PROPOSAL 3-5 (2009) – Rev 2

SCOPE: 11.8

Revise Provisions Section 11.8 as follows:

11.8 GEOLOGIC HAZARDS AND GEOTECHNICAL INVESTIGATION

11.8.1 Site Limitation for Seismic Design Categories E and F. A structure assigned to Seismic Design Category E or F shall not be located where there is a known potential for an active fault to cause rupture of the ground surface at the structure.

11.8.2 Geotechnical Investigation Report Requirements for Seismic Design Categories C through F. A geotechnical investigation report shall be provided for a structure assigned to Seismic Design Category C, D, E or F in accordance with this section. An investigation shall be conducted and a report shall be submitted that shall include an evaluation of the following potential geologic and seismic hazards:

a. slope instability;
b. liquefaction;
c. differential settlement; and
d. surface displacement due to faulting or lateral spreading.

The report shall contain recommendations for appropriate foundation designs or other measures to mitigate the effects of the above hazards.

Exception: Where deemed appropriate by the authority having jurisdiction, a site-specific geotechnical report is not required where prior evaluations of nearby sites with similar soil conditions provide sufficient direction relative to the proposed construction.

11.8.3 Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F. The geotechnical investigation report for a structure assigned to Seismic Design Category D, E or F shall include:

1. The determination of lateral pressures on basement and retaining walls due to earthquake motions.
2. The potential for liquefaction and soil strength loss evaluated for site peak ground accelerations, earthquake magnitudes, and source characteristics consistent with the maximum considered earthquake ground motions. Peak ground acceleration is permitted to be determined based on a site-specific study taking into account soil amplification effects or, in the absence of such a study, peak ground acceleration shall be assumed equal to PGA_M from Eq. 11.8-1.

3. Assessment of potential consequences of liquefaction and soil strength loss, including estimation of differential settlement, lateral movement, lateral loads on foundations, reduction in foundation soil-bearing capacity, increases in lateral pressures on retaining walls, and flotation of buried structures.

4. Discussion of mitigation measures such as, but not limited to, ground stabilization, selection of appropriate foundation type and depths, selection of appropriate structural systems to accommodate anticipated displacements and forces, or any combination of these measures and how they shall be considered in the design of the structure.

5. Where structures are designed to resist forces computed from soil movement, the design force is permitted to be taken as two-thirds of the force developed from the response to maximum considered earthquake ground motions.

$$PGA_M = F_{PGA}\, PGA \qquad \text{(Eq. 11.8-1)}$$

where

PGA_M = Maximum considered earthquake peak ground acceleration adjusted for Site Class effects.

PGA = Mapped maximum considered earthquake peak ground acceleration shown in Figures 22-_ through 22-_.

F_{PGA} = Site coefficient from Table 11.8-1.

Table 11.8-1 Site Coefficient F_{PGA}

Site Class	Mapped Maximum Considered Peak Ground Acceleration, PGA				
	PGA ≤ 0.1	**PGA = 0.2**	**PGA = 0.3**	**PGA = 0.4**	**PGA ≥ 0.5**
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7				
Note: Use straight-line interpolation for intermediate values of PGA.					

REASON FOR PROPOSAL:

Following up on the discussions of Proposal 3-5 at the April 7 PUC meeting, Section 11.8.3 paragraph 2 is modified to require that evaluations of liquefaction potential be made for maximum considered earthquake (MCE) ground motions rather than design earthquake ground motions to assure that the potential occurrence and effects of liquefaction during the MCE are considered in geotechnical and structural design. This change is consistent with the adoption of a risk-based target for collapse prevention as a performance goal as well as with other evaluations for the MCE required by the Provisions when judged necessary to meet the

collapse-prevention performance goal during MCE loading. The addition of paragraph 5 to Section 11.8.3 permits use of design forces for structural design to be at the design earthquake level (2/3 of the MCE) where structures are designed to resist forces computed from soil movement.

The proposal also requires that liquefaction potential evaluations be conducted using mapped peak ground acceleration (maps provided in a separate proposal) adjusted for site effects rather than using the current approximation for peak ground acceleration of multiplying short-period spectral acceleration by a factor of 0.4. The new maps provide substantially more accurate values for PGA since they are based on PGA attenuation relationships. PGA is modified for site class effects using Eq. 11.8-1 where the site coefficient F_{PGA} is obtained from Table 11.8-1. Values of F_{PGA} in the table are identical to F_a in Table 11.4-1 but are a function of PGA rather than S_S, where PGA is set equal to 0.4 S_S. Because PGA is a short-period parameter (equal to zero-period spectral acceleration), it is appropriate and consistent with current practice to use the same site coefficients for PGA and S_S. Setting PGA equal to $0.4S_S$ for the purpose of determining site coefficients in Table 11.8-1 is also consistent with the original development of F_a as a function of PGA.

TS 3 VOTE:

Yes =11 *Yes with Reservations = 1* *No =0* *Not Voting =1*

The YR vote came from Tom Hale. His reason for the YR vote is as follows:

I vote Yes with Reservations (YR) on revised Proposal 3-5.

My concerns are with Section 11.8.3, item 5, the design of structural components using 2/3s of the forces derived from the MCE displacements. Where the structural component design is displacement based, then the design forces from this provision do not make sense. Piles are structural components which would be subject to a displacement based design (using LPILE or similar computer program). I propose the following text to replace item 5:

"5. Where structures or structural components are designed to resist forces or displacements computed from soil movement, the design force is permitted to be taken as two-thirds of the force developed from the response to maximum considered earthquake ground motions or the design displacement is permitted to taken from ground motions that are two-thirds of the maximum considered earthquake."

Non-Persuasive. Wording in Item 5 is adequate.