



MUTCD DIGEST



U.S. FISH AND WILDLIFE SERVICE
DEPARTMENT OF INTERIOR
FALL 2021

INTRODUCTION

The [Manual on Uniform Traffic Control Devices](#) (MUTCD)¹ is a document administered by the U.S. Department of Transportation Federal Highways Association (USDOT FHWA), which contains the basic principles that govern the design and use of traffic control devices for all streets, highways, bikeways, and private roads open to public travel regardless of ownership or jurisdiction. Traffic control devices notify road users of regulations and provide warning and guidance needed for the uniform and efficient operation of all elements of the traffic stream in a manner intended to minimize the occurrences of crashes.

This document, the MUTCD Digest, serves as a reference guide and resource for use within the U.S. Fish and Wildlife Service (Service). Because the MUTCD is over 800 pages long, this document will focus on content in the MUTCD that has direct relevance to the work of Service and is designed for the intended audience of Regional Transit Coordinators (RTCs) and Station staff facilitating transportation projects. The Digest is comprised of an overview of Traffic Control Devices most relevant to work in the Service and provides general information and suggested resources for reference. Occasionally, where the MUTCD does not set out guidance for common elements of transportation infrastructure (such as with parking areas), this document will refer to relevant sections of the [Architectural Barriers Act \(ABA\) Standards](#)² (for accessibility in Federal facilities) and the [Service Sign Handbook](#)³. Likewise, this Digest will spell out those rare or emerging control devices for which there are presently no relevant standards, hopefully sparing project planners the effort of searching for guidance they will not find⁴.

1 USDOT Federal Highway Administration. Manual on Uniform Traffic Control Devices. (2009). <https://mutcd.fhwa.dot.gov/pdfs/2009r1r2/mutcd2009r1r2edition.pdf>

2 U.S. Access Board. Architectural Barriers Act: Accessibility Standards. (2015). <https://www.access-board.gov/aba/>

Contrary to popular belief, the Americans with Disabilities Act (ADA) guidance for accessibility does not generally apply to federal lands. Instead, refer to Architectural Barriers Act (ABA) standards, which came first and apply specifically to federal facilities.

3 USFWS Sign Handbook. (2019). <https://www.fws.gov/policy/USEFWSSignHandbook2019.pdf>

4 Additional resources regarding signage for internal-FWS reference: [FWS Sign Inventory Database SharePoint](#) and [Dashboard](#)

IMPORTANT TERMS

The MUTCD offers hundreds of relevant definitions in Chapter 1, Part A, Section 13.

- **Traffic Control Device:** a sign, signal, marking, or other device used to regulate, warn, or guide traffic that is placed on, over, or adjacent to a street, highway, private road open to public travel, pedestrian facility, or shared-use path under the authority of a public agency or official having jurisdiction or, in the case of a private road open to public travel, by authority of the private owner or private official having jurisdiction.
- **Sign:** any traffic control device that is intended to communicate specific information to road users through a word, symbol, and/or arrow legend. Signs do not include highway traffic signals, pavement markings, delineators, or channelization devices.
- **Sign Assembly:** a group of signs, located on the same support(s), which supplement one another in conveying information to road users.
- **Plaque:** a traffic control device intended to communicate specific information to road users through a word, symbol, or arrow legend that is placed immediately adjacent to a sign to supplement the message on the sign. The difference between a plaque and a sign is that a plaque cannot be used alone. The designation for a plaque includes a “P” suffix.
- **Regulatory Sign:** a sign that gives notice to road users of traffic laws or regulations.
- **Warning Sign:** a sign that gives notice to road users of a situation that might not be readily apparent.
- **Guide Sign:** a sign that provides road users with information to help them navigate through a part of the roadway; these signs could include standard route markings, directional signs, street names signs, and more.
- **Pavement Markings:** words, symbols, and other graphics that are marked on the road’s surface to convey official information. ⁵

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00. SIGNAGE INSTALLATION

Signs should be used only where justified by engineering judgment or studies, as provided in Section 1A.09 of the MUTCD. In some cases, the Service may employ Road Safety Audits (RSAs) to analyze the roadways and recommend signage improvements, as well as other roadway geometry and enforcement practices⁶. An RSA is a formal safety performance examination of an existing or future road or intersection by an independent, multidisciplinary team. The nature of RSAs accounts for road user capabilities and limitations, as well as a consideration of all potential road users, not exclusively motorized traffic. This guidance section gives readers a general overview of the considerations for installing signage at the Service's locations.

This section will include guidance on:

- *Location along Roadway*
- *Lateral Placement*
- *Mounting Height*
- *Sign Orientation*

Proper installation includes location, placement, and mounting. Mounting and structures must be engineered to American Society of Civil Engineering standards (also discussed in the [USFWS Sign Handbook](#)). Further, Traffic control devices, advertisements, announcements, and other signs or messages within the highway right-of-way shall be placed only as authorized by a public authority or the official having jurisdiction, or, in the case of private roads open to public travel, by the private owner or private official having jurisdiction, for the purpose of regulating, warning, or guiding traffic (page 3, MUTCD). When considering the use of signage Service staff should consider the involvement

of the Regional Sign Coordinator, Regional Transportation Coordinator, landscape architects, and internal engineers with traffic analysis experience.

LOCATION ALONG ROADWAY (MUTCD SECTION 2A.16)

Locate signs on the right side of the road unless specific standards require otherwise. Select locations to mount signs where they are clearly visible, minimize obstructions, and provide adequate time for proper viewer response. Avoid mounting signs on locations with dips in the road, where there is an increased need for users to focus on the road, or where vegetation could cover the sign.

Regulatory signs which inform users of traffic laws, regulations, and legal requirements must be placed at the point where the regulation begins.

Signs which supplement each other can be mounted on the same post. For example, a route marker and destination signs can be mounted on the same post. However, signs with different messages such as a warning sign and a guide sign, should be spread apart from one another for the appropriate decisions to be made. One of the factors considered when determining the appropriate spacing is the posts or 85th percentile speed determined by an engineering traffic study. Chapters 2B, 2C, and 2D of the MUTCD contain provisions regarding more specifics on the location of individual regulatory, warning, and guide signs, respectively. Though, table 1 provides the Service's general

6 Road Safety Audits (RSA) Reference Page: <https://safety.fhwa.dot.gov/rsa/>

guidelines on sign spreading based on roadway speeds found in the Sign Handbook.

Table 1: Minimum distances for sign placement based on speeds

Speed Limit (mph)	Distance from sign to intersection or between signs (in feet)
20	100
30	150
40	300
50	500
60	750

Source: USFW Sign Handbook

If two or more signs must be placed at about the same location, order the signs based on the following hierarchy:

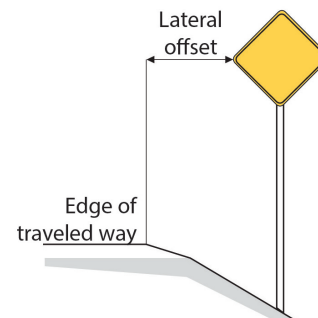
1. location-critical regulatory signs, such as STOP and YIELD signs
2. location-critical warning signs, such as TURN and INTERSECTION signs
3. other regulatory or warning signs, such as SPEED LIMIT or LIVESTOCK signs
4. route markers and guide signs
5. other informational signs

There are no standards for the placement of pedestrian signs. Physical surroundings are important considerations when locating pedestrian signs. They should be highly visible and unobstructed by vegetation or physical features in the area.

LATERAL PLACEMENT (MUTCD SECTION 2A.19)

A lateral offset- the distance from the edge of the traveled roadway to the nearest edge of the sign- is illustrated in figure 1.

Figure 1: Diagram Illustrating Lateral Offsets



On conventional roads, place signs at a minimum of 12 feet from the edge of the traveled way. If there is a shoulder of at least six feet, place signs at a minimum of 6 feet from the edge of the shoulder. Where it is impractical to follow these guidelines, place signs no less than two feet from the edge of the road. In business, commercial, or residential areas where sidewalk width is limited or where existing poles are close to the curb, signs may be placed no closer than one foot from the edge of the road.

On roads where signs are placed behind barriers such as curbs or guardrails, place signs at a minimum of 2 feet from the roadside edge of the barrier.

On low-volume roads (fewer than 400 vehicles per day) with no shoulders, place signs at a minimum of 12 feet from the roadside.

Where terrain or vegetation make it impractical to follow this guideline, allow a minimum of 2 feet between the sign and the roadway.

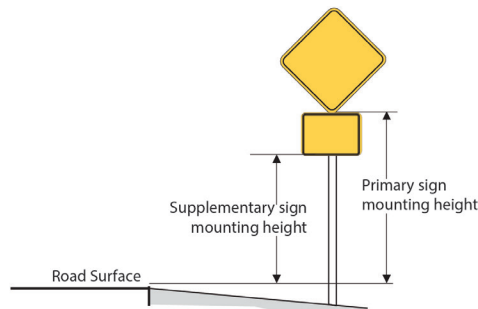
Breakaway Sign Usage

If a sign is installed within the clear zone, a breakaway sign post shall be used. The clear zone is the area that ideally would be clear of obstacles that might be a hazard to a vehicle that left the road. Refer to page 4 of the Forest Service's Signage Installation Guide for more information on the usage of breakaway signs.

MOUNTING HEIGHT (MUTCD SECTION 2A.18)

The mounting height- the distance from road surface to the bottom of the sign- is illustrated in figure X.

Figure 2: Diagram illustrating Mounting Heights



The primary sign should be mounted at least five feet high in rural areas. In urban areas, areas with parking or pedestrians, or areas where the view of the primary sign may be obstructed, the sign must be mounted at least seven feet high.

A supplemental plaque or sign may be one foot lower than the minimum mounting height for the primary sign (four feet in rural areas and 6 feet otherwise). There should be a one inch gap between primary and supplemental signs so they can expand and contract. A supplementary sign mounted lower than seven feet above a pedestrian sidewalk or pathway should not project more than four inches into that pedestrian facility. Figures 3-5 illustrate the mounting heights and lateral placements of signs in various scenarios.

