6. Design Standards

All bicycle and pedestrian facilities in the Village must meet State and federal design standards for such facilities. These standards help ensure that facilities are safe and meet guidance that has been vetted by professionals in the field. Additionally, meeting proper design standards may help lessen or remove the Village's liability should a crash or accident occur on one of the facilities.

The design standards presented on the following pages are intended as an informational guide and should not be used as engineering documents. All facilities should meet the standards presented in the federal and State guidance noted below, particularly the *Wisconsin Bicycle Facility Design Handbook* and the *Manual on Uniform Traffic Control Devices (MUTCD).*

6.1 Federal and State Design Guidance

The *Guide for the Development of Bicycle Facilities* by the American Association of State Highway and Transportation Officials (AASHTO) is commonly accepted as the "best practices" for building bicycle facilities.
http://www.sccrtc.org/bikes/AASHTO_1999_BikeBook.pdf

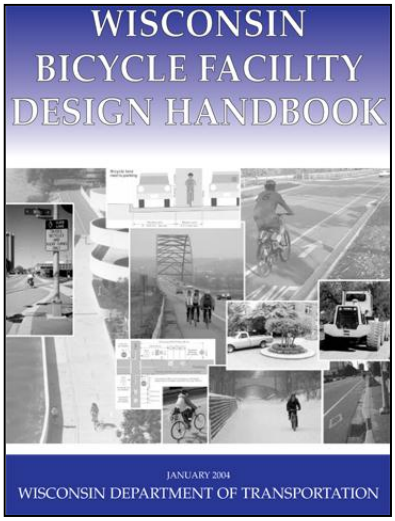
The *Manual on Uniform Traffic Control Devices (MUTCD)* by the United States Federal Highway Administration (FHWA) contains currently acceptable signage for use on bicycle facilities as well as experimental signs.
http://mutcd.fhwa.dot.gov/

The Wisconsin Department of Transportation *Facilities Development Manual (FDM)* details bicycle facility design (Chapter 11, Section 45, Subject 10). The manual provides definitive guidance from the State on all facility design standards.
http://roadwaystandards.dot.wi.gov/standards/fdm/index.htm

The *Wisconsin Bicycle Facility Design Handbook* expands on the *FDM* and meets or exceeds AASHTO guidelines. The *Handbook* uses information from the AASHTO *Guide for the Development of Bicycle Facilities* and is tailored to meet Wisconsin's needs and conditions.
http://www.dot.wisconsin.gov/projects/state/docs/bike-facility.pdf

Although intended for larger communities, the *Wisconsin Bicycle Planning Guidance: Guidelines for MPOs & Communities in Planning Bicycle Facilities* contains useful information about the importance of planning a complete bikeway network.
http://www.dot.state.wi.us/projects/bikes.htm

In addition to this guidance, all bicycle and pedestrian facilities shall meet the requirements of the Americans with Disabilities Act (ADA) Accessibility Guidelines.
http://www.access-board.gov/adaag/html/adaag.htm



The *Wisconsin Bicycle Facility Handbook* provides definitive guidance on bikeway design for all Wisconsin municipalities.

6.2 On-Street Facilities

Under Wisconsin law bicyclists are legal users of the roadway and are entitled to all of the rights and responsibilities of motor vehicles. All streets other than limited access highways are an important part of the bicycle transportation network regardless of if they are specifically designated for bicycle use. However, there are specific on-street facilities that can make streets safer, more comfortable and more convenient for bicycles to use. These facilities are detailed below.

Bike Lanes

A bicycle lane is a portion of the roadway designated for exclusive or preferential use by bicyclists. Bicycle lanes are always one-way facilities and are identified with pavement markings and signing. On two-way streets, a one-way bicycle lane should be provided on each side. Bicycle lanes are the preferred bicycle facility on higher volume urban and suburban roadways (i.e., collector and arterial streets) but are seldom justified on residential streets. Bike lanes provide a significant benefit to safe and efficient bicycle circulation by providing separate identifiable areas on the street for bikes and autos. Bicycle lanes can be used on streets with and without on-street parking. For more information and frequently asked questions regarding bike lanes, see the Pedestrian and Bicycle Information Center:
http://www.bicyclinginfo.org/engineering/facilities-bikelanes.cfm

Bike Routes

Signed bike routes are on-street routes intended to provide connectivity and continuity to the bikeway system. Bike routes are usually established along through routes not served by bike routes or as an alternative to bicycling on busy streets. Bike routes are designated by signs or permanent pavement markings and are shared by motorists. Bike routes should provide direct travel from one destination to another or connect discontinuous segments of shared use paths, bike lanes, or bike routes. Efforts should be made, if necessary, to adjust traffic control devices to give greater priority to bicyclists on the route as opposed to other parallel streets. For more information and frequently asked questions regarding bike routes, see the Pedestrian and Bicycle Information Center:
http://www.bicyclinginfo.org/engineering/facilities-roadways.cfm

Wide Shoulders

On rural highways smoothly paved shoulders can serve as a bicycle facility. Shoulders provide clearance between bicyclists and high-speed motor vehicle traffic and they reduce the “wind blast” effect of passing trucks. In addition to benefiting bicyclists, wide paved shoulders provide an area for vehicles to pull onto during emergencies and maintenance benefits due to elimination of rutting adjacent to the edge of travel lane, improved drainage, and lateral support for the roadway base. For more information and frequently asked questions regarding wide shoulders, see the Pedestrian and Bicycle Information Center:
http://www.bicyclinginfo.org/engineering/facilities-shoulders.cfm

Roundabouts

Although not specific bicycle facilities, roundabouts deserve a special mention due to their recent approval for construction on State Highway 165 in Pleasant Prairie and design issues that can be problematic for bicycles. In general, single-lane roundabouts are excellent facilities for bicycles due to the relatively low speed of traffic and the ability of bicyclists to "take the lane" as they proceed through the roundabout. Double-lane roundabouts much be approached with greater caution due to higher motor vehicle speeds and lane changing within the roundabout.

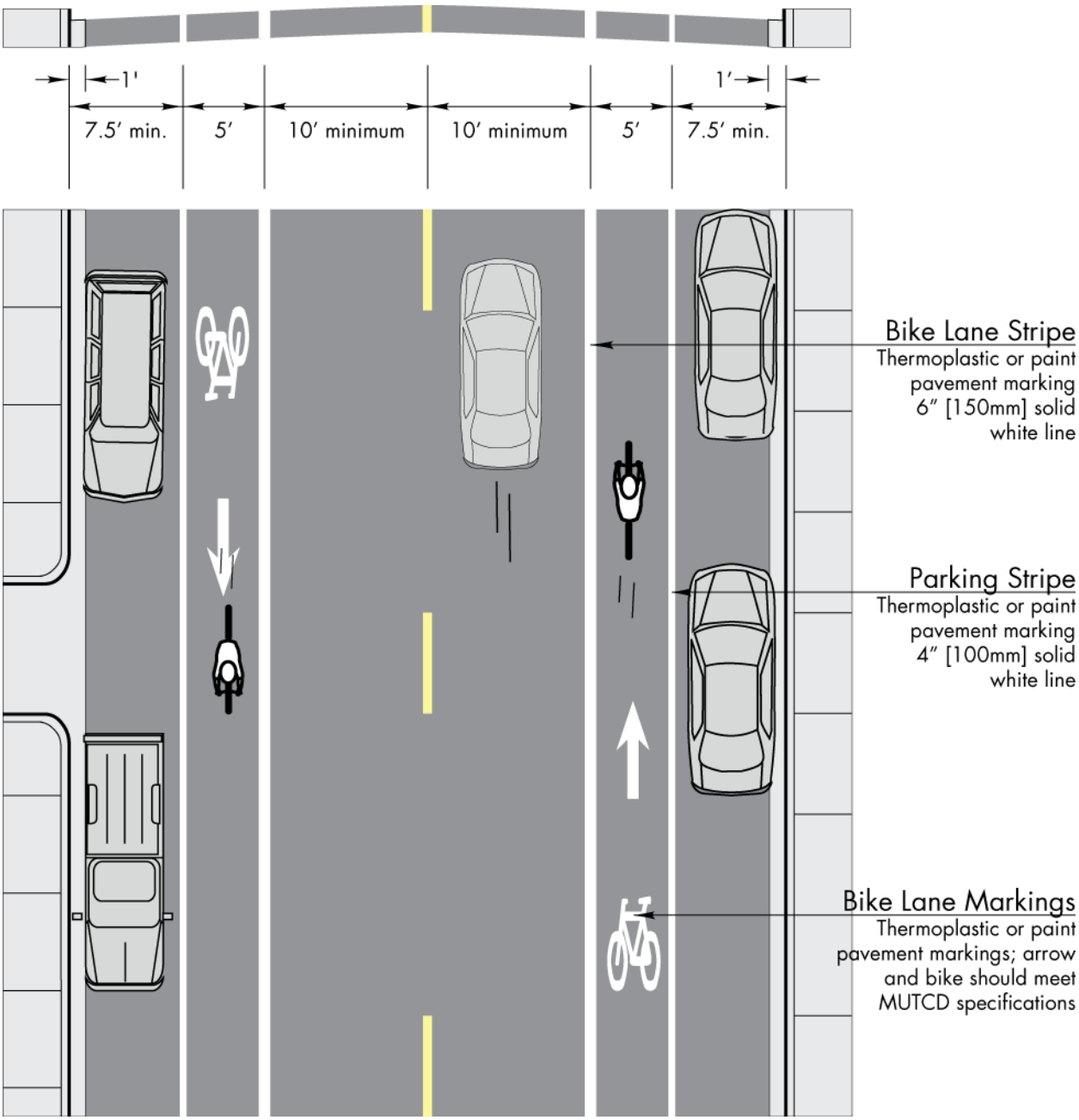
Bicycle lanes should end before the roundabout with signage indicating that bicycle traffic may use the full travel lane. Additionally, a shared-use path should be provided around the circumference of the roundabout with bicycle entrance and exit ramps from the street; this allows bicyclists who are not comfortable moving into the travel lane through the roundabout to use the path instead. Signage on the path should indicate that it is a one-way facility for bicycles and the path should provide adequate width for pedestrians and bicyclists. It should be noted that WisDOT will fund 100% of construction costs for roundabout shared-use paths on projects the State is responsible for as long as the local municipality assumes maintenance for the facility. For detailed information on design see the WisDOT Roundabout Guide, found in Chapters 11, Sections 25 and 26 of the Facilities Development Manual:
http://www.dot.state.wi.us/safety/motorist/roaddesign/roundabout-design.htm

