MnDOT Bicycle Facility Design Manual

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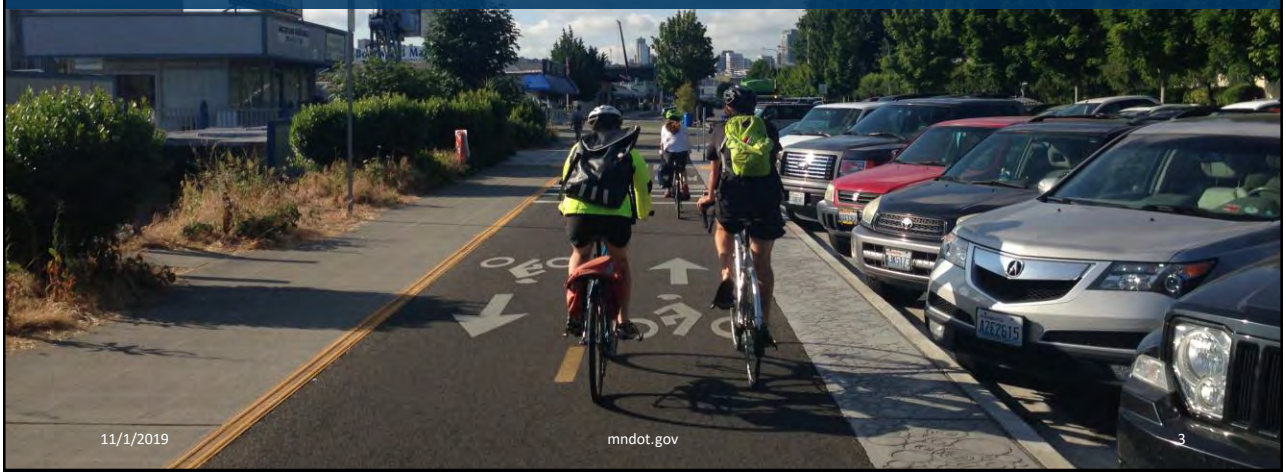
Bicycle Facility Design Manual

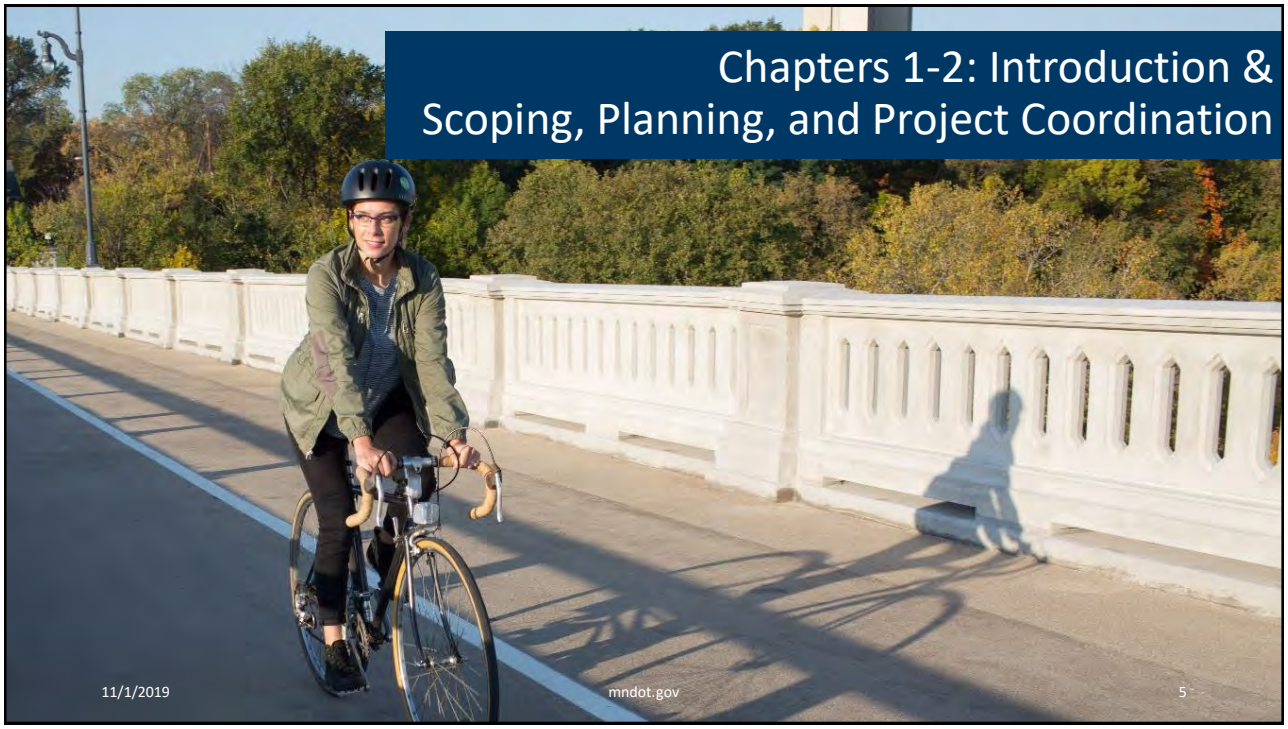
- Resource for MnDOT planners and designers to plan for and implement context-appropriate bicycle facilities on MnDOT right-of-way.
- Other agencies and advocates for bicycling may find the manual a useful reference.
- Expected release date: December 2019

