# Chapter Seventeen

## BICYCLE AND PEDESTRIAN ACCOMMODATIONS

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Chapter Seventeen

BICYCLE AND PEDESTRIAN ACCOMMODATIONS

When planning transportation improvements, the Department considers the travel needs of all users of a transportation corridor including bicyclists and pedestrians. Bicycle and pedestrian travel demand in the vicinity of a project is to be determined in the scoping and early project planning phases. When sufficient demand is indicated the Department will provide the appropriate accommodations by applying guidelines presented in Chapter 17.

Chapter 1 of the AASHTO Green Book identifies five context classifications that integrally affect the design of a transportation facility. These contexts – rural, rural town, suburban, urban, and urban core – were originally presented in NCHRP Report 855, An Expanded Functional Classification System for Highways and Streets. Primary factors that lead to the designation of a context classification include development density, land uses, building setbacks, and population density. The character of development along a corridor may vary such that a single project may include more than one context classification. Simply applying geometric criteria without regard to context and roadway user needs will not adequately meet the expectations of the traveling public and local community. This chapter acknowledges the AASHTO Green Book context classifications in making pedestrian and bicyclist accommodation decisions, and references context throughout.

Policies relating to accessibility, including curb ramps, crossing controls, and overpasses and underpasses are addressed in Chapter 58. Financial and maintenance responsibilities for bicycle and pedestrian accommodations are addressed in Chapter 5.

17-1 BICYCLE ACCOMMODATIONS: POLICIES AND PROCEDURES

17-1.01 Definitions

The following terms and definitions apply to Chapter 17:

1. Bicycle and Pedestrian Policy Engineer (BPPE). The engineer within the Bureau of Design and Environment, who is accountable for the development and interpretation of the engineering policies that govern the design of bicycle and pedestrian facilities.

2. Bicycle Box or Bike Box. A designated area on an approach to a signalized intersection, typically between an advance motorist stop line and the crosswalk, intended to provide bicyclists with a visible place to wait in front of stopped vehicles during the red signal phase.
3. **Bicycle Facilities.** A broad term which includes bikeways, shared roadways, shoulders (which may be used by bicyclists), shared-use paths, traffic control devices, shelters, and parking facilities for bicycles.

4. **Bicycle Lane or Bike Lane.** That portion of the traveled way that is designated for bicyclist use by pavement marking/symbols and optional signing. The bicycle lane width includes any buffer areas. Without buffers these lanes may be called conventional bike lanes.

5. **Bicycle Level-of-Service (BLOS).** A measure of on-road bicycle service quality along road segments that is based on studies of bicyclist perception of safety and comfort. The BLOS model considers a variety of factors influencing bicycle service quality and computes a numerical base score that is translated into a level of service ranging from A (best) to F (worst). Intersections are not considered. The *Highway Capacity Manual* describes BLOS computations in detail.

6. **Bicycle Travel Assessment (BTA).** The standard evaluation performed to determine whether bikeway warrants are met and bicycle accommodations should be included as part of a project. A BTA form BDE 1702 is used to document the results of the evaluation and describe the accommodations to be provided.

7. **Bikeway.** A generic term for any road, street, path, or way which is specifically designated for bicycle travel and provides space reserved for bicyclists distinct from motor vehicle traffic.

8. **Buffered Bicycle Lane.** A bicycle lane that includes a primary riding area and additional width to increase separation of bicyclists from vehicular traffic. The buffer area comprises a pattern of standard longitudinal markings and added chevron or diagonal markings for larger buffer widths.

9. **Excessive Cost.** In documenting whether pedestrian and bicycle facilities must be included in projects according to the *Illinois Highway Code*, excessive cost typically involves adding at least 20% to the total cost of a project not providing accommodation.

10. **Rural Roadway.** To guide the process of bicycle facility selection and design, rural roadways are discussed in this chapter as those generally in undeveloped and low-density development areas, with shoulders along the edges of the traveled way. These roadways are most generally present in the AASHTO rural *town* and *rural* contexts and may have posted speeds of 30 mph (in town) to 55 mph.

11. **Separated Bicycle Lane (SBL).** A portion of the roadway that is designated for use by bicyclists and is physically separated from the vehicle traveled way by horizontal distance and vertical elements such as flexible delineators, longitudinal raised curb islands, or parking lanes. SBLs are usually designed for one-way bicycle travel in the same direction as the adjacent lane, but may be designed for two-way bicycle travel when operationally justified. SBLs are also sometimes called protected bicycle lanes.
12. **Shared Lane.** A travel lane where motor vehicles and bicyclists share operating space. For projects on state routes shared lanes will typically be widened to a minimum of 14 ft (4.2 m) to provide adequate space for drivers to pass bicyclists while staying in the lane and providing the “three feet clear” distance required by state law.

13. **Shared Roadway.** Any roadway upon which a bicycle lane is not designated and which may be legally used by bicyclists, regardless of whether such facility is specifically identified as a bikeway.

14. **Shared-Use Path/Side Path.** A facility within public right-of-way but physically separated from the roadway, intended for bicycle and other non-motorized transportation (e.g., pedestrians, in-line skaters). A “side path” is typically located parallel within the road right-of-way. The terms “shared-use path” and “path” are used interchangeably throughout this chapter in discussing these facilities. “Trails” are considered recreational facilities, are often unpaved, and are not covered by this policy.

15. **Suburban Roadway.** To guide the process of bicycle facility selection and design, suburban roadways are discussed in this chapter as those in outlying portions of urban areas, with low-to moderate development densities, off-street parking, and posted speeds of 40 to 45 mph. Suburban roadways may incorporate either curb and gutter or shoulders along the edges of the traveled way and are generally found within the AASHTO suburban context.

16. **Two-Stage Bicycle Turn Box.** An area set aside for bicyclists, outside of the travel paths of motor vehicles and pedestrians, to queue to turn at a signalized intersection, and avoid having to merge across traffic ahead of the turn.

17. **Urban Area.** Urban areas are those places identified by the U.S. Census Bureau as having a population of 50,000 or more.

18. **Urban Roadway.** To guide the process of bicycle facility selection and design, urban roadways are discussed in this chapter as those generally in high-density development areas and generally incorporating curb and gutter along the edges of the traveled way, and quite often parking. With posted speeds of 40 mph and lower, these roadways are most generally found in the AASHTO urban core and urban contexts but occasionally also in the rural town context.
17-1.02 Policies

The Illinois Highway Code, 605 ILCS 5/4-220, states that:

1. Bicycle and pedestrian ways shall be given full consideration in the planning and development of transportation facilities, including the incorporation of such ways into State plans and programs.

2. In or within one mile of an urban area, bicycle and pedestrian ways shall be established in conjunction with the construction, reconstruction, or other change of any State transportation facility except:
   a. in pavement resurfacing projects that do not widen the existing traveled way or do not provide stabilized shoulders; or
   b. where approved by the Secretary of Transportation based upon documented safety issues, excessive cost or absence of need.

3. Bicycle and pedestrian ways may be included in pavement resurfacing projects when local support is evident or bicycling and walking accommodations can be added within the overall scope of the original roadwork.

4. The Department shall establish design and construction standards for bicycle and pedestrian ways.

Providing for the needs of persons traveling on foot or bicycle is a key goal of this policy. Therefore, an assessment of non-motorized transportation need and appropriate accommodation is central to the fulfillment of the policy. The location of a project in either urban areas covered in the Illinois Highway Code above or other areas is in and of itself insufficient to make accommodation decisions. On each project it is necessary to:

- Where bicyclists and pedestrians are legally allowed to use the roadway, evaluate and document safety issues and warrants specific to the project.

- If warrants do not exist, document the absence of need in the Phase I engineering report.

- If warrants do exist, assess the appropriate type of accommodation needed to meet user comfort needs, determine the respective costs, and coordinate accommodations (including any options) with local agencies.

- Where warrants are met, the Secretary must specifically approve accommodation omissions in or within one mile (1.6 km) of urban areas covered in the law on the basis of documented safety issues, excessive cost, or absence of need. BDE 1701 shall be used to request such an omission. The BPPE concurrence should be sought for any omissions in other areas of the State. As safety issues and costs will vary greatly depending on the characteristics of the project, there will not be simple and absolute guidelines. A cost analysis would include all costs specifically attributable to the accommodation, including...
construction costs, environmental mitigation, and right-of-way, as applicable. However, needs will be based on whether warrants have been met as defined in Section 17-1.03.

Exceptions to the provision of bicycle accommodations cannot be considered simply because a roadway is identified in the Illinois Official Bicycle Maps as unsuitable for bicycling. Current usability or comfort to cyclists does not preclude a roadway project from bicycle consideration or this policy.

17-1.02(a) Exceptions to Consideration of Accommodations – Access Controlled Facilities

Projects on interstate highways, or other roadways where bicycles and pedestrians are prohibited, can be excluded from consideration of accommodations. As such, no warrant analyses or needs assessments are required. In rare circumstances, incorporation of separated accommodations along access-controlled facility right-of-way may be possible in coordination with the Secretary and FHWA.

However, consideration for bicycle and pedestrian accommodations on roads/bridges crossing such roadways are typically appropriate. Especially in urban and suburban areas, strive to reserve sufficient space along crossing roadway approaches and bridges for pedestrian and bicycle facilities which may be added in the future.

17-1.02(b) Consideration of Accommodations on Resurfacing Projects

On pavement resurfacing projects that do not widen the existing traveled way nor provide stabilized shoulders bicycle accommodation is not mandated by 605 ILCS 5/4-220. However, the need for and feasibility of providing an accommodation should still be assessed in the scoping phase based on the statutory provisions on local support and accommodation within the overall scope of each project. Chapter 1 of the AASHTO Green Book encourages designers to consider all potential road users and apply flexibility for “projects on existing roads”. The potential for reallocation of available roadway space is a fundamental decision that must be made on all resurfacing projects except those in rural contexts. On some state routes there may be excess capacity that encourages faster speeds and discourages use by pedestrians and bicyclists. Such locations are particularly well-suited for reallocation of space on resurfacing projects since slower travel speeds and improved safety may result in conjunction with appropriately reduced motor vehicle capacity.

On rural route resurfacing projects, the presence of a bicycle warrant may affect paved shoulder rumble strip considerations; these issues are discussed in Chapter 34. Adding paved shoulder width will typically be constrained by scope considerations.

If sufficient width is available, bike lanes or shared lanes can be created in a resurfacing project by adjusting the pavement markings at very little cost. In other cases, reducing the number of through travel lanes through a Road Diet or eliminating parking may provide sufficient space for adding an accommodation. Evaluate trade-offs in terms of vehicle capacity, vehicle travel times,
bicycle and pedestrian facility widths, potential levels of bicycle use, on-street parking, potential vehicle speed reduction, and overall user safety. For certain project locations and contexts, a decision could be made during scoping that accommodations are infeasible; for most resurfacing projects assessments should be performed and decisions documented. Refer to the FHWA Road Diet Informational Guide and Section 17-2.02(g) for more information on these types of projects.

17-1.03 Bikeway Warrants - Needs Assessment

The Department shall provide on-road or off-road accommodations for bicycle travel in highway projects when any of the following warrant conditions exist:

1. The highway or street is designated as a bikeway or recommended bike route in a regionally or locally adopted bike plan or map. Note that regional or local maps should not be confused with the Illinois Official Bicycle Maps, which depict current bicycling conditions and should not affect decisions on accommodations.

2. The projected two-way bicycle traffic volume (see Section 17-1.04) will approximate 25 ADT or more during the peak three months of the bicycling season five years after completion of the project.

3. The route provides access to a park, recreational area, school, or other destination expected to attract bicycle traffic.

4. The route provides access across a natural or man-made barrier (e.g., bridges over rivers, bridges over railroad tracks/yards, bridges over freeways or expressways, highways through a national forest). Bicyclists shall be accommodated on the bridge, unless bicycles are otherwise prohibited to operate on the roadway approaches. See Sections 17-2.02(f) and 17-2.03(m) for bridge deck replacement or rehabilitation projects or for culvert replacement projects. For projects that meet no other warrants, a minimum shoulder width of 4 ft (1.2 m) with standard height parapet or bridge rail shall satisfy this warrant. For projects that meet this and other warrants, use the guidance provided in the Bicycle Facility Selection Table (Figure 17-2.A) and incorporate bridge railings appropriate for bicyclists.

5. The highway project will negatively affect the recreational or transportation utility of an independent bikeway or trail. Highway projects will negatively affect at-grade paths and trails when they are severed, when the projected roadway traffic volumes increase to a level that prohibits safe crossings at-grade, or when the widening of the roadway prohibits sufficient time for safe crossing. If certified by the State or local agency having jurisdiction as being programmed for construction no later than five years beyond the anticipated completion of the highway project, treat proposed or planned bikeways that cross or parallel a roadway as an existing facility. Specific improvements to address such facilities can potentially be included in projects.

Multilane arterial roads can create substantial barriers to bicycling and walking, if not properly planned and designed. A connected network is necessary for bicycling or walking to be practical
and feasible, and this policy seeks to expand connected networks. Development centers along state routes should be conveniently accessible by foot and by bike. State routes can provide regional connections that encourage greater numbers of people to bike and walk. Not all residents and workers may have access to private vehicles, so there is also an equity aspect to consider in designing IDOT facilities.

Problems can arise when accommodations start and stop such that users do not have clearly defined ways to proceed safely from the end of a bikeway accommodation. When looking at bicycle warrants and the need for accommodation as part of a project, designers are therefore encouraged to examine the overall network available to bicyclists. Connected and integrated networks provide transportation options to likely destinations and consider reasonable termini. Corridors should be considered for accommodation as part of a longer-term plan to provide for continuous bicycle travel and for connection to contiguous routes. As an example, an intersection improvement could include bike lanes in anticipation that adjacent areas could have bike lanes added in the future. Project limits may be extended beyond highway improvements for reasonable distances to connect to bicycling facilities at nearby intersections or to avoid short accommodation gaps. Reflect such extensions in the Phase I report. Documentation requirements and procedures are covered in Sections 17-1.04 and 17-2.01.

17-1.04 Documenting Bicycle Travel Accommodation Warrants

Assess bicycle travel demand in the project scoping phase or early in the project planning stage. The concepts of identifying cycling origins and destinations, and thus travel demand, are discussed in the FHWA publication Selecting Roadway Design Treatments to Accommodate Bicycles. Like motorists, many bicycle riders seek direct routes and require access to destinations immediately along arterial and collector roadways. Demand can therefore seldom be assumed to be satisfied by the presence of an alternate route. Because of the potential for bicycle travel, accommodation will likely be warranted in all urban core and in most urban and suburban areas. In all contexts, consider commercial, recreational, or other development near or along highways that may generate bicycling activity.

The first use of BTA form BDE 1702 on projects is to assess and document bicycle travel needs and accommodation decisions. The BTA is to be used on all projects other than those excluded under the Illinois Highway Code or where accommodations are clearly infeasible, including some resurfacing projects as described in Section 17-1.02(b). Bicycle origins and destinations should be reviewed. A map to illustrate travel generators and travel paths, a checklist for organization and public coordination, an overall assessment of bike warrants and travel in the project area, and a record of local coordination are to be included in the BTA. The completed sections of the form should be reviewed by the district bicycle coordinator, as it provides the basis for evaluating whether or not a travel demand warrant for bicycle accommodation has been met. The process used in subsequent accommodation decisions is described in 17-2.01.
**17-1.05 Maintenance**

Normally, responsibility for ongoing maintenance of bikeway facilities on the roadway surface and not separated from other traffic is assumed to be an integral part of the roadway. The state will assume maintenance of these facilities, although local agency maintenance agreements are sometimes developed by the districts for the restriping of bike lane and crosswalks. Responsibility for maintenance of bikeway and pedestrian facilities separated from motorized traffic should be delegated by agreement with local jurisdictions or others early in the project planning process. For example, separated bike lanes will become part of local maintenance responsibilities; refer to Chapter 5.

**17-1.06 Right-of-Way**

Acquire right-of-way for bikeway and pedestrian facilities in accordance with existing IDOT land acquisition policies and procedures. Additional right-of-way required for bikeway and pedestrian purposes should be purchased in conjunction with the right-of-way for the overall roadway improvement.

**17-1.07 Funding**

Bicycle facilities for the safe travel of bicyclists within an improvement corridor are considered an integral part of a highway project for funding purposes, and thus are eligible for federal cost participation, as discussed in Chapter 5.

Accommodations beyond those that are identified as required in the Bicycle Facility Selection Table, Figure 17-2.A, may be incorporated, if desired, by local officials with any additional cost typically being funded locally. Side path facilities are an option that fulfills accommodation requirements. Paths are subject to maintenance commitments by local agencies but are handled the same as on-road accommodations in terms of local construction cost participation requirements.
17-2 DESIGN GUIDANCE AND CRITERIA FOR BICYCLE FACILITIES

The Department utilizes the Guide for the Development of Bicycle Facilities (AASHTO Bike Guide) as the primary basis for design. The guide provides information on the physical infrastructure needed to support bicycling. The Bicycle Facility Selection Table, Figure 17-2.A, is based on the most recent AASHTO guidance and includes BLOS evaluations. Only on-road accommodations are listed; side paths are considered independently.

The FHWA issues guidance on the design and implementation of bicycle and pedestrian accommodations. FHWA websites and publications, including those listed at the end of this chapter, can be reviewed for additional design guidance and ideas. The National Association of City Transportation Officials Urban Bikeway Design Guide (NACTO Bikeway Guide) includes many bicycle design features which have been proven effective in locations including larger cities in the United States. Use of the NACTO Bikeway Guide is endorsed by FHWA and is often appropriate to enhance the safety and mobility of bicyclists. Design features in FHWA publications, the NACTO Bikeway Guide, or other recognized guidance documents may be proposed as long as they are fully compliant with the ILMUTCD and discussion in this chapter. Additional guidance and information on accommodation measures for bicyclists and pedestrians is included in the department’s Bicycle and Pedestrian Accommodations Study (2019). In all cases coordinate bicycle facility design with the cross section criteria presented in Part IV “Roadway Design Elements” and Part V “Highway Systems.”