General Urban Street Cross Section with Bike Lanes

This generalized cross section provides *minimum* dimensions for an urbanized street with bicycle lanes. It provides:

- One traffic lane in each direction
- One bicycle lane in each direction
- May include parking lanes on one or both sides of the street

Refer to the *Wisconsin Bicycle Facilities Design Handbook*, *Wisconsin Facilities Design Manual (FDM)* and *2009 Manual on Uniform Traffic Control Devices (MUTCD)* for full guidance and engineering specifications. Diagram is for informational purposes only and is not to scale.

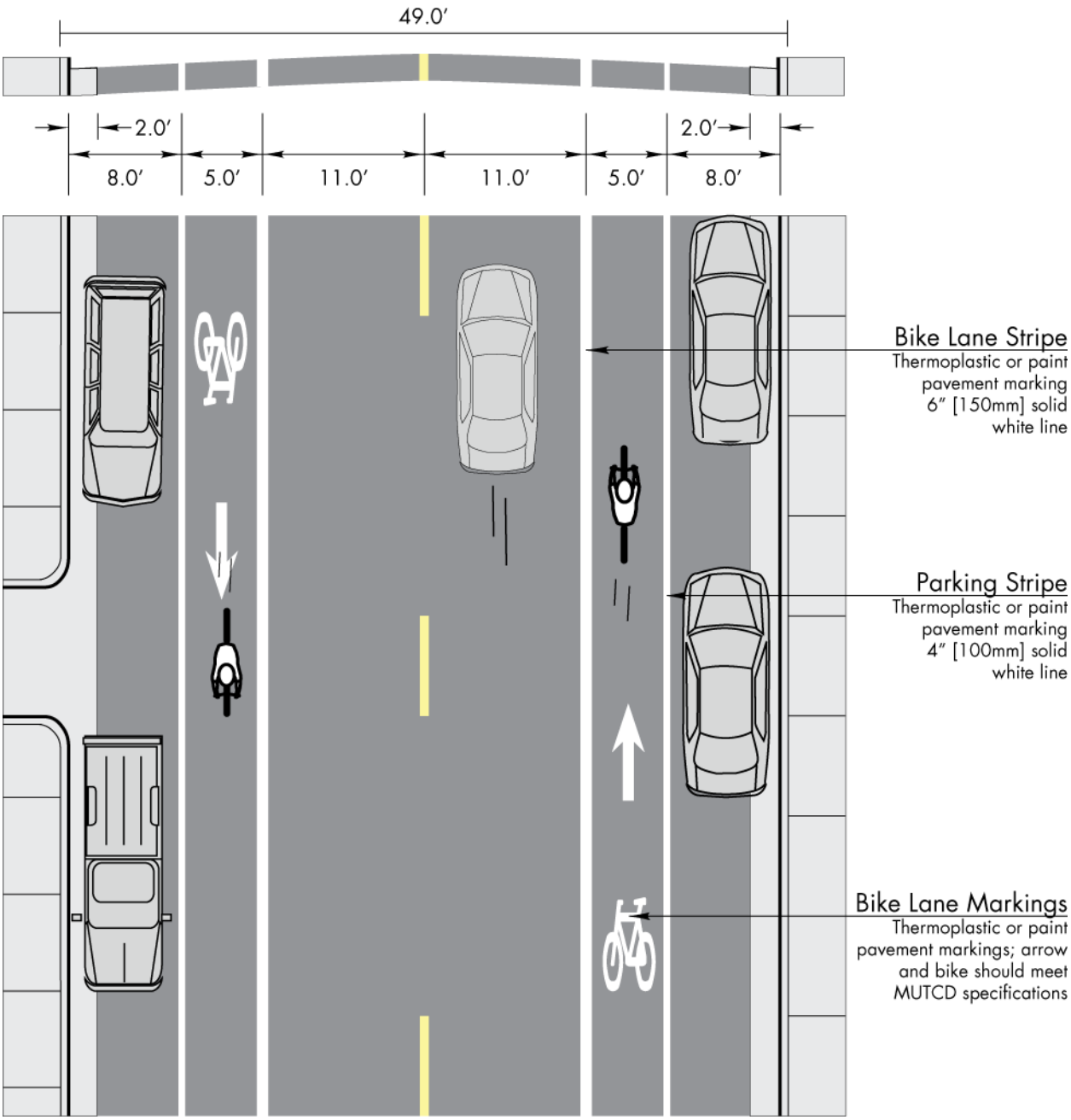


R-2 49’ Cross Section

This cross section provides dimensions for Pleasant Prairie’s R-2 Residential Collector. It provides:

- One traffic lane in each direction
- One bicycle lane in each direction
- Parking lanes on both sides of the street

Refer to the *Wisconsin Bicycle Facilities Design Handbook* and *Wisconsin FDM* for full guidance and engineering specifications. Diagram is for informational purposes only and is not to scale.

