18.2 GENERAL DESIGN REQUIREMENTS

18.2.1 Seismic Design Category A

Seismic Design Category A structures with a damping system shall be designed using the design spectral response acceleration determined in accordance with Section 11.4.4 and the analysis methods and design requirements for Seismic Design Category B structures.

18.2.2 System Requirements

Design of the structure shall consider the basic requirements for the seismic force-resisting system and the damping system as defined in the following sections. The seismic force-resisting system shall have the required strength to meet the forces defined in Section 18.2.2.1. The combination of the seismic force-resisting system and the damping system is permitted to be used to meet the drift requirement.

18.2.2.1 Seismic Force-Resisting System

Structures that contain a damping system are required to have a seismic force-resisting system that, in each lateral direction, conforms to one of the types indicated in Table 12.2-1.

The design of the seismic force-resisting system in each direction shall satisfy the requirements of Section 18.7 and the following:

1. The seismic base shear used for design of the seismic force-resisting system shall not be less than $V_{\min}$, where $V_{\min}$ is determined as the greater of the values computed using Eqs. 18.2-1 and 18.2-2:

$$V_{\min} = \frac{V}{B_{V+I}} \qquad (18.2\text{-}1)$$

$$V_{\min} = 0.75V \qquad (18.2\text{-}2)$$

where

V = seismic base shear in the direction of interest, determined in accordance with Section 12.8

B_{V+I} = numerical coefficient as set forth in Table 18.6-1 for effective damping equal to the sum of viscous damping in the fundamental mode of vibration of the structure in the direction of interest, β_{Vm} ($m = 1$), plus inherent damping, β_I, and period of structure equal to T_1

EXCEPTION: The seismic base shear used for design of the seismic force-resisting system shall not be taken as less than $1.0V$, if either of the following conditions apply:

   a. In the direction of interest, the damping system has less than two damping devices on each floor level, configured to resist torsion.
   b. The seismic force-resisting system has horizontal irregularity Type 1b (Table 12.3-1) or vertical irregularity Type 1b (Table 12.3-2).

2. Minimum strength requirements for elements of the seismic force-resisting system that are also elements of the damping system or are otherwise required to resist forces from damping devices shall meet the additional requirements of Section 18.7.2.

18.2.2.2 Damping System

Elements of the damping system shall be designed to remain elastic for design loads including unreduced seismic forces of damping devices as required in Section 18.7.2.1, unless it is shown by analysis or test that inelastic response of elements would not adversely affect damping system function and inelastic response is limited in accordance with the requirements of Section 18.7.2.6.

18.2.3 Ground Motion

18.2.3.1 Design Spectra

Spectra for the design earthquake ground motions and maximum considered earthquake ground motions developed in accordance with Section 17.3.1 shall be used for the design and analysis of a structure with a damping system. Site-specific design spectra shall be developed and used for design of a structure with a damping system if either of the following conditions apply:

1. The structure is located on a Class F site.
2. The structure is located at a site with S_1 greater than or equal to 0.6.

18.2.3.2 Ground Motion Histories

Ground motion histories for the design earthquake and the maximum considered earthquake developed in accordance with Section 17.3.2 shall be used for design and analysis of all structures with a damping system if either of the following conditions apply:

1. The structure is located at a site with S_1 greater than or equal to 0.6.
2. The damping system is explicitly modeled and analyzed using the response-history analysis method.