



## 8. Design Guidelines for Consideration

ADOT and other implementing agencies within Arizona should consider the appropriate accommodation of bicyclists and pedestrians in planning and construction projects. This section includes design guidelines that are important to the betterment of bicycling and walking within Arizona. At this time, it is not possible to address all impacts and fiscal implications these guidelines would have on any particular implementing agency within Arizona; therefore, the guidelines within this plan are provided for consideration by all agencies and are not a specific requirement on ADOT or any other agency within Arizona.

AASHTO developed national design guidelines for bikeways with input from state departments of transportation, including ADOT. Currently, ADOT recognizes design guidelines including the 1999 AASHTO *Guide for the Development of Bicycle Facilities* and the MUTCD, Millennium Edition Revision 1 with an Arizona Supplement. AASHTO is currently developing pedestrian facility design guidelines that will be reviewed by ADOT and adopted accordingly. The following design guidelines may be considered in addition to the above referenced guidelines.

### 8.1. Bicycle Facility Design Guidelines

The following design guidelines for consideration address bike lanes, shared-use paths, and bike routes. Where possible, it may be desirable to exceed the minimum guidelines for shared-use paths or bike lane widths, signage, lighting, and traffic signal detectors.

#### **Bike Lane Facilities Design**

The ADOT Bicycle Policy states that the 1999 AASHTO *Guide* and the MUTCD Part 9 will be utilized as the design guides for roadway features to accommodate bicyclists. The AASHTO guide states that all roadways should be designed to accommodate bicycles, which may include the designation of bicycle lanes on State Highways. In addition, the width and placement of roadway shoulders should follow these guidelines when practical.

The following guidelines should be considered in the construction and designation of bike lanes. Comprehensive design guidance and standards for bike lanes are found in the AASHTO *Guide for the Development of Bicycle Facilities* and Part 9 of the MUTCD.

1. All bike lanes should conform to the design guideline of AASHTO, which is displayed in **Figure 1** and the ITE Traffic Control Handbook. Under restricted circumstances, bike lanes may be four feet in width, including bike lanes located on lower-speed roadways that are uncurbed, or in some cases between through traffic lanes and right-turn only lanes. Four-foot bike lanes also may be utilized for paved shoulder locations where right-of-way is restricted or there are topographical constraints. Generally, bike lane widths of five to six feet are desirable. Bike lanes should be striped, signed, and marked in accordance with the MUTCD. Intersections with bike lanes should follow the MUTCD and the ITE Traffic Control Handbook and stripe the bike lane to the left side of right-turn only lanes. Please see **Figures 2A** through **2D** for this detail and other details for bike lane approaches to intersections.



Note: The ADOT Roadway Design Manual requirements for shoulder widths in Section 302.4 provide widths to accommodate bicycle lanes by specifying a six-foot to ten-foot shoulder based on roadway type for all roadways except urban undivided highways, where the shoulder has a two-foot minimum. On urban undivided highway cross sections, the ADOT typical 12-foot lane width plus the two-foot minimum shoulder does meet the recommended 14-foot shared lane width of AASHTO.

2. Signal detectors that sense bicycles should be considered for signalized intersections. A stencil of a bicycle can identify the location for bicyclists to stop in order to be detected. The stencil is typically only needed with loop detection systems. Curbside push buttons should not be considered a replacement for effective signal detection and they encourage bicyclists to stop in a location that places them too far to the right at the stop line and at a disadvantage to right-turning traffic. Curbside push buttons may be appropriate in certain situations such as when there is an island separating right turning traffic from through traffic and when other detection methods are not effective. As stated in Section 9D of the MUTCD 2000, the needs of bicyclists shall be considered when setting signal timing on bikeways.
3. Bike lanes should be continuous where practical. Where right-of-way or other constraints preclude continuous bike lanes, the bike lane segments can be connected with local bike routes until such time as a continuous bike lane can be provided; however, in most cases bicyclists should be permitted to continue along the roadway and not be required to use an alternate route. Signage confirming to the MUTCD should be provided to designate the facility changes along the bicycle route. Bike routes are discussed in the following section.
4. Standard bike lane signs as contained within Part 9 of the MUTCD must be utilized where bike lanes are designated. Part 9 also includes examples of optional signs, which help in the guidance of bicyclists utilizing regional routes. All signing and striping of bike lanes must conform to most recent MUTCD as approved by ADOT.

