

Chapter 11

SPECIAL DESIGN ELEMENTS

SOUTH CAROLINA ROADWAY DESIGN MANUAL

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Chapter 11

SPECIAL DESIGN ELEMENTS

The designer must address numerous design elements that are not directly related to the geometric design of the roadway. This chapter provides a discussion on several of these design elements including retaining walls, landscaping, noise control, rest areas, park and ride facilities, managed lanes, mailboxes and cul-de-sacs.

11.1 ACCESSIBILITY FOR INDIVIDUALS WITH DISABILITIES

Information on accessibility can be found in Section 13.1 of this manual.

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11.2 EARTH RETAINING STRUCTURES

Where increasing traffic requires a new roadway or the addition of lanes, earth retaining structures (ERS) are often necessary (e.g., where existing or proposed slopes are unstable and flattening of the slope is not reasonable). See the SCDOT *Geotechnical Design Manual* for definitions of ERS reinforced soil slope and reinforced and unreinforced embankments. The Program Manager and the Plan Production Team are responsible for identifying the need for an ERS (e.g., difference in grade elevations, slope stabilization, limited right of way available, environmental concerns, temporary excavation support). For information regarding right of way issues, see Chapter 12 “Right of Way.” For ERSs and design, see the SCDOT *Geotechnical Design Manual* and the SCDOT *Bridge Design Manual*. Roadway designers should coordinate the design of retaining systems with the Program Manager, structural designer and geotechnical designer.

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11.3 LANDSCAPING

The following controlling principles are based upon the conservation of natural resources; creating a facility that is compatible with its surroundings; minimizing future management efforts and expenditures; and producing a high quality, environmentally responsible finished product:

1. Environmental Impact. Where practical, avoid adverse or disruptive impacts to landscape and environmental features on or adjacent to the right of way. Where total avoidance of adverse or disruptive impacts is not practical, the designer should undertake all reasonable measures to reduce and minimize impacts to these features. If damage or disruption is unavoidable, undertake all reasonable measures to offset damages through mitigation in the project area or other designated areas. Note that the designer cannot recreate or restore natural systems, but can use native plant materials to represent some of the appearances and functions of the impacted feature.
2. Environmentally Sensitive Areas. Consider environmentally sensitive areas and those harboring endangered species to be a controlling factor in all designs.
3. Use of Indigenous Plants. Emphasize the use of plants native to and grown in South Carolina that are appropriate to the site, its planned use and its future management.
4. Site Compatibility. Design a specific landscape that is compatible with the site. This includes design elements that may affect a landscape plan for a specific site (e.g., conduit for electric, water requirements, pipe requirements, vegetation type).
5. Future Maintenance Considerations. Consider the future maintenance plans for the roadside area to be a controlling factor in the planning and design of that area.
6. Sustainable Roadside Environment. Strive to produce a sustainable roadside environment.
7. Visual Quality. Visual appearance and visual unity of the facilities are important components. Recognize that visual quality must be a component in almost all design development and that numerous factors influence the final appearance of the finished project. Durability and appearance are the two items most noticed and commented upon by the traveling public.
8. Plants to Avoid. For a list of plants to avoid, see the Department's internet site.

The designer should apply landscape and environmentally based design principles to the full range of highway types, from multi-lane freeways to the rehabilitation and improvement of existing local arterials and rural collector roads.

The extent of the application of these principles will depend on the type of project, the environmental resources affected and the public entities involved. For additional guidance, reference the Department's landscaping guidelines found on the Department's internet site, *AASHTO Roadside Design Guide*, *AASHTO A Guide for Transportation Landscape and Environmental Design* and *SCDOT Access and Roadside Management Standards Manual*.

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11.4 NOISE CONTROL

The SCDOT *Traffic Noise Abatement Policy* provides SCDOT noise abatement requirements with respect to 23 CFR 772, "Procedures for Abatement of Highway Traffic Noise and Construction Noise." SCDOT recognizes the adverse effects that highway traffic noise may have on the citizens of South Carolina and does what is practical to lessen these effects. During the project development process various noise abatement options are considered to abate noise impacts including alternative alignments or noise structures. The SCDOT Environmental Services Office is responsible for determining if noise abatement measures are required.

The designer should carefully consider the construction and placement of noise barriers so they will not increase the severity of crashes that may occur. Ensure noise barriers are located to allow for sign placement and to provide lateral offsets to obstructions outside the edge of the traveled way. However, such a setback may sometimes be impractical. In these situations, provide the largest practical width commensurate with cost-effectiveness considerations.

Stopping sight distance may be an issue with noise barriers. Check horizontal clearances along the inside of a horizontal curve to ensure adequate sight distances are available. Some designs use a concrete safety shape either as an integral part of the noise barrier or as a separate roadside barrier between the edge of the roadway and the noise barrier. On non-tangent alignments, a separate concrete barrier may obstruct sight distance even though the noise barrier does not. In these instances, it may be appropriate to install metal rather than concrete roadside barriers in order to retain adequate sight distance.

