

ACCOMMODATING PEOPLE ON BICYCLES THROUGH WORK ZONES

A Guidance Document for the Planning, Design, and Implementation of Measures to Improve Safety, Comfort, Accessibility, and Adequate Notice for People on Bicycles Through Work Zones



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01 INTRODUCTION

Need for Guidance

The Minnesota Department of Transportation (MnDOT) considers bicycling an integral part of the multimodal transportation system and is committed to supporting it in all circumstances, including in the context of work zones. MnDOT has already developed guidance on pedestrian facilities in work zones, and the development of this document will provide guidance for active transportation through work zones focusing on people bicycling. The purpose of the guidance is to improve consistency and level of service, legibility, safety and comfort of bicycle facilities through periods of disruption and construction activities.

This guidance can inform environmental coordinators or National Environmental Policy Act (NEPA) document writers with useful information on what mitigation options a work zone designer may implement and how the project may inform the public of temporary trail closures or impacts. The need for notification and engagement is a regulatory need when involving a Section 4(f) recreational impact.

This guidance should also inform a work zone designer/planner that on federally funded projects, the closure of a recreational trail may mean that Section 4(f) commitments were promised in the NEPA document. This guidance can bridge the gap between Section 4(f) commitments and actual work zone plans as it relates to recreational facilities. These commitments are legally binding and should therefore be considered when mitigating a temporary closure of a recreational facility.

Use of the Guidance Document

This guidance document is intended to be used by MnDOT staff in the planning and design of work zones to appropriately provide for bicycle facilities within MnDOT rights-of-way. Planners and designers outside of the jurisdiction of MnDOT may also use this guidance document to provide direction for local bicycling networks through work zones.

This document should be used during the planning process and when designing the temporary layout of a bicycle facility which will be part of a work zone or be affected by a work zone. The intention of the guidance provided in this document is to offer tools that allow stakeholders to make an informed decision when trade-offs are involved such that they benefit all road users. Although this document presents clear guidance on selecting the best alternatives to maintain the safety and comfort of bicycle facilities, it also encourages design flexibility during the decision-making process whenever spatial constraints are observed. Engineering judgement should be used based on the wide range of factors present within the right-of-way context.

There is a regulatory need for mitigation when impacting Section 4(f) recreational lands. If an impact from the project does exist, mitigation may have been committed to through Section 4f documentation, of which the MnDOT project manager should be made aware at this point in project development. Consultation with the Environmental Documentation group is recommended.

This document should be used in conjunction with other guidance documents and manuals, such as the MnDOT Bicycle Facility Design Manual, MnDOT Pedestrian Accommodations through Work Zones Design Guidance, Minnesota Manual on Uniform Traffic Control Devices (MN MUTCD), and FHWA Guidelines for Work Zone Designers: Pedestrian and Bicycle Accommodation.

This guidance document has four main sections:

- **Section 2** describes the guiding principles, which are the high-level goals that the guidance in this document is seeking to achieve.
- **Section 3** includes guidance on the types of bicycle facilities, alternatives to providing a bicycle facility through a work zone, and the process for selecting the most appropriate facility for a given context.
- **Section 4** includes guidance on bridge and overpass closures, which have special considerations.
- **Section 5** includes guidance on duration and physical placement of notification and signing in advance of and through work zones.

02 GUIDING PRINCIPLES

The high-level guiding principles form the foundation of this guidance document. The principles do not detail solutions or design directions but rather what the designs should achieve in providing a bicycle facility through a work zone.



Maintain Safety and Comfort

- People bicycling should have the same or better level of safety and comfort compared with before construction.
- The design of the bicycle facility should consider the needs of the intended users and follow applicable guidance for design of bicycle facilities.
- The bicycle facility through the work zone should be designed with the understanding that all users may make mistakes.



Design for Accessibility

- The design for the bicycle facility through the work zone should not introduce new barriers where it intersects or coincides with facilities for pedestrians and these locations should be designed in accordance with the Americans with Disabilities Act (ADA) and MnDOT Pedestrian Accommodations Through Work Zones.
- Inconvenience to people bicycling, such as a significantly longer detour, should be minimized to the extent practical.
- The design of detour routes should provide vertical and horizontal clearance that allows for access by emergency workers.

Provide Adequate Notice

- Changes to the bicycle facility through the work zone should be communicated to the public in a clear and concise way in advance of when and where the construction is occurring.
- Planning and design of the bicycle facility through a work zone should involve engagement with local stakeholders.



03

BICYCLE FACILITIES IN WORK ZONES

Bicycle Facility Types

The MnDOT Bicycle Facility Design Manual includes six types of bicycle facilities, four of which are discussed in this guidance document. These can be grouped into bicycle-only facilities and shared use facilities, as these groupings may have different needs and requirements. Paved shoulders and shared roadways are not discussed in this guidance document as they are not specific to people bicycling and covered by existing MnDOT Temporary Traffic Control Manuals and Guidelines.

Bicycle-Only Facilities

SEPARATED BICYCLE LANES

These facilities provide both horizontal and vertical separation from vehicle traffic lanes and are not shared with pedestrians. They can be for one-way or two-way travel.

BICYCLE LANES

These facilities use a portion of the roadway that is designated for one-way travel of people bicycling only. They can be horizontally separated from the motor vehicle lane by a painted buffer, but no vertical separation is provided.