MnDOT's vision for bicycle transportation: "bicycling is safe, comfortable and convenient for all people."



Bicycle Facility Design Manual Chapters

1. Introduction
2. Scoping, Planning, and Project Coordination
3. Facility Selection
4. Operational Characteristics & Elements of Design
5. Bicycle Facilities
6. Maintenance
7. Special Design Elements



State Statutes

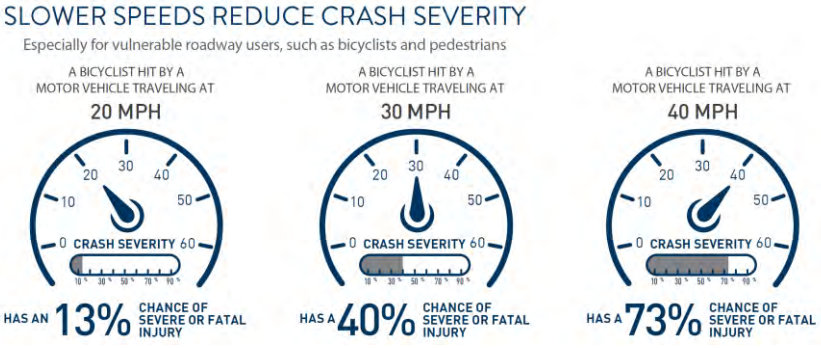
- In addition to federal laws and policies, state laws encourage MnDOT to support bicycling as part of Minnesota's complete and multimodal transportation system.
- By state law, MnDOT has substantial authority and responsibility to provide for and encourage safe bicycling.
- One stop shop for bicycle related statutes 160, 169, and 174

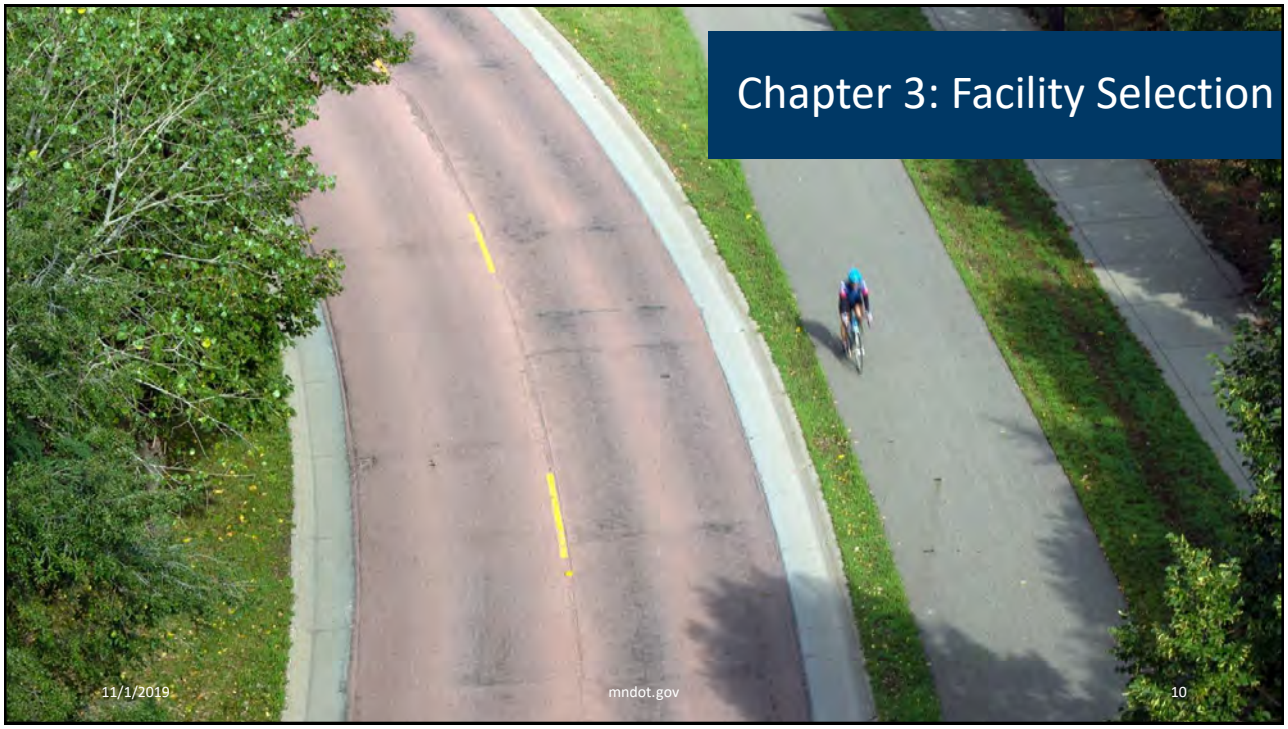
Policy, Planning, and Project Development

