NOISE BARRIER WALL DESIGN CRITERIA

1. DESIGN SPECIFICATIONS

Except as noted otherwise in these requirements, design noise 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 noise 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 noise barriers in the project for the higher wind velocity of the two counties if the velocities are different.

For noise barriers, use the factors Vo and Zo only from the Coastal, Open Country, and Sparse Suburban columns of Table 15.8.2-1."

2. MATERIALS

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

When required on specific noise barriers as determined by the final design noise analysis or NEPA commitment, provide sound absorptive material integral with and on the interstate traffic face of the precast concrete panels. See noise wall special provisions for additional requirements.

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 or use galvanized piles in accordance with the special provisions.

3. DESIGN AND DETAILING REQUIREMENTS

3.1 General

The maximum permissible wall height is 25 feet from ground line to top of panels. 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 Horizontal Alignment of Noise Barrier

Place noise barriers as far from the travel lanes as practical. The most desirable locations are just inside the right-of-way or outside of the clearzone. Noise barriers should be located to take advantage of terrain with higher elevation, if possible. In a roadway cut area, a noise barrier located along the right-of-way will often result in a lower noise barrier height than where located along the shoulder. Conversely, in a roadway fill area, a noise barrier located along the shoulder will often result in a lower noise barrier height.

Where located at the edge of the roadway shoulder (common in fill sections) or within the clearzone, protect the noise barrier with either guardrail or a concrete roadside barrier. Noise barrier design and placement, including protection treatment, shall not reduce the required roadway shoulder width. Where guardrail is located in front of a noise barrier, provide a minimum offset of 7 feet from face of guardrail to face to noise barrier to allow for guardrail deflection and pave the area between guardrail and face of noise barrier as directed in Exhibit 4a. Design concrete roadside barriers in accordance with Exhibit 4b.

Extend noise barriers past the end receiver at least four times the perpendicular distance from the receiver to the noise barrier. This distance may be shortened by bending the wall back toward the receiver.

Stopping sight distance along the roadway must be provided along the entire length of the noise barrier. This is of particular concern for noise barrier segments located along the inside of horizontal curves at the edge of the roadway shoulder, and where a noise barrier terminates at a ramp intersection or intersection with another roadway.

Where a gap in a noise barrier is necessary, such as when providing an opening for vehicular access or a drainage ditch, overlap the two segments. Provide an overlap ratio

between the overlap distance and gap width (between noise barriers) of at least 4:1 to maintain the integrity of the noise mitigation.

Where available and when the noise barrier has a height of six feet or more, the noise barrier may act as control of access, in place of controlled access fencing. Where the noise wall has breaks/overlaps, provide fencing.

3.3 Foundation Design

Perform subsurface investigations for noise 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 noise 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.

3.4 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.

3.5 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).

3.6 Concrete Cover

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

3.7 Anti-Graffiti Coating

Apply an anti-graffiti coating to both sides of the of concrete panels and to all exposed faces of the concrete posts, with the following exception. Where sound absorptive material is required on the interstate traffic face of the panels, omit anti-graffiti coating, which may alter the acoustical performance of the sound absorptive material.