fluid–structure interaction are permitted to be considered in determining the forces, effective period, and mass centroids of the system if the following requirements are met:

a. The sloshing period, T_c is greater than $3T$ where T = natural period of the tank with confined liquid (rigid mass) and supporting structure.
b. The sloshing mechanism (i.e., the percentage of convective mass and centroid) is determined for the specific configuration of the container by detailed fluid–structure interaction analysis or testing.

Soil–structure interaction is permitted to be included in determining T providing the requirements of Chapter 19 are met.

15.7.10.3 P-Delta Effects

The lateral drift of the elevated tank shall be considered as follows:

a. The design drift, the elastic lateral displacement of the stored mass center of gravity, shall be increased by the factor C_d for evaluating the additional load in the support structure.
b. The base of the tank shall be assumed to be fixed rotationally and laterally.
c. Deflections due to bending, axial tension, or compression shall be considered. For pedestal tanks with a height-to-diameter ratio less than 5, shear deformations of the pedestal shall be considered.
d. The dead load effects of roof-mounted equipment or platforms shall be included in the analysis.
e. If constructed within the plumbness tolerances specified by the reference document, initial tilt need not be considered in the P-delta analysis.

15.7.10.4 Transfer of Lateral Forces into Support Tower

For post supported tanks and vessels that are cross-braced:

a. The bracing shall be installed in such a manner as to provide uniform resistance to the lateral load (e.g., pretensioning or tuning to attain equal sag).
b. The additional load in the brace due to the eccentricity between the post to tank attachment and the line of action of the bracing shall be included.
c. Eccentricity of compression strut line of action (elements that resist the tensile pull from the bracing rods in the seismic force-resisting systems) with their attachment points shall be considered.
d. The connection of the post or leg with the foundation shall be designed to resist both the vertical and lateral resultant from the yield load in the bracing assuming the direction of the lateral load is oriented to produce the maximum lateral shear at the post to foundation interface. Where multiple rods are connected to the same location, the anchorage shall be designed to resist the concurrent tensile loads in the braces.

15.7.10.5 Evaluation of Structures Sensitive to Buckling Failure

Shell structures that support substantial loads may exhibit a primary mode of failure from localized or general buckling of the support pedestal or skirt due to seismic loads. Such structures may include single pedestal water towers, skirt-supported process vessels, and similar single member towers. Where the structural assessment concludes that buckling of the support is the governing primary mode of failure, structures specified in this standard to be designed to subsections a and b below and those that are assigned as Risk Category IV shall be designed to resist the seismic forces as follows:

a. The seismic response coefficient for this evaluation shall be in accordance with Section 12.8.1.1 of this standard with I_e/R set equal to 1.0. Soil–structure and fluid–structure interaction is permitted to be utilized in determining the structural response. Vertical or orthogonal combinations need not be considered.
b. The resistance of the structure shall be defined as the critical buckling resistance of the element, that is, a factor of safety set equal to 1.0.

15.7.10.6 Welded Steel Water Storage Structures

Welded steel elevated water storage structures shall be designed and detailed in accordance with the seismic requirements of AWWA D100 with the structural height limits imposed by Table 15.4-2.

15.7.10.7 Concrete Pedestal (Composite) Tanks

Concrete pedestal (composite) elevated water storage structures shall be designed in accordance with the requirements of ACI 371R except that the design input forces shall be modified as follows:

In Eq. 4-8a of ACI 371R,

For $T_s < T \le 2.5$ s, replace the term $\dfrac{1.2C_v}{RT^{2/3}}$ with

$$\frac{S_{D1}}{T\left(\dfrac{R}{I_e}\right)} \qquad (15.7\text{-}24)$$