- Minnesota GO
- Statewide Multimodal Transportation Plan (SMTP)
- Statewide Bicycle System Plan
- District Bicycle Plans
- Complete Streets Policy
- Performance Based Practical Design
- Project Development and Scoping
- Public and Stakeholder Engagement

Transportation Equity and Planning for Vulnerable Users

- Transportation contributes to many broad societal outcomes, such as employment, wealth and health.
- Bicycle facilities may address transportation equity challenges in Minnesota communities.





Types of Bicyclists

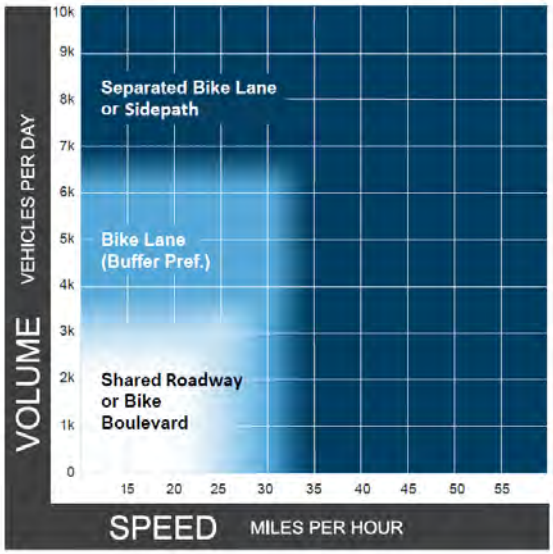
Interested but Concerned

Somewhat Confident

Highly Confident

Selecting a Bicycle Facility - Urban

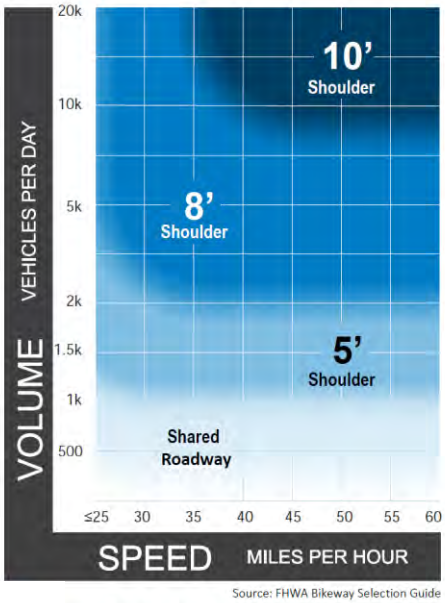
- Bicycle facility selection is a context-sensitive decision
- The type of bicycle facility selected will impact the level of comfort and, by extension, the amount of people in the community who will use it and benefit from it.



