Chapter 13

MULTIMODAL TRANSPORTATION

SOUTH CAROLINA ROADWAY DESIGN MANUAL

February 2021

SPACER PAGE

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Chapter 13
MULTIMODAL TRANSPORTATION

This chapter provides guidance for the design of walking, biking and transit facilities on the Department's Right of Way.

13.1 ACCESSIBILITY FOR INDIVIDUALS WITH DISABILITIES

Many highway elements can affect the accessibility and mobility of individuals with disabilities. These include pedestrian access routes, parking lots, buildings at transportation facilities, overpasses and underpasses. A pedestrian access route is a continuous and unobstructed path of travel provided for pedestrians with disabilities within or coinciding with a pedestrian circulation path. The pedestrian access routes are typically contained within the sidewalk.

The Department accessibility criteria complies with the 1990 *Americans with Disabilities Act* (ADA) and is provided in the Department's publication "Americans with Disabilities Act Transition Plan," which can be found on the Department's internet site. The ADA criteria provided in the SCDOT Transition Plan and the *SCDOT Standard Drawings* is based on the United States Access Board's *Public Right-of-Way Accessibility Guidelines* (PROWAG). The SCDOT Transition Plan sets forth the steps necessary to complete physical and other modifications of SCDOT facilities and programs for which it is responsible in order to achieve ADA required accessibility. The Plan includes the following:

- identification of certain physical obstacles that limit accessibility,
- description and details of the methods that will be used to make the facilities accessible,
- schedule for taking the steps necessary to achieve compliance with the ADA, and
- identification of the person responsible for implementation of the Plan.

Designers are required to meet the criteria presented in the Department's Transition Plan. Where other agencies or local codes require criteria that exceed the ADA Guidelines, then the stricter criteria may be required. This will be determined on a case-by-case basis.

The following definitions are used with ADA Guidelines:

1. Accessible Describes a facility in the public right-of-way that complies with PROWAG.
2. Alteration A change to a facility in the public right-of-way that affects or could affect access, circulation or use.
3. Facility All or any portion of buildings, structures, improvements, elements and pedestrian or vehicular routes located in a public right-of-way.
4. Pedestrian Access Route (PAR) A continuous and unobstructed walkway within a pedestrian circulation path that provides accessibility.

5. Pedestrian Circulation Path A prepared exterior or interior way of passage provided for pedestrian travel.

6. PROWAG PROWAG is recognized as the Department's technical guide for design of ADA compliant pedestrian facilities.

7. Public Right-of-Way Public land or property, usually in interconnected corridors, that is acquired for or devoted to transportation services.

8. Walkway The continuous portion of the pedestrian access route that is connected to street crossings by curb ramps or blended transitions.

13.2 BICYCLE ACCOMMODATIONS

Provisions for bicycles are an important consideration where new highways are being constructed or existing highways are being either reconstructed or otherwise modified as part of a 3R initiative. This is particularly true in urban and suburban areas and where tourism, congestion mitigation and alternative modes of transportation are major factors. In rural areas, bicycling accommodations will typically be on the roadway shoulder. In urban areas, bicycling accommodations may be provided by a shared roadway or dedicated space (e.g., designated bicycle lanes). Consider separate bicycle facilities where bicyclists would become involved with high-traffic volume roadways, where indicated as part of adopted plans by MPOs and COGs, or where safety measures are needed due to crash history. For pedestrian safety, the designer should not consider sidewalks as bicycle facilities.

13.2.1 Bikeway Classifications

The following definitions apply to bikeway classifications:

1. Bicycle Boulevard A street segment, or series of contiguous street segments, that has been modified to accommodate through bicycle traffic, but discourages through motor traffic with traffic calming measures.

2. Bicycle Lane or Bike Lane A portion of a roadway that has been designated by striping, signing and pavement markings for the preferential or exclusive use of bicyclists. It is distinguished from the travel portion of the roadway by a physical or symbolic barrier.

3. Separated Bicycle Lane or Separated Bike Lane A portion of a roadway that has been designated by a physical barrier for exclusive use of bicyclists. It is distinguished from the travel portion of the roadway by a physical barrier or grade separation.

4. Bikeway A generic term for any road, street, path or way which in some manner is specifically designated for bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes.

5. Bicycle Route A roadway or bikeway designated by the jurisdiction having authority, either with a unique route designation or with BIKE ROUTE signs, along which bicycle guide signs may provide directional and distance information. Signs that provide directional, distance and destination information for cyclists do not necessarily establish a bicycle route.

6. Shared Roadway A roadway that is open to both bicycle and motor vehicle travel. This may be an existing roadway, a street with wide curb lanes or a road with paved shoulders.

7. Shared Use Path A path physically separated from motorized vehicular traffic by an open space or barrier and either within the highway right of way or within an independent right of way. Shared use paths may also be used by pedestrians, skaters, wheelchair users, joggers and other non-motorized users.

8. Shared Lane A lane of a traveled way that is open to bicycle travel and vehicular use.

9. Sidepath A shared use path located immediately adjacent and parallel to a roadway.

10. Rail-Trail A shared use path, either paved or unpaved, built within the right of way of a former railroad.

11. Rail-with-Trail A shared use path, either paved or unpaved, built within the right of way of an active railroad.

13.2.2 Selection Guidelines

Although incorporating bicyclists' needs into the design of major transportation corridors can be challenging, the reality of planning bikeways in built environments means that roadways constitute the majority of a bicycle network. Whenever streets are constructed or reconstructed, the designer should include appropriate provisions for bicyclists. The designer should check SC Touring Routes and MPO/COG approved bicycle plans to assist in determining appropriate provisions. Bicycle accommodations options include:

- paved shoulders,
- bike lanes,
- separated bike lanes,
- bike boulevards,
- shared lanes,
- shared roadways,
- shared-use paths: independent corridor, and
- sidepaths

Selection of an appropriate bikeway facility requires the following information:

- road function (arterial, collector, local);
- vehicular and bike volume;
- speed;
- traffic mix (e.g., truck %);
- expected users (e.g., one type of user expected to dominate, such as children bicycling to school);
- road conditions (lane widths, total roadway width, conditions at intersections, parking demand);
- frequency of driveways and side streets;
- topography;
- existing and proposed adjacent land uses; and
- approved bikeway and transportation plan.

Figure 13.2-A outlines general considerations for each facility type.

