FGE Portland General Electric Correany

January 9, 1980

Trojan Nuclear Plant Docket 50-344 License NPF-1

Director of Nuclear Reactor Regulation ATTN: Mr. A. Schwencer, Chief Operating Reactors Branch #1 Division of Operating Reactors U. S. Nuclear Regulatory Commission Washington, D. C. 20555

Dear Sir:

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As indicated in our response dated December 31, 1979 to NRC Staff Question 6 of December 29, 1979 regarding LER 79-15, attached is a sample calculation which compares the use of transverse shear forces directly from the STARDYNE output with those calculated from displacement and rotation output from the same analysis. This completes our response to NRC Staff Question 6a.

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Sincerely,

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c: Mr. R. H. Engelken, Director U. S. Nuclear Regulatory Commission Region V

> Mr. Lynn Frank, Director State of Oregon Department of Energy

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INTERSTORY DRIFT

The following provides justification for the use of transverse shear forces directly from the STARDYNE computer output in lieu of displacement and rotation output from the same analysis. This completes our response of December 31, 1979 to NRC Staff Question 6a.

Element #300 from the STARDYNE model, which is a panel of wall 46 in the Auxiliary Buildling between el. 61' and 77' is selected for the purpose of illustration. The following nodal displacements and rotations in the boundary nodes of element 300 are taken from STARDYNE run for the N-S OBE motion. The first mode output quantities are considered below for purposes of illustration.



Interstory Drift

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	Node	# 1 1	Displacement X ₁ (ft)	Average Displ. X _l (ft) 	. ∆X ₁ (inch)	Rota (X ₅) 	tion 0 (radian) 	Average 0 (radian)
-	273	1	2.39 x 10 ⁻³		1	 2.48 	x 10 ⁻⁵	2.82×10^{-5}
TOL	274	1	1.85 x 10 ⁻³	1	1	3.16	x 10 ⁻⁵	
WC	268		1.41 x 10 ⁻³	1 1 1.42 x 10 ⁻³	-'84 x 10 ⁻⁴	1-2.47	x 10 ⁻⁵	-0.34 x 10 ⁻⁵
BOTTC	269		1.42 x 10 ⁻³		1	1 1.79	x 10 ⁻⁵	

The out-of-plane displacements and rotations, as obtained above from the STARDYNE analysis (N-S motion, 1st mode) will be used to calculate the transverse shear force in the element by application of the following beam formulae:



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Interstory Drift

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$$\begin{aligned} z &= 16 \text{ ft} = 192 \text{ in.} \\ t &= 16 \text{ in.} \\ E &= 4.20 \times 10^5 \text{k/ft}^2 = 2.917 \times 10^6 \text{ psi} \\ I &= \frac{1}{-} \times 12(16)^3 = 4096 \text{ in.}^4 \\ \frac{12}{12} \\ b &= 19.25 \text{ ft} (\text{panel width}) \\ M_1 &= \frac{6E14}{z^2} \\ &= \frac{6(2.917)(10)^6(4096)(84)(10)^{-4}}{192^2} = 16.35 \text{ in-kips} \\ \frac{1}{192^2} \\ M_{\Theta_1}^1 &= \frac{4E1\Theta_1}{z} \\ &= \frac{4(2.917)(10)^6(4096)(2.82)(10)^{-5}}{192} \\ &= 7.02 \text{ in-kips} \\ M_{\Theta_1}^2 &= \frac{2E1\Theta_1}{z} \\ &= 3.51 \text{ in-kips} \\ M_{\Theta_2}^1 &= \frac{4E1\Theta_2}{z} \\ &= -0.85 \text{ in-kips} \\ M_{\Theta_2}^2 &= \frac{2E1\Theta_2}{z} \\ &= -0.42 \text{ in-kips} \end{aligned}$$

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Interstory Drift

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. . .

Final moment at top:

$$M^{1} = M - M^{1} - M^{1}$$

= 16.35 - 7.02 - (-0.42) = 9.75 in-kips

Final moment at bottom:

$$M^{2} = M - M^{2} - M^{2}_{01}$$

= 16.35 - 3.51 - (-0.85) = 13.69 in-kips

Calculated transverse shear:

$$V = \frac{M^{1} + M^{2}}{\ell}$$

= $\frac{9.75 + 13.69}{16 \times 12}$
= 0.122 kip/ft width of wall

Transverse shear force from STARDYNE:

	Node	#	Shear	Panel	Total	Shear
	273		2.17 ^k	2.42k		
TOP	274		0.25 ^k			
BOTTOM	268		-2.51 ^k		-2.42 ^k	
	269		0.09 ^k			

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Interstory Drift

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. . .

Hence, shear = $\frac{2.42}{19.25}$

= 0.126 kip/ft width of wall

The calculated value is approximately 3% below that obtained from STARDYNE. This confirms our response of December 31, 1979 to NRC Staff Question 6a relative to the use of transverse shear forces from the STARDYNE analysis in lieu of displacement profile for the purpose of calculating transverse shear forces due to interstory displacements.

UNITED STATES OF AMERICA NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of) PORTLAND GENERAL ELECTRIC COMPANY,) et al) (Control Building Proceeding) (Trojan Nuclear Plant))

CERTIFICATE OF SERVICE

I hereby certify that on January 9, 1980, Licensee's letter to the Director of Nuclear Reactor Regulation with additional information relative to LER 79-15 has been served upon the persons listed below by depositing copies thereof in the United States mail with proper postage affixed for first class mail.

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Dated: January 9, 1980

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