17-2.01 Documentation Requirements and Procedures

The incorporation of context in design decisions allows for appropriate assessment of the needs of all transportation modes within a corridor, especially pedestrians and bicyclists. Urban and urban core areas, higher-density suburban areas and rural towns often have land uses that generate higher rates of bicycling and walking and a greater variety of users, including many who are less confident and therefore adequately comfortable only on separated facilities. User profiles are considered in the Bicycle Facility Selection Table and discussed in the following section, On-Road Accommodations. Reducing the comfort level of a bike facility will generally reduce the numbers and types of bicyclists using the facility.

When one or more of the warrants presented in Section 17-1.03 are met accommodation is required. Preliminary design should be guided by the Bicycle Facility Selection Table, considering options where listed. These are the base accommodation options. Local coordination and site conditions may sometimes constrain the accommodation and necessitate an adjusted design. Providing the highest-and-best bikeway facility that conditions and context dictate is better than providing no bike accommodation.
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<td><strong>Rural Roadway Two-Lane, ≥ 45 mph</strong></td>
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<td>Design Year ADT &gt; 10,000</td>
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<td><strong>Rural Roadway Multilane, All Speeds</strong></td>
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<td>6 ft (1.8 m)</td>
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<tr>
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<td>8 ft (2.4 m)</td>
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<td><strong>Urban Roadway Two-Lane, &lt;30 mph</strong></td>
<td>14 ft (4.3 m) 7/</td>
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<td>5 ft (1.5 m)</td>
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<tr>
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<tr>
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<tr>
<td><strong>Suburban Roadway Two-Lane, 40-45 mph</strong></td>
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<tr>
<td>Design Year ADT &lt; 6,500</td>
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<tr>
<td><strong>Urban Roadway Four-Lane, &lt;30 mph</strong></td>
<td>14 ft (4.3 m) 7/</td>
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<td><strong>Urban Roadway Four-Lane, 30-35 mph</strong></td>
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<tr>
<td><strong>Urban Roadway Four-Lane, 40 mph</strong></td>
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<tr>
<td>Design Year ADT &lt; 7,000</td>
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<tr>
<td><strong>Suburban Roadway Four-Lane, 40-45 mph</strong></td>
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<tr>
<td>Design Year ADT &lt; 13,000</td>
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<td>Design Year ADT ≥ 13,000</td>
<td>8 ft (2.4 m)</td>
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<td>7 ft (2.1 m)</td>
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</table>
Notes:

1/ A shared use path adjacent to the roadway (i.e., a side path) is an option that fulfills accommodation requirements in most situations. A side path can be selected whenever it is locally supported in accordance with Chapter 5 cost sharing and maintenance requirements. Two-way side paths shall be a minimum of 10 ft (3.0 m) wide.

2/ All widths shown are considered minimums for typical design situations. Wider facilities can be provided. Project-level assessments of highest-and-best facilities may also affect widths provided.

3/ Bicycle lane widths are measured from the outside lane line to the face of curb or edge of parking lane. Bicycle lane widths of 5 to 6 ft may be buffered; widths greater than 6 ft must be buffered. Buffer striping is included in the bicycle lane widths shown.

4/ One-way separated bicycle lane width shown is the minimum clear width between vertical features and allows bicycle passing. Additional width is needed for vertical elements such as raised curbs, tubular markers with striped buffer, or parking lanes. Each jurisdiction may identify larger minimum clear width restrictions based on maintenance requirements.

5/ As an alternate to a one-way SBL, a two-way SBL of a minimum 8 ft (2.4 m) clear width can be provided on one side of the roadway. Additional width is needed for vertical elements.

6/ This value assumes no rumble strips are present. If rumble strips will be installed, utilize Standard 642006 and increase the paved shoulder width to 4 ft (1.2 m) to maintain the required 3 ft (0.9 m) clear width for bicycles.

7/ Heavy truck (MU) volumes should be less than 3% of ADT in order to select a Wider Outside Lane accommodation. Refer to Figure 17-2.C for measurement of the Wider Outside Lane.

8/ Refer to Section 17-2.03. Determine Project Context in the Scoping Phase. Speeds listed refer to posted speed limits and are assumed consistent with the 85th percentile speed.
There are situations in which the principles of Context Sensitive Solutions (CSS) and Complete Streets conflict. Refer to Chapter 19 and 605 ILCS 5/4-219 for CSS principles and requirements. In instances where the requirements of the Complete Streets Law run counter to the consensus view of project stakeholders, the Regional Engineer will determine the accommodation solution, or lack thereof, typically in consultation with BPPE. After need has been established and the required accommodation has been identified using the Bicycle Facility Selection Table, it is the responsibility of the district to convey this information to the appropriate local agency. Not all accommodations require a local match or maintenance participation as identified in Chapter 5. In projects that require local participation, if the local agency chooses not to participate in the bicycle accommodation, the Department will request that that local agency pass a resolution indicating their non-participation and have this noted in the Phase I report. Proposed resolution language is included in Section 17-7. Without local agency participation, the Department will consider options and try to incorporate the next highest-and-best accommodation in consideration of project context and constraints.

If it is determined that the accommodation(s) in the Facility Selection Table cannot be built without excessive cost, local support, or disruptive ROW considerations, then the next highest-and-best accommodation shall be considered in order to achieve the highest comfort/safety for the user in light of the project’s cost, local support, and ROW considerations. An example of a next highest-and-best accommodation is provision of a paved shoulder width (rural contexts) or bicycle lane width (urban contexts) less than those shown in the Bicycle Facility Selection Table. In such cases BLOS would be checked as described in Section 17-2.02. Selection of next highest-and-best accommodations shall be determined on a case-by-case basis by the district, as many variables will need to be considered. This may become an iterative process when considering all project variables. The lowest level of accommodation that may meet the intent of this policy is a shelf of sufficient width to allow for future path construction within right-of-way. In rare cases and where there is local support, a parallel route adjacent to the state highway could be identified as the highest-and-best accommodation, but only when direct accommodation on the state route is determined infeasible and the parallel route would fill a critical gap in the bikeway network. Once all analysis and decisions are complete the BTA form should be signed by the district bicycle coordinator and included in the Phase I report.

17-2.02 On-Road Accommodations

On-road bicycle accommodations include paved shoulders, wider outside lanes, bicycle lanes, and separated bicycle lanes. Choice of accommodation is dependent on project context, roadway type, traffic volumes and speed; the base on-road accommodations are presented in the Bicycle Facility Selection Table. Whenever on-road accommodations are selected it is advisable to perform project-specific BLOS analysis prior to moving forward with local coordination. BLOS provides an estimate of bicyclist perceived safety and comfort – considering lane width, motor vehicle volumes, percent heavy (MU) vehicles, posted speed limit, and pavement condition. A better BLOS may result in more bicyclists using a facility.

Several bicyclist design user profiles have been developed through national research. There are “somewhat confident” and “highly confident” groups that makes up ten to fifteen percent of the total population. A much larger group is identified as “interested but concerned.” They comprise
just over fifty percent of the population and may not be comfortable in certain bike lanes, usually preferring separated facilities. Note that children were not considered in this research. In order to properly address the varying confidence levels of potential users, this policy introduces an assessment of BLOS as a part of design decision making. IDOT considers it appropriate to target BLOS C in the urban core, urban, and rural town contexts where a high number of bicyclists may desire to commute or otherwise travel on-road. This level of accommodation could encourage a substantial portion of the “interested but concerned” population segment to utilize facilities, making the accommodation provision cost effective in these contexts. In the rural context (higher speed roadways) most potential users would be in the highly confident group and a lower level of service, approximated by BLOS D, is considered acceptable. In the suburban context an intermediate BLOS C/D is the appropriate target.

The accommodations listed in the Bicycle Facility Selection Table have been checked for a reasonable range of variables and will typically provide the target minimum BLOS. When heavy trucks exceed 4 percent the results of BLOS analysis are less reliable due to data limitations of the model; coordinate the analysis with BPPE in those cases and work to provide a higher level accommodation.

Use one of the two worksheets provided in form BDE 1703 to calculate BLOS. The assessment applies to paved shoulders, bicycle lanes and shared lanes (e.g. wider outside lanes). Input needed for the calculation includes lane and shoulder widths, vehicle traffic volume, traffic speed (typically use posted speed), heavy truck percentage, and pavement surface condition (CRS). For traffic volume typically use design year ADT. Since the pavement surface condition will deteriorate over time it is appropriate to use a “fair” condition (CRS 5 to 6) to approximate the conditions that will be near the end of the project design life. The presence of intermittent on-street parking along a paved shoulder accommodation can negatively affect BLOS. A Shoulder Accommodation worksheet is available that allows consideration of the effects of such parking, which may sometimes be present in a rural town context. Such parking effects would not be seen in other rural contexts. The Bike Lane Accommodation worksheet does not allow consideration of parking encroachment; bike lanes cannot legally be blocked by parked or standing vehicles.

When the calculation shows an accommodation would likely not provide the target minimum BLOS (C through D depending on context), consider adjusting the design width (e.g. widen for a buffered bike lane) or instead incorporating a side path. A path fulfills accommodation requirements in most situations. Local coordination would then move forward with the adjusted accommodation. Additional information on BLOS is available in Chapter 15 of the Highway Capacity Manual.

17-2.02(a) Paved Shoulders on Rural Roadways

On-road bicycle accommodation on rural roadways typically consists of providing a paved shoulder. Paved shoulders can accommodate bicycle travel efficiently and offer many other benefits (e.g., added safety, reduced maintenance, rural mail delivery). The typical bicyclist in rural contexts is the recreational (i.e., highly confident) bicyclist. Other users do not feel comfortable on high-speed roadway shoulders, but there are usually no reasonable alternatives on rural roadways. Use the Bicycle Facility Selection Table to determine the appropriate width. The table specifies widths that will generally provide a BLOS D, which is considered sufficient for
travel by the recreational bicyclist. When rumble strips are installed in a paved shoulder which serves as a bicycle accommodation and the width of the paved shoulder is 6 ft (1.8 m) or less the 8 in (200 mm) rumble strip design should be used to minimize the impact to the accommodation.

Where the shoulder widths shown in the Table cannot be provided, a narrower shoulder might still be considered an adequate bicycle accommodation. A 3 ft (0.9 m) minimum clear width beyond a rumble strip is required to qualify as an accommodation. If rumble strips will or may be installed on a paved shoulder where bicycle warrants are met, always provide a minimum 4 ft (1.2 m) paved width to maintain the required 3 ft (0.9 m) clear width for bicyclists. Edge line rumble strips may also be considered in accordance with the Chapter 34 procedures in order to minimize impacts to bicyclists. Paved shoulders may include word or symbol markings along with arrow markings to designate preferential bicycle use (i.e., a bike lane) only where the paved width is 5 ft (1.5 m) or more and the posted speed limit is 45 mph or less.

Transitions from rural cross sections into urban cross sections (e.g., frequent entrances, intersections) should accommodate bicyclists through movements by providing additional width in the curb and gutter section. For example, Figure 17-2.B illustrates an acceptable approach where the urban accommodation would be a wider outside lane. A consistent cross section and consistent bikeway width is preferred in addressing rider comfort and safety.

17-2.02(b) Shared Roadways and Shared Lanes

On a shared roadway facility, bicyclists and motorists share the same travel lanes without a striped separation. The AASHTO Bike Guide identifies a minimum outside lane width of 14 ft (4.2 m) as adequate for accommodating bicyclists in a shared lane. At this width motorists can provide the required 3 ft (0.9 m) buffer to pass bikes without encroaching into an adjacent lane. As shown in the Bicycle Facility Selection Table, a wider outside lane of 14 ft (4.2 m) or more can be considered to provide bicycle accommodation for lower-speed and lower-volume roadways. Typical cross sections are shown in Figure 17-2.C. Measure the width of the lane from the lane/centerline stripe to the joint between the pavement and the gutter. If no joint exists, as with monolithic pavement, measure width to the face of the curb. Where parking is marked or allowed along the roadway additional width for a bicycle use area is required as shown in the figure. In shared lane situations where bus traffic is common, bicycles and buses may share an outside lane with a minimum width of 16.5 ft (5.0 m) to the curb face.
Shared roadways can also sometimes be identified as a next highest-and-best accommodation where posted speed limits will be up to 35 mph (55 km/h) in restricted locations, BLOS is checked, and any issues are discussed with BPPE. Shared lane markings, typically called “sharrows,” should not be used on roadways with posted speed limits above 30 mph (50 km/h), and should be considered only where traffic volumes are fairly low and local maintenance is agreed. Signing options for shared urban roadways are presented in the *AASHTO Bike Guide* and include the W11-1 and R4-11 signs. Other *ILMUTCD*-compliant bicycle signing may be proposed. A sign reinforcing the 3 ft (0.9 m) minimum clearance law for passing bicyclists is available.
TYPICAL CROSS SECTIONS FOR DESIGN OF SHARED ROADWAYS
FIGURE 17-2.C
17-2.02(c) Conventional and Buffered Bicycle Lanes

On-road bicycle accommodations on urban roadways typically consist of providing bicycle lanes. Two variations in the design of bicycle lanes can be applied based on the specific conditions of a project: conventional bike lanes and buffered bike lanes. The width of a bicycle lane is measured from the edge of the adjacent vehicular lane stripe to the face of curb or parking lane line as shown in Figures 17-2.D and 17-2.E. Use the Bicycle Facility Selection Table to determine the appropriate width. Five ft (1.5 m) is the minimum width of a bike lane (stripe-to-stripe or stripe-to-curb face). Gutter pans are sometimes not acceptable for bicycle travel due to the presence of debris or broken pavement, and the pavement/gutter joint can sometimes become vertically uneven or separated from the gutter and affect bicycles with narrow tires. However, clear distance to the curb face is increased by the presence of a gutter. Widths shown in the Bicycle Facility Selection Table and used in the calculation of BLOS include the gutter pan.

Bicycle lane word or symbol markings (e.g., the helmeted bicyclist) along with arrow markings are required to designate a bicycle lane. Markings inform all users of the restricted nature of the bicycle lane. A five in. (130 mm) minimum normal line width is appropriate between a through traffic lane and a bicycle lane. Refer to ILMUTCD Section 9C for discussion of marking requirements. The AASHTO Bike Guide provides further details on bicycle lane markings.

Green pavement markings may be used as a traffic control device to clarify for all users the locations where bicyclists are expected to operate. These markings are supplemental to the other pavement markings that are required for the designation of a bicycle lane. Green pavement marking can be installed under an MUTCD Interim Approval and therefore locations are tracked and performance reported. Green pavement markings should be used only within intersections and on intersection approaches where bicyclists and other roadway traffic would have potentially conflicting weaving or crossing movements; refer to Section 17-2.02(e) for further discussion.

Signing is optional when designating a bicycle lane. Use ILMUTCD Section 9B and apply engineering judgment to develop a signing plan that provides relevant information to adequately address safety for all users.

For conventional bicycle lanes the following are typical cross section requirements:

- On curbed streets without parking, locate the bicycle lane next to the gutter, as shown in Figure 17-2.D.

- Where parking is permitted, locate the bicycle lane between the parking lane and the through traffic lanes, as shown in Figure 17-2.E. Consider providing additional parking/bike lane width, above the required minimum, to reduce the likelihood of car door/bicyclist conflicts (a.k.a. dooring crashes) under the following conditions:
  + where there is frequent parking turnover,
  + where parked vehicles are mostly commercial vehicles, or
  + where the posted motor vehicle speed limit is above 35 mph.
Note: Bike lanes should include buffer area(s) per Section 17-2.02(c)

TYPICAL CROSS SECTIONS WITH BIKE LANES AND NO PARKING

Figure 17-2.D

Design bicycle lanes as one-way facilities that carry bicycle traffic in the same direction as adjacent motor vehicle traffic. Two-way bicycle lanes on one side of the roadway (without physical separation) and contra-flow bike lanes are unacceptable because riding against the flow of motor
vehicle traffic introduces safety concerns. Wrong-way riding is a major cause of bicycle crashes nationally and violates the *Illinois Vehicle Code*, 625 ILCS 5/11-1505. Locate one-way bicycle lanes that are on one-way streets on the right side of the street, except in areas where placing the bicycle lane on the left will decrease the number of conflicts (e.g., those caused by heavy bus traffic). Place bicycle lanes that are adjacent to dedicated bus lanes between the vehicular traffic lane and the bus lane as shown in Figure 17-2.F.

**Note:** Bike lanes should include buffer area(s) per Section 17-2.02(c)

**BICYCLE LANES ADJACENT TO BUS LANES**

*Figure 17-2.F*

Buffered bike lanes add a delineated buffer space to a conventional bicycle lane for the purpose of widening the bicycle travel space and providing a better level of comfort, as described by BLOS. The buffer areas can be placed on one or both sides of the primary riding area. The buffer area width(s) are included in the specified bike lane width; refer to Figures 17-2.G(1) and 17-2.G(2). Buffer areas are marked with two solid white lines (a 5 in. (130 mm) minimum line width is required on the vehicle traffic side) at least 12 in. (300 mm) apart. Where the buffer total width is 18 in. (460 mm) or more, diagonal (Case 1) or chevron (Case 2) markings are recommended for clarity. Placing a 2 ft 6 in. (760 mm) minimum buffer immediately adjacent to a parking lane can be effective in reducing dooring crashes. Buffered bike lanes should be transitioned to conventional skip-dash lines on intersection approaches and the width may be reduced where width constraints dictate. Note that the primary riding area must be a minimum of 3 ft 6 in. (1070 mm) to allow for placement of the bike lane pavement marking symbol. Bike lane widths of 7 ft (2.1 m) or more will accommodate bicycle passing within the limits of the bike lane.

Adding bike lanes to an existing roadway cross section is a way to utilize existing infrastructure to achieve multimodal goals efficiently at low cost; refer to Section 17-2.02(g). Figure 17-2.G(3) illustrates options for accommodating bikes within a specific roadway width. Project constraints will often dictate whether conventional, buffered or separated bike lanes can be provided as part of a road diet or lane diet project.
BICYCLE LANES WITH BUFFER AREAS

Figure 17-2.G
(1 of 3)

Note: Separation may also be provided between bike lane striping and the parking boundary to reduce door zone conflicts, as shown on the following page.
BICYCLE LANES WITH BUFFER AREAS

Figure 17-2.G
(2 of 3)
Note: Available options are shown for a 50’-0” two-way roadway with bike accommodation and both parking and no-parking scenarios. This is for illustration purposes. A range of available options should typically be considered.

