$$\nabla_{RD} = 2\pi \frac{\Delta_{RD}}{T_R} \quad (18.5\text{-}25)$$

where

∇_{1D} = design story velocity due to the fundamental mode of vibration of the structure in the direction of interest

∇_{RD} = design story velocity due to the residual mode of vibration of the structure in the direction of interest

18.5.3.5 Maximum Considered Earthquake Response

Total and modal maximum floor deflections at Level *i*, design story drifts, and design story velocities shall be based on the equations in Sections 18.5.3.1, 18.5.3.3, and 18.5.3.4, respectively, except that design roof displacements shall be replaced by maximum roof displacements. Maximum roof displacements shall be calculated in accordance with Eqs. 18.5-26 and 18.5-27:

$$D_{1M} = \left(\frac{g}{4\pi^2}\right)\Gamma_1 \frac{S_{MS}T_{1M}^2}{B_{1M}} \geq \left(\frac{g}{4\pi^2}\right)\Gamma_1 \frac{S_{MS}T_1^2}{B_{1E}},\ T_{1M} < T_S \quad (18.5\text{-}26a)$$

$$D_{1M} = \left(\frac{g}{4\pi^2}\right)\Gamma_1 \frac{S_{M1}T_{1M}}{B_{1M}} \geq \left(\frac{g}{4\pi^2}\right)\Gamma_1 \frac{S_{M1}T_1}{B_{1E}},\ T_{1M} \geq T_S \quad (18.5\text{-}26b)$$

$$D_{RM} = \left(\frac{g}{4\pi^2}\right)\Gamma_R \frac{S_{M1}T_R}{B_R} \leq \left(\frac{g}{4\pi^2}\right)\Gamma_R \frac{S_{MS}T_R^2}{B_R} \quad (18.5\text{-}27)$$

where

S_{M1} = the MCE_R, 5 percent damped, spectral response acceleration parameter at a period of 1 s adjusted for site class effects as defined in Section 11.4.3

S_{MS} = the MCE_R, 5 percent damped, spectral response acceleration parameter at short periods adjusted for site class effects as defined in Section 11.4.3

B_{1M} = numerical coefficient as set forth in Table 18.6-1 for effective damping equal to β_{mM} (m = 1) and period of structure equal to T_{1M}

18.6 DAMPED RESPONSE MODIFICATION

As required in Sections 18.4 and 18.5, response of the structure shall be modified for the effects of the damping system.

Table 18.6-1 Damping Coefficient, B_{V+I}, B_{1D}, B_R, B_{1M}, B_{mD}, B_{mM} (Where Period of the Structure ≥ T_0)

Effective Damping, β (percentage of critical)	B_{v+I}, B_{1D}, B_R, B_{1M}, B_{mD}, B_{mM} (where period of the structure ≥ T_0)
≤2	0.8
5	1.0
10	1.2
20	1.5
30	1.8
40	2.1
50	2.4
60	2.7
70	3.0
80	3.3
90	3.6
≥100	4.0

18.6.1 Damping Coefficient

Where the period of the structure is greater than or equal to T_0, the damping coefficient shall be as prescribed in Table 18.6-1. Where the period of the structure is less than T_0, the damping coefficient shall be linearly interpolated between a value of 1.0 at a 0-second period for all values of effective damping and the value at period T_0 as indicated in Table 18.6-1.

18.6.2 Effective Damping

The effective damping at the design displacement, β_{mD}, and at the maximum displacement, β_{mM}, of the m^{th} mode of vibration of the structure in the direction under consideration shall be calculated using Eqs. 18.6-1 and 18.6-2:

$$\beta_{mD} = \beta_I + \beta_{Vm}\sqrt{\mu_D} + \beta_{HD} \quad (18.6\text{-}1)$$

$$\beta_{mM} = \beta_I + \beta_{Vm}\sqrt{\mu_M} + \beta_{HM} \quad (18.6\text{-}2)$$

where

β_{HD} = component of effective damping of the structure in the direction of interest due to post-yield hysteretic behavior of the seismic force-resisting system and elements of the damping system at effective ductility demand, μ_D

β_{HM} = component of effective damping of the structure in the direction of interest due to post-yield hysteretic behavior of the seismic force-resisting system and elements of the damping system at effective ductility demand, μ_M

β_I = component of effective damping of the structure due to the inherent dissipation of energy