

Sound Barrier Wall Design Criteria

1.0 Design Specifications

Except as noted otherwise in these requirements, design sound barriers in accordance with the requirements of the AASHTO LRFD Bridge Design Specifications.

Modify Section 15 of the AASHTO LRFD Bridge Design Specifications by replacing the third and fourth paragraphs of Article 15.8.2 with the following:

“For sound barriers, base the wind velocity at 30.0 feet above low ground or above design water level, V30, on the county in which the barrier is located. For Beaufort, Berkeley, Charleston, Colleton, Dorchester, Georgetown, Horry, and Jasper Counties, use 110 mph for V30. For Aiken, Allendale, Bamberg, Barnwell, Calhoun, Clarendon, Dillon, Florence, Hampton, Marion, Orangeburg, and Williamsburg Counties, use 100 mph for V30. For all other counties, use 90 mph for V30. For a project that crosses a county line, design all sound barriers in the project for the higher wind velocity of the two counties if the velocities are different.

For sound barriers, use the factors V_o and Z_o only from the Coastal, Open Country, and Sparse Suburban columns of Table 15.8.2-1.”

2.0 Materials

Construct ground-mounted sound barrier walls using cast-in-place concrete, precast concrete panels and/or precast concrete posts. Support the barriers by spread footings, driven or drilled piles, or drilled shafts.

Use Class 4000 concrete for cast-in-place concrete, Class 4000P concrete for non-prestressed precast concrete, Class 5000 concrete for precast, prestressed concrete, and Class 4000DS concrete for drilled shafts and drilled piles.

Use reinforcing bars conforming with the requirements of ASTM A 706, Grade 60. Use Welded Wire Fabric meeting the requirements of AASHTO M 55 or AASHTO M 221. Use prestressing strands that are low-relaxation, 7-wire strands and that conform to AASHTO M 203, Grade 270.

Use elastomeric bearing pads conforming to the requirements of Section 724 of the SCDOT Standard Specifications for Highway Construction.

Use steel H-piles, steel pipe piles, prestressed concrete piles, or combination piles (prestressed concrete piles with steel pile extensions). If steel piles are extended and used as posts, detail the post portions of the piles with a precast concrete encasement that extends to at least 2 feet below the finished ground line.

3.0 Design and Detailing Requirements

3.1 General

The maximum permissible wall height is 25 feet. Detail the top of wall not to exceed a 2 feet vertical step between adjacent panels. Detail the wall panels to extend a minimum of 6 inches below the finished ground line. If a leveling pad is used, construct the pad of reinforced concrete that is a minimum of 6 inches thick and that extends a minimum of 3 inches beyond each face of the panel.

Design and detail the wall to accommodate obstructions (drainage, light or sign foundations, utilities, etc.) in the foundation zone.

Do not use precast panels that are longer than 20 feet. Use a consistent panel length for the entire length of the wall. Detail panels located in a horizontal curve to follow the roadway alignment. To minimize the chording effect of panels in a horizontal curve, consider the need to use shorter length panels.

3.2 Foundation Design

Perform subsurface investigations for sound barriers in accordance with the requirements of Section 4.3.6 of the SCDOT Geotechnical Design Manual.

Evaluate overall static and seismic stability of the ground supporting the sound barrier foundation system using the requirements of the SCDOT Geotechnical Design Manual. If it is determined that ground improvements are required, use a design methodology and construction specifications that comply with the requirements of the SCDOT Geotechnical Design Manual.

Calculate pile embedment design for lateral stability using P-y curves developed for the soils at the site, as used in LPILE.

Over the 75-year design life of the wall, limit the vertical settlement at any point of the wall to a maximum of 3 inches and limit the vertical differential settlement along the wall to a maximum of 1.25 inches in 50 feet. Limit the lateral displacement of the foundation at the base of the wall to a maximum of 1 inch.

3.3 Seismic Design

For the Acceleration Coefficient (A), use the Peak Ground Acceleration (PGA) for the Functional Evaluation Earthquake as modified by the appropriate Site Class.

3.4 Wind Design

Limit the maximum deflection at the top of the wall due to service wind load to the lesser of 1/50 of the wall height or 5 inches (deflection measured relative to the point of fixity in the soil).

3.5 Concrete Cover

Provide concrete cover that meets or exceeds the requirements of Section 15.3.1.2 of the SCDOT Bridge Design Manual.

3.6 Anti-Graffiti Coating

Apply an anti-graffiti coating to both sides of the concrete panels and to all exposed faces of the concrete posts.