



BICYCLE FACILITIES AT INTERSECTIONS

The majority of motor vehicle crashes involving bicycles in urban areas occur at intersections. Bicycles are not considered vehicles in State of Michigan Vehicle Code, but they are required to follow the same rules of the road as motorists. Good intersection design makes bicycling more comfortable and attractive, reduces conflicts with motor vehicles and pedestrians, and contributes to reduced crashes and injuries. Bicycles have different operating characteristics than motor vehicles, so special considerations are necessary in designing traffic signals that accommodate both motorists and bicyclists.

USE

- When designing intersections for bicyclists, approaches should be evaluated and designs should maintain continuity of bicycle facilities to the maximum extent feasible.
- Streets with dedicated bicycle lanes should consider striping through more complex signalized and complicated intersections to provide additional guidance and safety measures for bicyclists. This design principle is especially important at intersections where there are conflicting vehicular movements, unsignalized crossings, and/or crossings of more than four travel lanes.
- Bicyclists generally may have slower acceleration rates than motorists, and traffic signal phasing design considerations should include adjustment of minimum green intervals, clearance time, and extension time where appropriate.

- Special bicycle signals should be considered for bicycle tracks, two-way bicycle tracks, and contraflow bicycle facilities.
- Signal progression should be designed so that the needs of all users are considered, with appropriate design speeds and traffic signal coordination settings.

DESIGN

- Standard details for bicycle lane markings at intersections are provided in the MUTCD, the AASHTO Bike Guide, and the NACTO Urban Bikeway Design Guide.
- Dedicated bicycle lanes should be provided on intersection approaches and either carry through the intersection or be picked up on the other side.
- At intersections with a dedicated right turn lane, bicycle lanes should be provided to the left of the right turn only lane unless bicycle signals and dedicated phasing is provided.
- In order for bicyclists to prompt the green phase at signalized intersections, bicycle detection devices should be installed.
- Traffic signal detection devices should be located within bicycle lanes, bicycle boxes or where appropriate. They should be marked with a bicycle detector pavement marking symbol and supplemental signage as needed.
- When it is not feasible for the detection device to be located within the bicycle lane or bicycle box, detection devices should be located prior to the stop bar and span an appropriate distance to provide for left, through, and right turning bicyclists.

SPECIAL CONSIDERATIONS

- The AASHTO Guide for the Development of Bicycle Facilities provides a specific formula to estimate minimum green time in traffic signal phasing for bicycles from a standing position. It is based on average adult bicyclists who can typically operate at 10 mph. A slower speed or extended time may be appropriate at locations utilized by young children, such as near schools or where trails intersect streets
- Bicycle lane markings, including green-colored pavement, shared lane markings, dashed bicycle lane lines, and signage should be provided through intersections per engineering judgment.
- Selective removal of parking spaces may be needed to provide adequate visibility and to establish sufficient bicycle lane width at approaches to intersections.
- Shared lane markings may be used where space is not available for bicycle lanes at intersections; however, this should only be done if no other design is possible.
- Opportunities to remove existing vehicular right-hand turn-lanes to create space for on-street bicycle facilities should be evaluated.
- Bicycle lanes at the entrance and exit of a roundabout should allow direct access to a shared use bicycle/pedestrian path around the perimeter of the intersection via bicycle-specific sidewalk ramps; ramps should be provided for bicyclists to mount the sidewalk prior to the intersection and re-enter the roadway after traveling around the intersection. Circular intersection designs should also enable bicyclists to mix with traffic and proceed through the intersection.
- Typical detection of bicycles at signalized intersections is performed by loop detectors at actuated or semi-actuated intersections. Detection devices can also include:
 - Video detection,
 - Infra-red detection,
 - Microwave detection, or
 - Magnetometers.
- Bicycle signal heads provide dedicated signal indications to bicyclists and should be positioned for maximum visibility to bicycle traffic. They should be coordinated with pedestrian and non-conflicting vehicular movements to increase safety and minimize overall intersection delay.
- A combined bicycle lane/turn lane places a suggested bicycle lane within the inside portion of a dedicated motor vehicle turn lane. Shared lane markings or conventional bicycle stencils with a dashed line can delineate the space for bicyclists and motorists within the shared lane or indicate the intended path for through bicyclists.
- Green pavement or pavement markings may be used at high conflict points such as heavy merge areas with right turn lanes, slip lanes, and at interchanges. -

REFERENCES

- NACTO: Urban Bikeway Design Guide, Second Edition, 2014; Intersection Treatments <http://nacto.org/publication/urban-bikeway-design-guide/intersection-treatments/>
- AASHTO: Guide for the Development of Bicycle Facilities, 2012
 - Section 4.8: Bicycle Lanes at Intersections
 - Section 4.12.10: Bicycle Travel Through Interchange Areas
 - Section 4.12.11: Bicycle Travel at Roundabouts