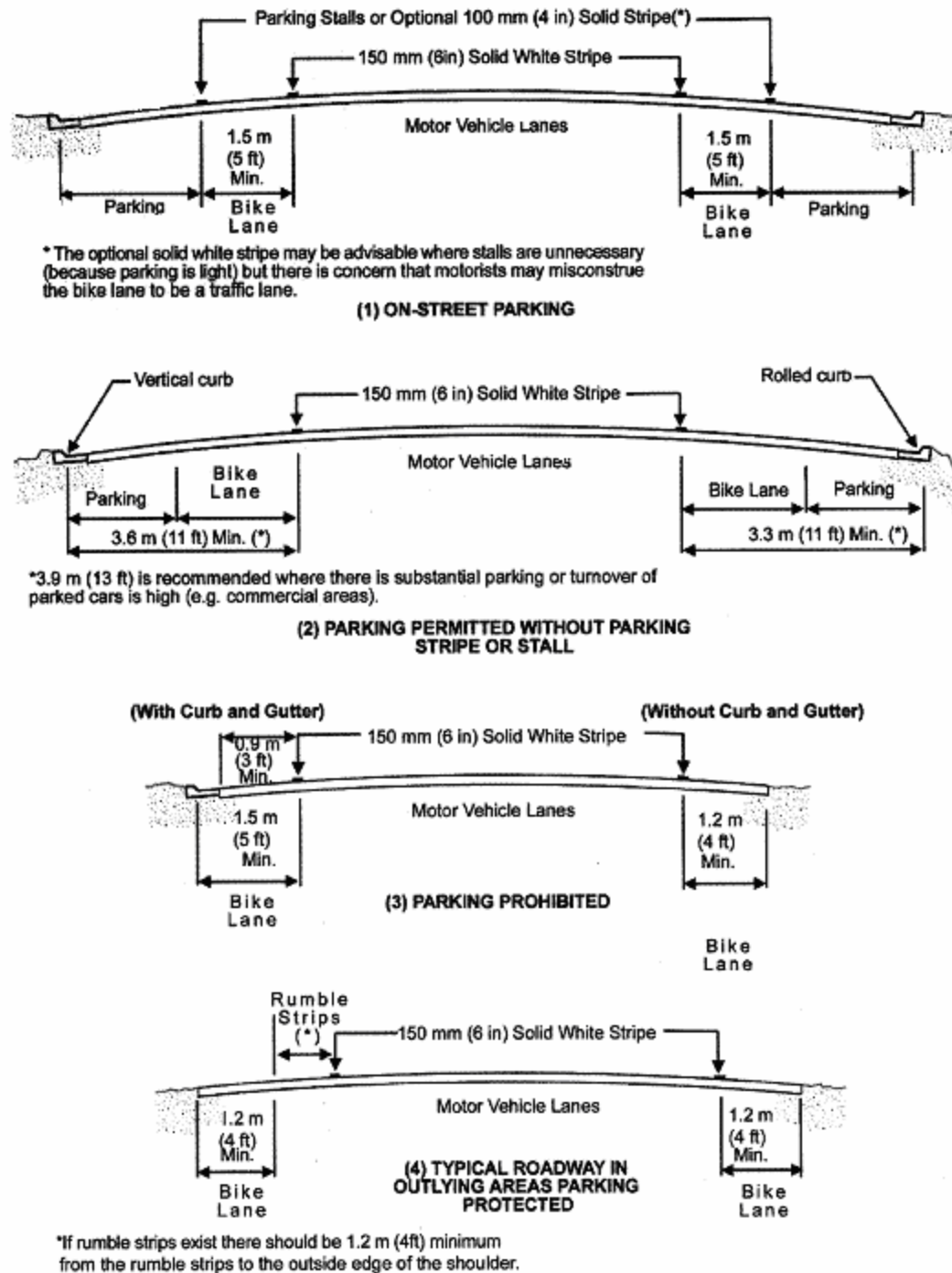
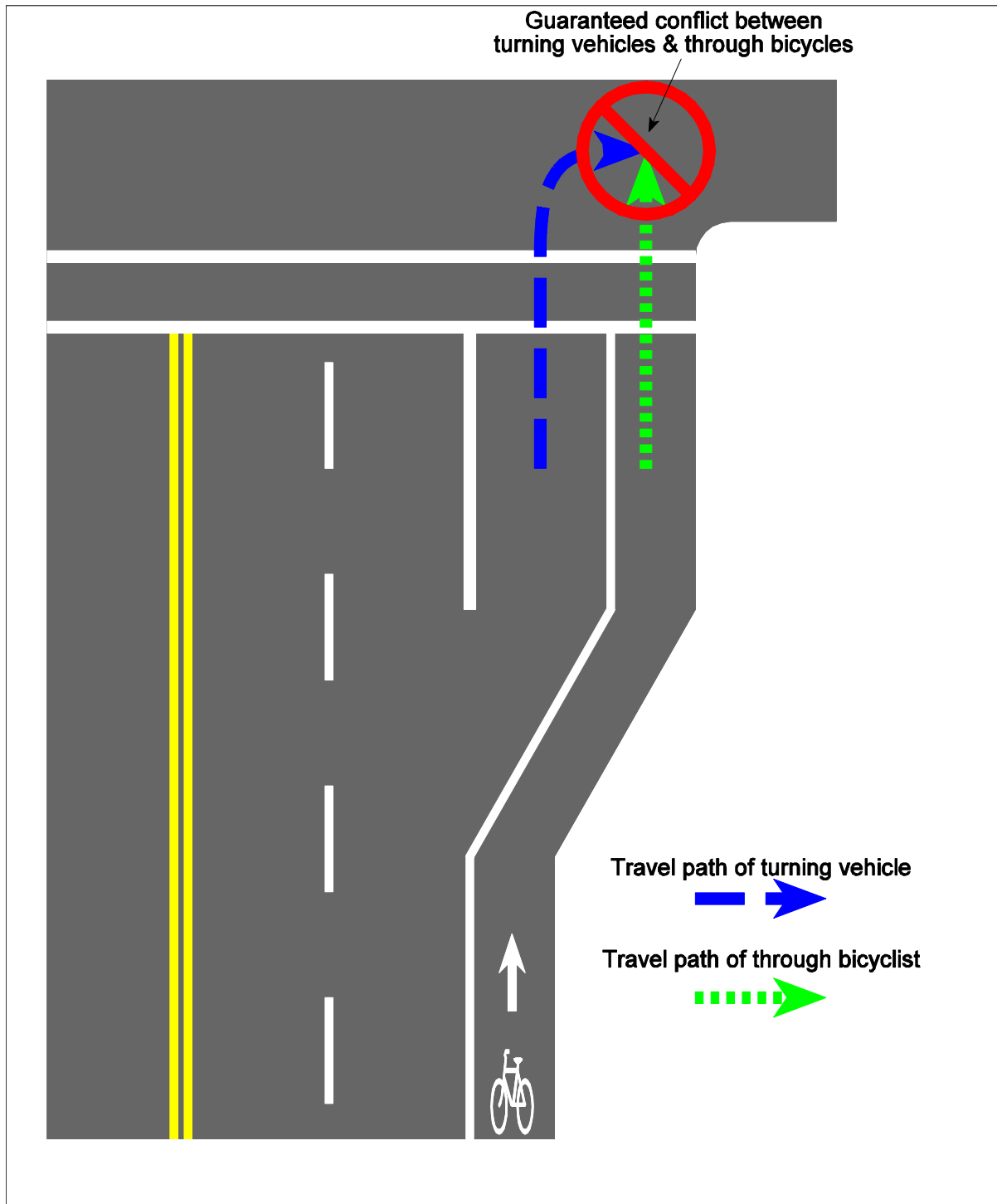
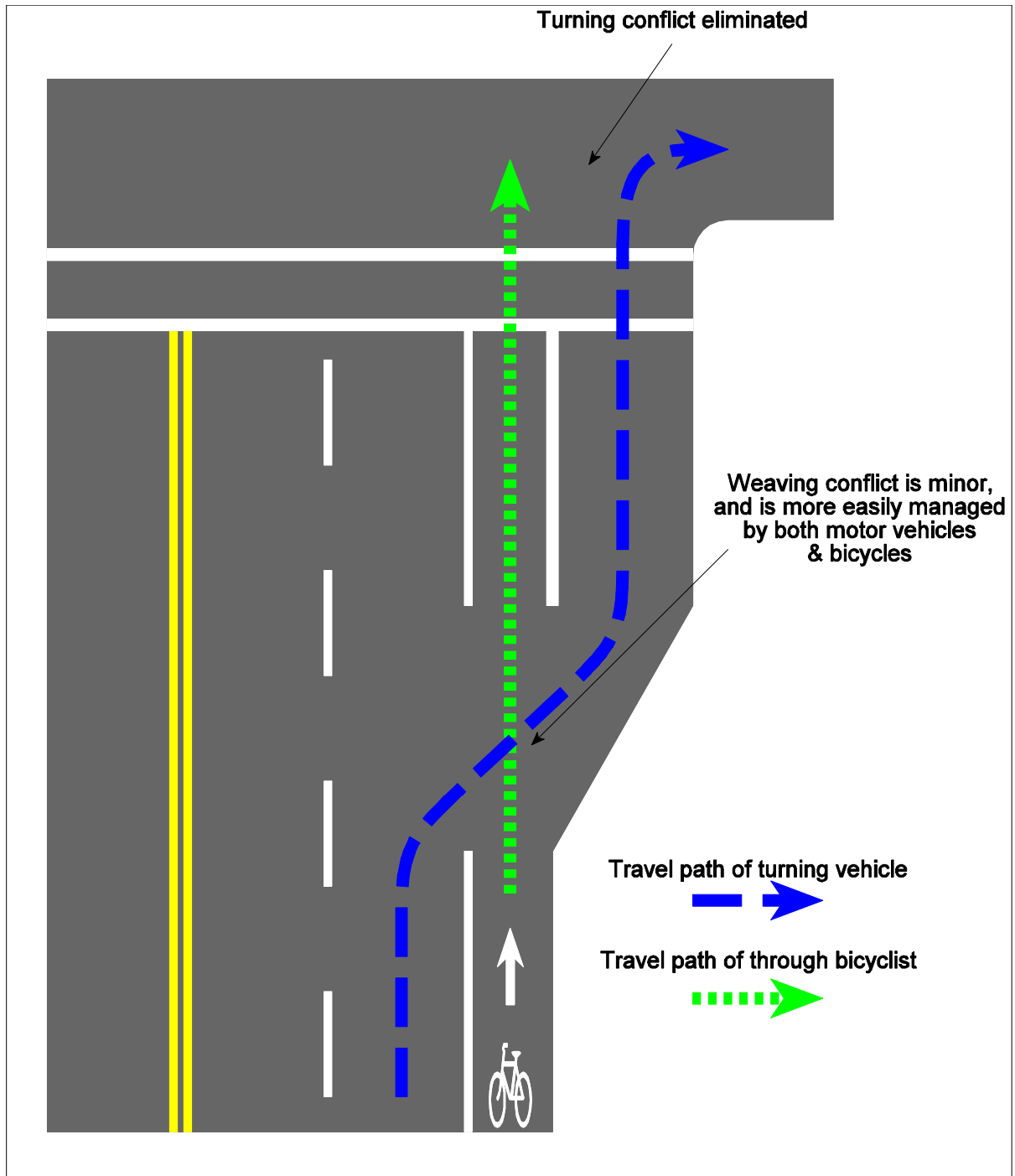