Figure 3: A diagram of a sign in an area with a shoulder greater than six feet

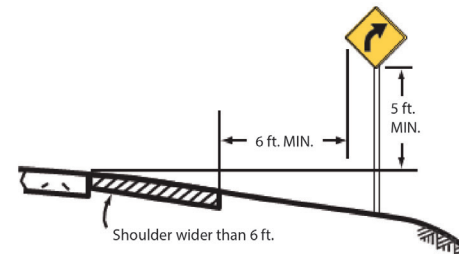


Figure 4: a diagram of a primary and supplemental sign in a rural area

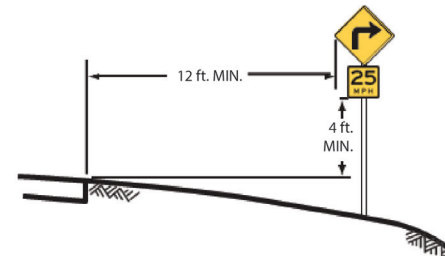


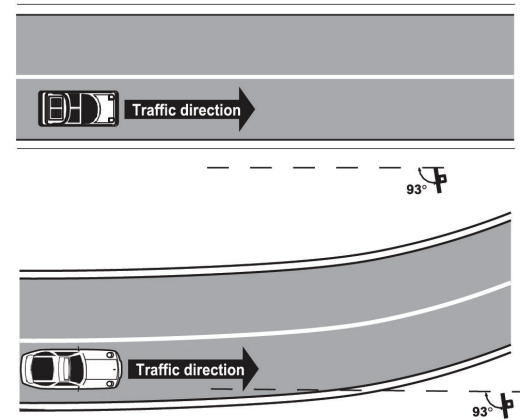
Figure 5: A diagrammatic image of a regulatory sign on a low-volume rural road where the terrain limits the lateral placement of the sign



SIGN ORIENTATION (MUTCD SECTION 2A.20)

Signs are mounted at approximately right angles to oncoming traffic. Where mirror reflection from the sign face could reduce the legibility of the sign, it may be necessary to rotate a sign slightly off 90 degrees away from the road to avoid glare reflecting off the sign face directly into the driver's eyes. An angle of about 93 degrees to the line of approaching traffic is recommended. On curves, orient the sign to face the oncoming traffic—not the road edge as illustrated in Figure 6. On steep grades, it may be necessary to tilt the sign forward (uphill grades) or back (downhill grades) to make it easier for motorists to read.

Figure 6: Diagram of sign orientation on a straight and curving road (93 degrees away from the direction of oncoming traffic)



Note: Figures 1 through 6 are sourced from [ES Sign Installation Guide](#).

01. INTERSECTIONS

DESCRIPTION

An intersection, by design, is a planned location where vehicles traveling on different roadways cross and may come into conflict. The functional area of an intersection extends upstream and downstream from the physical area of the crossing streets. The different approaches and crossing movements by motorists, bicyclists, and pedestrians make at-grade intersections one of the most complex traffic situations that roadway users encounter. Additional elements of complexity include motorists who disregard traffic controls by speeding or making illegal turns, which cause the risk to compound.

The Service has a variety of types of intersections in its stations and should consider different options to ensure that its intersections are safe and visible, thereby minimizing the potential for user conflicts related to the intersection. In most cases, signage is an effective way to improve intersections, and if the situation warrants, the Service may consider using traffic lights and roundabouts.⁷

CONSTRAINTS

- Is this intersection a safety concern? Have there been crashes that have occurred here? What kind of crashes have occurred (vehicles, bicycle/pedestrian-involved, etc.)?
- Is implementing an intersection control at a particular location a high priority issue for the station?
- How much funding is available for this project?

- Is there adequate staff available at the station to take on this project?
- Are there any environmental limitations for this project? What other obstacles exist for the completion of this project?
- Is the intersection wholly in a station, or does it cross jurisdictions/who do you need to coordinate with?
- Would the proposed intersection improvements favor one user group over another? How can all user groups be served by the improvements?

DATA NEEDS AND CONSIDERATIONS

- Number and angle of approaches
- Vehicle traffic volume (AADT or vehicles per day)
- Bicycle and pedestrian counts
- Approach speeds
- Crash data at this intersection
- Sight distance available on each approach
- Assignment of right-of-way

⁷ FHWA Gravel Roads: Construction and Maintenance, Intersection Issues. (2015). <https://www.fhwa.dot.gov/construction/pubs/ots15002.pdf>

DIAGRAMS

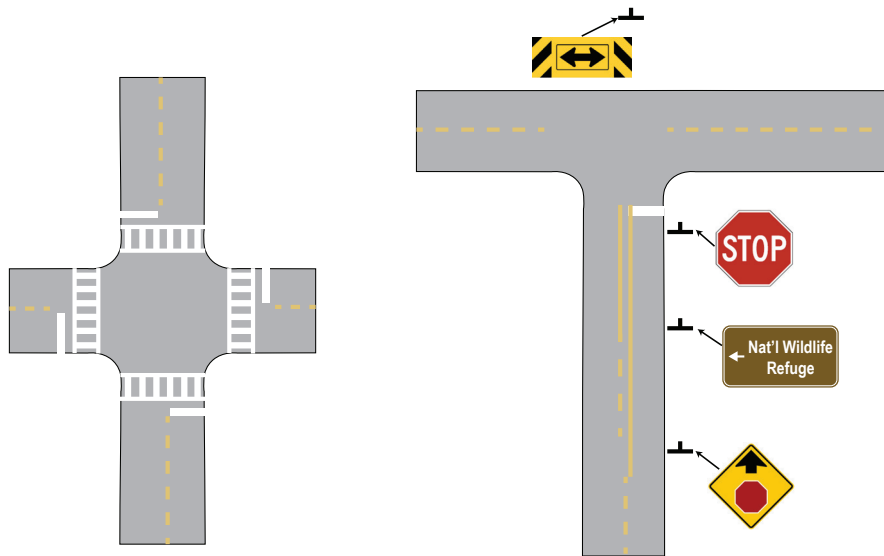


Figure 7: Two examples of intersections that could occur at a Service station; this is not an exhaustive list

Road Typology Considerations

In many the Service's stations, paving and maintaining a paved road may not be economically feasible, particularly along the Service's roadways with low traffic volumes. While gravel roads are thought to sometimes provide a lower quality of service in terms of safety for different user groups, proper grading and the use of good surface gravel will serve to maintain the greatest possible quality of service of the gravel road. FHWA's Gravel Roads: Construction and Maintenance guide provides greater detail on this topic. The major issue to avoid at gravel road intersections is corrugation, or washboarding, which is caused by a lack of moisture and also frequent and sharp acceleration and deceleration. Washboarding is the creation of regular bumps in the road which may cause a driver to lose control of their vehicle at a certain speed. For this reason, it is important to have sufficient speed reduction signs as well as proper gravel maintenance to preserve the function of the gravel roadway. Sections 1.23 and 1.24 of the Gravel Roads: Construction and Maintenance guide detail how to shape the crowns of gravel roads intersecting with one another and paved roads, respectively.

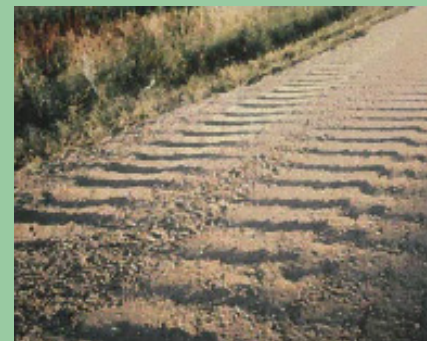




Image: Washboarding, a common issue at gravel intersections.

<div>INTERSECTION WARNING SIGNS</div>	<div> <div>Images:</div> <div>   </div> <div> <div>W2-1</div> <div>W2-4</div> </div> </div>
<div>Description</div>	<div>Intersection warning signs (W2-1, W2-4) call attention to an intersection that might not be readily apparent to road users. These signs alert road users that a reduction of speed or an action in the interest of safety and efficient traffic operations.</div>
<div>Low Cost:</div>	<div>Roadways analysis, sign fabrication, and installation</div> <div> <div>\$</div> <div>\$</div> <div>\$</div> </div>
<div>More Information:</div>	<div>MUTCD pages 103-127</div>
<div>Application:</div>	<div>The use of warning signs should be kept to a minimum.</div> <div>Defer to signage installation section for mounting height and lateral placement.</div>

YIELD SIGN

Image:



R 1-2



Pavement markings

Description

A YIELD sign (R1-2) is an equilateral triangle pointing downwards with the word "yield". Vehicles controlled by a yield sign must slow down to a speed that is reasonable for the existing conditions or stop to avoid interfering with conflicting traffic on the roadway assigned the right-of-way.

Yield line pavement markings are often installed with a yield sign. Yield lines (MUTCD pg. 381) may be used to indicate the point behind which vehicles are required to yield in compliance with a YIELD (R1-2) sign.

Low Cost:

Roadways analysis, sign installation, and pavement markings



More Information:

