Total design story velocity, Δ_D, shall be determined by the SRSS or complete quadratic combination of modal design velocities.

18.4.3.5 Maximum Considered Earthquake Response

Total modal maximum floor deflection at Level *i*, design story drift values, and design story velocity values shall be based on Sections 18.4.3.1, 18.4.3.3, and 18.4.3.4, respectively, except design roof displacement shall be replaced by maximum roof displacement. Maximum roof displacement of the structure in the direction of interest shall be calculated in accordance with Eqs. 18.4-16 and to 18.4-17:

For $m = 1$,

$$D_{1M} = \left(\frac{g}{4\pi^2}\right)\Gamma_1 \frac{S_{MS}T_{1M}^2}{B_{1M}} \geq \left(\frac{g}{4\pi^2}\right)\Gamma_1 \frac{S_{MS}T_1^2}{B_{1E}},\ T_{1M} < T_S \qquad \text{(18.4-16a)}$$

$$D_{1M} = \left(\frac{g}{4\pi^2}\right)\Gamma_1 \frac{S_{M1}T_{1M}}{B_{1M}} \geq \left(\frac{g}{4\pi^2}\right)\Gamma_1 \frac{S_{M1}T_1}{B_{1E}},\ T_{1M} \geq T_S \qquad \text{(18.4-16b)}$$

For $m > 1$,

$$D_{mM} = \left(\frac{g}{4\pi^2}\right)\Gamma_m \frac{S_{M1}T_m}{B_{mM}} \leq \left(\frac{g}{4\pi^2}\right)\Gamma_m \frac{S_{MS}T_m^2}{B_{mM}} \qquad \text{(18.4-17)}$$

where

B_{mM} = numerical coefficient as set forth in Table 18.6-1 for effective damping equal to β_{mM} and period of the structure equal to T_m

18.5 EQUIVALENT LATERAL FORCE PROCEDURE

Where the equivalent lateral force procedure is used to design structures with a damping system, the requirements of this section shall apply.

18.5.1 Modeling

Elements of the seismic force-resisting system shall be modeled in a manner consistent with the requirements of Section 12.8. For purposes of analysis, the structure shall be considered to be fixed at the base.

Elements of the damping system shall be modeled as required to determine design forces transferred from damping devices to both the ground and the seismic force-resisting system. The effective stiffness of velocity-dependent damping devices shall be modeled.

Damping devices need not be explicitly modeled provided effective damping is calculated in accordance with the procedures of Section 18.6 and used to modify response as required in Sections 18.5.2 and 18.5.3.

The stiffness and damping properties of the damping devices used in the models shall be based on or verified by testing of the damping devices as specified in Section 18.9.

18.5.2 Seismic Force-Resisting System

18.5.2.1 Seismic Base Shear

The seismic base shear, *V*, of the seismic force-resisting system in a given direction shall be determined as the combination of the two modal components, V_1 and V_R, in accordance with Eq. 18.5-1:

$$V = \sqrt{V_1^2 + V_R^2} \geq V_{\min} \qquad \text{(18.5-1)}$$

where

V_1 = design value of the seismic base shear of the fundamental mode in a given direction of response, as determined in Section 18.5.2.2

V_R = design value of the seismic base shear of the residual mode in a given direction, as determined in Section 18.5.2.6

$V_{\min}$ = minimum allowable value of base shear permitted for design of the seismic force-resisting system of the structure in direction of the interest, as determined in Section 18.2.2.1

18.5.2.2 Fundamental Mode Base Shear

The fundamental mode base shear, V_1, shall be determined in accordance with Eq. 18.5-2:

$$V_1 = C_{S1}\bar{W}_1 \qquad \text{(18.5-2)}$$

where

C_{S1} = the fundamental mode seismic response coefficient, as determined in Section 18.5.2.4

$\bar{W}_1$ = the effective fundamental mode seismic weight including portions of the live load as defined by Eq. 18.4-2b for $m = 1$

18.5.2.3 Fundamental Mode Properties

The fundamental mode shape, ϕ_{i1}, and participation factor, Γ_1, shall be determined by either dynamic analysis using the elastic structural properties and deformational characteristics of the resisting elements or using Eqs. 18.5-3 and 18.5-4:

$$\phi_{i1} = \frac{h_i}{h_r} \qquad \text{(18.5-3)}$$