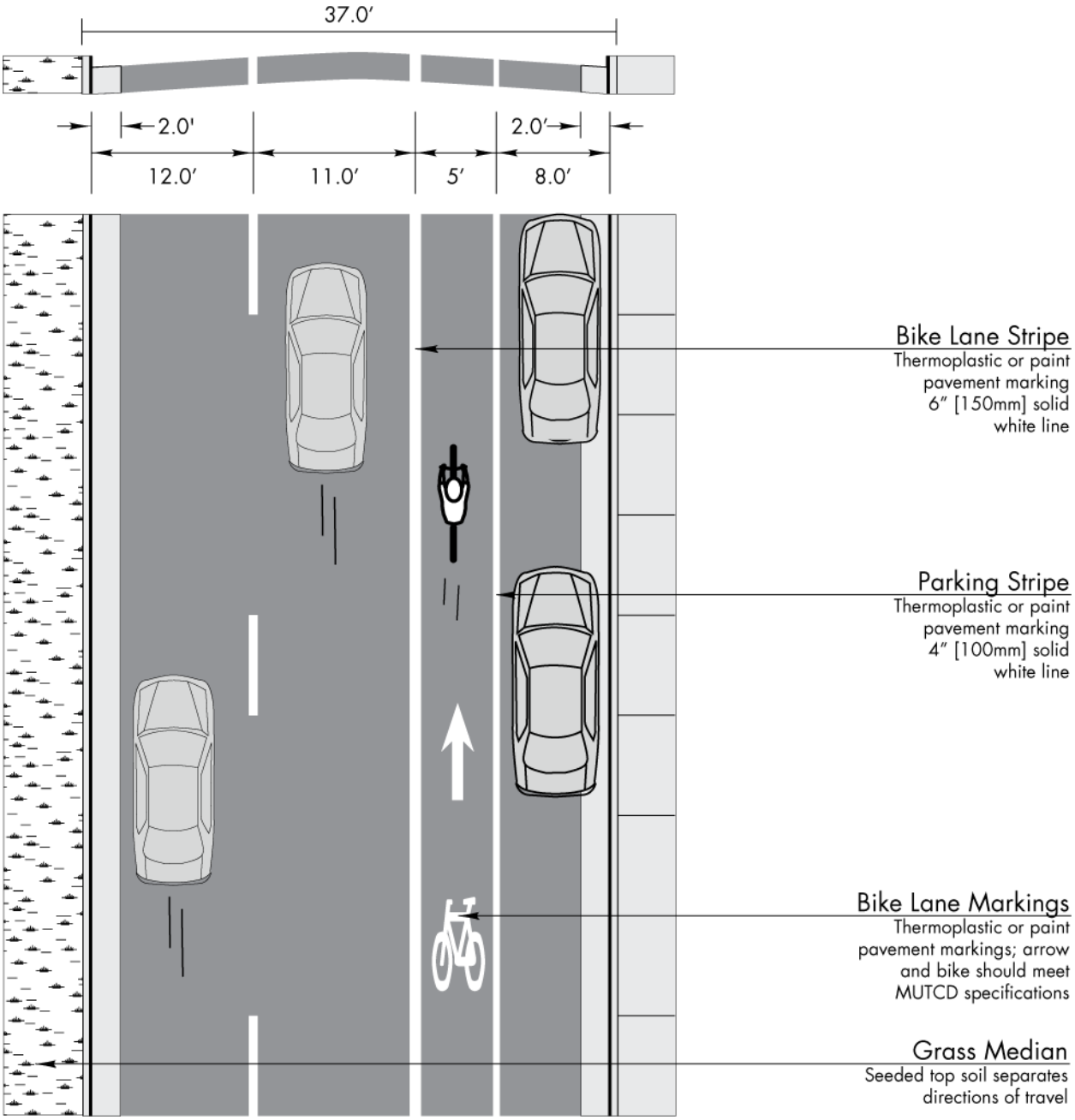


R-5 37’ Cross Section

This cross section provides dimensions for one side of Pleasant Prairie’s divided R-5 Arterial. It provides:

- Two traffic lanes in each direction (divided by a median)
- One bicycle lane/wide curb lane in each direction
- Parking lanes on both sides of the street (divided by a median)

Refer to the *Wisconsin Bicycle Facilities Design Handbook* and *Wisconsin FDM* for full guidance and engineering specifications. Diagram is for informational purposes only and is not to scale.

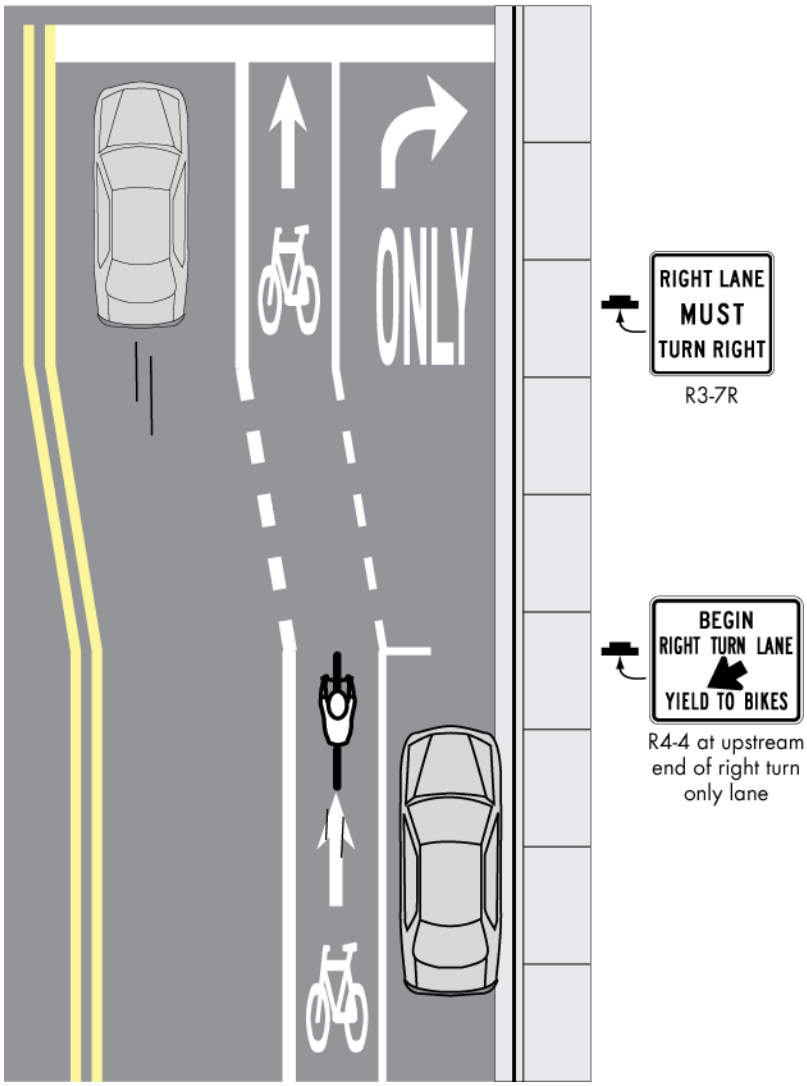


Generalized Intersection with Bike and Parking Lanes

This is a generalized intersection approach for an unban street with one travel lane, one bike lane and one parking lane. Specific Pleasant Prairie intersection engineering documents are provided on pages 34 through 37.

- The parking lane should drop in advance of the intersection
- The right turn only lane should be added in place of the parking lane
- The travel and bicycle lanes may need to shift away from the curb to provide adequate width for the turn lane
- The bicycle lane should be dashed across the area where cars merge into the turn lane
- Signage should indicate that cars merging to the turn lane must yield to bikes

Refer to the *Wisconsin Bicycle Facilities Design Handbook*, *Wisconsin Facilities Design Manual (FDM)* and *2009 Manual on Uniform Traffic Control Devices (MUTCD)* for full guidance and engineering specifications. Diagram is for informational purposes only and is not to scale.