Type Of Bikeway	Best Use	Motor Vehicle Design Speed	Traffic Volume	Classification or Intended Use	Other Considerations
Paved shoulders	Rural highways that connect town centers and other major attractors	Variable. Typical posted rural highway speeds (generally 40 mph – 55 mph)	Variable	Rural roadways; inter-city highways	Provides more shoulder width for roadway stability. Shoulder width is dependent on characteristics of the adjacent motor vehicle traffic (e.g., wider shoulders on higher-speed roads). Ensure rumble strips/stripes are applied per Engineering Directive 53 and a minimum 4' clear paved width is present between edge of pavement and rumble strip/stripe.
Bike lanes	Major roads that provide direct, convenient, quick access to major land uses. Also can be used on collector roads and busy urban streets with slower speeds.	Generally, any road where the design speed is more than 25 mph.	Variable. Speed differential is generally a more important factor in the decision to provide bike lanes than traffic volumes.	Arterials and collectors intended for major motor vehicle traffic movements	Where motor vehicles are allowed to park adjacent to bike lane, ensure width of bike lane sufficient to reduce probability of conflicts due to opening vehicle doors and other hazards. Analyze intersections to reduce bicyclist/motor vehicle conflicts. Sometimes bike lanes are left "undesignated" (i.e., bicycle symbol and signs are not used) in urban areas as an interim measure.
Bike boulevard	Local roads with low volumes and speeds, offering an alternative to, but running parallel to, major roads. Still should offer convenient access to land use destinations.	Use where the speed differential between motorists and bicyclists is typically 15 mph or less. Generally, posted speed limits of 25 mph or less.	Generally less than 3000 vehicles per day	Residential roadways	Typically only an option for gridded street networks. Avoid requiring bicyclists to make frequent stops. Use signs, diverters and other treatments so that motor vehicle traffic is not attracted from arterials to bike boulevards.
Shared lanes (wide outside lanes)	Major roads where bike lanes are not selected due to space constraints or other limitations.	Variable. Use as the speed differential between bicyclists and motorists increases. Generally, any road where the design speed is more than 25 mph.	Generally more than 3000 vehicles per day	Arterials and collectors intended for major motor vehicle traffic movements	Explore opportunities to provide parallel facilities for less confident bicyclists.

GENERAL CONSIDERATIONS FOR BIKEWAYS
Figure 13.2-A

Type of Bikeway	Best Use	Motor Vehicle Design Speed	Traffic Volume	Classification or Intended Use	Other Considerations
Shared roadways (no special provisions)	Minor roads with low speeds and volumes, where bicycles can share the road with no special provisions.	Speed differential between motorists and bicyclists is typically 15 mph or less. Generally, speed limits of 30 mph or less.	Generally less than 1000 vehicles per day	Neighborhood or local streets	Can provide an alternative to busier streets in a gridded street network. On a non-grid network, may be circuitous or discontinuous.
Shared use path: adjacent to roadways (i.e., sidepath)	Adjacent to roadways with no or very few intersections or driveways. The path is used for a short distance to provide continuity between sections of path on independent right-of-way.	The adjacent roadway has high-speed motor vehicle traffic such that bicyclists might be discouraged from riding on the roadway.	The adjacent roadway has very high motor vehicle traffic volumes such that bicyclists might be discouraged from riding on the roadway.	Provides a separated path for non-motorized users. Intended to supplement a network of on-road bike lanes, shared lanes, bicycle boulevards and paved shoulders. Not intended to substitute or replace on-road accommodations for bicyclists, unless bicycle use is prohibited.	Several operational issues are associated with this facility type. See AASHTO *Guide for the Development of Bicycle Facilities*.
Shared use path: independent corridor	Linear corridors in green ways, or along waterways, highways, active or abandoned rail lines, utility right of way, unused right of way. May be a short connection, (e.g., pathway connector between two cul-de-sacs) or a longer connection.	n/a	n/a	Provides a separated path for non-motorized users.	Analyze intersections to anticipate and mitigate conflicts between path and roadway users. Design the path with all users in mind, wide enough to accommodate expected usage. On-road alternatives may be desired for advanced riders who desire a more direct facility that accommodates higher speeds.

GENERAL CONSIDERATIONS FOR BIKEWAYS
Figure 13.2-A
(Continued)

13.2.3 Design Considerations

For the design criteria of bicycle facilities, the designer should refer to the AASHTO *Guide for the Development of Bicycle Facilities*. The AASHTO Guide contains criteria on the design of bicycle facilities which includes, for example, railroad crossings, intersections, criteria for horizontal/vertical alignment, pavements, traffic control devices, etc. In addition to the AASHTO Guide, the designer should review the guidance in the following sections.

13.2.3.1 Widths

Figures 13.2-B through 13.2-D provide typical cross sections for new construction roadways with bicycle accommodations. In addition, the designer should consider the following guidance for projects on SC Touring Routes and routes designated by a bicycling plan adopted by an MPO or COG:

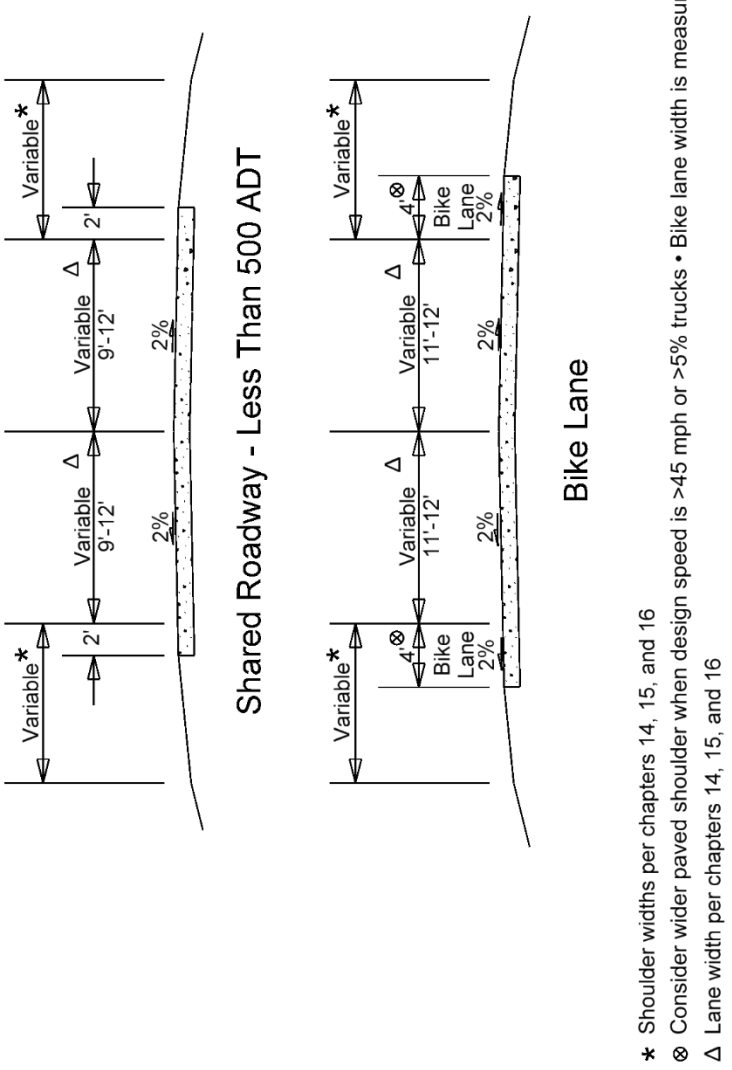
1. Shared Lanes On urban sections (curb and gutter), an outside travel lane width of 14 feet is the minimum recommended width for a shared-use lane. Lane widths that are 14 feet or greater allow motorist to pass bicyclist without encroaching into the adjacent lane. The usable lane width is normally measured from the center of the edge line to the center of the traffic lane line, or from the longitudinal joint of the gutter pan to the center of the lane line. The gutter pan is not included in the width of the shared lane.

