FDM 11-46-1 Bicycle and Pedestrian Elements Affecting Complete Streets

February 16, 2021

1.1 Introduction, Purpose, Definitions, Overview

"Complete streets" are broadly defined as roadways designed and operated to enable safe, convenient, and comfortable access and travel for all users. Pedestrians, bicyclists, motorists, and public transport users of all ages and abilities can move along and across a complete street with safety and comfort.

Federal policy for providing bicycle and pedestrian accommodation - per the 2010 "US DOT Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations" (Memorandum) *(1) - is as follows:*

"The DOT policy is to incorporate safe and convenient walking and bicycling facilities into transportation projects. Every transportation agency, including DOT, has the responsibility to improve conditions and opportunities for walking and bicycling and to integrate walking and bicycling into their transportation systems. Because of the numerous individual and community benefits that walking and bicycling provide — including health, safety, environmental, transportation, and quality of life — transportation agencies are encouraged to go beyond minimum standards to provide safe and convenient facilities for these modes."

Federal legislation currently requires that bicycle and pedestrian needs must be given due consideration under Federal Surface Transportation law (23 U.S.C. 217(g)(1)), and this should include, at a minimum, a presumption that bicyclists, pedestrians, and persons with disabilities will be accommodated in the design of new and improved transportation facilities. In the planning, design, and operation of transportation facilities, bicyclists, pedestrians, and persons with disabilities should be included as a matter of routine, and the decision to not accommodate them should be the exception rather than the rule. There must be exceptional circumstances for denying bicycle and pedestrian access (23 U.S.C 217(g)(1)). Federal Highway Administration (FHWA) policy requires the inclusion of bicycle and pedestrian accommodation on all modernization projects, with three exceptions:

1. Bicyclists and pedestrians are prohibited by law from using the roadway.
2. The cost of establishing bikeways would be excessively disproportionate to the need or probable use. Excessively disproportionate is defined by FHWA and state statutes as bicycle and pedestrian facilities together exceeding 20 percent of the cost of the larger transportation project.
3. Sparsity of population or other factors indicate an absence of need.

The FHWA Wisconsin Division Office directs that WisDOT shall follow federal policy on all projects on the National Highway System (NHS), and should follow federal policy on all federally funded projects off that system.

WisDOT policy, in conformance with Federal laws and policy, State Statute Section 84.01(35), and Connections 2030 *(2) (3)*, requires that projects must give due consideration to establishing bicycle accommodations and pedestrian facilities on all modernization and most rehabilitation (i.e. pavement and bridge replacement) highway projects funded in whole or in part from state or federal funds. After giving due consideration, if WisDOT determines that bike and pedestrian facilities are required on a project funded in whole or in part from state funds, then WisDOT is authorized to include those facilities only if each municipality[1] in which the project is located adopts a resolution authorizing WisDOT to establish a bikeway or pedestrian way. The state statute also states that the need for WisDOT to obtain a municipal resolution(s) does not apply if FHWA provides written notice that establishment of a bikeway or pedestrian way, as part of a project, is a condition of the use of federal funds for that project (s.84.01(35)(d)(2), Wis. Statutes.)

FHWA has indicated that when the results of due consideration show that bicycle and pedestrian facilities are to be provided, the signed final National Environmental Policy Act (NEPA) decision document is FHWA's written notice to WisDOT that establishment of a bikeway or pedestrian way as part of the project, is a condition of the use of FHWA funds, consistent with State Statute 84.01(35)(d). Therefore, for projects with any federal funding and those on the NHS, WisDOT's compliance with the FHWA written notice provision are satisfied by receipt of a completed environmental document from FHWA. However, even if the project does not require a resolution, the planning and design processes will still provide opportunities for public input and to evaluate environmental impacts of project alternatives that may include bike and pedestrian facilities. Municipalities may adopt

[1] Municipality is defined as a city, village, or town (Wis. Statutes Section 990.01(22).

resolutions that authorize the inclusion of facilities on the NHS or federal funded projects where WisDOT does not need to obtain them. These resolutions will be included in the environmental document.

Department policy on perpetuation and rehabilitation (i.e. reconditioning) project types is described in FDM 11-46-1.1.2 and 1.1.3.

The purpose of this procedure is to explain the requirements and applications of the state statute, WisDOT policy and federal laws and policies as they pertain to highway projects in Wisconsin.

1.1.1 State Statute

State Statute 84.01(35) was originally created in 2009 and was modified in 2014. The modifications to the state statute became effective on July 14, 2015. Projects with approved environmental documents as of July 14, 2015 will follow through on the commitments identified during the public involvement and environmental processes including bike and pedestrian commitments[2]. The state statute requires that WisDOT shall give due consideration to establishing bikeways, as defined in State Statute 84.60(1)(a), and pedestrian ways, as defined in State Statue 346.02(8)(a), on modernization projects funded in whole or in part from state funds or federal funds. The statute also states that the WisDOT may not establish bicycle and pedestrian ways if any of the following apply:

1. Bicycles and pedestrians are prohibited by law from using the highway; or
2. The project is wholly or partially funded with state funds, unless the governing body of each municipality within the project has adopted a resolution authorizing the department to establish the bikeway or pedestrian way. This subdivision does not apply if the federal government provides written notice to the department that establishment of a bikeway or pedestrian way as a part of a project is a condition of the use of federal funds for that project.

If after giving due consideration it is determined that establishment of bicycle and pedestrian facilities are proposed on a pavement replacement or modernization improvement project that is not part of the NHS system and has no federal funding, then WisDOT cannot establish those facilities unless each municipality[3] involved in the modernization project adopts an official resolution authorizing the establishment of those facilities as part of the improvement project. This requires consensus amongst all the governing bodies in which a portion of the project will occur. For this situation, WisDOT will not finalize an environmental document that recommends providing a bike or pedestrian accommodation unless the municipal resolutions have been adopted.

As stated previously in FDM 11-46-1, for projects with any federal funding and those on the NHS, WisDOT compliance with the FHWA written notice provision are satisfied above by receipt of a completed environmental document from FHWA. Therefore, WisDOT will not seek municipal resolutions on these types of projects (NHS or federal funded).

Further, a resolution is not required when bicycle and pedestrian facilities already exist and are to be replaced as part of the modernization improvement project.

For stand-alone bike and pedestrian projects funded using federal or state funding programs it is presumed that bike and pedestrian facilities are incorporated on the project and geometric design criteria applied accordingly.

Lastly, State Statute 32.015 provides condemnation authority limitations on establishing or extending a recreational trail, or bicycle or pedestrian way. However, this is not a limitation for evaluating bike and pedestrian accommodations as part of projects or from establishing within existing right-of-way, or through other land acquisition methods. It is expected that all projects will be evaluated for accommodations.

1.1.2 Asset Management

WisDOT has established a project delivery methodology focused on preserving and restoring existing facilities along the State Trunk Network (STN). Asset management provides the mechanism to meet these goals.

Projects consist of three (3) improvement strategies. These are perpetuation, rehabilitation and modernization. See FDM 3-5-1.1 for definitions of these Improvement strategies.

WisDOT has also adopted Performance Based Practical Design (PBPD) that assumes a perpetuation improvement strategy. Regardless of this strategy, all projects will be evaluated for bike and pedestrian accommodations as part of project development.

1.1.3 Construction Definition

As stated above, State Statute 84.01(35) is required on modernization and most rehabilitation (i.e. pavement and bridge replacement) projects.

However, that does not mean only modernization and most rehabilitation (i.e. pavement and bridge replacement) projects are reviewed for bike or pedestrian issues. All projects must go through the WisDOT Scope Certification process described in FDM 3-1 and FDM 11-4. It is the Scope Certification process which

determines whether a project will be designed to a perpetuation, rehabilitation, or modernization standard.

As part of PBPD, the Safety Certification Process (SCP) will validate if there are safety concerns warranting an increased strategy of rehabilitation or greater. A single bike or pedestrian crash of any type on a highway segment will trigger a project crash flag, and require a SCP review to be completed, and may result in an expanded design strategy. See FDM 11-38 for more details on SCP. If there are no bike or pedestrian crashes on the project, the Risk-Based Environmental Screening Template (RBEST) requires a discussion on presence of any bike or pedestrian concerns or conflicts. Both the SCP and RBEST are part of the Scope Certification process and lead to the following determinations:

1.1.3.1 If neither the SCP nor the RBEST identify any bike or pedestrian improvements, the perpetuation concept is validated by Scope Certification at LC 11, and no further evaluation is necessary during the final delivery phase.

1.1.3.2 If either the SCP or RBEST identify a bike or pedestrian improvement that can be accommodated within the perpetuation design strategy, that is noted in the Scope Certification documentation and further evaluation occurs during final design.

1.1.3.3 If either the SCP or RBEST identify a bike or pedestrian improvement that cannot be accommodated within a perpetuation design strategy, a rehabilitation design strategy may be necessary. Also, a rehabilitation design strategy may be necessary for issues other than bike and pedestrian needs. Regardless of how a rehabilitation consideration is prompted, a rehabilitation requires an evaluation of bike or pedestrian accommodations is those areas where S-2 design standards are applied.

Most rehabilitation designations occur because of spot safety or operational issues within a larger project segment. The spot locations where the rehabilitation need occurs is where S-2 design standards are applied and evaluation during final design required. The remaining portion of the project outside of the spot rehabilitation locations would still be considered a perpetuation where S-1 standards are applied. These perpetuation sections of the project are evaluated according to the preceding 1.1.3.1 and 1.1.3.2. The S-1 and S-2 standards may affect the extent and type of bike and pedestrian accommodations included within the scope of the project.

FDM 3-1 provides more on scoping phased deliverables for scope certification, including SCP and RBEST.

FDM 11-4-3 provides more information on the Scope Certification requirements.

Pursuant to sections in FDM 11-46-10 and FDM 11-46-15 certain bicycle and pedestrian design standards such as curb ramps and bicycle-acceptable grates are required on perpetuation or rehabilitation design strategies regardless of presence of crashes.

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[2] FAQs to Bicycle & Pedestrian State Statute 84.01(35); http://wisconsindot.gov/Documents/projects/multimodal/bike/8401-faq.pdf

[3] Municipality is defined as a city, village, or town (Wis. Stats. Section 990.01(22).

1.1.4 Asset Management and ADA Curb Ramp Compliance

Asset Management projects that are defined as an "alteration" per USDOJ and USDOT joint technical assistance memo and glossary of terms (See Attachment 1.2 and Attachment 1.3) are required to install or update curb ramps. This may include installing new curb ramps at locations if none previously existed or upgrading curb ramps to meet the applicable design criteria. FDM 11-1 Attachment 10.1 shows the relationship between Improvement Strategies, Improvement Concepts and Application of Design Criteria.

1.1.5 ADA Curb Ramp Compliance and Right-of-Way Requirements

If sufficient right-of-way is not owned and additional right-of-way is needed to install an ADA compliant curb ramp or to upgrade an existing curb ramp to full ADA compliance or to the maximum extent feasible, it is WisDOT's policy for state highways to acquire the necessary real estate to allow the curb ramp work to be constructed. The acquisition could be additional right-of-way or a temporary limited easement (TLE). See FDM 12-1-1 and FDM 12-1-15 for guidance to help determine the process to follow for real estate acquisition. A project is not exempt from ADA curb ramp compliance if no right-of-way is acquired.

These right-of-way requirements will apply to projects that have an environmental document that is signed on January 2, 2019 or later. For projects with an environmental document signed prior to January 2, 2019 these right-of-way requirements are not mandatory, however, curb ramps must still be made compliant to the maximum extent feasible within the existing right-of-way. Technical infeasibility documentation will still need to be provided accordingly (see FDM 11-46-5.1.2 Technical Infeasibility).

1.1.6 Bikeways

Bikeways will be repaired or resurfaced on projects where they exist as part of the roadway. This will apply to Perpetuation, Rehabilitation and Modernization projects.

1.1.7 Sidewalks

1.1.7.1 Sidewalk Treatment - Pavement Treatment Service Life < 18-Years

Perpetuation - Typically sidewalk improvements would not be scheduled for these projects. Thus, existing sidewalk will be left in place. Re-evaluate sidewalk treatment(s) with the next improvement project.

Rehabilitation - Existing sidewalk would be typically left in place on portions of rehabilitation projects where S-1 application is applied. The designer should evaluate the improvement portions of these projects where S-2 application is applied for inclusion of bicycle or pedestrian facilities. Project scope, context and system continuity should be considered to help determine if inclusion of a bicycle or pedestrian facility makes sense or should be scheduled at a time when a longer-term pavement treatment project or a modernization project is scheduled.

See FDM 11-1-10 for information about S-1 and S-2 applications.

1.1.7.2 Sidewalk Treatment - Pavement Treatment Service Life ≥ 18-Years

Modernization - Existing sidewalk will typically be repaired or reconstructed on modernization projects where S-3 application is applied. Right-of-way (Fee or TLE) will be acquired if necessary to allow the sidewalk to be repaired or reconstructed.

See FDM 11-1-10 for information about S-3 application.

1.2 Bikeways and Sidewalks

The state statute requires that WisDOT shall give due consideration to establishing bikeways, as defined in State Statue 84.60(1)(a), and pedestrian ways, as defined in State Statue 346.02(8)(a), on modernization projects funded in whole or in part from state funds or federal funds.

See the following references for guidance on bikeways:

- FDM chapter 11 - primarily FDM 11-46-15, but also other procedures, including FDM 11-15-1 and FDM 11-20-1
- Wisconsin Bicycle Facility Design Handbook *(4)*
- WisDOT Rural Bicycle Planning Guidelines *(5)*

Sidewalks are a common feature for urban and suburban roadways and recognized as pedestrian ways. The main issues associated with providing sidewalks in an urban environment are:

- Location of the sidewalk (placement on one side or both sides of the roadway),

- Sponsorship and maintenance of the sidewalks,
- Expected sidewalk usage
- Trade-offs with bicycle accommodations and other roadway features when funding or space is limited

See the following references for guidance on sidewalks:

- FDM chapter 11 - primarily FDM 11-46-5 and FDM 11-46-10, but also other procedures, including FDM 11-20-1
- Wisconsin Guide to Pedestrian Best Practices *(6)*
- Wisconsin Bicycle Facility Design Handbook, Chapter 4, Shared-use Path *(4)*

1.2.1 Prioritization between Bikeways and Sidewalks

It is WisDOT policy to strive to provide both sidewalks and bikeways on all modernization projects, to the geometric design criteria described in the FDM and associated design manuals. In locations where space is limited, provide the maximum extent of accommodations possible. Before omitting any accommodation for either bicyclists or pedestrians, give due consideration reducing the width of travel lanes, medians, terraces and gutter sections - to minimums, if needed. Then consider the following measures, in order of priority:

1. Reduce the width of bikeways to the minimal level, i.e., 14-foot-wide outside lanes instead of bike lanes.
2. Place a 6-foot minimum sidewalk directly behind the curb, i.e., eliminate the terrace.

   This is only acceptable for very short distances because a terrace serves many important functions (consult with region maintenance or the local government).
3. Omit bicycle accommodations.

   It is acceptable to prioritize sidewalks over bicycle facilities if a choice must be made between these two modes.
4. Provide a sidewalk on only one side, especially if meeting any of the criteria in Table 4.1, “WisDOT Guidelines for Sidewalk Placement” of the February 2011 Wisconsin Guide to Pedestrian Best Practices *(6)*.

These strategies can be used in combination. For example, it may be possible to provide wide outside lanes for a section of a project as well as a short stretch of sidewalk placed behind the curb.

1.2.2 Shared-Use Paths

Bicyclists are legal users of roadways, and the first responsibility is to provide on-road accommodations for bicycles where appropriate. Shared-use paths should only replace on-road bicycle accommodations in exceptional situations (e.g. bicyclists and pedestrians prohibited). In certain situations, shared-use paths can supplement on-road bicycle accommodations, or be used in place of a sidewalk (on a given side of the road) as a pedestrian facility.

The decision to use shared-use paths along roadways must meet the guidelines found in FDM 11-46-15 and in the “Wisconsin Bicycle Facility Design Handbook *(4).*

1.3 Project Development / Scoping Process

Due consideration shall be given to establishing bikeways and pedestrian ways in all modernization projects and applicable rehabilitation projects, consistent with state law, beginning with the first scoping meeting. WisDOT Regional Bicycle and Pedestrian Coordinators shall be involved in evaluating all projects for compliance with the state law and provide guidance in planning and design processes related to bicycling and walking.

Include the Regional Bicycle/Pedestrian Coordinator in all phases of project development and in all project review meetings (scoping, 30%, 60%, 90% (pre-PSE), TMP, etc.). The need for input from the Regional Bicycle/Pedestrian Coordinator will continue through construction.

1.3.1 Evaluation Criteria

There must be exceptional circumstances for not including bicycle and pedestrian access either by prohibition or by designing highways that are incompatible with safe, convenient walking and bicycling (23 U.S.C. 217(g)(1)). FHWA design guidance outlines exceptional circumstances in a Policy Statement and Supplementary Design Guidance.

The following are circumstances that may be useful for evaluating and documenting decisions:

1. Bicycles or Pedestrians Prohibited (see FDM 11-46-1.3.1.1)

2. Excessively Disproportionate Costs (see FDM 11-46-1.3.1.2)
3. Constrained Environments (see FDM 11-46-1.3.1.3)
4. Absence of Need (see FDM 11-46-1.3.1.4)
5. Refusal to Maintain (see FDM 11-46-1.3.1.5)

Even where circumstances are exceptional, and bicycle use and walking are either prohibited or made incompatible, States, Metropolitan Planning Organizations (MPOs), and local governments must still ensure that bicycle and pedestrian access along the corridor served by the new or improved facility is not made more difficult or impossible (23 U.S.C. 109(m) and 217(g)).

1.3.1.1 Bicycles or Pedestrians Prohibited

Bicyclists and pedestrians are prohibited on freeways and sometimes expressways in Wisconsin. Where a new prohibition is put into effect, it is critical to maintain connectivity by defining an alternative route that will accommodate bicyclists and pedestrians within the same corridor. In some cases, a shared-use path in the freeway right-of-way is a viable solution for short distances as a matter of providing basic access; however, care must be taken to ensure that the shared-use path is well-separated or partitioned off from the freeway or expressway traffic. The alternative facility and the type of bicycle accommodation thereon must be identified in the documentation.

It is also important to maintain connectivity across freeway and expressway corridors so that freeways and expressways do not create a barrier to bicyclists and pedestrians. Provide bicycle and pedestrian accommodations on a road that passes under or over a freeway or expressway (including the non-freeway and expressway roads running through interchanges) unless other criteria apply or that road prohibits bicyclists or pedestrians.

Documentation of each existing and proposed crossing is needed for every crossing of the facility that prohibits bikes and pedestrians.

1.3.1.2 Excessively Disproportionate Cost

Cost is excessively disproportionate when it exceeds 20 percent of the estimated total project cost. Implementation of bicycle and pedestrian facilities up to 20 percent of project costs *is expected and required*. Therefore, this portion of the rule functions as a limit of how much must be spent on bicycle and pedestrian facilities.

Neither WisDOT nor FHWA policy limits the percentage of state or federal funds used on a project for bicycle and pedestrian facilities. It is acceptable to spend more than 20 percent if it is not reasonable to limit bicycle and pedestrian facilities, either in length or in type, within a project.

If pedestrian and bicycle accommodations cannot both be provided for 20 percent or less of the total project cost, and it is not possible to allocate more than 20 percent of total project cost for bicycle and pedestrian facilities, then priority can and should be given to pedestrian facilities.

Document if it is not possible to provide bicycle and pedestrian facilities to WisDOT design criteria for 20 percent or less of a project's costs and it is not possible to allocate more than 20 percent.

The documentation of decisions should include at least the following four sections:

1. Location and Type of Project

   Provide the existing typical section as well as the type of project considered (rehabilitation or modernization). Provide sheets that illustrate the roadway section; existing right-of-way; pertinent mapping features such as building and driveway locations, retaining walls, utility and light poles; and affected landscaping such as street trees. Provide average current and projected traffic volumes on the roadway. If certain roadway features/characteristics contribute to the high cost of implementing bicycle or pedestrian facilities, include photographs of those features.

2. Alternatives Considered for Bicycle and Pedestrian Facilities

   Develop and analyze bicycle and pedestrian alternative(s) that have the greatest potential to satisfy the state statute while staying within 20 percent of total project costs. Engage the Regional Bicycle/Pedestrian Coordinator and project manager to aid in establishing reasonable, viable alternatives that are sensitive to the context of the corridor. When circumstances apply regarding disproportionate cost for limiting total expenditures on bicycle or pedestrian facilities, it is expected that reasonable alternatives include lower-level accommodations instead of high-level accommodations. For example, while a 12-foot travel lane and 5-foot bike lane may exceed 20 percent of total project costs, a 14-foot- wide outside lane may fall under the 20 percent threshold. The alternatives should

also consider shifting the existing centerline when there are constraints or excessive costs on one side of the project corridor that may not exist on the other side.

Costs Calculation steps for Each Alternative

- Estimate the total project cost as described in FDM 11-46-1.3.1.2.1.1.
- Estimate the marginal construction cost of establishing new/expanded sidewalks or bikeways as described in FDM 11-46-1.3.1.2.1.2.
- Estimate the marginal real estate cost of establishing new/expanded sidewalks or bikeways as described in FDM 11-46-1.3.1.2.1.3. - Perform the 20 percent disproportionate cost calculation using the formula:

$$\frac{(\text{marginal construction cost} + \text{marginal real estate cost})}{\text{total project cost}}$$

3. Bicycle and Pedestrian Measures Incorporated up to the 20 Percent Limit

   Make the determination in consultation with the Regional Bicycle/Pedestrian Coordinator, project manager, or Region Local Program Manager (for projects on the local system). The report should show which pedestrian and bicycle facilities are being provided for 20 percent of the total project cost, with the intent of providing the most accommodation, with a priority given to pedestrian facilities.

1.3.1.2.1 Cost Calculations

Not all costs can be attributed to bicycle/pedestrian facilities. The following sections describe how costs are calculated.

1.3.1.2.1.1 Calculation of Total Project Cost

The total project cost includes estimated construction costs (including the estimated cost of bikeway and sidewalk construction) and real estate costs (including compensable utilities).

1.3.1.2.1.2 Calculation of Marginal Costs for Bikeway/Sidewalk Construction

The cost of establishing a bikeway or sidewalk shall consider only the marginal cost of establishing any new or expanded bikeway or sidewalk and may not include any cost to reestablish any existing bikeway or sidewalk. Costs shall include only construction costs and the cost to acquire any real estate needed for a bikeway or sidewalk. See example #1 and Figure 1.1, and example #2, and Figure1.2 for examples of calculating marginal costs for bikeway/sidewalk construction.

1.3.1.2.1.3 Calculation of Marginal Real Estate Costs for Bikeway/Sidewalk Construction

Case 1 Real Estate Costs - Only 20 percent of the cost to acquire real estate needed for a bikeway or sidewalk shall be considered a cost of the bikeway or sidewalk if all of the following apply:

- Existing right of way is sufficiently wide to establish the bikeway and sidewalk were the highway construction project to occur without any additional travel lanes.
- Additional real estate is needed to accommodate all needed travel lanes, bikeways and sidewalks.

See example #3 and Figure 1.3 for an example of Case 1 real estate costs.

Case 2 Real Estate Costs - If bicycle or pedestrian facilities currently do not exist on a highway, and right-of-way must be acquired solely for the provision of bicycle and pedestrian facilities, then 100 percent of the right-of-way acquisition costs can be attributed to the 20 percent disproportionate cost calculation. See example #4 and Figure 1.4 for an example of Case 2 real estate costs.

Handle compensable utility costs the same way as right-of-way costs. If utility relocation is needed solely for the addition of bicycle and pedestrian facilities and there currently is not room for these facilities within the existing right-of-way, 100 percent of the utility relocation costs can be allocated toward the 20 percent disproportionate cost calculation. If utility relocation is part of the whole right-of-way acquisition package needed to construct the roadway, only 20 percent of the utility relocation costs can be counted toward the 20 percent disproportionate cost calculation. Non-compensable utility costs are not included in the 20 percent calculation.

Handle the cost to acquire temporary and permanent limited easement the same way as right-of-way costs. If easements are needed solely for the provision of bicycle or pedestrian facilities and there is not enough room in the existing right-of-way for these facilities, 100 percent of the easement acquisition costs can be allocated toward the 20 percent disproportionate cost calculation. Otherwise, only 20 percent of the easement acquisition costs can be included in the 20 percent disproportionate cost calculation.

1.3.1.2.2 Examples

Example #1: Calculation of Marginal Construction Costs for New Bikeways– Rural Paved Shoulder

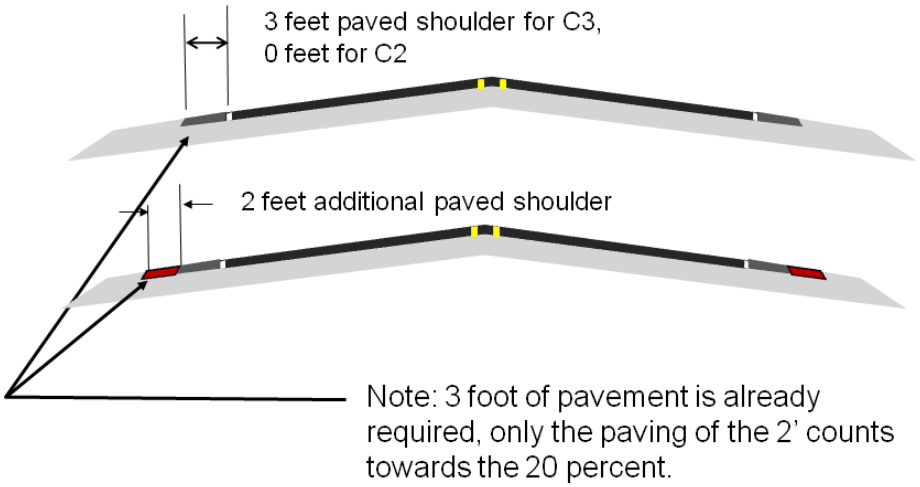

Figure 1.1 Example 1: New Bikeways - Rural Paved Shoulder

A rural state trunk highway carries 1500 vehicles per day (vpd) and has two 12-foot lanes and two 3-foot aggregate shoulders. The highway will be reconstructed to a C-3 classification with 5-foot paved shoulders to accommodate bicycles. The C-3 classification already requires a 6-foot shoulder of which 3 feet is paved. Therefore, the cost attributable to bicycle and pedestrian facilities is limited to the cost of the asphalt for 2 feet of each shoulder. The earthwork cost for widening of the shoulder to 6 feet, aggregate cost of the 6-foot shoulder, traffic control costs, and seeding costs cannot be included in the 20 percent disproportionate cost calculation because those costs would have been incurred even if no bicycle facility were provided.

Example #2: Calculation of Marginal Construction Costs for New Bikeways– Urban Street Widening

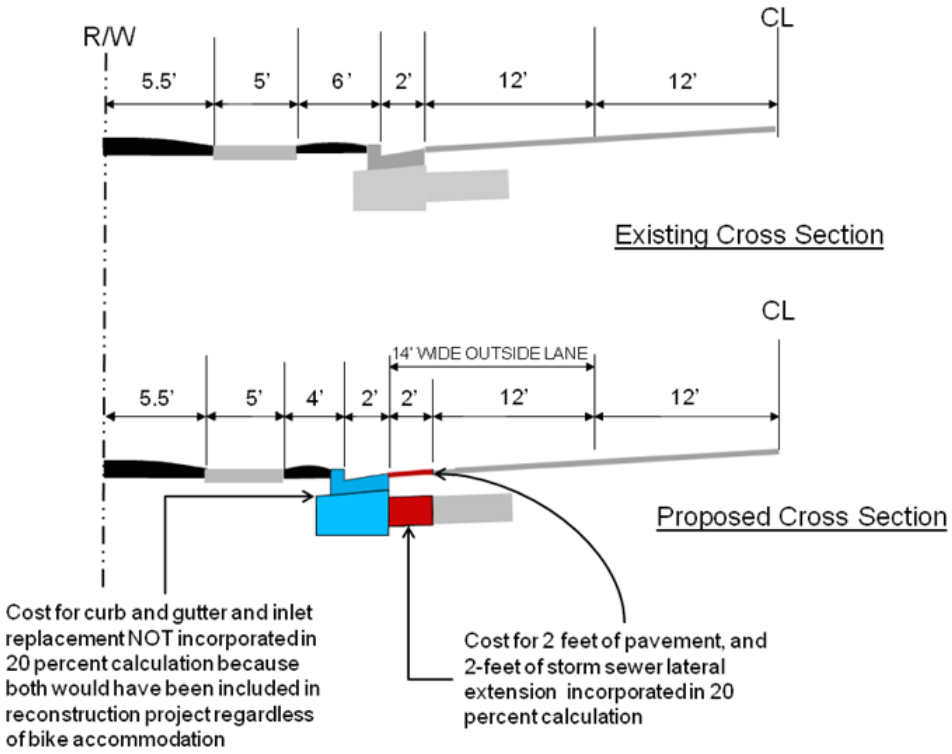

Figure 1.2 Example 2: New Bikeways - Urban Street Widening

An urban 4-lane undivided state highway carrying 10,000 vpd currently has four 12-foot lanes, 2-foot gutters, 6-

foot terraces, and 5-foot sidewalks. The project will reconstruct the roadway with two 12-foot inside lanes and two 14-foot outside lanes, while the terrace will be reduced from 6 feet to 4 feet. To accommodate bicycles, the curb line is moved, inlets are moved, and an additional 2 feet of pavement is provided. In this example, the cost for the 2-feet of pavement to create a wide outside lane, plus 2-feet of storm sewer lateral extensions associated with moving storm sewers are incorporated in the 20 percent disproportionate cost calculation since they are all required solely for the provision of bicycle facilities.