MUTCD Pages 51-53

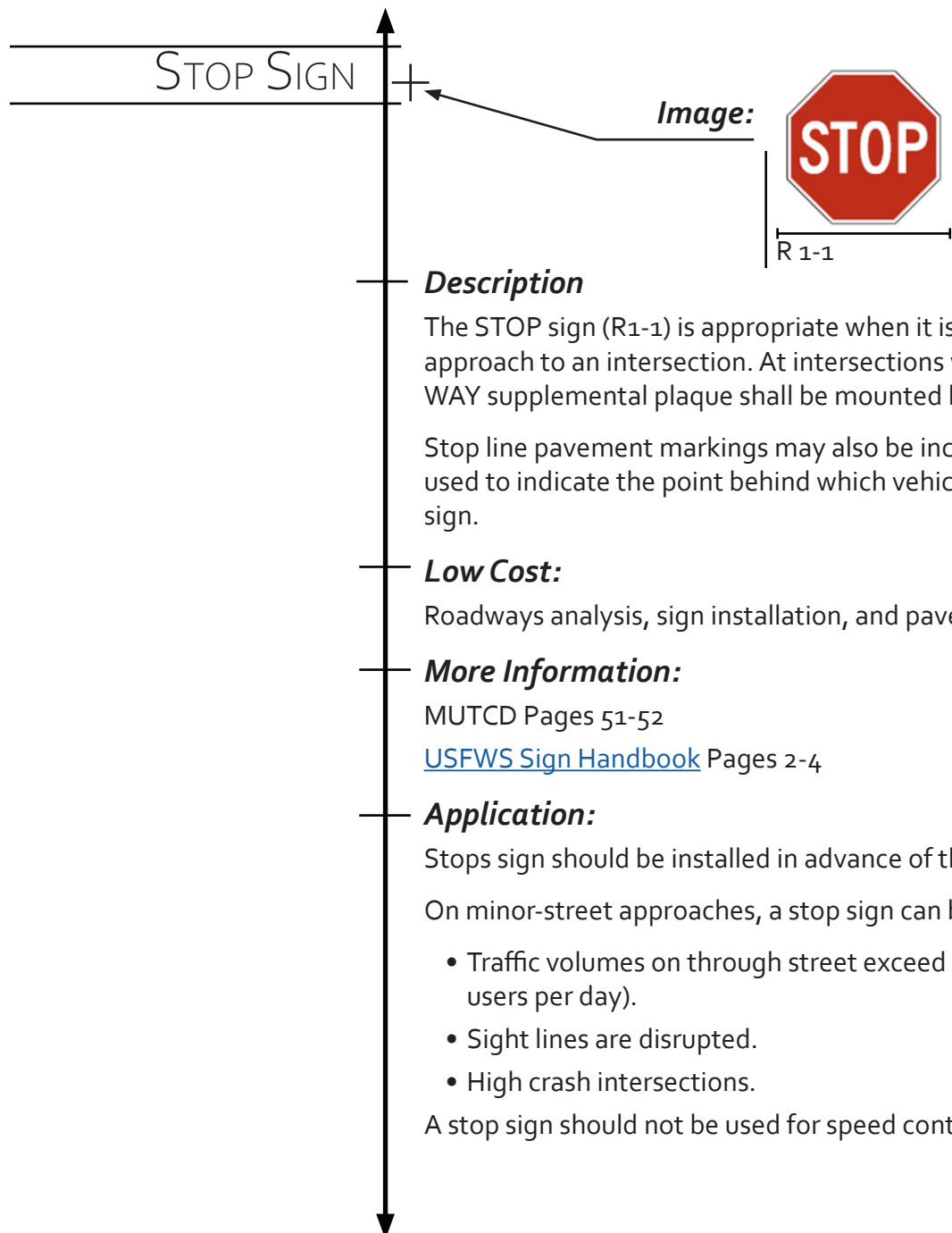
[USFWS Sign Handbook](#) Pages 2-4

Application:

Yield signs may be installed:

- On the approaches to a through street or highway a full stop is not always required.
- At the entrance to the first roadway of a divided highway.
- At a channelized turn lane that is separated from the adjacent travel lanes by an island (even if the adjacent lanes at the intersection are controlled by a highway traffic control signal or stop sign).
- At an intersection where engineering judgment indicates the problem to be susceptible to correction by the use of the yield sign.
- When entering a roadway for a merge-type movement if engineering judgment shows that yield is needed because acceleration geometry and/or sight distance is not adequate for merging traffic operation.

A yield sign should not be used for speed control.



Description

The STOP sign (R1-1) is appropriate when it is determined that a full stop is always required on an approach to an intersection. At intersections where all approaches are controlled by stop sign, an ALL WAY supplemental plaque shall be mounted below each Stop sign.

Stop line pavement markings may also be incorporated in addition to a stop sign. Stop lines may be used to indicate the point behind which vehicles are required to stop in compliance with a STOP (R1-1) sign.

Low Cost:

Roadways analysis, sign installation, and pavement markings



More Information:

MUTCD Pages 51-52

[USFWS Sign Handbook](#) Pages 2-4

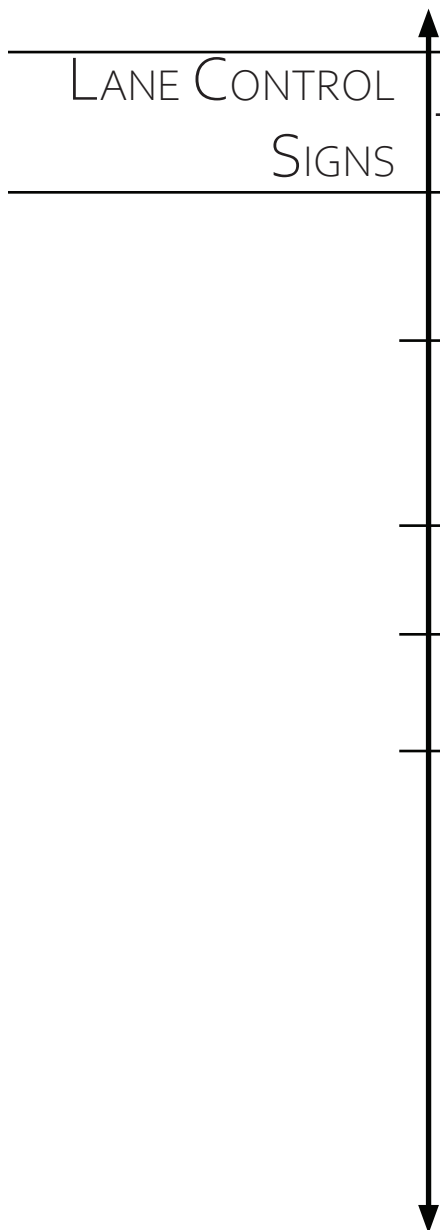
Application:

Stop signs should be installed in advance of the crosswalk line nearest to the approaching traffic.

On minor-street approaches, a stop sign can be considered if:

- Traffic volumes on through street exceed 6,000 vehicles per day (should be more than at least 2,000 users per day).
- Sight lines are disrupted.
- High crash intersections.

A stop sign should not be used for speed control.

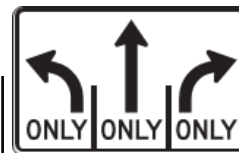


LANE CONTROL SIGNS

Images:



R3-20L



R3-8b



R3-7

Description

Intersection Lane Control signs indicate permitted movements from a lane. Some of these signs require road users in certain lanes to turn, permit turns from a lane where such turns would otherwise not be permitted, or require a road user to stay in the same lane and proceed straight through an intersection.

Low Cost:

Roadways analysis, sign installation(s), and pavement markings



More Information:

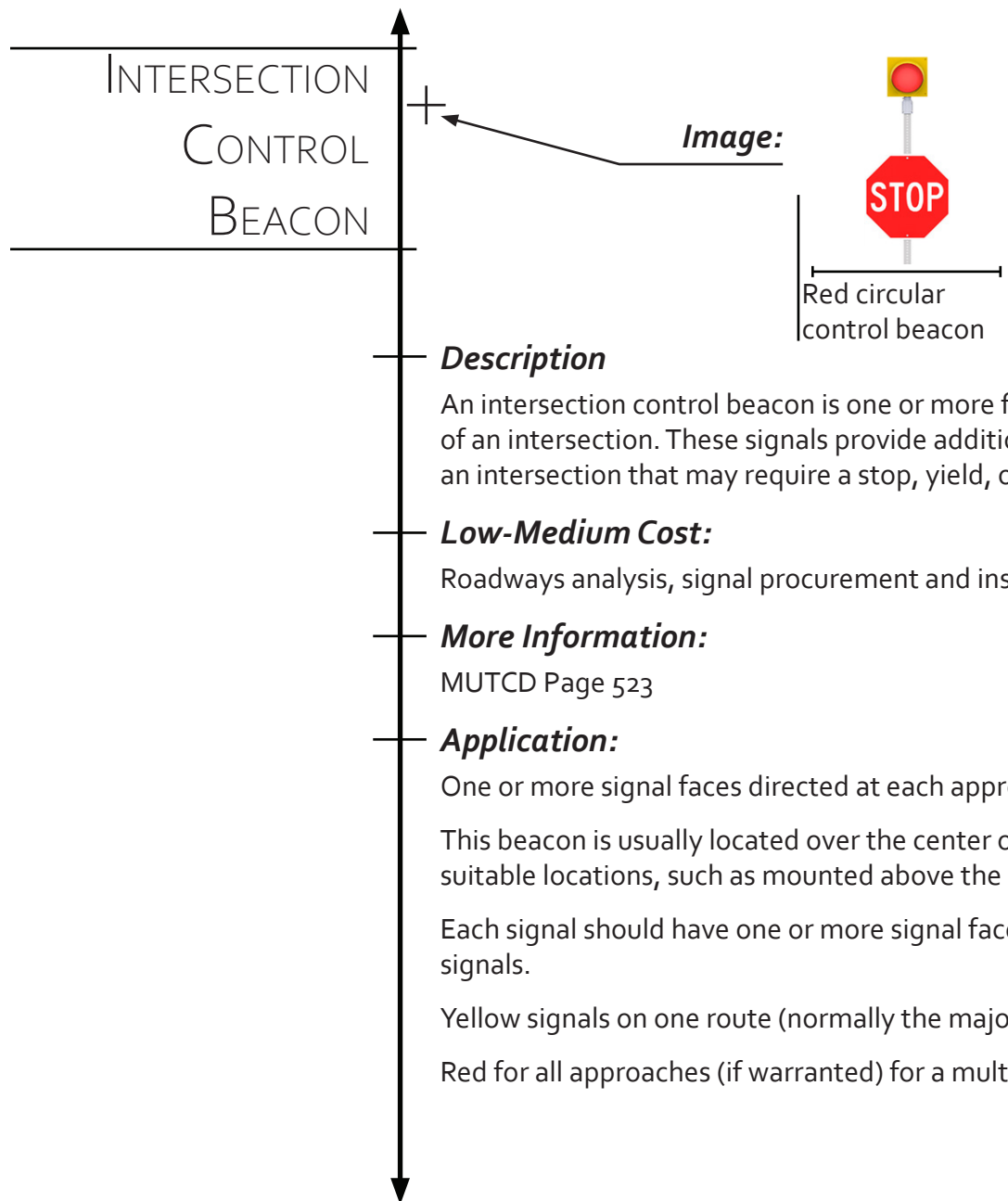
MUTCD Pages 60-64

Application:

Lane control signs shall be located in advance of the intersection, such as near the upstream end of the mandatory movement lane, and/or at the intersection where the regulation applies.

Mandatory movement lane control signs (ex: "left lane must turn left") should be accompanied by lane-use arrow markings, especially where traffic volumes are high, where there is a high percentage of commercial vehicles, or where other distractions exist.

When there are three or more lanes of through traffic, lane control signs, if used, shall be mounted overhead over the specific lane to which it applies; otherwise, lane control signs may be post-mounted adjacent to the lane which it applies.



Description

An intersection control beacon is one or more flashing signals that are directed towards each approach of an intersection. These signals provide additional warning for oncoming road users of the approach to an intersection that may require a stop, yield, or awareness and caution.