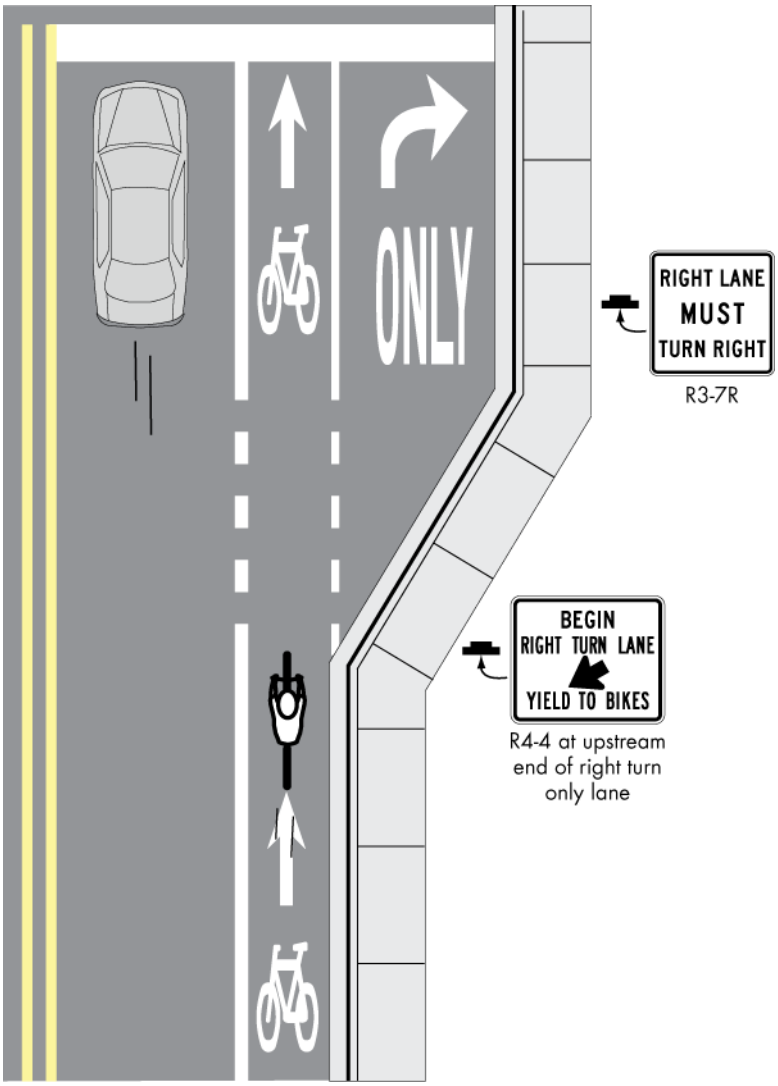


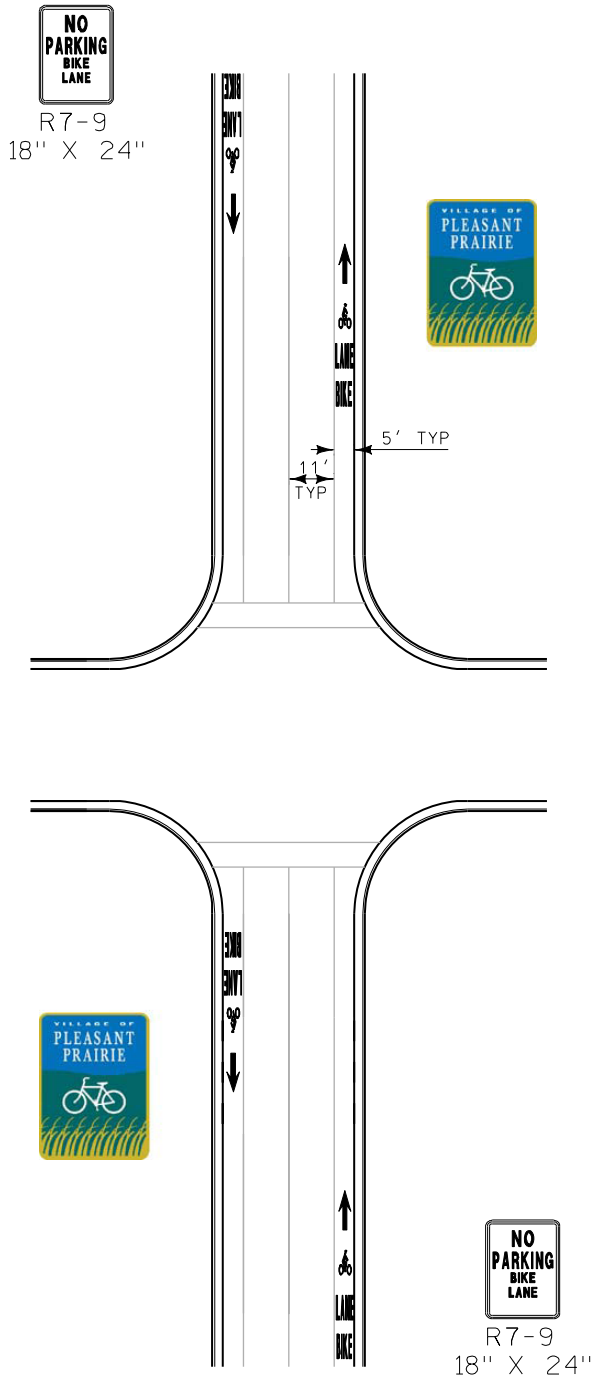
Generalized Intersection with Bike and Turn Lanes

This is a generalized intersection approach for an unban street with one travel lane, one bike lane and an added turn lane.

- The right turn only lane should be added to the right of the bike lane
- The bicycle lane should be dashed across the area where cars merge into the turn lane
- Signage should indicate that cars merging to the turn lane must yield to bikes

Refer to the *Wisconsin Bicycle Facilities Design Handbook*, *Wisconsin Facilities Design Manual (FDM)* and *2009 Manual on Uniform Traffic Control Devices (MUTCD)* for full guidance and engineering specifications. Diagram is for informational purposes only and is not to scale.





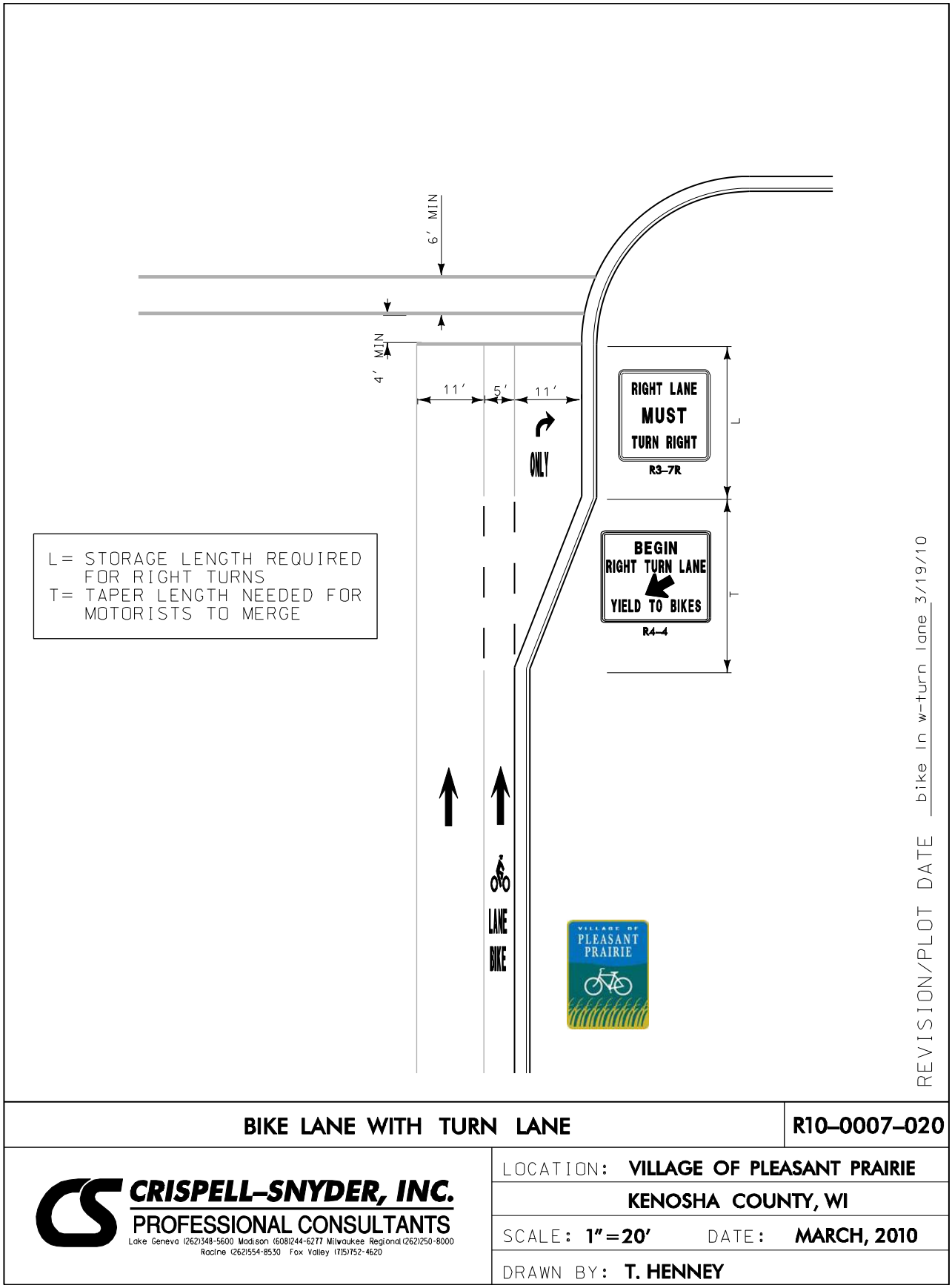
SIMPLE INTERSECTION WITH FEW RIGHT TURNS

REVISION/PLOT DATE bike In- no parking 3/19/10

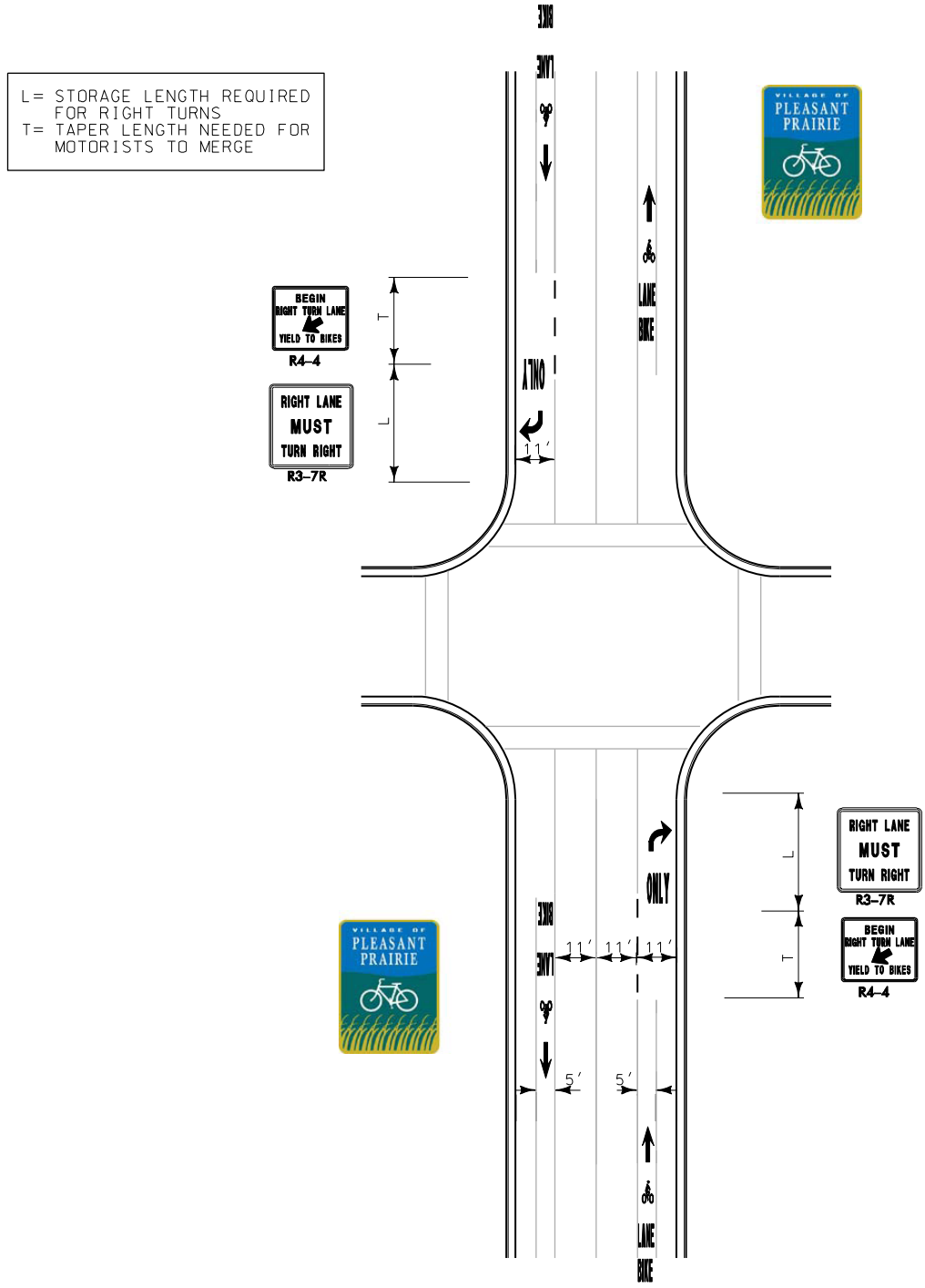
SOLID BIKE LANE STRIPE WITH NO PARKING	R10–0007–020

