

Section 14 – Retaining Walls with Sound Walls

Retaining Wall Type 1SWBP - Details No. 1 & 2

XS Sheet Numbers

XS14-320-1, XS14-320-2

Description of Component

These XS sheets are designed to meet AASHTO LRFD Bridge Design Specifications, 8th edition with Caltrans Amendments. These XS sheets should be used with xs15-130-1 and xs15-130-2. The sound walls are supported on concrete cantilever retaining walls, with concrete barrier type 842 (MOD). These retaining walls are on pile foundations using standard Class 90 piles.

Standard Drawing Features

The XS14-320-1 and XS14-320-2 consist of details for pile footing retaining walls supporting sound walls on concrete barriers Type 842 (MOD).

Design/General Notes

General notes shown on the XS sheets under Design Data. Geotechnical design is required to verify pile axial and lateral capacities assumed by the design. Passive resistance on footings and lateral pile resistance, horizontal components of battered piles are required for resisting lateral force effects.

Class 90 piles must have a minimum side dimension of 14 inches to produce the lateral resistance specified in the design notes.

Wind Loads

Wind loads are applied per AASHTO LRFD Bridge Design Specifications 8th Edition Section 15.8.2. Design wind pressures shall be determined using Section 3 of LRFD.

$$P_z = 2.56 \times 10^{-6} K_z G C_D \quad (\text{AASHTO 3.8.1.2.1-1})$$

Wind exposure category = D

The pressure exposure and elevation coefficient (K_z) shall be determined based on the site ground surface roughness, wind exposure category, and structure height (Z).

Z = Structure height (ft). In these XS Sheets, Z is assumed to be

Z = minimum of 33 ft or (Wall Design Height + Concrete Barrier Height + Soundwall Height)

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Table 1 – Wind Pressures

Load Combination	3-second Gust Wind Speed (mph)	Design Wind Pressure (psf)
Strength III	110	36.5 - 39.1
Strength V	80	19.6
Service I	70	15.0

The wind exposure categories, structure heights, and other values have been conservatively selected. These selections result in relatively high design wind pressures (P_z) values ranging from 36.5 psf to 39.1 psf for Strength III wind design pressure (refer to Table 1). Note that wind design pressures according to the AASHTO 8th edition are different for different loading combinations.

For site-specific designs, it is expected that designers will select the appropriate K_z Coefficient values for the site from the relevant AASHTO sections. The standard details may be used in all locations where the site-determined design wind pressures (P_z) are equal to or less than those used for the standard design details sheets (refer to Table 1). The higher pressures in Table 1 above does not consider the special wind regions as shown in AASHTO Figure 3.8.1.1.2-1. Where the retaining wall is constructed atop an embankment, Z should be measured from the lower ground surface surrounding the embankment.

For application of the design wind load pressure on the wall, AASHTO stipulates that it should be applied as a line load at 55% of the wall height.

Additional Drawings Needed to Complete PS&E

Wall horizontal and vertical layouts must be shown on the project plans. References to details on Caltrans Standard Plans B0-3, B3-5 and B3-6 can be made on the project plans as and when applicable. Sound wall layouts and applicable Standard Plan References must also be provided. Employ Bridge Standard Detail sheets xs15-130-1 and xs15-130-2 for masonry block sound walls and concrete barrier type 842 (MOD) on retaining walls as applicable.

For internal drainage, either pervious backfill material or geocomposite drain may be used.

Contract Specifications

Caltrans Standard Specifications: Section 49 Piling; Section 51 Concrete Structures, Section 52 Reinforcement, 58 Sound Walls and Section 83 Railings and Barriers.

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Restrictions on Use of Standard Drawings

Standard Drawing walls assume a maximum 16'-2" combined height of sound wall and concrete barrier type 842(MOD) measured from top of stem. A special design is required for taller sound wall heights, or sound walls that are heavier than the Caltrans Standard Plan sound walls. Site-specific seismic determinations are also required when seismic acceleration coefficient (k_h) is higher than 0.3.

Special Considerations

Retaining walls with Design height of 12 feet or shorter supporting barriers and with footing lengths shorter than 40' require special design for Extreme II (for Vehicular Impact) load cases.