Low-Medium Cost:

Roadways analysis, signal procurement and installation



More Information:

MUTCD Page 523

Application:

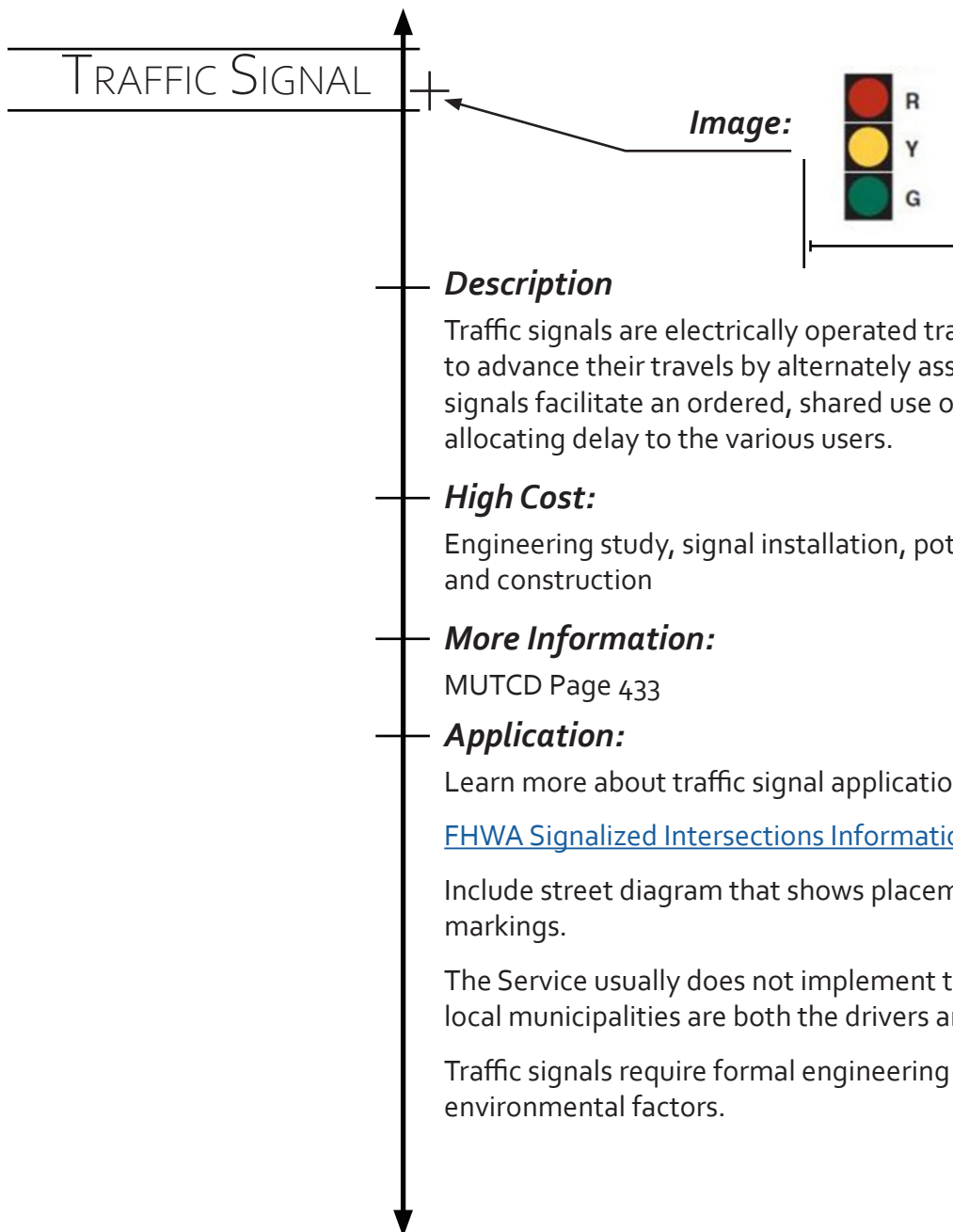
One or more signal faces directed at each approach of an intersection.

This beacon is usually located over the center of an intersection; however, it may be used at other suitable locations, such as mounted above the sign.

Each signal should have one or more signal faces with flashing, circular yellow or flashing, circular red signals.

Yellow signals on one route (normally the major street) and red for the remaining approaches.

Red for all approaches (if warranted) for a multi-way stop.



Description

Traffic signals are electrically operated traffic control devices that provide an indication for roadway users to advance their travels by alternately assigning right-of-way to each approach and movement. Traffic signals facilitate an ordered, shared use of road space by separating conflicting movements in time and allocating delay to the various users.

High Cost:

Engineering study, signal installation, potential road redesign, pavement markings, and construction



More Information:

MUTCD Page 433

Application:

Learn more about traffic signal application here:

[FHWA Signalized Intersections Informational Guide 2nd Edition](#)

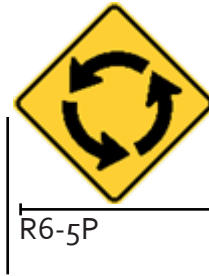
Include street diagram that shows placement of traffic signal, related signage, and related pavement markings.

The Service usually does not implement traffic signals on the Service's stations. In most cases, states or local municipalities are both the drivers and decision makers for these intersection control options.

Traffic signals require formal engineering study of the roadway geometry, traffic volume, and other environmental factors.

ROUNDAABOUT

Image:



Description

A Roundabout is a specific type of circular intersection designed to control speeds and having specific traffic control features.

A modern roundabout has the following distinguishing characteristics and design features: Channelized approaches; Yield control on all entries; Counterclockwise circulation of all vehicles around the central island; and Appropriate geometric curvature to encourage slow travel speeds through the intersection.

High Cost:

Engineering study, signal installation, pavement markings, road redesign, and construction



More Information:

MUTCD Pages #: 84, 399

Application:

Learn more about roundabout application here:

[FHWA Roundabouts: An Informational Guide](#)

Include street diagram that shows example of a roundabout, related signage, and related pavement markings.


The Service usually does not implement roundabouts on the Service's stations. In most cases, states or local municipalities are both the drivers and decision makers for these intersection control options.

Roundabouts require formal engineering study of the roadway geometry, traffic volume, and other environmental factors.


NEXT STEPS



Engage station-level partners, such as station managers and project managers, and regional-level partners, such as the RTC, Visitor Services personnel, Regional Sign Coordinator, etc.



Utilize expertise from internal engineers with traffic engineering experience to determine the intersection needs of road users. This could include a roadway analysis of the roadway geometry, traffic volume, modal use, and other environmental factors of an intersection.



Consult state DOT or local municipality for regulations, design, and placement of signs, pavement markings, and other traffic control devices for intersections, particularly intersections which are not within Service boundaries. Cultivate a relationship through regular contact with local and state DOT representatives to learn more about their best practices and regulations; this can also make it easier to request help.



Defer to signage installation section for mounting height and lateral placement.

02. SPEEDING VEHICLES

DESCRIPTION

First-time Service's visitors are often unfamiliar with roads and traffic patterns at the station. Most road users' behavior (speed, level of caution, etc.) is based on the design of a road or trail as much as or more than posted rules; this "design speed" should be a primary consideration for project planners. Wider roads and longer sightlines tend to encourage higher speeds, while curves and sudden changes of road width and elevation tend to slow drivers. It is also possible to slow drivers indirectly, by warning of conditions not normally encountered or alerting them to attractions, giving them a reason to slow their vehicles instead of simply a regulatory speed limit sign. Engineering judgment should be used to establish where roads themselves can be altered to change user behavior and where control devices may be best applied to change speed and manage intersections. Most of the guidance in this section will refer to Part 5 of the MUTCD "Traffic Control Devices for Low-Volume Roads."

Temporarily posting signs can be useful for managing speeds based on seasonal needs, whether driven by wildlife migrations (or nesting, etc.), special events, or busy visitor seasons.

FHWA offers a primer on traffic calming, which can be used for more detailed guidance on applying traffic calming measures, including the application of speed humps and speed cushions.⁸

CONSTRAINTS

- Will speeding vehicles disturb wildlife?
- Will speeding vehicles kick up dust and impair visibility?

- Where do you want visitors to slow down to experience interpretive sites?
- Where do different vehicles commonly interact?
- How much funding is available for this project?
- Is there adequate staff available at the station to take on this project?
- Are there any environmental limitations for this project? What other obstacles exist for the completion of this project?
- Is this project wholly in the Service's station, or does it cross jurisdictions/who do you need to coordinate with?
- Would the proposed project favor one user group over another? How can all user groups be served by the improvements?

DATA NEEDS AND CONSIDERATIONS:

- Number and angle of approaches
- Potential area for road expansion
- Vehicle traffic volume (AADT or vehicles per day)
- Bicycle and pedestrian counts
- Approach speeds
- Sight distance available on each approach
- Assignment of Right-of-way

8

FHWA Speed Management Primer. https://safety.fhwa.dot.gov/speedmgt/ePrimer_modules/module3pt2.cfm

