11.3 - Notation

Add the following definitions:

D_{min} = distance between the back of MSE facing elements and any concrete footing element (11.10.11)

H_{max} = distance between superstructure soffit and finished grade in front of the MSE facing (11.10.11)

This page intentionally left blank

11.5.1—General

Revise 2nd Paragraph of Article 11.5.1 as follows:

Abutments, piers and retaining walls shall be designed to withstand lateral earth and water pressures, including any live and dead load surcharge, the self weight of the wall, temperature and shrinkage effects, and earthquake loads (if applicable) in accordance with the general principles specified in this Section.

Revise the 3rd Paragraph as follows:

Earth retaining structures shall be designed for a service life based on consideration of the potential long-term effects of material deterioration, seepage, stray currents and other potential deleterious environmental factors on each of the material components comprising the structure. For most applications, permanent retaining walls should be designed for a minimum service life of 75 years. Retaining wall applications defined as temporary shall be considered to have a service life of ~~36 months~~ 5 years or less.

This page intentionally left blank

11.5.6—Load Combinations and Load Factors

Revise Article 11.5.6 as follows:

~~Abutments, p~~Piers and retaining structures and their foundations and other supporting elements shall be proportioned for all applicable load combinations specified in Article 3.4.1. Abutments and their foundations shall be proportioned for all applicable load combinations specified in Article 3.4.5.

This page intentionally left blank

Modify Table

Table 11.5.7-1–Resistance Factors for Permanent Retaining Walls

Wall-Type and Condition		Resistance Factor
Nongravity Cantilevered and Anchored Walls		
Axial compressive resistance of vertical elements		Article 10.5 applies
Passive resistance of vertical elements		~~0.75~~ 1.00
Pullout resistance of anchors(1)	• Cohesionless (granular) soils • Cohesive soils • Rock	0.65(1) 0.70(1) 0.50(1)
Pullout resistance of anchors(2)	Where proof tests are conducted	1.0(2)
Tensile resistance of anchor tendon	• Mild steel (e.g., ASTM A615 bars) • High strength steel (e.g., ASTM A722 bars) • High strength steel strands (e.g. ASTM A416)	0.90(3) 0.80(3) 0.75(3)
Flexural capacity of vertical elements		0.90
Mechanically Stabilized Earth Walls, Gravity Walls, and Semigravity Walls		
Bearing resistance	• Gravity and semi-gravity walls • MSE walls	0.55 0.65
Sliding	• Friction • Passive resistance	1.00 0.50
Tensile resistance of metallic reinforcement and connectors	Strip reinforcements(4) • Static loading Grid reinforcements(4)(5) • Static loading	 ~~0.75~~ 0.90 ~~0.65~~ 0.80
Tensile resistance of geosynthetic reinforcement and connectors	• Static loading	0.90
Pullout resistance of tensile reinforcement	• Static loading	0.90
Prefabricated Modular Walls		
Bearing		Article 10.5 applies
Sliding		Article 10.5 applies
Passive resistance		Article 10.5 applies

(1) Apply to presumptive ultimate unit bond stresses for preliminary design only in Article C11.9.4.2.

(2) Apply where proof test(s) are conducted on every production anchor to a load of 1.0 or greater times the factored load on the anchor.

(3) Apple to maximum proof test load for the anchor. For mild steel apply resistance factor to Fy.For high-strength steel apply the resistance factor to guaranteed ultimate tensile strength.

(4) Apply to gross cross-section less sacrificial area. For sections with hole, reduce gross area in accordance with Article 6.8.3 and apply to net section less sacrificial area.

(5) Applies to grid reinforcement connected to a rigid facing element, e.g., a concrete panel or block. For grid reinforcements connected to a flexible facing mat or which are continuous with the facing mat, use the resistance factor for strip reinforcements.

This page intentionally left blank

11.6.1.5.2—Wingwalls

Modify as follows:

Reinforcement bars or suitable rolled sections shall be spaced across the junction between wingwalls and abutments to tie them together. Such bars shall extend into the concrete and/or masonry on each side of the joint far enough to develop the strength of the bar as specified for bar reinforcement, and shall vary in length so as to avoid planes of weakness in the concrete at their ends. If bars are not used, an expansion joint shall be provided and the wingwall shall be keyed into the body of the abutment.

11.6.1.6—Expansion and Contraction Joints

Modify as follows:

Weakened plane ~~Contraction~~ joints shall be provided at intervals not exceeding 24.0 ~~30.0~~ ft and expansion joints at intervals not exceeding 96.0 ~~90.0~~ ft for conventional retaining walls and abutments. All joints shall be filled with approved filling material to ensure the function of the joint. Joints in abutments shall be located approximately midway between the longitudinal members bearing on the abutments.