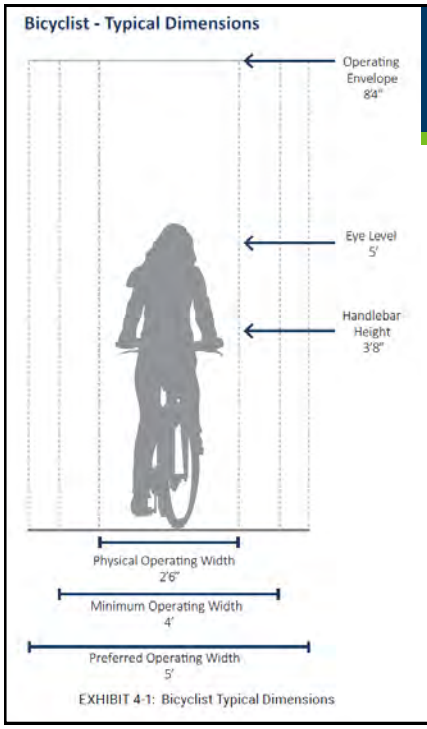
Source: FHWA Bikeway Selection Guide

Selecting a Bicycle Facility - Rural

- In natural and rural contexts, designing for Interested but concerned users may not be feasible.
- Due to long distances between land uses bicycle commuting or utilitarian trips are also less likely.
- Shoulder width is an important factor that affects bicyclists' comfort.



Source: FHWA Bikeway Selection Guide



Common Design Elements

- Bicyclist Characteristics
- Facility Transitions
- Pavement Markings
- Signs & Signals
- Drainage
- Lighting
- General Intersection Design Principles

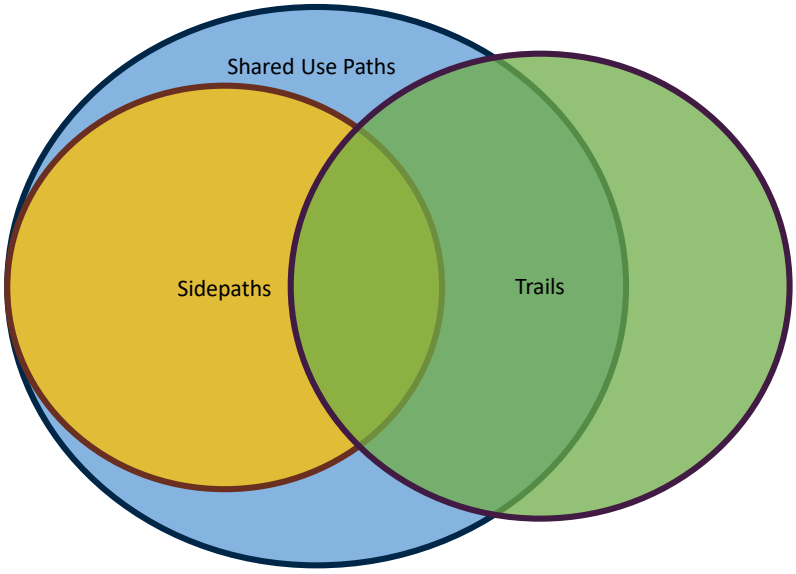
Markings and Intersections

Chapter 5: Bicycle Facilities

Guidance on Six Types of Bicycle Facilities

From Most Separated to Least Separated:

- Shared Use Path
- Sidepath
- Separated Bike Lane
- Bike Lane
- Paved Shoulder
- Shared Roadway



Shared Use Path

DESIGN OVERVIEW

Shared use paths are bicycle facilities physically separated from motor vehicle traffic by an open space or barrier. Most shared use paths are designed for two-way travel and can serve a variety of nonmotorized users. They may be located within roadway right-of-way or an independent right-of-way. Shared use paths are sometimes referred to as trails and greenways. In Minnesota, trails are facilities that may adhere to a variety of surface materials, widths and other standards. So, while a shared use path might be called a trail, not all trails are shared use paths.

The DNR is the state agency responsible for trails. In this document, the term trail is not interchangeable with shared use paths and follows different design guidelines. Sidepath is another common term used nationwide. Sidepaths are shared use paths located immediately adjacent and parallel to a roadway, and are covered in the following section.