Example #3: Calculation of Marginal Construction & Real Estate Costs for Reestablishing Existing Sidewalks and Establishing New Bikeways– Urban Street Widening (Case 1 Real Estate Costs)

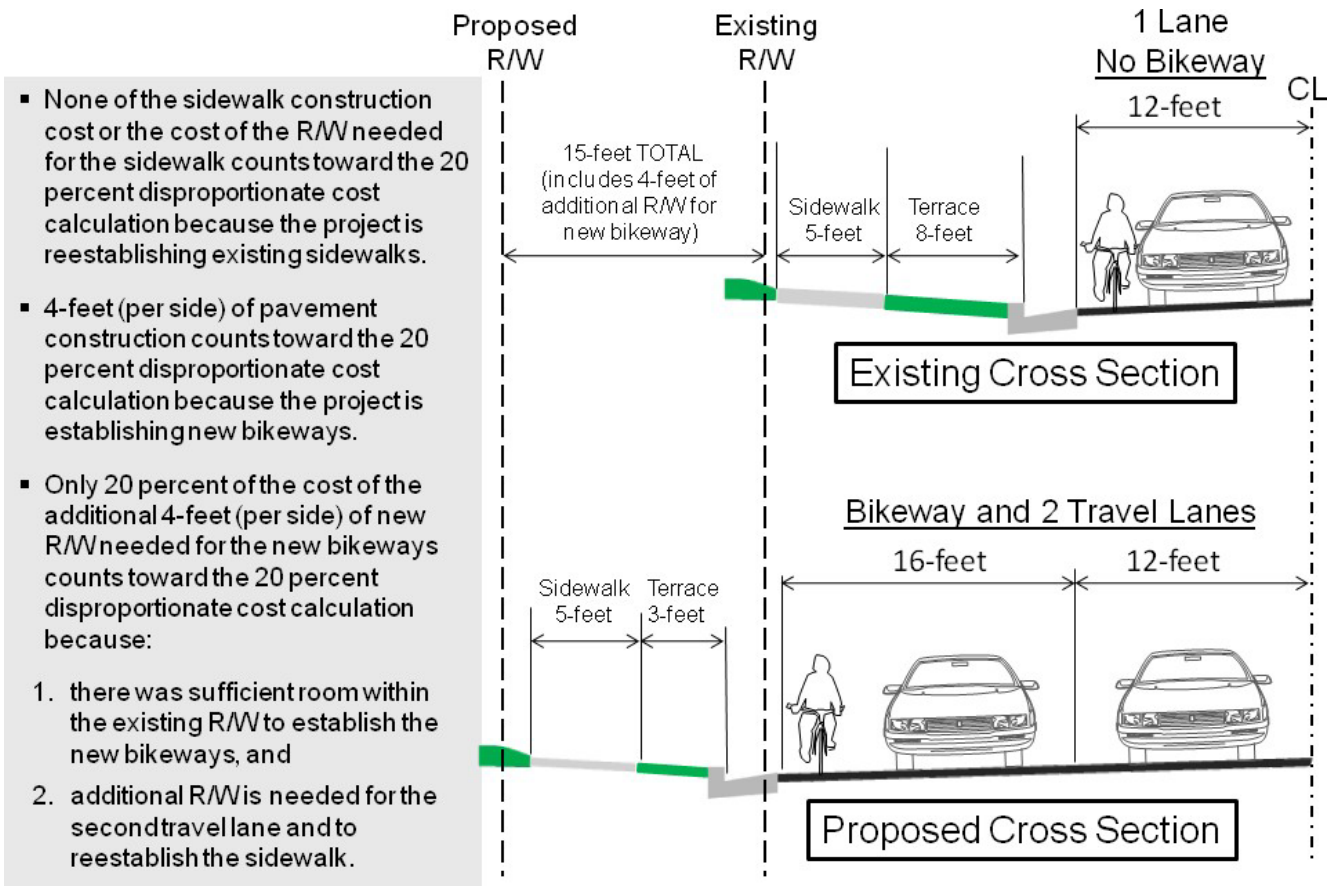

***Figure 1.3** Example 3: Reestablishing Existing Sidewalks and Establishing New Bikeways - Urban Street Widening (Case 1 Real Estate Costs)*

An existing 2-lane urban highway with sidewalks, but no bikeways, is expanded to four lanes with bikeways. The larger cross-section requires additional right-of-way, which needs to be wide enough to reestablish the existing sidewalks and to establish the new bikeways.

None of the sidewalk construction costs or sidewalk real estate costs counts toward the 20 percent disproportionate cost calculation because the project is reestablishig existing sidewalk.

Four feet of pavement are being added on both sides of the road for new bikeways. The construction cost for this additional pavement counts toward the 20 percent disproportionate cost calculation. An additional four feet of right-of-way is needed on both sides of the road to accommodate the new bikeways. Only 20 percent of the cost for this additional real estate counts toward the 20 percent disproportionate cost calculation because the project meets the Case 1 real estate criteria described in FDM 11-46-1.3.1.2.1.3.

Example #4: Calculation of Marginal Construction & Real Estate Costs for New Sidewalk (Case 2 Real Estate Costs)

- All of the construction cost of the sidewalk counts towards the 20 percent because the project is not reestablishing an existing facility
- All of the cost of the R/W needed for the sidewalk counts toward the 20 percent because there was not sufficient room within the existing R/W to accommodate the sidewalk

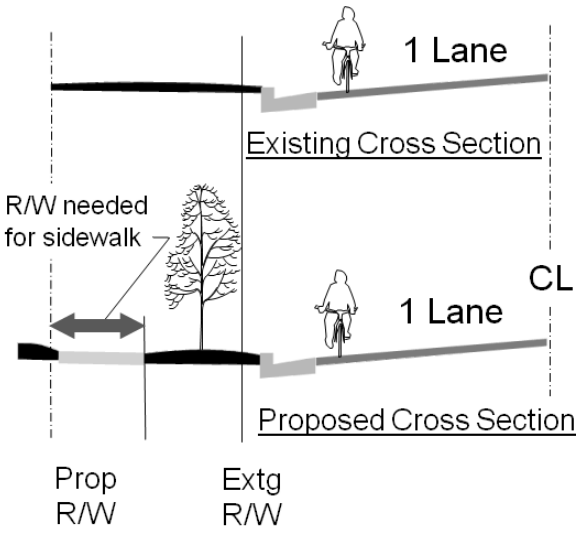

Figure 1.4 Example 4: Establishing New Sidewalk (Case 2 Real Estate Costs)

An existing two-lane urban highway without sidewalk is reconstructed to include a sidewalk and an 8-foot terrace. There is not enough existing right-of-way to accommodate either the sidewalk or terrace. The purchase cost of the right-of-way needed for the sidewalk counts fully toward the 20 percent disproportionate cost calculation because the project meets the Case 2 real estate criteria described in FDM 11-46-1.3.1.2.1.3. In addition, all sidewalk construction costs counts toward the 20 percent disproportionate cost calculation because the project is establishing new sidewalk.

The purchase cost of the right-of-way needed for the terrace does not count toward the 20 percent disproportionate cost because the terrace supports the roadway by providing room for snow storage, signage, and lighting.

1.3.1.3 Constrained Environments

Constrained environments may be used in due consideration evaluations. A May 21, 2010 letter (see Attachment 1.1) explains FHWA Wisconsin Division's position on this criterion.

> Until further guidance is developed, projects should consider this definition of constrained environment. A "constrained environment" is any area in which structures, improvements, natural resources, or historical or archaeological sites adjacent to the highway do not allow construction of all of the following on each side of the roadway unless the obstruction is eliminated:
>
> (a) A terrace at least 3 feet wide, including the width of the curb, and having no sidewalk.
>
> (b) A sidewalk that is either of the following:
>
> 1. Five feet wide, if adjacent to a terrace at least 3 feet wide.
> 2. Six feet wide, if adjacent to a curb or terrace less than 3 feet wide.
>
> (c) A bikeway.

In certain situations, it may not be possible to establish bikeways or sidewalks and they may be omitted from either or both sides of the roadway in a constrained environment where establishing them would have excessively negative impacts. However, those facilities shall be included to the greatest extent practicable and provide the highest level of accommodation while avoiding the constraint. This includes varying minimum widths, establishing bikeways or sidewalks using the amount of space remaining in the highway after the omission, and considering the establishment of omitted facilities nearby.

Impacts are considered excessively negative if:

- Constructing a sidewalk and bikeway or just a sidewalk reduces the terrace width to less than 3 feet for more than 50 percent of total project length.
- Constructing a sidewalk or bikeway requires eliminating structures or improvements adjacent to the highway that would dramatically reduce the aesthetic value or functionality of the remaining area.
- The environmental documentation process shows that providing bike or pedestrian facilities would result in loss or degradation of natural resources or has an adverse impact on historical or

archaeological sites potentially eligible for the National Register of Historic Places (NRHP).

This circumstance is likely to be most applicable in urban situations, often in traditional downtown districts where commercial buildings front the project roadway.

Bicycle and pedestrian facilities must be designed with sensitivity to the adjacent context. If bicycle or pedestrian facilities are not provided on a constrained corridor there would have to be substantial impacts on environmental resources, existing structures, or archaeological or historic sites potentially eligible for the NRHP. In most instances, this situation applies to traditional downtown districts where commercial buildings front the project roadway.

Because these locations often have existing sidewalks, this criterion most often applies to bicycle facilities. See Figure 1.5 for an example where providing bike accommodations would have a significant impact on both the outside use of the sidewalk and on the street trees. Explore a range of alternatives that have the greatest potential to satisfy the state statute and provide accommodations.

***Figure 1.5* Constrained Environment**

If possible, include sidewalks on both sides of the street. Consider installing a sidewalk on only one side of the street if limited by the constrained environment. See “WisDOT Guidelines for Sidewalk Placement” Table 4.1 of the February 2011 “Wisconsin Guide to Pedestrian Best Practices” *(6).*

Provide the highest level of accommodation while avoiding the constraint before omitting facilities. Evaluate various alternatives to create space for bicycle and pedestrian accommodations, including:

- Reduce the number of lanes and lane widths to the minimum necessary to accommodate projected traffic volumes
- Shift the alignment of the roadway.
- Utilize a ‘road diet’, which converts a 4-lane undivided roadway into a 3-lane roadway with bike lanes
- Accommodate parking* needs in another fashion
- Eliminate parking* from one or both sides of the street
- Eliminate parking* in areas requiring a turn lane
- Eliminate the terrace for a short distance to avoid a particular constraint. This will require the use of a 6-foot sidewalk.
- Reduce the terrace width to less than 3-feet for not more than 25 percent of the overall project length in order to establish a bikeway. This will require the use of a 6-foot sidewalk.
- Include a narrower bikeway

It is acceptable to consider retaining parking on an urban section when evaluating a location for a “constrained environment” exception. However, it is necessary to consider the trade-offs and to explore all options for providing bikeways and sidewalks in a “constrained environment”. See FDM 11-46-15.3.1.2 for additional guidance.

Documentation of decisions that omit facilities due to a constrained environment should include:

1. Location and Type of Project

   Provide the existing typical section(s), the type of project considered (rehabilitation or modernization), and the average traffic volumes for the roadway. Provide drawings that illustrate the proposed roadway section(s); existing right-of-way; pertinent mapping features such as building and driveway

locations, retaining walls, utility and light poles; and affected landscaping such as street trees. Include pictures showing the resource(s) or structure(s) that must be avoided.

2. Alternatives Considered for Bicycle and Pedestrian Facilities

   As stated in the “excessive cost” text, the alternative development process is the most critical aspect of providing bicycle and pedestrian facilities. Some creativity may be necessary in developing reasonable bicycle and pedestrian alternatives that are sensitive to the corridor and that avoid buildings/resources to the extent possible. Review the bicycle and pedestrian alternatives considered with the Regional Bicycle/Pedestrian Coordinator and BPD Project Oversight Engineer. For example, using a single typical section may not be reasonable if it is necessary to avoid a structure on a corridor. It may be appropriate to eliminate the terrace and use a 6-foot sidewalk for 100 feet to preserve the structure and maintain continuous bicycle and pedestrian facilities.

   To accommodate bicycle and pedestrian facilities, narrower widths for travel lanes, medians, terraces, and gutters should be explored and incorporated when needed. For example, a 1-foot gutter pan with other lane width reductions may allow enough room for a bikeway to be added to the adjacent travel lane. If adding a 1-foot gutter pan, check drainage impacts on the project.

3. Type of Resource Being Avoided

   Describe the type of resource being avoided and the impact and magnitude that provision of bicycle (or pedestrian) facilities would cause. For example, eliminating 3 parking spaces from an 18-space parking lot is significantly different than eliminating 3 parking spaces from a 5-space parking lot. Similarly, removing three street trees is different than removing all trees from a half-mile corridor. Provide a cross section of the roadway with the minimum bikeway and pedestrian facility clearly showing how even the minimum cross section adversely impacts the resource or structure being preserved.

4. Bicycle and Pedestrian Measures Being Incorporated

   Describe the type of bicycle and pedestrian facilities being incorporated in the constrained environment. The project should include bicycle and pedestrian facilities to the greatest extent practicable. However, in a constrained environment, omitting a sidewalk or bikeway, or both, from either or both sides of the roadway, or varying the minimum widths may be necessary. If it is necessary to omit a bikeway or sidewalk for a portion of the project, state how bikeways or sidewalks are established after the omission for the remainder of the project. Consider establishing those omitted facilities nearby the constrained environment, such as along a parallel corridor, and document the details of this analysis.

This documentation can be in the form of a Technical Memo and should be referenced and added as an attachment in the DSR.

1.3.1.4 Absence of Need

For evaluating Absence of Need, both bikeway and sidewalk needs are associated with current and expected future residential/commercial land uses and land use densities. Bikeway needs are also associated with current and expected future traffic volumes. Criteria for this will vary depending on whether an area is an “Outlying District”, “Rural Area”, “Semi Urban District” or “Urban Area”. Definitions for these areas are:

- (b) “*Outlying District” means the territory contiguous to and including any highway within the corporate limits of a city or village where on each side of the highway within any 1,000 feet along such highway the buildings in use for business, industrial or residential purposes fronting thereon average more than 200 feet apart*.”
- (c) "*Rural area" means any area that is not an urban area or a semi urban district.*
- (d) *“Semi urban district” means the territory contiguous to and including any highway where on either side of the highway within any 1,000 feet along such highway the buildings in use for business, industrial or residential purposes fronting thereon average not more than 200 feet apart or where the buildings in use for such purposes fronting on both sides of the highway considered collectively average not more than 200 feet apart.”* [4]
- (e) *“Urban area" means any area which is an urbanized area or urban place, as determined by the Department under 23 USC 101 (a) and regulations adopted under 23 USC 101 (a) and approved by*

[4] “Fronting thereon” or “fronting on” will include any portion of a property line that abuts the highway in question.

the appropriate federal authority." [5]

See FDM 11-46-1.3.1.4.1 for "Absence of Need" criteria for sidewalks. See section FDM 11-46-1.3.1.4.2 for "Absence of Need" criteria for bikeways.

Documentation of decisions where sidewalks and bikeways are not provided, should include:

Location, type of Project, and facility being excluded: Provide the existing typical section as well as the type of project considered (rehabilitation or modernization). Describe the bicycle or pedestrian facility that would not be established.

Basis for not establishing: Reasons for not establishing a facility will vary. One of the most common reasons for not providing a bikeway is a low volume roadway (under 750 for rural areas and under 1,500 for urban and semi urban areas). Similarly, sidewalks will rarely be built within rural areas.

Definition of the Area: Identify areas as urban, semi urban, outlying, or rural. If the highway or street project involves a town center or an outlying district, include a map or aerial photo that supports the low-density definition (on average, more than 200 feet between buildings over a length of 1,000 feet).

Attach pertinent portions of the community, county and regional land use plans and long-range transportation plans for projects within 3 miles of a community.

Mitigation: Describe the conditions that will remain for bicyclists and pedestrians. For example, a low volume roadway without paved shoulders may still be acceptable for the area given the types of cyclists that will be using the roadway. A short segment of wide paved shoulder may be acceptable for a town center with only eight homes spread over 2,000 feet. Discuss any mitigation efforts that will improve conditions for bicyclists or pedestrians short of complying with the design criteria in this procedure or in the FDM.

This documentation can be in the form of a Technical Memo and should be referenced and added as an attachment in the DSR.

1.3.1.4.1 Sidewalks

For sidewalks, adjacent land use and density determines "Absence of Need", not actual pedestrian counts or projected pedestrian counts. Conditions in which sidewalks should be established will vary depending on whether an area is an "urban area", "semi-urban district", "outlying district" or "rural area". See WisDOT classification maps for rural, urban, and urbanized areas, as well as other incorporated cities and villages meeting standards for small community criteria.

Urban Areas and Semi-Urban Districts: Sidewalks should be established in any urban area or semi-urban district. There are few areas within a city or village where it is not appropriate to include sidewalks.

Outlying Districts and Rural Areas: The usual practice is to omit sidewalks in an outlying district or rural area because the presumption is that sidewalk use will be too sparse to justify their inclusion. However, establishing sidewalks should be considered in any outlying district or rural area if, based on an official land use plan, there will be significant development within the outlying district within the next 10 years (i.e., the area will become a "Semi Urban District" or an "Urban Area").

Also, if land use is expected to change over the design life[6] of a project such that sidewalk would likely be needed by the end of a project's design life then give greater weight to the land use projected for the second half of the design life than for the first half. This does not necessarily mean including

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[5] 23 USC 101 (a): "(36) URBAN AREA.-The term ''urban area'' means an urbanized area or, in the case of an urbanized area encompassing more than one State, that part of the urbanized area in each such State, or urban place as designated by the Bureau of the Census having a population of 5,000 or more and not within any urbanized area, within boundaries to be fixed by responsible State and local officials in cooperation with each other, subject to approval by the Secretary. Such boundaries shall encompass, at a minimum, the entire urban place designated by the Bureau of the Census, except in the case of cities in the State of Maine and in the State of New Hampshire.

(37) URBANIZED AREA. -The term ''urbanized area'' means an area with a population of 50,000 or more designated by the Bureau of the Census, within boundaries to be fixed by responsible State and local officials in cooperation with each other, subject to approval by the Secretary. Such boundaries shall encompass, at a minimum, the entire urbanized area within a State as designated by the Bureau of the Census."

http://www.gpo.gov/fdsys/pkg/USCODE-2010-title23/pdf/USCODE-2010-title23-chap1-sec101.pdf

[6] For purposes of this evaluation, use a "design life" of 20 years for a roadway, and 75 years for a bridge

sidewalk as part of the project. It could mean designing the project to make it easier to install sidewalk in the future.

For example, on a structure project:

- If planned growth will affect the need for sidewalk in a 0 to 10-year period, add sidewalk to both sides of the structure and on the approaches.
- If planned growth will affect the need for sidewalk in a 10 to 20-year period, add sidewalk to one side of the structure and approaches. Design the other side of the structure and approaches to facilitate adding sidewalk in the future (e.g., construct a wider substructure for the bridge).
- If planned growth will not affect the need for sidewalk for over 20 years, do not add sidewalk but consider designing the structure and approaches to facilitate adding sidewalk in the future (e.g., construct a wider substructure for the bridge).

1.3.1.4.2 Bikeways

For bicycle accommodations, often few improvements are needed on low-volume roadways where a bicyclist can use a full travel lane or adequate roadway width already exists for a motorist to safely pass a bicyclist. Evaluating establishing a bikeway may be more involved and will vary depending on whether an area is an "urban area", "semi-urban district", "outlying district" or "rural area".

Urban Areas and Semi-Urban Districts: Bikeways are generally needed on highways with a design year ADT>=1,500 within an "Urban Area" or "Semi Urban District".

Outlying Districts and Rural Areas: It may not be necessary to provide additional roadway improvements in an outlying district or rural area if the highway that is the subject of the modernization project has, or upon completion will have, less than 750 ADT and any of the following applies:

(a) The average bicycle traffic volume[7] on the highway is or is expected to be less than 25 per day during the 10 most traveled days for bicycling of the year.

(b) The highway is not identified in part of a government bike transportation plan, in the Wisconsin Bicycle Transportation Plan or in any other bicycle plan endorsed by or supported by WisDOT.

(c) The highway does not provide a connection of one mile or less between any existing or planned bike routes, as defined in State Statue 340.01 (5m), Stats.

(d) The highway is not a short connection of one mile or less needed to connect an existing bikeway to the nearest local road."

Consider a bikeway on a highway with a design year ADT<750 if, based on an official land use plan, there will be significant development within the outlying district within the next 10 years, and establishing a bikeway will do any of the following:

- Complete a gap of one mile or less in an otherwise continuous bike route.
- Make a connection of not more than 3 miles from communities or urban areas to a town or county roadway network, excluding any dead-end roadway.

Also, if land use is expected to change over the design life[8] of a project such that a bikeway should be provided by the end of a project's design life, then give greater weight to the land use projected for the second half of the design life than the first half. This does not mean including a bikeway as part of the project. It could mean designing the project to make it easier to install a bikeway in the future.

1.3.1.5 Refusal to Maintain Sidewalks

In the past FHWA has indicated that it does not allow facilities to be omitted based solely on the lack of community support for the maintenance of sidewalks for urban and suburban sections of the NHS (see May 21, 2010 letter from FHWA Wisconsin Division office in Attachment 1.1). Currently, it is recommended to continue this approach on NHS roadways.

Often, one of the biggest issues related to the inclusion of sidewalks relates to their maintenance and

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[7] Volumes shown are two-way bicycle traffic. With respect to the criteria of 25 bicyclists per day, it may not be necessary to actually count the current number of bicyclists using a highway or to go through an involved methodology to project the anticipated number of bicyclists. For example, if a bicycle club uses the highway as an informal bicycle route, there are likely to be 25 cyclists using the roadway. Also, certain land uses on or near the highway can be used to estimate usage. For example, subdivisions, parks, schools and major businesses can all generate at least light to moderate numbers of bicyclists (on average, during the summer approximately 2 to 3 percent of all trips in the state are by bicycle). Assume that all roadways within 2 miles of an incorporated area meet these criteria unless counts specifically prove otherwise.

[8] For purposes of this evaluation, use a "design life" of 20 years for a roadway, and 75 years for a bridge

maintenance costs. Most municipalities in Wisconsin have passed ordinances that require landowners to clear snow, ice, and debris from sidewalks that are adjacent to their property. Even though, according to State Statute 66.0907(5) Wis. Stats, sidewalk maintenance is ultimately the municipality's responsibility, the initial burden falls on the adjacent landowners. [9] Objections to the placement of new sidewalks on a project often result from property owners' concerns regarding the future maintenance of the new sidewalks.

If a community considers not providing sidewalks it should be based on their inability to maintain them. Conditions for which a local unit of government (city, village, town, or county) can document their inability to maintain sidewalks on non-NHS highways, should include the following:

1. There are no existing sidewalks on the highway system[10] under the local unit of government's jurisdiction.
2. The local unit of government has no ordinance that requires the installation of sidewalks or that requires the removal of snow and ice from sidewalks.
3. The local unit of government lacks sufficient equipment for the efficient removal of snow and ice from sidewalks.

If it is determined to establish sidewalks as part of the roadway improvement project, the local unit of government must agree in writing to maintain any sidewalks added to the project when federal or state funds are used. Work with the local unit of government, to develop and execute a State-Municipal Agreement and, for STH projects, a Maintenance Agreement early in the planning and design process. This allows the local unit of government to decide early in a local road project whether to accept the maintenance of sidewalks or to forego the use of state or federal funds on the local road project. Similarly, the Department may put a STH project on hold until the local unit of government decides to accept the maintenance of sidewalks. Alternatively, for STH projects, the Department may decide to substitute a perpetuation project type, such as resurfacing, if pavement condition or other deficiencies require more immediate attention.

1.4 References

Refer to FDM 11-46-99 for list of references.

LIST OF ATTACHMENTS

Attachment 1.1	FHWA letter
Attachment 1.2	DOJ/DOT Joint Technical Assistance on the ADA Title II Requirements to Provide Curb Ramps when Streets, Roads, or Highways are Altered through Resurfacing
Attachment 1.3	Glossary of Terms for DOJ/FHWA Joint Technical Assistance on the ADA Title II Requirements to Provide Curb Ramps when Streets Roads or Highways are Altered through Resurfacing

FDM 11-46-5 Pedestrian Facilities

February 15, 2024

5.1 Introduction

In conformance with federal law and policy and pursuant to State Statute 84.01(35), the Department shall give due consideration to establishing bikeways and pedestrian ways on all modernization projects and applicable rehabilitation projects depending on the extent of work funded in whole or in part from state or federal funds. See FDM 11-46-1 for guidance.

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[9] Section 66.0907 (5), Wis. Statutes: Snow and ice. The board of public works shall keep the sidewalks of the city clear of snow and ice in all cases where the owners or occupants of abutting lots fail to do so, and the expense of clearing in front of any lot or parcel of land shall be included in the statement to the comptroller required by sub. (3) (f), in the comptroller's statement to the city clerk and in the special tax to be levied. The city may also impose a fine or penalty for neglecting to keep sidewalks clear of snow and ice.

[10] Section 340.01 (22) Wis Statutes. "Highway" means all public ways and thoroughfares and bridges on the same. It includes the entire width between the boundary lines of every way open to the use of the public as a matter of right for the purposes of vehicular travel. It includes those roads or driveways in the state, county or municipal parks and in state forests which have been opened to the use of the public for the purpose of vehicular travel and roads or driveways upon the grounds of public schools, as defined in s. 115.01 (1), and institutions under the jurisdiction of the county board of supervisors, but does not include private roads or driveways as defined in sub. (46).

Department policy for other project types, such as perpetuation and certain rehabilitation projects, may require an evaluation to include bicycle and pedestrian accommodations where possible/practical within the scope of the project.

Pedestrian facilities on roadways typically include sidewalks, shared-use paths, curb ramps and crosswalks. See the following FDM sections for guidance on pedestrian facilities:

- FDM 11-46-1 (Statutory requirements and policy)
- FDM 11-46-5.1 (Borders, sidewalks and terraces)
- FDM 11-46-10 (Curb Ramps and Crosswalks)
- FDM 11-46-15.6 (Shared-use paths and Roundabout sidepaths)
- FDM 11-46-20 (Publicly owned trail crossings of rural highways)
- FDM 11-20-1 (Urban cross sections)

Many of the guidelines in this procedure were developed using AASHTO, U.S. Access Board *(7)*, FHWA guides and design criteria *(20)* and WisDOT's *Wisconsin Guide to Pedestrian Best Practices (6)*. Collectively, these guidelines and design criteria are the most applicable for the design of pedestrian accommodations on state and federally funded projects.

FHWA memos *(19) and (19a)* encourage agencies to use other guides and resources that build upon the flexibilities provided in the AASHTO guides. These other guides and resources can provide useful information in project planning and development when used in context with AASHTO, U.S. Access Board, FHWA, and WisDOT design guidance. If a project proposes a pedestrian facility treatment(s) outside of Wisconsin guidelines, approval is required. Contact WisDOT regional bike and pedestrian coordinators to initiate this process. Use the WisDOT regional bike and pedestrian coordinators as a resource for planning and designing bike and pedestrian facilities on state and federally funded projects. Also, see the "references" section for additional documents and resource information.

5.1.1 ADA Compliance

When pedestrian facilities are provided, they are required to be accessible to people with disabilities.[11] Furthermore, there are Americans with Disabilities Act (ADA) design guidelines and standards that must be applied in roadway improvement projects with regards to pedestrian facilities within the public right-of-way.

All rehabilitation and modernization improvements that meet the ADA "alteration" definition will require curb ramp improvements. Most pavement strategies under perpetuation improvements meet the ADA "alteration" definition and will also require curb ramp improvements. Refer to Attachment 1.2 and Attachment 1.3 for a list of pavement strategies meeting the ADA "alteration" definition. FDM 11-1 Attachment 10.1 shows the relationship between Improvement Strategies, Improvement Concepts and Application of Design Criteria.

Newly constructed and altered facilities must be ADA-compliant. New construction is to provide the highest level of accessibility and meet current ADA accessibility standards. For altered facilities, there is some flexibility to work within existing conditions. The flexibility is provided to recognize that retrofits are different from new construction. When existing conditions alter portions of facilities and if it is technically infeasible to meet modernization design criteria, the facilities must meet current design criteria to the maximum extent feasible and the design decisions must be documented. Alterations must not decrease the accessibility of a facility.