Shared Use Facilities

SHARED USE PATHS

Shared use paths are two-way facilities designed for people bicycling, pedestrians, and other non-motorized users. They may be in their own right-of-way or in the roadway right-of-way and are physically separated from motor vehicle traffic. Shared use paths often offer less flexibility than other types of facilities since they often operate in much narrower rights-of-way and tend to connect to intersecting streets and pathways less frequently.

SIDEPATHS

Sidepaths are shared use paths that are located in the roadway right-of-way and are located immediately adjacent and parallel to the roadway. They are physically separated from motor vehicle traffic by a barrier or raised curb or separated from traffic by 5 or more feet.

As pedestrians may also use shared use facilities, these facilities are also subject to the Alternate Pedestrian Routes and Temporary Pedestrian Access Route as described in MnDOT Pedestrian Accommodations Through Work Zones. More information about each of the facility types described above can be found in the MnDOT Bicycle Facility Design Manual.

Bicycle Facility Options

The staging and management of a work zone throughout a construction project often requires decision-making regarding how best to design for people bicycling. There are three main alternatives that should be considered and which are described herein:

1. Maintaining the bicycle facility
2. Providing a detour
3. Having people bicycling merge into traffic

Maintain the Bicycle Facility

A bicycle facility that is maintained through the work zone will have the same level of service for people bicycling. The MN MUTCD Part 6K (Minnesota Temporary Traffic Control Field Manual) states that *a designated bicycle facility should be maintained through the work zone if possible, and that on multi-lane roads, it may be possible to implement temporary pavement markings to close or narrow lanes to maintain space for the bicycle facility.*

GUIDANCE

- The bicycle facility should have the same or greater width with physical separation as necessary in accordance with the MnDOT Bicycle Facility Design Manual. This may be accomplished by reducing the number or width of general traffic lanes in order to meet the space requirements for the bicycle facility.
- Where the bicycle facility cannot maintain the same width due to constraints and it is not possible to reduce the number or width of general traffic lanes, a reduced width of the bicycle facility may be considered, provided it follows the guidance in the MnDOT Bicycle Facility Design Manual for width and physical separation.



Figure 1: Example of bicycle facility maintained through work zone (source: Oregon Department of Transportation)

Provide a Detour

A detour route will avoid the effective closure of the bicycle facility in circumstances where there are spatial constraints and traffic lanes cannot be shifted or closed to maintain the bicycle facility in the original right-of-way.

GUIDANCE

- The detour route should have comparable characteristics to the closed facility so people bicycling have a similar level of comfort. This includes surface material and quality, facility width, signalized crossings, illumination, and other elements. Facility selection for a detour should adhere to FHWA Bikeway Selection Guide and the MnDOT Bicycle Facility Design Manual.
 - » For short-term detours of less than 30 days a temporary bicycle-only facility around the worksite may be constructed of asphalt or compacted gravel, with consideration for any abutting natural areas. Any shared use facilities must be constructed of hard surface to meet ADA requirements.



Figure 2: Example of detour provided through a work zone (source: Alta Planning + Design)

- The detour route should be selected to minimize additional length, with a goal of a maximum 30 percent increase in distance to the original route. The length of the detour affects the decisions people bicycling make about where to travel - longer routes may result in people bicycling opting to travel through a restricted work zone. Changes in grade should also be minimized. Where the detour length is longer than 30 percent, a shorter temporary pathway should be considered if feasible. If it is determined, through consultation with local agencies, that the temporary bicycle facility should become permanent, MnDOT can participate in the local agency's process to design and construct the permanent facility.
- For shared use facilities, the detour route should be the same for pedestrians and people bicycling, except where:
 - » There is an obstacle or constraint that prevents the detour bicycle facility from following the same route as the pedestrian facility route;
 - » The detour route necessary to accommodate people bicycling would be significantly longer than the detour route necessary to accommodate pedestrians. Pedestrians are more sensitive to distance than people bicycling; or
 - » There is a sidewalk parallel to the detour route of the shared facility.

- Where the detour involves designating an existing sidewalk as a shared facility, “Bicycles Yield to Pedestrians” (R9-6) sign should be provided to instruct people bicycling to yield to pedestrians. The minimum width should be as per the MnDOT Bicycle Facility Design Manual. Ramps should be provided so that people bicycling can seamlessly access the detour route. Designating a sidewalk as a shared facility should only be done for short distances (approximately one block or 200 feet) where there are less than 100 people bicycling in the peak hour and less than 1000 total users per day. The Minnesota Pedestrian and Bicyclist Data Program should be considered for collection of traffic counts for pedestrians and bicycles.
- Signing should be provided to direct users and orient them to the detour route, as per the guidance in **Section 5**.
- For federally funded projects involving closure of a shared use facility that is a recreational facility, there is a regulatory requirement to provide a detour or mitigation. Work zone designers should consult the Environmental Documentation group to determine what mitigation was considered and expected in 4(f) documentation.