CRISPELL–SNYDER, INC.
PROFESSIONAL CONSULTANTS
Lake Geneva (262)348-5600 Madison (608)244-6277 Milwaukee Regional (262)250-8000
Racine (262)554-8530 Fox Valley (715)752-4620

LOCATION:	VILLAGE OF PLEASANT PRAIRIE
	KENOSHA COUNTY, WI
SCALE: 1"=40'	DATE: MARCH, 2010
DRAWN BY: T. HENNEY	



BIKE LANE WITH TURN LANE	R10–0007–020
CRISPELL–SNYDER, INC. PROFESSIONAL CONSULTANTS Lake Geneva (262)348-5600 Madison (608)244-6277 Milwaukee Regional (262)250-8000 Racine (262)554-8530 Fox Valley (715)752-4620	LOCATION: VILLAGE OF PLEASANT PRAIRIE KENOSHA COUNTY, WI
	SCALE: 1"=20' DATE: MARCH, 2010
	DRAWN BY: T. HENNEY

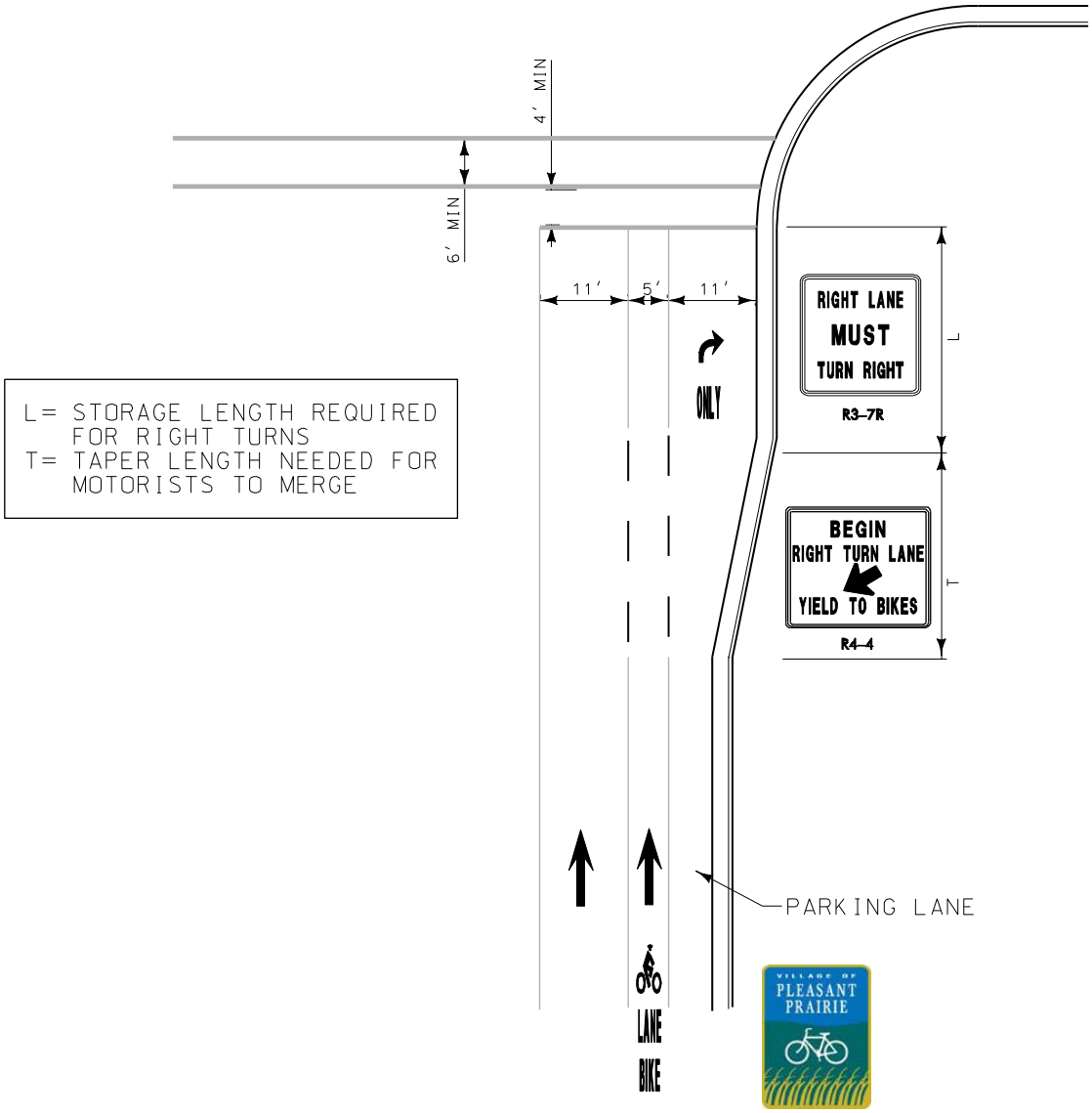


SIMPLE INTERSECTION WITH MODERATE RIGHT TURN TRAFFIC

SOLID BIKE LANE STRIPE WITH PARKING	R10–0007–020

CRISPELL–SNYDER, INC.
PROFESSIONAL CONSULTANTS
Lake Geneva (262)348-5600 Madison (608)244-6277 Milwaukee Regional (262)250-8000
Racine (262)554-8530 Fox Valley (715)752-4620