The Department looks to meet the needs of all disabled users. To ensure that a project can meet accessibility requirements, a scoping of accessibility needs is required. During scoping, evaluate the existing right-of-way adequacy for bike and pedestrian facilities, particularly for accommodating full ADA-compliant curb ramps. At a minimum for ADA compliance, consider acquiring temporary limited easements if construction operations and final sloping requires access onto adjacent private property. Best practices may include working jointly with local units of governments to meet full curb ramp ADA requirements during an alteration-type project versus performing several partial curb ramp improvements with future projects, as this is the most cost-effective approach. If a public entity does not control sufficient right-of-way, it should seek to acquire the necessary right-of-way and document those efforts. If a complaint is filed, public entities will likely need to demonstrate that reasonable efforts were made to obtain access to the necessary right-of-way. Improvements must incorporate ADA accessibility standards to the maximum extent feasible within the existing right-of-way.

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[11] Title II of the Americans with Disabilities Act (ADA) Accessibility Guidelines (ADAAG) and Section 504 of the Rehabilitation Act (49 CFR, Part 27) Act (49 CFR, Part 27).

5.1.2 Technical Infeasibility

Technical infeasibility is when there are existing physical or site constraints[12] that limit or restrict the ability to meet current minimum ADA accessibility standards to the full extent for new construction of facilities which are necessary to provide accessibility. Examples of existing physical or site constraints that may make it technically infeasible to make a facility fully compliant include but are not limited to the following:

- Right-of-way availability - If sufficient right-of-way is not owned, land acquisition (including easements) should be acquired to achieve full ADA compliance. Where right-of-way is not able to be acquired, improvements within the existing right-of-way must incorporate the ADA accessibility standards to the maximum extent feasible (see FDM 11-46-1.1.5). Technical infeasibility documentation will still need to be provided accordingly.
- Underground structures that cannot be moved without greatly expanding the project scope.
- Adjacent developed facilities, including buildings that would have to be removed or relocated to achieve accessibility.
- Drainage cannot be maintained if the feature is made accessible.
- Significant natural or historic features that would have to be altered in a way that lessens their aesthetic or historic value.
- Underlying terrain that would require significant expansion of the project scope to achieve accessibility.
- Street grades within the crosswalk exceeding the maximum cross slopes for pedestrian access route, if an engineering analysis has concluded that it cannot be done without greatly expanding the project scope (for example, changing from resurfacing an intersection to reconstructing the intersection).

Technically infeasible may also apply based on the project scope. Alterations of streets, roads, or highways include activities such as reconstruction, rehabilitation, resurfacing, widening, and projects of similar scale and effect. This requires curb ramps to be addressed.[13] The scope of an alteration project is determined by the extent the alteration project directly changes or affects the public right-of-way within the project limits. The public agency or municipality must improve the accessibility, to the maximum extent feasible, of only that portion of the public right-of-way changed or affected by the alteration. For example, if a project resurfaces the street, for accessibility purposes the curb ramps and pavement at the pedestrian crosswalk are in the scope of the project, but the sidewalk between intersections may not be in the scope of the project. Any of the features disturbed by construction must be replaced so that they are accessible. All remaining access improvements within the public right-of-way shall occur within the schedule provided in the public agency/municipality's planning process (FHWA Q&A about ADA, question 20. *(25)*. Unaltered, non-compliant facilities will then be improved to meet design criteria or to the maximum extent feasible with a stand-alone or future project. Implementation of the WisDOT transition plan may be used to prioritize, schedule and rectify the non-compliant facilities. At scoping, include any evaluation of the condition of existing sidewalks, shared use paths or other pedestrian facilities.

Document technically infeasible design decisions in the DSR. Tables summarizing the evaluation analysis for infeasible design decisions may be used as a DSR attachment to supplement conclusions. This documentation will serve to demonstrate the situation was evaluated and curb ramps improved to the maximum extent feasible. The documentation will also help address future concerns should they arise.

For modernization projects, technically infeasible should seldom be a factor. In projects that are an alteration per ADA, curb ramps are required to be installed or updated[14] within the project scope to the maximum extent feasible. Cost is not a reason to exclude improvements. At a minimum, if other pedestrian facilities are altered as part of the project, then those altered facilities must be improved or upgraded to meet current design criteria. Although additional work beyond curb ramp improvements may not be required, FHWA and WisDOT policy is to take the opportunity to evaluate and consider additional improvements to unaltered facilities where possible within the project scope to improve pedestrian access. It may be more efficient and beneficial to include

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[12] Existing physical constraints include, but are not limited to, underlying terrain, right-of-way availability, underground structures, adjacent developed facilities, drainage, or the presence of a notable natural or historic feature (i.e. aesthetic features such as stone walls, statues, or items with historical value or significance) or facility (generally a structure or something created to serve a certain function). Where existing physical constraints make it impractical for altered elements, spaces, or facilities to fully comply with new construction requirements, compliance is required to the maximum extent practicable/feasible within the scope of the project.

[13] https://www.fhwa.dot.gov/civilrights/programs/doj_fhwa_ta.cfm

[14] See FDM 11-46-1.1.3 and FDM 3-5-1.1.

improvements as part of the existing project.

5.2 Borders and Zone System

A border is the area adjacent to a street, measured from the face of curb to the right-of-way line, and is described using the zone system, as shown in Figure 5.1. The zone system helps to better define the usage of space between the face of curb and the right-of-way line or property line, and consists of four distinct areas:

1. Curb zone
2. Planter/furniture zone
3. Pedestrian or sidewalk zone
4. Frontage or sidewalk clearance zone

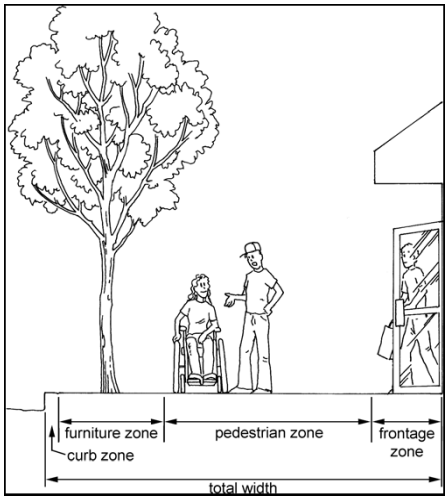

Figure 5.1 Zone System (7)(23)

See Attachment 5.1 for illustrations and descriptions of various scenarios for incorporating sidewalks into the project under the following conditions:

- Protruding objects and vertical clearance
- Elevation difference between street and building
- Sidewalk cross slope
- Constructing a sidewalk through a driveway apron

Many municipalities have developed their own design criteria and policies that may vary somewhat from those indicated in this procedure. Use the municipality's design criteria, when practical and when not in conflict with WisDOT policy. Desirably, design an urban project from the outside toward the center so as first to assure that sidewalks, curbs, driveway grades etc., have the best possible fit to the abutting property.

On urban projects, problems such as steep driveway and sidewalk ramp grades, poor drainage designs and poor blending of roadways and border areas are often due to inadequate design of urban profiles and cross sections. When laying out an urban profile it may be helpful to develop point profiles of critical grades at intersections, sidewalks, adjacent buildings or properties, driveways and other features to visualize key profile elevations and features. Use these key feature profiles and existing curb profiles to develop centerline and traffic lane profiles.

Roadways at some locations are on or along a natural ridge causing elevations to be higher on one side and lower on the other side of the roadway. This also affects and complicates the design of the border area. To better fit site conditions at these locations, cross section designs may need to incorporate elements such as special warping of the parking lanes and possibly travel lanes, steeper slopes and possibly retaining walls within the border area. Make sure that pavement cross-slope transitions are not too abrupt, and that the pavement cross slope rollover does not exceed the maximum allowed (see FDM 11-10-5.3.3 and FDM 11-20-1.1 for urban cross slope requirements). Other design issues at these locations include:

- Adequate drainage to prevent ponding of water and creation of ice patches due to snow melt.
- Designing sidewalks and curb ramps to comply with ADA requirements.
- Driveway grades and break-over angles.

- Preventing water from back draining towards existing houses and or buildings.

5.2.1 Sidewalks

Sidewalks on both sides of urban streets are typical treatments on all federal or state-funded projects (on the state highway system and local road system). It is most practical and cost-effective to incorporate sidewalks when the street is newly constructed or reconstructed.

Generally, sidewalks are placed higher than the curb top and sloped to drain toward the street. Changes in level are vertical elevation differences between adjacent surfaces and are generally not to exceed 0.5 inches (i.e. gutter flow line to top of curb cut for curb ramp installation). Changes in level are important in the sidewalk environment, especially to impaired users.

Minimum sidewalk width is 5 feet if adjacent to a terrace that is equal to or greater than 3-feet wide.

Minimum sidewalk width is 6 feet back of curb if adjacent to a terrace that is less than 3-feet wide. In this case, there will not be enough room within the terrace to place signs, utility poles, light poles, hydrants, or other fixed objects.

Provide wider sidewalk if any of the following conditions apply:

- Higher pedestrian traffic is anticipated such as in a town center area or central business district.
- There are signs, utility poles, light poles, hydrants, or other fixed objects that intrude into the pedestrian zone.
- Angle parking is used, and the vehicle overhang intrudes into the pedestrian zone (note: angle parking is not allowed except in certain limited situations – see FDM 11-20-1.6.1).

The sidewalk slope shall be 5 percent maximum. Where the sidewalk or pedestrian access routes are within a street or highway right-of-way, the running grade is permitted to be equal and shall not exceed the general grade established for the adjacent street or highway (*PROWAG, Chapter R3*).

A sidewalk segment that is not contained within a street or highway right-of-way with a running slope greater than 5 percent and up to a maximum of 8.33 percent shall have 5-foot by 5-foot level landings at each 2.5 feet maximum of vertical change in grade. Do not exceed a 2 percent slope in any direction on the landing. If there is a rise greater than 6 inches, handrails shall be used. (*PROWAG, Chapter R4*)

For the construction of new sidewalk routes, avoid constructing only stairs or steps for primary access, since they are difficult or impossible to negotiate by pedestrians with mobility impairments and are not part of an accessible route. Where stairs currently exist, evaluate designs that remove stairs and provide an accessible route.

The sidewalk cross slope shall be 1.5 percent with a construction tolerance of ±0.5 percent, as stated on SDD 8D5. The maximum sidewalk cross slope according to ADA is 2.0 percent and the minimum cross slope to achieve drainage is 1.0 percent. If this cross slope with this construction tolerance cannot be built, then constructability is “technically infeasible”. Document this condition in the DSR.

There may be locations where a sidewalk may be constructed with less than a 1.0 percent cross slope. If the longitudinal sidewalk slope is greater than 1 percent, it has been determined that there will be no standing water or ponding in these situations.

Transitional sections of sidewalk that connect unaltered sections of existing sidewalk and new curb ramp/sidewalk must comply with ADA technical requirements to the maximum extent feasible. Modifications must not decrease or have the effect of decreasing the accessibility of a facility. Typically, one or two sections of sidewalk (typical length 5 to 10 feet) may be all that is needed for this transition. Document design decisions in the DSR when complying with ADA requirements to the maximum extent feasible.

Curb ramps and detectable warning fields are required in areas with curb and sidewalks. Information on curb ramps is provided in FDM 11-46-10 and SDD 8D5.

See Chapter 5, “Designing Pedestrian Facilities”, of the Wisconsin Guide to Pedestrian Best Practices *(9)* for more detailed information regarding sidewalk design, including guidance on:

- 5.3.1.1. The purpose of sidewalks and general considerations
- 5.3.1.2. Specific design parameters for sidewalk corridors
- 5.3.1.2.1. Corridor widths
- 5.3.1.2.2. Cross slope
- 5.3.1.2.3. Grade/running slope
- 5.3.1.2.4. Surface material

- 5.3.1.2.5. Driveways and sidewalks
- 5.3.1.2.6. Side slopes and vertical drops
- 5.3.1.2.7. Obstructions and other pedestrian obstacles
- 5.3.1.2.8. Street trees and planting strips
- 5.3.1.2.9. Streetscape
- 5.3.1.2.10. Lighting for sidewalks.

Also see the "NACTO Urban Street Design Guide" (23)

5.2.1.1 Walkway/Sidewalks in Areas with a Rural Cross Section

Like sidewalks in urban areas, sidewalks in rural areas must be adequately separated from vehicle travel lanes. Where sidewalks do not exist, pedestrians use shoulders as walkways. Walkways are defined as the continuous portion of the pedestrian access route that is connected to street crossings by curb ramps or blended transitions[15] *(PROWAG, Chapter R1) (26)*. However, Wisconsin State Statute 340.01(54) and 340.01(58) does not define roadway shoulders as legal sidewalks or pedestrian facilities. Even though roadway shoulders are not legal pedestrian facilities and cannot legally be designated as pedestrian access routes, the occasional pedestrian that uses a shoulder as a walkway, benefits from a wide paved shoulder. Evaluate the options described under this subsection below when encountering the following conditions:

- Along places where pedestrians are commonly using the shoulders
- Where footpaths indicate that a separate walking facility is needed
- Along a transitional area where residential and commercial development creates a demand for pedestrian facilities

Sidewalks should be designed and constructed along the outside of the ditch on top of the backslope within the right-of-way. It is important to review the constraints that may prevent providing a sidewalk at this location. If the entire distance of the proposed project cannot accommodate the sidewalk outside the ditch area, then perhaps most of it can be.

The next best alternative to installing a sidewalk outside the ditch is to install a sidewalk at least 5 feet from the edge of where the shoulder would be located even if the existing shoulder does not meet design criterion. This provides room for the shoulder to be updated to the design criteria and shouldn't require moving the walkway in the future. Provide a minimum of five feet of separation between the shoulder and the sidewalk. The minimum 5-foot separation needs to be constructed with different material than the shoulder material. In other words, if the inside portion part of a shoulder, say 3 to 5 feet or so, is paved and the outside portion is aggregate then provide a minimum 5-foot grass separation strip between the outside edge of aggregate shoulder and the inside edge of sidewalk. This is similar to the development of a shared use path with a separation between the shoulder and the path.

When planning for a walkway adjacent to a rural cross-section roadway, always consider final sidewalk location with respect to clear zone or lateral clearance requirements for both existing and ultimate cross section for the roadway's design classification. Additional drainage features may be needed, such as a swale, inlets and storm sewer between shoulder and sidewalk. Consider sloping sidewalk toward the right-of-way and away from roadway if ditching exists. Coordinate with the municipality to address snow removal and minimize freeze/thaw potential on the sidewalk. Document roadside design decisions in the DSR.

5.2.1.2 Sidewalks on Rural Bridges

Consider sidewalks on rural bridges at the following locations:

1. In growth areas around cities, villages, and urban areas where the need for sidewalks may not be readily apparent but will be necessary for future growth as documented in community and regional land use and long-range transportation plans.
2. In town centers where sidewalks are being considered or included on the rest of the roadway because of adjacent land use densities.

Bridges are designed to last up to 75 years. By comparison, reconstructed rural roadways may have useful lives of up to 20 years. While retrofitting sidewalks onto roadways is usually relatively easy, retrofitting sidewalks onto existing bridges is not. Consult with the Bureau of Structures (BOS) if a structure design needs to accommodate future sidewalk.

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[15] WisDOT does not construct blended transition curb ramps.

See FDM 11-35-1.6 and FDM 11-35 Attachment 1.1 for additional guidance.

5.2.2 Terraces

A terrace is the area between the back of the curb and the edge of the sidewalk. The terrace area usually consists of grass, but paved terraces are common in areas with heavy pedestrian usage, such as central business districts.

Terrace width varies but it is generally best to provide 6-feet or more to accommodate snow storage, signing, utilities, plantings and other uses while still maintaining the required lateral clearance from the face of curb (refer to FDM 11-15-1 and FDM 11-20-1 for guidance on lateral clearance). Generally, provide at least a 3-foot clearance from trees to curb, and at least a 3-foot clearance from trees to sidewalk (at least 6-feet total width). Grass terraces have a minimum cross slope of 4% while paved terraces have a minimum cross slope of 2%.

See FDM 11-20 Attachment 1.2, 1.3, and 1.6 for typical urban street cross sections.

See Chapter 5, “Designing Pedestrian Facilities”, of the Wisconsin Guide for Pedestrian Best Practices *(9)* for more information on terrace design. Also, see the “NACTO Urban Street Design Guide” *(23)*.

5.3 References

Refer to FDM 11-46-99 for list of references.

LIST OF ATTACHMENTS

Attachment 5.1 Sidewalk Design Considerations

FDM 11-46-10 Curb Ramps *February 15, 2024*

10.1 General

The design guidance in this procedure and associated Standard Detail Drawings (SDD 8D5) has been developed in accordance with the Public Rights-of-Way Accessibility Guidelines (PROWAG). PROWAG was developed by the United States Access Board to provide design guidance on the application of the Americans with Disabilities Act (ADA) within public right-of-way areas such as sidewalks and curb ramps. When there are differences between WisDOT and PROWAG criteria, designers are to utilize the WisDOT criteria.

All improvements that meet the ADA “alteration” definition are required to evaluate the existing curb ramps for ADA compliance. Curb ramps that do not meet PROWAG standards shall be improved to the maximum extent feasible. See FDM 11-46-5.1.1 ADA Compliance for additional detail.

See Attachment 10.1 for a Curb Ramp Evaluation Workflow for use when evaluating existing ramps. The Allowable Values for Evaluation of Existing Curb Ramps criteria provided in Attachment 10.2 Table 1 shall be used when evaluating existing curb ramps for ADA compliance.

Document the results of the evaluation of existing curb ramps. Documentation should include slopes and widths of the critical curb ramp components described in this chapter. Contact the Region Bicycle/Pedestrian Coordinator for what documentation is required in each region.

Replacement and new curb ramps shall use the design values specified in this guidance. The design values in this section account for construction tolerances, changes in field conditions, and other WisDOT design criteria. See Attachment 10.2 Table 2 for a summary of design values for curb ramp components.

When newly constructed curb ramps are evaluated in the field for ADA compliance, the Allowable Values for Evaluation of Existing Curb Ramps in Attachment 10.2 Table 1 shall be used. If a curb ramp meets the evaluation criteria in Attachment 10.2 Table 1, then the ramp may remain as constructed.

If designers encounter situations not covered by this guidance, they should contact the Bureau of Project Development (BPD) Region Design Oversight Engineer.

Curb ramps are designed to accommodate users with multiple types of disabilities including those who are visually impaired and/or mobility impaired.

When a curb ramp is constructed on one side of a street, companion curb ramp(s) are required on the opposite side if there is either existing sidewalk on the opposite side or sidewalks are being constructed on the opposite side as part of the project. Companion ramps are required when there is a legal crosswalk unless the crosswalk is closed. See FDM 11-46-10.2 for additional information on legal crosswalks and FDM 11-46-10.2.1 for additional information on crosswalk closures. When there is no sidewalk present in a quadrant of an intersection and a companion ramp is needed a pass-through ramp should be constructed as shown in Figure 10.1.

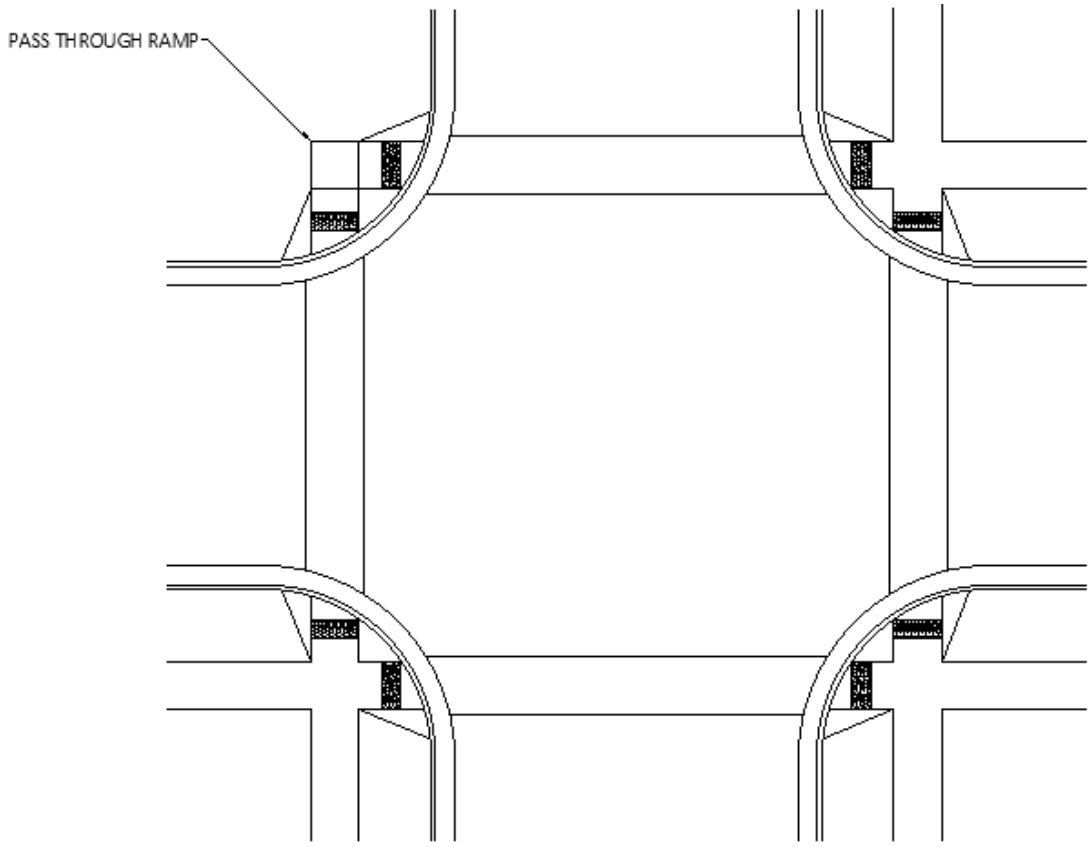


Figure 10.1 Example of a Pass-Through Ramp

When a legal crosswalk does not exist a companion ramp is not required but should be evaluated to determine if a companion ramp would provide any additional benefit. See Figure 10.2 for an example of an intersection where companion ramps are not required in all quadrants of the intersection.

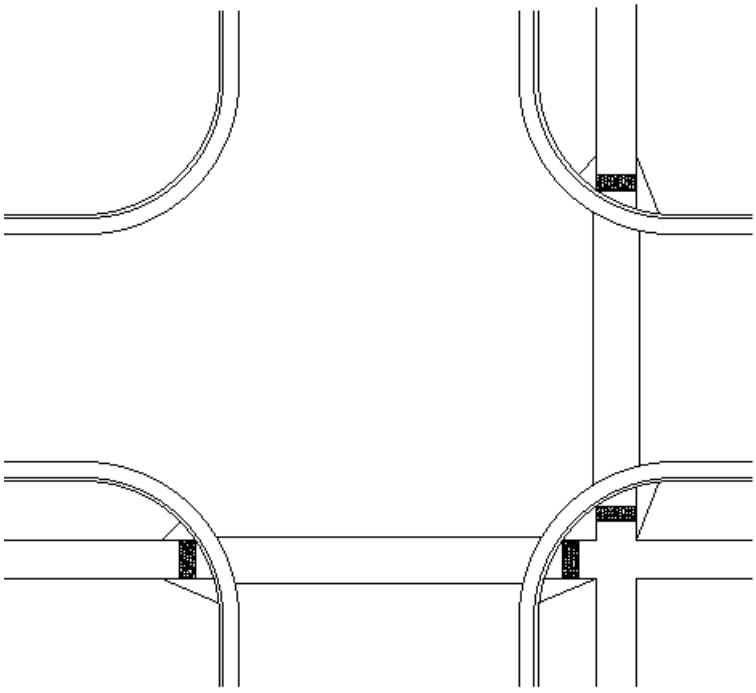


Figure 10.2 Example of an Intersection Where Companion Ramps are Not Required

When a project terminates adjacent to or in the middle of an intersection, curb ramps and landings must be constructed, where sidewalk is present, on the street corners beyond the project limits, even though no other construction may be necessary at those corners.

There may be some locations where curb ramp installation may be desirable but is not required. Consider installing companion ramps when sidewalk is part of a future project that is in the WisDOT Six Year Highway Improvement program or part of a Municipal Capital Improvement Plan. Also, there may be safety reasons to justify a free-standing curb ramp. For example, the distance between crossing locations, adjacent land uses, and destinations may indicate the need, or to provide a space for pedestrians to move temporarily out of the intersection or to access a pedestrian push button. Coordinate with the local community to ensure that any free-standing curb ramps are properly located and maintained.

Pavement treatments that are considered “maintenance of the road surface” do not require curb ramp installation or curb ramp updating. Curb ramps may be installed/updated on “maintenance of the road surface” project types for other reasons and needs.

10.2 Crosswalks

Crosswalks are defined as pedestrian crossings where motorists must legally yield the right-of-way to crossing pedestrians. As stated in State Statute 340.10(10), crosswalks exist at all intersections where sidewalks are present, even if the crosswalks are unmarked. Intersection crosswalks are legally considered prolongations of the contiguous sidewalks. Crosswalks can also exist at mid-block locations. However, unlike crosswalks at intersections, mid-block crosswalks must be marked. Figure 10.3 shows a diagram of a legal crosswalk layout.

At intersections, including “Tee” intersections, where the side road has sidewalks on one or both sides of the street and the through street has sidewalk on the opposite side of the street from the side road, this condition establishes a legal crosswalk whether the crosswalk is marked or not per State Statute 340.01(10(b)).

Curb ramps shall be provided for each sidewalk extended across the through street crosswalks and side road crosswalks as shown in Figure 10.3, except as noted in FDM 11-46-10.2.1, "Crosswalk Closure”. It is generally undesirable to close the crosswalk on one side and direct pedestrians to the other side of the side road before crossing the through street since this requires pedestrians to avoid using what was once a legal crosswalk. Often pedestrians will not detour out of their way when they face an obvious crossing in front of them.

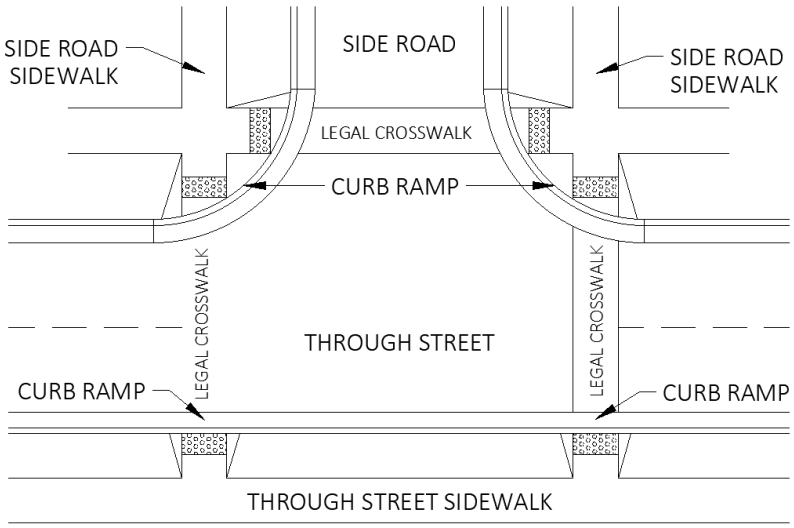


Figure 10.3 Legal Crosswalk Layout

Provide ADA-compliant curb ramps at intersections (including traffic islands and medians) and mid-block crossings where a sidewalk or other pedestrian walkway crosses the curb at locations where crosswalks (either marked or unmarked) are present on alteration improvement project types. Refer to Attachment 1.2 and Attachment 1.3 for a list of pavement strategies meeting the ADA “alteration” definition. FDM 11-1 Attachment 10.1 shows the relationship between Improvement Strategies, Improvement Concepts and Application of Design Criteria.

Crosswalks and the associated curb ramps should not be offset more than 10 feet from a sidewalk continuation without agreement from the region bicycle/pedestrian coordinator. Offsetting the ramps by more than 10 feet may cause orientation problems for pedestrians with visual impairments or make it difficult for pedestrians to be seen by turning motorists. The 10-foot offset distance is measured from the back side of the sidewalk to the crosswalk. See Figure 10.4 below for how the offset is measured.

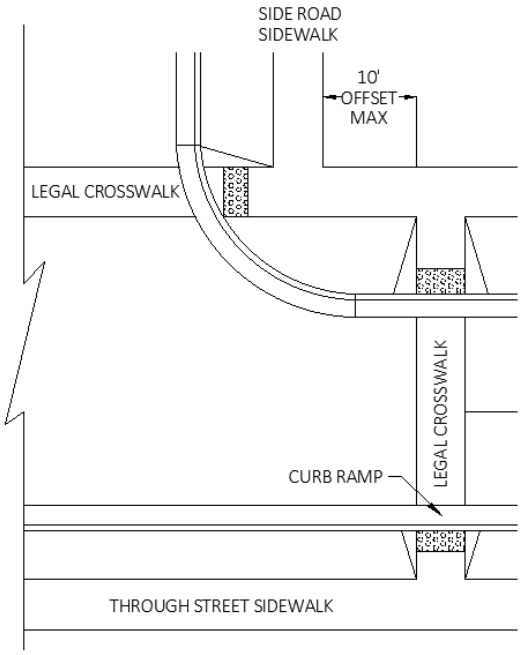


Figure 10.4 Sidewalk to Crosswalk Offset

Crosswalk cross slope is important for pedestrian and impaired user navigation.

Side roads that are controlled by a stop sign, yield sign, or signal must provide a 1.5 percent (2 percent maximum) cross slope on the crosswalk and extend the 1.5 percent side road profile back to a point beyond the stop bar, yield bar or control location, whichever is greater. If any technically infeasible conditions cited under FDM 11-46-5.1 are satisfied, develop the side road profile to the maximum extent feasible. Document all technically infeasible conditions in the Technical Infeasibility Form (Attachment 10.3) and attach to the DSR.