Figure 1 – Typical Bike Lane Cross Sections  
(Source: AASHTO)

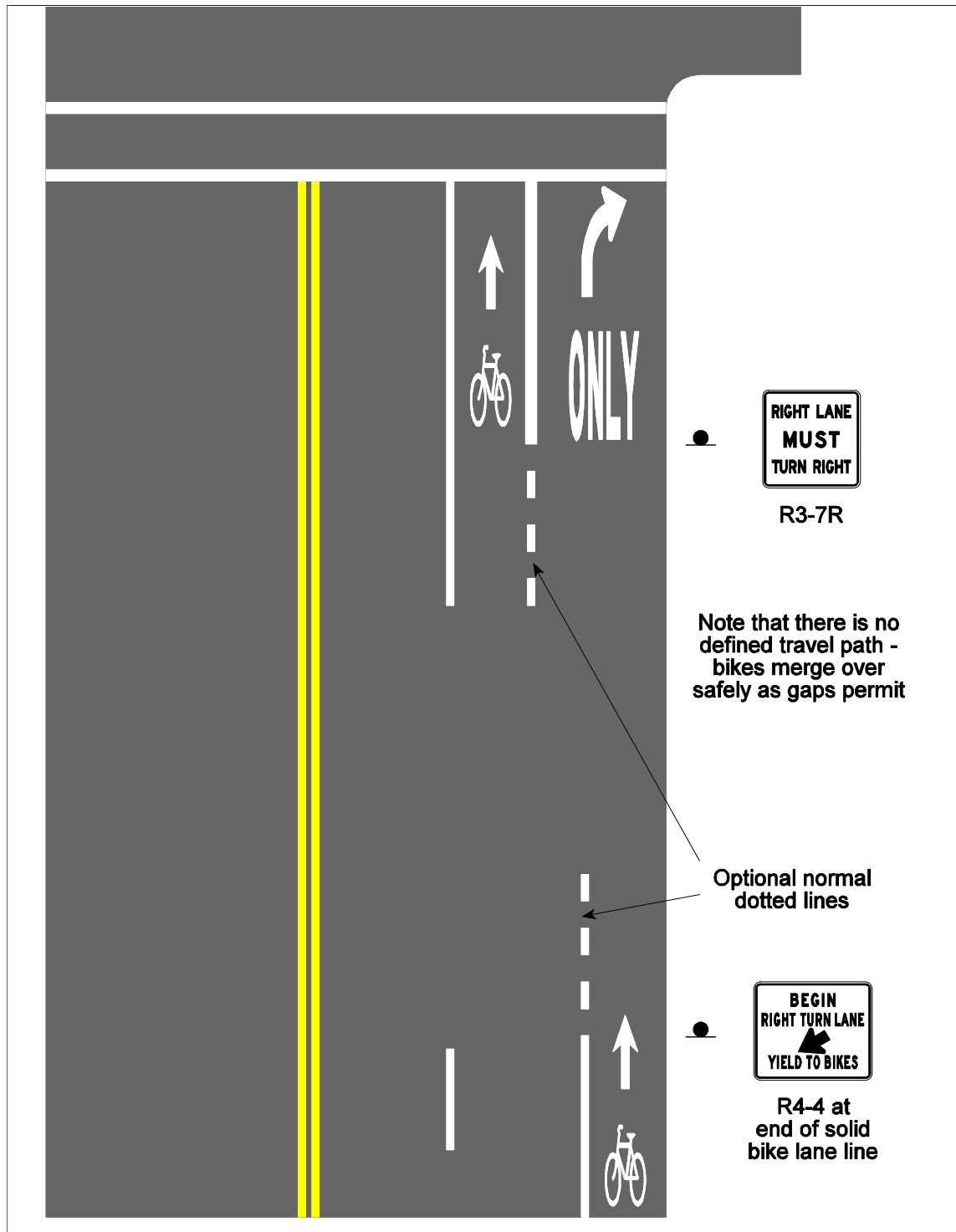


**Figure 2A – Problems with Placement of Bike Lane to the Right of a Right Turn Lane**

(Source: ITE Traffic Control Devices Handbook)



**Figure 2B – Correct Placement of Bike Lane to the Left of a Right Turn Lane**  
(Source: ITE Traffic Control Devices Handbook)



**Figure 2C – Optional Bike Lane Treatment Where Right Lane Becomes Right Turn Only Lane**  
(Source: ITE Traffic Control Devices Handbook)