Merge People Bicycling Into Traffic

Merging people bicycling into mixed traffic requires people bicycling to shift from a dedicated bicycle facility to sharing a lane with general traffic. FHWA's Bikeway Selection Guide and the MnDOT Bicycle Facility Design Manual suggest that shared lane facilities are appropriate for roads with speeds below 25 MPH and where volumes are below 3,000 AADT. In addition, the discomfort and heightened risk that may be associated with navigating a route through a constrained construction zone increases the level of stress for a person bicycling. Because of the significant shift in facility type from a dedicated bicycling facility to mixed traffic, this strategy may not often be considered as a reasonable accommodation and may result in an effective closure of the facility for a majority of users. This option is only available to facilities in the roadway right-of-way and cannot be considered for shared use paths.

GUIDANCE

- Requiring people bicycling to merge into traffic should only be considered where the posted or temporary work zone speed limit of the roadway is 25 MPH or less and there are fewer than 3,000 vehicles per day and where non-motorized traffic is not prohibited.
- A signed detour route should be considered in conjunction with a merge condition to provide an option for an alternate route. Signs detailing relative distance of both options should be provided, as shown in **Figure 6**.
- A temporary speed limit reduction through the work zone should be considered in order to improve conditions for people bicycling where there is a merge condition. Speed limit reductions should be in accordance with MnDOT Speed Limits in Work Zones Guidelines.

- Appropriate signs and pavement markings, such as temporary sharrow or "bikes may use full lane" signs should be implemented.

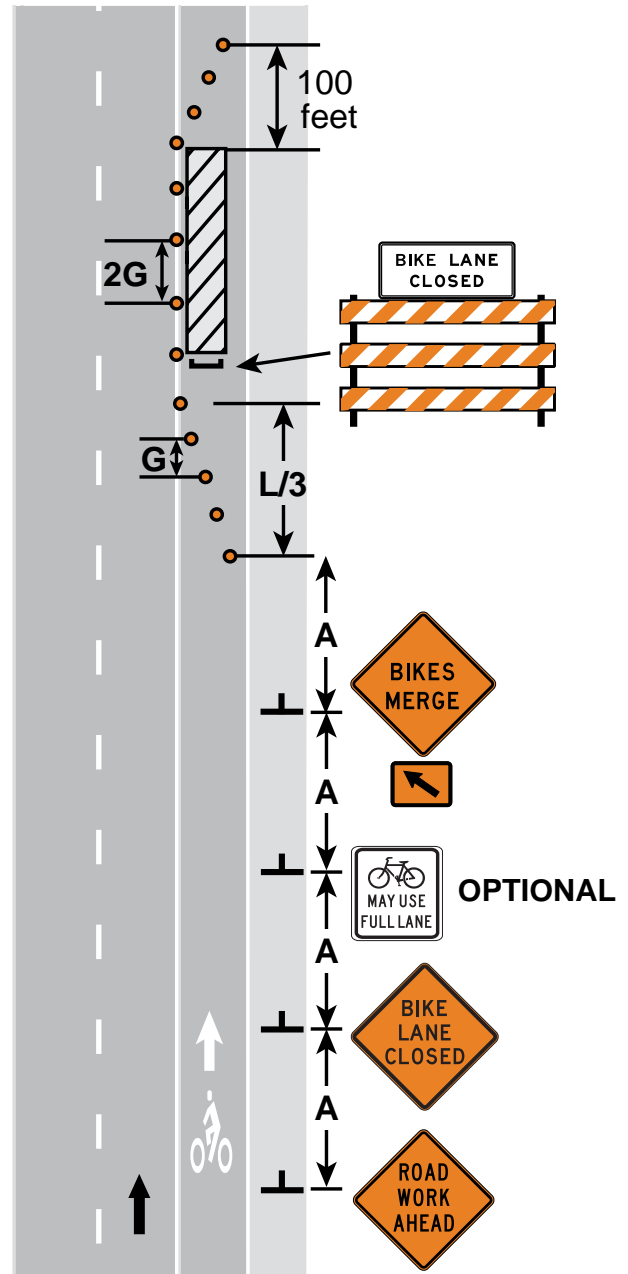


Figure 3: The design layout for a merge into traffic (source: MnDOT Temporary Traffic Control Field Manual (January 2018), p. 154)

Selection Process

The bicycle facility options described in this section should be selected only after careful consideration based on the following guidance:

GUIDANCE

- The first preference should always be to maintain the existing facility, especially if:
 - » Volumes of people bicycling are greater than 150 per hour;
 - » The route provides a key connection in the overall network; or
 - » The route provides a crossing of a major barrier, such as a river, railroad, or highway.
- Where there is insufficient space to maintain the existing facility, reducing the lane widths, repurposing a lane, or closing one direction of vehicle travel should be considered in order to provide the space necessary to provide a bicycle facility. For any lane or directional closure, analysis of impact on the local roadway system will be required.
- Where it is not possible to maintain a comparable bicycle facility through the work zone, a detour route should be provided. This may be via an existing nearby bicycle route, or by constructing a temporary bicycle facility.
- Where it is not possible to maintain the existing bicycle facility or provide a detour, and the roadway is or can be altered to meet the criteria of a speed limit of 25 MPH or lower and exhibit a maximum of 3,000 vehicles per day, requiring people bicycling to merge into traffic may be considered. The speed limit may be temporarily reduced to achieve this. It is recommended that an alternative detour route should also be provided.
- Where it is not possible to maintain the existing bicycle facility or provide a detour, and the speed limit is greater than 25 MPH or there are 3,000 or more vehicles per day, temporarily designating the sidewalk as a shared use facility may be considered as a detour. People bicycling would be required to yield to pedestrians. This is a last resort and should only be considered if all other options are not possible.
- For intermittent or very short (i.e., single day) closures, a flagger may be used to allow people bicycling to pass separate from other traffic.
- Where it is not possible to provide any of the above, the Transportation Management Plan for the project should document the options considered and decision process.