On projects where the improvement strategy generally requires the existing pavement and curb and gutter to remain in place, crosswalk cross slopes in excess of 2 percent may remain as reconstructing the intersection is beyond the scope of these project types. When crosswalk cross slope exceeds 2 percent on these types of projects, document how the crosswalk slope was designed to meet accessibility standards to the maximum extent feasible in the Technical Infeasibility Form and attach to the DSR.

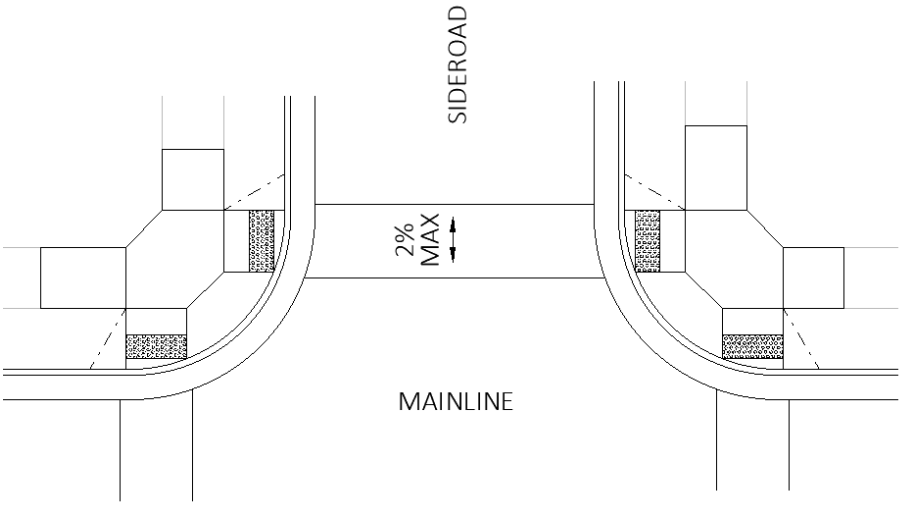


Figure 10.5 Cross Slope in Crosswalk

Mainline roads (through traffic movement) that are signal controlled, not controlled at an intersection, or for mid-block crossings the crosswalk may have a cross slope equal to the profile slope of the mainline roadway. For example, if the mainline roadway has a 5 percent grade, then the crosswalk cross slope may also be 5 percent.

10.2.1 Crosswalk Closure

There may be times, especially for safety reasons, where it may be necessary to close a crosswalk. Document the reasons for the crosswalk closure in the Design Study Report (DSR). Site conditions, safety concerns, and State Statues 349.185(2) regulate the prohibition of pedestrian crossings and shall be evaluated prior to closing a crosswalk.

When a crosswalk is closed, the crossing must be signed as closed, and a barrier must be installed to alert all pedestrians and other users that a crossing at this location is not permitted.

The standard signs used for closing a crossing are shown below in Figure 10.6. The arrow on the sign may be oriented whichever direction is appropriate for the location. The sign post location must meet lateral clearance requirements as shown in FDM 11-20, Table 1.5 (typically 4 feet from the travel lane, assuming a 2-foot gutter and 2 feet behind the face of curb). Provide documentation in the DSR, per FDM 11-1-2, if lateral clearance requirements are not met.

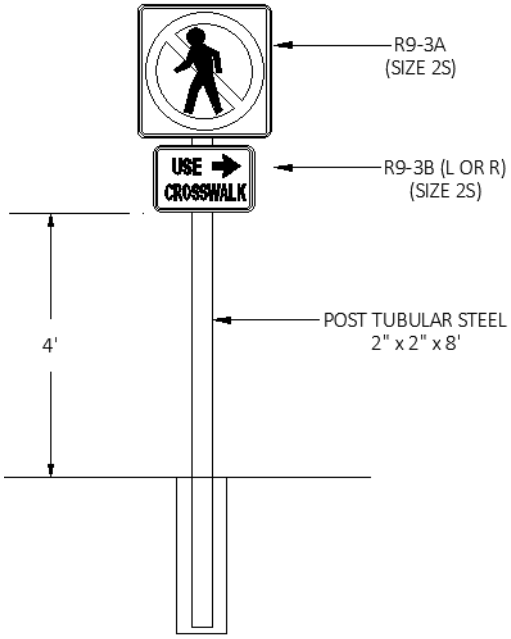


Figure 10.6 Crosswalk Closure Sign Details

There are several options for closing a crosswalk where there is a through street terrace width of 3 feet or more.

One option is a 4-inch to 6-inch curb, with tapered ends, across the end of the side road sidewalk extended, or a raised planter with perimeter curbing. Install the standard signs on a post behind the Concrete Pedestrian Curb as shown in Figure 10.7.

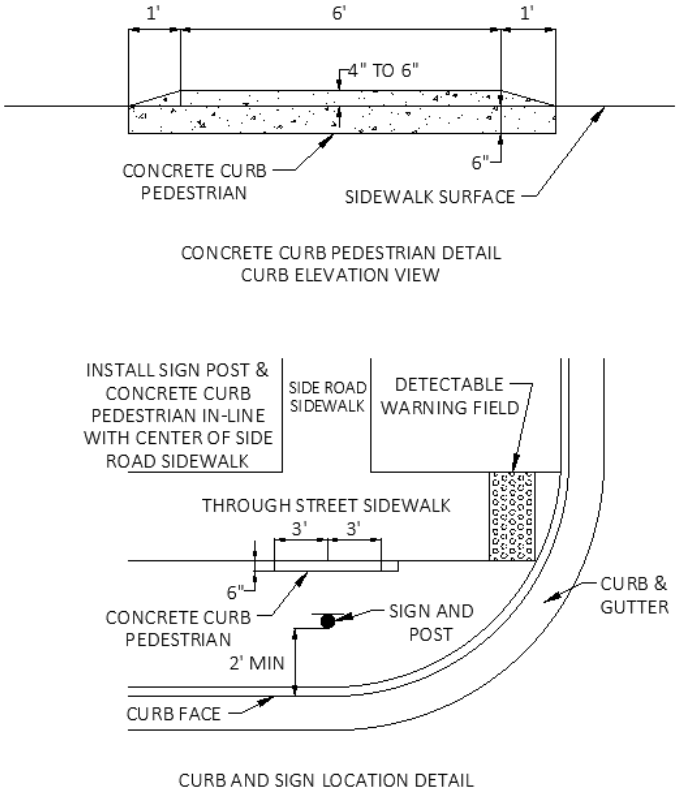


Figure 10.7 Crosswalk Closure Detail with Pedestrian Curb

Another option is low growth plantings (18-inch maximum height at maturity) or terrace mound with WisDOT approval. The terrace mound is approximately 6 inches high and across the end of the side road sidewalk extended. The mounding option is acceptable providing the curb, planters, or plantings identified above is determined by WisDOT to be unacceptable. Install the standard signs on a post as shown in Figure 10.6.

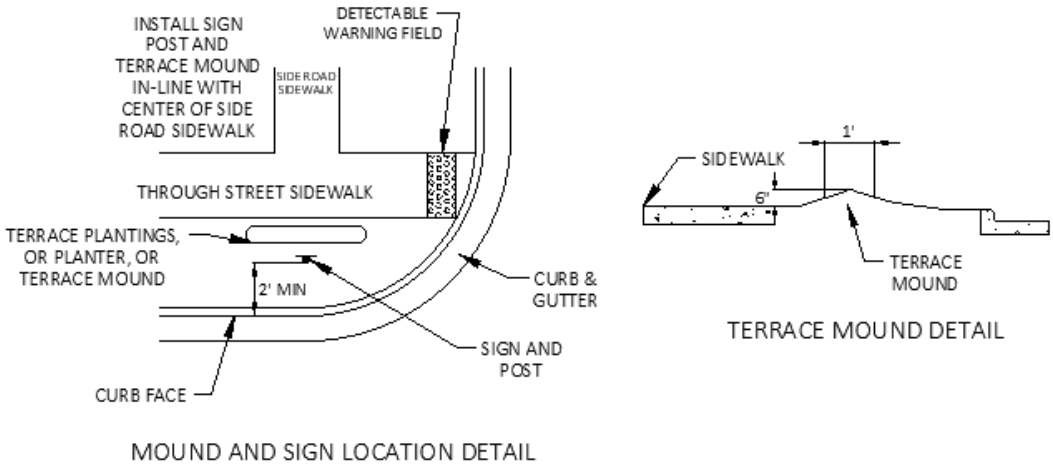


Figure 10.8 Crosswalk Closure Detail with Berm or Plantings

Evaluate the conditions and context when selecting a preferred design. Barrier options may include a planter, concrete pedestrian curb, plantings, or a terrace berm.

If there is less than a 3-foot terrace, or the sidewalk is adjacent to the back of curb, then close the crosswalk by first moving the sidewalk back and away from the through street back of curb as it approaches the intersection (as shown in Figure 10.9), and then using one of the options explained above. This option may require purchasing right-of-way, depending on available space. If right-of-way is not available and the sidewalk and terrace are narrow, then it may be acceptable, with WisDOT approval, to install a raised curb along with a “pedestrian crossing closed” sign.

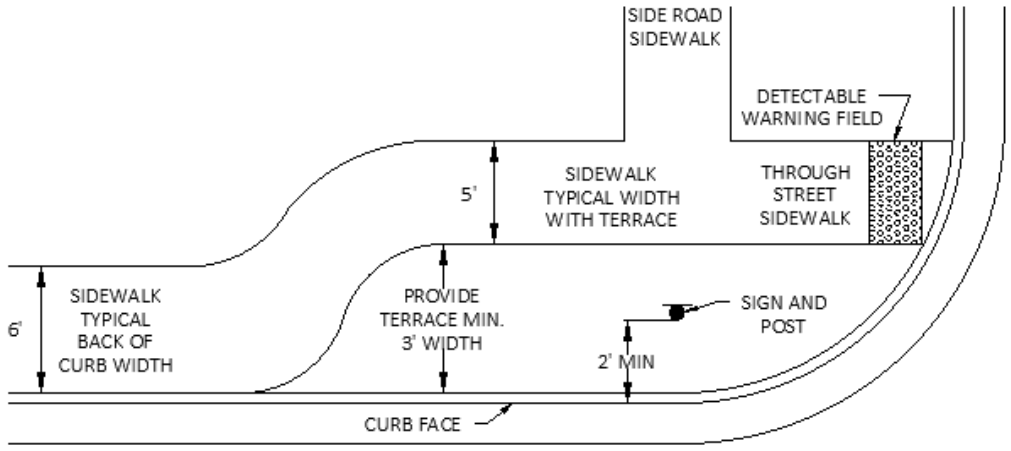


Figure 10.9 Crosswalk Closure Detail with Narrow Terrace

10.3 Pedestrian Access Route and Pedestrian Circulation Path

PROWAG R105.5 defines the pedestrian access route as a continuous and unobstructed path of travel provided for pedestrians with disabilities within, or coinciding with, a pedestrian circulation path. Curb ramps are a critical component of the pedestrian access route and shall comply with ADA requirements to the maximum extent feasible. PROWAG R105.5 defines the pedestrian circulation path as a prepared exterior or interior surface provided for pedestrian travel in the public right-of-way.

10.4 Pedestrian Crossings at Railroads

Detectable warning fields, (i.e., truncated domes), are required when at-grade pedestrian facilities (including shared use paths) cross railroads. When a sidewalk or shared use path is adjacent to a roadway, provide curb ramps to bring the pedestrian walkway to the same grade as a railroad crossing as necessary. See SDD 8D5 (sheet e) for detectable warning field placement at a railroad crossing.

Detectable warning fields, (i.e., truncated domes), are also considered part of a railroad warning device installation and must be provided when the warning device system is installed or updated.

10.5 Curb Ramps and Detectable Warning Fields

On all state or federally funded projects with sidewalk, curb ramps with detectable warning fields shall be installed at all legal crosswalks whether the crossing has pavement marking or not. These include all projects that are defined as an alteration per ADA (see FDM 11-46-1.1.4) where curb ramps do not exist, or they are not ADA compliant. This shall be done regardless of whether new or replacement sidewalk is programmed as part of the project.

The following sections will define the different components of a curb ramp. Figure 10.10 provides a plan view graphic of each component's location on a curb ramp.

10.5.1 Curb Ramp Components

Figure 10.10 illustrates the individual components of a curb ramp. Additional details for each component are provided below.

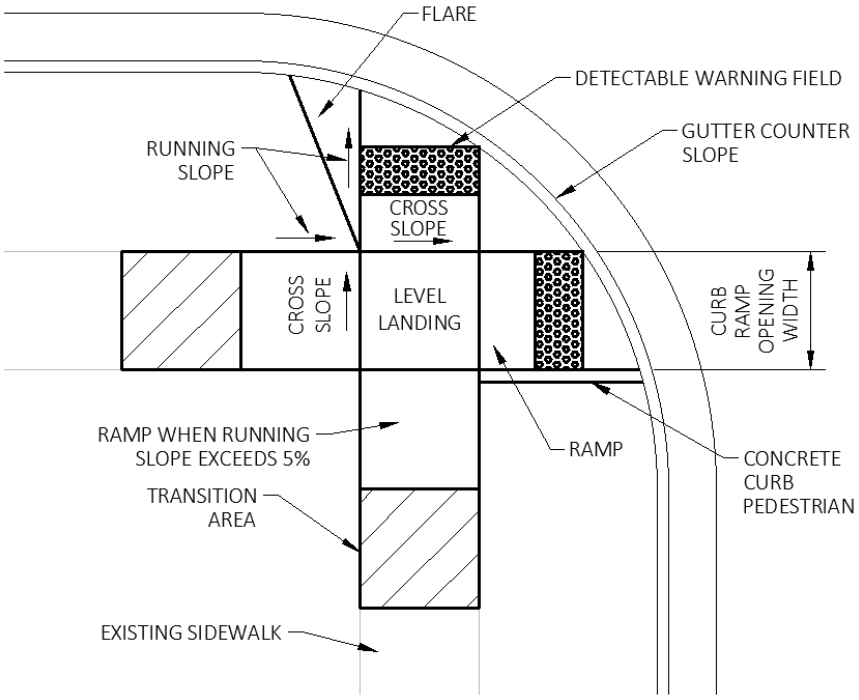


Figure 10.10 Curb Ramp Components

The design values of all curb ramp components discussed in FDM 11-46-10.4.1 have been summarized in Attachment 10.1.

10.5.1.1 Running Slope

The running slope is the slope in the direction of pedestrian travel. The maximum running slope for a curb ramp is 7 percent. This accommodates a maximum 11 percent grade break between the curb ramp and WisDOT's standard 4 percent gutter counter slope. In certain circumstances, the running slope may be a maximum of 8.33 percent. When the running slope of a curb ramp exceeds 7 percent at the back of curb, the gutter counter slope must be flattened to not exceed the 11 percent maximum grade break.

Whenever a section of sidewalk near a curb ramp has a running slope in excess of 5 percent, it is considered a ramp and should have a level landing at the top and the bottom of the ramp. This standard applies to sidewalk between the back of curb and level landing, as well as, between the level landing and the match point with the existing sidewalk.

In areas with steep roadway and sidewalk grades, it may be difficult to match into the existing sidewalk without reconstructing a substantial section of sidewalk. PROWAG R304.2.2 allows the length of the ramp between the lower-level landing and upper-level landing at the existing sidewalk match point to be limited to 15 feet. When the length of the ramp is limited to 15 feet and the running slope exceeds 8.33%, document in the Technical Infeasibility Form and attached to the DSR. See Figure 10.11.

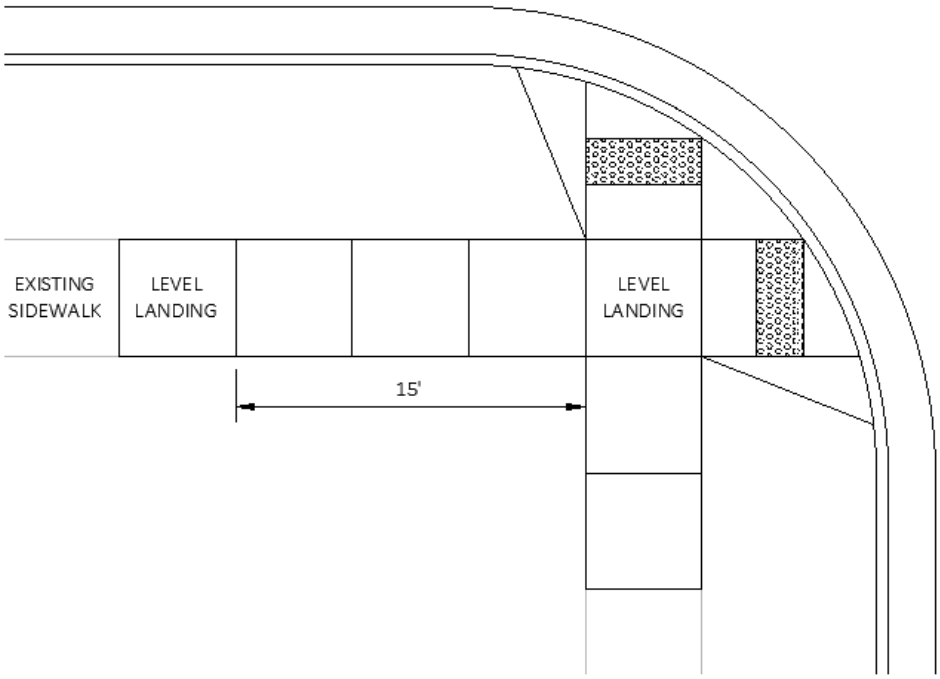


Figure 10.11 15 Foot Rule Detail

10.5.1.2 Cross Slope

The cross slope is the slope perpendicular to pedestrian travel. The design maximum for cross slope is 1.5 percent. The cross slope value is less that the PROWAG maximum of 2 percent to provide a construction tolerance. A cross slope up to 2 percent may be used in certain circumstances when using a flatter slope is not feasible.

When the cross slope of the existing sidewalk match point is greater than 2 percent, the cross slope of new sidewalk shall be designed at 1.5 percent except the last panel before the existing sidewalk. This final panel is known as the transition area and is discussed further in FDM 11-46-10.5.1.9.

On projects where the improvement strategy generally requires the existing pavement and curb and gutter to remain in place and the existing slope of the gutter flowline exceeds 2 percent, the cross slope of the ramp may need to be steeper than 2 percent immediately adjacent to the back of curb. When this situation occurs, it shall be documented in the Technical Infeasibility Form (Attachment 10.3).

10.5.1.3 Curb Ramp Opening Width

The curb ramp opening width is defined as the width of the depressed curb head at the bottom of the curb ramp. The minimum curb ramp opening width is 5 feet. However, the curb ramp opening width should match the width of the approaching pedestrian access route when the approaching sidewalk or shared-use path exceeds 5 feet. When the width of the pedestrian access route is wider on one side of the intersection than the other, the curb ramp openings shall match the width of the pedestrian access route at that ramp. The crosswalk markings, if present, shall be wide enough to include the wider of the two ramps. See Figure 10.12 for an example. If the ramp opening width cannot be constructed as wide as the approaching sidewalk or shared-use path, document that the ramp was designed to meet accessibility standards to the maximum extent feasible in the Technical Infeasibility Form (Attachment 10.3) and attach to the DSR.

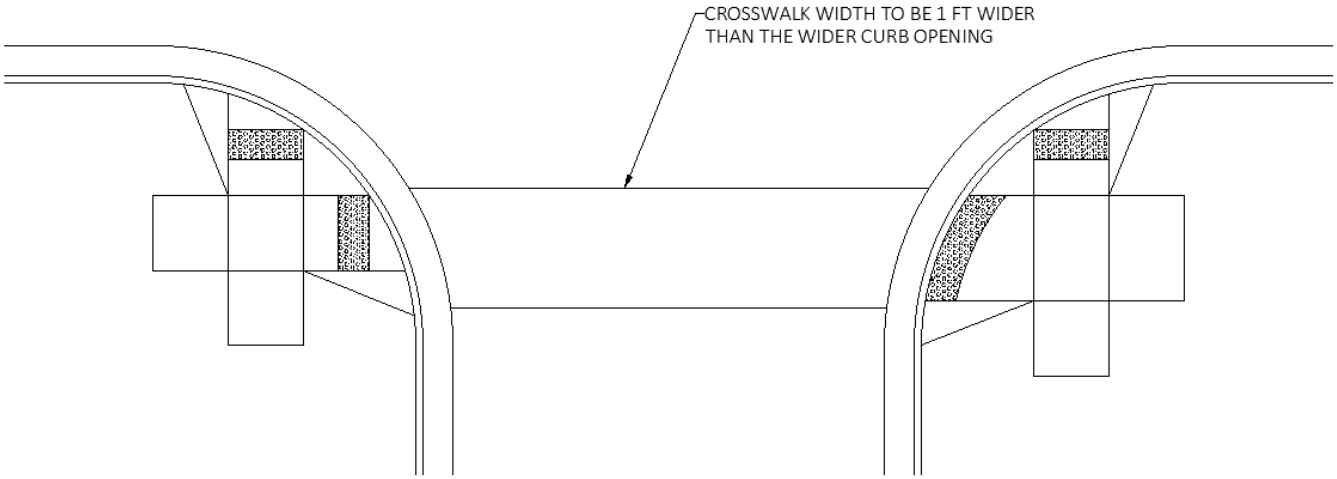


Figure 10.12 Crosswalk with Variable Curb Ramp Opening Width Detail

10.5.1.4 Gutter Counter Slope

The gutter counter slope is the opposing slope that meets the bottom of the curb ramp. In most cases, this is the gutter cross slope. On modernization projects and some perpetuation and rehabilitation projects, the gutter counter slope will be 4 percent matching curb and gutter standard detail drawings. For curb ramp replacements on perpetuation and rehabilitation projects, the gutter counter slope may be designed greater or less than 4 percent to match the existing gutter counter slope and to avoid trapping water in the intersection radii. Designers should check the grades in the gutter flowline to verify drainage is maintained.

10.5.1.5 Grade Breaks

Grade breaks along the pedestrian access route shall be perpendicular to the direction of travel to avoid a wheelchair tipping over when traversing a change in grade.

A rapid change of grade, between the curb ramp slope and the gutter cross slope, may be difficult to negotiate because the wheelchair's footrests or anti-tip wheels cannot clear the ground surface. In general, footrests are positioned low to the ground and extend beyond the front casters. Anti-tip wheels are placed on the back of some wheelchairs, behind the rear axle, to improve stability. Both the footrests and anti-tip wheels limit the clearance height of the wheelchair. Clearance may be a problem at an abrupt change of grade because the footrests or anti-tip wheels extend beyond the wheelbase of the wheelchair and therefore may contact the surface across the transition point from where the wheels are located. See Figure 10.13.

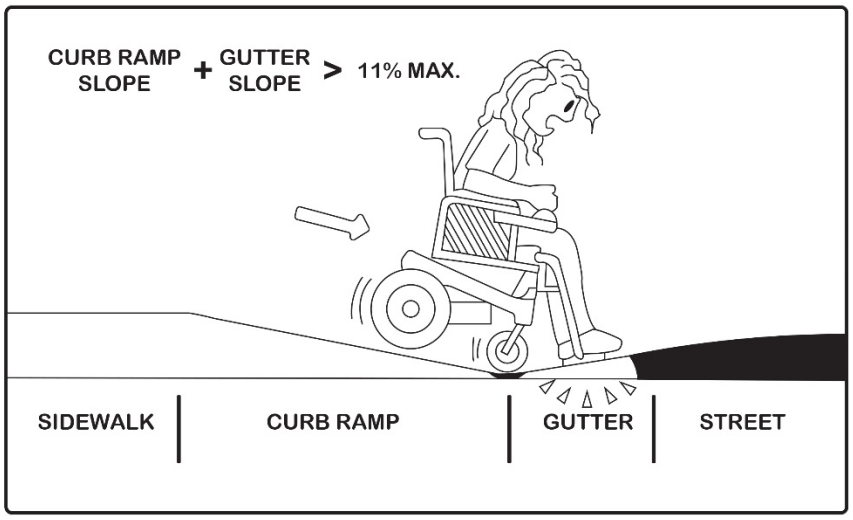


Figure 10.13 Effect of Greater than 11% Grade Difference between Gutter and Curb Ramp

The maximum grade break shall be 11 percent. The 11 percent maximum grade break applies to the gutter flowline grade break, as well as other grade differences in the pedestrian access route.

The 11 percent grade difference at the gutter flowline is an important criterion when designing curb ramps as wheelchair users can become stuck at the bottom of the ramp and possibly be struck by a vehicle. If it is infeasible to meet this standard, design to be compliant to the maximum extent feasible and document in the Technical Infeasibility Form (Attachment 10.3) and the DSR.

Existing gutters commonly have a common cross slope of 3/4 inch/foot or 6.25 percent. Adjust the curb ramp running slope and the gutter slope to comply with the 11 percent grade break requirement. Refer to Figure 10.14 for schematic diagram of allowable algebraic differences between gutter cross slope and curb ramp profile.

Refer to FDM 11-20-1.2.1.1 for gutter cross slope selection criteria and plan requirements with various improvement projects. A 4 percent gutter cross slope for rehabilitation and modernization improvement projects will effectively facilitate attaining the 11 percent algebraic maximum grade difference (i.e., grade break or rollover) at curb ramps. SDD 8D1 notes the gutter cross slope as 4 percent unless otherwise noted in the contract plans.

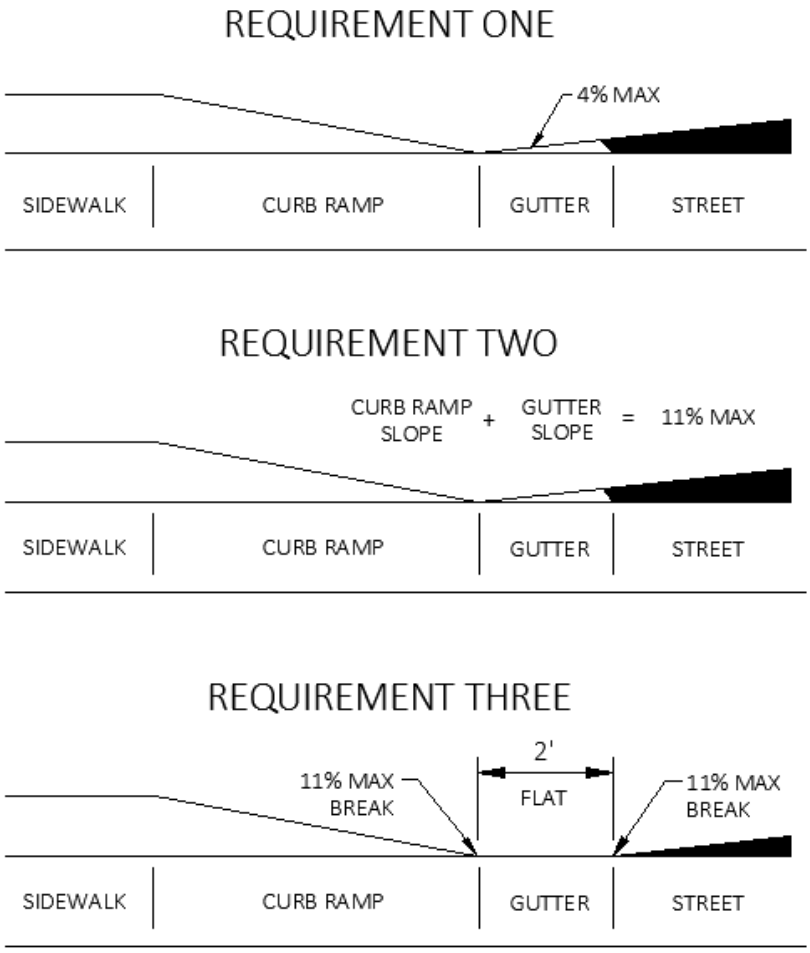


Figure 10.14 Algebraic Difference in Slope between the Gutter and the Adjacent Curb Ramp

Figure 10.14 shows the algebraic difference in slope between the gutter and the adjacent curb ramp may have challenges attaining curb ramp slopes of 7 percent or less for retrofit projects due to tight site conditions or other constraints. Curb ramps may be designed and constructed at an absolute maximum of 8.33 percent (12H:1V) in these situations. If the designer elects to design the curb ramp with this absolute maximum of 8.33 percent slope, then the gutter slope must be set to 2.67 percent or flatter to maintain an 11 percent maximum grade change. Refer to Figure 10.14.

In some situations, it may not be possible to keep the grade break below 11%. In those situations, reduce the gutter slope so that it has a flat cross slope and is 2 feet wide. As long as the flat gutter is 2 feet wide, the grade break between the roadway and ramp can exceed 11%. See Requirement Three of Figure 10.14 for more details.

In some instances where curb ramps are being added or redesigned at existing intersections, curb ramp running slopes between 8.33 percent and 10 percent may be permitted when the maximum rise is 6 inches[i]. Slopes between 10 percent and 12.5 percent may be permitted when the maximum rise is 3 inches. Coordination with the region bicycle/pedestrian coordinator is required prior to proceeding with this type of design. When it is technically infeasible to meet the design standard set forth in this manual, document in the

Technical Infeasibility Form (Attachment 10.3) and DSR, and design to be compliant to the maximum extent feasible.