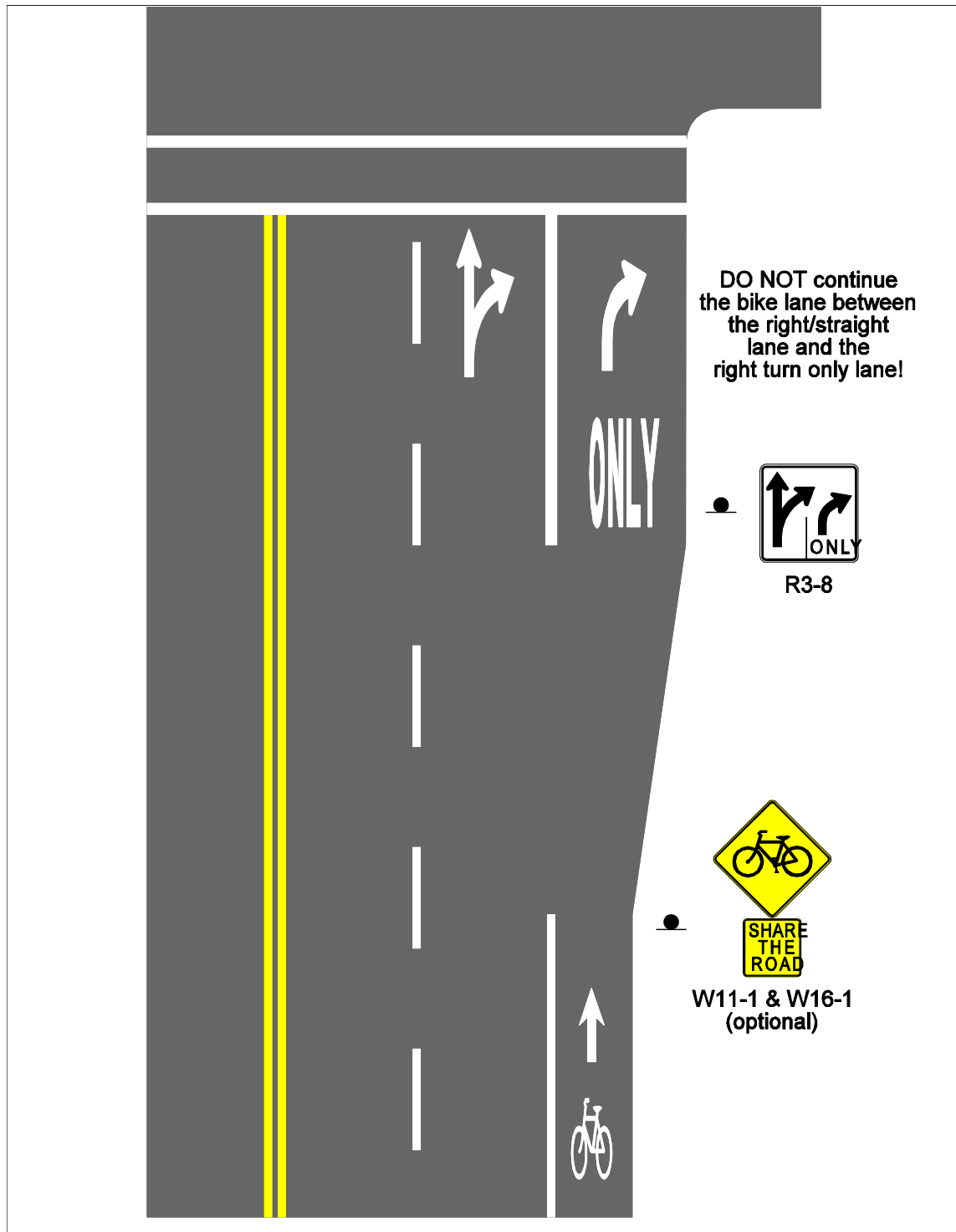


Figure 2D – Optional Bike Lane Treatment at Multiple Right Turn Lanes  
(Source: ITE Traffic Control Devices Handbook)



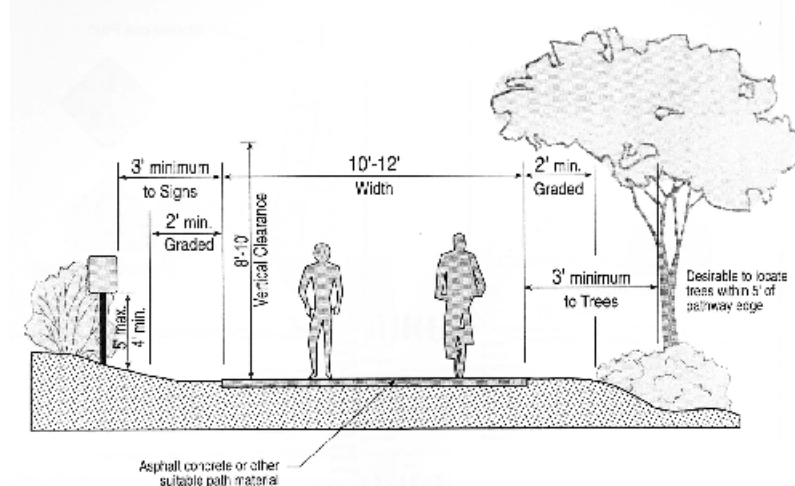
### Shared-Use Path Facilities Design

The following guidelines should be considered in the construction and designation of shared-use paths. Comprehensive design guidance and standards for shared-use paths are found in the AASHTO *Guide for the Development of Bicycle Facilities* and Part 9 of the MUTCD.

Sidewalk paths and shared-use paths located immediately adjacent to the roadway are discouraged by AASHTO. This is due to several factors including the potential for high numbers of intersecting roadways, conflicts at intersections particularly with bicyclists traveling in the opposite direction of the adjacent roadway travel lane, potential insufficient sight distances due to walls and other obstructions, and possible conflicts within the right-of-way such as utility poles.

### Shared-Use Path Facilities Design Considerations

1. Shared-use path crossings of roadways and driveways must be carefully considered during the design process. Pathways built adjacent to roadways are discouraged by AASHTO; however, where pathways are built adjacent to roadways it is recommended that street crossings be minimized. Generally speaking, shared-use paths that cross roadways with high traffic volumes may require signalization or grade separation.
2. Shared-use paths should be located a minimum of five feet and preferably more from the traveled way or a suitable barrier should be provided between the pathway and roadway. The pathway should be a minimum of 10 feet wide and should include a minimum two feet of shoulder on each side and preferably four feet on each side (see **Figure 3**). In areas of high usage, 12 feet of pavement or more is recommended, and in some cases an additional separate unpaved parallel path is optimal for pedestrian travel. Pavement widths of 10 feet or more also better accommodate maintenance vehicles and reduces damage to the pavement edge from these vehicles.



**Figure 3 – Shared-Use Path Standard Cross-Section (Curtis Lueck & Associates)**





3. Landscaping for shared-use paths should generally be low water use native vegetation. Selected plant species should generally be native plants. Selecting species that require minimal maintenance, including falling litter and debris is an important consideration. Shade landscaping should be considered as a valuable enhancement for bicycle and pedestrian use, and should be considered as a continuous design element along the pathway or at nodes within reasonable spacing along the pathway. Trees trunks are recommended to be located between three and five feet from the shared-use path edge so that the tree provides the path with shade but not so close as to cause future pavement damage from root intrusion (root guard may be needed); however, consideration should be taken so that the tree typically does not encroach into the vertical clearance of the path.
4. Pedestrian-scale lighting should be considered where bicycle users and others will likely use the shared-use path in the evenings or early mornings. This is an important safety and security consideration in warmer areas of the State where users may frequently use the path during early or late hours in order to avoid the heat.
5. Barriers such as posts or bollards to prevent unauthorized motor vehicle use of shared-use paths may be used as appropriate. Ideally, fewer restrictions at entry points are preferred; however, if barriers are used, the barriers should be clearly marked as per MUTCD standards and should be Americans with Disability Act (ADA) accessible.
6. Shared-use path construction should take into consideration maintenance and emergency vehicles particularly for shared-use path surface material, width, shoulders, and vertical clearance requirements.
7. Unpaved smooth shoulders two to four feet in width should be provided where feasible for pedestrians and runners. The shoulders provide a softer running and walking surface, increase capacity of the path, and provide a clear zone for bicyclists and in-line skaters who may unexpectedly leave the path. Bicyclists and pedestrians may be directed to the right side of the pathway with signing and/or stenciling, and signs may be provided illustrating the rules of the path.
8. Where paths are heavily used, consideration may be made to install emergency phone service.
9. Grades that meet ADA provisions are important to accommodate users with disabilities. ADA requires that the grade of shared-use paths not exceed 8.33 percent.
10. Where shared-use path design occurs in environmentally sensitive areas, design exceptions may be pursued to minimize environmental impacts; however, the minimum AASHTO design guidelines should be followed, or if not feasible (e.g., if only a six-foot width can be achieved), the path should not be designated for bicycle use.
11. Shared-use paths should not be considered a substitute for on-road bicycle facilities. Paved shoulders or bicycle lanes should be considered along roadways that have adjacent shared-use paths. As stated within AASHTO, many bicyclists will use the roadway instead of the shared-use path because they have found the roadway to be safer, more convenient, or better maintained. AASHTO