The flow chart shown in Figure 4 shows the decision-making process for determining the applicable alternatives, as described above.

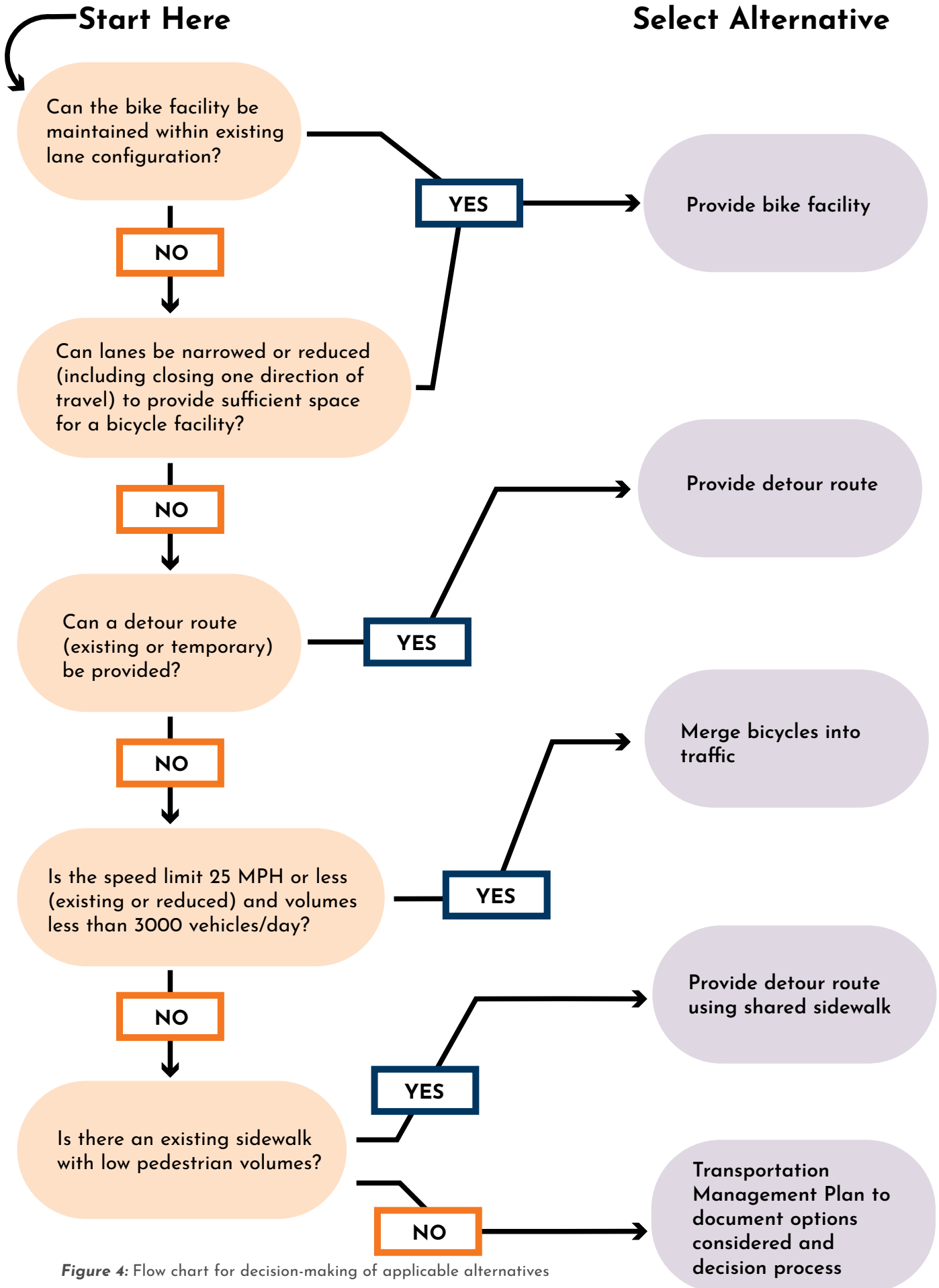


Figure 4: Flow chart for decision-making of applicable alternatives

04 BRIDGE AND UNDERPASS CLOSURES

Bridge and underpass closures introduce special considerations as right-of-way constraints and limited alternate routes restrict the options to address the closures. The distance between adjacent highway overpasses or bridges over a river may be several miles apart. Although motorists can easily detour one to two miles with relative ease, this level of deviation is generally not practical for people bicycling and less so for pedestrians (**Figure 5**). In light of this, it is critical to provide a facility for people bicycling during bridge and underpass closures.

It is important to note that a structure closure impacts traffic on the structure but may also impact traffic under or above the structure.

This guidance is also applicable to other closures where there are limited alternative routes.