DIAGRAM

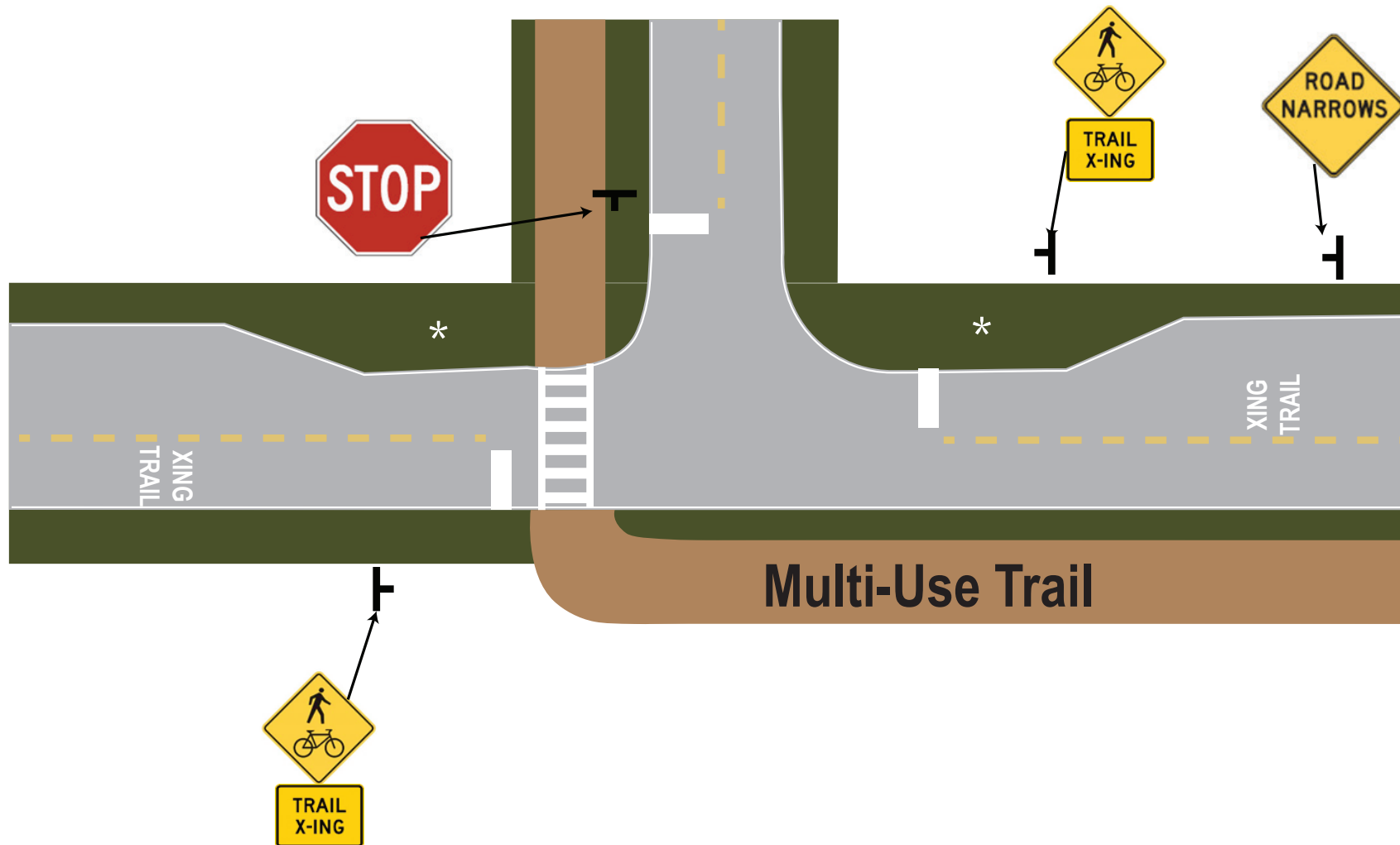
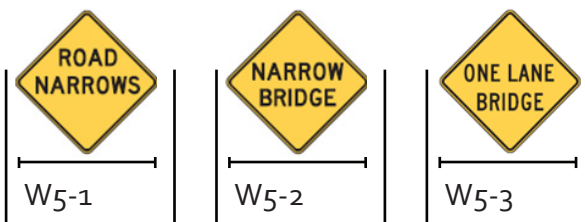


Figure 8: Diagram showing a three way intersection with a trail crossing. The asterisks denote bulb outs which narrow the road at the trail crossing, improving safety for pedestrians and bicyclists.

<div>PASSING SIGNS</div>	
	<div> <div>Image:</div> <div> <div>DO NOT PASS R4-1</div> <div>DO NOT PASS ON SHOULDER R4-18</div> <div>STAY IN LANE R4-9</div> <div>SLOWER TRAFFIC KEEP RIGHT R4-3</div> </div> </div>
	<div> <div>Description</div> <div> <p>Passing can be dangerous on narrow auto-tour routes and other the Service’s station roads. The R4 series of signs may be used to instruct road users to move with or around each other more predictably. This can be of additional use around hazards and sensitive habitat.</p> </div> </div>
	<div> <div>Low Cost:</div> <div> <div>Roadway analysis, sign installation</div> <div>\$\$\$</div> </div> </div>
	<div> <div>More Information:</div> <div> <p>MUTCD Pages 72-75</p> </div> </div>
	<div> <div>Application:</div> <div> <ul style="list-style-type: none"> • The DO NOT PASS sign (R4-1) and related signs may be used in addition to pavement markings to emphasize the restriction on passing. The signs may be used at the beginning of, and at intervals within, a zone through which sight distance is restricted or where other conditions make overtaking and passing inappropriate. • The DO NOT PASS ON SHOULDER sign (R4-18) may be installed to inform road users that using the shoulder of a roadway to pass other vehicles is prohibited. </div> </div>

ROAD NARROWS WARNING SIGNS

Images:



Description

Changes in road width often necessitate abrupt deceleration. These signs warn drivers of situations that will require them to decelerate their vehicle before they reach a road narrowing, narrow bridge, or one lane bridge.

Low Cost:

Roadway analysis, sign installation



More Information:

MUTCD Pages 117-118

Application:

A ROAD NARROWS sign (W5-1) should be used in advance of a transition on two-lane roads where the pavement width is reduced abruptly to a width such that vehicles traveling in opposite directions cannot simultaneously travel through the narrow portion of the roadway without reducing speed. These signs may be omitted on low-volume local streets that have speed limits of 30 mph or less.

A NARROW BRIDGE sign (W5-2) should be used in advance of any bridge or culvert having a two-way roadway clearance width of 16 to 18 feet, or any bridge or culvert having a roadway clearance less than the width of the approaching travel lanes.

ONE LANE BRIDGE (W5-3) sign should be used on two-way roadways in advance of any bridge or culvert:

- Width of less than 16 feet;
- Width of less than 18 feet when often used by commercial vehicles;
- Width of less than 18 feet with limited sight distance.

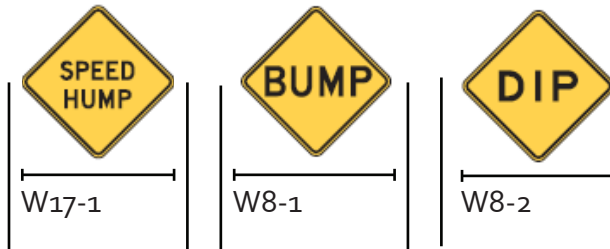
In some cases, reducing the visible lane width by expanding shoulder width can help to reduce speeds.

The Service should review bridge inspection reports.

The use of object markers, delineators, and/or pavement markings should be explored in combination with this signage.

SIGNS AND MARKINGS FOR SPEED HUMPS, BUMPS, AND TABLES

Images:



Description

Speed humps generally provide more gradual vertical deflection than speed bumps. Speed bumps limit the speed of traffic more severely than speed humps. Other forms of speed humps include speed tables (which are long enough to include a raised crosswalk) or raised intersections. However, these differences in engineering terminology are not well known by the public, so for signing purposes these terms are interchangeable.

If speed hump markings are used, they shall be a series of white markings placed on a speed hump to identify its location.

Whether or not speed hump markings are used, signs should be used, because the hump exists to give attentive road users a reason to slow rather than as a potential hazard for speeding users.

Low Cost:

Roadways analysis, sign analysis, pavement grading for (hump, bump, or table)



More Information:

MUTCD Pages 120-121, 395-398

Application:

The SPEED HUMP sign (W17-1) should be used to give warning of a vertical deflection in the roadway that is designed to limit the speed of traffic.

If used, the Speed Hump sign should be supplemented by an Advisory Speed plaque (see Section 2C.08 of the MUTCD).

If a series of speed humps exists in close proximity, an Advisory Speed plaque may be eliminated on all but the first Speed Hump sign in the series.

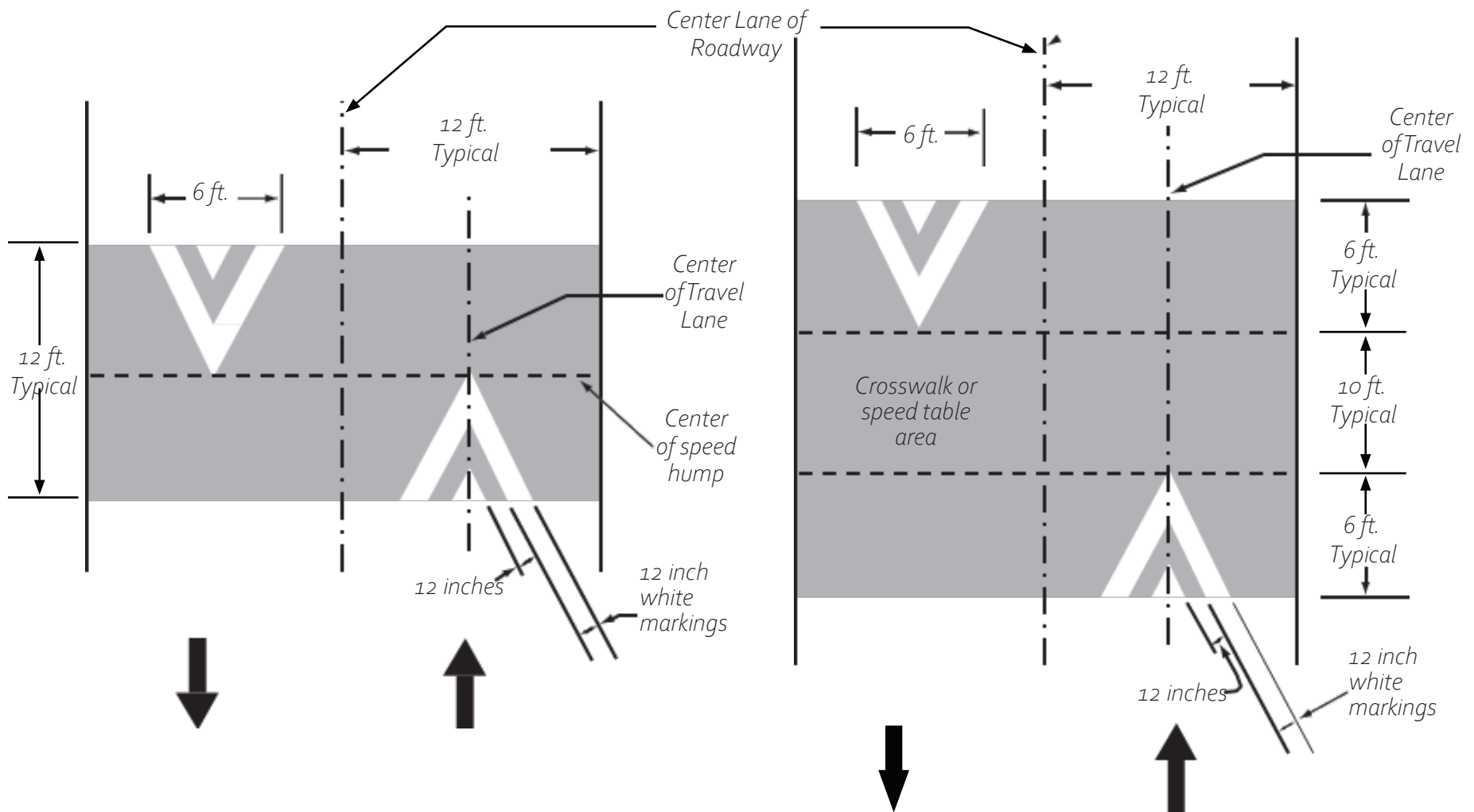


Figure 8: Diagrams denoting the dimensions for speed humps and tables, taken from pages 396 to 397 of the MUTCD.