lists several additional operational and safety reasons why paved shoulders or bike lanes should be implemented on the roadway if adjacent shared-use paths are built.

### **Bike Route Facilities Design**

Bike routes have been typically designated as signed routes along street corridors, usually on local streets and sometimes on collectors. With proper route signing, reasonably direct connectivity, and good street maintenance bike routes can be effective in guiding bicyclists to local and regional destinations. Bike routes also can be good incubators for beginning bicyclists to develop their skills. Bike routes can become more useful when coupled with such techniques as:

- Special route name, directional, and distance signing;
- “Share the Road” signs along roadways where additional guidance is needed for motorists to share the road with bicycles, including locations where the bikeway narrow to substandard conditions;
- Wide curb lanes on collector roadways (14 feet to 16 feet in width);
- Routine pavement maintenance schedules;
- Traffic signals timed for bicyclists and signalized crossings specifically for bicyclists and/or pedestrians, where high use warrants increased safety and accessibility across major roadways; and
- Traffic calming and development of “bicycle boulevards” (e.g., includes provision of speed humps, traffic circles, curb extensions, entrances to neighborhoods limited only to bicyclists, and pedestrians, etc).

### **Riding on Sidewalks**

The use of sidewalks as bicycle facilities should not be encouraged especially as a bike route. Some communities prohibit bicycle riding contrary to the flow of traffic (e.g., Tempe). Others prohibit bicycle riding on all sidewalks (e.g., Tucson) except for bicycles with wheel diameters less than 16 inches (technically Arizona Revised Statutes do not classify these as bicycles). Yet other jurisdictions do not have any restrictions on bicycle riding on sidewalks, including such entities as ADOT and several rural counties. Although bicycle and motor vehicle speeds are generally lower at sidewalk intersections with roadways, potential conflicts can still result in severe injuries. It is inappropriate to sign these facilities as bikeways. Significant safety issues arise when those riding on the sidewalk, especially contrary to the flow of traffic, encounter driveways and side streets where motorists do not expect to see them. Bicyclists should not be encouraged to ride facilities that are not designed to accommodate bicycle travel.

The following excerpt is from the 1999 AASHTO Design Guidelines on the use of sidewalks for bicycle facilities.

### **Undesirability of Sidewalks as Shared-Use Paths**

Utilizing or providing a sidewalk as a shared-use path is unsatisfactory for a variety of reasons. Sidewalks are typically designed for pedestrian speeds and maneuverability and are not safe for higher speed bicycle use. Conflicts are common between pedestrians traveling at low speeds (exiting stores, parked cars, etc.) and bicyclists, as are conflicts with fixed objects (e.g., parking meters, utility poles, sign posts, bus benches, trees, fire hydrants, mail boxes, etc.). Walkers,



joggers, skateboarders, and roller skaters can, and often do, change their speed and direction almost instantaneously, leaving bicyclists insufficient reaction time to avoid collisions.

Similarly, pedestrians often have difficulty predicting the direction an oncoming bicyclist will take. At intersections, motorists are often not looking for bicyclists (who are traveling at higher speeds than pedestrians) entering the crosswalk area, particularly when motorists are making a turn. Sight distance is often impaired by buildings, walls, property fences, and shrubs along sidewalks especially at driveways. In addition, bicyclists and pedestrians often prefer to ride or walk side-by-side when traveling in pairs. Sidewalks are typically too narrow to enable this to occur without serious conflicts between users.

It is especially inappropriate to sign a sidewalk as a shared-use path or designated bike route if to do so would prohibit bicyclists from using an alternate facility that might better serve their needs. It is important to recognize that the development of extremely wide sidewalks does not necessarily add to the safety of sidewalk bicycle travel. Wide sidewalks might encourage higher speed bicycle use and can increase potential for conflicts with motor vehicles at intersections, as well as with pedestrians and fixed objects.

*Source 1999: AASHTO Guide for the Development of Bicycle Facilities*

### **Drainage Grates**

ADOT and other agencies should require that all newly constructed drainage grates on roadways open to bicyclists have a maximum gap of four inches in the direction of bicycle travel. Where driveways or curb cuts are present, drainage grates should be avoided. If grates must be placed in these locations, they need to have a maximum gap of four inches in any direction. See **Section 10** for retrofit considerations on existing drainage grates.

### **Signing**

All bikeway signing for State Highways in Arizona shall conform to signing standards identified in the MUTCD (Millennium Edition Revision 1 with an Arizona Supplement) when adopted by ADOT including addenda. This document provides specific information on the type and location of signing for bikeway systems. Stencils and pavement markings as indicated in the MUTCD also can be included on bicycle facilities to help bicyclists and motorists more easily identify travel lanes and bike facilities and routes.

### **Access Management**

The Transportation Research Board's Access Management Committee defines access management as follows:

- Access management is the process that provides access to land development while simultaneously preserving the flow of traffic on the surrounding road system in terms of safety, capacity, and speed.

The spacing and frequency of driveways and the provisions for access between adjacent parcels has a significant impact on bicyclists and pedestrians. Implementing agencies should consider having an



Access Management Plan that regulates the spacing of driveways and requires new developments to include direct access for pedestrians and bicyclists from the adjacent roadway and to adjacent parcels.

## 8.2. *Pedestrian Guidelines*

Pedestrian travel can be encouraged or discouraged through basic design features. While most pedestrian activity is concentrated in urbanized areas, both urban and rural, State Highways in Arizona should consider the unique circumstances and needs of pedestrians. The fundamental ethic should be that the pedestrian is considered an important form of mobility and that accessibility for all persons is an important consideration (i.e., facilities must conform to the ADA of 1990). State Highway routes through every community in Arizona should be designed with consideration of the safety and convenience of pedestrians. In larger metropolitan areas and smaller jurisdictions as well, safe and accessible pedestrian movement is critical to establishing livable communities. When more people choose to walk in our communities, people reap the benefits in several ways:

- Reduced traffic congestion;
- Reduced air pollution, global warming gases, and energy consumption;
- Quieter, more convivial streets;
- Safer environment;
- Increased use of public transit; and
- Healthier economic conditions for local merchants.