Curb ramps at skewed intersections or along wider curb openings may require additional attention during final plan development. For these instances, gutter cross slopes and curb head opening slopes may vary when measured parallel to the direction of pedestrian travel and where measured along the curb ramp (e.g., center of curb ramp vs. edge of curb ramp). Maintain a maximum 7 percent curb head opening slope at any location along the entire width of a curb ramp opening. Consider flatter (e.g., <7 percent), consistent curb opening slopes within a project due to the effects of the skew and construction forming practices.

On projects where it may be technically infeasible to properly construct the sloping combination of curb ramps and gutters to current design criteria, design the facilities to meet current ADA accessibility standards to the maximum extent feasible (see FDM 11-46-5.1). Document the technical infeasibility design decisions in the Technical Infeasibility Form (Attachment 10.3), which is attached to the DSR.

10.5.1.6 Level Landing

The level landing is a flat area used as a location for wheelchair users to rest or turn. Level landings are required at the top and bottom of all ramps with running slopes steeper than 5 percent and at any location where there is a turn in the pedestrian access route.

Although PROWAG allows a maximum level landing slope of 2 percent in any direction, a 1.5 percent maximum slope in any direction shall be used to provide a construction tolerance.

The minimum level landing size is 5 foot by 5 foot. In constrained areas, a 4 foot by 4 foot level landing may be considered which meets the PROWAG R304.2.1 minimum specified level landing size. When the width of the approaching sidewalk or path is wider than 5 feet the width of the level landing should be the same width as the approaching facility. If the level landing is not able to meet the 5 foot by 5 foot requirement, document in the Technical Infeasibility Form (Attachment 10.3) and DSR.

If the landing is next to a vertical wall, a 5 foot width is desirable to allow a wheelchair user more room to maneuver.

It is common for level landings to be non-rectangular when pedestrian access routes intersect at any angle other than 90 degrees. It is important that the grade break between the level landing and ramp, or the level landing and approaching sidewalk, be perpendicular to the direction of travel.

10.5.1.7 Curb Ramp Flares and Curb Returns

Curb ramp flares are the sloped transitions from a curb ramp to the surrounding area. Curb ramp flares should be free of obstacles (fire hydrants, inlets, manholes, etc.). For pedestrians with visual impairments, flares may be one of the cues used to identify a curb ramp and upcoming street edge.

10.5.1.7.1 Traversable Flare

Curb ramp flares may be part of the pedestrian circulation path (FDM 11-46-10.3) but are not part of the pedestrian access route (FDM 11-46-10.3). A traversable flare is used whenever the pedestrian circulation path crosses the curb ramp and is constructed using a material that pedestrians can safely utilize. The maximum slope for a traversable flare is 10 percent (10:1) measured parallel to the curb line. Traversable flares should be paved with a surface that is generally planar and smooth, preferably concrete. Heavily textured, rough, or chamfered and paving systems consisting of individual units that cannot be laid in plane may be challenging for some pedestrians to navigate.

When a traversable flare is used between two closely spaced ramps, like Type 2 ramps, the minimum curb head height between the two ramps is 2 inches. If 2 inches of height cannot be achieved between the two ramps, the layout needs to be modified spacing the ramps farther apart.

Figure 10.15 provides an example of a traversable flare with a maximum slope of 10:1 on the left side of the ramp where the flare is within the pedestrian circulation path and a paved, non-traversable flare on the right side of the ramp where the flare is adjacent to grass or other non-traversable surface. If a 10:1 traversable flare cannot be achieved, document in the Technical Infeasibility Form (Attachment 10.3) and the DSR.

Figure 10.15 Traversable and non-traversable flares

10.5.1.7.2 Non-Traversable Flare

A non-traversable flare may be used whenever the adjacent terrace area is not part of the pedestrian circulation path. See FDM 11-46-10.3. The maximum slope for newly constructed non-traversable flares is 6:1. A non-traversable flare may be paved, have a heavily textured, rough, or chamfered surface or may be a graded grass slope.

Figure 10.16 provides an example of graded non-traversable flares on both sides of the curb ramp. Figure 10.17 is an example of a paved, non-traversable flares on both sides of the ramp.

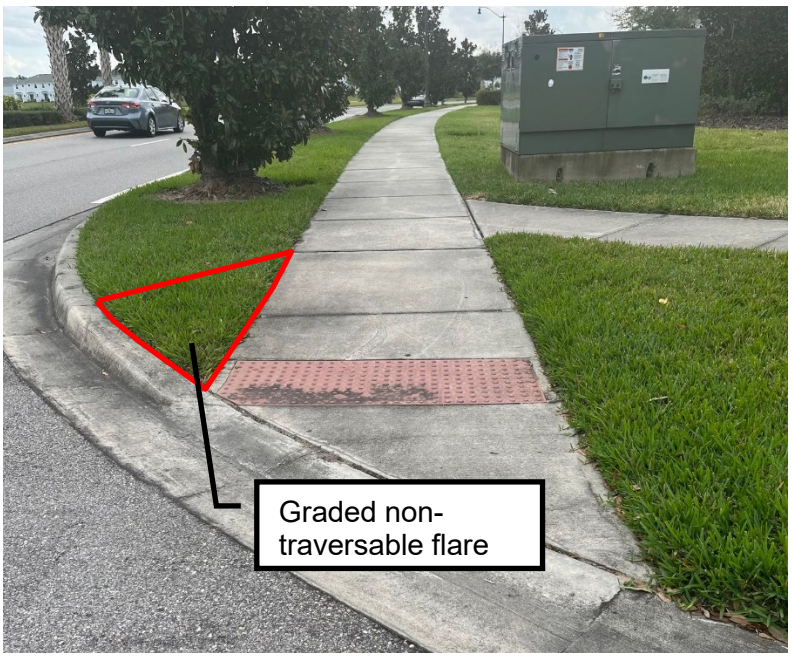


Figure 10.16 Graded non-traversable flares

Figure 10.17 Paved non-traversable flares

10.5.1.8 Curb Returns

Curb returns may be utilized instead of a non-traversable flare. Curb returns are typically used in constrained areas to avoid impacts to adjacent objects such as trees, utility facilities, and signal poles. See SDD 8D5-B Detail B and Figure 10.18 for curb return details.

Curb returns may not be used when the adjacent terrace is a traversable surface or in areas where the sidewalk is adjacent to the back of curb as the vertical drop associated with them is unacceptable and dangerous for pedestrians. In cases where an obstruction such as a utility pole or signal equipment prevents the terrace from being part of the pedestrian access route, curb returns may be used to avoid impacts to the utility or signal equipment. Curb returns may be straight or curved per Figure 10.18.

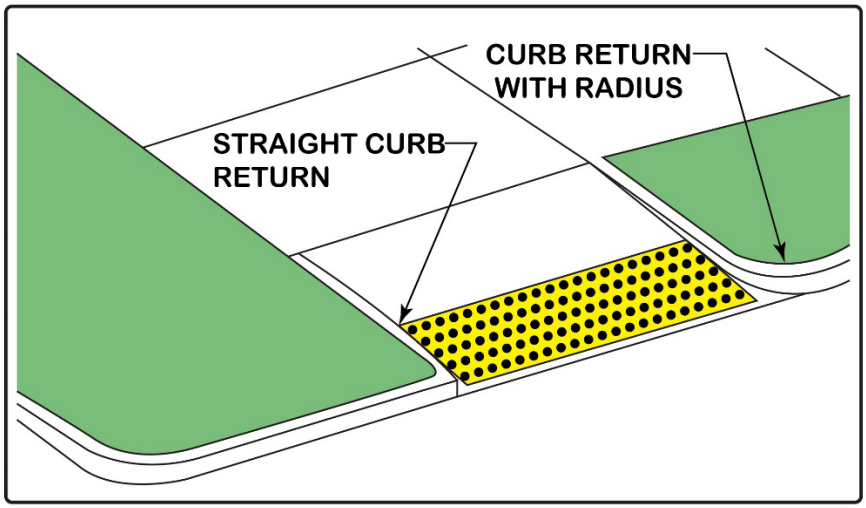


Figure 10.18 Typical Perpendicular Curb Ramp with Curb Returns

10.5.1.9 Transition Area

Transition areas are the last sidewalk panel or short stretch of shared-use path prior to matching into existing sidewalk or path. They are used to transition from the existing sidewalk or path width and cross slope to the proposed sidewalk or path width and cross slope.

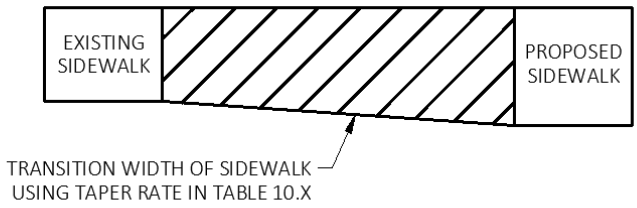
A minimum transition of one sidewalk panel can be used to reduce the length of sidewalk replacement. Consider using the following transition design guidance to avoid abrupt changes in width or cross slope which may be difficult to some users with visual or mobility challenges to navigate.

Table 10.1 Transition Area Horizontal Taper Criteria

Condition	Taper Rate [1]
Preferred	1:10
Constrained	1:5
Minimum	1:3

[1] Taper rate shown is the distance parallel to the pedestrian access route needed for a one-foot change in width.

For transitioning the sidewalk or shared-use path cross slope, the transition area length shall be determined by providing a rate of change of less than, or equal to, 0.5 percent cross slope change per one foot of distance parallel to the pedestrian access route.



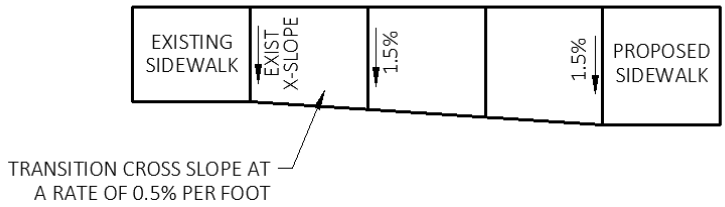


Figure 10.19 Transition Area Tapers

10.5.1.10 Detectable Warning Fields

Detectable warnings fields are a distinctive surface pattern of truncated domes detectable by cane or underfoot. They are used to alert people with vision impairments of their approach to streets or hazardous drop-offs.

Detectable warning surfaces shall contrast visually with adjacent gutter, street or highway, or pedestrian access route surface, either light-on-dark or dark-on-light.

The cast iron detectable warning panel standard size is 2-foot by 2-foot. Other sizes are also available such as 2' x 1', 2' x 1.5', 2' x 2.5' and 2' x 3'. Radial detectable warning panels are also available. Align detectable warning fields at the back of the gutter flow line and the full width of the ramp (as measured perpendicular to the pedestrian direction of travel) and have a minimum length of 2 feet (as measured parallel to the pedestrian direction of travel). The warning field closest to the back of curb is installed 6 inches to 8 inches from the gutter flow line, or typically about 1 to 2 inches from the back of curb.

For existing detectable warning fields installed in median cut-throughs or in traffic islands, the existing warning field may remain in place if the edge of the warning field is 6 inches, or less, from the edge of the pedestrian path and the remaining features of the ramp are ADA compliant.

Truncated domes will replace the expanded mesh pattern grooves, striations, exposed aggregate or other pre-existing designs at the bottom of a curb ramp. If the existing curb ramp does not have a detectable warning field (i.e. truncated domes) or the current condition does not comply with ADA requirements or the ramp area is severely cracked or has cracks/joints with a change in level that produces a lip greater than 1/4-inch, then replace the curb ramp and install a detectable warning field. In cases where absence of a detectable warning field is the only deficiency, replace only the ramp panel to install the detectable warning field if replacement can be completed without damaging the rest of the curb ramp.

10.5.1.11 Truncated Domes

Truncated domes are the only curb ramp detectable warning field meeting ADA requirements and PROWAG. These requirements and guidelines apply to all projects involving new or altered pedestrian facilities, not just projects funded by state or federal sources.

Each truncated dome has an acceptable range of values for bottom diameter, top diameter, height and center to center spacing (see SDD 8D5 sheet g) for a drawing of the detectable warning field with truncated domes). Domes should be arranged in straight lines and not offset with each other.

The quality of detectable warning field products *(10), (11), (12), (28)* is important to the overall performance of the transportation facility. As shown in Table 10.2, curb ramp detectable warning fields must be on the WisDOT "Approved Products List" (APL) prior to bidding to be eligible for state or federal funding. The WisDOT APL shows the various approved product names, acceptable colors, manufacturer, and distributor information. Click on "curb ramp detectable warning fields" under "roadway appurtenances" on the "Approved Products List" page.

Per FHWA's "Visual Detection of Detectable Warning Materials by Pedestrians with Visual Impairments (Final Report)" (13), the detectable warning field color is a functional part of the product (not aesthetic) for people who are visually impaired. Based on field reviews with people who are visually impaired, yellow was the most discernible color. White color also ranked very high in the field review. The natural patina (or rust) of the cast iron product is also acceptable. Therefore, yellow, white, or natural patina are the required colors on WisDOT facilities, including state trunk highways and connecting highways. The color chosen should be a contrasting color to the adjacent pavement so that people who are visually impaired can discern the warning field. The designer may choose to coordinate yellow, white, or natural patina with the community on projects where new curb ramps will be installed. The bid item number(s) dictate the color of the detectable warning field to be used and are provided on the backside of SDD 8D5 along with other associated bid items.

Local units of government are encouraged to use yellow, white, or natural patina as the curb ramp detectable warning field color. However, as shown in Table 10.2, local units of government may choose another color that meets national design criteria and ADA requirements. Therefore, local governments must submit desired products that are not already on the WisDOT APL, several months ahead of the scheduled bidding to allow for product review or testing. If time is not available to evaluate or there is current knowledge about the product that it is deemed unacceptable, then it will not be added to the APL.

Table 10.2 Curb Ramp Detectable Warning Field Policy

Location	Funding for warning field bid item	Product	Color
STH System (STH or Connecting Highway)	Participating Item	Must be on WisDOT APL prior to bid	Yellow, White, or natural patina
Local System	Participating Item (eligible for state or federal funds)	Must be on WisDOT APL prior to bid	Yellow, white, or natural patina recommended. If color is not yellow, white, or natural patina a letter to WisDOT is required stating that ADA requirements are met.
Local System	Non-participating Item (not eligible for state or federal funds)	APL products are recommended. If product is not on the APL a letter to WisDOT is required stating that ADA requirements are met.	Yellow, white, or natural patina recommended. If color is not yellow, white, or natural patina a letter to WisDOT is required stating that ADA requirements are met.

10.5.1.12 Detectable Warning Field Placement

According to PROWAG, detectable warning fields shall extend a minimum of 2 feet in the direction of pedestrian travel and extend the full width of the ramp run. Detectable warning fields shall be placed at the back of curb.

Detectable warning fields are to be installed in plastic concrete for proper installation. The concrete border around the detectable warning field perimeter should not exceed 2 inches. Where the back of curb edge is tooled to provide a radius, the border dimension should be measured from the end of the radius. Refer to curb ramp SDDs for more information.

When a sidewalk approaches a curb radius, the placement of detectable warning fields at the back of curb may not be possible while keeping the truncated domes in alignment with the longitudinal path of the wheelchair. Refer to curb ramp SDDs for common applications with detectable warning field placement.

When determining ramp slopes, the portion of ramp that contains the detectable warning field needs to be a planar section of concrete, so the warning field sits flush with the adjacent concrete. Detectable warning fields are constructed of cast iron and cannot be bent or warped to match concrete slabs that are not planar. Placing detectable warning fields in concrete that is not planar could result in a tripping hazard for pedestrians or cause a snowplow to catch the edge of the warning field and damage the curb ramp. The running slope of the ramp should be equal on both sides from the back of curb to at least the back of the detectable warning field. When necessary, a grade break can be added at the back of the detectable warning field so that the cross slope can transition from the cross slope at the detectable warning field to the cross slope at the level landing. If cross slope at the detectable warning field exceeds 2 percent for projects where existing pavement or curb and gutter is to remain, provide documentation in the Technical Infeasibility Form (Attachment 10.3) and the DSR.

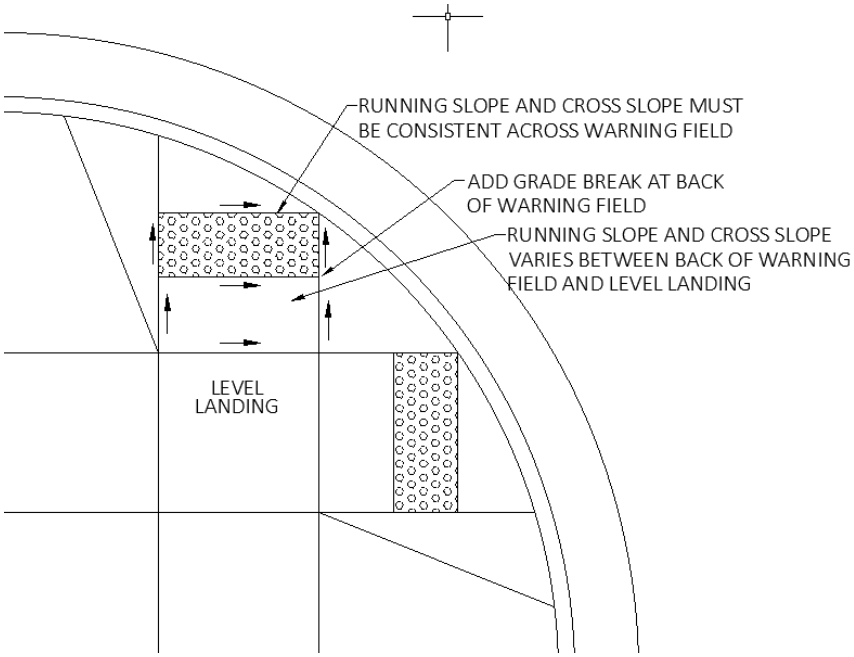


Figure 10.20 Warning Field Placement on Ramp

Evaluate each curb ramp for the most effective placement of the detectable warning fields, as conditions may vary. For example, along skewed intersections with narrow terraces, or at perpendicular curb ramps with adjacent sidewalk abutting back of curb, aligning the domes parallel to the direction of pedestrian travel may result in the detectable warning field panels protruding into the adjacent sidewalk. This may result in visually impaired pedestrians bypassing the warning fields when entering the curb ramp openings. For these situations, ensure the domes are placed as close to back of curb as possible. Dome alignment may not always be parallel to crosswalk alignment in these situations. However, ensure that the curb ramp running slope does not exceed a desirable maximum 1.5 percent (5 percent absolute maximum) for these situations. Orientation of the domes is less critical where detectable warning surfaces are provided on a surface with a slope that is less than 5 percent (PROWAG) (28).

For perpendicular and type 4A/A1 or 4B/B1 curb ramps with a larger intersection radius, placing detectable warning fields at full width of the ramp may further increase the grade break distance behind the back of curb along one edge of the curb ramp. If the grade break distance exceeds 5 feet, then radial detectable warning fields are required. See subsection FDM 11-46-10.4.1.9.3 for radial detectable warning field guidance.

Detectable warning fields at parallel curb ramps and diagonal curb ramps shall be placed as close to the back of curb as possible. Refer to SDD 8D5-a and Figure 10.20.

At skewed crossings where the sidewalk intercepts the curb along a tangent and where the grade break distance is greater than 5 feet (see Figure 10.23), the detectable warning fields shall be installed as close as possible to the back of curb. See Figure 10.21. When detectable warning fields are placed at skewed crossings, standard rectangular detectable warning field panels are used and are installed at the back of curb. The contractor is required to cut the edges of the warning field to match the width of the ramp.

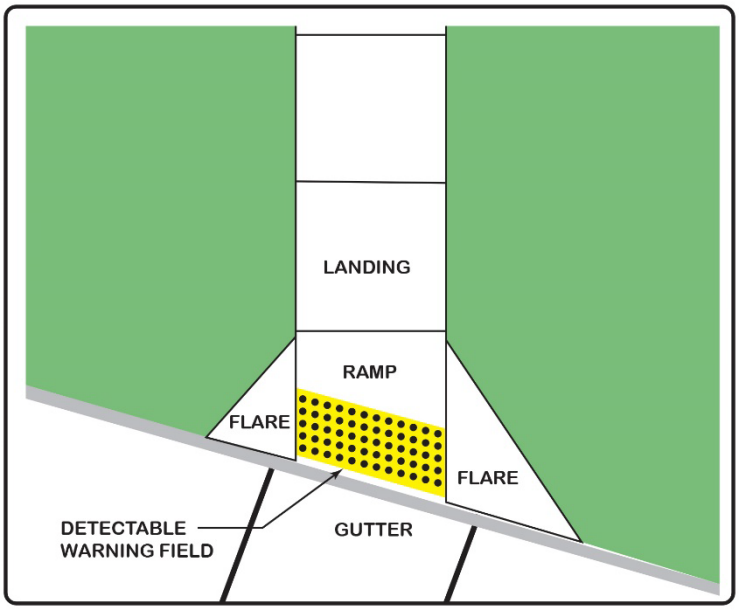


Figure 10.21 Example of Detectable Warning Field Installation for Skewed Crossing

At street-level pedestrian refuge islands, place detectable warning fields at the edges of the pedestrian island. Extend the detectable warning fields a minimum length of 2 feet at each edge of the island measured in the direction of pedestrian travel. Separate these fields a minimum 2 feet of surface length without detectable warning fields (PROWAG, U.S. Access Board) (*28*). An 8-foot median width (measured between curb faces) will provide adequate distance to meet these conditions.

Detectable warning fields are not required at street-level pedestrian refuge islands if a minimum 2-foot concrete surface without detectable warning fields, measured in the direction of pedestrian travel, cannot be achieved. For this situation, a traffic signal should be timed for a complete crossing of the street (PROWAG, U.S. Access Board) (*28*).

Install detectable warnings on paved shared-use paths at roadway crossings. Curb ramps with wire mesh imprint warning field, any warning field other than truncated domes, or with missing warning fields are not ADA compliant and need to be replaced. Existing non-cast iron truncated domes, if in good condition, may remain in place if the curb ramp meets ADA accessibility standards.

If a shared-use path crosses a roadway that has curb, then provide a concrete pad adjacent to the back of the curb and install the detectable warning fields into the plastic concrete. If a shared-use path crosses a roadway that has a paved or aggregate shoulder, then provide a concrete pad at the outside edge of the shoulder and install the detectable warning fields into the plastic concrete. See Figure 10.22 for an example detectable warning field installation of a shared-use path crossing a non-curbed roadway. Continue the shared-use path across any unpaved portion of the shoulder by paving the unpaved shoulder through the crossing.

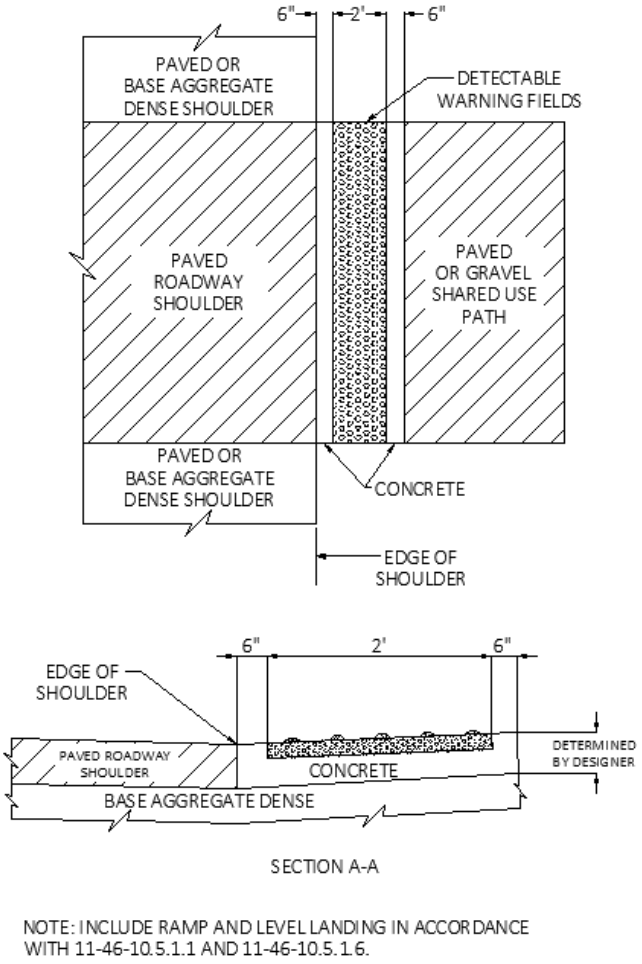


Figure 10.22 Example of Detectable Warning Field Installation for Shared-Use Path Crossing a Non- Curbed Roadway

10.5.1.12.1 Radial Warning Fields

Where the grade break distance exceeds 5 feet (see Figure 10.23), radial detectable warning fields (i.e., radial plates) are necessary. Radial plates provide full detectable coverage immediately at back of curb.

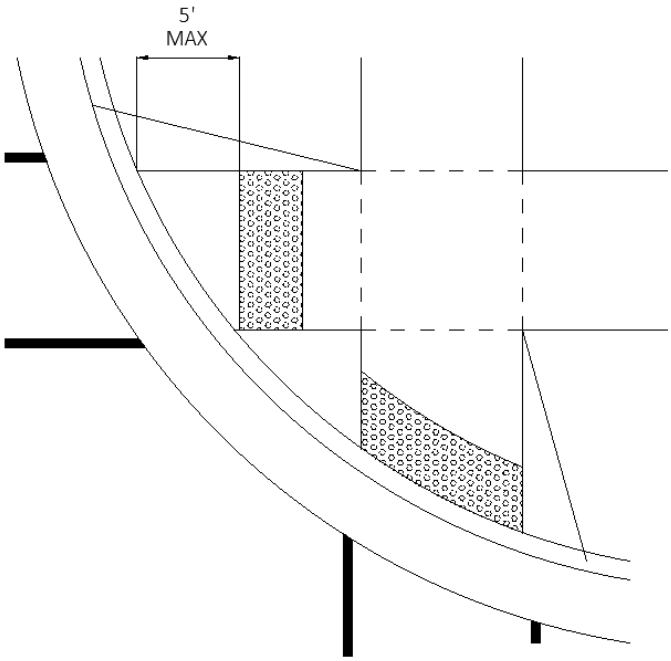


Figure 10.23 Example of Grade Break distance

Radial plates are typically available from the manufacturer's approved list in varying radii. The contractor will select the appropriate radial plate radius that matches the intersection radius design. A slight variance of up to 3 feet between the radii of the detectable warning field and the radii of the back of curb will provide a uniform concrete border between back of curb and radial field. A maximum 3-inch concrete border is allowable between the back of curb and radial detectable warning field for constructability purposes, with the concrete border width variable up to 1 inch.

Manufacturers differ with their radial detectable warning field designs. Manufacturers typically do not produce individual plates with all intersection radius sizes. Some manufacturers have developed combinations of sequentially placed radial and square plates to replicate radius warning field options for larger intersection radii. Some manufacturers supply radial wedge plates, and when placed alongside square plates, the desired detectable warning field radius is developed. Radial plate anchorage into the plastic concrete will also differ between manufacturers. View the various manufacturer's website for radius plate availability and options.

The WisDOT "Approved Products List" (APL) shows the various manufacturers and distributor information. Click on "curb ramp detectable warning fields" under "roadway appurtenances" on the APL page.

When radial detectable warning fields are used, the outermost radial plates will not coincide with the curb ramp edges. The outermost radial plates will need to be field cut to match the curb ramp edges. Since the dimensions of radial plates will differ depending on which manufacturer is used, the contractor is responsible for determining the layout of radial warning plates in the field. The designer is required to provide a layout table for radial warning plates that includes the back of curb radius, landing length, radial warning field area, and radial long chord.

Include grade break locations within the detail construction plans. Grade breaks are perpendicular to the direction of pedestrian travel and will coincide with the most- remote radial plate from back of curb. Provide a level landing (i.e., 1.5 percent longitudinal slope) within the radial detectable warning field limits.

See radial detectable warning field applications and plates under SDD 8D5 (sheets 'f' and 'g') with further details for inclusion in plan construction details. Include coordinates, elevations, slopes, grade breaks, etc. as similarly depicted in Figure 10.35.

Radial detectable warning fields will be paid as Curb Ramp Detectable Warning Field Radial (color) based on final quantity embedded in concrete. Include the following information with the contract plans for bidding purposes:

- Back of curb radius
- Landing length 'XR' (i.e., grade break distance)
- Radial warning field area (square feet)
- Radial long chord dimension (feet) (exclusive of curb ramp flares)

10.5.1.13 Vertical Surface Discontinuity

A vertical surface discontinuity refers to the vertical difference between two adjacent surfaces. Vertical surface discontinuities can create a tripping hazard for pedestrians and can cause wheelchairs to become stuck. The maximum vertical discontinuity allowed is 0.25 inches (PROWAG 302.7.2). See Figure 10.24 for an example of vertical surface discontinuity.

The change in angle from the gutter slope to the ramp slope (including curb head) shall be flush and without a lip, raised joint, or gap. Lips or gaps between the curb ramp slope, curb head, and the gutter slope can catch caster wheels or crutch tips and cause pedestrian injuries.

When evaluating existing curb ramps, replace the ramp panel if there is more than a 0.25 inch difference between the ramp and curb and gutter.