**BICYCLE LANES WITH BUFFER AREAS**

Figure 17-2.G
(3 of 3)
17-2.02(d) Separated Bicycle Lanes on Urban and Suburban Roadways

Separated Bicycle Lanes (SBLs) in their most common application are one-way, bike-only facilities located on both sides of two-way roadways or one side of one-way roads. Separation is provided by incorporating continuous or intermittent vertical elements within a street-side buffer that is at least 2 ft 6 in. (760 mm) wide. Compared to conventional bike lanes SBLs provide an enhanced level of perceived comfort and safety that may attract a greater range of users and better fulfill the goal of serving more potential bicyclists. Some contexts and operational conditions are appropriate for two-way separated bike lanes. Refer to Figure 17-2.G(3) for example cross sectional views of the two types of SBLs within a specific roadway width. SBLs are appropriate in many contexts as an alternative to side paths; both are separated sufficiently from traffic such that a BLOS evaluation is not required or appropriate.

For one-way accommodation, design separated bicycle lanes to carry bicycle traffic in the same direction as adjacent motor vehicle traffic for the reasons stated in Section 17-2.02(c). Since bicyclists in one-way SBLs better follow the expectations of drivers, there is potential safety advantage at crossings in comparison to two-way side paths. SBLs also provide a dedicated bikeway space as opposed to the shared-use space along a path. Two-way separated bicycle lanes on one side of the roadway (and contra-flow separated bike lanes) are not-preferred where riding against the flow of motor vehicle traffic will introduce specific safety concerns. Locate one-way SBLs that are on one-way streets on the right side of the street, except in areas where placing the SBL on the left will decrease the number of conflicts (e.g., those caused by heavy bus traffic). Refer to the Illinois Vehicle Code, 625 ILCS 5/11-1505.

SBLs are typically located at street level and separated from the traffic by vertical elements, such as raised curb islands, tubular markers (flexible posts) with a striped buffer, or a parking lane. A detail of a typical tubular marker is shown on Figure 17-2.I(3) in Section 17-2.02(e). Reasons for a street level configuration include control of pedestrian encroachment, provision of a detectable edge for low vision individuals, and (in retrofit projects) the possibility of using existing drainage systems with minimal modification. The street-side buffer should provide adequate separation from motor vehicles and control other curbside activities (e.g., loading). The following are considerations in the selection and design of separation elements.

Raised curb islands:
- May add considerable cost,
- Typically construct as cast-in-place features; precast options may provide less integrity,
- Provide a continuous island; with gaps primarily to facilitate necessary drainage,
- Discontinue on intersection approaches to allow for operational mixing,
- May be used in conjunction with parking where space and cost considerations allow,
- Widths typically range from 3 ft (0.9 m) to 6 ft (1.8 m); wider islands can allow additional features (e.g., low-growing vegetation) with a 6 ft (1.8 m) minimum face-to-face width also providing for pedestrian refuge at crosswalks where applicable.

Tubular markers:
- Typically add relatively minor cost beyond that of a buffered bike lane,
- Buffer widths as narrow as 2 ft 6 in. (760 mm) may be used, and these may partially overlap the usable riding area,
- Must meet minimum ILMUTCD requirements for color (the same as the pavement marking they supplement) and retro-reflectivity,
- Must be identified specifically as a local maintenance item in an agreement,
- Shall be removable to facilitate maintenance, which is typically frequent,
- Must not be bolted into place on bridge decks (epoxy pad fastening is available),
- May be considered less attractive and will require replacement when damaged. The need for regular ongoing maintenance must be committed to by the local agency.

Parking Lanes:
- Ten ft (3.0 m) is the preferred minimum separation distance to allow for parking and separation elements; curbed noses can be used to introduce the parking lane on the approach end,
- Opening of car doors (on the passenger side along two-way roads) creates the potential for dooring crashes; a striped buffer of minimum 2 ft 6 in. (750 mm) width is highly recommended for any bike lane running along the edge of a parking lane,
- Parked vehicles can restrict sight lines between motor vehicles and bicyclists; it is necessary to prohibit parking near intersections to maintain sight lines.

Measure SBL clear width between curb face and edge of tubular markers or face of curved island. The minimum width of a one-way SBL is typically 7 ft (2.1 m) to allow for bicycle passing and the use of local maintenance equipment (e.g. for snow removal). This minimum clear width is specified in the Bicycle Facility Selection Table since passing is typically important. In constrained conditions a one-way SBL width could possibly be reduced, but only if a local agency confirms maintenance would be practical. However, the SBL should also be wide enough to accommodate anticipated bicycle volumes, noting that completion/extension of a bicycling network could increase bicycle use.

A two-way SBL of minimum clear width 8 ft (2.4 m) can be provided on one side of a roadway where operational issues and all safety concerns can be effectively mitigated. This minimum clear width cannot be reduced for two-way SBL as passing will be necessary and usually frequent. An additional 3 ft (910 mm) minimum buffer width for raised curb, or 2.5 ft (760 mm) minimum for tubular markers, is also needed. Two-way SBL provide user separation and a low-stress bicycling experience. One potential concern is that drivers may not expect the counter-flow direction of bicycle travel. Careful attention must be paid to the design of crossings of driveways and intersections to maximize bicyclist visibility. The design to accommodate counterflow bicycle traffic movements may require additional traffic signals (often bicycle signal heads) and related infrastructure. On the other hand, maintenance costs may be less for a two-way facility based on the much shorter SBL length required. Selecting the appropriate configuration for separated bike lanes, one-way versus two-way, will include location-specific consideration of safety, connectivity, ease of access, public feedback, available right-of-way, termini transitions, traffic signal controls, and maintenance. Either design option could provide good accommodation solutions. Carefully assess the constraints and circumstance that will be present along project segments and intersections and design accordingly.
17-2.02(e)  Intersection and Interchange Treatments

Accommodations for on-road bicycle travel through conventional intersections are covered in the ILMUTCD, Part 9, including striping and signing requirements for bicycle lanes. Specific situations are further discussed and illustrated in this section. Safety and usability for bicyclists through roundabouts depend on details of the roundabout design including provisions unique for cyclists; these issues are covered in Section 17-2.04.

Local legs approaching signalized intersections may have various accommodation types, often including shared lanes or paved shoulders of widths different than those required for state route accommodations. When redesigning an intersection, maintain accommodation widths on local approaches and through the intersection so that restricted-width bottlenecks are not created, and comfortable bicyclist travel is provided on those legs. As an example, avoid reducing through lane widths when adding turn lanes on the local approaches. Considering and accommodating all bike movements during intersection design will often affect the scope of work along local legs. Where bicycle lanes are not provided, typically continue an approaching wider outside lane through intersections to accommodate bicycle through movements. Since bicyclists may be on-road even if a side path is provided, avoid outside lane width reductions through intersections in any case.

Figure 17-2.H(1) provides an example of pavement markings and signing at a signalized intersection where bike lanes are present along the routes. Typical movements for signalized intersections with bike lanes are shown in Figure 17-2.H(2). A bicycle lane on a signalized intersection approach may be continued through the intersection as “dotted” line extensions (i.e., skip-dashes) as shown in Figure 17-2.H(2). Left-turning bicyclists may follow the optional paths shown. Some bicyclists will move to the left in advance of an intersection and turn from the left turn lane, utilizing an optional bicycle box where provided on the approach. Most bicyclists will proceed straight through the intersection staying to the right on the far side, then either crossing like a pedestrian or using a two-stage bicycle turn box where provided. Either a bicycle box or the two-stage bicycle turn box may be included under an MUTCD Interim Approval; there are specific marking, signing, signalization, and reporting requirements involved, administered through the central Bureau of Operations as discussed below. Consultation with BPPE is recommended where these features will be incorporated into the design in order to discuss design details. Refer to the AASHTO Bike Guide and the ILMUTCD for additional design considerations. Dotted line extensions of bike lanes through intersections, where used, should be consistent with ILMUTCD Section 3B.08.
Note: Consider and accommodate all bicycle movements on all legs.

TYPICAL STRIPING AND BICYCLE MOVEMENTS AT INTERSECTIONS
FOR STREETS WITH BICYCLE LANES

Figure 17-2.H
(1 of 2)
TYPICAL STRIPING AND BICYCLE MOVEMENTS AT INTERSECTIONS FOR STREETS WITH BICYCLE LANES

Figure 17-2.H
(2 of 2)
The *AASHTO Bike Guide* includes a discussion of the requirements for on-road bicycle accommodations on intersection approaches and at intersection, and the *ILMUTCD* provides examples of required pavement markings; see Figures 9C-1, 9C-4, 9C-5, and 9C-6. Additional striping considerations and details for general guidance at these locations are illustrated in Figure 17-2.I. Figure 17-2.I(1) shows the general striping required for bicycle lanes on approaches to intersections. Through bike lanes should be located to the right of the right-hand through lane and to the left of an auxiliary right turn lane for both urban or rural roadways. This placement greatly reduces the potential for last-moment conflicts with right-turning vehicles. A 5 ft (1.5 m) minimum width bike lane adjacent to the right turn lane typically provides comfortable bicyclist operating space. Where an auxiliary right turn lane is introduced, two dashed lines are used through the right turn lane tapers to designate the priority of bicyclist operations. For rural roadways these may be the only marked bike lane accommodations provided when the accommodation is located along a paved shoulder. Consider Begin Right Turn Lane Yield to Bikes (R4-4) signs to add clarity for drivers. In a situation with bike lanes where a through travel lane is dropped into a right-turn-only lane, bicyclists not motorists are the users who must yield. In such a situation the bike lane should not be striped diagonally across the travel lane, as shown in Figure 17-2.I(1).

Examples of striping and signing for bike lanes at and between intersections are shown in Figure 17-2.I(2). A possible layout for transitioning two one-way separated bike lanes to a two-way separated bike lane at an intersection is shown in Figure 17-2.I(3). In all cases strive to maintain good visibility among all roadway users and provide channelization for proper positioning of all traffic. For conventional, buffered, and separated bike lanes clearly mark intersection approaches and through movements. Checking visibility and line-of-sight between motor vehicles and bicyclists is especially important at intersections with SBLs, and the separation elements must be discontinued to provide for all crossing and merging movements.

Consider access to/from links in the bicycle network and to/from adjacent properties and side streets. When considering bicycle safety, geometry that reduces vehicle speeds for turns is encouraged since vehicle turns involve potential conflicts with bicyclists. Well-designed corner islands, possibly including mountable aprons, can accommodate large vehicle turning movements while also providing bicycle/pedestrian refuge areas and appropriately reducing the turning speeds of vehicles.
TYPICAL TREATMENTS ON APPROACHES AND AT INTERSECTIONS FOR STREETS WITH TRADITIONAL AND SEPARATED BICYCLE LANES

Figure 17-2.1
(1 of 3)
TYPICAL TREATMENTS ON APPROACHES AND AT INTERSECTIONS
FOR STREETS WITH TRADITIONAL AND SEPARATED BICYCLE LANES

Figure 17-2.1
(2 of 3)
TYPICAL TREATMENTS ON APPROACHES AND AT INTERSECTIONS FOR STREETS WITH TRADITIONAL AND SEPARATED BICYCLE LANES

Figure 17-2.I
(3 of 3)
IDOT is administering statewide Interim Approvals (I.A.) for bicycle boxes, two-stage bicycle turn boxes, bicycle signal faces, and green colored pavement markings. To comply with the terms of an Interim Approval, any jurisdiction that utilizes these devices must report the location to IDOT, which will maintain an inventory of all installation locations. Installations must be in accordance with the terms of the Interim Approval, and the requirements and guidance on use of these devices as listed below. Contact the central Bureau of Operations to identify locations and have them added to the statewide inventory.

17-2.02(e)1 Bicycle Boxes (I.A.-18 for Optional Use of an Intersection Bicycle Box)

In conjunction with bike lanes, a bicycle box is a designated area on the approach to a signalized intersection consisting of an advanced stop line and bicycle symbol markings. The box is provided as a space for bicyclists to wait in front of stopped motor vehicles during the red signal phase, so they are more visible to motorists at the start of the green phase. Bike boxes can serve to mitigate conflicts between through bicyclists and right-turning motorists by allowing bicyclists to proceed first. Bicycle boxes may be installed across only one through lane. They may also be installed across a right turn lane. Turns on red should be prohibited using a NO TURN ON RED sign on an approach where a bike box is placed in front of traffic that otherwise has the potential to turn on red.

Bicycle boxes may be installed across a left turn lane at T-intersections or if a high left turning bike volume is anticipated. In other situations, bicyclists will tend not to utilize bike boxes for left turns, and the preferred treatment is to include a two-stage bicycle turn box, as described below, for left-turning bicyclists. Bike boxes shall be at least 10 ft (3.0 m) in depth, include a bicycle symbol within the box, and connect directly to a bike lane on the approach. At least 50 ft (15.2 m) of bike lane should be provided on the approach to a bike box. Green colored pavement marking may be used within the bike box and in this approach portion of the bike lane. The stop bar for motorists should coincide with the beginning of the bike box. A STOP HERE ON RED sign (R10-6 or R10-6a) should be placed even with this stop bar, along with an EXCEPT BICYCLES (R3-7bP) plaque. This must be modified where stop bars for through lanes and turn lanes will be at staggered locations.

17-2.02(e)2 Two-stage Bicycle Turn Boxes (I.A.-20 for Optional Use of Two-Stage Bicycle Turn Boxes)

The two-stage bicycle turn box designates an area at an intersection for bicyclists to wait for traffic to clear before proceeding in a different direction. These boxes are used to facilitate left-turning bicycle traffic at signalized intersections. They are a preferred treatment along high-volume multi-lane roadways where bicyclists would otherwise have to make lane changes, weave across traffic on an approach to turn left at a signal. Operationally, bicyclists traverse the intersection (e.g. along an extension of the through bike lane), stop within the turn box, reorient the bike to the cross street, and wait for the green phase to proceed. The following requirements apply to two-stage bicycle turn boxes:

- Locate where visible and outside the path of potentially conflicting through and turning vehicle traffic. Where the paths of other vehicles turning on a red signal
would travel through the two-stage bicycle turn box, these turns shall be prohibited using a NO TURN ON RED sign;

- Locate so bicycles will not queue into the path of moving traffic;
- Locate downstream of the cross-street crosswalk and stop bar;
- Include a bike symbol oriented in the direction of entry of the box and an arrow showing the direction of turn;
- Outline the box in solid white lines using a 6.5 ft (1.9 m) minimum length to accommodate the queued bike and consider green colored pavement marking to increase conspicuity;
- Passive detection of bicycles shall be provided in the two-stage bicycle turn box, if detection is required to actuate the signal for the cross street.

17-2.02(e)3 Bicycle Signal Faces (I.A.-16 for Optional Use of a Bicycle Signal Face)

A bicycle signal face incorporates bicycle symbols on the lenses of the signal head. In one-way contra-flow situations these may be the only signal faces visible to users; in other cases, these signal faces are placed at an offset location from the primary signal faces on the intersection approach. When these devices are present, bicyclists are not to follow pedestrian signals or standard traffic signal heads, as they do at other signalized locations. The current Interim Approval allows these devices only where there will be no conflicting motor vehicle movements concurrent with the bike green phase. The most common applications are for bike lanes that must be placed to the right of right turn lanes and in conjunction with both contra-flow and two-way separated bike lanes. They are not allowed at PHB locations. Early coordination with the local municipality regarding these devices is highly recommended; local jurisdictions may affect device placement and direct vehicle travel paths, pursuant to 625 ILCS 5/11-1510.

When operating on shared use paths, bicyclists must follow pedestrian signal heads and use the crosswalk, unless a bicycle signal face is also present. When operating in a separated bike lane, bicyclists will typically use the vehicle signal heads. However, if these are obscured in certain geometric situations, or if bikes have a directional movement separate from vehicle movements, bicycle signal faces may be utilized. The BIKE SIGNAL sign (R10-10b) sign must supplement these signals. Where appropriate, the BIKES USE PED SIGNAL sign (R9-5) may be mounted adjacent to the pedestrian signal heads; however, studies have indicated that compliance rates are low for bicyclists directed to follow pedestrian signals. This will be an important consideration at intersections with long crossings or unique signal phasing.

17-2.02(e)4 Green Colored Pavement Markings (I.A.-14 for Optional Use of Green Colored Pavement for Bike Lanes)

The primary application for green colored pavement markings will be for increased conspicuity on approaches to intersections (e.g. within the final 50 ft (15.2 m) before a stop bar or between dashes in taper areas), within bicycle storage/queue areas, across intersections or high-volume driveways (e.g., between dashed lane extensions), within bicycle boxes, and within two-stage bicycle turn boxes.
Use of green colored pavement markings in bike lanes outside approach and transition areas is not recommended due to application and maintenance costs. There is likely little benefit in conspicuity. Use of green colored markings is encouraged in strategic locations based on positive operational effects on bicyclist positioning, improved comfort for bicyclists, and increased awareness for drivers of the potential for bicyclist interactions. Strategic locations include conflict areas and other areas where operations are likely improved by additional guidance and conspicuity.

Green colored pavement markings should be applied both strategically and systematically to properly guide bicyclists through transition and conflict areas and to best meet the expectations of all road users, as these markings become more widely used on both the state and local roadway networks. These markings have specific requirements related to marking material, green color limits, and retro-reflectivity; refer to IDOT material specifications. See Interim Approval 14 for restrictions on the use of green colored pavement markings at locations other than those specifically mentioned above.

Intersection improvement projects are sometimes undertaken separate from adjacent roadway segment improvements. For such projects a bicycle warrant analysis must be completed, and if warrants are met the intersection geometrics should be designed to accommodate bicyclists along the intersection legs. Such accommodation may include, for example, width for bicycle lanes and offset corner islands and signal poles. Pavement areas can be hatched with diagonal lines to maintain consistency with the existing adjacent lane widths through an interim period. The ultimate design must be understood, and interim measures designed in the appropriate form and width so that subsequent roadway improvements may require only restriping at the intersection, thereby minimizing costs for the overall improvements.