In general, bridge or underpass closures should consider:

- The length of closure—the longer the duration, the more significant the approach should be in providing an equivalent alternative in terms of comfort, safety, and access
- The cost and longevity of alternative options
- The ability to provide a minimum acceptable width
- Importance of the bicycle route
- Physical conditions of a possible detour

GUIDANCE

- The priority should be to maintain an appropriately sized bicycle facility on the bridge or underpass. This may be facilitated by repurposing a lane or lanes of traffic, or modifying an existing sidewalk as a shared facility (if the volume of pedestrians and people bicycling are low).
- For a long-term closure where the bicycle facility cannot be maintained, the following options should be considered, with regard for the considerations noted above:
 - » Implementation of a temporary replacement bridge with bicycle facilities
 - » Provision of transit/shuttle service capable of carrying bicycles. A detour should also be provided in accordance with **Section 3**
- For a short-term closure where the bicycle facility cannot be maintained, the following options should be considered, with regard for the considerations noted above:
 - » Use of a flagger, if it is possible to temporarily stop work or alternately close one or both directions of travel to allow people bicycling to proceed
 - » Provision of transit/shuttle service capable of carrying bicycles. A detour should also be provided in accordance with **Section 3**
- District multimodal planning staff should use tools available to them to determine common origins and destinations for people bicycling and pedestrians that typically use the route to be closed and determine a detour strategy that most closely replicates direct routes between the two.
- In all cases, engagement with local stakeholders should occur during the development of the proposed solution.

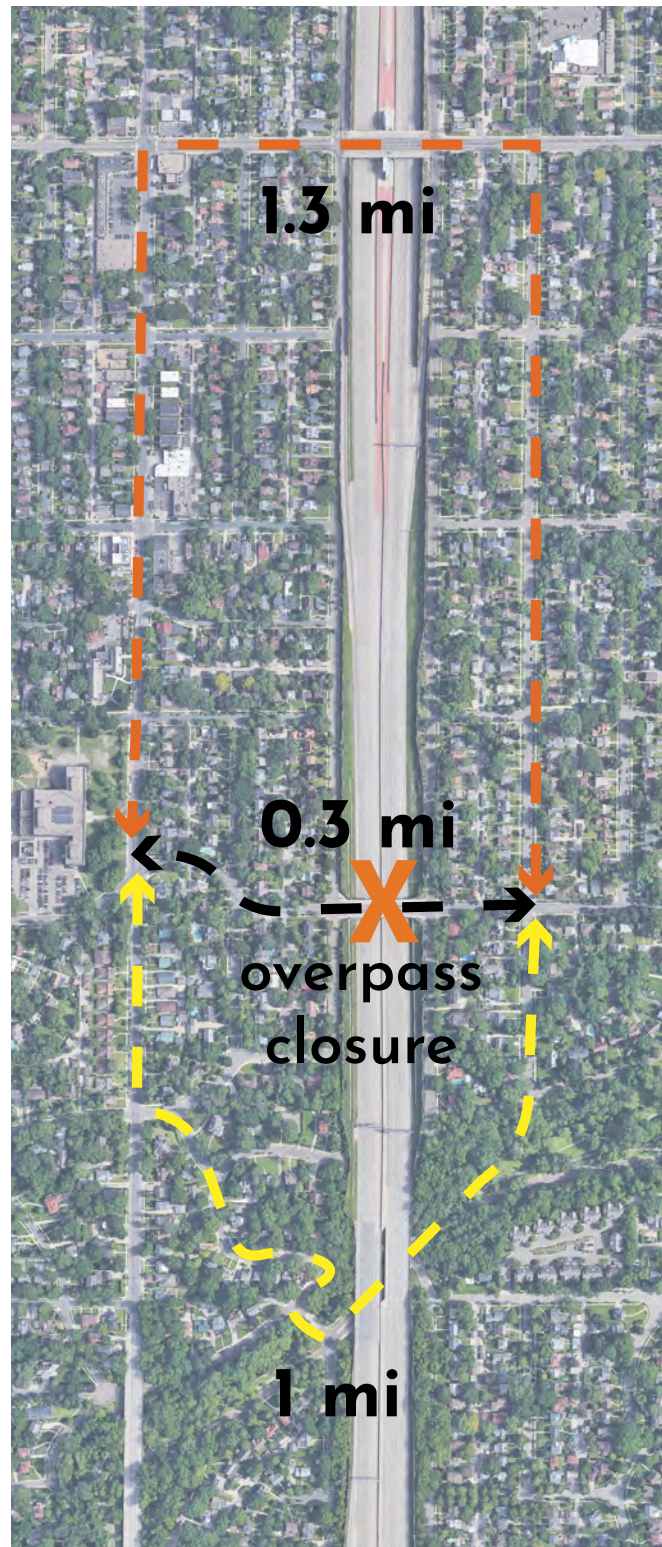


Figure 5: Plan view of a hypothetical bridge closure and impacts to people bicycling

05 NOTIFICATION, ENGAGEMENT, AND SIGNING

Need for Notification and Engagement

Importance of Notification

The traveling public are very habitual in their route choices. People bicycling are especially so, due to the more limited number of streets with bicycle facilities. Adequate notice is recommended to give people bicycling the opportunity to seek alternate options, especially when a facility is closed and requires a detour. People bicycling approaching a work zone also need to be made aware of any changes to bicycle facility far enough in advance to make an informed decision about their route. This includes time and duration of the work, possible detour, and changes in the type or design of the bicycle facility. The information provided on signs needs to be accurate and up-to-date. Approaching and within work zones, all road users need to be given adequate direction, and signs are an important component of this.