LOCATION:	VILLAGE OF PLEASANT PRAIRIE
	KENOSHA COUNTY, WI
SCALE: 1" = 40'	DATE: MARCH, 2010
DRAWN BY: T. HENNEY	



REVISION/PLOT DATE bike ln w- turn lane and parking 3/19/10

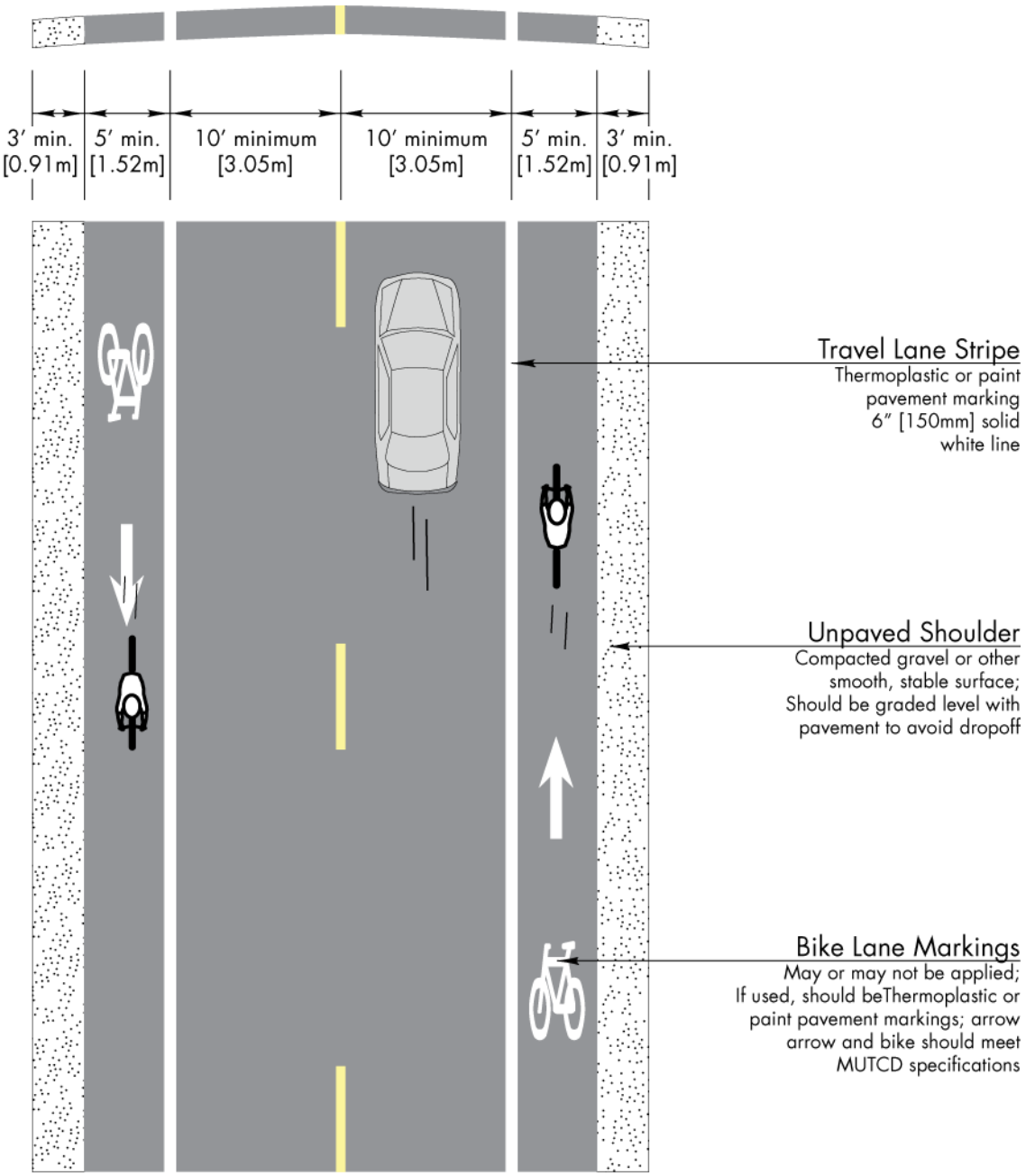
BIKE LANE WITH TURN LANE AND PARKING LANE	R10-0007-020
CRISPELL-SNYDER, INC. PROFESSIONAL CONSULTANTS Lake Geneva (262)348-5600 Madison (608)244-6277 Milwaukee Regional (262)250-8000 Racine (262)554-8530 Fox Valley (715)752-4620	LOCATION: VILLAGE OF PLEASANT PRAIRIE KENOSHA COUNTY, WI
	SCALE: 1"=20' DATE: MARCH, 2010
	DRAWN BY: T. HENNEY

Rural Collector/Arterial Cross Section

This cross section provides dimensions for a rural collector or arterial street with wide paved shoulders. It provides:

- One traffic lane in each direction
- One bicycle lane/paved shoulder in each direction
- May include parking lanes on one or both sides of the street

Refer to the *Wisconsin Bicycle Facilities Design Handbook* and *Wisconsin FDM* for full guidance and engineering specifications. Diagram is for informational purposes only and is not to scale.



Signed Bicycle Routes

Signed bicycle routes are typically designated on low traffic streets and do not feature any special on-street marking for bicycles. Signs for bicycle routes should be placed before and after every turn, at every signalized intersection, every ¼ mile in urbanized areas and every ½ mile in rural areas.

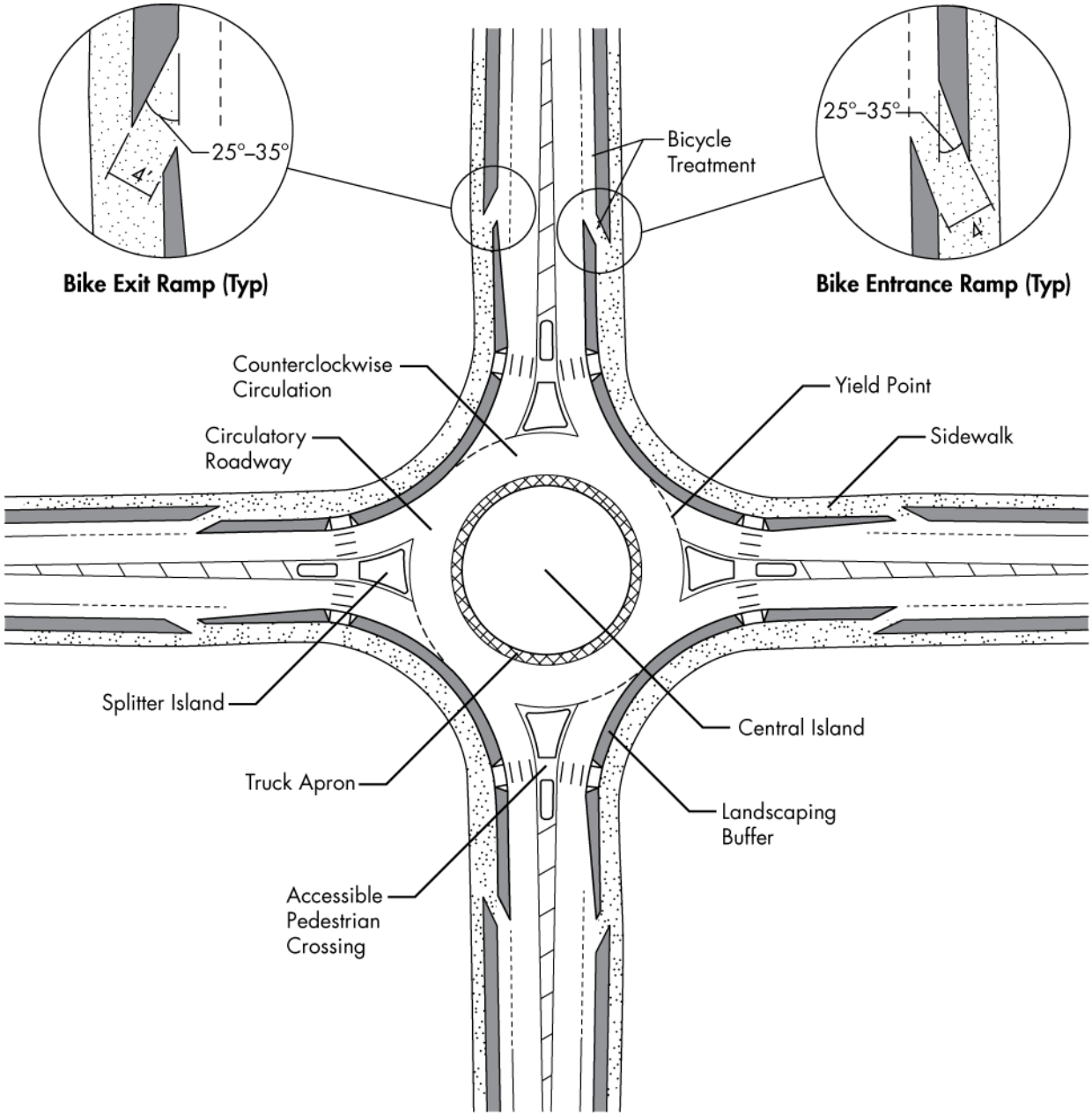
Bicycle route signage should be combined with directional signage that allows users to easily determine the distance to specific destinations. Common destinations include parks, schools, cultural centers, retail areas, and other popular locations.

Refer to the *Wisconsin Bicycle Facilities Design Handbook*, the *MUTCD* and *Wisconsin FDM* for full guidance and engineering specifications.

Roundabouts

Roundabouts are increasingly replacing intersections of collector and arterial streets. These facilities provide numerous benefits, but can be challenging for bicyclists to navigate. When approaching a single-lane roundabout, bicyclists should be given the option to "take the lane" and proceed through the roundabout as a motor vehicle would or to use a shared-use path around the exterior of the roundabout.

Refer to the *Wisconsin Department of Transportation Roundabout Guide* and *Wisconsin FDM* for full guidance and engineering specifications.



Source: Wisconsin Department of Transportation Roundabout Guide

6.3 Off-Street Facilities

Off-street facilities are a critical part of the bicycle and pedestrian network. For bicyclists, off-street facilities provide a supplement to on-street facilities and can provide more direct access to specific destinations than on-street facilities do. For pedestrians, off-street facilities can also provide more direct access to destinations. Both sets of users can benefit from facilities that are designed for their specific use without the use of motor vehicles. It should be stressed that as a part of the bicycle network, off-street facilities are a complement to, and not a replacement for, on-street facilities.