TRANSVERSE/ IN-LANE RUMBLE STRIPS

Image:



Transverse rumble strips

Description

Transverse or in-lane rumble strips consist of intermittent narrow, transverse areas of rough-textured or slightly raised or depressed road surface that extend across the travel lanes to alert drivers to unusual vehicular traffic conditions.

Through noise and vibration, they attract the attention of road users to such features as unexpected changes in alignment and conditions requiring a reduction in speed or a stop.

Transverse or in-lane rumble strips differ from *longitudinal* rumble strips that consist of a series of rough-textured or slightly raised or depressed road surfaces located along the shoulder to alert road users that they are leaving the travel lanes.

Medium Cost:

Roadways analysis, pavement grading



More Information:

MUTCD Pages 432, 618

Application:

Intervals between transverse rumble strips may be reduced as the distance to the approached condition is diminished in order to convey an impression that a closure speed is too fast and/or that an action is imminent.

A sign warning drivers of the onset of rumble strips may be placed in advance of any transverse rumble strip installation.

If it is desirable to use a color other than the color of the pavement for a longitudinal rumble strip, the color of the rumble strip shall be the same color as the longitudinal line that the rumble strip supplements.

TRANSVERSE/ IN-LANE RUMBLE STRIPS (CONT.)

If the color of a transverse rumble strip used within a travel lane is not the color of the pavement, the color of the rumble strip shall be white, black, or (for temporary traffic control) orange. White rumble strips used in a travel lane should not be placed where they could be confused with other transverse markings such as stop lines or crosswalks.

Transverse rumble strips should not be placed on sharp horizontal or vertical curves.

It should be noted that the lifespan of rumble strips is relatively short and may require frequent renewal.

Rumble strips should not be placed across pedestrian crossings or across bicycle routes. If bicycle usage is common on the station, rumble strips should be considered as a last resort in the event that other vehicle control options are not permissible. In some cases, longitudinal rumble strips can be used to protect bicycle lanes. See the Bicycle Infrastructure section for more information on this option. If rumble strips are necessary along a bicycle route, consult *AASHTO's Guide to the Development of Bicycle Facilities*.⁹

The MUTCD contains no provisions regarding the design and placement of transverse rumble strips that approximate the color of the pavement; it only covers the use of markings in combination with a transverse rumble strip. Consult local and state guidance.

9


AASHTO Guide to the Development of Bicycle Facilities. (2012).

<https://njdotlocalaidrc.com/perch/resources/aashto-gbf-4-2012-bicycle.pdf>


NEXT STEPS



Engage station-level partners, such as station managers and project managers, and regional-level partners, such as the RTC, Visitor Services personnel, Regional Sign Coordinator, etc.



Utilize expertise from internal engineers with traffic engineering experience engineers to determine the needs of road users. This could include a roadway analysis of the roadway geometry, traffic volume, modal use, and other factors of speeding.



Non-FWS roads and trails should consult state DOT or local municipality for regulations, design, and placement of signs and pavement markings.



Defer to signage installation section for mounting height and lateral placement.

03. PEDESTRIAN CROSSINGS

DESCRIPTION:

On many of the Service's stations there are likely to be locations where paths and roads will intersect, thus requiring proper precautions to ensure the safety for both drivers and pedestrians. In areas where visitors on foot will intersect with vehicular traffic, infrastructure and traffic control devices are available to increase visibility and raise awareness of areas with shared use. Pedestrian crossing signage, often installed in the form of yield or stop signage, serve to both protect pedestrian visitors to stations and to alert drivers to any areas where pedestrians may be frequent in number or are not readily visible. Such signage may be needed in a station at a particular location where pedestrian trails may intersect with vehicular traffic or where crosswalks may not be readily visible from a distance, particularly on rural roads typically found on many of the Service's stations. Pedestrian crossing signage is generally clear with a simple meaning and often with minimal text.

In addition to signage, additional infrastructure can promote improved traffic safety for pedestrians, such as lighting and pavement markings. In locations where visibility may be limited, signage with flashing beacons or lighting installed into roads are both solutions that may be beneficial. Pavement markings and tubular markers also serve as generally inexpensive yet effective mechanisms to provide safer crossing areas that designate where pedestrian visitors should cross or help to delineate traffic. By commanding attention to such locations, pedestrian crossing traffic control devices protect the safety of both pedestrians and drivers, particularly to alert drivers and to provide adequate time for them to assess their surroundings.

In some cases, these pedestrian-focused interventions may be temporary during special events or other times of high visitation. While the installation and fabrication of these temporary signs, pavement markings, or traffic controls may differ from permanent installations, the information provided in this section can be used as guidance for these temporary interventions.

CONSTRAINTS

- At what speed are vehicles travelling here?
- What are the sight lines?
- Are attractions or distractions near the crossing?
- How many people use this path or walkway? What range of use and volumes of use can be expected?
- How much funding is available for this project?
- Is there adequate staff available at the station to take on this project?
- Are there any environmental limitations for this project? What other obstacles exist for the completion of this project?
- Is this project wholly in the Service's station, or does it cross jurisdictions/who do you need to coordinate with?
- Would the proposed project favor one user group over another? How can all user groups be served by the improvements?

DATA NEEDS AND CONSIDERATIONS:

- Number and angle of approaches
- Potential area for road expansion or constriction

- Vehicle traffic volume (AADT or vehicles per day)
- Pedestrian counts and bicycle counts
- Approach speeds
- Sight distance available on each approach
- Assignment of right-of-way

DIAGRAM

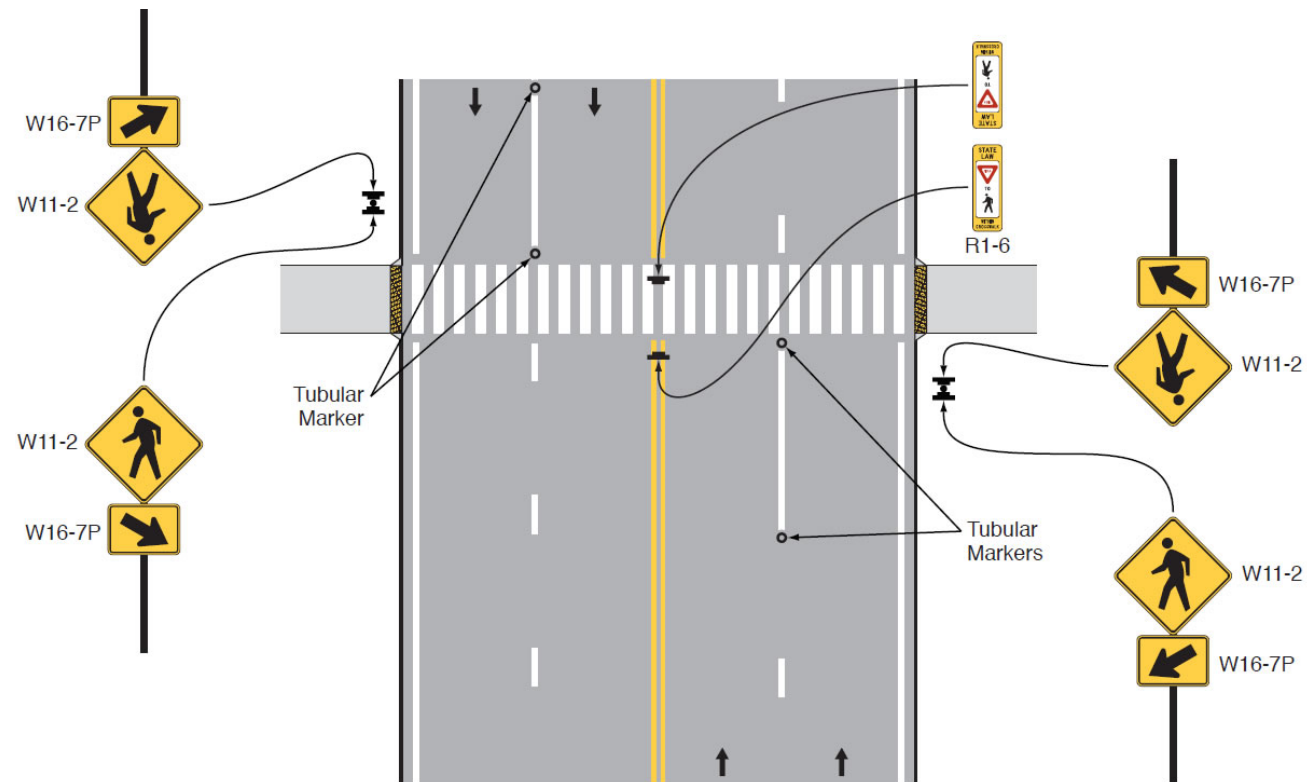


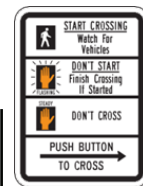
Figure 9: Diagram showing the correct placement of tubular markers and regulatory signs for motorists around a crosswalk.

REGULATORY SIGNS FOR PEDESTRIANS

Images:



R10-3a



R10-3b



R9-2



R9-3



R9-3bp

Description

Pedestrian Crossing signs may be used to limit pedestrian crossing to specific locations.

In areas with installed traffic lights and walk signals, instructional signage may be used to inform pedestrians which street they should cross and signals they should be aware of (R10-3a,b,c).

In areas where pedestrians should not trespass, stations may also install signage designating no pedestrian crossing (see R9-3) to limit pedestrian crossing to specific locations.

Low Cost:

Sign fabrication and installation



More Information:

MUTCD Pages 92-94

Application:

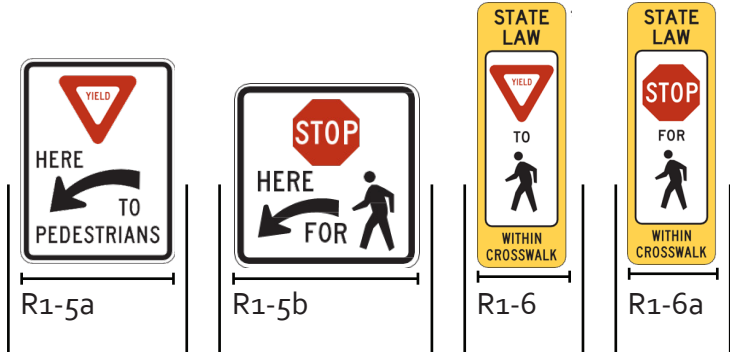

Where crosswalks are clearly defined, the CROSS ONLY AT CROSSWALKS sign (R9-2) may be used to prohibit pedestrians from crossing at locations away from crosswalks.