In addition, with improved access and mobility, pedestrians benefit on a personal level from walking with increased exercise and by enjoying the ambiance of pedestrian-friendly streets. When people choose to walk, they save money by not driving or parking, and surveys show that people like to live in communities and neighborhoods where they can walk. The design of roadways should consider pedestrian needs and identify areas to improve safety for pedestrians and persons with physical challenges.

These guidelines will assist ADOT to provide assistance to local jurisdictions and others on how they might incorporate pedestrian concepts into future planning efforts. These are not to be thought of as requirements. Rather, they are merely guidelines for the State to consider and apply where appropriate.

### **Pedestrian Facility Guidelines**

The following is a listing of pedestrian specific needs:

1. Sidewalks should be considered along State Highways where there are origins and destinations in close proximity. Within close proximity is defined as an origin and a destination within 1.5 miles walking distance from one another and the subject facility is between the original and destination. A transit stop is considered a destination. Sidewalks should be provided when the above requirement is met regardless of an agreement with another governmental agency to maintain the sidewalk. It is the responsibility of ADOT to ensure that an Intergovernmental Agreement is in place for a city or county to maintain the sidewalk, if available.



2. Sidewalks should almost always be placed on both sides of a highway. Exceptions could include commercial strips entirely on one side with absolutely no destinations on the other side (e.g. railroad tracks). In most instances, placing a sidewalk on only one side leads to pedestrians walking on the roadway without a sidewalk, or crossing the highway twice to access the sidewalks.
3. The minimum clear width for comfortable walking is five feet. This allows two pedestrians to walk side by side. Six feet is preferable, as this allows two pedestrians to pass another pedestrian. Eight feet is needed for two pedestrians to pass two other pedestrians. Clear width means no obstructions such as poles, signs, trees, and benches. Sidewalk dimensions are approximately equivalent when they are two feet wider when sidewalks are adjacent to the roadway. For example, a five-foot separated sidewalk is equivalent to a seven-foot curbside sidewalk.
4. Sidewalks may be separated from traffic by five feet or more. The offset serves three essential purposes:
  - Comfort;
  - The ability to keep sidewalks level (two percent ADA requirement) through driveways; and
  - This provides an area in which to place signs and hydrants, keeping the sidewalk clear of obstructions. Sidewalks should typically not be offset more than five feet at intersections, where pedestrians need to be seen by drivers.
5. The amount and placement of street furniture is very dependent on surroundings. The most common features are benches, water fountains, and trash receptacles. Street furniture provides some of the same comforts drivers enjoy in their cars, including seats, cup holders, and trash receptacles.
6. As stated in the FHWA November 2000 study, *Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations*, pedestrian needs in crossing streets should routinely be identified and appropriate solutions should be selected to improve pedestrian safety and access. This study researched and documented that on many roadways, improvements more substantial than simply striping a crosswalk are often needed for safe pedestrian crossings, such as adding traffic signals (with pedestrian signals) when warranted, providing raised medians, speed-reducing measures and others.
7. Shade is essential in a climate like Arizona's. It will take many years to see trees planted now to grow to maturity. Water restrictions may make this difficult. In central business districts, municipalities should consider adopting ordinances requiring awnings that provide shade over the walking area.
8. Lighting is critical for pedestrian safety at intersections, midblock crossing points, and also along sidewalks. Lighting enables pedestrians to take walking trips at all hours. Pedestrian-scale lighting illuminates the entire walking area, without too much glare. Lighting is often too bright, creating a prison yard feel. It should be bright enough so drivers on the road sense the sidewalk area is different from the roadway. At intersections and midblock street crossings, overhead illumination should be considered so pedestrians in crosswalks are visible. Overhead illumination along suburban arterials often illuminates sidewalks adequately, unless there are trees casting shadows. Pedestrians-scale lighting is preferred though.
9. Pedestrian oriented signs have not been used much in the U.S., but they help provide useful information to tourists, newcomers, or even residents who had not previously considered walking to their destination. Signs should be to a pedestrian-scale, offer information useful to pedestrians (e.g., distance in blocks or minutes rather than miles), and indicate a route that is not obvious if one drives





(e.g., pedestrians can walk “against traffic” on one-way streets). The design of one-way streets should consider having small-scale street signs mounted at pedestrian level, so those walking against traffic can see the names of cross streets.

10. Bus ridership and use of other modes of transit are 100 percent dependent on walking trips at both ends of every trip. All drivers become pedestrians the instant they step out of their cars. The preferred way to improve access to walking by drivers is with on-street parking. Then a sidewalk system needs to be in place so drivers can access several destinations on foot once they leave their parked car. Safe street crossings are essential for both transit patrons and drivers, as bus riders will need to cross the street at one leg of their journey, and drivers often park on one side to access a destination on the other side (or else they will make U-turns).
11. Pedestrian-activated signals are appropriate in suburban locations where pedestrians won’t be present at every cycle, and where the cycle time needs to be lengthened to accommodate adequate pedestrian clearance time. They are not appropriate in central business districts or downtown, where signal cycles are short and a high volume of pedestrians is expected.
12. Connectivity of facilities is paramount. Sidewalks are functional only when they connect – to destinations, to land uses, to other streets, and to transit. Pedestrians are at the greatest risk at intersections and when crossing the street. Most modern intersection designs do not consider pedestrian safety – multiple lanes, right- and left-turn lanes, long crosswalks, and large radii are the most detrimental to pedestrian safety.
13. Shared-use paths serve pedestrians well, if they are located where they serve destinations (as opposed to “paths in the middle of nowhere”). They are particularly helpful when provided in corridors not served by the street system (along canals and streams, abandoned railroad tracks etc.) From the pedestrian’s perspective, a bicyclist riding on a sidewalk is a negative, as cyclists riding at higher speeds can be threatening to pedestrians. It’s one of the main reasons bicyclists should be accommodated on the roadway.
14. A separated grade crossing over a roadway should be considered when the roadway separates a significant public destination from residential homes or commercial destinations and the alternate route for pedestrians or bicyclists is significantly longer than a separated grade crossing would provide.

### **Pedestrian-Friendly Design Features**

The following general design features will impact pedestrian mobility within the State Highway System. Not all of these features will be present in every location. Every situation requires a tailored approach that best suits the particular project or area.

Pedestrian-friendly design starts with several key attributes:

- Accessibility;
- Safety;
- Facilities;
- Connectivity;
- Continuity; and
- Aesthetics.



