where

Q_E = effects of horizontal seismic forces from V or F_p. Where required by Section 12.5.3 or 12.5.4, such effects shall result from application of horizontal forces simultaneously in two directions at right angles to each other
ρ = redundancy factor, as defined in Section 12.3.4

12.4.2.2 Vertical Seismic Load Effect

The vertical seismic load effect, E_v, shall be determined in accordance with Eq. 12.4-4 as follows:

$$E_v = 0.2S_{DS}D \quad (12.4\text{-}4)$$

where

S_{DS} = design spectral response acceleration parameter at short periods obtained from Section 11.4.4
D = effect of dead load

EXCEPTIONS: The vertical seismic load effect, E_v, is permitted to be taken as zero for either of the following conditions:

1. In Eqs. 12.4-1, 12.4-2, 12.4-5, and 12.4-6 where S_{DS} is equal to or less than 0.125.
2. In Eq. 12.4-2 where determining demands on the soil–structure interface of foundations.

12.4.2.3 Seismic Load Combinations

Where the prescribed seismic load effect, E, defined in Section 12.4.2 is combined with the effects of other loads as set forth in Chapter 2, the following seismic load combinations for structures not subject to flood or atmospheric ice loads shall be used in lieu of the seismic load combinations in either Section 2.3.2 or 2.4.1:

Basic Combinations for Strength Design (see Sections 2.3.2 and 2.2 for notation).

5. $(1.2 + 0.2S_{DS})D + \rho Q_E + L + 0.2S$
6. $(0.9 - 0.2S_{DS})D + \rho Q_E + 1.6H$

NOTES:

1. The load factor on L in combination 5 is permitted to equal 0.5 for all occupancies in which L_o in Table 4-1 is less than or equal to 100 psf (4.79 kN/m^2), with the exception of garages or areas occupied as places of public assembly.
2. The load factor on H shall be set equal to zero in combination 7 if the structural action due to H counteracts that due to E. Where lateral earth pressure provides resistance to structural actions from other forces, it shall not be included in H but shall be included in the design resistance.

Basic Combinations for Allowable Stress Design (see Sections 2.4.1 and 2.2 for notation).

5. $(1.0 + 0.14S_{DS})D + H + F + 0.7\rho Q_E$
6. $(1.0 + 0.10S_{DS})D + H + F + 0.525\rho Q_E + 0.75L + 0.75(L_r \text{ or } S \text{ or } R)$
8. $(0.6 - 0.14S_{DS})D + 0.7\rho Q_E + H$

12.4.3 Seismic Load Effect Including Overstrength Factor

Where specifically required, conditions requiring overstrength factor applications shall be determined in accordance with the following:

1. For use in load combination 5 in Section 2.3.2 or load combinations 5 and 6 in Section 2.4.1, E shall be taken equal to E_m as determined in accordance with Eq. 12.4-5 as follows:

$$E_m = E_{mh} + E_v \quad (12.4\text{-}5)$$

2. For use in load combination 7 in Section 2.3.2 or load combination 8 in Section 2.4.1, E shall be taken equal to E_m as determined in accordance with Eq. 12.4-6 as follows:

$$E_m = E_{mh} - E_v \quad (12.4\text{-}6)$$

where

E_m = seismic load effect including overstrength factor
E_{mh} = effect of horizontal seismic forces including overstrength factor as defined in Section 12.4.3.1
E_v = vertical seismic load effect as defined in Section 12.4.2.2

12.4.3.1 Horizontal Seismic Load Effect with Overstrength Factor

The horizontal seismic load effect with overstrength factor, E_{mh}, shall be determined in accordance with Eq. 12.4-7 as follows:

$$E_{mh} = \Omega_o Q_E \quad (12.4\text{-}7)$$

where

Q_E = effects of horizontal seismic forces from V, F_{px}, or F_p as specified in Sections 12.8.1, 12.10, or 13.3.1. Where required by Section 12.5.3 or 12.5.4, such effects shall result from application of horizontal forces simultaneously in two directions at right angles to each other.
Ω_o = overstrength factor

EXCEPTION: The value of E_{mh} need not exceed the maximum force that can develop in the element as determined by a rational, plastic mechanism analysis