PATH WIDTH

Choosing an appropriate shared use path width is needs-based and dependent on demand and land use context (See Chapter 3). Consider the following when determining a shared use path width:

- User type
- User volume
- Nearby land use context
- Scenery
- Distractions
- Obstructions
- Right-of-way availability
- Maintenance vehicle access

Typical shared use path widths range from 10 to 15 feet. The minimum paved, operational width for a two-way shared use path is 10 feet. A 10-foot wide shared use path does not include clearance distances, which may or may not be paved. This allows for a bicyclist traveling single file to pass someone coming from the opposite direction without a conflict, effectively a "two-lane" path. A 12-foot shared use path allows one single file bicyclist to pass two bicyclists riding side-by-side in the opposite direction without conflict, effectively a "three-lane" path. In areas with very high use and a wide variety of users, a path width of up to 20 feet may be warranted (EXHIBIT 5-1: Two Way Shared Use Path Dimensions and EXHIBIT 5-2: Shared Use Path Widths).

For cases where use is (or is expected to be) high and a width of more than 10 feet may be needed, consider using the FHWA's Shared Use Path Level of Service Calculator to inform this decision.[4] Wider paths are warranted where there are either large numbers of bicyclists or large percentages

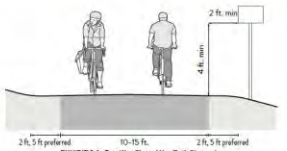


EXHIBIT 5-1: Two Way Shared Use Path Dimensions

EXHIBIT 5-2: Shared Use Path Widths

	TYPICAL TWO-WAY SHARED USE PATH	HIGH-VOLUME SHARED USE PATH**
Preferred width	10-12	12-15
Minimum	10	12
Constrained minimum*	8	11

*Constrained minimum should only be applied for short distances where physical constraints

**Either a high volume of bicycle traffic or a high percentage of pedestrian traffic

Shared Use Path

- Design Overview
  - Shared use paths are bicycle facilities physically separated from motor vehicle traffic by an open space or barrier.
  - Most shared use paths are designed for two-way travel and can serve a variety of nonmotorized users.
  - They may be located within roadway right-of-way or an independent right-of-way.

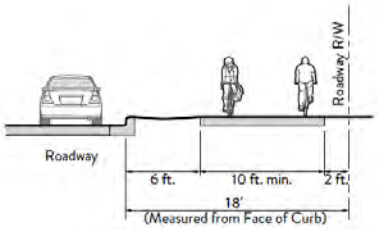


EXHIBIT 5-23: Sidepath Dimensions

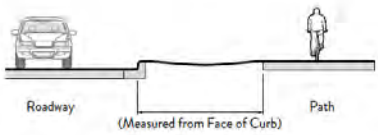


EXHIBIT 5-21: Sidepath Separation from Roadway, Urban Section

EXHIBIT 5-22: Sidepath Separation from Roadway, Rural Section

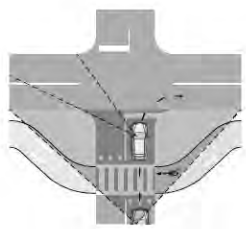
Sidepath

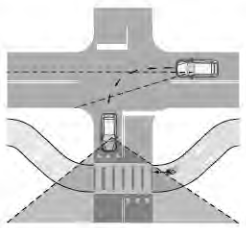
- Design Overview
  - A sidepath is a type of shared use path that is parallel to a roadway but is physically separated from vehicle traffic.
  - Most sidepaths are designed for two-way travel and can serve a variety of nonmotorized users.
  - Bicyclists may legally ride on a road even if a sidepath is present and may choose to do so for a variety of reasons.

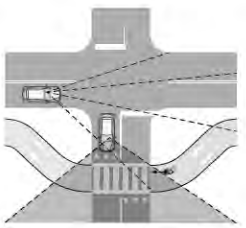
SP

Sidepath

- With offset geometry, also known as “bend out” design, a driver turning from the parallel roadway more directly faces a bicyclist in the crossing. This offset distance
  - improves bicyclist visibility
  - improves motorist reaction time
  - creates space for a right-turning driver to yield and wait for a through-moving bicyclist.







Separated Bike Lane

- Design Overview
  - Separated bike lanes are exclusive facilities for bicyclists that are located within or directly adjacent to a roadway.
  - Physically separated from motor vehicle traffic by a vertical element such as
    - flexible post delineators
    - raised medians
    - landscaping
  - MnDOT has adopted the FHWA's Separated Bike Lane Planning and Design Guide as its guidance for separated bike lane design.