The No Pedestrian Crossing sign (R9-3) may be used to prohibit pedestrians from crossing a roadway at an undesirable location or in front of a school or other public building where a crossing is not designated.

The USE CROSSWALK supplemental plaque (R9-3bP), along with an arrow, may be installed below either sign to designate the direction of the crossing. This plaque should not be installed in combination with educational plaques.

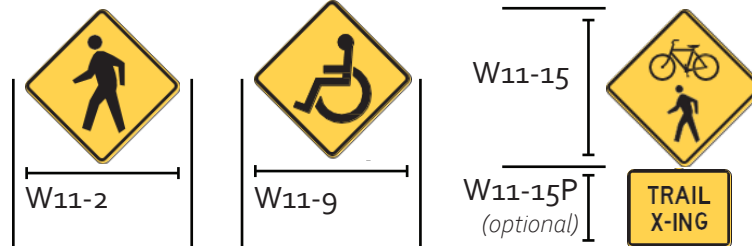
Locations with traffic lights and frequent pedestrian traffic may benefit from the installation of pedestrian signals and cross buttons.



REGULATORY SIGNS FOR MOTORISTS	<div data-bbox="793 272 924 308"><i>Images:</i></div> <div data-bbox="934 97 1659 446"><div data-bbox="945 381 1029 414">R1-5a</div><div data-bbox="1155 381 1239 414">R1-5b</div><div data-bbox="1396 381 1480 414">R1-6</div><div data-bbox="1543 381 1627 414">R1-6a</div></div>
	<div data-bbox="546 446 735 479">Description</div> <div data-bbox="546 495 1921 609">YIELD HERE TO signs (R1-5, R1-5a, R1-6) or STOP HERE FOR (R1-5b, R1-5c, R1-6a) Pedestrians signs are used to warn road users of a regulation to yield to pedestrians or stop for pedestrians in advance of a marked crosswalk that crosses an uncontrolled multi-lane approach.</div> <div data-bbox="546 633 714 665">Low Cost:</div> <div data-bbox="546 682 1018 714">Roadways analysis, sign installation</div> <div data-bbox="1029 625 1260 738"></div> <div data-bbox="546 738 840 779">More Information:</div> <div data-bbox="546 795 829 828">MUTCD Pages 54-56</div> <div data-bbox="546 852 745 893">Application:</div> <div data-bbox="546 909 1270 941">The use of warning signs should be kept to a minimum.</div> <div data-bbox="546 966 1890 1031">These signs are appropriate for use on multi-lane approaches where there is a multiple-threat scenario that can block other drivers' and pedestrians' views of one another.</div> <div data-bbox="546 1055 1921 1201">If yield (stop) lines and Yield Here To (Stop Here For) Pedestrians signs are used in advance of a crosswalk that crosses an uncontrolled multi-lane approach, they should be placed 20 to 50 feet in advance of the nearest crosswalk line and parking should be prohibited in the area between the yield (stop) line and the crosswalk.</div> <div data-bbox="546 1226 1890 1299">Yield (stop) lines and Yield Here To (Stop Here For) Pedestrians signs should not be used in advance of crosswalks for roundabouts.</div>

NON-VEHICULAR WARNING SIGNS

Images:



Description

Non-Vehicular Warning signs may be used to alert road users in advance of locations where unexpected entries into the roadway might occur or where shared use of the roadway by pedestrians might occur. (Signage related to animal or equestrian crossing is found in the same section if applicable.)

Low Cost:

Roadways analysis, sign installation



More Information:

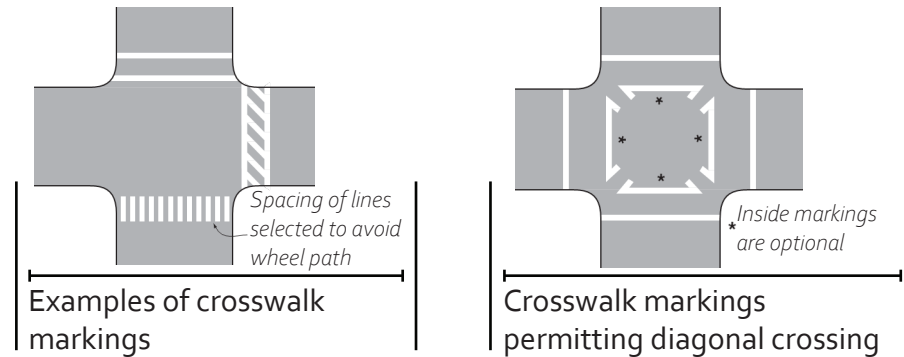
MUTCD Page 130

Application:

If used in advance of a pedestrian crossing, the simple pedestrian symbol in yellow diamond sign (W11-2) should be supplemented with plaques with the legend AHEAD or [#] FEET to inform road users that they are approaching a point where crossing activity might occur.

CROSSWALK MARKINGS

Images:



Description

Crosswalk markings provide guidance for pedestrians who are crossing roadways by defining and delineating paths on approaches to and within signalized intersections and on approaches to other intersections where traffic stops. In conjunction with signs and other measures, crosswalk markings help alert road users of a designated pedestrian crossing point across roadways at locations that are not controlled by traffic control signals or STOP or YIELD signs.

Medium Cost:

Intersection surveilling, engineering study, and implementation



More Information:

MUTCD Page 384

Application:

Crosswalk lines should not be used indiscriminately. An engineering study should be performed before a marked crosswalk is installed at a location away from a traffic control signal or an approach controlled by a STOP or YIELD sign.

The engineering study should consider the number of lanes, the presence of a median, the distance from adjacent signalized intersections, the pedestrian volumes and delays, the average daily traffic (ADT), the posted or statutory speed limit or 85th-percentile speed, the geometry of the location, the possible consolidation of multiple crossing points, the availability of street lighting, and other appropriate factors.

IN-ROADWAY WARNING LIGHTS AT CROSSWALKS

Image:



Example¹⁰

Description

In-Roadway Lights are special types of traffic signals installed in the roadway surface to warn road users that they are approaching a condition on or adjacent to the roadway that might not be readily apparent and might require the road users to slow down and/or come to a stop. This includes, but is not necessarily limited to, situations warning of marked school crosswalks, marked midblock crosswalks, marked crosswalks on uncontrolled approaches, marked crosswalks in advance of roundabout intersections.

Medium Cost:

Intersection surveilling, engineering study, and implementation



More Information:

MUTCD Page 384

Application:

Crosswalk lines should not be used indiscriminately. An engineering study should be performed before a marked crosswalk is installed at a location away from a traffic control signal or an approach controlled by a STOP or YIELD sign.

The engineering study should consider the number of lanes, the presence of a median, the distance from adjacent signalized intersections, the pedestrian volumes and delays, the average daily traffic (ADT), the posted or statutory speed limit or 85th-percentile speed, the geometry of the location, the possible consolidation of multiple crossing points, the availability of street lighting, and other appropriate factors.

¹⁰ Photo Source: <https://fhwa.dot.gov>

WARNING BEACON

Image:



Example¹¹

Description

A Warning Beacon is a highway traffic signal with one or more signal sections that operates in a flashing mode

Medium Cost:

Engineering consultation and implementation



More Information:

MUTCD Page 523

Application:

Typical applications of Warning Beacons include serving as an emphasis for midblock crosswalks

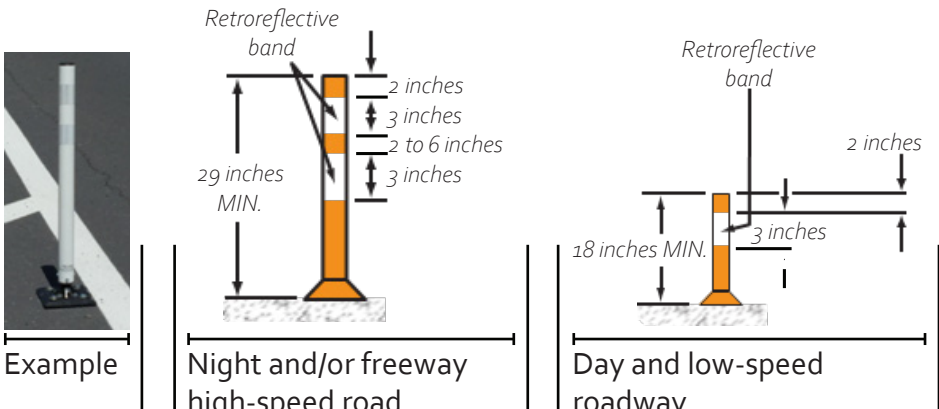
Warning Beacons that are actuated by pedestrians, bicyclists, or other road users may be used as appropriate to provide additional warning to vehicles approaching a crossing or other location.

An Intersection Control Beacon should not be mounted on a pedestal in the roadway unless the pedestal is within the confines of a traffic or pedestrian island.

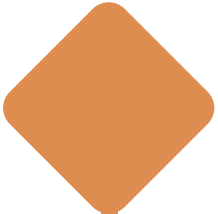
In areas with intermittent or infrequent pedestrian crossings that may require flashing beacons, signals that are actuated by pedestrians or cyclists may be considered.

¹¹


Photo Source: <https://portal.ct.gov/DOT/Traffic-Engineering/Rectangular-Rapid-Flashing-Beacon>

<p>TUBULAR MARKERS</p>	<p>Images:</p>  <p>Example</p> <p>Night and/or freeway high-speed road</p> <p>Day and low-speed roadway</p>
<p>Description</p> <p>A tubular marker is an installed or temporary channelizing device, such as a plastic/rubber cone or tube, which serves to delineate traffic.</p> <p>One or more tubular markers may be used on the centerline, lane lines, or edge lines at a mid-block pedestrian crossing in order to provide additional emphasis for the pedestrian crossing and to provide a channelizing and potentially calming effect on vehicle traffic.</p>	
<p>Low Cost:</p> <p>Engineering consultation and implementation</p>	<p>\$\$\$</p>
<p>More Information:</p> <p>MUTCD Pages 605-606</p> <p>Section 3H.01 (MUTCD Amendment) ¹²</p>	
<p>Application:</p> <p>Tubular markers should be the same color as the pavement marking that they supplement, in accordance with Section 3H.01 of the MUTCD. The color of the tubular markers can also be orange.</p> <p>When the tubular markers are used to supplement an R1-6 Series sign that is either on the center line, lane line, or median island, they should not be used on the same pavement marking line where the R1-6 Series sign is installed.</p>	


NEXT STEPS




Engage station-level partners, such as station managers and project managers, and regional-level partners, such as the RTC, Visitor Services personnel, Regional Sign Coordinator, etc.