Bike lanes may be dropped at logical locations beyond intersections (for example to a shared lane, shoulder, or side-path facility), if necessary due to width constraints near a project improvement limit. Refer to the discussion of network considerations in Section 17-1.03. The goal is to provide the on-road bicyclist with a safe path to continue travel. At roundabouts bike lanes can be transitioned off of the pavement using angled ramps; see Section 17-2.04 for more information regarding bicycle accommodation through roundabouts. An example application of signing is the BIKE LANE ENDS sign (R3-17 and R3-17bP) to give warning to bicyclists that the on-road accommodation is ending.

Accommodating bicyclists through an interchange with free-flow ramps requires design considerations to address safety of bicyclists. Where on-road accommodation is necessary, the design shown in Figure 17-2.J reflects an acceptable approach to directing bicyclists through interchanges (shoulder accommodation is illustrated; bicycle lanes similar). Each specific interchange design requires individual consideration to meet accommodation and geometric design requirements. A diverging diamond interchange accommodates left-turning movements at signalized intersections while eliminating the need for left turn phasing. Single Point Urban interchanges involve larger open pavement areas. On-road accommodations can continue along the right side of the arterial route travelled way in each direction through these interchange types.
SHOULDER ACCOMMODATION THROUGH HIGHER SPEED INTERCHANGES

Figure 17-2.J
17-2.02(f) Accommodations on Highway Structures

Bicycle accommodations on approach roadways, either on-road or as shared-use side paths, should be carried across structures in the same form. Side path crossings are discussed in Section 17-2.03. The width of new highway structures should, at a minimum, equal the width of the traveled way plus the width of approaching bicycle lanes and/or paved shoulders. Minimum cross sections for roadways and structures will vary significantly depending on the type of bicycle facility being accommodated. Several examples of minimum cross sections for shared wider outside lanes, bicycle lanes, and separated bicycle lanes are shown in Figures 17-2.K, 17-2.L, and 17-2.M respectively.

A minimum 4 ft (1.2 m) outside railing height shall be provided on roadway structures accommodating bicycles. This railing height is necessary to provide for bicyclist safety on any structure where bicycle warrants are met or where a bike route will be specifically designated. Bicycles are considered a design vehicle in these situations. When no warrant is met, only a standard parapet is required. Details available on the Bureau of Bridges and Structures base sheets may exceed this height and have been developed in consideration of AASHTO and FHWA crashworthiness requirements, as well as future bridge overlays.

Coordinate SBL design with the Bureau of Bridges and Structures and BPPE regarding any SBL on a bridge deck. Flexible posts are typically anchored into the pavement, so their use on bridges is discouraged given the need to avoid any deck reinforcement damage, which could also cause deck deterioration. Epoxy pads are usually the best alternative fastening method on bridge decks. Retrofitting raised curbs on bridge decks would require structural analysis by the Bureau of Bridges and Structures.

Bridge deck replacement or rehabilitation projects are not typically intended to widen the traveled way but rather to improve the roadway surface and integrity of the structure. Bridge width is limited by the existing superstructure components, with very limited opportunity for widening, and as such, may not allow for the bicycle accommodations called for in the Bicycle Facility Selection Table. If an existing structure cannot provide the accommodation widths provided along the roadway, appropriately sign the facility to warn users of width restrictions. However, such restrictions (e.g., narrowing a shoulder or bike lane) should still provide an accommodation. If only a shared lane can be provided, signing for drivers and bicyclists on the approaches is especially critical. For example, the BIKES MAY USE FULL LANE sign may be appropriate in such situations.

For any corridor improvement that includes existing culverts where warrants are met, the culverts should provide for the appropriate bicycle accommodation. Assess bicycle warrants as part of spot culvert projects and provide width for the appropriate future accommodation. Hydraulic analysis is typically required in conjunction with culvert extensions.

When a project has a bridge omission and accommodations are included along the roadway, bikeway facilities will be added within the project limits in order to allow for compatible future accommodations on the omitted structures; signing may be appropriate as noted above. Funding splits shall be as outlined in Chapter 5 (5-5.02 and 5-5.05).
TYPICAL CROSS SECTIONS FOR TWO-LANE SHARED ROADWAYS AND STRUCTURES
(Without Marked Bicycle Lanes)

Figure 17-2.K
BIKE LANES ON RURAL ROADWAY SHOULDERS

Note: Illustrative example. Paved shoulder width should be provided as indicated in Figure 17-2.A.

BIKE LANES ON URBAN ROADWAY

Note: Bike lane width should be provided as indicated in Figure 17-2.A.

BIKE LANES ACROSS STRUCTURE

TYPICAL CROSS SECTIONS FOR MARKED BIKE LANES ON TWO-LANE ROADWAYS AND STRUCTURES

Figure 17-2.L
Typical cross sections for separated bike lanes on two lane roadways and structures

Figure 17-2.M
Road Diets and Lane Width Reductions

Bicycles also can be accommodated on a roadway by marking or re-marking the pavement to increase the width of the curb lane or to add bike lanes. For example, it may be feasible to:

- reduce the width of traffic lanes in accordance with IDOT and AASHTO criteria;
- change the median width, create raised curb medians if pedestrian refuge is needed, or remove portions of a two-way center turn lane;
- remove parking, possibly in conjunction with providing off-street parking; or
- reduce the number of through traffic lanes, subject to analysis of capacity, safety, and operational needs.

Reducing the number of through traffic lanes, when accompanied by the addition of bicycle and/or pedestrian improvements, is referred to as a road diet. Figure 17-2.N depicts example plan and cross section views of an existing 4-lane roadway and two options for a 3-lane road diet improvement within the same face-to-face roadway dimension. Districts should review the range of issues involved on the specific corridor when deciding whether to pursue a road diet. Districts may also consider and determine whether to study locally suggested road diets and can require local study on a case-by-case basis. Specific dimensions applied would be unique for each project. The following guidance applies when road diets are considered.

Safety. Studies indicate that properly designed road diets can result in both speed reduction and safety benefits. Refer to the HSM and the Crash Modification Factor Clearinghouse for details on safety analysis for these projects. Both improved BLOS and the potential reduction in severe crash frequency should be investigated and reported.

Operations. Traffic studies must be performed to evaluate future capacity and vehicle level of service. Signal system modifications are generally needed for any signalized intersections that are within the project limits. It is likely that timing and phasing changes will be required that will affect operations along cross streets. The lane reduction upstream of a road diet should be accomplished in accordance with the requirements of Chapter 36. Early coordination with both district and central office Operations staff is necessary.

Local coordination. Review and consider local complete streets policies, whenever a community has adopted them. If a road diet is an option, begin local coordination early in Phase I, applying CSS procedures as appropriate. If a road diet is selected through the local coordination process, the district should request and receive a formal resolution stating that a municipality supports a road diet. At a minimum, a public meeting that includes invitations to area residents/business owners and roadway users is typically necessary and should be completed early in the process, before a design alternative has been selected.

Similar to other project types, if the accommodation identified in the Bicycle Facility Selection Table will not fit within the constraints of the roadway width, consider next highest-and-best options in order to provide an accommodation. Appropriate accommodations can sometimes be
developed by narrowing through lanes (e.g., to a minimum 10 ft (3.0 m) width), commonly referred to as a "lane diet." Use form BDE 1703 to calculate BLOS for the accommodation width available, targeting BLOS C or C/D, and move forward to local coordination identifying the next highest- and-best accommodations. Raised median and corner islands are a key consideration for the safety of non-motorized users and can be established in conjunction with existing or new crosswalks as part of road diet projects. Additional discussion of road diets is provided in the AASHTO Bike Guide and FHWA’s Road Diet Informational Guide.
ROAD DIET EXAMPLES ADDING BUFFERED OR SEPARATED BIKE LANES

Figure 17-2.N
**17-2.02(h) Other Design Considerations**

Regardless of the type of on-road bicycle accommodation improvement being developed, always consider the following items:

**Drainage Grates.** Drainage grates and utility covers on roads, bridge approaches, and bridges can be hazardous to bicyclists. Bicycles often have narrow tires and no shock absorbent systems, and therefore are more sensitive to older elongated-slot style drainage inlets and irregularities on the pavement surface. Current IDOT drainage grate designs suitable for bicycle travel include Types 3, 3V, 4, 9, 10, 11, 11V, 23, and 24. Types 20, 21, and 22 are conditionally acceptable if the vane length is perpendicular to bicycle travel. Other grates are acceptable for bicycles, if the opening slots do not exceed 6¼" L x 1½" W (159 mm L x 38 mm W). With pavement overlay projects, replace utility covers and non-conforming drainage grates and adjust them flush with the new surface.

**Railroad Crossings.** Bicyclists should be able to cross railroad tracks at or near a right angle to minimize the potential for a bicycle’s front wheel to become trapped in the flangeway, which would cause loss of steering control. The potential for a bicyclist’s front wheel to be trapped in the rail flangeway increases when the angle of approach deviates greatly (20° or more) from 90°. When the crossing angle is less than 45°, consider widening the outside lane, shoulder, or bicycle lane to improve the angle of approach; see Figure 17-2.O(a). Where this is not practical, consider using commercially available compressible flangeway fillers, such as that shown in Figure 17-2.O(b), to provide a smooth transition over the rails. Coordination with the railroad owner is required. Design the bicycle portion of the pavement surface so that it is the same elevation as the rails and consistent with the vehicular crossing surface. Remove abandoned tracks, if practical, to eliminate the hazard.

**Pavement Joints and Surfaces.** Consider the following factors related to pavement structures:

a. **Joints and Drop-Offs.** In new construction, pavement surface irregularities can cause a bicyclist to lose control and crash. Because bicycle tires may be as narrow as 1 in. (25 mm), gaps between pavement slabs and gutters or drop-offs at overlays, especially parallel to the direction of travel, can trap a bicycle wheel and result in loss of control. This loss of control can cause a bicyclist to fall or swerve into the path of motor vehicle traffic. To the extent practical, pavement surfaces should be free of irregularities and the edge of the pavement should be uniform in width. To assure pavement suitability, overlay projects should consider options to scarify the old pavement up to the gutter edge.
b. **Rumble Strips.** Where rumble strips are placed across the traffic lane in rural areas to warn motorists of upcoming traffic controls, provide a minimum 3 ft (900 mm) clear paved area on the paved portion of the shoulder to allow a bicyclist an opportunity to avoid the rumble strips.
When rumble strips are installed in a paved shoulder which serves as a bicycle accommodation and the width of the paved shoulder is 6 ft (1.8 m) or less, the 8 in. (200 mm) rumble strip design should be used to minimize the impact to the accommodation. The minimum width of a paved shoulder accommodation with rumble strips is 4 ft (1.2 m). This width maintains a minimum paved width of 3 ft (0.9 m) beyond the edge of the rumble strip for bicyclist use.

c. **Surface Type.** Many rural roadways, because of their low traffic volumes, are very conducive to bicycling. When selecting the surface type and maintenance methods, consider the impacts on bicycle use. Particularly with oil and chip (A2/A3) surfaces, the aggregate specified should be a coarse aggregate, and care should be exercised to ensure that the surface is properly rolled and swept. Any loose stones and debris allowed to accumulate on the outer edges of the roadway or shoulder can present safety concerns for bicyclists.

### 17-2.02(i) Bicycle Routes

It may be advantageous to sign some roadways as bicycle routes, particularly if certain roadways provide preferred alternatives to heavily traveled highways. When providing continuity to other bicycle facilities, a bicycle route can be relatively short; however, a bicycle touring route can be quite long.

Base the decision whether to provide a bicycle route on the advisability of encouraging bicycle use on a particular road instead of on parallel and adjacent highways. Consider the roadway width, BLOS, and other factors (e.g., volume, speed, type of traffic, parking conditions, grade, sight distance) when identifying appropriate bicycle routes.

Generally, bicycle traffic cannot be diverted to a less direct alternative route, unless the favorable factors outweigh the inconvenience to the bicyclist. Roadway conditions such as adequate pavement width, traversable drainage grates, railroad crossings, pavement smoothness, peak traffic volumes and times, and signal responsiveness to bicycles always should be considered before a roadway is identified as a bicycle route. Local agency support is required.

Bicycle route signing should not end at a location where bike travel conditions suddenly downgrade. Rather, provide information signing to direct the bicyclist to a relatively safe route to continue travel. Further guidance on signing bicycle routes is provided in the _ILMUTCD_.

### 17-2.02(j) Signing, Marking, and Traffic Control

Signing, pavement markings, and traffic control for bicycle facilities will be in accordance with the criteria presented in the _ILMUTCD_ and applicable local ordinances. Signing and pavement markings are especially important at the approaches to intersections and at bike lane termini. Where a bike lane ends, bicyclists may be required to merge with motor vehicle traffic. Bicyclists
should be encouraged with the appropriate signing and pavement markings to make appropriate lane changes in advance of an intersection.

Not all bicycle accommodations or bikeways need to be or should be marked as bike routes. Generally, only low-volume roads, bike lanes, and bicycle paths should be marked as designated bicycle routes. The following are some examples of what should not be marked:

- wide curb lanes that provide intermittent access to businesses along the route, but provide no connection to another part of a bike route; and
- any facility that does not meet minimum design criteria throughout its length.

At signalized intersections where frequent bicyclists need access to a green signal phase, a number of acceptable alternative methods are available including timed signals (where aclist must wait for the signal to change), traffic-actuated detectors (usually recommended for bike lanes or shoulders), and push-button actuation (more common for side paths). This opportunity (to access a green signal) should be provided where a marked bikeway runs along a project corridor or crosses a project corridor. Other crossing locations to consider include those in the vicinity of potential bicycle travel from schools, parks, or other significant destinations described in Sections 17-1.03 and 17-1.04.

Traffic-actuated detection should be sensitive to bicycles and should be located in the bicyclist’s expected path, including left turn lanes, if necessary. Figure 17-2.P(a) shows recommended loop types for bicycle detection, each with particular advantages. Figure 17-2.P(b) also shows a pavement-marking stencil used to designate where a bicyclist should stand to activate the detector loop. The following information on bicycle detection should be considered:

1. **Quadrupole Loop Detectors.** The quadrupole loop detector functions best in a bicycle path or lane situation. In such a situation, the expected position of a bicyclist can be easily predicted. This loop is less sensitive over its outer wire than over its center wires and is also relatively insensitive to motor vehicle traffic in neighboring lanes.

2. **Diagonal Quadrupole Loop Detector.** The diagonal quadrupole loop detector functions best in shared-roadway situations where the position of a bicycle cannot be easily predicted. This detector is equally sensitive over its entire width and is relatively insensitive to motor vehicle traffic in neighboring lanes.
Signal phasing lengths may need to be increased to allow adequate time for bicycle crossing. The AASHTO publication *Guide for the Development of Bicycle Facilities* recommends calculating clearance intervals with a bicyclist’s speed of 10 mph (16 km/hr) and a perception, reaction, braking time of 2.5 seconds. Figure 17-2.Q illustrates the approximate times for bicycles to cross intersections. A conservative approach to timing is recommended to avoid having bicyclists being caught in the middle of wider intersections. At very wide intersections consider providing a median refuge area that is at least 6 ft (1.8 m) wide if signal timing would prohibit adequate crossing time. Providing for two-stage crossings is a good approach for many larger intersections and requires median pushbuttons and/or detection areas.
QUADRUPOLE LOOP
- Detects most strongly in center.
- Sharp cut-off of sensitivity.
- Used in bike lanes.

Direction of Travel
\[
\begin{align*}
\text{varies} & \quad 3' (0.91 \text{ m}) \\
6' \text{ min.} & \quad (1.83 \text{ m}) \\
3' (0.91 \text{ m}) & \\
\end{align*}
\]

Type 0 Quadrupole

Note: Video detection technology is available at comparable costs. Pavement Marking detail used for loop or video detection.

DIAGONAL QUADRUPOLE LOOP
- Sensitive over whole area.
- Sharp cut-off of sensitivity.
- Used in shared lanes.

Direction of Travel
\[
\begin{align*}
15' (0.38 \text{ m}) & \\
30' (0.76 \text{ m}) & \\
27' (0.69 \text{ m}) & \\
6' (1.83 \text{ m}) & \\
\end{align*}
\]

Type D Quadrupole

STANDARD LOOP
- Detects most strongly over wires.
- Gradual cut-off.
- Used for advanced detection.

(relevant diagrams)

RECOMMENDED LOOP TYPES AND PAVEMENT MARKINGS FOR BICYCLE DETECTION LOOPS

Figure 17-2.P
### APPROXIMATE BICYCLE TRAVEL TIMES THROUGH INTERSECTIONS

**Figure 17-2.Q**

<table>
<thead>
<tr>
<th>Number of Lanes*</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approximate Time to Cross Intersection</td>
<td>4.2 sec</td>
<td>5.0 sec</td>
<td>5.8 sec</td>
<td>6.6 sec</td>
<td>7.4 sec</td>
<td>8.2 sec</td>
<td>9.0 sec</td>
<td>9.9 sec</td>
</tr>
</tbody>
</table>

*Assumes average of 12 ft (3.6 m) lane widths and no median. Consider median refuge where possible and calculate crossing time manually if median is present and no refuge is possible.

### 17-2.03 Off-Road Accommodations (Shared-Use Paths)

Off-road bicycle accommodations are provided on shared-use paths where bicyclists, pedestrians, and some other motorized (e.g., e-bikes and e-scooters) and non-motorized users share space. Paths fulfill a primary transportation purpose by providing an opportunity for relatively safe and separated travel for both pedestrians and bicyclists. Shared-use paths comprise both facilities along roadway corridors (side paths) and those along independent rights-of-way that have minimal cross flow of motor vehicles.

As noted in the Bicycle Facility Selection Table, side paths are an option that fulfills accommodation requirements, and they are effective in many project contexts. In an urban core or urban context, side path effectiveness can be diminished due to ROW constraints, operational inefficiencies (e.g., mixing of bicyclists and high pedestrian volumes), or the presence of closely-spaced commercial driveways. The suburban and rural town contexts can very often be conducive to side paths. A side path can be selected for an accommodation whenever it is locally supported in accordance with Chapter 5 cost sharing and maintenance requirements. Note that many communities have ordinances that disallow bicycles on sidewalks, often with exceptions for children. AASHTO and NACTO, among others, identify issues that make cycling on sidewalks generally inappropriate. The unique features of paths, including design speed and their minimum 10 ft (3.0 m) width, differentiate side paths from sidewalks and allow for effective bike accommodation.

