Chapter C19
SOIL–STRUCTURE INTERACTION FOR SEISMIC DESIGN

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The use of these provisions will decrease the design values of the base shear, lateral forces, and overturning moments, but may increase the computed values of the lateral displacements and the secondary forces associated with the P-delta effects.

A dynamic modifier (α_θ) is included in the formulation of rocking stiffness (K_θ). When back-analyzed period lengthening and foundation damping values from stiff shear-wall structures are compared to predictions from code-type analyses, the predictions become significantly more accurate with the addition of the α_θ term.

For the calculation of impedance terms K_y and K_θ, there are no specific recommendations for when half space versus finite soil layer over rigid base solutions should be used. Studies have shown the stiffness of a two-layer soil model approaches the stiffness of a finite soil layer over a rigid base when the underlying soil layer has a shear wave velocity greater than twice the velocity of the surface layer. The restrictions originally placed on the use of the finite soil layer over rigid base model still apply ($r/D_s < 0.5$, where r = foundation radius and D_s = depth of finite soil layer).

For the calculation of static impedance terms with the half-space solution, one key issue is over what depth the actual soil shear wave velocities should be averaged to provide a representative half-space velocity. Studies have shown that for a variety of velocity profiles, a depth of $0.75r_a$ was appropriate for translational stiffness, and $0.75r_m$ was appropriate for rocking stiffness.

The definitions of K_y and K_θ no longer contain the word "static" because dynamic effects will be considered subsequently for K_θ.