Shared-Use Paths

Shared-use paths are paved facilities located in a separate right of way, for the exclusive use of bicycles and pedestrians, with minimal cross flow by motor vehicles. Off -street bike paths are typically located within open space corridors along creeks, high voltage power line corridors and community/city-wide parks. They may also be located within greenways, which are landscaped areas created for the purpose of providing important bicycle and pedestrian linkages between uses. Shared-use paths offer important bicycle commuting opportunities, but on their own are not sufficient to fully support bicycle commuting because of limited connections to destinations. Shared-use paths provide an important recreational amenity for bicyclists, pedestrians, dog walkers, runners, roller blades and other non-motorized forms of travel.

Shared-use paths are paved facilities that should be wide enough to offer a wide range of users a comfortable and safe experience. They are also often located and designed to provide service vehicle access to utility corridors and emergency vehicle access to open space, including police and fire vehicles.

Recreational Trails

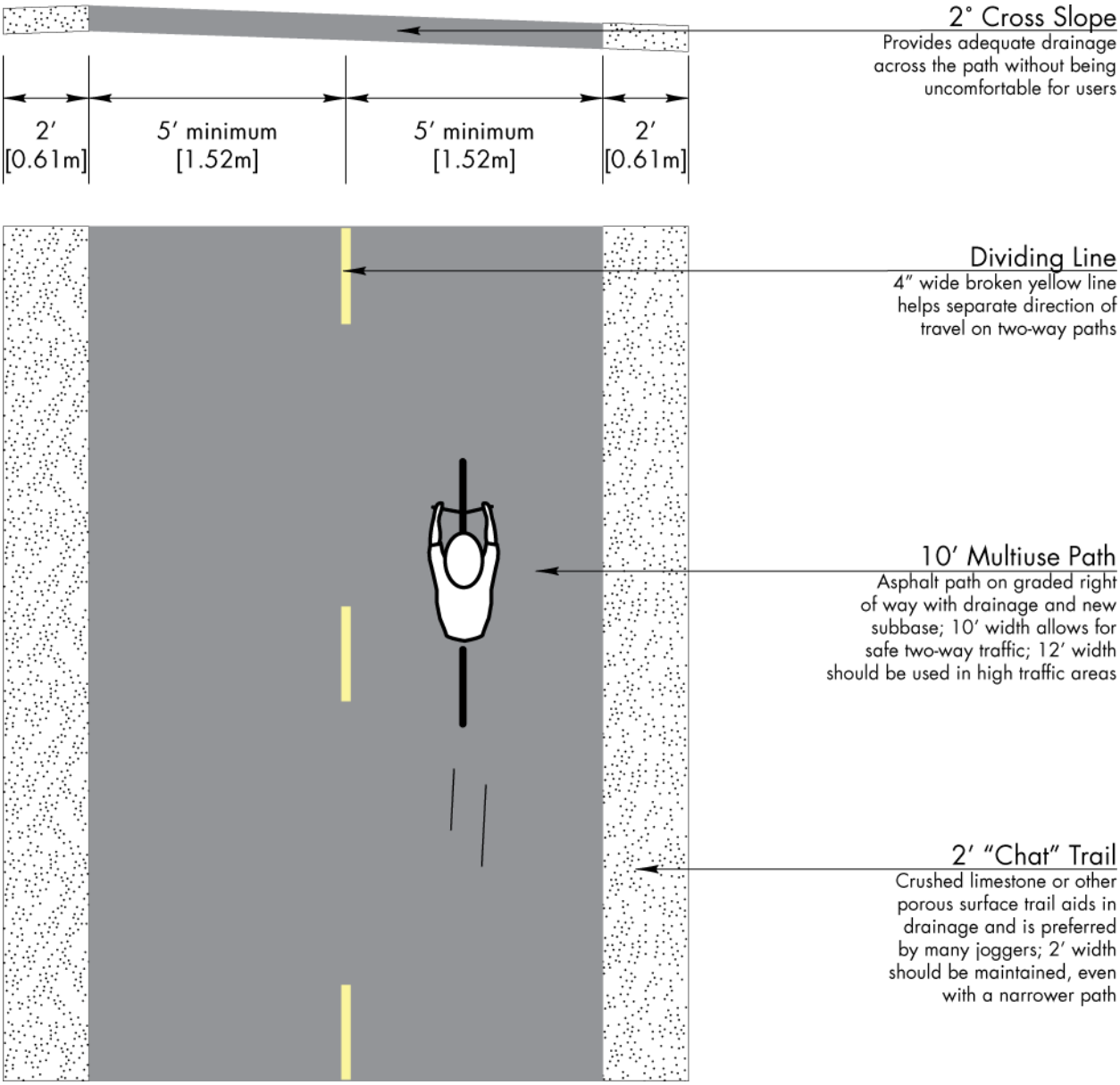
Recreational trails are typically non-paved, narrower trails designed specifically for pedestrian use. Such trails are appropriate in sensitive ecological areas or areas where high levels of bicycle and pedestrian traffic are not desired. Recreational trails are designed primarily for recreational and not transportation purposes, although some may use them for transportation. These trails should be provided as a supplement to the off-street shared-use path network and the on-street bicycle facility network.

Shared-use Paths

Shared-use paths are off-street bicycle facilities that serve two-way bicycle and pedestrian traffic. Because shared-use paths are intended for pedestrian use, the design must conform to Americans with Disabilities (ADA) guidance.

Shared-use paths should be considered a supplement to, and not a replacement for, on-street bicycle facilities.

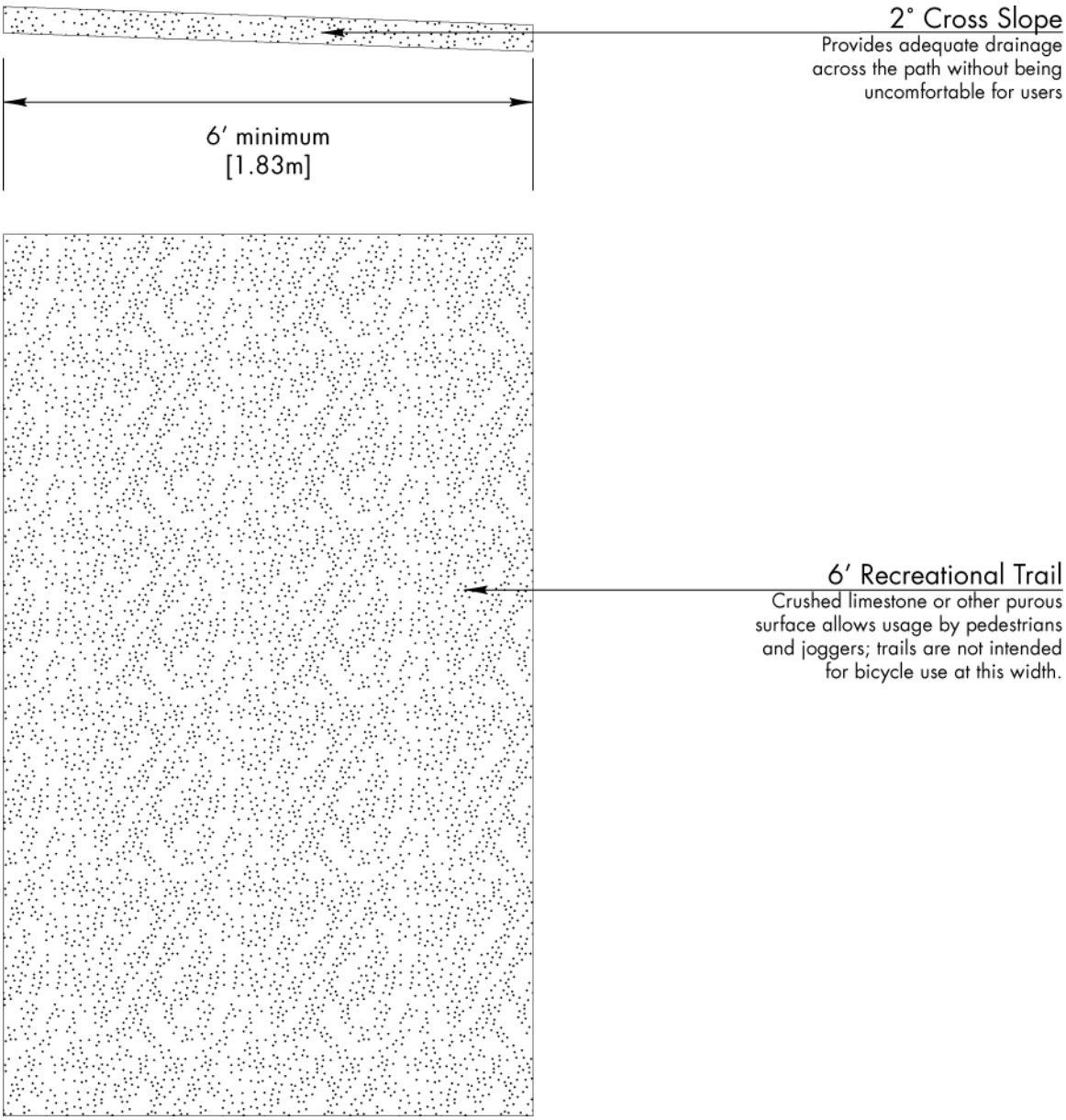
Refer to the *Wisconsin Bicycle Facilities Design Handbook* and *Wisconsin FDM* for full guidance and engineering specifications. Diagram is for informational purposes only and is not to scale.



