PROPOSAL 8-10R5 (2009)

SCOPE: Section 15.7.6.1 and Commentary Section C15.7.6.1

PROPOSAL FOR CHANGE:

Revise the following Sec. 15.7.6.1 to Part 1 of the 2009 *Provisions*:

For $T_c > T_L$:

$$S_{ac} = \frac{1.5 S_{D1} T_L}{T_c^2} \qquad (15.7\text{-}11)$$

EXCEPTION: For $T_c > 4$ sec, S_{ac} may be determined by a site-specific study using one or more of the following methods: (i) the procedures found in Chapter 21, provided such procedures, which rely on ground-motion attenuation equations for computing response spectra, cover the natural period band containing T_c, (ii) ground-motion simulation methods employing seismological models of fault rupture and wave propagation, and (iii) analysis of representative strong-motion accelerogram data with reliable long-period content extending to periods greater than T_c. However, in no case shall the value of S_{ac} be taken as less than the minimum of:

a. the value determined in accordance with Eq. 15.7-11 using 50% of the mapped value of T_L from Chapter 22, or

b. 0.8 times the value determined in accordance with Equation 15.7-11 using the mapped value of T_L from Chapter 22.

In determining the value of S_{ac}, the value of T_L shall not be less than 4 seconds.

Revise the following Sec. C15.7.6.1 to Part 2 Commentary of the 2009 *Provisions*:

C15.7.6.1 General. The response of ground storage tanks to earthquakes is well documented by Housner, Mitchell and Wozniak, Veletsos, and others. Unlike building structures, the structural response of these tanks is influenced strongly by the fluid-structure interaction. Fluid-structure interaction forces are categorized as sloshing (convective) and rigid (impulsive) forces. The proportion of these forces depends on the geometry (height-to-diameter ratio) of the tank. API 650, API 620, AWWA D100, AWWA D110, AWWA D115, and ACI 350.3 provide the data necessary to determine the relative masses and moments for each of these contributions.

The standard requires that these structures be designed in accordance with the prevailing reference documents, except that the height of the sloshing wave, δ_s, must be calculated using Equations 15.7-13. Note that API 650 and AWWA D100 include this requirement in their latest editions.

Equations 15.7-10 and 15.7-11 provide the spectral acceleration of the sloshing liquid for the constant-velocity and constant-displacement regions of the response spectrum, respectively. The 1.5 factor in these equations is an adjustment for 0.5 percent damping. An exception in the use of Equation 15.7-11 was added in the 2009 *Provisions*. Actual site specific studies carried out since the introduction of the T_L requirements of ASCE 7-05 indicate that the mapped values of T_L are extremely conservative. Because a revision of the T_L maps is a time consuming task that would not be possible in the 2009 revision cycle, an exception was added to allow the use of site specific values that are less than the mapped values with a floor of 4 seconds or one-half the mapped value of T_L. The exception was added under 15.7.6 because T_L is a tank issue. Discussion of the site specific procedures can be found in the Chapter 22 Commentary.

REASON FOR PROPOSAL:

Actual site specific studies carried out since the introduction of the T_L requirements of ASCE 7-05 indicate that the mapped values of T_L are extremely conservative. Because a revision of the T_L maps is a time consuming task that will not be possible in this revision cycle, it is proposed that site specific values may be used that are less than the mapped values with a floor of 4 seconds or one-half the mapped value of T_L. The exception is added under 15.7.6 because T_L is a tank issue.