   On sections of roadways where bicyclists may need more maneuvering space, consider providing a 15-foot travel lane width. This width may be appropriate on sections with steep grades (greater than 5 percent) or where drainage grates, raised delineators or on-street parking effectively reduce the usable width. Shared lane widths greater than 16 feet that extend continuously along stretches of roadway may encourage undesirable motor vehicle operations, especially in urban areas (e.g., two motor vehicles to travel side by side, faster vehicular speeds). Therefore, shared lanes greater than 16 feet are not recommended and consideration should be given to striping the additional width.

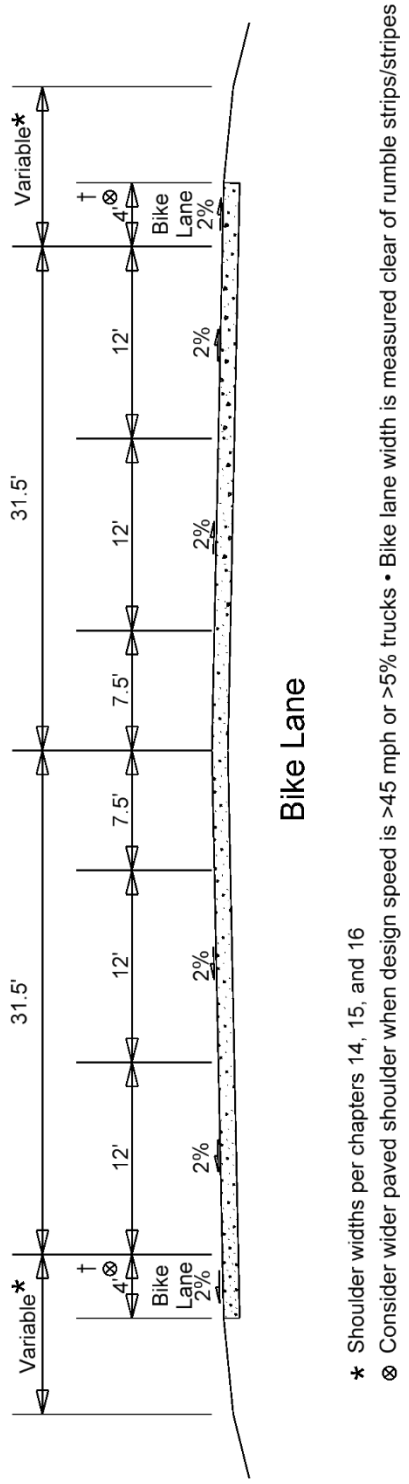
   Roadways with shared lanes narrower than 14 feet may still be designated for bicycles with bicycle guide signs and/or shared-lane markings.

2. Paved Shoulders On rural sections (shoulder) with ADT greater than 500, paved shoulders should be a minimum of 4 feet wide (beyond the rumble strips/stripes) in each direction to accommodate bicycle travel. Where the design speed exceeds 45 miles per hour or the percentage of trucks, buses and recreational vehicles is greater than 5 percent of the ADT, the designer should consider providing additional width of paved shoulder to accommodate bicycle travel and to lessen the effect of windblast from larger vehicles. On rural sections (shoulder) with ADT less than 500, paving 2 feet of the earthen shoulder typically will be adequate to better accommodate bicyclists.

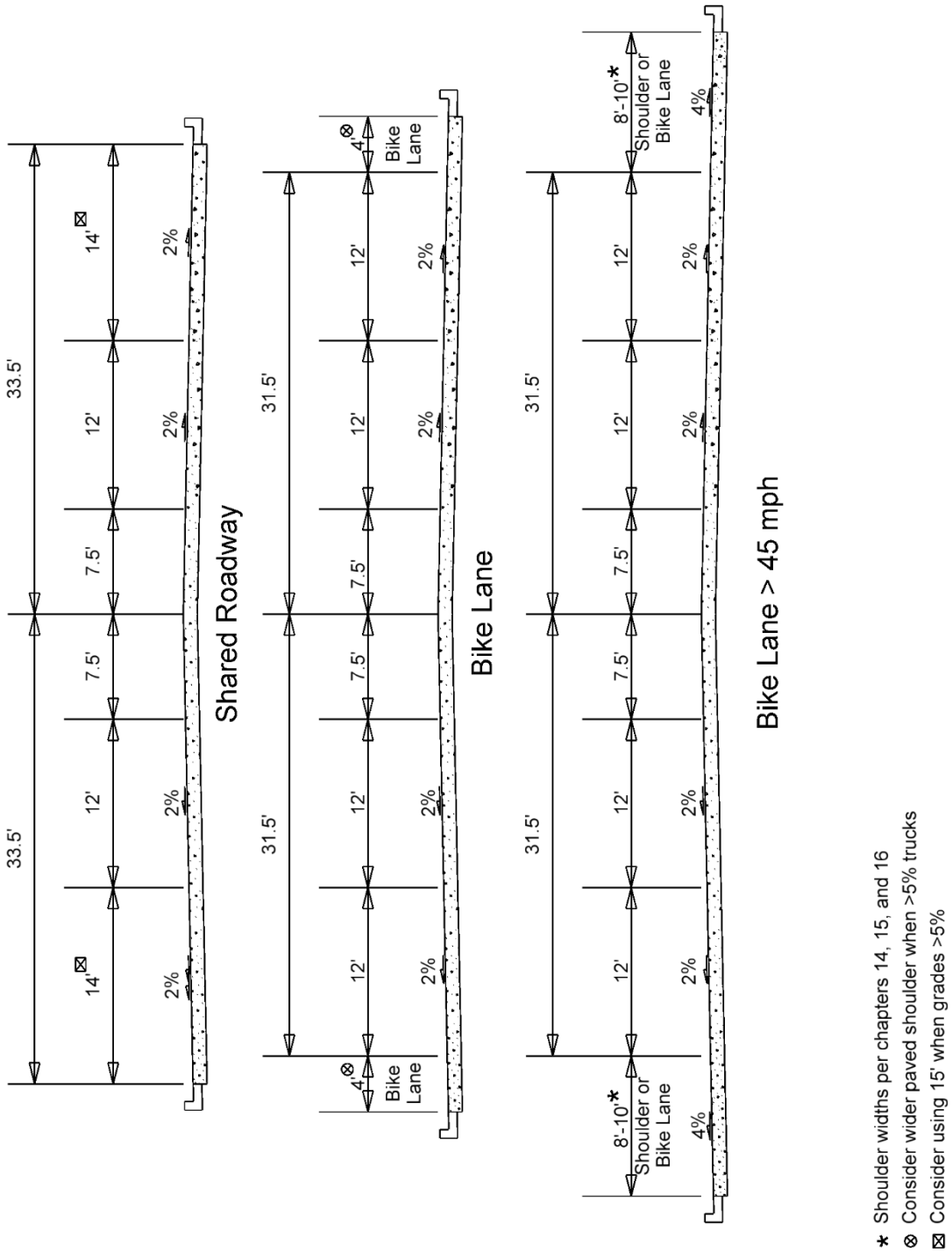
   On urban sections (curb and gutter), paved shoulders should use the guidelines for roadway shoulder widths provided in Chapters 14 “Local Roads and Streets,” 15 “Collector Roads and Streets” and 16 “Rural and Urban Arterials”.



