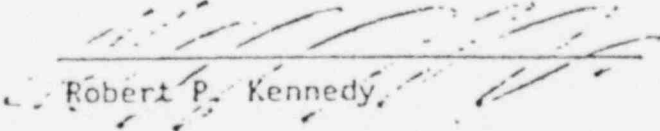
It has been proved some decades ago that modal responses to earthquake motions may be conservatively combined by SRSS methods with the same degree of conservatism as that of the motions. If each of such responses is considered to be at the level of mean plus one standard deviation, the SRSS value is also at this level. For the same reasons, responses from the three component directions of earthquake motions may also be conservatively combined by SRSS methods.

2. Criterion.

When response time-histories are available for all multiple dynamic loadings being combined, SRSS methods may be used for peak combined response when CDF calculations, using appropriate assumptions on the range of possible time lags between the response time-histories, show the following criteria are met:

- a. There is estimated to be less than approximately a 50% conditional probability that the actual peak combined response from these conservatively defined loadings exceeds approximately the SRSS calculated peak response, and
- b. There is estimated to be less than approximately a 15% conditional probability that the actual peak combined response exceeds approximately 1.2 times the SRSS calculated peak response.


Nathan M. Newport


Robert P. Kennedy

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