Figure 10.24 Example of Vertical Surface Discontinuity

10.5.1.14 Curb Ramp Type Selection

Proper curb ramp selection is important for pedestrians walking along a sidewalk or shared use path and attempting to cross a street. It is important to select the proper curb ramp type for each crosswalk location.

10.5.1.14.1 Perpendicular Curb Ramps

Perpendicular curb ramps have a running slope that cuts through or is built up to the curb at right angles or meets the gutter break at right angles where the curb is curved. On large corner radiuses, it will be necessary to indent the gutter break on one side of the curb ramp in order for the curb ramp to meet the gutter break at right angles (PROWAG R304.1). This is known as the lower landing. See Figure 10.25 for an example of the location of the lower landing.

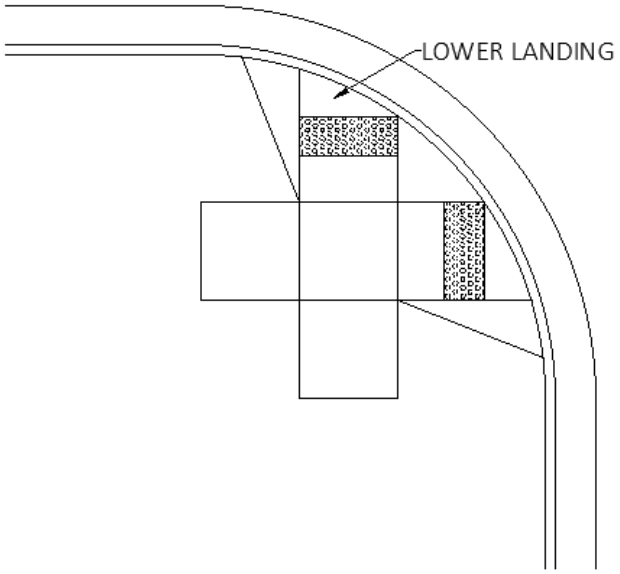


Figure 10.25 Example of Location of Lower Landing

Use of perpendicular curb ramps (Type 2) that are in line with the sidewalk is preferred because the crossing distance is shorter, and it helps to align people with visual or mobility issues to the opposite side of the street. See Figure 10.26.

Perpendicular curb ramps are typically used when there is a terrace between the sidewalk and the curb and gutter. At times, it may be necessary to offset the perpendicular ramps slightly for adequate room between the two ramps to provide at least a 2-inch curb head between the ramps. Consider Type 3 curb ramps in these situations.

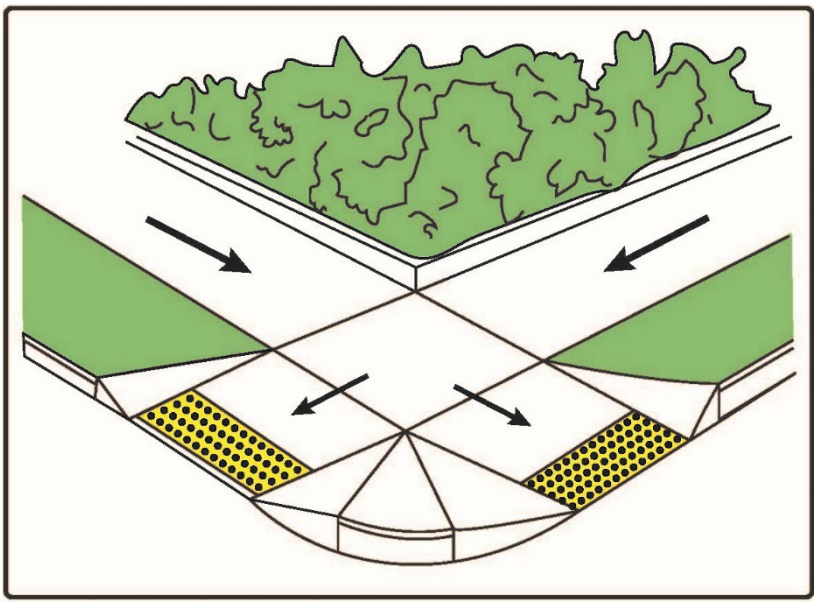


Figure 10.26 Typical Perpendicular Curb Ramp

10.5.1.14.2 Parallel Curb Ramps

Where perpendicular (Type 2) curb ramps are not feasible, parallel ramps are the next preferred ramp type. A parallel ramp consists of two ramps, both parallel, where the running slope is in-line with the direction of travel and the sidewalk is lowered to a level landing space where a turn is made to enter the street crossing, level landings are provided on each side of the of the street-level landing. See Figures 10.27 and 10.28. Parallel ramps are typically installed where the available space between the back of curb and property line is insufficient to permit a typical perpendicular ramp installation. Type 7A and 7B curb ramps are essentially parallel ramps. A curb ramp design may also consist of a combination of a perpendicular and parallel ramps, known as a combination ramp, depending on intersection geometry.

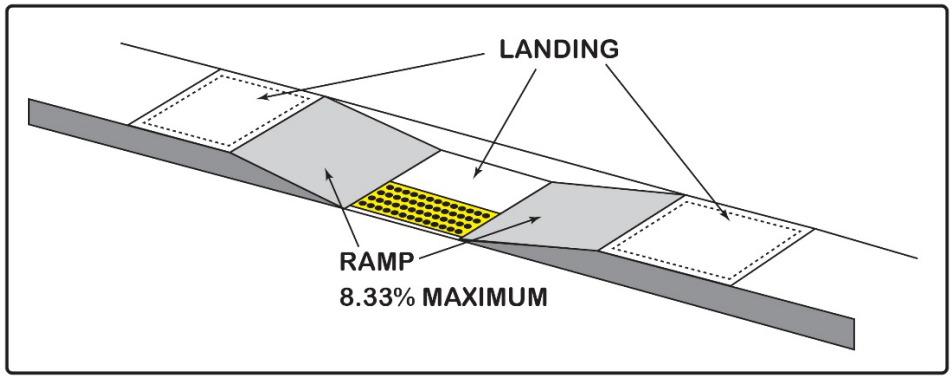


Figure 10.27 Typical Parallel Curb Ramp

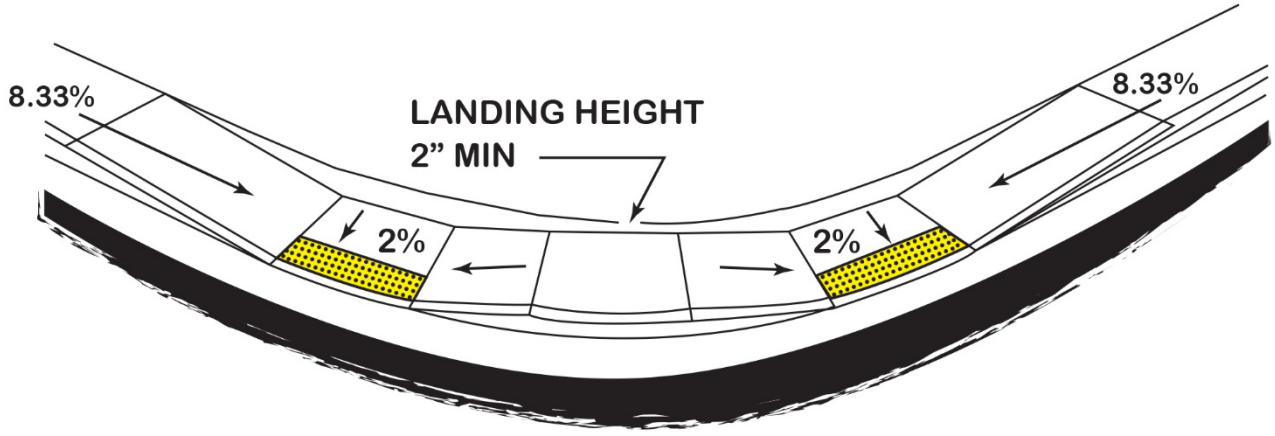


Figure 10.28 Parallel Ramps at Constrained Intersection

10.5.1.14.2 Diagonal Curb Ramps

A diagonal ramp (Type 1 or 1A) may be constructed as a single ramp centered on the curb return. Diagonal ramps are the least preferred type of curb ramp because they require wheelchair users to turn at the top and bottom of the ramp. Therefore, a bottom in-street landing is required in addition to the top landing.

When a diagonal ramp is used in one intersection quadrant, a diagonal ramp is not required to be used for the entire intersection. Designers should use perpendicular and parallel ramps except where they are not feasible. Provide documentation to the region bicycle/pedestrian coordinator for why perpendicular or parallel ramps cannot be used.

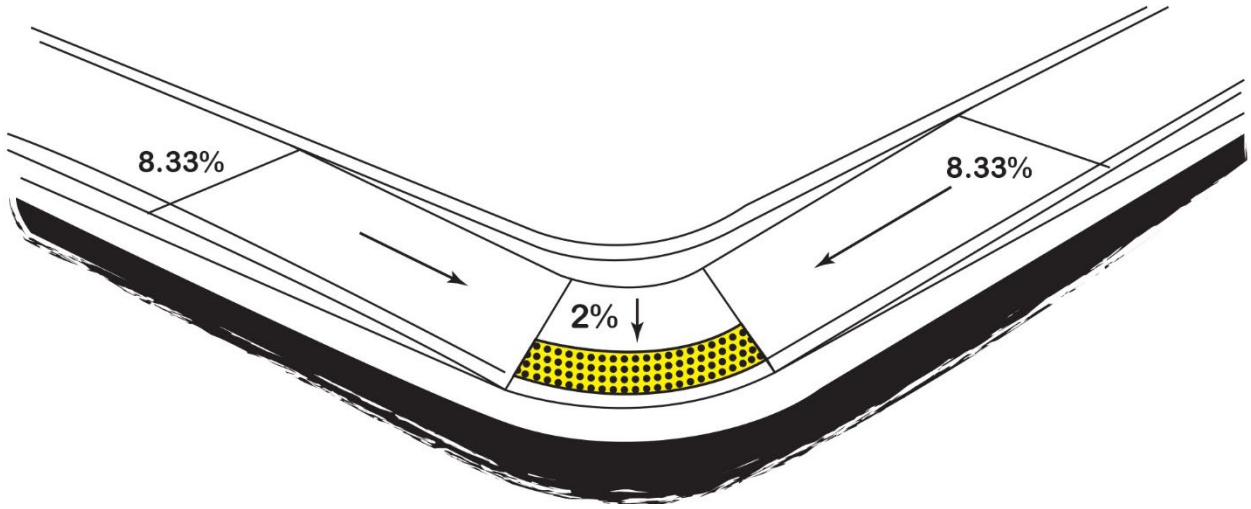


Figure 10.29 Typical Diagonal Curb Ramp

10.5.1.14.3 Other Curb Ramp Types

For non-midblock locations that have a single cross walk, use curb ramps Type 4A/A1 or 4B/B1. The ramp type depends on whether a terrace exists.

Other curb ramp types are provided in SDD 8D5 to illustrate the various configurations that require detectable warning fields that may occur on a project (i.e., railroad crossing, median crossing, mid-block crossing and island crossing). Document any technically infeasible design decisions in the Technically Infeasible Form (Attachment 10.3) relative to curb ramp selection and hierarchy (perpendicular ramp, parallel ramp, diagonal ramp).

10.6 Curb Ramp Design Considerations

10.6.1 Curb Ramp Drainage

Surface water runoff from the roadway can flood the lower end of a curb ramp. Determine the grades along the flow line and provide catch basins or inlets to prevent flooding of the ramps. Verify that the drainage structure will not be in the path of a wheelchair user or pedestrian.

On projects where the improvement strategy generally requires the existing pavement and curb and gutter to remain in place, it is critical that the designer reviews grades along the gutter flowline during the curb ramp design. It is common for the gutter counter slope to be warped from the existing slope at the match point to 4 percent at the curb ramp opening to allow for a 7 percent maximum ramp slope. When the curb and gutter have a relatively flat existing slope in the flowline, the warping of the gutter can create flat spots, or even low points in the flowline of the gutter.

Designers also need to verify drainage on the curb ramp itself to confirm that a low point has not been created on the level landing.

10.6.2 Curb Extensions

Curb extensions (also known as bump-outs or bulb-outs) are a traffic calming device used to reduce traffic speeds, increase sight distance for pedestrians and motorists, delineate on-street parking, reduce pedestrian crossing distances, and create additional space for curb ramps in constrained urban areas.

Before installing curb extensions on the State Trunk Highway Network, consult with the region bicycle/pedestrian coordinator and Bureau of Project Development (BPD) Region Design Oversight Engineer to determine if curb extensions are appropriate for a given project.

See FDM 11-20-1.7.2 for more information.

10.6.3 Skewed Intersections

When roadways do not intersect at 90 degrees it can make laying out curb ramps difficult. Typically, the curb ramp layouts shown in the Standard Detail Drawings need to be modified to fit the skewed angle of the intersection.

On quadrants with obtuse angles, often two perpendicular ramps need to be spread apart to align with the ramps on adjacent quadrants. In that situation, there is a separate level landing for each ramp and a section of sidewalk between the ramps.

On quadrants with acute angles, a porkchop island is often added to help delineate the path for vehicles and to

reduce pedestrian crossing distances. When a porkchop island is added, the layout of the curb ramp on the corner is generally straightforward. When a porkchop island is not added the curb ramp layout can become complicated as it can be difficult to obtain adequate room between the ramps for two perpendicular ramps. In some situations, the crosswalks may need to be moved further from the corner to provide sufficient room between the ramps. When moving crosswalks further from the corner, care should be taken that the stop bars are not moved so far from the intersection that drivers may not be aware of pedestrians in the crossing.

10.6.4 Modified Curb Ramp Layouts

Sidewalk is typically constructed in urban areas where buildings, parking lots, trees, and other obstructions are built in close proximity to the sidewalk. In many cases, curb ramps cannot be constructed as shown in the Standard Detail Drawings without unacceptable impacts to adjacent parcels. In those cases, designers will need to design modified versions of the curb ramp types shown in the Standard Details Drawings and still meet the design standards described in this manual and the Standard Detail Drawings.

One of the most common scenarios is when a Type 2 (perpendicular) ramp cannot be constructed because there is inadequate terrace width on the intersecting roadways to fit the minimum height curb head between the ramps without causing significant impacts behind the sidewalk. In those cases, designers should consider modifying ramp layout by offsetting the ramp crossing the mainline from the sidewalk approaching the intersection from the sideroad.

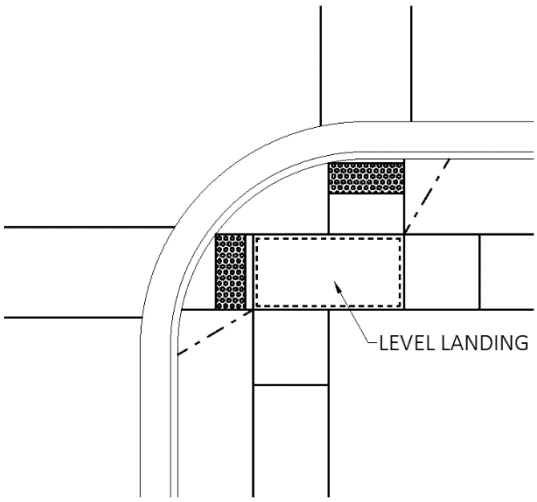


Figure 10.31 Example of Modified Type 2 Curb Ramp

Sometimes, a single 5 foot by 5 foot level landing is not feasible due to the layout of the ramps, the skew of the intersection or the crosswalks, and/or vertical differences in grade. Level landing shapes can be modified as long as they have a minimum width of 5 feet and there is sufficient room for a 5 foot by 5 foot turning space at the top of each ramp. Figure 10.32 shows an example of a level landing that is non-rectangular but allows for proper room for a turning space at the top of each ramp.

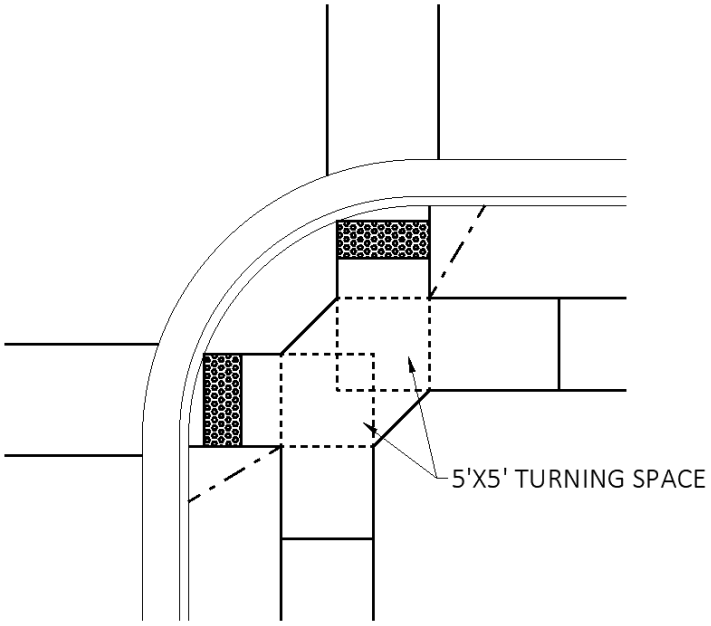


Figure 10.32 Example of Non-Rectangular Level Landing

10.6.5 Curb Ramps at Shared Use Paths

Curb ramps on shared use paths are handled similarly to sidewalk with the exception of a few unique circumstances.

Since shared use paths are typically wider than a sidewalk, the curb ramp opening, and detectable warning fields need to be wider so that they span the full width of the approaching path. In situations where the shared use path ends at an intersection and the other side of the intersection is a sidewalk, the curb ramp openings shall match the width of the pedestrian access route at that ramp. The crosswalk markings, if present, shall be wide enough to include the wider of the two ramps. See Figure 10.12 for an example.

Another consideration is that shared use paths are typically constructed of asphalt pavement. It can be difficult to construct turning spaces and ramps that will consistently meet curb ramp design standards because of how asphalt pavement is constructed. As specified in FDM 11-46-10.4.1.9.2, the portion of the ramp containing the detectable warning field should be constructed of concrete. Similarly, it is recommended that all level landings on shared use paths be constructed of concrete, so the level landings are more likely to be constructed to meet standards.

10.6.6 Pedestrian Curb

With sidewalk at curb ramps typically lowered below existing grade to meet design standards, it is common to utilize pedestrian curb along the ramp and level landing to limit impacts to adjacent land or to maintain acceptable slopes between the sidewalk and back of curb.

Dimensions and typical placement of pedestrian curb are shown in SDD 8D5. The curb varies in height from 0 inches to 6 inches above the top of sidewalk depending on the adjacent land. It is not tied to the adjacent sidewalk. In some locations, a 6 inch high pedestrian curb is not sufficient to limit impacts. A pedestrian curb up to 12 inches can be constructed. However, any pedestrian curb more than 12 inches high needs to be tied to the adjacent sidewalk and should be constructed monolithically with the sidewalk to prevent the curb from rotating over time. Figure 10.33 provides a detail of how pedestrian curb between 6 inches and 12 inches high is constructed.

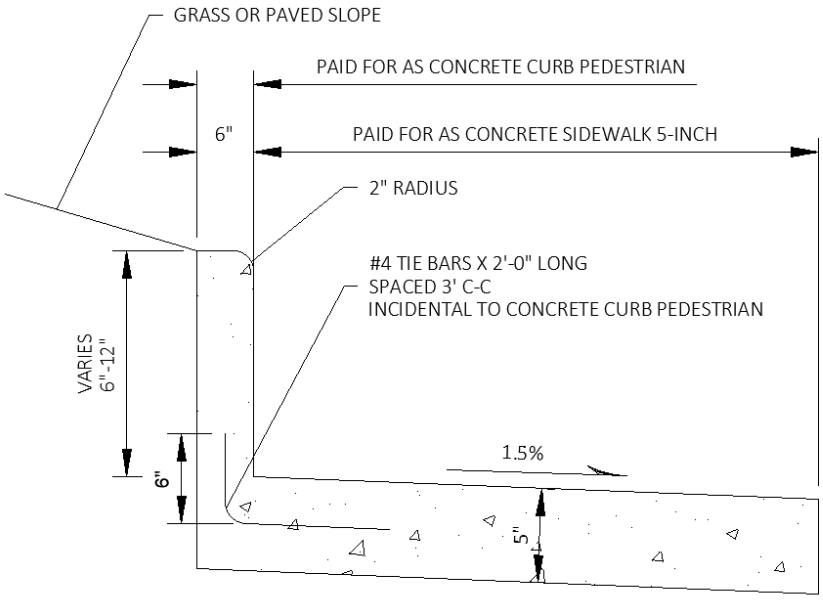


Figure 10.33 Concrete Curb Pedestrian Detail

If a pedestrian curb taller than 12 inches is required, a minor retaining wall or a custom concrete curb pedestrian may be required. Consult with BPD Roadway Standards Unit to determine if a structural design is required.

10.6.7 Technical Infeasibility Form

When a curb ramp cannot be constructed to meet all ADA standards, the deficient elements shall be listed on the Technical Infeasibility Form. A template of the form can be found in Attachment 10.3. Elements that do not meet this manual's design values but meet PROWAG standards are not considered technically infeasible and should not be included on the Technical Infeasibility Form.

When there are technically infeasible elements, those elements should be noted on the curb ramp details so that the contractor and field engineer are aware that the ramp cannot be constructed to all PROWAG standards. The plan sheet should note the ramp was designed to the Maximum Extent Feasible using an MEF annotation block at each location. Along with the MEF annotation, a brief note of what is non-compliant should be included on the curb ramp detail. A long description of the technically infeasible element is not needed as this should be documented in the Technical Infeasibility Form provided to the contractor and field engineer.

10.7 Curb Ramp Construction Details

The Standard Detail Drawings (SDD 8D5) are developed to show general layout dimensions for the various types of curb ramps, they are not intended to represent the actual site-specific curb ramp design. The site-specific dimensions, elevations and grades should be shown on separate curb ramp construction details. Curb ramp details are required for all curb ramps. See Figure 10.34 for the various design elements that are considered essential for a well-constructed curb ramp. When curb ramp construction details are inserted in the final plans, they should include the following items listed below:

Elevation Point Table Columns

- Point ID
- Station
- Offset
- Elevation
- X Coordinate
- Y Coordinate

Elevation points locations

- All grade breaks, both sides of sidewalk
- All corners of landings and ramp
- Flange at all curb profile grade breaks and vertical curvature locations
- Flange at radius points and quarter points
- Flange at gutter slope transition points
- Top of curb and gutter at grade breaks

- Top of pedestrian curb at grade breaks
- Top of pedestrian curb at horizontal geometry points
- Building steps/landings/doors
- Additional elevation points at designer's discretion

Slope Arrows and Percentages

- Gutter slope and all gutter slope transition points
- All locations for transverse slope change
- All longitudinal grade locations, both sides of walk
- Special attention to landing and ramp edges
- Slope of gutter in middle of cross walk in direction of pedestrian travel

Miscellaneous

- North arrow
- Legend
- Road Names
- Curb ramp type
- Detectible warning fields
    - Note warning field size for rectangular warning fields
    - Provide layout table for radial warning plates that includes the following:
        - Back of curb radius
        - Landing length ('XR' value from SDD)
        - Radial warning field area
        - Radial long chord
    - Note all level landings
    - Note flare type (traversable, paved non-traversable, or unpaved non-traversable)
- Proposed inlets and manholes
- Existing Topography Symbols
    - Signal equipment
    - Pole bases
    - Cabinets
    - Lights
    - Signal poles
    - Power poles
    - Fire hydrants
    - Signs
    - Existing inlets and manholes (if not being replaced)
- Other objects at the designer's discretion
- Horizontal dimensions at designer discretion
- Sidewalk width
- Theoretical joint locations including a general note
    - Sidewalk and Building Locations in some urban environments
    - Existing sidewalk match point
- Non-standard flare dimensions
- Technically Infeasible elements (labeled as MEF, see Figure 10.35)
- Slope Intercepts
- Curb ramp general notes
- Curb height between ramps (only when curb head is not full height)
- Right of Way line work (existing, proposed, and easements)
- Proposed edge-lines
- Proposed traffic signal equipment to scale (include callout to all pedestrian push button items)
- Sawcuts, removals, and additional miscellaneous callouts as needed

- Roadway reference lines

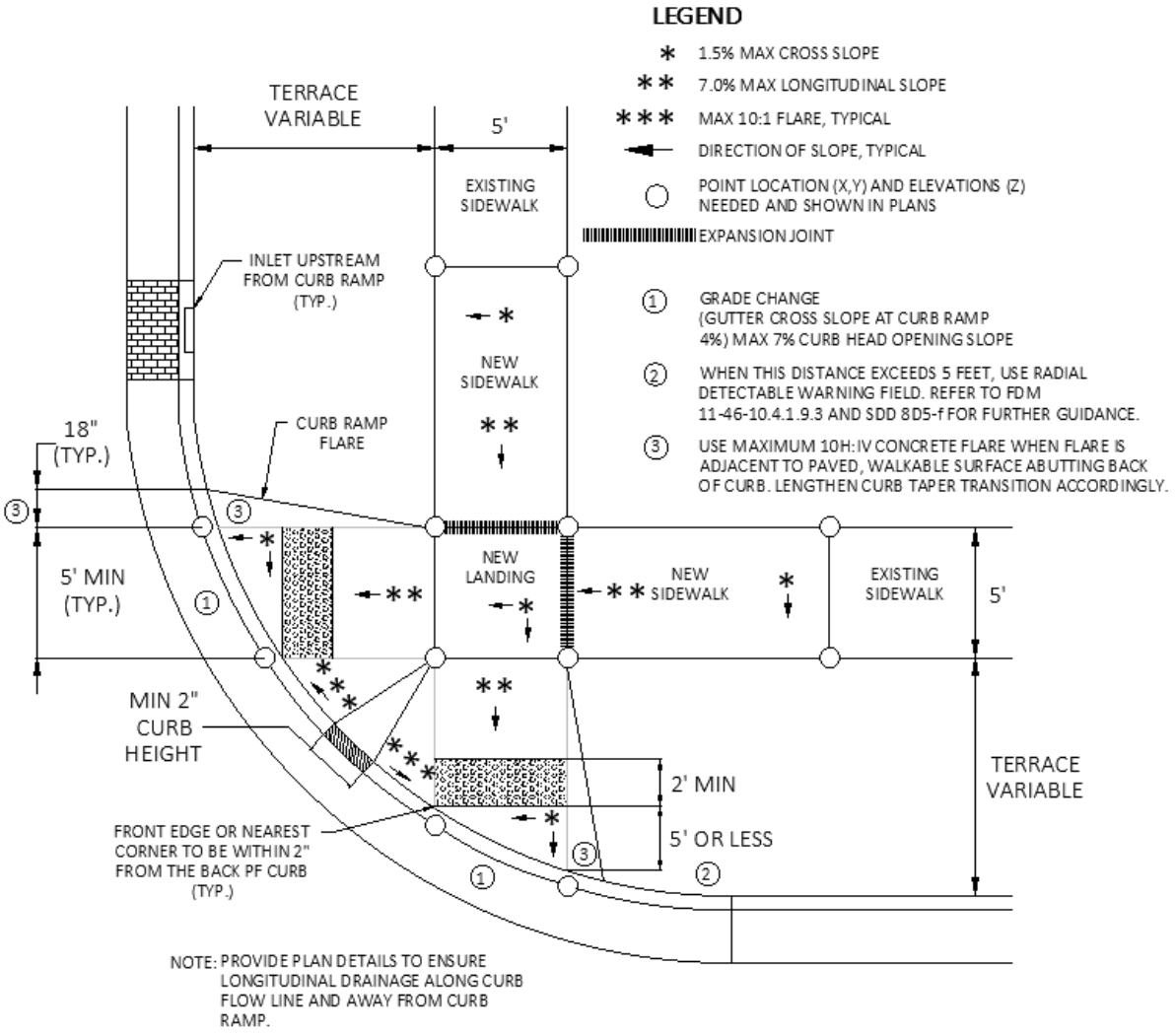


Figure 10.34 Typical Type 2 Curb Ramp Installation with Recommended Plan Details

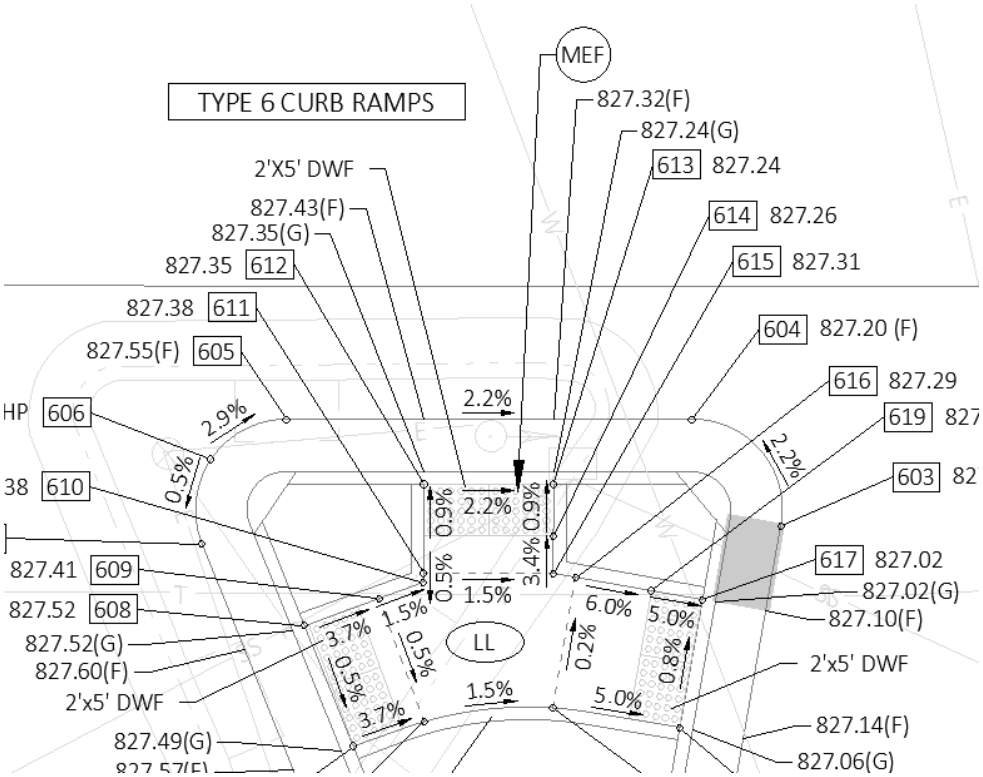


Figure 10.35 Example of How to Annotate Maximum Extent Feasible on Curb Ramp Details

See FDM 11-46-10.4 for further description of curb ramp design considerations for development and inclusion as project construction details.