BICYCLE FACILITIES
(New Construction – Two-Lane Rural Section with Paved Shoulders)
Figure 13.2-B



BICYCLE FACILITIES
(New Construction – Five-Lane Rural Section with Paved Shoulders)
Figure 13.2-C



BICYCLE FACILITIES
(New Construction – Five-Lane Urban Section with Curb and Gutter)
Figure 13.2-D

3. Bicycle Lanes The AASHTO *Guide for the Development of Bicycle Facilities* provides the Department's design criteria for bicycle lane widths.

4. Shared Use Paths and Sidepaths The AASHTO *Guide for the Development of Bicycle Facilities* provides the Department's design criteria for shared use path and sidepath widths.

5. One-Way Streets For a bike lane to function as intended when built against the dominant flow of traffic on a one-way street, incorporate the following features into the design:

    a. Bike Lane Location Place the bike lane on the right side of the roadway.

    b. Narrow Streets A bike lane should be provided for bicyclists traveling in the same direction as motor vehicle traffic. If there is insufficient room to provide a bike lane in the dominant-flow direction of the street, consider providing shared-lane markings to emphasize that bicyclists must share the travel lane on this side of the street.

    c. Contraflow Bike Lanes Contraflow bike lanes require special considerations and should only be considered after analysis of bike patterns. If contraflow bike lanes are to be included in the design, see the guidance on contraflow bike lanes provided in the AASHTO *Guide for the Development of Bicycle Facilities*.

    d. Intersections Use bike lane symbols and directional arrows on both the approach and departure of each intersection, to remind bicyclists to use the bike lane in the appropriate direction, and to remind motorists to expect bicycle traffic.

13.2.3.2 Paving Existing Shoulders

In order for a shoulder to be usable to a bicyclist, it generally must be paved. Adding or improving paved shoulders often can be the best way to accommodate bicyclists in rural areas and benefit motor vehicle traffic. Paved shoulders have the added benefit of not only accommodating bicyclists, but they can also extend the service life of the road surface (i.e., edge deterioration will be significantly reduced). Provide 2 feet of paved shoulder width on all new projects with earthen shoulders. For projects on SC Touring Routes and on adopted bicycling plans by an MPO or COG, provide a minimum paved shoulder width of 4 feet (beyond the rumble strips/stripes) to provide for bicycle facilities where the AADT of the road is greater than 500. Where constraints do not allow obtaining the indicated widths, any additional width will be beneficial to a bicyclist.

13.2.3.3 Resurfacing/Restriping Existing Roadways

Where it is desirable to accommodate bicycle facilities by resurfacing/restriping existing roadways, lane and/or median widths may be narrowed to obtain the desired bicycle facility. Roadways designated as being on the National Truck Network or South Carolina Truck Network or roadways where the percentage of trucks, buses and recreational vehicles is greater than 5 percent of the AADT should have lane widths of 12 feet. Where conditions allow using lane widths narrower than 12 feet to accommodate bicycle facilities, the designer should determine the impacts of narrower lane widths to safety and operations. Guidance on selecting the proper lane width for a roadway can be found in Chapters 14 through 16.

The typical flush/painted median width is 15 feet; however, the width can be reduced to 12 feet to accommodate bicycle facilities on an existing roadway; see Figure 13.2-E. Median widths less than 12 feet are not recommended where posted speeds are greater than 35 miles per hour and the percentage of trucks, buses and recreational vehicles is greater than 5 percent of the ADT.

13.2.3.4 Drainage Inlet Grates

Where practical, place all drainage inlets outside of the bicycle facility. Where this is not practical, use hydraulically efficient bicycle-safe grates and place or adjust the inlets to be flush with the adjacent pavement surface. On bridges, a minimum of 4 feet from the edge of the travel lane should be clear of drainage inlets.

13.2.3.5 Longitudinal Rumble Strips

See Engineering Directive 53 “Installation of Rumble Strips” for guidance on rumble strips and bicyclists.

13.2.3.6 Bridges

Generally, bridge widths should match the approach roadway widths (traveled way plus bike lanes/shoulders). However, in determining the width for major water crossings, consider the cost of the structure, traffic volume, structural design life and potential for future width requirements.