Shared-use paths can also be located along abandoned railroad rights-of-way, on former canal towpaths, river banks, and other similar areas. Paths sometimes can provide access to areas that are otherwise only served by limited-access highways that are closed to bicycles. Appropriate locations for paths can be identified during the planning process.

Shared-use paths will serve both transportation/utilitarian and recreational purposes and must be fully accessible to people with disabilities in accordance with the American with Disabilities Act (ADA). Refer to Section 58-1.01(a) for accessibility standards and Sections 58-1.05 through 58-1.12 for accessibility requirements. Chapter 58 guidance is generally based on information presented in the *2010 ADA Standards for Accessible Design* and the *Illinois Accessibility Code*. However, for situations in the public right-of-way that are not specifically or adequately addressed by either of the above standards, the guidance is taken from information presented in the *Draft Public Rights-of-Way Accessibility Guidelines (draft PROWAG)*. An accessible pedestrian access...
route (PAR) fully compliant with ADA shall be provided for the full width of any shared-use path, with maximum cross slopes limited to 2% at all points. Paths must be firm, stable, and slip-resistant. Hard, all-weather pavement surfaces are required since unpaved surfaces are more likely to result in bicyclists losing traction, can restrict some users, and will require more maintenance. Both asphalt and PCC can provide good all-weather pavement structures.

Paths should be considered extensions of the highway system that are intended for the preferential use of bicycles and pedestrians. As such, design criteria for paths are based on both bicycle use (e.g., for curvature, sight distance) and pedestrian use (e.g., for accessibility). Design considerations include horizontal alignment, sight distance requirements, drainage, signing and markings, horizontal and vertical clearance requirements, grades, and pavement structure. Section 17-3 provides bicycle clearances and operating characteristics. During design, always be cognizant of the operating characteristics of bicycles and how they influence the design of paths. Electric-assist bikes (e-bikes) are a growing segment of overall bicycle use and may increase the number of people bicycling, as well as average bicycling speeds. E-bikes include a motor, typically electric, that can either assist rider pedaling efforts or provide self-propelled operations. Any conventional bicycle may be converted to an e-bike. In general, the behavior of people riding e-bikes is very consistent with traditional bicyclist behavior on a national level (e.g. related to compliance with traffic control devices and risky behavior). In addition to e-bikes, electric assist pedestrian mobility (personal mobility) devices such as e-scooters may be used on shared-use paths. These devices are generally not allowed to operate on sidewalks, although local ordinances vary. The acceleration and braking characteristics of e-bikes and pedestrian mobility devices may vary somewhat from traditional bicycles. The design guidance provided in this chapter is based on traditional riders and is appropriate to cover the mix of users expected to use paths. The following sections provide guidance for designing safe and functional paths. Several issues that are unique to side paths are covered in Section 17-2.03(c).

17-2.03(a) Consideration of All Users

Potential users of shared-use paths include bicyclists, pedestrians, joggers, in-line skaters, and individuals with disabilities in either motorized or un-motorized wheelchairs. In most local jurisdictions in Illinois, bicycles on paths may be motorized (e-bikes) as long as operated at reasonable speeds. All potential users should be considered in the design of the facility. Where practical and where use levels are high, provide separate areas to minimize the conflicts arising from the different user speeds. If this is not feasible and usage is expected to be high, consider providing additional width, signing, and pavement markings. Figure 17-2.R shows an option for accommodating diverse users, minimizing conflicts, and delineating rights-of-way.
Using a path for both bicycles and horses is not a recommended practice. However, when circumstances dictate that horses share the same corridor as bicyclists, provide a minimum unpaved width of 4 ft (1.2 m) and provide signs to warn users of shared use (see Figure 17-2.S) and to restrict equestrians to the side area. Further guidance on equestrian trails is provided in the publication *Trails for the Twenty-First Century.*
17-2.03(b) Width and Clearance

Widths for shared-use paths will vary in accordance with the use level, as illustrated in Figure 17-2.T. Most locations will have use levels under 300 users per peak hour. Figure 17-2.U illustrates the minimum cross sections for two-way, shared-use paths. The 10 ft (3.0 m) minimum paved width shall be used for two-way paths. Wider paved paths should be considered in areas where very high use is expected. Widths less than 10 ft (3.0 m) do not allow for appropriate operation even with low use volumes. Normal social behavior, the need for passing, and the normal mix of users and operating speeds necessitates this width to address safety concerns for all users. However, where is a substantial physical constraint or an environmental feature to be avoided, reductions to an 8 ft (2.4 m) width for short distances may be allowed. Provide signing to notify path users of narrowed path conditions.

A minimum 2 ft (600 mm) wide graded turf or gravel area should be maintained adjacent to both sides of the path pavement. Three ft (0.9 m) or more is desirable to provide clearance from trees, poles, walls, fences, guardrails, and other lateral obstructions.

As shown in Figure 17-2.T, a paved width of 7 ft (2.1 m) may be considered as a one-way bicycle accommodation where such bike travel is allowed by local ordinances and pedestrian use is low. Paths are needed on both sides of the roadway where one-way facilities are selected.

<table>
<thead>
<tr>
<th>Anticipated Volume</th>
<th>One-Way</th>
<th>Two-Way</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 300 Users per Peak Hour</td>
<td>7 ft (1.8 m)</td>
<td>10 ft (3.0 m)</td>
</tr>
<tr>
<td>&gt; 300 Users per Peak Hour</td>
<td>10 ft (2.1 m)</td>
<td>12 ft (3.6 m)&lt;sup&gt;(1)&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Notes:

1. With very high use, separating bicycle and pedestrian travel should be considered, as shown in Figure 17-2.U.

**SHARED-USE PATH WIDTHS**

Figure 17-2.T
TYPICAL SHARED-USE PATH FOR LOWER USE

TYPICAL SHARED-USE PATH FOR HIGHER USE
(Optional Striping Shown)

TYPICAL CROSS SECTIONS FOR TWO-WAY SHARED-USE PATHS

Figure 17-2.U
17-2.03(c) Side Path Separation from Traffic

Side paths must be sufficiently offset or otherwise separated from motorized traffic so that operational and safety needs are met. Separation should be as wide as practical while allowing bicyclists to be visible to motorists at intersections and driveways; refer to Figure 17-2.V. Along urban roadways, a path could be located much like a sidewalk, with the edge of the path located at least 5 ft (1.5 m) from the curb face and 7 ft (2.1 m) from the traveled way. In rural sections, it is desirable for a two-way shared use path to be located on the top of the back slope at least 30 ft (9.1 m) away from the edge of the traveled way. At a minimum in a high-speed rural section the path edge should be 10 ft (3.0 m) from the outside edge of the shoulder. Turf areas will typically provide an adequately delineated boundary between the roadway and the path. Maintaining minimum offsets will reinforce that the bicycle path is an independent facility and will discourage bicyclists from making unexpected and undesirable movements between the path and the traveled way. Existing side paths closer than the offset distances described should be addressed as part of a project. Where safety issues are identified for such side paths consider retrofit options that either shift the path or insert appropriate barrier separation. Concrete barrier used for this purpose should be a minimum of 3 ft (910 mm) high; standard guardrail also provides adequate separation at a slightly lower height. Refer to Section 17-2.03(m) for further discussion.

All vertical surfaces within a 2 ft (600 mm) clear distance adjacent to the bicyclists’ path should be smooth to avoid snagging of clothing or incurring abrasive injuries from contact with the surface. A primary concern in this regard is protection of the sharp edges of the backside of guardrail located within 2 ft (600 mm) of the edge of a path by smooth planking or a rub rail as shown in Figure 17-2.W. No modifications shall be made within the length of Type 1 guardrail terminals. Highway Standard 630116 provides further details. Approved crash testing for elements attached to guardrail should be investigated by the designer.
Figure 17-2.V

TYPICAL SIDE PATH SEPARATION FROM ROADWAY

(a) Proposed/Existing Traveled Way

(b) Proposed 10'-12' (3.0-3.6 m) Path

2% max.

Proposed/Existing Traveled Way

24' (7.2 m)

5' min.

10' min. (3.0 m)

to Proposed/Existing Shoulder

2% max.

30' (9 m)

or More Desirable

ROW Line & A/C

IV14H or IV16H
(Typ)

IV13H max.

Turf

Two-Way Path

10' (3.0 m) Wide
(Typical)
2 x 10 (50 x 254) S4S treated timber. Install flush with top of post.

Traveled Way

Steel post

2' min. (0.6 m) required to omit Protection

10' min. (3.0 m)

Side Path

ELEVATION WITH W-BEAM GUARDRAIL

¾ (6) gap where boards meet

Top of post and timber

Four bolts shown where boards meet. Only two required for continuous board.

Top of W-beam guardrail

VIEW A-A

Note: Refer to Highway Standards 6300I and 6301I6.

PROTECTION OF BACKSIDE OF GUARDRAIL

Figure 17-2.W
17-2.03(d) Additional Safety Considerations

Safety rails should be considered alongside paths with front slopes steeper than 1:3. Refer to Section 17-4.07 for situations where safety rails should be considered and to Figure 17-4.D for guidance on railing placement and height. The minimum height for a bicycle safety rail is 4 ft (1.2 m). Generally, if the consequences of striking a fixed object hazard or running off the path are believed to be more serious than hitting the railing, then the barrier may be warranted. In addition, the cost effectiveness and probability of encroachment also should be considered. For example, along a lengthy tangent section of path on an elevated railroad section, the cost effectiveness of installing safety rail along the entire distance would be questionable; however, the placement of rail at clearly hazardous locations (e.g., river crossing approaches, less than minimum widths and curves, potential points of conflict) may be prudent. Select the treatment that is judged to be the most practical and cost-effective for the site. The range of treatments includes:

- eliminating the hazard (e.g., flatten embankment, remove rock outcroppings);
- relocating the hazard;
- shielding the hazard with safety railing; or
- doing nothing.

The determination of the separation distance between a path and an active railroad is dependent on the speed and frequency of the rail service, the amount of access available to the railroad from the surrounding area, and the requirements of the railroad company. For low speed and low frequency service, the separation may be as little as 10 ft – 15 ft (3.0 m – 4.6 m), with no physical barrier (e.g., fencing, landscaping). As railroad speeds and frequencies increase, the requirements for increased separation and a physical barrier increase as well. An 8 ft (2.4 m) high chain link fence or other barrier type may be required to satisfy the railroad company that path users will be adequately separated from the hazards of the trains.

The vertical clearance to obstructions should be an absolute minimum of 8 ft (2.4 m). However, vertical clearance may need to be greater to permit passage of maintenance vehicles, rescue vehicles, and ambulances. Rescue vehicles typically can exceed 9 ft (2.7 m) in height and 9 ft (2.7 m) in width. In undercrossings and tunnels, a vertical clearance of 10 ft (3.0 m) is desirable. The geographical location of the vertical obstructions, as well as alternate access points, are primary considerations for determining clearance. It is imperative that adequate clearance be provided where the path offers the primary access to a remote location. Any overhead restrictions with less than a 10 ft (3.0 m) clearance should be marked on the structure according to the ILMUTCD.

17-2.03(e) Design Speed

Paths should be designed for a selected speed that is at least as high as the preferred speed of the faster bicyclists. In general, use a minimum design speed of 20 mph (30 km/hr). However, where the grade exceeds 4% or where strong prevailing tail winds exist, (e.g., along a lake or river), a design speed of 30 mph (50 km/hr) is advisable. On approaches to intersections, bicyclists can be expected to slow since the path will typically cross the side street in a crosswalk fashion and caution is required. A 10 mph (15 km/hr) design speed may be applied to the curves that provide for alignment into crosswalks.
17-2.03(f) **Horizontal Alignment and Superelevation**

Unlike an automobile, a bicycle must be leaned while cornering to prevent it from falling outward due to centrifugal force. The horizontal curvature should not require a bicyclist to use a lean angle greater than 15° nor need more than 2% superelevation. The minimum radius is calculated by the following equation:

\[ R_{\text{min}} = 0.067 \frac{V^2}{\tan \theta} \quad \text{(U.S. Customary) Equation 17-2.1} \]
\[ R_{\text{min}} = 0.0079 \frac{V^2}{\tan \theta} \quad \text{(Metric) Equation 17-2.1} \]

where: 
- \( R_{\text{min}} \) = minimum radius of curvature, ft (m)
- \( V \) = design speed, mph (km/hr)
- \( \theta \) = lean angle from vertical, degrees

Figure 17-2.X presents minimum radii for horizontal curves using a 15° lean angle. Paths should be superelevated so that the 1% to 2% cross slope is partially counteracting the inward friction force on a bicycle as it traverses the horizontal curve, but the radius values shown in the figure are acceptable for adverse cross slopes of up to 2%.

<table>
<thead>
<tr>
<th>Design Speed (V)</th>
<th>Lean Angle (θ)</th>
<th>Minimum Radius (R_{\text{min}})</th>
</tr>
</thead>
<tbody>
<tr>
<td>mph</td>
<td>km/hr</td>
<td>(degrees)</td>
</tr>
<tr>
<td>10</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>20</td>
<td>30</td>
<td>15</td>
</tr>
<tr>
<td>25</td>
<td>40</td>
<td>15</td>
</tr>
<tr>
<td>30</td>
<td>50</td>
<td>15</td>
</tr>
</tbody>
</table>

**DESIRABLE MINIMUM RADIUS FOR PAVED PATHS BASED ON 2% SUPERELEVATION RATE AND 15° LEAN ANGLE**

Figure 17-2.X

In restricted conditions a lean of up to 20° can be tolerated. The same formula is applied. Figure 17-2.Y presents minimum radii for horizontal curves where lean angles up to 20° can be tolerated. For either lean angle the radii assume a maximum superelevation rate of 2% so that ADA requirements for accommodation of users with disabilities are fully met. A minimum 1% cross slope should be maintained to facilitate drainage of the path. Where transitioning from a
1% to a 2% cross slope on tangent to a 2% superelevation rate on the high side of the curve or where reversing curvature, use a minimum transition length of 15 ft (4.6 m).

Figure 17-2.Y presents minimum radii for horizontal curves where lean angles up to 20° can be tolerated and the path is not paved. Use of unpaved paths (or portions of paths) would be very rare; additional detail is available in the *AASHTO Bike Guide*.

<table>
<thead>
<tr>
<th>Design Speed (V)</th>
<th>Side-Friction Factor (f) (Paved Surface)</th>
<th>Minimum Radius (R_{min})</th>
</tr>
</thead>
<tbody>
<tr>
<td>mph</td>
<td>km/hr</td>
<td>ft</td>
</tr>
<tr>
<td>10</td>
<td>16</td>
<td>0.31</td>
</tr>
<tr>
<td>20</td>
<td>30</td>
<td>0.28</td>
</tr>
<tr>
<td>25</td>
<td>40</td>
<td>0.25</td>
</tr>
<tr>
<td>30</td>
<td>50</td>
<td>0.21</td>
</tr>
</tbody>
</table>

**MINIMUM RADII FOR PAVED PATHS BASED ON 2% SUPERELEVATION RATE AND 20° LEAN ANGLE**

*Figure 17-2.Y*

When a lean angle of 20° is used, the bicyclist taking the curve will occupy more horizontal space and more width needs to be provided. In these cases, the path width should be increased as noted in Figure 17-2.Z and a centerline located in the middle of the curve.

When curve radii smaller than those shown in Figure 17-2.X must be used because of limited right-of-way, topographical features, or other considerations, standard curve warning signs and supplemental pavement markings should be installed according to the *ILMUTCD*. The negative effects of sharper curves can also be partially offset by widening the pavement through the curves as shown in Figure 17-2.Z.
### BIKEWAY CURVE WIDENING FOR VARIOUS CURVE RADII

#### Figure 17-2.Z

<table>
<thead>
<tr>
<th>Curve Radius (ft)</th>
<th>Additional Pavement Width (ft)</th>
<th>Curve Radius (m)</th>
<th>Additional Pavement Width (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-25</td>
<td>4</td>
<td>0-7.5</td>
<td>1.2</td>
</tr>
<tr>
<td>25-50</td>
<td>3</td>
<td>7.5-15</td>
<td>0.9</td>
</tr>
<tr>
<td>50-75</td>
<td>2</td>
<td>15-22.5</td>
<td>0.6</td>
</tr>
<tr>
<td>75-100</td>
<td>1</td>
<td>22.5-30</td>
<td>0.3</td>
</tr>
<tr>
<td>100+</td>
<td>0</td>
<td>30+</td>
<td>0</td>
</tr>
</tbody>
</table>

**Note:** Only use additional pavement width where curve radii are less than design speed of bike path or where a 20° lean angle is assumed.
17-2.03(g) Drainage

Typically design paths with cross slopes of 1% to 1.5% for drainage; ensure that a 2% maximum cross slope is not exceeded. Sloping in one direction instead of crowning is preferred and usually simplifies the drainage and surface construction. A smooth surface is essential to prevent water ponding and ice formation. Shoulders should provide further positive drainage by sloping away at 2% to 4%.

Where a path is constructed on a hillside a ditch of suitable dimensions should be provided on the uphill side to intercept the hillside drainage. Design these ditches so as not to present an obstacle to bicyclists. Figure 17-2.AA shows the dimensions of a minimum swale/ditch to redirect runoff. Where necessary, provide catch basins with drains to carry intercepted water under the path. Locate drainage grates and manhole covers outside the traveled way of bicyclists. To assist in draining the area adjacent to the path, consider preserving the natural ground cover. Include seeding, mulching, and sodding of adjacent slopes, swales, and other erodible areas in the design plans.

Side paths should pass over waterways at elevations consistent with the adjacent roadway, and path flooding would not be a concern. However, concerns related to path overtopping may be relevant for some paths along independent alignments, such as for roadway underpasses or for locations along waterways. Path usability at such locations is a pertinent issue, and studies of the potential for path flooding will be important to understand the reliability of the path system. Refer to the IDOT Drainage Manual for further information.