Signs oriented exclusively to motorists may not meet the needs of people bicycling because of their size and location, as well as the type of information provided. In addition, the detour for motorists may not be suitable for people on bicycles.

Where a shared-use path that is a recreational trail is affected by a work zone, notification and engagement is a regulatory requirement of Section 4(f) documentation.

Communication Tools

A variety of communication methods are available to disseminate information regarding construction impacts to people bicycling. The methods chosen should provide both offline and online notification. The format of information should be concise and visual to assist readers with understanding the impacts.

Distinct signing can communicate information to people bicycling that may not apply to motorists or pedestrians, and this consists of the following classes of signs:

- Guide signs related to any applicable bicycle-specific detour
- Warning signs to notify people bicycling and motorists of changes ahead
- Regulatory signs to clarify expected behavior of drivers and people bicycling

Off-site notification should also be used, such as web-based or mail-out information. Web-based information can be updated in real time throughout the duration of the project. The MnDOT Public Affairs Coordinator (PAC) for the project should be consulted when developing the notification plan.

Information provided should include:

- A description of the works being completed and their timelines;
- A map to identify impacts, how users are accommodated, and detour route(s) where they are relevant; and
- A contact person.

Engagement with Local Stakeholders

As part of the notification process, engagement should occur with local stakeholders, such as bicycle/pedestrian interest groups, property owners, and local officials. This should occur before any impacts on the bicycle facilities are finalized. These stakeholders may have local information that is important for the design and implementation of the bicycle facility through the work zone, such as scheduling or travel patterns.

When to Provide Notice

Advance notification methods to inform facility users of upcoming construction and of updates should be sensitive to project length and the impact to people bicycling, as well as the impacted area. Where a facility is maintained to the same level of separation and comfort, notification may not be required. Communication methods should also consider the surrounding community's needs, such as language, and access to online information.

GUIDANCE

- Notification should be provided at least one week (7 calendar days) in advance of construction, with additional advance notice where there is higher impact (e.g., detour).
- On-site signs should be supplemented with further information online that can more easily provide updates during construction as well as a map.
- In some cases, advance notice of the impacts on the bicycle facility should occur via flyer dissemination in the surrounding neighborhood, such as where there are likely to be a high proportion of people with limited internet access.

Where to Provide Notice

During construction, advance notification should be provided on-site to notify users of an upcoming construction impact.

GUIDANCE

- Where users will be required to merge with traffic, or where there is a detour, signs should be provided at all decision points including:
 - » Sufficiently in advance of where a detour begins for a person bicycling to appropriately turn or transition onto the correct route;
 - » Where the bicycle facility intersects with an alternate route in the bicycling network (where available) whether a dedicated detour is provided or not; and
 - » Where a person bicycling can decide to dismount and walk in lieu of merging into mixed traffic
- Detour signs should be placed such that a person bicycling can see the next sign immediately after passing the previous sign, providing confirmation that the correct route is being followed.
- Signs should be placed in accordance with Chapter 9 of the MN MUTCD.

Sign Types

Guide signs in work zones provide directional information for people bicycling to follow where a detour route is in place. They are rectangular in shape and have black lettering on orange background, which is in contrast to the white lettering on green background found on standard guide signs. They include bicycle route signs, and detour signs with a directional arrow.

Warning signs provide advance notification to drivers and people bicycling of an approaching work zone or another feature. In work zones, they have black lettering on orange background and have a “diamond” shape. Any black on yellow warning sign may also be used as a black on orange work zone sign, as per MN MUTCD Section 6F.2

Regulatory signs notify drivers and people bicycling of certain rules that they are obligated to follow by regulation or by law. At a work zone this may include do not enter, speed limit, or yield signs.

Parts 6 and 9 of the MN MUTCD includes requirements regarding traffic control devices applicable to people bicycling in work zones. The following pages show typical guide, warning, and regulatory signs that relate to bicycle facilities in work zones. The MN MUTCD and Traffic Engineering Manual (TEM) should be consulted for specific requirements for application of these signs.

Guide Signs



M1-8 or M1-9 with
M4-8 or M4-8a



M4-9c



M4-9a

Warning Signs



W11-1b with W16-1P



W20-1



W20-2



W20-3



W20-3M



W20-X5



W20-X17



W20-X21

Regulatory Signs



R2-1



R3-17 with
R3-17bP



R4-11



R5-6



R9-5



R9-6



R9-7



R5-3

Sign Requirements

Signs for people bicycling have different functional requirements based on their differing user characteristics. The MN MUTCD sets out minimum sizes for signs for people bicycling, which is supported by the MnDOT Bicycle Facility Design Manual. Some of the relevant characteristics are as follows:

- People bicycling have a lower eye level so signs should be placed closer to the ground. The MN MUTCD requires bicycle-specific signs to be mounted between 4 and 5 ft off the ground, and that vehicle-oriented signs or shared signs be a minimum of 5 ft.
- Signs should be a minimum of 2 feet from the bicycle facility.
- People bicycling travel more slowly than motor vehicles so signs may be smaller, in accordance with MN MUTCD requirements.