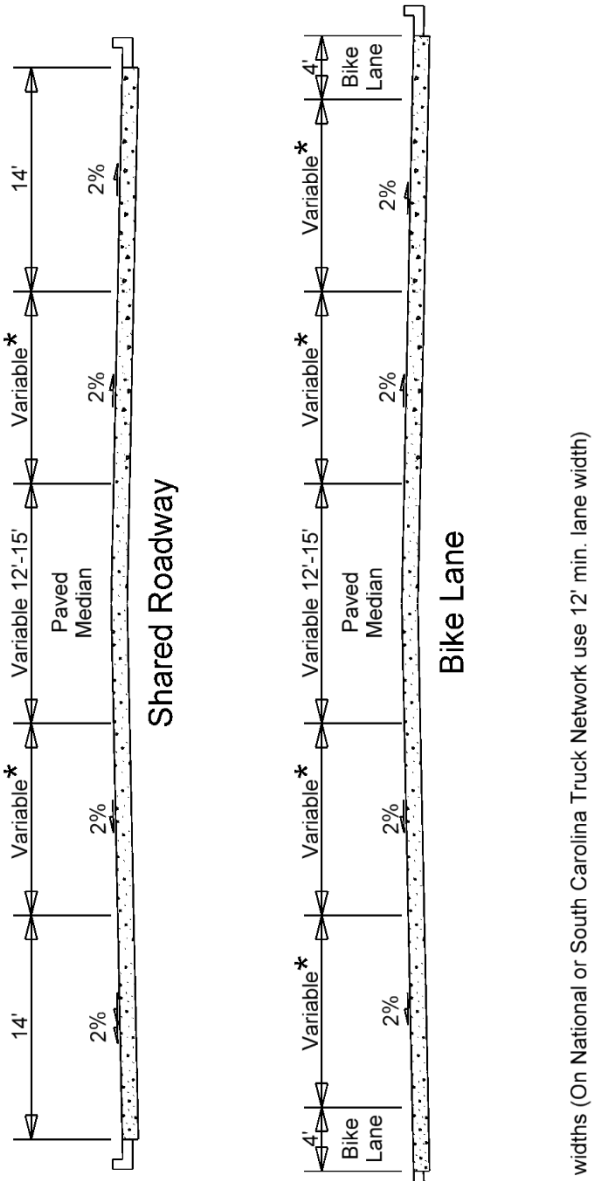
13.2.3.7 Valley Gutter Sections

See Figure 13.2-F for guidance on shared roadways and bike lanes/paved shoulders adjacent to valley gutters. Because valley gutter sections are typically used on low-volume, two-lane local roadways, the cross slope of the paved shoulder/bike lane should be 50H:1V (2.00 percent).

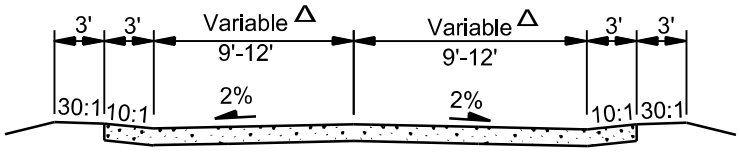
13.2.3.8 Design Speed

Establish a design speed for shared use paths based upon guidance in the AASHTO *Guide for the Development of Bicycle Facilities*.

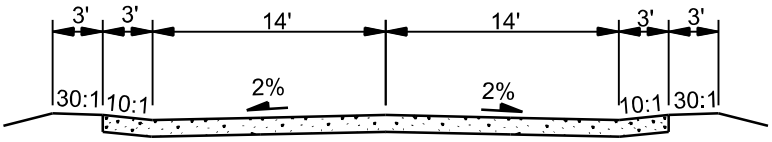
Bicycle accommodations that do not require independent alignments (e.g., bike lanes, sidepaths, etc.) do not require the selection of a design speed. Angular breaks or deflections resulting from auxiliary lanes or roadway widening do not necessitate the addition of horizontal curves for the bicycle facility.



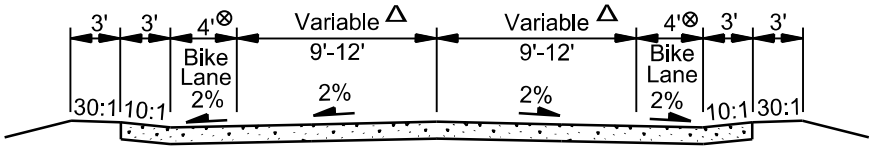
BICYCLE FACILITIES
(Restriping Existing Five-Lane Urban Section with Curb and Gutter
Posted Speed ≤ 45 mph)
Figure 13.2-E



Shared Roadway - Less Than 500 ADT



Shared Roadway



Bike Lane

△ Lane Widths Per Chapter 14
⊗ Consider Using 6' When > 5% Trucks

BICYCLE FACILITIES
(New Construction – Two Lane with Valley Gutter Sections)
Figure 13.2-F

13.3 PEDESTRIAN ACCOMODATIONS

The designer should evaluate the need for pedestrian accommodations on every project. Pedestrian accommodations are usually warranted where curb and gutter is present. Sidewalks are the predominant designated pedestrian accommodation used on The Department's right of way. Shared-use paths/sidepaths are sometimes used to accommodate pedestrians. Guidance for the design of shared-use paths/sidepaths can be found in Section 13.3 and in the *AASHTO Guide for the Development of Bicycle Facilities*.

In determining the sidewalk design, the designer should consider the following:

1. Width The minimum sidewalk width is 5 feet. However, consider wider sidewalks along streets with schools or where on-street parking and bus stop areas are located. In commercial areas, wider sidewalks may allow for the increased volume of pedestrian traffic normally associated with these areas. Sidewalk usage and widths are determined using the *Highway Capacity Manual*.

   The designer should also evaluate the width considering compatibility with local city and community criteria.

2. Placement The designer should evaluate the following considerations for sidewalk placement:

   a. Curb and Gutter Desirably, provide a 3-foot buffer area between the curb and the sidewalk; see Item #5. If there is insufficient right of way to provide the 0.5-foot space to the right-of-way line, the sidewalk may be placed adjacent to the curb and gutter.

   b. Valley Gutter A valley gutter section with sidewalk is discouraged in high pedestrian traffic areas. The Project Development Team should discuss pedestrian options during the design field review if a valley gutter with sidewalk is recommended. Desirably, include a buffer strip between the valley gutter and the sidewalk. If there is insufficient right of way to provide the 0.5-foot space to the right-of-way line, the sidewalk may be placed adjacent to the outside edge of the valley gutter.

   c. Shoulder For all new/reconstruction projects, place the sidewalk beyond the ditch, but no closer than 0.5 foot from the right-of-way line. For retrofit projects (e.g., Safe Routes to School), the sidewalk may be placed within the shoulder and as far as practical away from the traveled way. Only consider this option where there are no other practical options available. Include at least a 1-foot shelf between the sidewalk and edge of the ditch section.

3. Cross Slope The maximum cross slope on the sidewalk is 2 percent sloped towards the roadway.

4. Appurtenances The designer should also consider the impacts of roadside appurtenances within the sidewalk (e.g., fire hydrants, parking meters, utility poles, signs). These elements will reduce the effective width because they interfere with pedestrian activity. Preferably, place these appurtenances behind the sidewalk. If they are placed within the sidewalk, the sidewalk should have a minimum clear width of 4 feet; desirably, a 5-foot

clear width Measure the clear width from the edge of the appurtenance to the edge of the sidewalk. A 4-foot minimum is necessary to meet the accessibility requirements; see the *SCDOT ADA Transition Plan*.