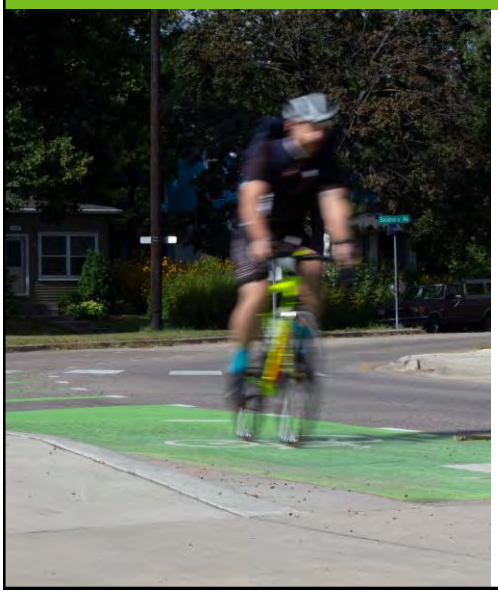
Separated Bike Lanes

Separated Bike Lanes

Separated Bike Lanes

Separated Bike Lane – Intersections

Bike Lane



- Design Overview
  - On-street bike lanes designate a preferential space for bicyclists through the use of pavement markings and signs.
  - Bike lanes are for one-way travel and are normally provided in both directions on two-way streets and/or on one side of a one-way street.

Bike Lane

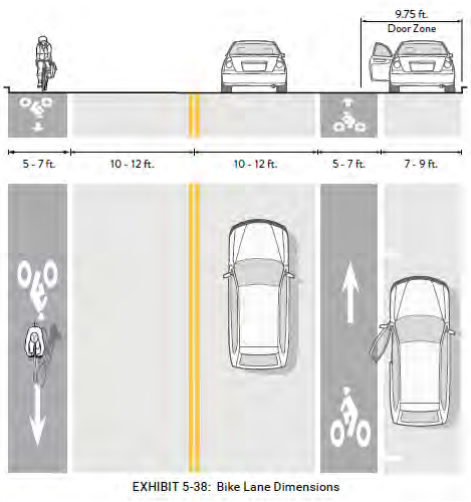


EXHIBIT 5-38: Bike Lane Dimensions

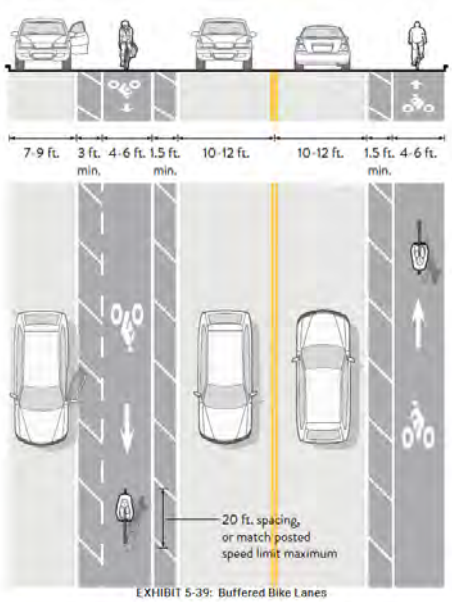
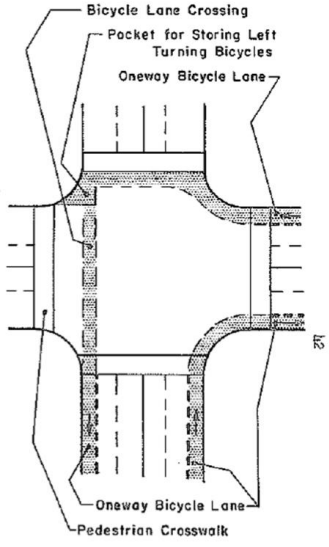