GUIDANCE

- Signs included on pages **18** and **19** (and others as necessary) should be implemented in accordance with the MN MUTCD. A typical work zone sign plan showing a detour for people bicycling is shown in **Figure 6**.
- Signs for people bicycling and pedestrians should be combined where their routes coincide to reduce sign clutter and confusion.
- Where a detour route is provided, a sign with a map should be posted, and example of which is shown in Figure 7. The map should be sized to be legible to people bicycling while stopped. People bicycling have the ability to come to a complete stop at a closure to interpret a sign, so more detailed maps and signs can be provided in complex situations. An area for people bicycling to stop without obstructing the bicycle facility should be provided. The map should clearly show:
 - » Affected route;
 - » Detour route, if applicable;
 - » Other roads in the area that have speeds 25 MPH or less and less than 3,000 vehicles per day; and
 - » Important local features for orientation and navigation.
- Pavement markings should be provided on all bicycle facilities through work zones in accordance with the guidance in the MnDOT Bicycle Facility Design Manual and MN MUTCD.

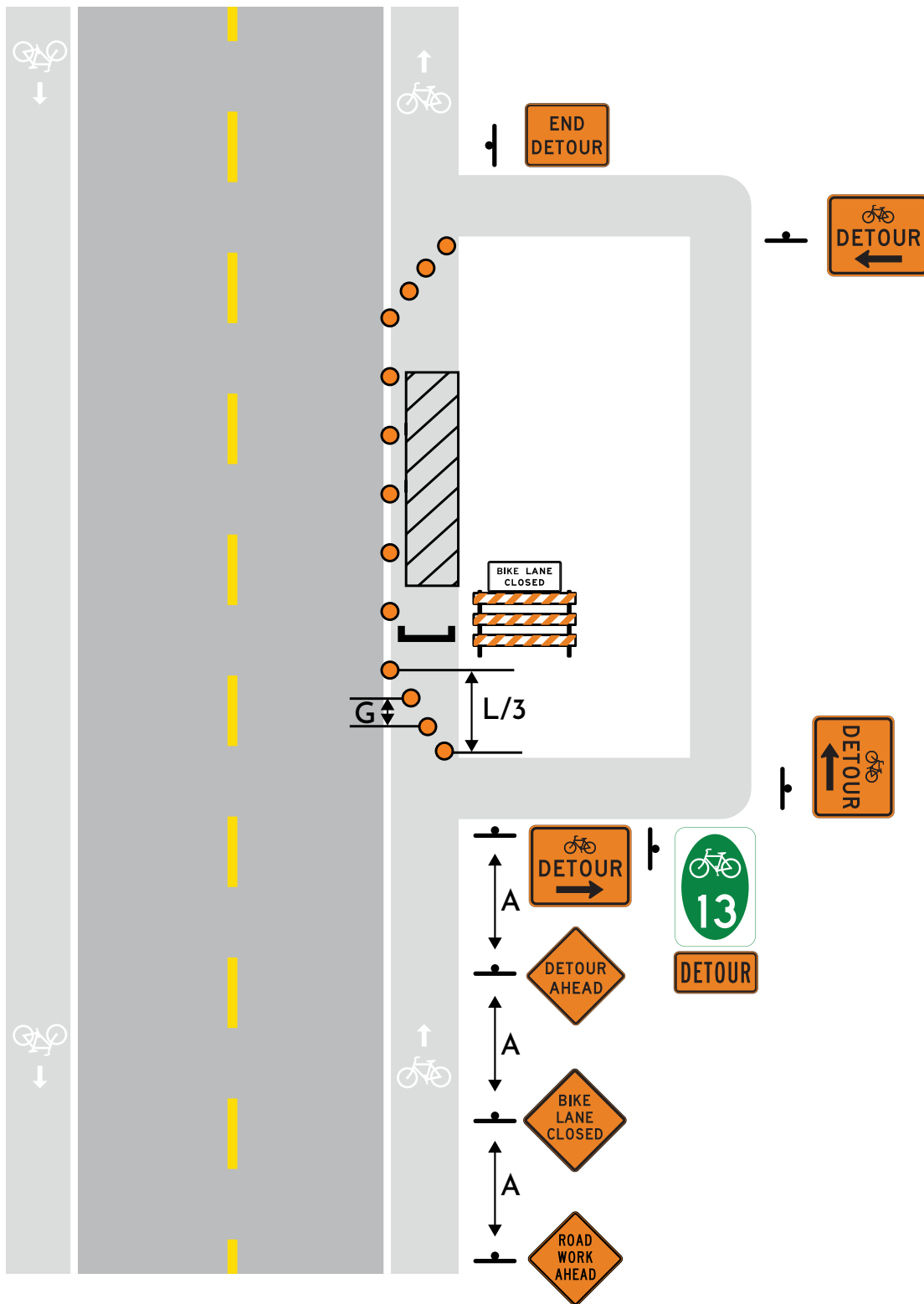
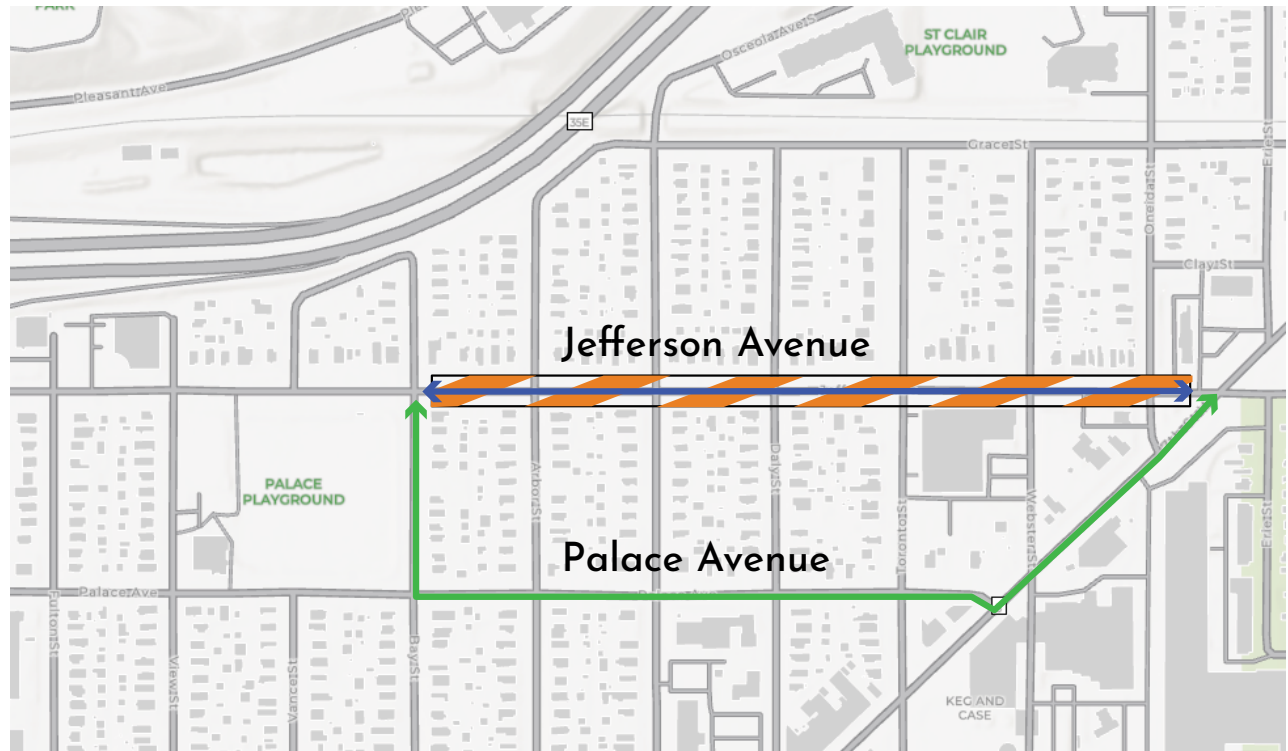