5. Buffer Areas If the available right of way is sufficient, a grass buffer area between the curb and sidewalk is desirable. The buffer area should desirably be 3 feet wide; however, lesser widths may be considered in constrained urban environments. The buffer provides enhanced sight visibility at driveways/intersections, space for street and highway hardware (e.g., signs, hydrants, mailboxes) and groundcovers, and provides a greater distance between pedestrians and moving traffic or the opening of doors of parked cars.

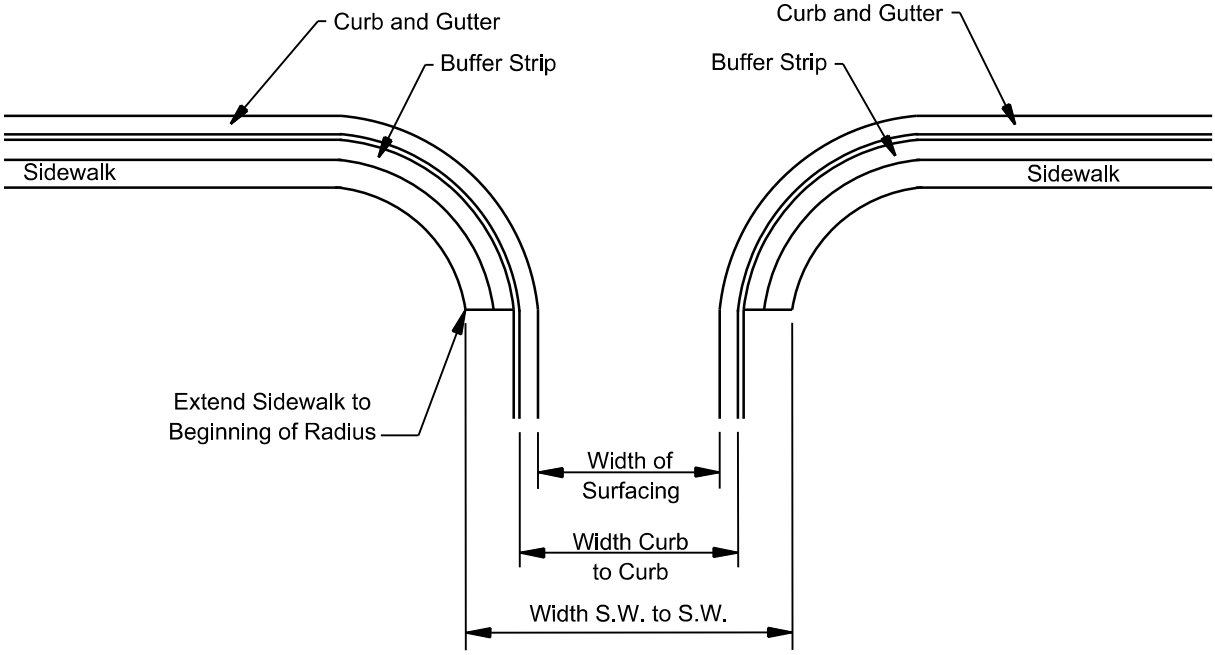
6. Intersections Extend sidewalks to the beginning of the corner radius on the adjacent roadway as shown in Figure 13.3-A (a). Note the extension of the sidewalk on Figure 13.3-3 (b) beyond the corner radius in order to match the sidewalk on the opposite side. Discuss the location of sidewalk termini during the Design Field Review.

7. Pedestrian Crossings Pedestrian crossings are normally located at intersections. In areas where there are curbs, provide curb ramps at crossing locations. See the *SCDOT Standard Drawings* and *SCDOT ADA Transition Plan* for additional guidance.

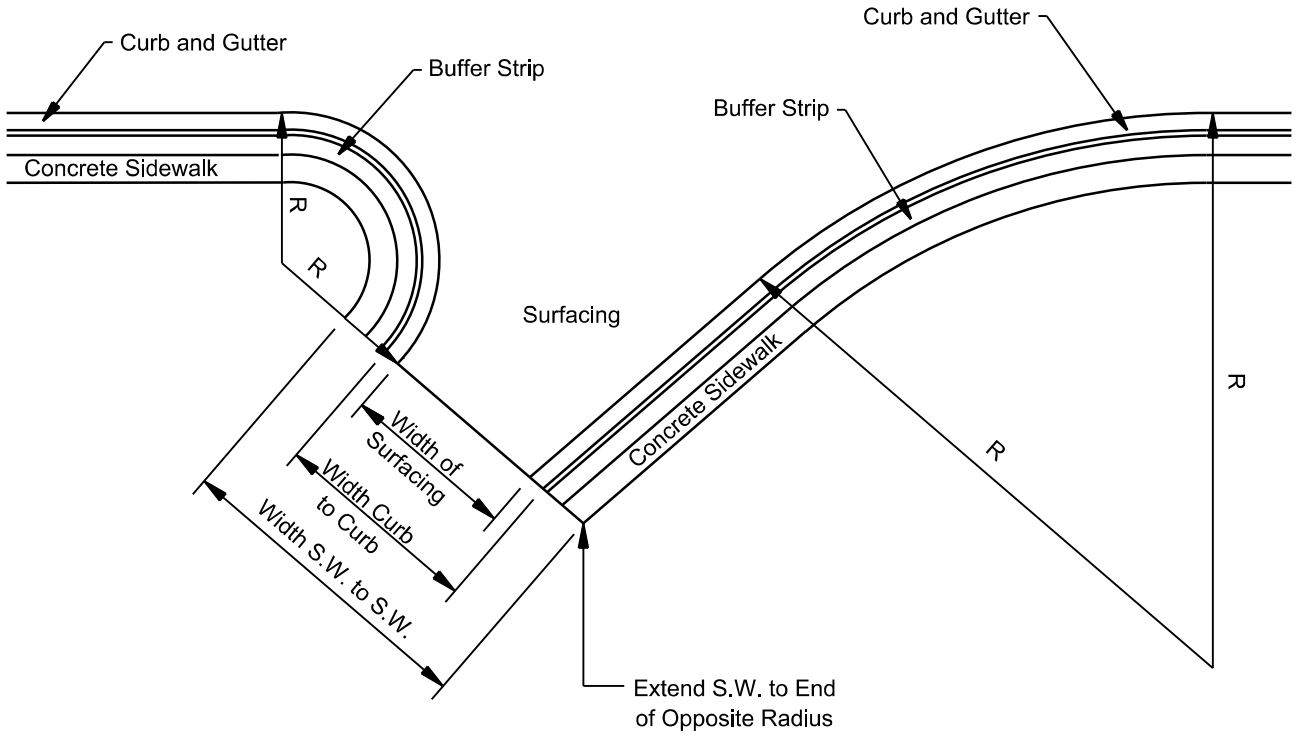
8. Pavement Material Sidewalks are generally constructed of concrete and are 4 inches thick except at driveways where the thickness is increased to 6 inches.

