

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of

PORTLAND GENERAL ELECTRIC COMPANY,
ET AL.

(Trojan Nuclear Plant)

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Docket No. 50-344
(Control Building)

TESTIMONY OF KENNETH S. HERRING,
OFFICE OF NUCLEAR REACTOR REGULATION,
ON FLOOR RESPONSE SPECTRA AND QUALIFICATION OF
SAFETY-RELATED EQUIPMENT AND SYSTEMS
IN THE AS-BUILT CONTROL BUILDING COMPLEX

NOVEMBER 25, 1978

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This testimony is directed at the capability of the safety-related equipment, systems, piping and components in the Control/Auxiliary/Fuel Building complex to withstand earthquakes up to and including the SSE of 0.25g considering the effects of the anomalies (existence of spectral peaks not enveloped by the original response spectra) between the STARDYNE 3-D finite element model and the original stick model. Previous NRC staff testimony regarding interim operation of the Trojan Nuclear Plant with the Control Building walls in their existing state, stated that this item was to be resolved prior to NRC staff concurrence on the issue of interim operation.

To determine the effect of the anomalies between the STARDYNE model and the original stick model, the licensee has generated new horizontal response spectra using a time history analysis of the STARDYNE 3-D finite element model. The expected degradation of the structures, the properties of the materials at this time, and the effects of the results of this overall evaluation of the building complex on the original vertical response spectra for the Control/Auxiliary/Fuel Building complex were considered. The investigation of the response spectra and the effects on the safety-related equipment, systems, piping and components are presented in the licensee submittals on this subject dated October 27, November 2, November 22, and November 24, 1978.

The information contained in these submittals has been reviewed by the NRC staff. We find that the analysis techniques, acceptance criteria, and the results of this investigation are acceptable to support interim operation of the Trojan Nuclear Plant.

Further, given that the appropriate modifications are performed to assure conformance of the equipment, systems, piping and components with the spectra as defined in the October 27 and November 2, 1978 submittals and further widened as indicated in the November 22, 1978 submittal, these investigations are adequate to make the determination that there is reasonable assurance that the safety-related equipment, systems, piping and components in the Control/Auxiliary/Fuel Building complex will withstand an earthquake up to and including the 0.25g SSE.

The spectra calculated as presented in the October 27, and November 2, 1978 submittals considered an elastic case with structural stiffnesses based upon design material properties rather than the as-built properties. These stiffnesses were degraded and inelastic behavior considered to determine the lower bounds for the spectra peaks. While the elastically calculated peaks were broadened to consider possible variation in material properties, masses and analysis techniques, the broadening was not sufficient to make the determination that the peaks were broadened to an elastic high frequency bound which considered the elastic stiffnesses of the existing structure and broadening. Additionally, the lower calculated peaks were not broadened to account for the variations which also have the effect of broadening these peaks. Therefore, it was not obvious from these two submittals that the derived spectra represented the totally elastic (upper bound), and the degraded and inelastic (lower bound) spectral bounds.

The effects of the existing material properties, and expected values and variations of the various parameters which influence the analysis results were addressed in the November 22 and 24, 1978 submittals. The high frequency spectral bounds, with the additional widening of the spectra, as indicated in the November 22, 1978 submittal, provide adequate assurance that the high frequency response to an earthquake is bounded. Additionally, in the November 24, 1978 submittal the adequacy of the originally drawn low spectral frequency peaks considering degradation and the design material properties was confirmed. The widening in these peaks to the low side is assured by the consideration of the existing material properties. The composite walls are stiffer by a factor of about 1.25 and the concrete walls are stiffer by a factor of about $\sqrt{\frac{6600}{5000}} = 1.15$, which imply frequency increase factors of about 1.12 and 1.072, respectively. Additionally, Poisson's ratio reductions imply a frequency increase of about 1.01. Therefore, considering that the building complex has both composite and concrete walls, these stiffness (frequency) increase would ensure that 8.4 percent peak widening would exist on the low frequency spectral bounds.

The results of the additional investigations as described in the submittals referenced herein allow the NRC staff to conclude that the interim operation for the approximate one-year period necessary to effect structural repairs and improvements is appropriate.

This evaluation, which has concluded that interim operation should be permitted, has not considered the effects on interim operation of structural modifications to the Control Building since the proposed modifications are not known in detail at this time. Prior to the time modifications are authorized, the staff will assess whether modifications or portions thereof will require the facility to shutdown prior to and during their performance, or whether other appropriate actions are necessary.

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CERTIFICATE OF SERVICE

I hereby certify that copies of "TESTIMONY OF KENNETH S. HERRING, OFFICE OF NUCLEAR REACTOR REGULATION, ON FLOOR RESPONSE SPECTRA AND QUALIFICATION OF SAFETY-RELATED EQUIPMENT AND SYSTEMS IN THE AS-BUILT CONTROL BUILDING COMPLEX" in the above-captioned proceeding have been served on the following by deposit in the United States mail, first class, or, as indicated by an asterisk, through deposit in the Nuclear Regulatory Commission's internal mail system, this 25th day of November, 1978:

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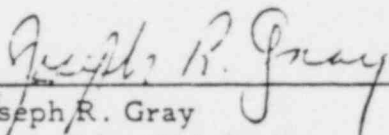
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