The design features that follow generally include:

- Compact, concentric development locates a greater number of destinations within walking distance compared to linear development.
- Mixed land use makes it possible to walk between land uses—from home to work, from home to the store, from work to restaurants, etc.
- Good transit access encourages a mode of travel that stimulates walking at either end of the trip.
- Compact parking structures spread walking destinations less than large surface parking lots.
- Lower parking codes make for smaller parking structures or lots and also spread walking destinations less than larger parking facilities. This can often function best with shared parking among land uses that have varying peak demand times.
- Sidewalks adjacent to business and storefronts make access more convenient than those with parking separating sidewalks from entrances. This is safer for pedestrians as well. Sidewalks next to businesses attract window shoppers and make for interesting and pleasant walking environments.
- Zero lot line zoning allows buildings to abut one another, keeping the distance between them convenient for walkers.
- Ground floor retail and other interesting uses on the ground floor of buildings also attract window shoppers and make for interesting and pleasant walking environments, as opposed to large windowless walls.
- Adequately wide sidewalks and street lighting comfortably accommodate pedestrians and increase safety, as well as the perception of safety.
- Lower speed limits in high pedestrian activity areas make for safer, quieter, more pleasant walking.
- Intersections designed for the blind and people in wheelchairs including wheelchair ramps, textured mats to alert the blind to intersections, and audio indications for the blind to cross make it safer for those with disabilities to travel along roadways.
- Textured or colored crosswalks may draw more attention to pedestrians and they also enhance the aesthetics of the walking area.
- Adequately wide crosswalks and adequate crossing times accommodate users well and give them time to cross. Crossing times should be set with consideration of the need to provide for slower walkers to cross safely.
- Scramble intersections in busy pedestrian areas allow pedestrians to cross diagonally and reduce the walking distance between stores, restaurants, and businesses.



- Narrowed streets in busy pedestrian areas provide for easy crossing, make walking more interesting, and bring land uses closer to pedestrians. They also slow motor vehicle traffic.
- Design standards for commercial signage enhance the aesthetics of public space.
- Pedestrian-activated flashing lights help pedestrians to cross with greater ease, convenience, and perception of safety.
- Lighted/reflective markings at crosswalks add visibility to nighttime walkers, thereby increasing safety.

### **Pedestrian Activity Center Streetscape Features**

Pedestrian-friendly activity areas have a number of features that add to convenience and aesthetics of being on the sidewalk. Some of these features also are common in auto-free areas.

- Bus shelters;
- Trees and landscaping;
- Benches and other street furniture;
- Textured or colored sidewalk paving;
- Attractive street lights;
- Attractive, standard trash and recycling receptacles;
- Attractive news racks;
- Matching street furniture;
- Clocks;
- Public art;
- Banners and flags;
- Regulated food vendors;
- Information kiosks;
- Fountains;
- Area wide logo/signage programs;
- Street performers; and
- Bicycle parking.

### **Guidelines for Pedestrian-Friendly New Development**

Arizona's cities and counties are responsible for development requirements and they can encourage the design of future neighborhoods with pedestrians in mind. The communities have many tools at their disposal, including development standards and guidelines, zoning, community plans, density bonuses, transfer of development rights, and review boards. Key guidelines are listed below.

- Zoning for compact, mixed land use. Denser commercial and retail planned around intersecting transit lines. Multi-family housing planned near, or within downtown areas. Short, as opposed to long, blocks. Parking constructed in compact structures.
- Developers can be given density bonuses for putting housing in commercial areas.

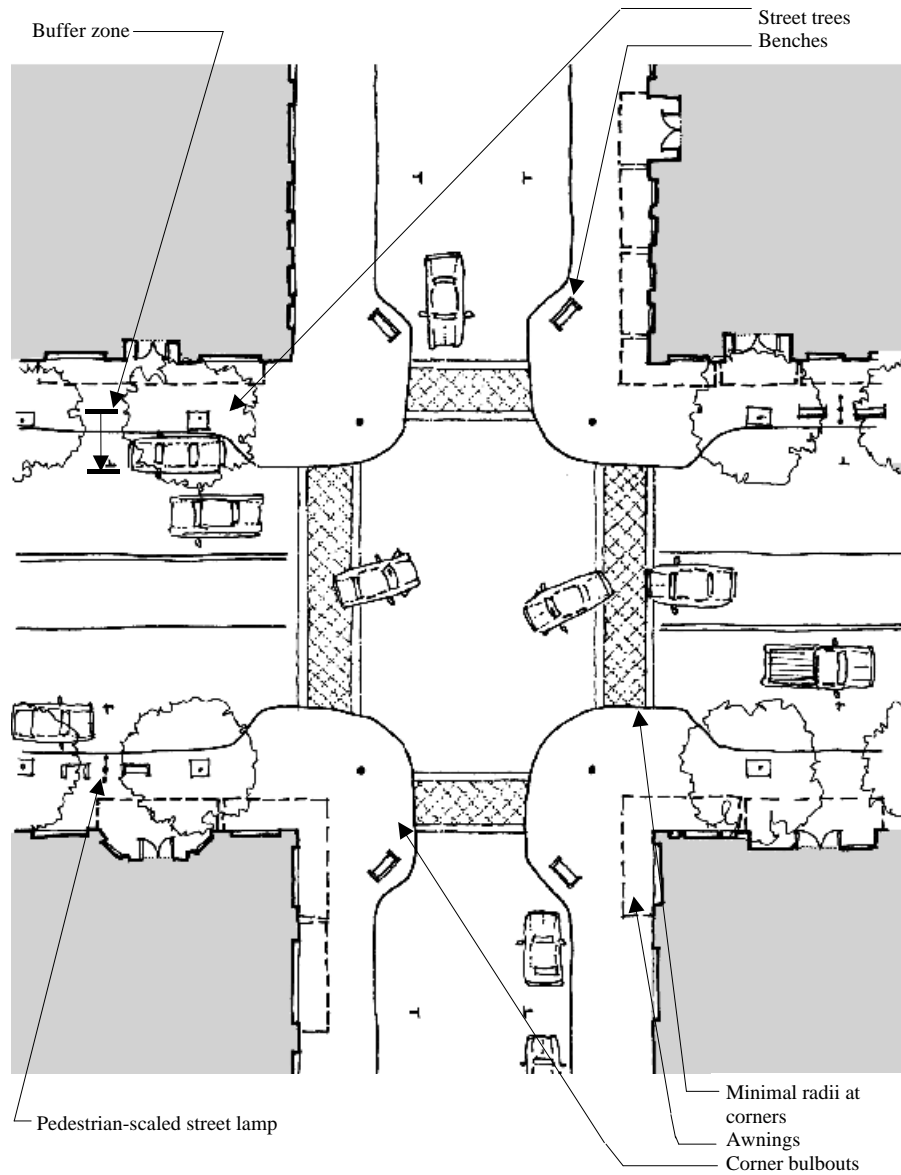




- Pedestrian activity centers planned and accommodated in denser commercial and retail areas.
- Shared parking in downtown areas, as opposed to building parking at each new building. The number of driveways minimized.
- Developers can be given incentives to build compactly with lower parking requirements.
- In commercial and retail activity centers sidewalks at least ten feet wide, and wide enough to accommodate the anticipated foot traffic.
- Multi-story commercial office buildings provide ground floor retail. No blank walls in commercial and retail activity centers. Development not entirely internally focused. Building entrances facing sidewalks.
- Locate sidewalks adjacent to store and business door fronts. Locate parking so that it doesn't separate pedestrians from door fronts.
- Sidewalks at least eight feet wide in multi-family residential areas. Landscaped parkways can be used to buffer sidewalks from the street.
- Sidewalks at least five feet wide in single-family residential areas. Landscaped parkways can be used to buffer sidewalks from the street.
- Street lighting on new non-rural streets.
- Architectural design standards for all commercial, retail, and multi-family residential developments, as well as for commercial signage. Design review boards also can be established to guide the quality of new architecture.
- Design standards for attractive landscaping and streetscape attributes. Street lighting, street furniture, bus shelters, trash/recycling receptacles, and other street level features within an area or community that follow a set standard to be aesthetically pleasing, consistent, and compatible with the surroundings.
- City streets generally planned for motor vehicles to move at pedestrian-compatible speeds. Intersection design in circulation plans that include crosswalks, signals where warranted, and other features that make the crossing safe and convenient.