9. Bridges The structural designer is responsible for the dimensioning and structural design of all sidewalks on bridges.

10. Pedestrian Safety Railing. The designer should consider including handrails and fall protection elements where appropriate in accordance with the AASHTO *Guide for the Planning, Design, and Operations of Pedestrian Facilities*, the *International Building Code*, and PROWAG. In evaluating the need for and design of pedestrian safety elements, the designer should also consider vehicular roadside safety needs.



(a) Perpendicular Intersection



(b) Angled Intersection

SIDEWALK EXTENSIONS AT INTERSECTIONS
Figure 13.3-A

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13.4 BUS STOPS AND TURNOUTS

13.4.1 Location

13.4.1.1 Bus Stops

If local bus routes are located on an urban or suburban highway, the designer should consider their impact on normal traffic operations. The stop-and-go pattern of local buses will disrupt traffic flow, but certain measures can minimize the disruption. The location of bus stops is particularly important. These are determined not only by convenience to patrons, but also by the design and operational characteristics of the highway and the roadside environment.

There are three basic bus stop designs — far-side or near-side of an intersection, and mid-block. These designs are shown in Figure 13.4-A and discussed below:

1. Far-Side Stop Typically, far-side intersection placement is desirable. Placing turnouts after signal-controlled intersections allows the signal to create gaps in traffic.

2. Near-Side Stop Avoid using near-side turnouts because of conflicts with right-turning vehicles, delays to transit services as buses try to re-enter the traveled way, and obstructions to traffic control devices and pedestrian activities.

3. Mid-Block Stop Only use mid-block turnouts in conjunction with major traffic generators.

13.4.1.2 Selection

In general, far side locations of bus stops and turnouts are preferred. The municipality or local transit authority will determine the location of the bus stop or bus turnout. However, the designer usually has some control over the best placement of a bus stop or turnout location when considering layout details, intersection design and traffic flow patterns.

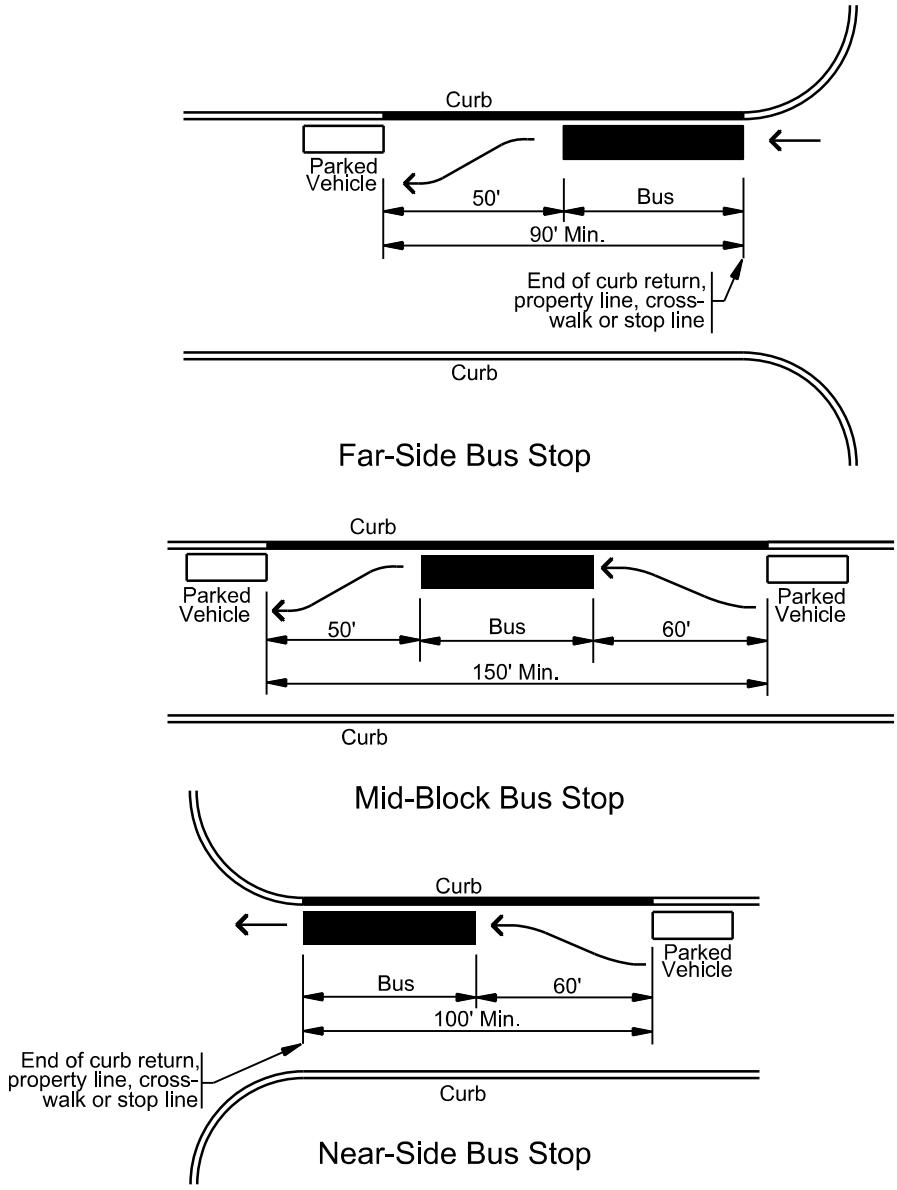
13.4.2 Design

13.4.2.1 Bus Stops

Figure 13.4-A provides the recommended distances for the prohibition of on-street parking near bus stops.

13.4.2.2 Bus Stop Pads

The minimum dimensions for a concrete bus pad installed and owned by the Department, also known as a boarding and alighting area, are 8 ft perpendicular to the roadway exclusive of the curb by 5 ft parallel to the roadway. Coordination with local transit providers is essential to ensure the concrete bus stop pad dimensions meets the needs of the transit users. All new bus stops that are constructed for use with lifts or ramps must meet the accessibility criteria in the Department’s ADA Transition Plan.