![Typical Path Drainage Diagram](image)
**17-2.03(h) Grade**

Grades on paths shall not exceed 5%, except along a roadway with a grade that exceeds 5%, in which case the path grade may match but not exceed the roadway grade. Long grades of over 2% on shared-use paths should be avoided to the extent possible. Some users, especially individuals with disabilities, may have difficulty negotiating high grades over 300 ft (90 m) in length. Consider incorporating intermediate flatter and wider landings when this distance would be exceeded.

**17-2.03(i) Accessible Width**

Because the intent is to create a facility to accommodate pedestrians, shared-use paths must meet accessibility requirements across the full width. Vertical discontinuities must be less than ¼ in. (6 mm) untreated or ½ in. (13 mm) beveled per ADA guidelines to accommodate individuals in wheelchairs. Additionally, grates and utility covers located in the expected paths of bicyclists or pedestrians should be flush with the pavement. Refer to Section 58-1 for accessibility standards and the criteria to be met in the design of paths.

**17-2.03(j) Sight Distance**

To provide bicyclists with an opportunity to see and react to the unexpected, a shared-use path should be designed with adequate stopping sight distance and intersection sight distance. The distance required to bring a bicycle to a full controlled stop is a function of:

- the bicyclist’s perception and brake reaction time,
- the initial speed of the bicycle,
- the coefficient of friction between the tires and the pavement, and
- the braking characteristics of the bicycle.

See the AASHTO Bike Guide for information on determining adequate sight distance.

Bicyclists frequently ride abreast of each other on paths, and on narrow paths bicyclists tend to ride near the middle of the path. For these reasons, and because of the serious consequences of a head-on bicycle crash, calculate lateral clearances on horizontal curves based on the sum of the stopping sight distances for bicyclists traveling in opposite directions around the curve. Where this is not feasible, consider widening the path through the curve, installing a yellow center stripe, installing turn or curve signs (W1-1 or W1-2) as appropriate, or a “KEEP RIGHT” (R4-7b) sign, or some combination of these alternatives.

**17-2.03(k) Path Intersections**

Shared use paths usually cross various transportation elements. These intersections can be roadways, railroads, or other paths; all present potential conflicts and must be thoroughly analyzed to consider their impacts on the path users as well as the users of the other intersecting
legs. Figure 17-2.BB illustrates how a bikeway could interact with crossing roads and railroads. All paths intersecting with roads and railroads require the installation of detectable warnings immediately adjacent to the crossing. Unauthorized access is sometimes a concern. Although rigid bollards have been used to restrict motor vehicle access to paths the hazards they create for bicyclists, and in some cases for motor vehicles, often outweigh access concerns. Refer to Section 2.03(p) for further guidance on this issue.

Where a side path crosses a street, by definition near an intersection, the path should cross in a typical crosswalk fashion, as in Figure 17-2.CC. AASHTO notes that paths should be located in close proximity to the parallel roadway at intersections so that motorists turning off the roadway can better detect the path users. Locating the crosswalk close to the parallel through edge of pavement may also lead motorists to better obey the single stop bar location. Consider including right-turn corner islands for path crossings to provide refuge areas for all vulnerable users. Regardless of location, crosswalks width must equal or exceed the full width of the path.

For paths on independent rights-of-way, according to AASHTO, it is preferable that any crossing of the path and a highway be at a location away from the influence of intersections with other highways. Crosswalks width must equal or exceed the full width of the path; refer to Figure 17-2.DD. Assign right-of-way and provide adequate sight distance to minimize the potential for conflicts. For further discussion of mid-block crossings see Section 17-4, Operations Policy TRA-23 (IDOT Guidelines for Pedestrian Crossings at Uncontrolled Locations), and the AASHTO Bike Guide.

Design crossings as close to a right angle as possible for safety reasons. Controlling vehicular movements at mid-block intersections is more easily and safely accomplished through the application of standard traffic control devices and normal rules of the road. Use engineering judgement in determining appropriate crossing measures such as markings, post-mounted signs, overhead signs, flashing beacons, traffic signals, or a grade separation. At crossings with high-volume, multi-lane arterial highways where a signal or a grade separation is not practicable, consider providing a median refuge area for bicyclists and pedestrians. IDOT Bureau of Operations Policy TRA-23 provides design guidelines for uncontrolled pedestrian crossing locations and includes recommended signing, striping, refuge areas and beacon treatments based on vehicle speeds, traffic volumes, and roadway cross section. These guidelines apply to roadway crossings involving either paths or sidewalks. At all roadway crossings, appropriate curb ramps and detectable warnings shall be included on the paths as discussed in Section 58-1.09.
Figure 17-2.BB
BIKE PATH/TRAIL INTERACTION WITH VARIOUS INTERSECTIONS
Where paths terminate, integrate the path into the adjacent road network. Transition traffic into a safe merging or diverging situation, considering all users. Provide appropriate signing to warn and direct both bicyclists and motorists regarding these transition areas. Ensure that signs are located so that they clearly direct each user group. Do not merge a shared-use path into a bicycle lane or paved shoulder without providing an alternative connection for pedestrians away from vehicular traffic to the existing sidewalk network.

Path intersection approaches should have relatively flat grades. Check stopping sight distances at each intersection and provide adequate warning to allow bicyclists to safely stop before the intersection, considering downgrades where present.

Flare the ramps for curb cuts at intersections to allow bicycle movements from the roadway to the path. A minimum radius or flare of 5 ft (1.5 m), as shown in Figure 17-2.DD, will allow bicycles, including tandem bicycles (i.e., two-person bicycles) and bicycles with trailers, sufficient opportunity to negotiate turns. If maintenance vehicles are expected to access the path at these points, provide a 15 ft (4.5 m) flare to reduce edge rutting and turf disturbance.
Where independent paths intersect with railroads, locate the crossing as close to a right angle as practical for safety reasons, as shown in Figure 17-2.EE. Considerations noted in Section 17-2.02(h) apply. Signing and pavement markings shall be in accordance with the ILMUTCD. Crossbuck signs and pavement markings are minimum advanced warning requirements. In addition, ensure that adequate sight distance is provided so bicyclists can see approaching trains. Existing and planned railroad operations always should be factored into the design elements of the crossing. As train speeds and frequencies increase, the level of crossing protection should increase. It may be necessary to provide train activated crossing gates and signals, along with fencing, to ensure the safety of bicyclists and to satisfy the requirements of the railroad company. In extreme situations, rerouting the path to an adjacent roadway crossing or installing an underpass or overpass may provide the best crossing solution.
Where paths intersect with other paths, the minimum return radius provided should be 15 ft (4.5 m), as shown in Figure 17-2.FF, to accommodate tandem bicycles, bicycles with trailers, and occasional vehicular movements without running off the pathway. These movements are likely to be negotiated at higher speeds and thus the larger radii are necessary. The figure also shows a circular intersection option that can be applied to slow riders where there are operational and safety concerns.
PATH INTERSECTIONS

Figure 17-2.FF

Note: Consider "KEEP RIGHT" signs.
17-2.03(1) Independent Path Structures

An overpass, underpass, bridge, or drainage facility may be necessary to provide continuity to a path. Modification of existing facilities are sometimes necessary to construct a side path under an existing bridge, most commonly along expressways. One method for retrofitting paths under bridges is illustrated in Figure 17-2.GG. Slopewall modifications typically involve full removal and reconstruction of the walls. Consult with the Bureau of Bridges and Structures in developing the structural plans.

With new shared-use path structures, the minimum clear width should be the same as the path’s paved approach, and the desirable clear width should include 2 ft (600 mm) minimum shoulders on each side; see Figure 17-2.HH. Carrying the clear width across a bicycle path structure has two advantages. First, it reduces concerns about horizontal shy distance from the railing or barrier; and second, it provides needed maneuvering space to avoid conflicts with pedestrians and other bicyclists who are stopped on the bridge. Additional width would be warranted on structures over rivers where users would likely stop to enjoy the view. Users would be less likely to stop on bridges over railroads or highways or in tunnels.

Bridges designed exclusively for bicycle and pedestrian traffic should be designed for live loadings in accordance with the AASHTO publication, *Guide Specifications for Design of Pedestrian Bridges*. Bridges that must provide access for ambulances or rescue vehicles shall support specific minimum design loads.

On all bridge decks, ensure that bicycle-safe expansion joints are used. Where wood planking is used for flooring, it should be placed 45° to 90° from the direction of travel, as shown in Figure 17-2.HH. Bridge railings on paths should be a minimum of 4 ft (1.2 m) tall. Bridge approaches should provide a safety railing as shown in Figure 17-2.HH to protect users from hazardous conditions.

Other types of bikeway structures will be necessitated by the various ways that paths can interface with roadways, rivers, or railroads. Paths can utilize the underside of a highway or railroad bridge and can cross under roadways or railroads in various ways, as illustrated in Figures 17-2.II and 17-2.JJ. Where bikeways are routed under highway bridges, drainage from the bridge above should be routed to drain away from the path surface.

Design of bikeway underpasses should proceed with recognition of the types of traffic that need to be accommodated (e.g., emergency vehicles). Minimum vertical clearance should be 10 ft (3.0 m) and the minimum width should be 10 ft (3.0 m). With tunnels or box culverts exceeding 100 ft (30 m) in length, the users’ sense of security is enhanced with larger openings (e.g., 12 ft (3.6 m) high and 14 ft (4.2 m) wide). The alignment of the approaching path should provide a clear view through the structure where practical. On long structures (e.g., under multi-lane highways) a shaft opening at the median can provide natural light and ventilation. Lighting should be considered in areas where security is a concern.
Note: Alternate bikeway is considered under bridge where separate two-way side path is proposed within or adjacent to existing right-of-way line of a freeway or expressway.
PLAN AND CROSS SECTION OF SHARED USE PATH BRIDGE WITH RAILING

FIGURE 17-2.HH
Figure 17-2-II
BOX CULVERT FOR BIKEWAY
BIKE PATH DEPRESSED TO GAIN ADEQUATE VERTICAL CLEARANCE

Figure 17-2.JJ
17-2.03(m) Paths on Highway Structures

Side paths should be accommodated on new and rehabilitated structures in accordance with the dimensions shown in Figure 17-2.KK. Appropriate railings must be provided. Bridge railings along shared-use paths must provide a minimum 4 ft (1.2 m) rail-height on the outside edge. The required barrier or separation element between the path and the adjacent traffic lane must be a minimum of 3 ft (910 mm) high, with the lesser height in recognition of the need for both path user safety and the need for visibility between path users and motorists. Consider the potential for sight line impediments at adjacent intersections created by barriers. Adjacent signalized intersections may need to include right-turn-on-red (RTOR) restrictions if intersection sight distance is substantially limited by a barrier adjacent to the traveled way.

Several examples of barriers and railings used for path applications on bridges are shown in Figure 17-2.LL. Specific configurations depend on the roadway speed limit, roadway classification and the facility being crossed. Barrier and railing selection can be determined in consultation with BPPE and the Bureau of Bridges and Structures.

When a project has a bridge omission with side path accommodations along the roadway, fully compatible future accommodations should be planned for the omitted structure. Where it is necessary to accommodate a shared-use path across an existing highway bridge as an interim condition, consider alternatives in light of what the geometrics of the bridge will allow. Carrying the path across the bridge is a primary goal where the bridge facility will connect to a shared-use path at both ends. Sufficient width may be provided on one side of the bridge by shifting, narrowing or restriping lanes, or by reducing median width. Consider a reduced path width if necessary. In all cases separate bicycle traffic from motor vehicle traffic by means of a crashworthy barrier. Identifying existing sidewalks as one-way shared-use facilities is not typically acceptable, since bicyclists do not have good options for crossing a roadway twice to access a path on the opposite side of the roadway. Raised sidewalks without a separation barrier do not provide for two-way bicycle accommodation adjacent to traffic lanes. Consult with BPPE and Bureau of Bridges and Structures for retrofit options. Adding a separation barrier on the deck could sometimes be an option, as illustrated in Figure 17-2.KK.
Figure 17-2.KK

TYPICAL CROSS SECTIONS FOR PATHS ON HIGHWAY STRUCTURES
Figure 17-2.II

BICYCLE RAILING APPLICATIONS

A raised path on a bridge can only be pursued in a retrofit condition where the raised walkway already exists.

Illinois BICYCLE AND PEDESTRIAN ACCOMMODATIONS August 2019

17-2.68 HARD COPIES UNCONTROLLED
17-2.03(n) Paths Through Interchanges

Design of a path along an arterial roadway, as it passes through an interchange with free-flow ramps, requires design considerations to address safety of bicyclists. Providing a separate structure for bicyclists and pedestrians will maximize safety but can be cost-prohibitive. A side path can be accommodated at ramp crossings in a similar pattern to that shown for on-road accommodations, as discussed in Section 17-2.02(e) and shown in Figure 17-2.J. All interchange ramp crossings require individual consideration to meet accommodation, sight distance, and geometric design requirements.

A diverging diamond interchange (DDI) accommodates left-turning movements at signalized intersections while eliminating the need for left-turn phasing. DDIs will typically feature paths within the center of the arterial roadway to provide improved sight lines further from the bridge parapet walls, to place path crosswalk at signalized intersections, and to allow free-flow left turns onto entrance ramps without the potential for conflicts. These paths typically would be protected from traffic by barrier wall for the full length between the two intersections. A single-point urban interchange (SPUI) provides a convergence of all through and left-turning movements into a single large signalized intersection area. There are significantly wider pavement areas for path users to cross at SPUIs. The addition of path crosswalks may create greater delays in traffic when compared to the conventional diamond since SPUI signal phasing does not typically provide a red phase where crosswalks would be protected. Unique operational and safety design considerations will apply at SPUI interchanges.

17-2.03(o) Signing and Marking

Adequate signing and marking are essential on paths and the adjacent roadway, to alert bicyclists and pedestrians to potential conflicts and to convey regulatory messages to motorists and other users at highway intersections. Provide warning signs to identify conflict points and for design elements that are less than minimum criteria (e.g., less than minimum curve radii, vertical or horizontal clearances, speeds dictated by grades) to warn the user of these conditions. Additionally, use guide signing, (e.g., directions, destinations, distances, route numbers, names of crossing streets) in the same manner as they are used on highways. In general, uniform application of traffic control devices, as described in the ILMUTCD, will tend to encourage proper bicyclist and motorist behaviors.

A solid yellow centerline may be appropriate on path approaches to an intersection to discourage passing and help increase bicyclist awareness of the intersection. Consider a broken yellow centerline stripe (3 ft (0.9 m) stripe with 9 ft (2.7 m) gap) to separate opposite directions of travel on path segment under the following circumstances:

- for heavy volumes of bicycles,
- on curves with restricted sight distance, and
- on unlighted paths where nighttime riding is expected.
White edge lines also can be beneficial where nighttime bicycle traffic is expected. Marking should be considered for shared-use paths that are 12 ft (3.6 m) or wider to delineate lanes for bicyclists and pedestrians.

Investigate friction qualities of pavement marking materials. Some marking materials become slippery when wet. Marking materials with reflective elements typically offer better friction properties, especially in wet conditions.

17-2.03(p) Lighting

Fixed-source lighting reduces the potential for crashes and conflicts along paths and at intersections. Additionally, lighting allows the bicyclist to see the bicycle path direction, surface conditions, and obstacles. Lighting should be considered where substantial riding at night is expected (e.g., bicycle paths serving college students or commuters, highway intersections). Lighting is important through underpasses or tunnels and when nighttime security could be an issue; see Chapter 56. Depending on the location, average maintained horizontal illumination levels of 5 lux to 22 lux should be considered. Where special security problems exist, higher illumination levels may be considered. Light standards (poles) should meet the recommended horizontal and vertical clearances. Luminaires and standards should be at a scale appropriate for a path and should be designed to deter vandalism.

17-2.03(q) Restriction of Motor Vehicle Traffic

Restriction of path use by motor vehicles may be reinforced by signing at roadway intersections. In certain situations, a physical barrier may be appropriate to prevent unauthorized motor vehicles from using the facility. Rigid bollards have often been used to restrict motor vehicle access to paths and can be an acceptable solution. However, the hazards they create for bicyclists, and in some cases motorists, can be significant. Barriers to path entry need not be proposed where unauthorized access is considered unlikely.

An alternate method of physically discouraging entry of motor vehicles is to split the entry way into two 5 ft (1.5 m) minimum sections separated by very low landscaping (e.g. groundcover, grass) as shown in Figure 17-2.MM. Motorists can thereby identify the path as a restricted feature while emergency vehicles can enter, if necessary, by straddling the landscaping.
Pavement Structure

Designing and selecting pavement sections for bicycle paths are in many ways similar to designing and selecting highway pavement sections. A soils investigation should be conducted to determine the load carrying capabilities of the native soil and the need for any special provisions. The investigation need not be elaborate, but should be performed by, or under the supervision of, a qualified engineer. Additionally, while loads on bicycle paths will be substantially less than highway loads, design bicycle paths to sustain, without damage, the wheel loads of occasional emergency, patrol, maintenance, and other motor vehicles that are expected to use or cross the path.
Give particular consideration to the location of motor vehicle wheel loads on the path. Where motor vehicles are driven on paths, especially if less than 10 ft (3.0 m) wide, their wheels usually will be at or very near the edges of the path. Because this can cause edge damage that will, in turn, reduce the effective operating width of the path, adequate edge support should be provided. Edge support can be either in the form of stabilized shoulders (e.g., use of geotextile fabric underlay) or in constructing additional pavement width.

Paths built along streams and in wooded areas can present unique problems. The roots of shrubs and trees can pierce through the path surfacing and cause it to bubble up and break apart in a short period of time. Preventative methods include: removal of vegetation, realignment of the path away from trees, and placement of root barriers (e.g., a 1 ft (300 mm) deep plastic shield) along the edge of the path as shown in Figure 17-2.NN.

**Fig. 17-2.NN**

**SHARED-USE PATH ADJACENT TO TREES**
At unpaved highway or driveway crossings of shared-use paths, pave the highway or driveway a minimum of 10 ft (3.0 m) on each side of the crossing to reduce the amount of gravel being scattered along the path by motor vehicles. Design the pavement structure at the crossing to adequately sustain the expected loading at that location.

Bituminous (HMA) or PCC pavement surfaces are required for side paths in state right of way. Aggregate materials provide a much lower level of service and require substantially more maintenance over the life of a project. PCC may offer advantages in wet soil conditions or in areas that may periodically flood. As guidance, Figure 17-2.OO provides examples of several acceptable pavement cross sections (an aggregate surface is also shown for reference). Consider using geotextile fabric in all areas. Fabric offers advantages that include extended pavement life, weed control, and lower maintenance.

