RESPONSE TO

Discussion of "Comparison of Base Shears Estimated from Floor Accelerations and Column Shears"

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The author agrees with Dr. Pinho about difficulties associated with the use of different damping models in nonlinear dynamic analysis. However, the focus of the original manuscript was to illustrate the difference between base shear estimated from floor accelerations, denoted as inertial base shear, and base shear estimated from column shears, denoted as the structural base shear. The difference between the two base shears exists regardless of the damping model used in the nonlinear analysis. In order to illustrate this conclusion, the Los Angeles building of the original manuscript (Goel 2011) was re-analyzed for Earthquake No. 15 using two different Rayleigh damping models: $\mathbf{C} = \alpha_0\mathbf{m} + \alpha_1\mathbf{k}_{\text{initial}}$, in which the stiffness-proportional component is proportional to the initial elastic stiffness, $\mathbf{k}_{\text{initial}}$, and $\mathbf{C} = \alpha_0\mathbf{m} + \alpha_1\mathbf{k}_{\text{current}}$, in which the stiffness-proportional component is proportional to the current stiffness, $\mathbf{k}_{\text{current}}$.

The nonlinear dynamic analyses, which formed the basis for results presented in the original manuscript, were conducted in PERFORM-3D (CSI 2006). Since PERFORM-3D did not provide an option for including current stiffness in damping formulations, the Los Angeles building was modeled in OpenSees (McKenna and Fenves, 2001) and analyzed using the two damping models. The results are presented in Figure 1 for damping model $\mathbf{C} = \alpha_0\mathbf{m} + \alpha_1\mathbf{k}_{\text{initial}}$, and in Figure 2 for damping model $\mathbf{C} = \alpha_0\mathbf{m} + \alpha_1\mathbf{k}_{\text{current}}$. Note that the results presented in Figure 1 are for the same damping model that was used in Figure 5 of Goel (2011), with the exception that results in Figure 1 are generated using OpenSees, whereas the results in Figure 5 of Goel (2011) were generated using PERFORM-3D; the results in the two figures differ due to slight differences in modeling and analytical approaches used in the two programs. The results presented indicate that the differences similar to those observed in the original manuscript (Goel 2011) based on the $\mathbf{C} = \alpha_0\mathbf{m} + \alpha_1\mathbf{k}_{\text{initial}}$ damping model (Figure 1) exist even when the $\mathbf{C} = \alpha_0\mathbf{m} + \alpha_1\mathbf{k}_{\text{current}}$ damping model (Figure 2) is used. Therefore, the conclusions in the original manuscript about differences between the inertial and structural base shears appear to be independent of the damping model.

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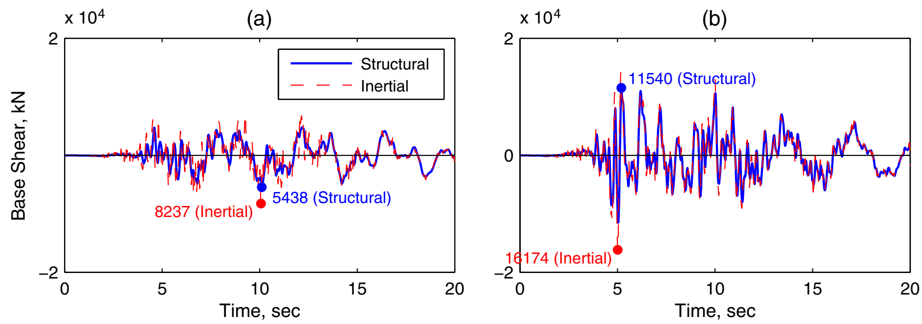

Figure 1. Comparison of inertial and structural base shears in the Los Angeles building for Earthquake No. 15 using the $\mathbf{C} = \alpha_0\mathbf{m} + \alpha_1\mathbf{k}_{\text{initial}}$ damping model: (a) longitudinal direction and (b) transverse direction.

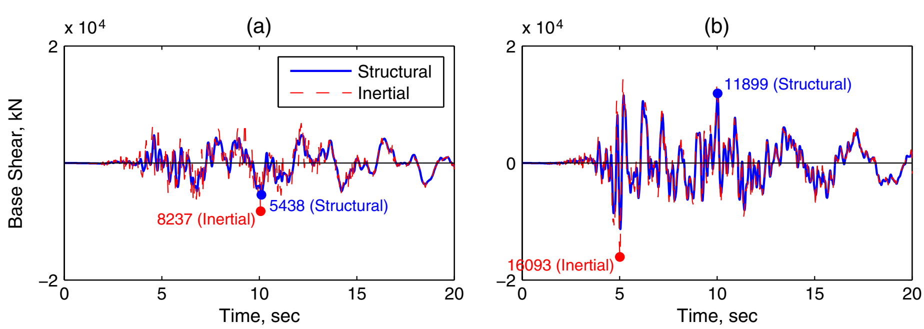

Figure 2. Comparison of inertial and structural base shears in the Los Angeles building for Earthquake No. 15 using the $\mathbf{C} = \alpha_0\mathbf{m} + \alpha_1\mathbf{k}_{\text{current}}$ damping model: (a) longitudinal direction and (b) transverse direction.

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