EXHIBIT 5-39: Buffered Bike Lanes

Bike Lane – Intersections



(c.) Bicycle Lanes continued on cross street

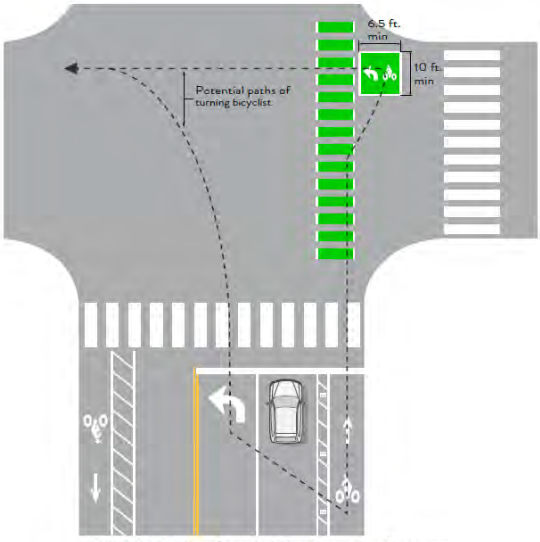
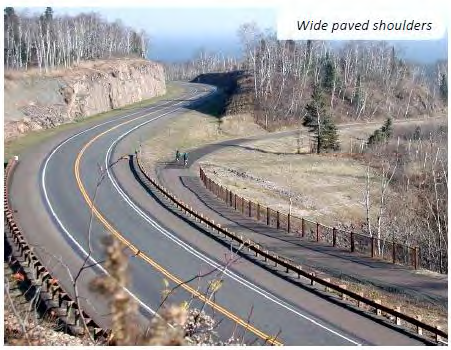


EXHIBIT 5-52: Two-Stage Left Turn Queue Box Placement

Paved Shoulder

- Design Overview
  - Paved shoulders serve as nonmotorized space where no other bicycle facilities are present, such as on rural roads.
  - They allow bicycles, a lower-speed vehicle, to separate from higher-speed vehicles in lieu of sharing the travel lane.


Paved sholder with rumble strips


Wide paved shoulders

Paved Shoulder

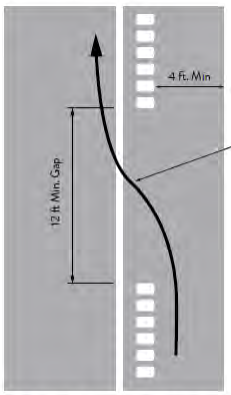


EXHIBIT 5-58: Rumble Strip Dimensions

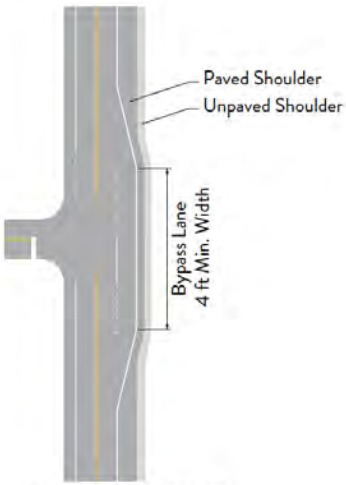


EXHIBIT 5-59: Shoulder Bypass Lane

Shared Roadway

- Design Overview
  - By MN Statute, bicycles are considered vehicles, and therefore may operate on all streets except where expressly prohibited (i.e., limited access roadways).
  - Two types of shared roadways
    - bicycle boulevards that have been designed specifically to favor bicycle travel
    - shared lanes on motor vehicle-oriented roadways.

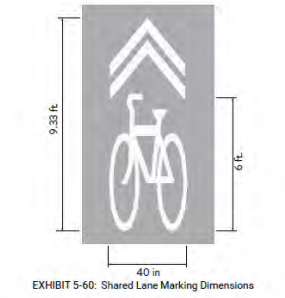
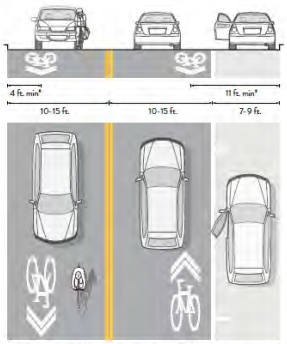


EXHIBIT 5-60: Shared Lane Marking Dimensions



*Center of lane placement may be optimal in lower speed and narrow lane urban contexts. Placement 12-13 feet from curb recommended if parking turnover is high.

EXHIBIT 5-61: Shared Lane Marking Placement

Shared Roadway


EXHIBIT 5-63: Traffic diverter


EXHIBIT 5-64: Traffic circle

Chapters 6 & 7: Maintenance and Special Design Elements

Chapter 7 Design Elements:

- Vehicle Bridges & Underpasses
- Ped/Bike Bridges & Underpasses
- Interchanges
- Roundabouts
- Alternative & Innovative Intersections
- Median Refuge Islands
- Continuous Raised Medians
- Channelized Right Turn Islands
- Curb Extensions
- Speed Tables, Raised Crossings and Raised Intersections
- Mountable Truck Aprons
- Rails & Railroad Grade Crossings
- Bike Parking

DEPARTMENT OF TRANSPORTATION

Thank you!

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