In some situations, an HMA surface treatment (A1/A2/A3) may be adequate for paths, considering the limitations of the surface (e.g., bleeding oil on hot summer days). The proper application of this type of surface is very important. Specify a CA 16 aggregate size or smaller. The surface should be rolled, and the excess stone should be swept away, preventing accumulation at the outside edges of the path. Negotiating loose gravel on a bicycle can be very hazardous.

Figure 17-2.PP provides information regarding the advantages and disadvantages of various path surfaces.
UNPAVED PATH CROSS SECTIONS

*CA-6 or CA-10

Note: Unpaved path surfaces are not directly covered in this policy and all paths constructed in state right of way must be paved. Refer to Bureau of Local Roads guidance for unpaved paths.

PAVED PATH CROSS SECTIONS

SHARED-USE PATH CROSS SECTIONS

Figure 17-2.00
<table>
<thead>
<tr>
<th>Surface Material</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crushed Aggregate</td>
<td>Soft but firm surface; natural material; moderate cost; rough surface;</td>
<td>Surface can rut or erode from heavy rainfall; surface softens when set - bike</td>
</tr>
<tr>
<td></td>
<td>accommodates some multi-use.</td>
<td>tires, horses will damage surface; regular maintenance to keep consistent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>surface; replenishing aggregate may be a long-term expense; not for slopes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;3%.</td>
</tr>
<tr>
<td>Bituminous Surface Treatment (also</td>
<td>Inexpensive to apply; more stable surface, durable.</td>
<td>Potential for oil bleeding to surface in hot weather, application methods</td>
</tr>
<tr>
<td>called Oil &amp; Chip, Chip Seal)</td>
<td></td>
<td>important to minimize loose gravel.</td>
</tr>
<tr>
<td>Asphalt</td>
<td>Hard surface; supports most types of use; all weather; does not erode;</td>
<td>Higher installation costs; more costly to repair; not a natural surface;</td>
</tr>
<tr>
<td></td>
<td>accommodates most users simultaneously; low maintenance.</td>
<td>freeze/thaw can crack surface; heavy construction vehicles need access.</td>
</tr>
<tr>
<td>Concrete</td>
<td>Hardest surface; easy to form to site conditions; supports multiple use;</td>
<td>High installation cost; costly to repair; not a natural looking surface;</td>
</tr>
<tr>
<td></td>
<td>lowest maintenance; resists freeze/thaw; best cold weather surface; best</td>
<td>construction vehicles will need access to the trail corridor.</td>
</tr>
<tr>
<td></td>
<td>for wet conditions.</td>
<td></td>
</tr>
</tbody>
</table>

**SHARED-USE PATH/TRAIL SURFACE SYNOPSIS**

*Figure 17-2.PP*
17-2.04  **Accommodations Through a Roundabout**

Safety and usability for bicyclists through roundabouts depend on the details of the roundabout design and provisions unique for bicyclists. When approaching a roundabout using an on-road bike accommodation, some cyclists may choose to travel like other vehicles, through the circulatory roadway, while others may choose to travel like pedestrians, along the sidewalks. Roundabouts can be designed to accommodate either choice.

Since typical on-road bicycle travel speeds are between 12 mph and 20 mph (20 km/hr to 30 km/hr), roundabouts that are designed to constrain the speeds of motor vehicles below 30 mph (50 km/hr) thereby improve safety and usability for cyclists. As described in Section 36-9.04(a), roundabouts designed for urban conditions should have a recommended maximum entry speed of 20 mph to 25 mph (30 km/hr to 40 km/hr) based on theoretical fastest path. These speeds are generally compatible with bicycle travel. Note that side paths at a roundabout are treated similarly to more typical intersection types, but clear opportunities for bicyclists to join the path from the sideroad approaches need to be provided in all such cases.

17-2.04(a)  **Traversing Roundabouts like Motorized Vehicles**

In general, cyclists who have the knowledge and skills to ride effectively and safely on collector roadways can navigate low-speed, single-lane roundabouts without much difficulty. Cyclists and motorists will travel at approximately the same speed, making it easier for bicyclists to merge with other vehicular traffic and take the lane within the roundabout itself; these are necessary actions for safe bicycling in a roundabout. Even at multilane roundabouts, many cyclists will be comfortable traveling through like other vehicles.

Where bicycle lanes or shoulders are used on approach roadways, they should be terminated in advance of roundabouts. The full-width bicycle lane should normally end at least 100 ft (30 m) before the edge of the circulatory roadway. Terminating the bike lane helps remind cyclists that they need to merge. An appropriate taper should be provided to narrow the sum of the travel lane and bike lane widths down to the appropriate width necessary to achieve desired motor vehicle speeds on the roundabout approach.

The taper should end prior to the crosswalk at the roundabout to achieve the shortest possible pedestrian crossing distance. A taper rate of 7:1 is recommended to accommodate a design speed of 20 mph (30 km/hr), which is appropriate for bicyclists and motor vehicles approaching the roundabout. To taper a 5 ft to 6 ft (1.4 m to 1.8 m) wide bicycle lane, a 40 ft (12 m) taper is recommended. The bicycle lane line should be dotted for 50 ft to 200 ft (15 m to 60 m) prior to the beginning of the taper and dropped entirely through the taper itself. A longer dotted line gives advance notice to cyclists that they need to merge, providing more room for them to achieve this maneuver and find an appropriate gap in traffic; see Figure 17-2.QQ.

Bicycle lanes should not be located within the circulatory roadway of roundabouts. This would suggest that bicyclists should ride at the outer edge of the circulatory roadway, which can increase crashes resulting from exiting motorists who cut off circulating bicyclists and from entering motorists who fail to yield to circulating bicyclists.
At roundabout exits, an appropriate taper should begin after the crosswalk, with a dotted line for the bike lane through the taper. The solid bike lane line should resume as soon as the normal bicycle lane width is available.

### 17-2.04(b) Traversing Roundabouts like Pedestrians

Because some cyclists may not feel comfortable traversing roundabouts in the same manner as other vehicles, bicycle ramps can be provided to allow access to the sidewalk or a shared use path at the roundabout. Bicycle ramps at roundabouts have the potential to be identified as pedestrian ramps, particularly by pedestrians who are blind or who have low vision, unless properly designed.

Bicycle ramps may always be used. At some roundabouts traffic speeds or other conditions (e.g., a right turn bypass lane) make circulating like other vehicles more challenging for less confident riders than is typically the case. Multilane roundabouts are more challenging for all cyclists, and bicycle ramps should always be provided along with widened sidewalk or path connections. Where bicycle ramps are provided, provide a shared-use path or a widened sidewalk of 7 ft (2.1 m) between the ramps along all edges of the roundabout. A minimum 10 ft (3.0 m) width is recommended, and appropriate shared-use path design details should be applied.

In some jurisdictions, local laws may prohibit cyclists from riding on sidewalks and local coordination is encouraged to address this. In these areas, the following options could be considered:

- Signs could be posted to remind cyclists that they must walk their bicycles on the sidewalk.
- An exception could be made to allow cyclists to ride on the sidewalks at the roundabout; with appropriate regulatory signs posted.
- The sidewalk could be designed and designated as a shared use path.

**Appropriate** bicycle ramps are critical to provide choice to cyclists, ensure usability by cyclists, and reduce the potential for confusion of pedestrians, particularly those who are blind or who have low vision. Bicycle ramps should be placed at the end of the full-width bicycle lane where the taper for the bicycle lane begins. Cyclists approaching the taper and bike ramp will thus be provided the choice of merging left into the travel lane or moving right onto the sidewalk/path.

Bike ramps should not be placed directly in line with the bike lane or otherwise placed in a manner that appears to cyclists that the bike ramp and the sidewalk is the recommended path of travel through the roundabout. This encourages more sidewalk use by bicyclists, which can have a negative effect on pedestrians at the roundabout and may be less safe for bicyclists as well. Bicycle ramps should be placed at least 50 ft (15 m) prior to the crosswalk along the entry approach to the roundabout.

Wherever possible, bicycle ramps should be placed entirely within the planting strip between the sidewalk and the roadway. In these locations, the bicycle ramps should be placed at a 35° to 45° angle to the roadway and the sidewalk to enable cyclists to use the ramp even if pulling a trailer,
but to discourage them from entering the sidewalk at high speed. The bike ramp can be fairly steep, with a slope potentially as high as 20%. If placed within the sidewalk area itself, the ramp slope must be built in a manner so that it is not a tripping hazard. Figure 17-2.QQ illustrates several possible designs of bike ramps, depending on whether a planting strip is available and the available sidewalk width.

Detectable warnings are shown at the top of the bicycle ramps in Figure 17-2.QQ. These ramps are not intended for pedestrians. This detectable warning position indicates that the ramp itself is part of the vehicular area for which the detectable warning is used. If the ramp is in the sidewalk itself the detectable warning should be placed at the bottom of the ramp. Other aspects that can help keep pedestrians from misconstruing the bike ramp as a pedestrian crossing location include the angle of the ramp, the possible steeper slope of the ramp, and location of the ramp relatively far from the roundabout and crosswalk.

Bicycle ramps at roundabout exits should be built with similar geometry and placement as the ramps at roundabout entries. On exits, the angle between the bike ramp and the roadway can be as small as 20° since it is not necessary to encourage bicyclists to slow down as they reenter the roadway, but some angle is necessary so that visually-impaired pedestrians do not inadvertently travel down the ramp. Bike ramps should be placed at least 50 ft (15 m) after the crosswalk at the roundabout exit.
POSSIBLE TREATMENTS AND RAMP OPTIONS FOR BICYCLES

Figure 17-2.QQ
17-3 BICYCLE OPERATING CHARACTERISTICS

Bicycle operating characteristics, rider dimensions, and rider clearances are important considerations in design. There are many different types and sizes of bicycles, ranging from children’s bicycles to tandem units for two riders, as well as buggy carts for transporting children and belongings. Typical bicycle dimensions and clearances are shown in Figures 17-3.A and 17-3.B, respectively. Figure 17-3.C illustrates the rider envelopes that are a primary basis for the minimum widths for paths, buffered bike lanes, and one-way and two-way SBLs. Minimum operating space is 3.5 ft (1.1m) for each rider. Passing between bicyclists will occur regularly along SBLs; the addition of pedestrians along paths, and considering social walking behavior, is a primary basis for the minimum 10 ft (3.0 m) width of paved paths. Providing the shy space envelopes shown in Figure 17-3.C is desirable and will further improve bicyclists comfort.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Dimensions*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width (physical space)</td>
<td>30 in. (760 mm)</td>
</tr>
<tr>
<td>Length</td>
<td>6 ft (1.8 m)</td>
</tr>
<tr>
<td>Height</td>
<td>7 ft (2.2 m)</td>
</tr>
<tr>
<td>Vertical Pedal Clearance</td>
<td>6 in. (150 mm)</td>
</tr>
</tbody>
</table>

*Note: If bike trailers are likely, the characteristic width becomes 3 ft – 3.5 ft (0.9 m - 1.0 m) wide and 9 ft (2.7 m) long. The indicated height of an adult bicyclist takes into consideration that the rider may be standing up while riding. Adult bicyclists sit between 5 ft (1.5 m) and 6 ft (1.8 m) above the riding surface while sitting on the saddle.

TYPICAL BICYCLE AND RIDER DIMENSIONS

Figure 17-3.A
### Lateral Clearances

<table>
<thead>
<tr>
<th></th>
<th>Preferred Vertical Clearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bike to Parked Car</td>
<td>2 ft (600 mm)</td>
</tr>
<tr>
<td>Bike to Curb Drop-Off</td>
<td>2 ft (600 mm)</td>
</tr>
<tr>
<td>Bike to Utility Poles, Trees, Hydrants</td>
<td>2 ft (600 mm)</td>
</tr>
<tr>
<td>Bike to Soft Shoulder</td>
<td>1.5 ft (450 mm)</td>
</tr>
<tr>
<td>Bike to Sloped Drop-Off</td>
<td>1 ft (300 mm)</td>
</tr>
<tr>
<td>Bike to Raised Curb</td>
<td>1 ft (300 mm)</td>
</tr>
</tbody>
</table>

### Preferred Vertical Clearance

- **Bike Rider to Overhead Obstruction**: 3 ft (900 mm)

### Maneuvering Clearances

<table>
<thead>
<tr>
<th></th>
<th>Preferred Vertical Clearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bike to Vehicle</td>
<td>3 ft (900 mm)</td>
</tr>
<tr>
<td>Bike to Other Bike</td>
<td>2.0 ft (600 mm)</td>
</tr>
<tr>
<td>Bike to Pedestrian</td>
<td>2.5 ft (750 mm)</td>
</tr>
<tr>
<td>Turning Radius</td>
<td>5 ft (1.5 m) (min)</td>
</tr>
</tbody>
</table>

**Note:** Because turning radius, sight distance, and braking of bicycles differ significantly from that of motor vehicles, design of bicycle facilities should take a conservative approach. This conservative approach should accommodate differing aspects of bikes, including the fact that riders are of different skill levels.

**BICYCLE OPERATIONAL CLEARANCES**

**Figure 17-3.B**
BICYCLE RIDER ENVELOPES FOR DESIGN

Figure 17-3.C

Note: A 7 ft (2.1m) minimum width is required to accommodate the operating space requirements of either side-by-side or two-way bicyclist operations.
17-4 PEDESTRIAN ACCOMMODATIONS

17-4.01 General

Pedestrian accommodations are an integral part of urban and suburban transportation corridors. They facilitate pedestrian travel and access to public transportation, thereby contributing to alleviation of urban traffic congestion. The most pressing need for accommodation is at points of community development that result in pedestrian concentrations near or along the highway, such as at schools, public transportation stations and stops, local businesses, industrial plants, hospitals, churches, shopping centers, parking lanes, etc. Moreover, pedestrians should be included as design users at all intersections where they are expected to cross. Accommodations can include sidewalks, elevated walkways, grade-separated structures, curb ramps, crosswalks, traffic signals, and other traffic control devices.


The legal basis for bicycle and pedestrian policy is discussed in Section 17-1.02.

17-4.02 Pedestrian Warrants – Needs Assessment

The Department seeks to accommodate pedestrians within all project contexts with the exception of rural. Exceptions to the provision of accessible sidewalks on both sides, and logical crosswalks, will be quite rare within the urban and urban core project contexts. Suburban and rural town contexts will also typically include pedestrian accommodations, although in these contexts there may be more situations where constraints dictate that sidewalk be provided only along one side of a roadway. Consistent with this philosophy, there is no mechanism for tracking lack of need, excessive cost, or user safety issues to potentially justify sidewalk omissions, as there is with the BTA form for bicycle travel.

Pedestrian accommodations are specifically warranted, including provision of logical new state route crossing opportunities if they are absent, if any of the following conditions exist:

- there is current evidence of frequent pedestrian activity;
- there is a history of pedestrian-related crashes;
- the roadway improvement will create a safety impediment to existing or anticipated pedestrian travel (e.g., adding lanes so that the improvement itself acts as a barrier to pedestrian traffic);
- there is urban or suburban development that would attract pedestrian travel along or immediately adjacent to the route to be improved;
pedestrian-attracting development is expected along the route within five years of project completion, either as documented in a local plan or anticipated as a factor of similar development history; and/or

- the roadway provides access to a park, recreation area or other significant destination, or across a natural or man-made barrier, within contexts other than rural.

In projects that require local participation, if the local agency chooses not to participate in the sidewalk, the Department will request that local agency pass a local resolution indicating their non-participation. Note this in the Phase I project report. Proposed resolution language is included in Section 17-7.

Overpasses and underpasses involve substantial cost and accessibility challenges and will be evaluated on a case-by-case basis considering the level of pedestrian travel, travel generators (e.g., schools, factories, stadiums, parks, transit terminals, shopping districts), the amount of other non-motorized traffic, and the potential safety impacts of not providing the accommodations. Anticipated pedestrian trip length to generators should be 1 mile (1.6 km) or less and the adverse travel distance alleviated by construction of the overpass/underpass should be greater than 0.5 miles (800 m). Refer to Section 58-1.12 for more information on grade separations.

### 17-4.03 Sidewalk Design Considerations

Where pedestrian accommodations are provided they must be accessible to all users. Refer to Section 58-1 for accessibility standards and the criteria to be met in the design of sidewalks and crosswalks. The typical ROW challenges associated with adding sidewalks to existing roadways underscore the importance of providing adequate sidewalks during new construction and reconstruction projects. Refer to 17-2.02(g) on road diets and lane diets for a discussion of redistribution of space within the right of way; pedestrian accommodations can be added by similar means into urban roadway projects where no (or substandard) facilities exist. Amenities along sidewalks to increase pedestrian safety and comfort levels may include sidewalk buffers, plantings, bump-outs, and street furniture. Note that on projects that will not move curb lines (e.g., resurfacing) scope constraints will typically restrict construction work beyond the curb lines.

Sidewalks are typically 5 ft (1.5 m) wide along state routes. Where conditions do not allow for a width of 5 ft (1.5 m), a minimum clear sidewalk width 4 ft (1.2 m) is permissible as long as 5 ft by 5 ft (1.5 m by 1.5 m) passing spaces are provided at least every 200 ft (60 m). Sidewalks wider than 5 ft (1.5 m) should be considered if more compatible with the local sidewalk network or if intended to accommodate a high volume of pedestrians or a wider range of users. If located directly behind a curb, sidewalks should be a minimum 7 ft (2.1 m) wide. Preferably and especially where utilities will be present, include a 3 ft (900 mm) minimum turf sidewalk buffer, considering that an area is typically required for signs and other small appurtenances. The object free operational offset must be met and encroachments on the sidewalk PAR width must be avoided. Consider applying the enhanced lateral offset (see Section 38-9.02) for any locally-desired features being evaluated for placement within a corridor with sidewalk. Typical sections for
sidewalks along urban roadways are presented in Section 48-2.03; incorporation of sidewalks on urban roadways is covered in Section 48-2.04.