Figure 6: Plan view of typical detour sign layout. Refer to MN MUTCD Park 6K for applicable sign distances

BICYCLE DETOUR AHEAD



Merge Lane (Jefferson Ave) - 0.36 miles

Detour Route (Palace Ave) - 0.5 miles

STARTS MAY 15

Figure 7: Sample map of detour

Standards and Guidelines

Minnesota Manual on Uniform Traffic Control Devices (2011)

MnDOT Bicycle Facility Design Manual (2020)

MnDOT Pedestrian Accommodations Through Work Zones

MnDOT Speed Limits in Work Zones Guidelines (2014)

FHWA Guidelines for Work Zone Designers: Pedestrian and Bicycle Accommodation (2018)

FHWA Bikeway Selection Guide (2019)

Traffic Engineering Manual

Glossary of Terms

Bicycle facilities: A general term denoting provisions to accommodate or encourage bicycling, including bicycle boulevards, parking facilities, bikeways, bikeway maps and shared roadways not specifically designated for bicycle use (MnDOT Bicycle Facility Design Manual).

Bicycle route: A roadway or shoulder signed to encourage bicycle use (MN Statute 169.011 Subd. 7)

Bicycle lane: A portion of a roadway or shoulder designed for exclusive or preferential use by persons using bicycles. Bicycle lanes are to be distinguished from the portion of the roadway or shoulder used for motor vehicle traffic by physical barrier, striping, marking, or other similar device. (MN Statute 169.011 Subd. 5).

FHWA: Federal Highway Administration

MnDOT: Minnesota Department of Transportation

MN MUTCD: Minnesota Manual on Uniform Traffic Control Devices

Separated bicycle lane: A bicycle lane that is physically separated from motor vehicle traffic by vertical elements and a horizontal separation from motor vehicle traffic. Also known as protected bike lanes or cycle tracks (MnDOT Bicycle Facility Design Manual).

Shared use facility: A bicycle facility that is shared with other active transportation users, such as pedestrians

Shared use path: A bicycle facility that is physically separated from motor vehicle traffic by an open space or barrier, located within either the highway right-of-way or an independent right-of-way and available for use by other nonmotorized users (MN Statute 160.02 Subd 27a).

Sidepath: A sidepath is a type of shared use path that is parallel to a roadway but is physically separated from motor vehicle traffic (MnDOT Bicycle Facility Design Manual).