This page intentionally left blank

Revise Title:

11.6.5—Seismic Design for ~~Abutments and~~ Conventional Retaining Walls

C11.6.5

Add Article C11.6.5 as follows:

Abutments founded in competent soil have been exempted from Extreme Event (Seismic) design considering the following facts:

- Post seismic observations have not shown any catastrophic damage to abutments that resulted in collapse, provided that enough seat width has been provided for superstructure movements.
- For non-integral type abutments, excessive movement of the abutment towards the bridge is prevented by contact of the back wall to the superstructure.
- Components of the abutments, such as shear keys and the backwall, are designed to break without causing any failure in the foundation system.
- Overall (slope) stability check is performed by the geotechnical professional.

11.6.5.1—General

Revise: 1st sentence of the 1st paragraph as follows:

Rigid gravity and semigravity retaining walls ~~and abutments~~ shall be designed to meet overall stability, external stability, and internal stability requirements during seismic loading.

Delete the 3rd paragraph of Article 11.6.5.1:

~~For bridge abutments, the abutment seismic design should be conducted in accordance with Articles 5.2 and 6.7 of AASHTO's Guide Specifications for LRFD Seismic Bridge Design but with the following exceptions:~~

- ~~K_h should be determined as specified in Article 11.6.5.2 and~~
- ~~Lateral earth pressure should be estimated in accordance with Article 11.6.5.3~~

Revise Title:

11.6.5.4—Calculation of Seismic Earth Pressure for Nonyielding ~~Abutments and~~ Walls

Revise 1st sentence of the 1st paragraph as follows:

For ~~abutments walls and other~~ walls that are considered nonyielding, the value k_h used to calculate seismic earth pressure shall be increased to $1.0k_{h0}$,, unless the Owner approves the use of more sophisticated numerical analysis techniques to determine the seismically induced earth pressure acting on the wall.

This page intentionally left blank

11.10.6.4.2a—Steel Reinforcements

Add the following before Paragraph 4:

When soil backfill conforms to the following criteria:

- pH = 5 to 10
- Resistivity ≥ 2000 ohm-cm
- Chlorides ≤ 250 ppm
- Sulfates ≤ 500 ppm
- Organic Content ≤ 1 percent

Sacrificial thicknesses shall be computed for each exposed surface as follows:

- Loss of galvanizing takes 10 years
- Loss of carbon steel = 1.1 mil./yr. after zinc depletion

C11.10.6.4.2a

Add a new paragraph to Article after Paragraph 4:

Considerable data from numerous MSE in California has been gathered for a national research project to develop the resistance and load factors for corrosion in actual field conditions. As a result, the equations, design parameters and construction specifications are under review. This section continues current practice in conjunction with the more aggressive soils permitted in current Caltrans construction specifications, until that review is complete.

This page intentionally left blank

11.10.11— MSE Abutments

Modify the following text in the 6th Paragraph:

~~The minimum distance from the centerline of the bearing on the abutment to the outer edge of the facing shall be 3.5 ft.~~ The minimum soil cover over the footing shall be 2.0 ft. The minimum thickness of compacted backfill between the concrete footing elements and the soil reinforcement shall be 4 inches. The minimum distance, D_{min}, between the back ~~face of the panel and the~~ of the MSE facing elements and any element of the concrete footing shall be ~~6.0 in~~ as follows

$$D_{min} = 8 - 0.3(20 - H_{max}) \geq 5 \text{ ft.} \qquad (11.10.11\text{-}3)$$

Where H_{max} is the clear distance between the superstructure soffit and the finished grade in front of the MSE facing. The maximum clearance, H_{max}, shall be 30 ft.

Modify the following text in the 9th Paragraph:

In pile or drilled shaft supported abutments, the horizontal forces transmitted to the deep foundation elements shall be resisted by the lateral capacity of the deep foundation elements by provision of additional reinforcements to tie the drilled shaft or pile cap into the soil mass, or by batter piles. Lateral loads transmitted from the deep foundation elements to the reinforced backfill may be determined using a P-Y lateral load analysis technique. The facing shall be isolated from horizontal loads associated with lateral pile or drilled shaft deflections. A minimum clear distance of ~~1.5~~ 5.0 ft shall be provided between the facing and all deep foundation elements. Piles or drilled shafts shall be specified to be placed prior to wall construction and cased through the fill if necessary.

This page intentionally left blank