response amplitude equal to the effective yield displacement of the structure.

The calculation of the work done by individual damping devices shall consider orientation and participation of each device with respect to the mode of vibration of interest. The work done by individual damping devices shall be reduced as required to account for the flexibility of elements, including pins, bolts, gusset plates, brace extensions, and other components that connect damping devices to other elements of the structure.

18.6.3 Effective Ductility Demand

The effective ductility demand on the seismic force-resisting system due to the design earthquake ground motions, μ_D, and due to the maximum considered earthquake ground motions, μ_M, shall be calculated using Eqs. 18.6-8, 18.6-9, and 18.6-10:

$$\mu_D = \frac{D_{1D}}{D_Y} \geq 1.0 \qquad (18.6\text{-}8)$$

$$\mu_M = \frac{D_{1M}}{D_Y} \geq 1.0 \qquad (18.6\text{-}9)$$

$$D_Y = \left(\frac{g}{4\pi^2}\right)\left(\frac{\Omega_0 C_d}{R}\right)\Gamma_1 C_{S1} T_1^2 \qquad (18.6\text{-}10)$$

where

D_{1D} = fundamental mode design displacement at the center of rigidity of the roof level of the structure in the direction under consideration, Section 18.4.3.2 or 18.5.3.2

D_{1M} = fundamental mode maximum displacement at the center of rigidity of the roof level of the structure in the direction under consideration, Section 18.4.3.5 or 18.5.3.5

D_Y = displacement at the center of rigidity of the roof level of the structure at the effective yield point of the seismic force-resisting system

R = response modification coefficient from Table 12.2-1

C_d = deflection amplification factor from Table 12.2-1

Ω_0 = overstrength factor from Table 12.2-1

Γ_1 = participation factor of the fundamental mode of vibration of the structure in the direction of interest, Section 18.4.2.3 or 18.5.2.3 ($m = 1$)

C_{S1} = seismic response coefficient of the fundamental mode of vibration of the structure in the direction of interest, Section 18.4.2.4 or 18.5.2.4 ($m = 1$)

T_1 = period of the fundamental mode of vibration of the structure in the direction of interest

The design ductility demand, μ_D, shall not exceed the maximum value of effective ductility demand, μ_{max}, given in Section 18.6.4.

18.6.4 Maximum Effective Ductility Demand

For determination of the hysteresis loop adjustment factor, hysteretic damping, and other parameters, the maximum value of effective ductility demand, μ_{max}, shall be calculated using Eqs. 18.6-11 and 18.6-12:

For $T_{1D} \leq T_S$,

$$\mu_{max} = 0.5[(R/(\Omega_0 I_e))^2 + 1] \qquad (18.6\text{-}11)$$

For $T_1 \geq T_S$,

$$\mu_{max} = R/(\Omega_0 I_e) \qquad (18.6\text{-}12)$$

where

I_e = the importance factor determined in accordance with Section 11.5.1

T_{1D} = effective period of the fundamental mode of vibration of the structure at the design displacement in the direction under consideration

For $T_1 < T_S < T_{1D}$, μ_{max} shall be determined by linear interpolation between the values of Eqs. 18.6-11 and 18.6-12.

18.7 SEISMIC LOAD CONDITIONS AND ACCEPTANCE CRITERIA

For the nonlinear procedures of Section 18.3, the seismic force-resisting system, damping system, loading conditions, and acceptance criteria for response parameters of interest shall conform with Section 18.7.1. Design forces and displacements determined in accordance with the response-spectrum procedure of Section 18.4 or the equivalent lateral force procedure of Section 18.5 shall be checked using the strength design criteria of this standard and the seismic loading conditions of Section 18.7.1 and 18.7.2.

18.7.1 Nonlinear Procedures

Where nonlinear procedures are used in analysis, the seismic force-resisting system, damping system, seismic loading conditions, and acceptance criteria shall conform to the following subsections.

18.7.1.1 Seismic Force-Resisting System

The seismic force-resisting system shall satisfy the strength requirements of Section 12.2.1 using the seismic base shear, V_{min}, as given by Section 18.2.2.1. The story drift shall be determined using the design earthquake ground motions.