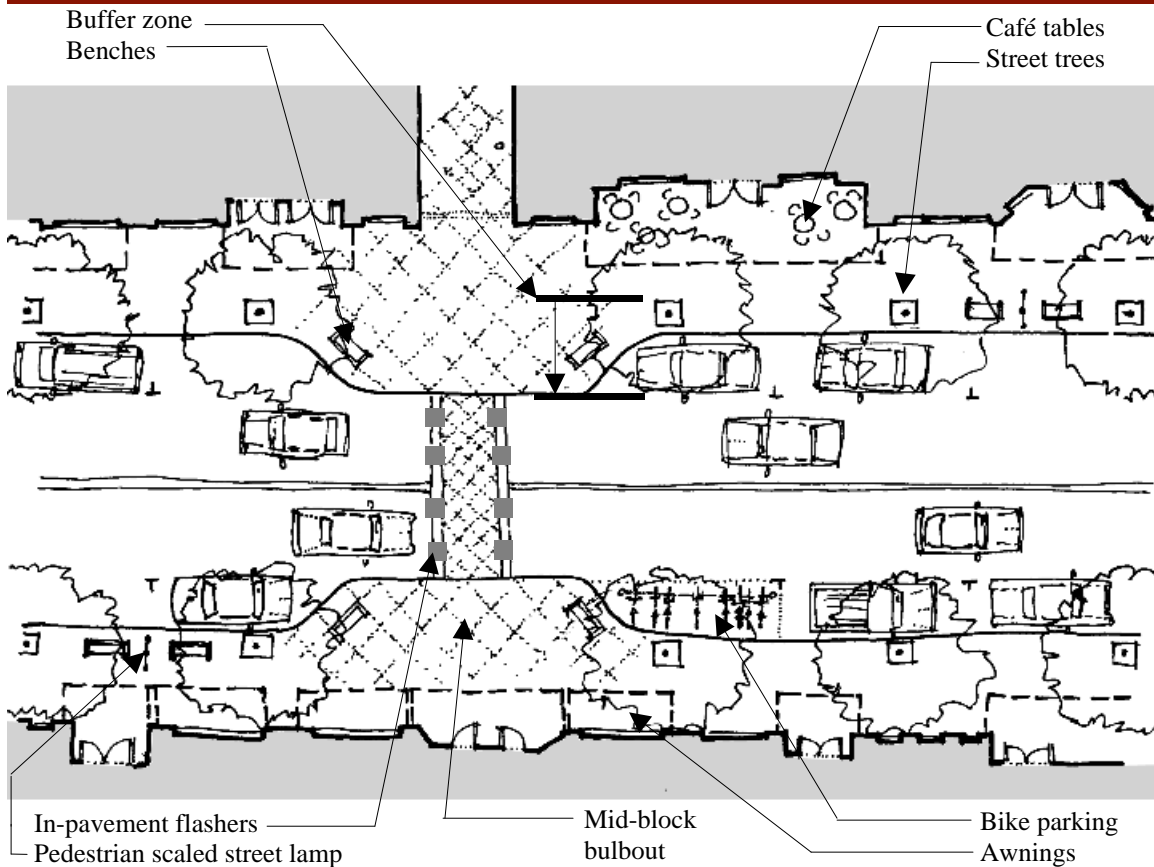
### **Design Diagrams**

**Figures 4 and 5** illustrate samples of pedestrian-friendly designs for intersection and mid-block treatments in urban (commercial or retail) areas. The primary corridor illustrated could be an urban arterial that is part of the State Highway System in any jurisdiction or city in Arizona. The design concept suggests enhancements to the pedestrian curb area by including 'bulb-outs' at intersections or roadway 'neck-downs' to reduce the crossing distance for pedestrians at intersections.



**Figure 4 – Intersection Treatment in Retail Areas**

**Source: Marin County Bicycle and Pedestrian Plan – Design Community and Environment**



**Figure 5 – Mid-Block Treatment in Retail Areas**

**Source: Marin County Bicycle and Pedestrian Plan – Design Community and Environment**

Additional methods to alert motorists to the presence of pedestrians in the crosswalk, such as in-pavement warning lights or flashing beacons, are being investigated. Although included in this picture, in-pavement warning lights at two-lane, low speed crosswalks such as shown is minimal due to the fact that such crosswalks eliminate many other hazards. New designs should review current standards and recent research to determine the appropriate design and if an experimental treatment is appropriate. The following section discusses some issues with experimental treatments and the appropriate procedures to follow.



## **Experimentation**

Section 1A.10 Interpretation, Experimentation, and Changes of the 2000 MUTCD includes the following:

The Manual on Uniform Traffic Control Devices recognizes that continuing advances in technology will produce changes in the highway, vehicle and road user proficiency; therefore, portions of the system of traffic control device in this Manual will require updating. In addition, unique situations often arise for device applications that might require interpretation or clarification of this Manual. It is important to have a procedure for recognizing these developments and for introducing new ideas and modifications.

The reason for the need to follow the MUTCD experimentation procedure is that many innovative treatments have the real potential for serious unintended consequences and there is a need for before and after studies to document the actual impacts of the experimental traffic control device. Furthermore, Arizona Revised Statute 28-641 requires the MUTCD to be followed. It is recommended that before and after studies specified in the MUTCD for traffic control experimentation be followed for roadway design changes as well.

It is important to recognize the importance of improving upon existing established design guidelines and standards. As such, a higher level of discussion and awareness of current ongoing practices in use in other areas of the United States is a valuable tool for ADOT and other Arizona jurisdictions.

The 2002 Institute of Transportation Engineers (ITE) publication, *Innovative Bicycle Treatments* identifies and shares information on approximately 50 bicycle treatments. The treatments include on-street innovations such as contra-flow bike lanes, shared bike/bus lanes, bicycle boulevards, raised bike lanes, and colored bike lanes. There is information on trail facilities including one-way trails and median trails. This technical report, divided into eight sections, also summarizes treatments for bicycles at intersections, bicycle detection, unique bicycle signs, traffic calming accommodations, and bicycle parking. The intent of the ITE report is to identify and share information on the application, advantages and disadvantages of each innovation, but does not include a complete evaluation of each treatment and does not necessarily encourage or discourage their use.

AASHTO is sponsoring a pedestrian guideline document that is currently in draft form. Once finalized, this document will provide valuable information on alternative treatments to address numerous pedestrian facility design issues.