Give special consideration of noise barriers near gore areas. Barriers at these locations should begin or terminate, as the case may be, at least 200 feet from the theoretical nose.

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11.5 REST AREAS

The primary responsibility of the State to motorists using highway systems is safety, and rest areas are an important instrument for highway improvement. Crash reduction is the primary function. Greater highway safety is the major benefit in establishing rest areas, through safe off-road locations for motorists to rest, sleep, change drivers and check vehicle loads and/or minor mechanical problems. Additional benefits for motorists are relief from extended travel period time, increased comfort and convenience, and locations for public agencies to communicate with travelers.

Well-designed, well-maintained rest areas also create positive images for out-of-state motorists and enhance quality of life for the South Carolina's own residents. They provide opportunities for SCDOT and tourism groups to communicate with motorists in promoting State and local programs, and to provide road and weather information and such directional services as maps, routing suggestions, traffic incident warnings and road construction schedules.

Roadway designers are typically responsible for the design of exit and entrance terminals, internal roadways and parking areas, and work with other SCDOT Sections (e.g., Traffic, Planning) to design and rehabilitate rest areas. For the design of exit and entrance terminals and internal roadways; see Chapter 10 "Interchanges." For the design of parking areas, see Section 7.2.7. For additional guidance on rest areas, see the *AASHTO Guide for Development of Rest Areas on Major Arterials and Freeways*.

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11.6 PARK-AND-RIDE FACILITIES

The designer should review the *SCDOT Access and Roadside Management Standards Manual* and the *AASHTO Guide for the Design of Park-and-Ride Facilities* for guidance on the implementation and design of park-and-ride facilities.

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11.7 MANAGED LANES

Managed lanes are defined as highway facilities or a set of lanes where operational strategies are proactively implemented and managed in response to changing conditions. The managed lane concept is typically a “freeway-within-a-freeway” where a set of lanes within the freeway cross section is separated from the general-purpose lanes. Examples of operating managed lane projects include high-occupancy vehicle (HOV) lanes, value priced lanes, high occupancy toll (HOT) lanes, or exclusive or special use lanes. Each of these concepts offers unique benefits; therefore, careful consideration must be given to project goals and objectives in choosing an appropriate lane management strategy or combination of strategies.

For guidance on the design and implementation of managed lanes, see the FHWA document *Managed Lanes: A Primer*, which can be found on the FHWA Office of Operations website, and the AASHTO *Guide for the Design of High Occupancy Vehicle Facilities*.

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11.8 RESERVED

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11.9 MAILBOXES

Mailboxes should be placed with safety considerations for motorists, pedestrians, the carrier and the postal patron. The designer should consider the walking distance for the patron, pedestrian access route, stopping sight distance in advance of the mailbox and sight distance restrictions at intersections and driveways. For additional information on the placement of mailboxes on roadways, see the *AASHTO Roadside Design Guide*.

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11.10 CUL-DE-SACS

A local street open at only one end should have a special turning area at the closed end. The commonly used design is a circular pavement symmetrical about the centerline of the street sometimes with a central island. Provide minimum outside radii of 30 feet in residential areas and 50 feet in commercial and industrial areas; see the SCDOT *Standard Drawings*. Improved operations may be obtained if the design is offset so that the entrance of the pavement is in line with the approach half of the street. One steering reversal is avoided with this design. The designer should revise the geometry of the cul-de-sac if adjoining residences also use the cul-de-sac for parking. The designer should give consideration to through pedestrian traffic when a cul-de-sac is constructed on an existing through street.

Other variation or shapes of cul-de-sacs that include right-of-way and site controls may be provided to permit vehicles to turn around by backing only once. Alternative designs are discussed in the AASHTO *A Policy on Geometric Design of Highways and Streets*.

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11.11 REFERENCES

1. *SCDOT Americans with Disabilities Act Transition Plan*, SCDOT, 2014.
2. *SCDOT Geotechnical Design Manual*, SCDOT, 2010.
3. *SCDOT Bridge Design Manual*, SCDOT, 2006.
4. *Access and Roadside Management Standards Manual*, SCDOT, 2015.
5. *A Guide for Transportation Landscape and Environmental Design*, AASHTO, 1991.
6. *Guide for Development of Rest Areas on Major Arterials and Freeways*, AASHTO, 2001.
7. *Guide for the Design of Park-and-Ride Facilities*, AASHTO, 1992.
8. *Managed Lanes: A Primer*, FHWA, FHWA-HOP-05-031, 2005.
9. *Guide for the Design of High Occupancy Vehicle Facilities*, AASHTO, 1992.
10. *Roadside Design Guide*, AASHTO, 2011.
11. *A Policy on Geometric Design of Highways and Streets*, AASHTO, 2011.

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