10.8 Other Considerations

Curb ramp installations at intersections may have other options to consider including pedestrian signal push button locations. See Attachment 10.4 for pedestrian signal push button location guidance.

10.9 Curb Ramp Adjacent to Historically Significant Resources

Existing curb ramps or sidewalks adjacent to qualified historic facilities need to be evaluated and ADA compliance is required to the maximum extent feasible that does not threaten or diminish the historic significance. The element or facility that is altered must have the historic significance. Be aware that curb ramps within a historic district are not necessarily contributing elements to a historic facility. The State Historic Preservation Officer or Advisory Council on Historic Preservation determines if compliance would threaten or destroy the historic significance of the element or facility. A qualified historic facility is a facility that is listed in, or is eligible for listing in, the National Register of Historic Places or is designated as historic under state or local law. Reproductions or replications of historic facilities shall not qualify as historic facilities. If the existing sidewalk/curb ramp remains and does not meet ADA accessibility standards, document the evaluation and decision as technically infeasible in the DSR accordingly.

10.10 References

Refer to FDM 11-46-99 for list of references.

LIST OF ATTACHMENTS

Attachment 10.1	Curb Ramp Evaluation Workflow
Attachment 10.2	Curb Ramp Component Summary Tables
Attachment 10.3	Technical Infeasibility Form Template
Attachment 10.4	Pedestrian Signal Push Button Locations

FDM 11-46-15 Bicycle Facilities

May 15, 2019

15.1 Introduction to Bicycle Facilities

Department policy, in conformance with Federal law and policy, Section 84.01 (35) Wis. Stats.:

and Connections 2030*(2)(3)*, requires providing due consideration to establishing bikeways and pedestrian ways on all modernization highway projects funded in whole or in part from state or federal funds.

See FDM 11-46-1 for guidance.

Department policy for other project types, such as perpetuation and rehabilitation, may need to complete an evaluation to include bicycle and pedestrian accommodations where possible/practical within the scope of the project. In addition, certain bicycle and pedestrian design practices are required when applicable, e.g., curb ramps and bicycle-acceptable grates.

The past three surface transportation bills placed increased importance on the use of the bicycles for transportation and calls on each state highway agency to encourage their use. Federal legislation provides the stimulus for planning, designing, and constructing a fully integrated transportation system benefiting the traveling public and the environment. According to federal legislation (23 USC Section 217(g)) transportation officials have to “consider” bicycle and pedestrian accommodations on projects. While this legislation stops short of requiring specific bicycle and pedestrian accommodation on every transportation project, FHWA intends for bicyclists and pedestrians to have safe, convenient access to the transportation system and sees nearly every transportation improvement as an opportunity to enhance the safety and convenience of the two modes. Thus, they developed a policy in 2001 for all projects that use federal funding in urban and suburban areas which requires the inclusion of bicycle and pedestrian facilities unless there are notable exceptions.

15.2 Design Guidelines and Basic Improvements

Certain bicycle-acceptable design practices should be considered regardless of the type of improvement being developed. An important design consideration is to provide adequate width within the roadway for bicycle travel. Information about minimum and typical widths is contained elsewhere in this procedure. Other bicycle-acceptable design factors that require attention are drainage grates, railroad crossings, signing and pavement marking.

Many of the guidelines in this procedure are from the Wisconsin Bicycle Facility Design Handbook *(4)*, which is the most applicable document for the design of bicycle accommodations on state and federally funded projects. The AASHTO "Guide for the Development of Bicycle Facilities *(17)* is the primary basis for the WisDOT Bicycle Facilities Design Handbook.

FHWA’s 2013 memos *(19)* encourage agencies to use other guides and resources that build upon the flexibilities provided in the AASHTO guides, as appropriate. These other guides and resources can be useful information in project planning and development when used in context with AASHTO and WisDOT design guidance and expertise. If a project proposes a bicycle facility treatment(s) outside of Wisconsin guidelines approval is required. Contact WisDOT regional bike and pedestrian coordinators to initiate this process. Use the WisDOT regional bike and pedestrian coordinators as a resource for planning and designing bike and pedestrian facilities on state and federally funded projects. Also, see the “references” section for additional documents and resource information.

Use the WisDOT Bicycle Facilities Design Handbook if this procedure (or other FDM procedures) does not fully address a design issue. See FDM 11-15-1 and FDM 11-20-1 for additional guidance.

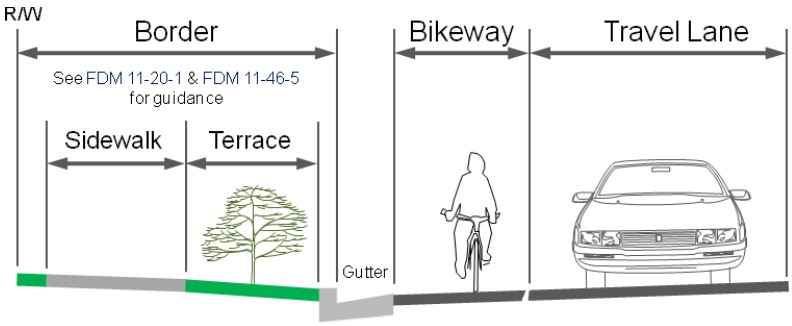
15.3 Urban On-road Bicycle Accommodations

If streets and highways have higher traffic volumes, additional space might be necessary to make it more convenient and safer for motorists to pass bicyclists. An urban on-road bicycle accommodation can be a bike lane, an urban paved shoulder, a wide outside lane or a combined parking/bike lane. A shared travel lane (see FDM 11-46-15.5) is not wide enough for motorist and bicyclists to operate side-by-side and is not a bicycle accommodation.

Requirements for on-road bicycle accommodation depend on whether there is parking or no parking as well as traffic volumes and speeds. Give due consideration to on-road bicycle accommodations on urban and suburban projects that use state or federal funding (see FDM 11-46-1).

Figure 15.1 shows the sequential preference and dimensions needed for bicycle accommodations (bike lanes, urban paved shoulders or wide outside lanes) for urban roadways without parking (also see the Bicycle Facilities Development Handbook). Most cyclists will be most comfortable and feel safest when separation markings are used with wider bicycle accommodations, equating to higher use. Do not use minimum bikeway widths unless cost or land constraints prevent additional widths. Options 11, 12, 13, 14 and 15 may not applicable for concrete pavement with a thickness less than 10-inches due to random longitudinal crack control. See SDD 8D1-a for

concrete edge line jointing application adjacent to integral curb and gutter.



1st	2' gutter, 5' bike lane, 11'-12' travel lane
2nd	6' concrete bike lane with integral curb, 11'-12' travel lane
3rd	1' gutter, 5' bike lane, 11'-12' travel lane
4th	2' gutter, 4' bike lane, 11'-12' travel lane
5th	1' gutter, 4' bike lane, 11'-12' travel lane
6th	5' concrete bike lane with integral curb, 11'-12' travel lane
7th	2' gutter, 4' urban paved shoulder, edgeline, 11'-12' travel lane
8th	1' gutter, 4' urban paved shoulder, edgeline, 11'-12' travel lane
9th	2' gutter, 3' urban paved shoulder, edgeline, 11'-12' travel lane
10th	1' gutter, 3' urban paved shoulder, edgeline, 11'-12' travel lane
11th	2' gutter and 15' wide outside lane
12th	1' gutter and 15' wide outside lane
13th	2' gutter and 14' wide outside lane
14th	15' concrete integral curb/gutter (wide outside lane)
15th	1' gutter and 14' wide outside lane

***Figure 15.1** Urban Bicycle Accommodations without Parking (in order of preference)*

Figure 15.2 shows the dimensions needed to accommodate bicyclists side by side with parked autos and adjacent traffic. The bicycle accommodation is always located between the parking lane and the motor vehicle lane. Using the maximum combined width of 28-feet for parking lane, bikeway and travel lane allows the conversion of the parking lane to a travel lane while still providing a bicycle accommodation.

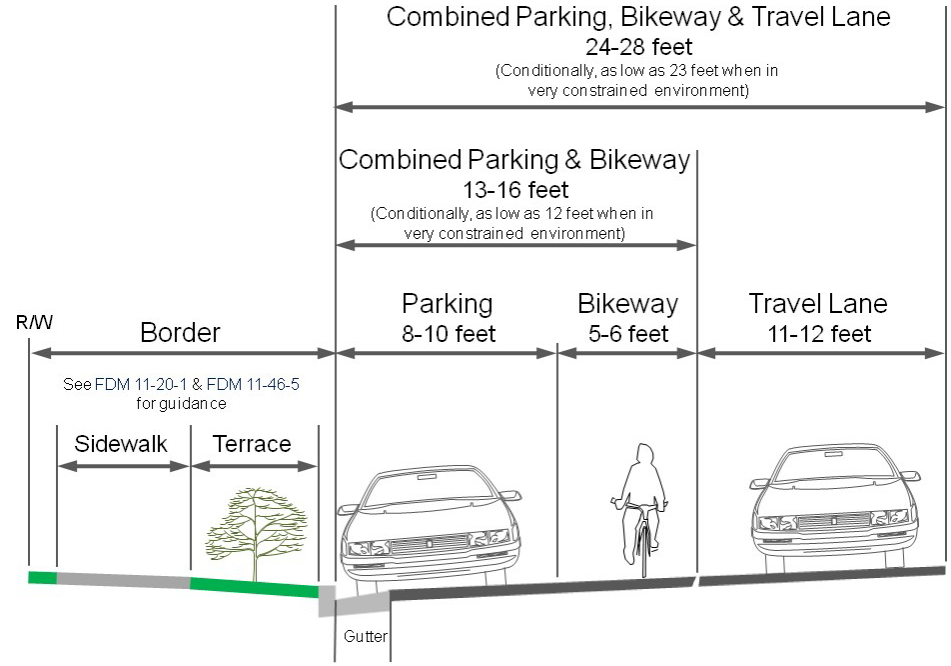


***Figure 15.2** Urban Bicycle Accommodations with Parking*

15.3.1 Bicycle Lanes

Bicycle lanes are usually the preferred form of bicycle accommodation on streets and have been shown to increase the comfort level of bicyclists using them. They are marked and designated as bike lanes, which distinguishes them from other types of bicycle accommodation. Bicycle lanes are always one-way facilities and flow in the same direction as the adjacent motor vehicle traffic. Conventional bicycle lanes may be enhanced with buffer space separating the bicycle lane from the adjacent motor vehicle travel lane or parking lane, this is known as a buffered bike lane. Adequate width must be provided and MUTCD guidelines followed for buffered preferential lanes in (MUTCD section 3D-01). Other design guides (NACTO) (22) may be appropriate to use in planning and design of buffered bike lanes.

A separated bike lane is an exclusive facility for bicyclists located within or directly adjacent to the roadway and is physically separated from motor vehicle traffic with a vertical element. The vertical element is what differentiates separated bike lanes from regular and buffered bike lanes. They are different from shared-use paths by their proximity to the adjacent roadway and that they are bike-only facilities. The planning and designing for this type of facility needs to consider other roadway design elements such as maintenance and drainage issues and roadside design. These facilities may be considered in designs with Bureau of Project Development approval. See FHWA's Separated Bike Lane Planning and Design Guide for more guidance (30).

Separated and marked bike lanes are not allowed within the circulatory roadway of a roundabout.

15.3.1.1 Bike Lane on Curbed Street without Parking

On curbed streets without parking, the bicycle lane is located next to the curb. The minimum width of the bike lane measured from the face of curb is 5 feet when the curb is integral with the pavement (see Figure 15.3). The minimum bike lane width is 4 feet as measured between a gutter/pavement longitudinal joint and an 11-foot minimum motor vehicle traffic lane (see Figure 15.3). The bike lane must be free of longitudinal joint lines.

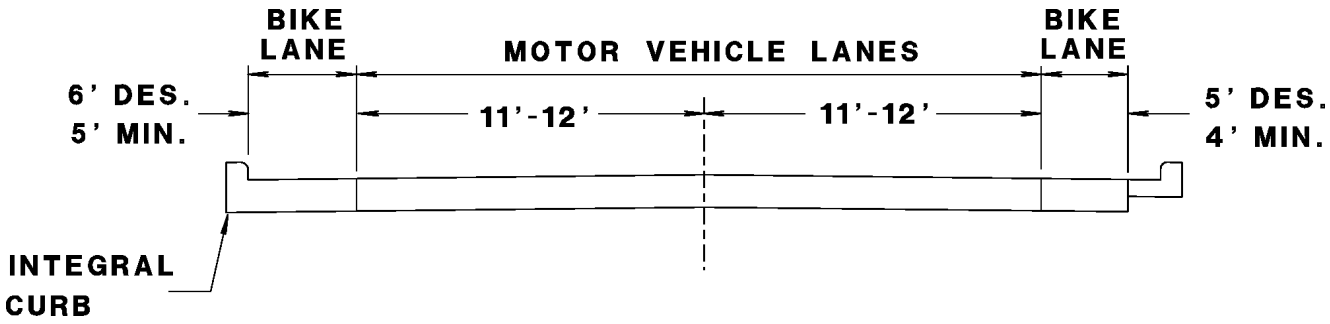


Figure 15.3 Bike Lane on Curbed Street without Parking

A concrete bike lane with integral curb that abuts asphalt pavement requires additional design consideration - including concrete thickness, dowel bar installation, straight edging, cross slope(s) and saw cutting - as well as finishing quality.

15.3.1.2 Bike Lane on Curbed Street with Parking

A bicycle lane is always located between the parking lane and the motor vehicle lane. The width of this combined bicycle and parking lane can vary from 13-feet to 16-feet depending on the width required for the parking lane (see Figure 15.4). The width provided for bicycle travel is 5 feet. Use the preferred width of 6-feet to provide safe bicycle operation where there is frequent parking turnover, parked vehicles are mostly commercial vehicles, or posted speed exceeds 40 mph.

See FDM 11-46-15.3.3.1 for possible bike accommodations where site conditions and right of way restrictions preclude providing the minimum width for combined bicycle and parking lane.

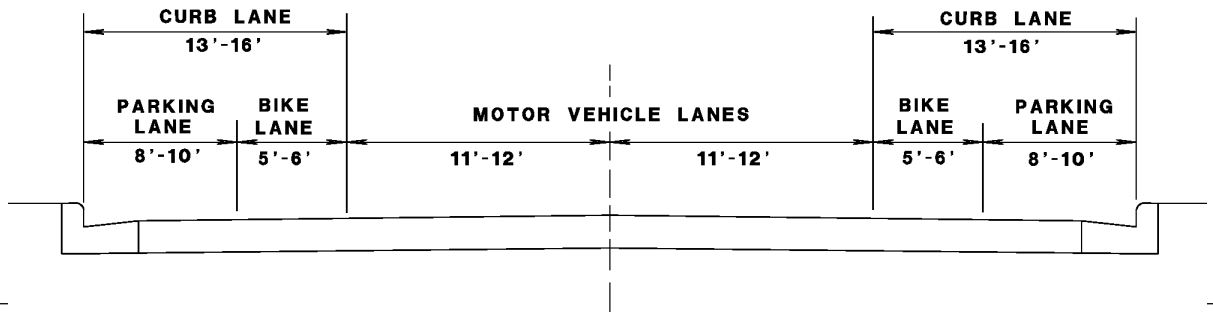


Figure 15.4 Combined Bike Lane and Parking Lane

At some locations, even after the above width adjustments are considered, there may not be enough room for accommodating bicycle travel between parked autos and traffic - and there may be no practical means of increasing the width of the roadway without impacting structures, improvements, natural resources, historical sites, or archaeological sites adjacent to the highway. It may be acceptable to consider keeping on-street parking when evaluating a location if *continuation* of on-street parking is warranted and supported by the community. This is particularly relevant in downtowns and neighborhood commercial areas where constraints are prevalent, and parking is at a premium.

However, even in these situations, all options to accommodate bicyclists and pedestrians should be explored and included to the greatest extent practicable. Even if parking is allowed, bicycling conditions can still be improved with methods such as limiting parking to only one side or creating limited parking bays for low parking demand situations (see Figure 15.5). When parking usage is low, these options are more viable.

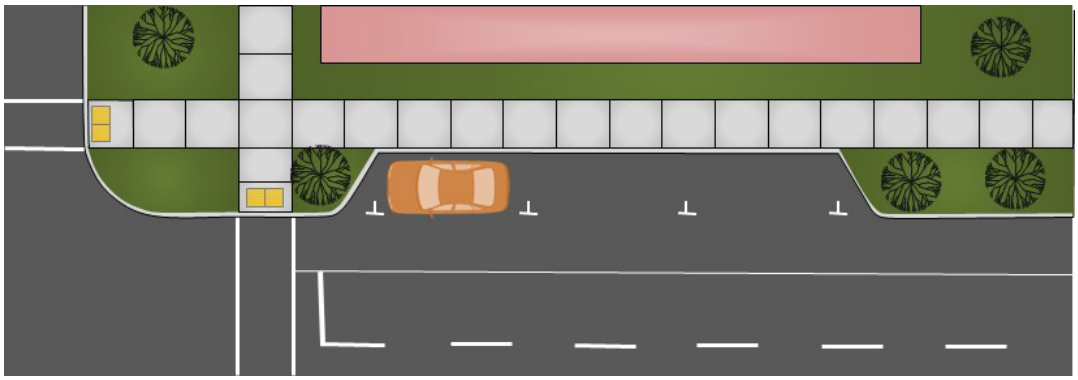


Figure 15.5 Parking Bay

The more important the route for bicycling, the more thoroughly options must be considered and documented.

Some municipalities use short-term parking restrictions, i.e., temporarily prohibit parking, on a combined parking lane/bike lane during the peak hour(s) to provide an additional travel lane on some of their urban streets. During this peak-hour time period, bicyclists use the travel lane and do not have their own space on the roadway. The continuation of short-term parking restrictions on a combined parking lane/bike lane in order to provide an additional travel lane during peak hours is acceptable as a bicycle accommodation under the following conditions:

- The parking restrictions are equal to or less than 2 hours per day in any one direction, and
- The WisDOT Regional Project Manager and the WisDOT Regional Bicycle/Pedestrian Coordinator concur with the continuation.

Otherwise, the width of the combined parking lane/bike lane must at least meet the requirement for a wide outside lane on a street with no parking, i.e., 14-feet minimum, not including gutter. This allows the operation of a temporary travel lane while still maintaining a bike accommodation.

15.3.2 Urban Paved Shoulders

An urban paved shoulder is the space between a travel lane and a curb/gutter section delineated with an edge line at the edge of travel lane. The minimum urban paved shoulder width to be a bicycle accommodation is 3-feet adjacent to an 11 or 12-foot travel lanes, and 4-feet adjacent to a 10-foot travel lane, not including gutter. In effect, a minimum width urban paved shoulder bicycle accommodation is a wide outside lane (see FDM 11-46-15.3.3) delineated with an edge line at the edge of travel lane. A minimum width urban paved shoulder bicycle accommodation is preferred over a wide outside lane bicycle accommodation because the edge line better defines the separation between motorists and bicyclists.

An urban paved shoulder that meets the width requirements of a bike lane (see section 15.3.1) will have many of the same benefits as a bike lane, but it is not marked and designated as a bike lane. A bike lane is preferred over an urban paved shoulder bicycle accommodation because it increases motorists' awareness of bicyclists.

15.3.3 Wide Outside Lanes on Urban Streets

A wide outside lane (aka wide curb lanes or wide outside travel lane) is essentially a travel lane plus an urban paved shoulder (see FDM 11-46-15.3.2) without an edge line. A wide outside lane bicycle accommodation is wide enough for bicyclists and motorists to operate side-by-side. In fact, a wide outside lane bicycle accommodation allows most types of vehicles to pass a bicyclist with at least 3 feet of separation without

encroaching into the adjacent travel lane. However, motorists and bicyclists might not recognize a wide outside lane as a bicycle accommodation because there is no pavement marking to define their respective space.

A bike lane is preferred over a wide outside lane bicycle accommodation, but wide outside lanes have application where physical constraints such as buildings or environmentally sensitive areas prevent widening a street to provide bike lanes. An urban paved shoulder bicycle accommodation is preferred over a wide outside lane bicycle accommodation because the edge line better defines the separation between motorists and bicyclists.

On urban streets with no parking, the minimum width of a wide outside lane to be a bicycle accommodation is 14 feet not including the gutter. See Figure 15.1 for various widths that constitute a wide outside lane bicycle accommodation on urban streets with no parking.

It is strongly recommended that 2-lane connecting highways and STHs have a minimum curb to curb width of 36 feet when no provision is made for parking (See FDM 11-20-1). This would provide useable lane widths of 16 feet from edge of gutter to the centerline.

On urban roadways with 4 or more lanes, consider widening the outside lane by narrowing the gutter or widening the street's footprint as part of a modernization project. Additionally, narrowing the inside lane to provide a 14-foot outside lane to accommodate bicyclists can work independently or in addition to the techniques above.

15.3.3.1 Wide Outside Lanes on Urban Streets - Wide Parking Lane

On urban streets with parking, (see Figure 15.2), consider a minimum width of 23 feet, including gutter, for the combined travel lane/bicycle accommodation /parking lane where site conditions and right of way restrictions preclude a greater width and the following conditions are met:

- Posted speeds are low (less than or equal to 35 mph),
- There is low parking turnover or little on-street parking, and
- The traffic lane next to the bike accommodation is at least 11 feet wide.
- The combined width of bike accommodation and parking lane is at least 12 feet, including gutter.

Evaluate the location periodically to ensure that the assumed design conditions are still valid and that bicyclists are operating safely on the facility.

15.3.4 Adding Bike Lanes, Urban Paved Shoulders or Wide Outside Lanes to Existing Roadways

Consider one or more of the following methods to retrofit bike lanes, urban paved shoulders or wide outside lanes on existing urban roadways:

1. Physically widen the roadway to add these facilities
2. Mark or remark the pavement to gain space for bicycle accommodations. For example:
    - Reduce the width of traffic lanes.
    - Remove parking.
    - Convert a 4-lane undivided two-way street to a 2-lane street with a center turn lane (TWLTL) (see FDM 11-25-5 for guidance on TWLTLs) and bike lanes on each side (aka a "road diet"). Besides providing bike accommodations, this might also increase safety, decrease delay and improve overall operations.

See FHWA's Incorporating On-Road Bicycle Networks into Resurfacing Projects for guidance and strategies for installing and integrating bicycle facilities onto existing roadways (31).

15.4 Rural On-road Bicycle Accommodations

A paved shoulder is the most common on-road bicycle accommodation on rural highways.

A shared roadway is not a bicycle accommodation but is appropriate on some low-volume rural roads. See FDM 11-46-15.5 for guidance on shared roadways.

A shared-use path is an off-road bicycle accommodation, not an on-road bicycle accommodation. Shared-use paths, which typically parallel a rural divided highway or other high volume rural arterial, are much less common (see FDM 11-46-15.6 for guidance).

A shared roadway is not a bicycle accommodation but is appropriate on some low-volume rural roads. See FDM 11-46-15.5 for guidance on shared roadways. Also see WisDOT Rural Bicycle Planning Guidelines (5) for additional guidance.

Table 15.1 Conditions Requiring Due Consideration of Bicycle Accommodations

Condition Number	Condition
1	Identified in the Wisconsin Bicycle Transportation Plan or another WisDOT-endorsed or supported bicycle plan,
2	The two-way bicycle traffic volume is (or is expected to be) 25 per day or more during peak travel days for cycling (average of the 10 most traveled days for bicycling for the year)
3	To complete short gaps in an otherwise continuous bicycle route,
4	To make short connections from communities or urban areas of up to approximately 3 miles to the town or county roadway network (not to a dead-end roadway).
5	If bicycle accommodation projects were proposed and funded as bikeways under the Transportation Enhancement (TE), Congestion Mitigation & Air Quality (CMAQ), or Safe Routes to School (SRTS) programs, a minimum 5' shoulder shall be provided. For projects funded under these programs, 4' paved shoulders may be used only when ADTs are less than 1,500 in the design year or there are extenuating circumstances that will not permit 5' or wider paved shoulders. Appropriate justification and documentation of the extenuating circumstances must be developed and maintained in the project file.

15.4.1 Rural Paved Shoulders

Paved shoulders are a common feature on rural state highways and consist of at least a 3-foot paved area to the right of the edge line which provides on-road bicycle accommodations. See FDM 11-15-1.7 and FDM 11-15-1.8 for more information on paved shoulder width and rumble strip installation on modernization projects. Also, see FDM 11-15, Attachment 1.5 and FDM 11-15-5.3.2.

For paved shoulder and rumble strip information on rehabilitation projects, see FDM 11-40-1.5.1 and FDM 11-40-1.7.1.

Table 15.2 shows minimum rural paved shoulder widths for on-road bicycle accommodations. If a wider paved shoulder is called for in FDM 11-15-1 or FDM 11-15-5, then use that width. Paved shoulders with shoulder rumble strips may require additional width.

Typically, paved shoulders result in just a small marginal project cost, especially on modernization and rehabilitation projects. In some cases, it may be necessary to rebuild or widen the shoulder to provide wider paved shoulders, which could result in adding substantial costs for the project. In these cases, it may be appropriate to widen the paved shoulders as much as possible even if falling short of the required width. However, local conditions and expected bicycle use must be thoroughly evaluated. Additionally, on some lower volume state and county highways, a 3-foot paved shoulder may be acceptable where the overall shoulder widths are currently not wide enough to support a wider paved shoulder and are not being widened as part of a project. See the "WisDOT Rural Bicycle Planning Guidelines".

Use these guidelines as an aid to determine the suitability of roadways when 3-foot paved shoulders are the only feasible option. If these guidelines indicate a rating of "moderate conditions for bicycling" for the design year ADT, 3' paved shoulders are permitted under this procedure.

Table 15.2 Minimum Paved Shoulder Width for On-Road Bike Accommodation on Rural Roads

Design Year AADT	Conditions from Table 15.1	Adjacent Travel Lane Width (feet)	Paved Shoulder Width (feet)	
			without shoulder rumble strip*	with shoulder rumble strip
< 750	Meets 0 or more of conditions 1, 2, 3, or 4 AND DOES NOT meet condition 5 none of the conditions are met	10	4	5
		11 or 12	3	5
	Meets 0 or more of conditions 1, 2, 3, or 4 AND Meets condition 5	10, 11 or 12	4	5
>= 750	DOES NOT meet ANY of conditions 1, 2, 3, 4, or 5	10	4	5
		11 or 12	3	5
750-1,499	Meets 1 or more of conditions 1, 2, 3, 4, or 5	10 or 11	4	5
	Meets 1 or more of conditions 1, 2, 3, or 4 AND DOES NOT meet condition 5	12	3	5
	Meets 0 or more of conditions 1, 2, 3, or 4 AND Meets condition 5	12	4	5
1,500-1,999	Meets 1 or more of conditions 1, 2, 3, 4, or 5	11	5	5
	Meets 1 or more of conditions 1, 2, 3, or 4 AND DOES NOT meet condition 5	12	4	5
	Meets 0 or more of conditions 1, 2, 3, or 4 AND Meets condition 5	12	5	5
>= 2,000	Meets 1 or more of conditions 1, 2, 3, 4, or 5	11 or 12	5**	5**

* Width is OK if Rumble Strips (see SDD 13A10-b, “Type 2 Milled Rumble Strip”) used instead of shoulder Rumble Strips

** When AADT exceeds 4,500, a 6ft paved shoulder is advisable[18]

15.5 Shared Roadways

On a shared roadway, there is inadequate pavement width or paved shoulder width for motorists and bicyclists to operate side-by-side, i.e., bicyclists share the same travel lane with motorists.

Shared roadways do not comply with criteria for a bikeway and are not a bike accommodation. However, shared roadways are appropriate under certain conditions.