Notes:

1. *Where articulated buses are expected, use a bus length of 60 feet.*
2. *Provide an additional 50 feet of length for each additional bus expected to stop simultaneously at any given bus stop area. This allows for the length of the extra bus, 40 feet, plus 10 feet between buses.*

RECOMMENDED PARKING RESTRICTIONS FOR ON-STREET BUS STOPS
Figure 13.4-A

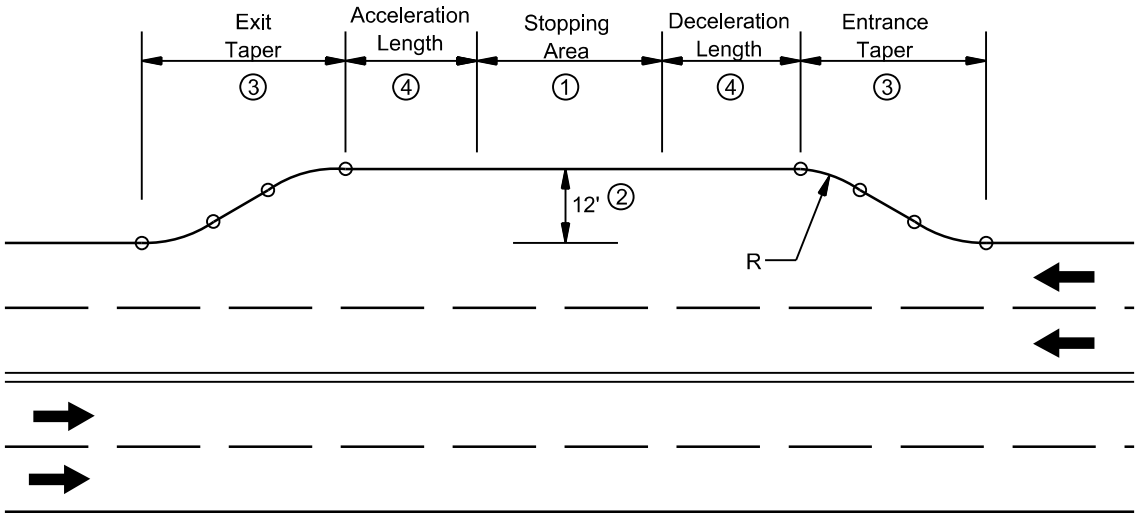
13.4.2.3 Bus Turnouts

Desirably, the total length of a bus turnout will allow for an entrance taper, a deceleration length, a stopping area, an acceleration length and an exit taper. Providing bus turnouts can reduce interference between buses and other traffic significantly. Turnouts remove stopped buses from the through lanes and provide a well-defined user area for bus stops. Figure 13.4-B illustrates the design details for bus turnouts. Providing separate deceleration and acceleration lengths are desirable in suburban areas and on rural arterials and may be provided wherever feasible. However, common practice is to accept deceleration and acceleration in the through lanes and only constructing the tapers and stopping area.

Figure 13.4-B provides information on taper lengths that may be used for entrance and exit tapers. To improve traffic operations, use short horizontal curves (100-foot radius) on the entry end and 50-foot to 100-foot curves on the re-entry end. Where a turnout is located at a far-side or near-side location, the cross street area can be assumed to fulfill the need for the exit or entry area, whichever applies.

13.4.2.4 Bus Shelters

In general, the municipality or the local transit authority will determine the need for and location of bus shelters. The local transit authority will determine the design of the bus shelter. The designer should ensure that the shelter does not restrict vehicular sight distance, pedestrian flow or pedestrian accessibility.



Notes:

① *Stopping area length consists of the length of the bus plus 10 feet for each bus expected to be at the stop simultaneously.*

② *Bus turnout width is desirably 12 feet. For posted speeds under 30 miles per hour, a 10-foot minimum bay width is acceptable. These dimensions do not include the gutter width.*

③ *Suggested taper lengths are listed below. A minimum taper of 5:1 may be used for an entrance taper from an arterial street for a bus turnout while the exit or re-entry taper should not be sharper than 3:1.*

④ *The minimum design for a bus turnout does not include acceleration or deceleration lengths. Recommended acceleration and deceleration lengths are listed below.*

Design Speed	Entering Speed*	Acceleration Lengths	Deceleration Lengths **	Suggested Taper Lengths
35 mph	25 mph	250 ft	185 ft	170 ft
40 mph	30 mph	400 ft	265 ft	190 ft
45 mph	35 mph	700 ft	360 ft	210 ft
50 mph	40 mph	975 ft	470 ft	230 ft

* *Desirably, the bus speed at the end of taper should be within 10 miles per hour of the design speed of the traveled way.*

** *Based on a 2.5 miles per hour per second deceleration rate.*

TYPICAL BUS TURNOUT DIMENSIONS
Figure 13.4-B

13.5 OTHER RESOURCES

These resources serve as tools to ensure designers are aware of the numerous resources available to develop compliant, context-sensitive, multi-modal, and practical design solutions. Project specific requirements may add or delete publications as agreed to by the Department. The following information provides guidance regarding the usage of each list.

The resources include information, guides, and research with which the Agency has some familiarity but are not directly involved in producing or publishing. Information included in these design resources encompasses a variety of disciplines, treatments, and research focus areas related to design applications. Some of these publications may identify design treatments for which the Department has not issued or adopted formal guidance. Designers are encouraged to review these resources when preparing conceptual designs to gain familiarity with industry developments that may present alternative solutions for varied engineering issues.
The Department shall under no circumstances be responsible for any errors or omissions contained within these design resources, or any consequences from reliance on these resources. Users are responsible for adhering to duty of due care and judgment as required by industry standards in using information from these resources. Approval from SCDOT is required prior to using these design resources on projects within the state highway system.

- National Association of City Transportation Officials (NACTO) Design Guides
- National Aging and Disability Transportation Center (NADTC) Publications
- Safe Transportation for Every Pedestrian (STEP)
- FHWA Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE)

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13.6 REFERENCES

1. *SCDOT Americans with Disabilities Act Transition Plan*, SCDOT, 2014.

2. United States Access Board's *Public Right-of-Way Accessibility Guidelines*.

3. *Guide for the Development of Bicycle Facilities*, AASHTO, 2012.

4. *Guide for the Planning, Design, and Operations of Pedestrian Facilities*, AASHTO, July 2004.

5. *International Building Code*, International Code Council, current edition.

6. *The Location and Design of Bus Transfer Facilities*, Institute of Transportation Engineers, 1992.

7. *Guidelines for the Location and Design of Bus Stops*, TCRP Report 19, Transportation Research Board, 1996.

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