Along high-speed rural roadways, sidewalks should be located as far as practical from the roadway. At a minimum along lower speed rural roadways (e.g., rural town context), the sidewalk edge should be at least 5 ft (3.0 m) from the outside edge of the shoulder. While pedestrians are not prohibited by law from walking on roadway shoulders they should not be designed for pedestrian use or designated as pedestrian facilities.

Project limits may be extended beyond highway improvements for reasonable distances to include necessary pedestrian facilities at nearby intersections, to provide access to public transportation facilities, or to avoid short sidewalks gaps either on one side or both sides of the primary route. Any such extensions should be documented to show justification and reflected in the Phase I report.

17-4.04 Sidewalks on Highway Structures

Raised sidewalks are the typical pedestrian accommodation provided on roadway bridges. Chapter 39 includes additional design considerations. Provide a 5 ft (1.5 m) minimum clear width for pedestrians on a structure. If not separated from traffic by a barrier, a sidewalk is raised 8 in. (200 mm) above the bridge deck to provide a level of separation and comfort for pedestrians. A vertical barrier is required between the travelled way and the sidewalk when speed limits exceed 40 mph, and the raised surface is optional in those cases. At lower speeds the vertical barrier should still be considered where there are high pedestrian volumes, concentration of school children, or safety concerns. Regardless of speed limit, bicycles are accommodated in the traffic lane, on the shoulder or in a bicycle lane adjacent to the traffic lane. If bicyclists are to be separated from the traveled way, provide a side path as described in Section 17-2.03(m).

Sidewalks should be provided on new and rehabilitated structures in accordance with the dimensions shown in Figure 17-4.A. Required bridge railings along sidewalks must provide a minimum 3 ft 6 in (1070 mm) rail height along the structure edge, and 3 ft (910 mm) between the sidewalk and adjacent traffic lanes. Consider the potential for sight line impediments created by barriers and/or railings for drivers at adjacent intersections. Adjacent signalized intersections may need to include right-turn-on-red (RTOR) restrictions if intersection sight distance is restricted by a pedestrian railing. Several examples of barriers and railings used for sidewalk applications on bridges are shown in Figure 17-4.B. Specific configurations depend on the roadway speed limit, the roadway classification, and the facility being crossed. Refer to Chapters 39 and 58 for requirements of protective fencing.

When a project has a bridge omission with sidewalk accommodations along the roadway, fully compatible future accommodations should be planned for the omitted structure. Where it is necessary to accommodate pedestrians on an existing highway bridge as an interim condition, consider alternatives in light of what the geometrics of the bridge will allow. If it is necessary to accommodate pedestrians directly on the bridge deck, separate pedestrians from motor vehicle traffic with a barrier. When questions arise consult with BPPE and Bureau of Bridges and Structures for retrofit options and/or barrier and railing selection.
TYPICAL CROSS SECTIONS FOR SIDEWALKS ON HIGHWAY STRUCTURES

Figure 17-4.A
17-4.05 Intersection Crosswalks

Wherever pedestrians use an intersection, crosswalks are a primary geometric design element and should be considered in the initial steps of the intersection design process that is governed by Chapter 36. Signalized intersections are often the most direct and best places for pedestrians to cross a major roadway. Consider roadway width, traffic volumes, traffic speeds, and lines-of-sight when designing crossings. Assess the overall pedestrian network. Consider that the Illinois Vehicle Code includes in the definition of a crosswalk the prolongation or connections of the lateral lines of a sidewalk or shoulder across the intersection regardless of whether a crossing is marked or not, pursuant to 625 ILCS 5/1-113.

Pedestrian safety at intersections is typically improved with slowed turning traffic and good sight lines. Minimizing curb return radii within the constraints of operational needs can improve accommodations. Tighter radii can increase visibility of pedestrians, slow vehicle turning speeds, and reduce crossing distances.

Longer crossing distances increase pedestrian exposure to traffic and the potential for vehicle–pedestrian conflicts. Providing for multi-stage crossings can decrease overall traffic delay. Intermediate pedestrian refuge areas within raised medians and corner islands can reduce exposure and enhance pedestrian safety by providing multi-stage crossing opportunities. Refuge areas must provide 6 ft (1.8 m) minimum face-to-face width measured along the pedestrian travel path. Well-designed channelizing raised corner islands can help separate the individual conflicts between motor vehicles and pedestrians or bicyclists. They can be especially effective in conjunction with right-turn lanes and where intersection returns must accommodate larger design vehicles. Painted islands with crosswalks provide neither refuge for pedestrians nor directional guidance for persons with vision impairment. Actuated signalized intersections where raised medians provide refuge, pedestrian signal heads and pushbuttons/detectors must be installed within the median. Where corner islands are used in conjunction with dual right-turn lanes, the same requirement applies. Countdown pedestrian signal heads are required, and lead pedestrian interval (LPI) phasing should be considered, especially in urban core and urban contexts. Consult the Bureau of Operations regarding inclusion of LPI phasing on projects.

To the extent possible, minimize intersection skews and place crosswalks at right angles to traffic movements where they best meet both driver and pedestrian expectations. Skewed crossings tend to increase pedestrian exposure to traffic and may reduce sight distance for some users. Design return radii to minimize crossing distances considering that design turning vehicles may utilize all available roadway width in the direction of travel rather than turning into the near lane.

The ILMUTCD provides standards for marked crosswalks. All crosswalk markings must be white. For simplicity of maintenance, two transverse crosswalk lines are typically used for marking crosswalks on stop-controlled and signalized approaches. Two transverse crosswalk lines provide for good channelization and guidance and are adequately visible in conjunction with stop bars. However, longitudinal crosswalk markings (e.g. Continental style) should be considered at locations where (a) physical or level-of-use conditions are such that added visibility of the crosswalk is desired; or (b) a pedestrian crosswalk might not be expected by drivers. Studies show that crosswalks marked longitudinally can be detected much further away than crosswalks...
with only transverse lines. IDOT Bureau of Operations Policy TRA-23 provides design guidance for crosswalk striping that can apply to intersection markings.

17-4.06 Midblock Crosswalks

In areas of considerable pedestrian activity, midblock crosswalks reduce distances pedestrians must travel and focus crossing interactions where pedestrian safety can be maximized. Pavement markings legally establish a crosswalk at any non-intersection location. Designated midblock crossings must meet the same accessibility requirements as pedestrian crossings at intersections. Where safety concerns are identified at midblock crosswalks, first consider potential methods for upgrading the design, rather than simply working to remove them.

Because drivers may be less expectant of pedestrians crossing at non-intersection locations, these crossings should include enhanced visual cues and/or geometric features to increase driver awareness of the crossing and improve safe behavior by all users. IDOT Bureau of Operations Policy TRA-23 provides guidelines for establishing pedestrian crossings at midblock locations, including recommended signing, striping, and beacon treatments based on vehicle speeds, traffic volumes, and roadway cross section. A general illustration of a midblock crosswalk for a multi-use path is shown in Figure 17-4.C(1). The location and design of midblock crossings should consider pedestrian volumes, vehicle mix, desired paths for pedestrians, and adjacent land uses. Longitudinal crosswalk markings (e.g., Continental or ladder style) should typically be specified. Especially for areas where there has been a history of nighttime pedestrian crashes, crosswalk lighting should be considered. Guidance on crosswalk lighting can be found in Chapter 56 as well as FHWA’s *Informational Report on Lighting Design for Midblock Crosswalks*.

Providing shorter directional crossings can maximize pedestrian safety. Raised medians that are a minimum 6 ft (1.8 m) wide face-to-face with cut-throughs provide an area of refuge for both pedestrians and bicyclists. For guidance on the use of medians to divide traffic, refer to Chapters 31 and 36 as well as the *AASHTO Green Book*. Raised medians with cut-throughs also call attention to a crossing, reduce pedestrian exposure, and allow pedestrians to address one direction of conflict at a time. Designers can sometimes provide adequate space for a raised median refuge by reducing lane or shoulder widths. Cut-throughs within raised medians may be angled to better align pedestrians toward oncoming traffic, increasing their awareness of traffic. Refer to Figure 17-4.C(2) for an example. Another measure to enhance safety is a curb bump-out. These geometric features can greatly improve sight lines at crosswalks, especially where parking or other sight line constraints will exist. It is critical that operational and maintenance issues are considered when curb bump-outs are to be included in the roadway design.
EXAMPLE MIDBLOCK CROSSWALK WITH REFUGE FOR SHARED-USE PATH

Figure 17-4.C
(1 of 2)
Pedestrian Hybrid Beacons (PHBs) are a type of traffic control device used to warn and control motorists at marked unsignalized midblock crosswalks and assist pedestrians in crossing. PHBs are typically not to be considered at locations where conventional signal warrants are met. The ILMUTCD provides guidance regarding the volume of pedestrians crossing a roadway that would merit the consideration of PHBs as well as the location and design requirements. The ILMUTCD also identifies specific restrictions on the locations of PHBs near intersections or entrances. The primary location for consideration of PHBs is at midblock crosswalks along multi-lane urban and suburban roadways, as covered in Operations Policy TRA-23.

Another example of a supplemental device to increase driver awareness of pedestrian presence at a midblock crosswalk is the Rectangular Rapid Flashing Beacon (RRFB). RRFBs can be utilized under an Interim Approval statewide (IA-21.38). Specific technical conditions are established by FHWA for their use. Pedestrian actuation and supplemental signs and pavement markings are required with both PHBs and RRFBs. Compliance by pedestrians and motorists can be maximized by providing a relatively “hot response” (fast activation) for pedestrians pressing a button. For PHBs, this type of activation may adversely affect progression along...
arterial roadways. Consider whether the potential safety benefit of a system that reduces non-compliance by all users (e.g. improves motorist stopping behavior) warrants some disruption to vehicle traffic flow. Coordinate these issues with the Bureau of Operations.

**17-4.07 Safety Rails and Handrails**

Safety rails are placed along paths or sidewalks to protect pedestrians and bicyclists from hazards such as vertical drop-offs or steep slopes. Refer to Figure 17-4.D for guidance on railing placement and height. Consider the range of non-motorized users expected in applying this guidance to sidewalks and paths. Situations that should be considered for the inclusion of safety rails include areas where there are:

- Slopes steeper than 1:3 (for drops of 6 ft (1.8 m) or greater) or 1:2 (for drops of 4 ft (1.2 m) or greater immediately adjacent to the path,
- Drop-offs of more than one ft (300 mm) and steeper than 1:1 immediately adjacent to the path,
- Slope surfaces consisting of rough materials, such as revetment or rip-rap, immediately adjacent to the path, or
- Bodies of water at the bottom of a slope adjacent to the path.

Safety rails adjacent to pedestrian-only areas (e.g., sidewalks) should be a minimum of 3 ft 6 in. (1070 mm) high. A typical design for a safety rail includes two to four horizontal elements with vertical elements equally spaced. On bridges or other locations with high vertical drops there are important opening restrictions. Opening sizes in the lower 27 in. (700 mm) should be small enough so that a 6 in. (150 mm) sphere cannot pass between them. Above 27 in. (700 mm) openings should restrict passage of an 8 in. (200 mm) sphere.

Related to accessibility, handrails are required in the following situations in accordance with ADA requirements:

- On both sides of stairways, with appropriate extensions at the top and bottom,
- On both sides of ramps, not curb ramps, where the rise of the ramp run is more than 6 in. (150 mm).

However, it is not the intent to typically provide handrails along state highways as they likely could pose a hazard to vehicle traffic. Handrails may have applications perpendicular to traffic, and when outside of the clear zone. Also note that matching the grade along a side road usually does not create a condition where a handrail is required.
SAFETY RAILS FOR WALKWAYS AND SHARED-USE PATH

Figure 17-4.D
17-4.08 **Documentation**

When one or more of the warrants presented in Section 17-4.02 are met, appropriate and accessible pedestrian sidewalk accommodations are required. When pedestrian accommodations will be included in the project, include documentation of the decision in the Phase I report. When urban core, urban or suburban context projects do not meet warrants, send an electronic copy of the assessment of the warrants to BPPE to obtain concurrence. Exceptions to these design treatments, either on the basis of cost or user safety, require concurrence by BPPE and will be granted at coordination meetings after a sufficient review period. Total omissions based on documented safety issues, excessive cost or lack of need on projects within 1 mile (1.6 km) of an urban area will require concurrence of the Secretary. Signed documentation of the Secretary’s concurrence on a BDE 1701 shall be included in the Phase I report.

17-4.09 **Pedestrian Accommodations During Construction**

The *ILMUTCD* requires that alternate pedestrian access routes (APAR) be provided whenever existing pedestrian accommodations are affected by construction; refer to *ILMUTCD* Section 6D. Accessibility must be maintained consistent with the features present in the existing facility. See Section 55-2.01(d) and the *Highway Standards* for guidance. Lengthy pedestrian detours should be avoided. In rare circumstances, provision of an APAR or a reasonable pedestrian detour may not be feasible along a roadway or across a structure. In such cases alternative accommodations such as a shuttle service may be provided.

17-4.10 **Maintenance and Jurisdiction**

Jurisdiction and maintenance of pedestrian walkways are considered a local responsibility and should be coordinated with local agencies early in the planning process; see Chapter 5.

If the local agency chooses not to participate in the pedestrian accommodation, the Department will request that that local agency pass a local resolution indicating their non-participation and note this in the Phase I report. Proposed resolution language is included in Section 17-7.

In such cases, consider the inclusion of a shelf or berm of sufficient width to allow for future sidewalk construction within right of way.
17-5 REFERENCES

The following are applicable references for bicycle travel assessments and facility design and pedestrian accommodation evaluation and design:


17. Standard Specifications for Road and Bridge Construction, IDOT.


All projects involving bicycle and pedestrian accommodation for the Department will be in accordance with Reference Publications 1 and 2 above. For projects involving separate bikeways, guidance beyond the AASHTO Guide (i.e., Reference Publication 1) is available in Reference Publication 3. The following FHWA-endorsed webpages can also be referenced for additional guidance and information on specific design features:


## 17-6 BICYCLE CHECKLISTS AS INCLUDED ON BTA FORM (BDE 1702)

### CHECKLIST FOR BICYCLE TRAVEL GENERATORS IN PROJECT VICINITY

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### CHECKLIST FOR ORGANIZATIONS AND PUBLIC COORDINATION

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</tbody>
</table>

Organizations and Public Coordination addresses:

- League of Illinois Bicyclists, 2550 Cheshire Drive, Aurora, IL 60504.
- Illinois Department of Natural Resources, Office of Planning and Realty, One Natural Resources Way, Springfield, IL 62702-1271.
- Active Transportation Alliance, 35 East Wacker Place #1782, Chicago, IL, 60601.
EXAMPLE OF MAP TO ACCOMPANY CHECKLIST FOR BICYCLE TRAVEL

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<td>Other</td>
</tr>
</tbody>
</table>
QUESTIONS ON BICYCLE TRAVEL ASSESSMENT

Route ____________________________
Section ____________________________
County ____________________________

Warrants Met

Warrant 1: Is the highway or street designated as a bikeway or recommended bike route in a regionally or locally adopted bike plan or shown in a regionally or locally adopted map as a recommended bike route?
Describe the designation

Warrant 2: Will the projected two-way bicycle traffic volume approximate 25 ADT or more during the peak three months of the bicycling season five years after completion of the project?
Describe estimating method

Warrant 3: Does the route provide access to a park, recreational area, school, or other significant destination?
List destinations

Warrant 4: Does the project provide access across a river, railroad, highway, corridor, or other natural or man-made barrier?
Note barriers

Warrant 5: Will the highway project negatively affect the recreational or transportation utility or an independent bikeway or trail? Highway projects will negatively affect at-grade paths or trails when they are severed, when the projected roadway traffic volumes increase to a level that prohibits safe crossing at-grade, or where the widening of the roadway prohibits sufficient time for safe crossing.
List bikeway(s) affected

If any of the five warrants above are met, the Department shall provide on-road or off-road accommodations for bicycle travel. Roadway improvement corridors should also be assessed with respect to adjacent/contiguous routes. Items to be addressed in the reporting include:

- The following bicycle network considerations apply
- Key connections to be provided with this project
- Accommodations type identified as "required" or "optional" in the Bicycle Facility Selection Table
- Accommodations proposed
- Reasons for lesser accommodations (highest/best or none)
- Bicycle LOS information (urban on-road facilities only; attach BDE 1703)
17-7  PROPOSED RESOLUTION LANGUAGE FOR NON-PARTICIPATING LOCAL AGENCIES

WHEREAS, The Illinois Department of Transportation (IDOT) has the power to approve and determine the final plans, specifications and estimates for all State highways; and

WHEREAS, IDOT’s projects must adequately meet the State's transportation needs, exist in harmony with their surroundings, and add lasting value to the communities they serve; and

WHEREAS, IDOT must embrace principles of context sensitive design and context sensitive solutions in its policies and procedures for the planning, design, construction, and operation of its projects for new construction, reconstruction, or major expansion of existing transportation facilities by engaging in early and ongoing collaboration with affected citizens, elected officials, interest groups, and other stakeholders to ensure that the values and needs of the affected communities are identified and carefully considered in the development of transportation projects; and

WHEREAS, Bicycle and pedestrian ways must be given full consideration in the planning and development of transportation facilities, including the incorporation of such ways into State plans and programs; and

WHEREAS, The State’s complete streets law requires bicycle and pedestrian ways to be established in or within one mile of an urban area in conjunction with the construction, reconstruction, or other change of any State transportation facility, except in pavement resurfacing projects that do not widen the existing traveled way or do not provide stabilized shoulders, or where approved by the Secretary of Transportation based upon documented safety issues, excessive cost or absence of need; and

WHEREAS, During the development of highway projects throughout the State, IDOT gives consideration to accommodating bicyclists and pedestrians on a need-basis; and

WHEREAS, IDOT has presented the (local authority), for its consideration, a bicycle and/or pedestrian improvement with funding to be split 80% State, 20% local with maintenance to be provided by (IDOT/unit of local government); therefore, be it

RESOLVED, That the (local authority) hereby rejects IDOT’s proposed bicycle and/or pedestrian improvement and acknowledges that such rejection will result in a cancellation of the proposed improvement; and be it further

RESOLVED, That a suitable copy of this resolution be presented to the IDOT district office associated with the proposal, or his or her equivalent, within IDOT.