Recreational Trails

Recreational trails are dirt or gravel trails intended for pedestrian only use. These trails are appropriate in environmentally sensitive areas.

Refer to the *Wisconsin Bicycle Facilities Design Handbook* and *Wisconsin FDM* for full guidance and engineering specifications. Diagram is for informational purposes only and is not to scale.



6.4 Support Facilities

With the provision of bicycle and pedestrian facilities it is critical that the Village or private sponsors offer support facilities and services to ensure that paths and roadways are safe and comfortable to use. These facilities and services include high-level maintenance and the provision of signage throughout the bicycle and pedestrian network. Additionally, trailheads, lighting, and parking areas can be appropriate in specific locations to ease access to the network and increase safety.

General Maintenance

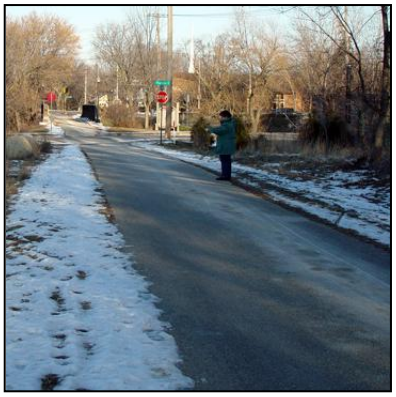
Good maintenance is critical for the safe operation of bicycle and pedestrian facilities. Debris in bicycle lanes or on paths presents a hazard to users as bicyclists can easily fall or be pushed into traffic while pedestrians also risk falls.

On-street bicycle facilities should be maintained as part of regular street maintenance. However, due to the susceptibility of bicycles to damage and danger risks from debris or pavement damage, priority should be given to sweeping bicycle lanes and repairing potholes or other damage more frequently than standard travel lanes. Frequent sweeping of priority bicycle lanes and routes is particularly important because cars in adjoining lanes push rocks and other debris into the less traveled bicycle lanes.

Bicycle lanes and access should be maintained through street construction or projects that impede into the bike lane.

Off-street bicycle and pedestrian facilities, including sidewalks, should also receive frequent regular maintenance. Off-street facilities should be swept as needed, with particular attention paid to areas adjoining gravel paths where gravel may spread onto the pavement and present a slip hazard. Sweeping should also be conducted more frequently during the fall and spring seasons when leaves may present a hazard on trails and paths. The appearance of potholes or cracks is less common on off-street facilities, but those that do appear should be promptly patched and sealed. Regular inspection of sidewalks should check for cracking or lifting due to pressure from tree roots. Vegetation adjoining sidewalks and paths must be pruned to maintain visibility along the facility.

Appendices A.3 and A.4 of the *Wisconsin Bicycle Facilities Design Manual* provide additional details on maintenance of on- and off-street facilities



Shared-use paths should be plowed immediately after a snow fall.

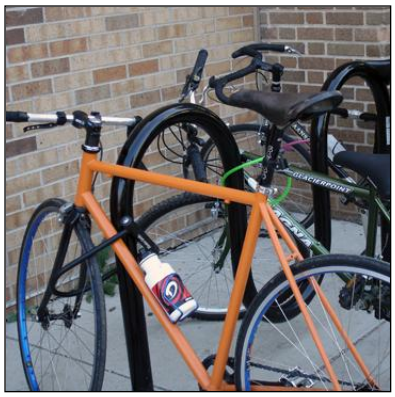
Snow Plowing

For bicycle and pedestrian facilities to serve as true transportation alternatives they must be accessible and usable year round. Snow should promptly be cleared from all priority portions of the network. On-street facilities should be plowed when the street is cleared. It is critical that travel lanes are not plowed into the bike lane therefore forcing bicyclists into the regular travel lane, particularly on high-speed arterials. Sidewalks should be cleared of snow in a timely manner especially in key corridors and areas around schools.

Priority off-street paths should be plowed at the same time as major arterials and collectors. These priority routes should be those that parallel major roadways, serve as cross-Village links, or provide access to major destinations including employment centers, schools, and recreation facilities. Assigning snow clearance duties to the Public Works Department allows path plowing concurrent to the plowing of streets. Plowing of minor off-street paths can occur after major paths and streets have been cleared, but should be cleared in a timely manner after each snowfall.

Bicycle Parking

Bicyclists must have a reasonable expectation that there will be a safe location to lock their bike at their destination for bicycling to serve as a practical form of transportation. The Village should ensure that adequate bicycle parking exists both at recreational sites such as parks, the RecPlex and trailheads, as well as commercial, industrial and employment sites. This can be accomplished by direct installation of racks by the Village, offering a cost sharing program for rack installation with interested businesses, and through changes in the local ordinance that require minimum amounts of bicycle parking at employment and commercial buildings, as is currently done for motor vehicles.



Ample bicycle parking should be provided at popular destinations.

It is important that racks adequately support bicycles and are securely fastened to the ground. The City of Madison has produced a one-page handout that describes racks that do and do not meet the City's standards for bicycle parking. The document also describes minimum dimensions for the installation of bicycle racks. http://www.cityofmadison.com/trafficEngineering/documents/MadisonBikeParking.pdf

Bicycle racks should be prominently located so that cyclists can easily find them when arriving at destinations. Cyclists should not have to search around a building for a rack or lock their bike to objects such as street signs or railings because racks are not available. Studies have shown that patrons arriving by bike or on foot typically spend more money at local restaurants and shops than those arriving in motor vehicles. Additionally, employees who regularly commute by bike tend to be healthier and have lower medical costs than those who do not commute by bike. It may be useful to highlight these facts to business owners when requesting or requiring that they install bicycle parking.

Signage and Markings

Adequate signage is essential throughout the bicycle and pedestrian network. This signage provides regulatory, warning and directional information to users on both on-road and off-road facilities.

Regulatory signage and marking should provide users with a clear indication of how they should behave. Common markings and signage indicates proper direction of travel, speed limits and establishing right of way for users.

Warning devices alert users to potential hazards. These devices often warn of hazardous conditions including steep grades, sharp curves or changes in path conditions. Signage can also alert users to approaching intersections or railroad crossings. When used on off-street facilities, warning signage should be the same as MUTCD-approved on-road signage, although it is often scaled down slightly in recognition of the lower speeds of path users compared to street users.

Users often consider informational signage the most important signage on a path or street. This signage commonly points users to popular destinations, orients users within the larger network and provides travel distances and approximate times to specific locations. Informational signage should generally follow MUTCD guidance, although there is more freedom to use custom colors or designs with this signage, particularly on off-street paths.

All signage and markings should comply with the *Wisconsin Bicycle Facilities Design Manual*, which details signage and marking requirements throughout the manual. Section 4.14 of the Manual presents guidance specific to off-street paths, although much of the signage detailed there is also relevant to on-street facilities.

Lighting

Bicyclists in the State of Wisconsin are required to use a front headlight when traveling between dusk and dawn. Despite this requirement, fixed-source lighting should be considered to improve visibility and safety along paths and at intersections with streets. Lighting allows bicyclists to better see their surroundings and observe potential hazards, while also providing pedestrians who may not have a light the same advantages. Lighting should be strongly considered where night use of paths is expected; paths to and from the RecPlex are a good example in Pleasant Prairie. Regardless if lighting is provided along paths, lighting should always be provided at intersections between paths and streets or other paths. Additionally, lighting should be strongly considered through underpasses or tunnels, on overpasses and in areas where personal safety may be a concern, even if lighting is not provided on other portions of the path.

All path lighting should comply with the guidance provided in the Wisconsin Bicycle Facility Design Manual, section 4.13. Additionally, lighting should be provided at a scale that is appropriate for bicycles and pedestrians. Tall street lamps intended for lighting streets or parking lots are not appropriate for path or sidewalk lighting, although they may be used where paths intersect streets.

Pedestrian scale lighting should be closely spaced. These lights in Madison are solar powered.

Trailheads

Trailheads located at a number of locations throughout the Village can provide an important amenity to path and trail users. Trailheads should be located at heavily used path and street intersections. At a minimum, these locations should provide a small parking lot, bicycle racks, a large map of the bicycle and pedestrian network and benches for resting. Additional amenities can include drinking fountains, public restrooms and lighting. The trailheads should provide a safe and welcoming environment for path users whether they are beginning and ending their trip there, or using the area for a rest during their commute or workout. The Village should consider integrating trailheads and with existing and planned parks, this allows shared use of facilities with park visitors.

Trailheads can be provided at popular destinations such as parks where parking and other facilities can be shared.