[18] *Table 2.1 page 2-19 of reference (4) Wisconsin Bicycle Facility Design Handbook*. Wisconsin DOT, 2004. https://wisconsindot.gov/Documents/projects/multimodal/bike/facility.pdf, Table 2.1 on p.2-19

15.5.1 Shared Roadways on Urban Streets

Residential streets in communities that are not functionally classified almost always have low enough speeds and traffic volumes (design year <1,500 ADT) that bicyclists can use most of or the entire travel lane for bicycling. No special bicycle accommodations are necessary on these roadways. The low volume of traffic provides ample passing opportunities for motorists and increases the comfort level for bicyclists. Use the "Pavement Marking for Shared Lanes" shown in SDD 15c29-f to help increase motorists' awareness of bicyclists.

Another application of a shared roadway on an urban street is providing a shared parking/bicycle lane of less than 12 feet. This is not a bicycle accommodation but can be justified for short segments in highly constrained environments (e.g., through a two-block downtown segment or commercial zone where buildings are directly adjacent to the sidewalk).

Consider a shared parking / bicycle lane of less than 12 feet (next to 11-foot or wider travel lanes) if parking usage is 20% or less, even during peak parking periods, and the following thresholds are met for residential areas (these are based on the FHWA Bicycle Compatibility Index):

1. For street widths of 44 feet from curb face to curb face and posted speeds of 25 mph, design year AADTs of 5,000 or less
2. For street widths of 44 feet from curb face to curb face and posted speeds of 30 mph, design year AADTs of 4,000 or less
3. For street widths of 42 feet from curb face to curb face and posted speeds of 25 mph, design year AADTs of 4,000 or less
4. For street widths of 42 feet from curb face to curb face and posted speeds of 30 mph, design year AADTs of 2,500 or less

Use the following thresholds for commercial and industrial areas with 20 percent parking use or less:

1. For street widths of 44 feet from curb face to curb face and posted speeds of 25 mph, design year AADTs of 3,000 or less
2. For street widths of 44 feet from curb face to curb face and posted speeds of 30 mph, design year AADTs of 1500 or less

15.5.2 Shared Roadway on Rural Highways

A Rural highway is a shared roadway if it has no paved shoulder or it has a paved shoulder whose width is less than the minimum required width for a bicycle accommodation shown in Table 15.2. A shared roadway on a rural highway is not a bike accommodation and does not comply with criteria for a bikeway. A shared roadway is not appropriate other than on very low volume roads - less than 750 ADT - and sometimes not on those. However, with very low volumes, motorists will generally have ample passing opportunities and additional features are usually not necessary for compatibility with bicycling.

15.6 Shared-use Paths

See chapter 4 of the Wisconsin Bicycle Facility Design Handbook *(4)* for guidance on shared-use path design.

According to FHWA website "Shared Use Paths Along or Near Freeways and Bicycles on Freeways" *(18)*, "the term "shared-use path" means a multi-use trail or other path, physically separated from motorized vehicular traffic by an open space or barrier, either within a highway right-of-way or within an independent right-of-way, and usable for transportation purposes. Shared use paths may be used by pedestrians, bicyclists, skaters, equestrians[19], and other non-motorized[20] users."

Bicyclists are legal users of roadways, and the first responsibility is to provide on-road accommodations for bicycles where appropriate. Shared-use paths shall only replace on-road bicycle accommodations in exceptional situations (e.g. bicyclists and pedestrians prohibited). In certain situations, shared-use paths can supplement on-road bicycle accommodations, or be used in place of a sidewalk (on a given side of the road) as a pedestrian facility.

The decision to use shared-use paths along roadways must meet the guidelines found in this procedure and in

[19] Equestrian use is not typical on shared-use paths.

[20] Although shared-use paths are usually non-motorized facilities, there are some state trails in Wisconsin that permit snowmobile use.

the “Wisconsin Bicycle Facility Design Handbook” (4).

Because it is a facility intended for pedestrian use, American with Disabilities Act (ADA) regulations and guidance shall also be followed in the design of these projects. The width of a shared-use path is 10 feet (see Figure 15.6). Use the width unless there is justification for using a different width. See section 4.4 of the Wisconsin Bicycle Facility Design Handbook for guidance when considering a non-standard width.

A minimum 5-foot separation of a shared-use path from the roadway shoulder or curb is required and the separation should be as wide as practical (and preferably outside the clear zone) to prevent operational and safety problems that may occur when two-way bike traffic operates adjacent to motor vehicle traffic.

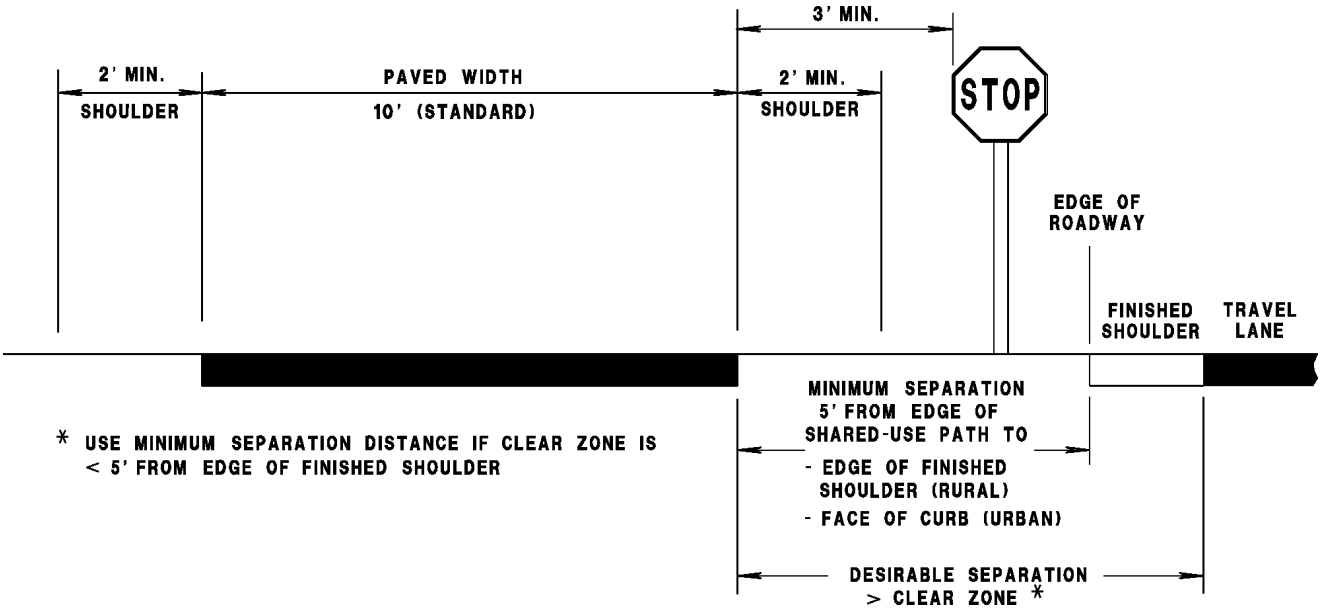


***Figure 15.6* Shared-use Path Design**

A shared-use path is generally more expensive to construct and maintain than bike lanes or paved shoulders. In addition, a shared-use path may be a less direct route for a bicyclist and safety is often a concern at street intersections or driveways when a shared-use path is located adjacent to a roadway. Nevertheless, under some circumstances, a shared-use path may be the best option but does not substitute or preclude the need to provide on-street bicycle accommodations.

In a rural setting, there are fewer intersection and driveway crossings than in urban/suburban areas. This reduces potential hazards for bicyclists and helps make a shared-use path for bicyclists a viable option, particularly when 2-lane roadways are re-designed as expressways or freeways, typically with posted speed limits over 55 mph. The greatest opportunity to include a shared-use path presents itself when real estate is being purchased for the expansion of a roadway.

Consider a shared-use path on a rural highway if either of the following guidelines apply and right-of-way is either available or can be readily acquired through the real estate acquisition process.

1. Safety and Access: When rural highways undergo changes that will cause restrictions for bicyclists and pedestrians, and posted speeds increase to over 55 mph, a shared-use path is often a viable solution to provide a bike accommodation. This is especially relevant when there are no frontage roads or nearby parallel roadways (within one-half mile). When a new 4-lane roadway is built on the alignment of an existing 2-lane roadway, bicyclists and pedestrians still need to access the corridor. In other cases, bicyclists and pedestrians may be permitted, but high speeds (over 55 mph) on 4-lane highways make on-road bicycling difficult and undesirable. Though shared-use paths are generally more expensive to construct and maintain than paved shoulders, in certain situations they are the best way to provide connectivity for short to moderately long distances in this type of setting.
2. Usage: Usage is expected to be at least moderate (25 users per day). Good indicators of sufficient future path usage include connections between specific destinations (e.g., schools, major subdivisions, parks), or connections between two communities separated by 5 miles or less, or regional connections that may extend more than 5 miles. In urban or suburban areas, shared-use paths next to roadways can pose operational problems and often increase the hazards to bicyclists,

particularly at intersections and driveways. For this reason, on-street bicycle accommodations are almost always the best choice.

Use the following guidelines to evaluate whether a shared-path is an appropriate choice in urban and suburban areas. Most of the conditions shall be met.

1. Considerable numbers of bicyclists and pedestrians are expected to use the facility daily.
2. The shared-use path is sited in a sound location for travel by bicyclists and pedestrians. This usually occurs where there are both high traffic volumes and vehicle speeds on the adjacent roadway and the shared-use path would not have to cross many roadways or driveways (especially commercial driveways). Only in rare cases would the path substitute for on-street bicycle accommodations.
3. There are no reasonable alternatives for bicycle accommodations on nearby parallel roadway routes.
4. The shared-use path connects to an existing or planned bicycle facility (shared-use path or another bikeway) or street/road where bicycle travel is accommodated. For instance, the shared-use path would be part of a larger bicycle transportation network that provides continuity for bicycle travel. As an alternative, a shorter shared-use path could provide direct access to a park, school, business district, etc. Where the shared-use path will be part of a planned bicycle facility that does not yet exist, the local government should provide a written commitment to complete the facility within a reasonable time frame.
5. The shared-use path is consistent with local, regional and state adopted land use/smart growth plans and current transportation plans for the area by an MPO, local or state government.
6. There is ample room for the shared-use path itself and for its separation from the roadway.
7. There is a reasonable expectation that the safety and service benefits derived from the shared-use path would be worth the total cost of the facility, including right of way, construction, marking and signing, and maintenance.

15.6.1 Roundabout Sidepaths

A roundabout sidepath is a variant of a shared-use path. “A “roundabout sidepath” is a sidepath around the perimeter of an isolated roundabout or a sidepath between two closely spaced roundabouts and around their perimeters. Bicyclists on the roadway enter and exit roundabout sidepaths via ramps upstream and downstream from the roundabout circular roadway. Bicycle traffic on roundabout sidepaths is assumed unidirectional. Roundabout sidepaths connect to sidewalks where there are sidewalks and are standalone facilities where there are no sidewalks. Roundabout sidepaths do not connect to community/region shared-use paths. See FDM 11-26-30.5.13 for additional information.

15.7 Bicycle Accommodations on Highway Structures

See FDM 11-35-1.6, “Structures/ Sidewalks, Bicycle Accommodations, Shared Use Paths and Roundabout Sidepaths”, and FDM 11-35 Attachments for width requirements for sidewalks, shared-use paths and roundabout sidepaths, as well as criteria and height requirements for parapets and fences adjacent to bikeways, sidewalks, shared-use paths or roundabout sidepaths.

Also, See section 2.9, “Structures”, and section 4.16.4 “Separation on Combined Structures” of the Wisconsin Bicycle Facility Design Handbook *(4)* for guidance.

Generally, continue the bicycle accommodations provided (or planned) on the approaches to a structure across the structure. New highway structures need to be wide enough to accommodate required bikeways and sidewalks, shared-use paths or roundabout sidepaths. Width requirements vary depending on whether the bikeway is a wide outside lane, a continuation of a paved shoulder, a bike lane, a shared-use path, or roundabout sidepath; and whether there is a sidewalk.

In urban and suburban areas, the preferred design is a 6-foot striped area (unmarked or marked as bike lanes). The 6-foot shoulder on the structure is typically comprised of the width needed off the structure to accommodate a 2-foot gutter and a 4-foot bike lane. The next preferred design is a 4 or 5-foot striped area (not marked as a bike lane). If the bike accommodation on the approach roadway is a wide outside lane, the minimum accommodations is at least 14-foot lane, not including curb and gutter, or if next to a parapet or concrete barrier, provide a 4-foot shy distance.

Current design criteria for clear roadway width of structures for most – but not all - rural highway design classes provide adequate width for bicycle accommodations (see FDM 11-15 Attachments 1.1 thru 1.4 and FDM 11-15 Attachment 1.16 thru 1.18). Also, see FDM 11-35-1 and FDM 11-26-30-5.13 for additional information on structure widths.

At some locations, it may be appropriate to provide a shielded shared-use path in addition to bike lanes, wide outside lanes or shoulders across the structure. This situation arises when a structure (or the roadway under a structure) provides continuity for a shared-use path serving a different corridor than the highway.

For example, a shared-use path could follow a river corridor and use the bridge to cross to the other side of the river where it will continue to follow the same river corridor. At the same time, the bridge and the highway leading to and from the bridge could serve an entirely different corridor. Having only a shared-use path facility would be especially problematic for cyclists who are traveling on the opposite side of the bridge who would have to cross several lanes of traffic to get to and from the shared-use path. These cyclists are not likely to have an origin or destination served by the shared-use path.

15.7.1 Shared-use Path Grade Separations

Safety concerns may require providing a grade separation structure for a shared-use path rather than an at-grade crossing on rural highways (see FDM 11-46-20, “Permanent Public Trails Crossing Rural Public Roads”).

Guidance is limited on design treatments for intersections involving shared-use paths and roadways in urbanized areas. Constrained environments are often an additional impediment to providing grade-separated facilities in urbanized areas. Use engineering judgment to decide when such safety measures are necessary and cost effective by considering traffic volumes, motor vehicle speeds, site conditions and the age and experience of typical bicyclists. One possibility is to consider bicyclist and pedestrian actuated traffic signals where shared-use paths intersect high speed/high volume highways or streets.

15.8 Inlet, Manhole and Utility Covers

Inlet, manhole and utility covers can be hazardous to bicyclists. The front wheel of a bicycle may drop into the openings of the parallel bar drainage grates causing the bicyclist to crash. Likewise, grates and utility covers that are not flush with the pavement surface and located in bicyclists' expected path can cause the bicyclists to crash.

The grates for the following inlet cover Types A, H, B, B-A, F, HM, HM-GJ, S, and Z are considered bicycle acceptable. The inlet covers which are narrow and therefore encroach the least into a bicycle curb lane and that use the vane style grate are Types A, H, and HM. These inlet cover types should be used for modernization projects and also as replacement covers for Perpetuation and Rehabilitation improvements providing they have the necessary hydraulic capacity.

Pavement overlays should be designed and constructed to taper into grates and covers to prevent an abrupt drop at the frame edge. As an alternative, the inlet grate or utility cover can be adjusted to be flush with the new surface. Do this regardless of work type, whenever grates are installed where there might be bicycle traffic.

15.9 At-Grade Railroad Crossings

Where possible, a bikeway should cross railroad tracks at or near a right angle to minimize the potential for trapping a bicyclist's front wheel in the flangeway and causing a loss of steering control.

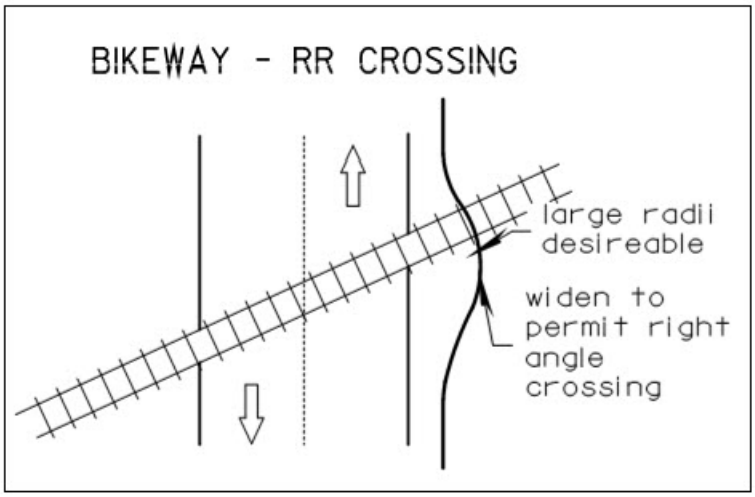


Figure 15.7 Bikeway – Railroad Crossing Detail

If the crossing angle is less than approximately 60 degrees, consider widening the outside lane, shoulder or bicycle lane to improve the angle of approach (see Figure 15.7). The typical crossing angle is 60 ° to 90° (AASHTO) (17).

It is also important that the roadway surface be at the same elevation as the rails. The type of crossing surface is negotiated between WisDOT and the railroad company on state highway projects.

15.10 Signing and Marking

Marking and signing of bicycle accommodations and bikeways shall be in accordance with the Wisconsin Manual on Uniform Traffic Control Devices (MUTCD) and applicable local ordinances. Additionally, use the WisDOT Traffic Engineering Operations and Safety Manual (TEOpS) for state highway projects.

The Region Traffic Engineer determines marking and signing requirements for the state highway system. It is permissible and encouraged to provide a marked shoulder segment not only on rural cross-section highways, but also on urban cross-section streets.

Pavement marking and signing are especially important at the approaches to intersections and at the ends of a bike lane. At intersections, bicyclists proceeding straight through and motorists turning right must cross paths. Motorists/bicyclists should be encouraged to make these crossings in advance of the intersection if possible. When a marked bike lane exists at an intersection with an exclusive right-turn only lane, the bike lane must be located between the exclusive right-turn lane and the through travel lane. Two channelizing lines without bike symbols (although bike lanes symbols are recommended) or a wider through lane are typical in order provide adequate bike accommodations to the left of an exclusive right-turn lane and to the right of a through travel lane (see SDD 15c29).

Appropriate marking and signing is essential where bike lanes end. These locations require bicyclists to merge with motor vehicle traffic.

15.11 References

Refer to FDM 11-46-99 for list of references.

FDM 11-46-20 Permanent Public Trail Crossing Rural Public Roads

November 30, 2018

20.1 Introduction

A trail (path) is a travel way, physically separated from motor vehicle traffic by an open space or barrier. It can be either within a highway right-of-way or within an independent corridor, such as a former railroad right-of-way. On-road bikeways such as bike lanes, paved shoulders or signed bike routes are not considered trails.

The “Engineering Warrants for Trail-Highway Crossings”, along with the guidelines presented in this procedure, apply only to permanent public trails crossing rural public roads with posted speeds from 40 to 55 mph. They are meant to be a starting point in determining whether a crossing is to be grade separated or at-grade. Final determination of the appropriate crossing type requires the application of engineering judgment.

Safety is the primary factor determining whether a grade separation structure or an at-grade treatment will be needed for a crossing. Other important considerations include cost, cost sharing with the trail owner, maintenance, and maintenance responsibilities. A project agreement is needed in order to define the public trail owner’s cost sharing and maintenance responsibilities.

Crossings not covered in this procedure include:

- Permanent public trails crossing urban roadways. Trails in urban areas may require more flexibility.
- Temporary trails. Temporary trails, where land easements are established year-to-year, are to be handled through WisDOT right-of-way access permit process.
- Nonpublic trails. Private trails are often temporary in nature. To be eligible for cost sharing, a privately-owned trail must be put into the hands of a public sponsor, who will ensure its long-term use

20.2 Engineering Warrants For Trail-Highway Crossings

Warrants for trail-highway crossings must consider the potential users of the crossing. Trail users can be categorized into two types, motorized and non-motorized. Motorized users include snowmobilers and all-terrain vehicles (ATV) users. Non-motorized users include bicyclists and pedestrians but can include equestrians as well.

The engineering warrants for trail-highway crossings shown in Attachment 20.1 are based on gap analysis, similar to the method found in the Manual of Uniform Traffic Control Devices (MUTCD) for determining warrants for traffic signals. Gap analysis helps to identify whether there are sufficient gaps in traffic for users to safely and comfortably cross a roadway with little delay. Justification for using these warrants for trail-highway crossings is based on:

- Snowmobiles and ATV’s are motorized vehicles, and traffic signal warrants were developed for motorized vehicle crossings.

- Grade separations and traffic signals have similar purposes, i.e. reducing potential conflicts between opposing streams of traffic.

The MUTCD warrants most applicable to trail-highway crossings are those that address hourly, as opposed to daily, trail and highway volumes, namely the Fourth Highest Hourly Exposure Factor and the Highest or Peak Hourly Exposure Factor.

In addition, these warrants include special reduction factors for pedestrians and bicyclists. Because non-motorized trail users include pedestrians, the reduction factors recommended in the MUTCD for pedestrians are applied to all non-motorized users when applying the engineering warrants for trail-highway crossings.

20.2.1 Steps to Follow When Using the Engineering Guidelines

1. Determine the proposed posted speed of the roadway to be evaluated for a grade separation under this procedure. The road must have a posted speed limit between 40 and 55 mph, because urban conditions typically exist when the speed limit is less than 40 mph.
2. Obtain site information for crossing location, including existing crossing type, available sight distance, structure dimensions and condition, trail owner, etc.
3. Obtain current and design year traffic volumes for both highway and trail (both motorized and non-motorized) users.
4. Evaluate traffic counts. Use current traffic counts for perpetuation or rehabilitation roadway projects with trail crossings within the project limits, as they have a shorter user life. Use design year traffic counts (typically 20 years), for modernization roadway projects with trail crossings within the project limits. When determining design year trail counts, a 1-2% per year trail growth is recommended.

   To be considered for a grade separation, the minimum highway Average Daily Traffic (ADT) is recommended to be 3500 or greater. (This threshold is a starting point and does not preclude looking at highways with ADT's < 3500). Determine if trail users are predominantly motorized or non-motorized (Use Attachment 20.2 worksheet).
5. Calculate Exposure Factors. Once the traffic counts for the trail and highway have been obtained, exposure factors need to be calculated for the entire counting period. An "Exposure Factor" is the product of the highway volume times the trail volume during the same hour that the count was taken. The result is then divided by 1000 to obtain an exposure factor that can be compared with those listed in Attachment 20.1.

   The "Fourth Highest Exposure Factor" represents the fourth highest product over the traffic counting period, and the "Highest Exposure Factor" is the highest product over the same traffic counting period.

   Attachment 20.3 shows examples of calculating exposure factors.
6. Using the Engineering Warrant Table. The engineering warrant table in Attachment 20.1 has three columns to be used as a starting point for helping decide whether to build a grade separation or not. The numbers in each column are the exposure factors in thousands. They differ depending on whether the trail users are predominantly motorized or non-motorized. Find the cells that match the computed "Fourth Highest Exposure Factor" and the "Highest Exposure Factor". The value in the right-most column controls.

   6.1 The first column "Does Not Meet Warrants" indicates that a grade separation is not warranted for traffic volumes. However, a grade separation might still be provided if site conditions would make an at-grade crossing unsafe.

   6.2 The second column "May be Justified" indicates that a grade separation may be justified for traffic volumes. However, evaluate other alternatives because grade separations can present their own safety problems. Sight lines, available gaps in traffic and future trail plans are some of the factors to be considered. Alternatives to a grade separation may include:

   - Improving the sight distance for the trail and highway user.
   - Evaluating traffic signal alternatives in fringe/suburban areas to provide more gaps in traffic.
   - Relocating the trail to a safer crossing area.
   - Relocating the trail crossing to an existing grade separation.
   - Enhanced signing and marking.

   6.3 If the other alternatives for the site are found to be either inadequate or not appropriate, then a grade separation is justified. The third column "Meets WisDOT Warrants" indicates that a

grade separation is warranted for traffic volumes, unless circumstances such as poor site conditions require that other alternatives be considered.

7. Present alternative(s) to the trail owner, including cost estimates and cost sharing information. Accommodate trail owner's request - even for a grade separation at a location where it is not warranted or justified - if it is possible to do so without compromising the safety of either motorists or trail users, and if the trail owner agrees to the required cost share and maintenance responsibilities.

20.3 Freeways and Expressways

20.3.1 Freeways

Freeways are multi-lane divided highways on which access is provided only at interchanges. Do not allow at-grade trail crossings on freeways.

20.3.2 Expressways

Expressways are non-freeway multi-lane divided highways where access is provided at interchanges and at at-grade intersections. Do not allow new at-grade trail crossings on expressways with posted speeds greater than 55 mph. Consider grade-separating existing at-grade crossings when they are within the limits of highway improvement projects on these routes. Work with the trail owner when making this determination. Look at such things as trail use and volume, crash history and the type of impending improvement project (modernization projects will offer a greater opportunity to incorporate a grade separation than a perpetuation project would).

Trail crossings on expressways with posted speeds of 55 mph, or less, can be evaluated with the procedures in this section. Warrant thresholds are adjusted per Note 1 of Attachment 20.1.

20.4 At-Grade Treatments

- Design trails to cross roadways at right angles, and at relatively flat grades.
- Provide sufficient intersection and approach sight distances at crossings for both motorists and trail users (see Attachment 20.4). Improve sight distance by removing trees or brush, lowering highway profile or relocating a trail to a more visible area. Evaluate traffic signal options in suburban area to see if it is possible to provide more available gaps in traffic.
- Provide median refuge for trail users at wider crossings and at other crossings, if appropriate.
- Provide appropriate traffic control devices and markings for both roadway and trail. This includes advance warning, including, if necessary, flashing signals. Use signs that are large enough to meet the size requirements for trail speed on trails that allow motorized vehicles. Also, traffic signals may be appropriate at some suburban locations. Review signing and marking options with the region traffic engineer.

20.5 Grade Separation Structure Guidance

In addition to structural requirements, a grade separation structure for a trail-highway crossing must meet the following minimum requirements:

- Provide for the safety of both trail and highway users. Although a grade separation reduces potential conflicts between trail users and motorists, the structure itself can pose a hazard. In addition to being a fixed obstruction, structures can be more prone to icing.
- Build structures large enough to accommodate maintenance equipment, including snow-grooming equipment on trails where snowmobiles are allowed.
- Box culvert-type structures must have sufficient height and width to accommodate trail users.

Structures for trail crossings include box culverts, as well as bridge overpasses or underpasses. Also, as an alternative to building a new structure, consider relocating the trail crossing to a suitable nearby existing grade separation.

Consult with the Regional Bike and Pedestrian Coordinator as well as the Bureau of Structures if a grade separation for a permanent public trail is warranted.

20.5.1 Structures on a "Rails-to-Trails" Trail

"Rails-to-Trails" trails are railroad corridors that have been deeded to a public agency (usually the DNR) and converted to interim trail use. The corridors must be preserved for possible re-conversion to railroad use. If re-conversion is necessary, then the corridor is sold to the railroad company involved.

Existing structures on these corridors may be in use as grade separations at trail-highway crossings. If a "Rails to Trails" structure is included within the limits of a highway project, evaluate the crossing based on the guidelines presented in this procedure. The possibility of re-conversion to railroad use presents additional

factors to consider when making the final determination of crossing treatment, including:

- Whether to perpetuate a grade separation, even if it is not warranted
- Whether to design a structure to accommodate railroad use, or to accommodate trail use only

Contact the Bureau of Railroads and Harbors for additional information on "Rails-to-Trails" corridors.

20.6 Financial and Cost Share Responsibilities

Cost share percentages for trail-highway crossings are in the WisDOT's Program Management Manual (PMM) Chapter 02-05-25. Apply these percentages to the Net Structure Cost:

NET STRUCTURE COST = STRUCTURE COST - COST FOR AN AT-GRADE CROSSING

These cost share percentages apply only when:

1. The trail crossing is included as part of a WisDOT highway improvement project: Projects will be given consideration based on safety needs and engineering warrant criteria. In cases where there is not a highway improvement project, communities may be able to find funding help from one of the programs listed in "Programs for Local Governments" website.
2. The trail is publicly owned.
3. A privately-owned trail has been put into the hands of a public sponsor, who ensures its long-term use.
4. The trail crosses existing highway alignment. In cases of new alignment where WisDOT's highway impacts an existing trail, WisDOT would work with the trail owner to provide the appropriate crossing type and to negotiate a cost share.
5. The has no pre-existing agreements. (including those with the former railroad). Existing agreements may take precedence. Contact the Bureau of Railroads and Harbors when a WisDOT project impacts a "Rails-to-Trails" crossing, because pre-existing agreements with the former railroad owner may take precedence.
6. The trail is a permanent facility. Temporary trails will be handled through WisDOT's access permit approach process.

Contact WisDOT's Region Planning Office or WisDOT's Division of Transportation Investment Management (DTIM) for more information.

20.6.1 Maintenance Agreements

Maintenance Policy for trail-highway crossings are also in WisDOT's Program Management Manual (PMM) Chapter 02-05-25. Include the following provisions in a signed maintenance agreement, unless over-ridden by a pre-existing agreement:

1. For at-grade crossings, trail owners would be responsible for the maintenance of trails on WisDOT right-of -way.
2. For grade separations, trail owners would be responsible for funding the maintenance cost of the structure. WisDOT would be responsible for structure inspection.

LIST OF ATTACHMENTS

Attachment 20.1	Grade Separation Warrants
Attachment 20.2	Grade Separation Warrant Worksheet
Attachment 20.3	Sample Grade Separation Warrant Determination
Attachment 20.4	Sight Distance for Trail Crossing

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