

650 Appendix E, and API 620 Appendix L as modified by this standard, and stacks and chimneys that are designed to ACI 307 as modified by this standard, shall be subject to the larger of the minimum base shear value defined by the reference document or the value determined by replacing Eq. 12.8-5 with the following:

$$C_s = 0.044S_{DS}I_e \quad (15.4-3)$$

The value of C_s shall not be taken as less than 0.01.

and for nonbuilding structures located where $S_1 \geq 0.6g$, Eq. 12.8-6 shall be replaced by

$$C_s = 0.5S_1/(R/I_e) \quad (15.4-4)$$

Minimum base shear requirements need not apply to the convective (sloshing) component of liquid in tanks.

3. The importance factor, I_e , shall be as set forth in Section 15.4.1.1.
4. The vertical distribution of the lateral seismic forces in nonbuilding structures covered by this section shall be determined:
 - a. Using the requirements of Section 12.8.3, or
 - b. Using the procedures of Section 12.9, or
 - c. In accordance with the reference document applicable to the specific nonbuilding structure.
5. For nonbuilding structural systems containing liquids, gases, and granular solids supported at the base as defined in Section 15.7.1, the minimum seismic design force shall not be less than that required by the reference document for the specific system.
6. Where a reference document provides a basis for the earthquake resistant design of a particular type of nonbuilding structure covered by Chapter 15, such a standard shall not be used unless the following limitations are met:
 - a. The seismic ground accelerations, and seismic coefficients, shall be in conformance with the requirements of Section 11.4.
 - b. The values for total lateral force and total base overturning moment used in design shall not be less than 80 percent of the base shear value and overturning moment, each adjusted for the effects of soil–structure interaction that is obtained using this standard.
7. The base shear is permitted to be reduced in accordance with Section 19.2.1 to account for the effects of soil–structure interaction. In no case shall the reduced base shear be less than $0.7V$.
8. Unless otherwise noted in Chapter 15, the effects on the nonbuilding structure due to gravity loads

and seismic forces shall be combined in accordance with the factored load combinations as presented in Section 2.3.

9. Where specifically required by Chapter 15, the design seismic force on nonbuilding structures shall be as defined in Section 12.4.3.

15.4.1.1 Importance Factor

The importance factor, I_e , and risk category for nonbuilding structures are based on the relative hazard of the contents and the function. The value of I_e shall be the largest value determined by the following:

- a. Applicable reference document listed in Chapter 23.
- b. The largest value as selected from Table 1.5-2.
- c. As specified elsewhere in Chapter 15.

15.4.2 Rigid Nonbuilding Structures

Nonbuilding structures that have a fundamental period, T , less than 0.06 s, including their anchorages, shall be designed for the lateral force obtained from the following:

$$V = 0.30S_{DS}WI_e \quad (15.4-5)$$

where

V = the total design lateral seismic base shear force applied to a nonbuilding structure

S_{DS} = the site design response acceleration as determined from Section 11.4.4

W = nonbuilding structure operating weight

I_e = the importance factor determined in accordance with Section 15.4.1.1

The force shall be distributed with height in accordance with Section 12.8.3.

15.4.3 Loads

The seismic effective weight W for nonbuilding structures shall include the dead load and other loads as defined for structures in Section 12.7.2. For purposes of calculating design seismic forces in nonbuilding structures, W also shall include all normal operating contents for items such as tanks, vessels, bins, hoppers, and the contents of piping. W shall include snow and ice loads where these loads constitute 25 percent or more of W or where required by the authority having jurisdiction based on local environmental characteristics.

15.4.4 Fundamental Period

The fundamental period of the nonbuilding structure shall be determined using the structural