Utilize expertise from internal engineers with traffic engineering experience to determine the needs of pedestrians. This could include a roadway analysis of the roadway geometry, traffic volume, pedestrian volume, and other environmental factors.



Consult state DOT or local municipality for regulations, design, and placement of signs, pavement markings, and other traffic control devices. Cultivate a relationship through regular contact with local and state DOT representatives to learn more about their best practices and regulations; this can also make it easier to request help.



Determining pedestrian needs could include anecdotal evidence from project leaders and station-level staff.



Defer to signage installation section for mounting height and lateral placement.

04. BICYCLE INFRASTRUCTURE AND SHARED PATHS

DESCRIPTION:

The absence of a marked bicycle lane or any of the other bicycle facilities should not be construed to mean that bicyclists are not permitted to travel on that roadway. Many road users are not aware of their responsibility to safely accommodate other modes of transportation, and road signs and other instruments can serve to both safely delineate separated use areas and to coordinate share use.

Roads separated from trails with markings, barriers, or physical space can be safer, but road users will intersect eventually and projects should plan for this occurrence. As a rule of thumb, it is preferable to limit signage to what is necessary to communicate immediately important information; repeating information can reinforce guidance but it may also confuse road users. Prioritize warnings and controls at critical spots, such as before turns, intersections, or changes in road width, where users may need to alter their behavior. Where signs serve both bicyclists and other road users, vertical mounting height and lateral placement should optimize legibility for the users who can potentially cause or sustain the most harm. Busier intersections should be well marked or incorporate speed humps or other controls to slow users and provide more opportunity to safely read and react to signs and each other. See Page 108 of the MUTCD for guidance about advance placement of warning signs and the time needed for sign detection, recognition, decision, and reaction.

CONSTRAINTS

- Are there any environmental limitations for this project?
What other obstacles exist for the completion of this project?

- Is this project wholly in the Service's station, or does it cross jurisdictions/who do you need to coordinate with?
- Will improved cycling infrastructure improve visitor experience or expand access?
- Will the bicycle infrastructure connect to other bicycle facilities to create a useful connection?
- How much funding is available for this project?
- Is there adequate staff available at the station to take on this project?
- Is the road wide enough for separated bicycle lanes?
- Of what materials are the road or trail built?
- Is this facility a safety concern? Have there been crashes that have occurred here?
- Would the proposed project favor one user group over another? How can all user groups be served by the improvements?

DATA NEEDS AND CONSIDERATIONS:

- Number and angle of approaches
- Vehicle traffic volume (AADT or vehicles per day)
- Bicycle and pedestrian counts
- Approach speeds and sight distance available on each approach
- Availability of bike racks, tools, etc. at the station
- Assignment of right-of-way

DIAGRAMS

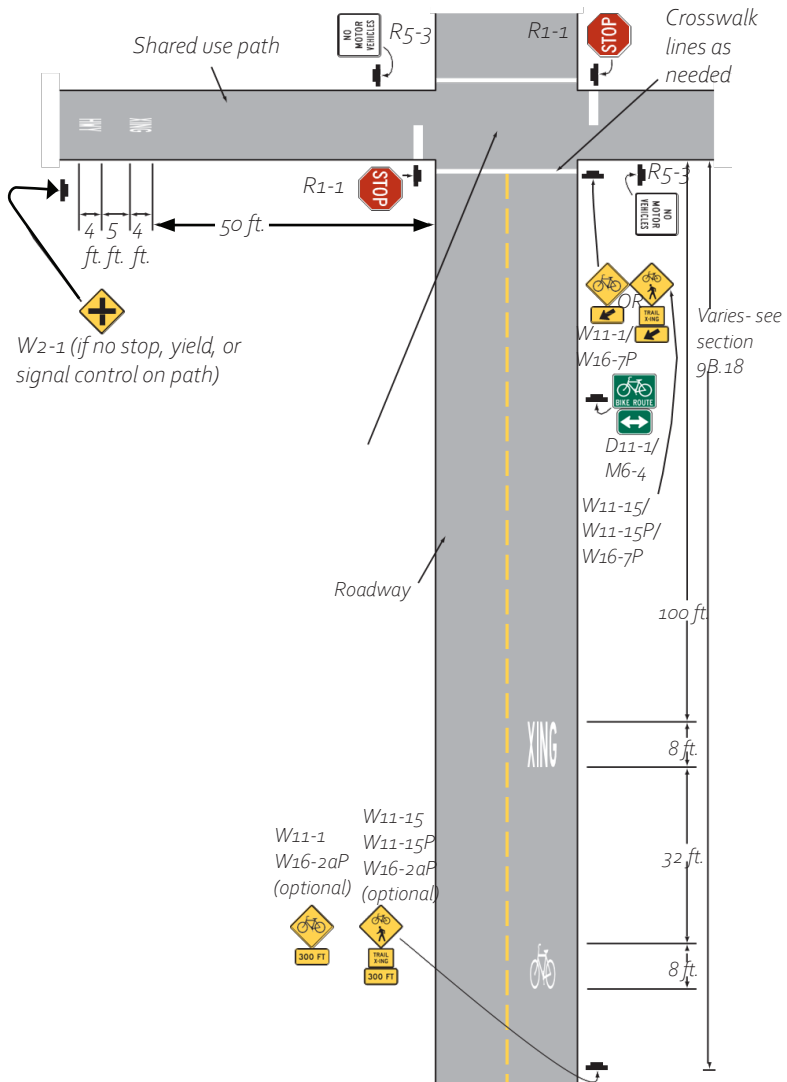


Figure 10: Examples of Signing and Markings for a Shared- Use Path Crossing (source: MUTCD Page 803)

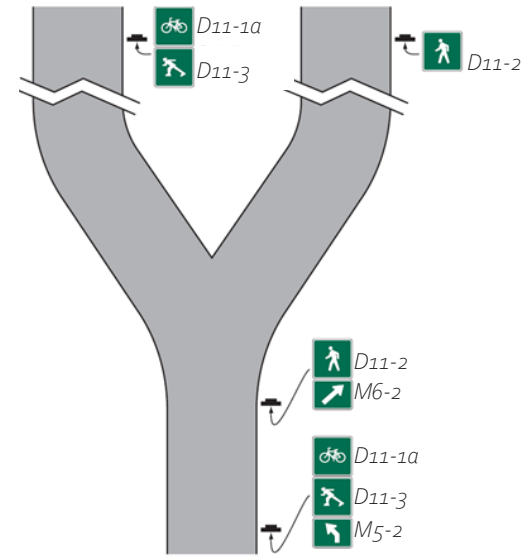


Figure 11: Examples of Mode-Specific Guide Signing on a Shared-Use Path
(source: MUTCD page 508)

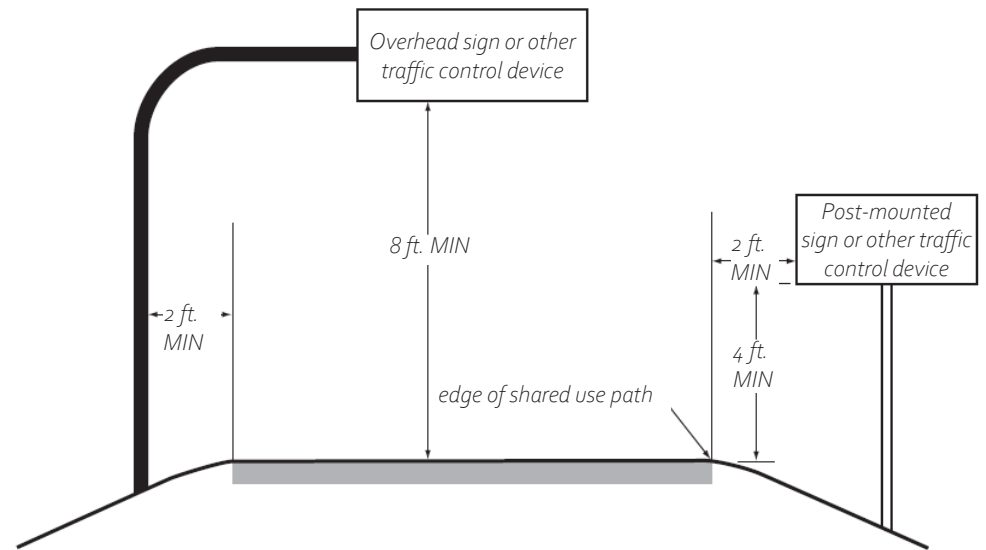
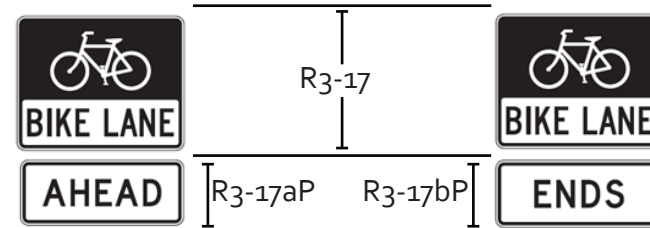


Figure 12: Sign placement on Shared-Use Paths (source: MUTCD page 790)

BIKE LANE SIGNS

Images:



Description

These signs indicate the beginning and end of dedicated bicycle lanes.

Low Cost:

Roadways analysis and sign installation.



More Information:

MUTCD Pages 790-794

Application:

Bike Lane signs and plaques should be used in advance of the upstream end of the bicycle lane, at the downstream end of the bicycle lane, and at periodic intervals along the bicycle lane as determined by engineering judgment based on the prevailing speed of bicycle and other traffic, block length, distances from adjacent intersections, and other considerations.

The BIKE LANE sign (R3-17) and the accompanying plaques shall be used only in conjunction with marked bicycle lanes.

REGULATORY SIGNS FOR DIRECTING MOTORISTS AND BICYCLISTS

Images:



R4-11



R4-4



R7-9



R7-9a

Description

These regulatory signs call attention to prescribed road behaviors that might not be readily apparent to road users. These signs alert road users—primarily motorists—that they are to either share the road with bicyclists or altogether avoid spaces such as bike lanes.

Low Cost:

Roadways analysis and sign installation.



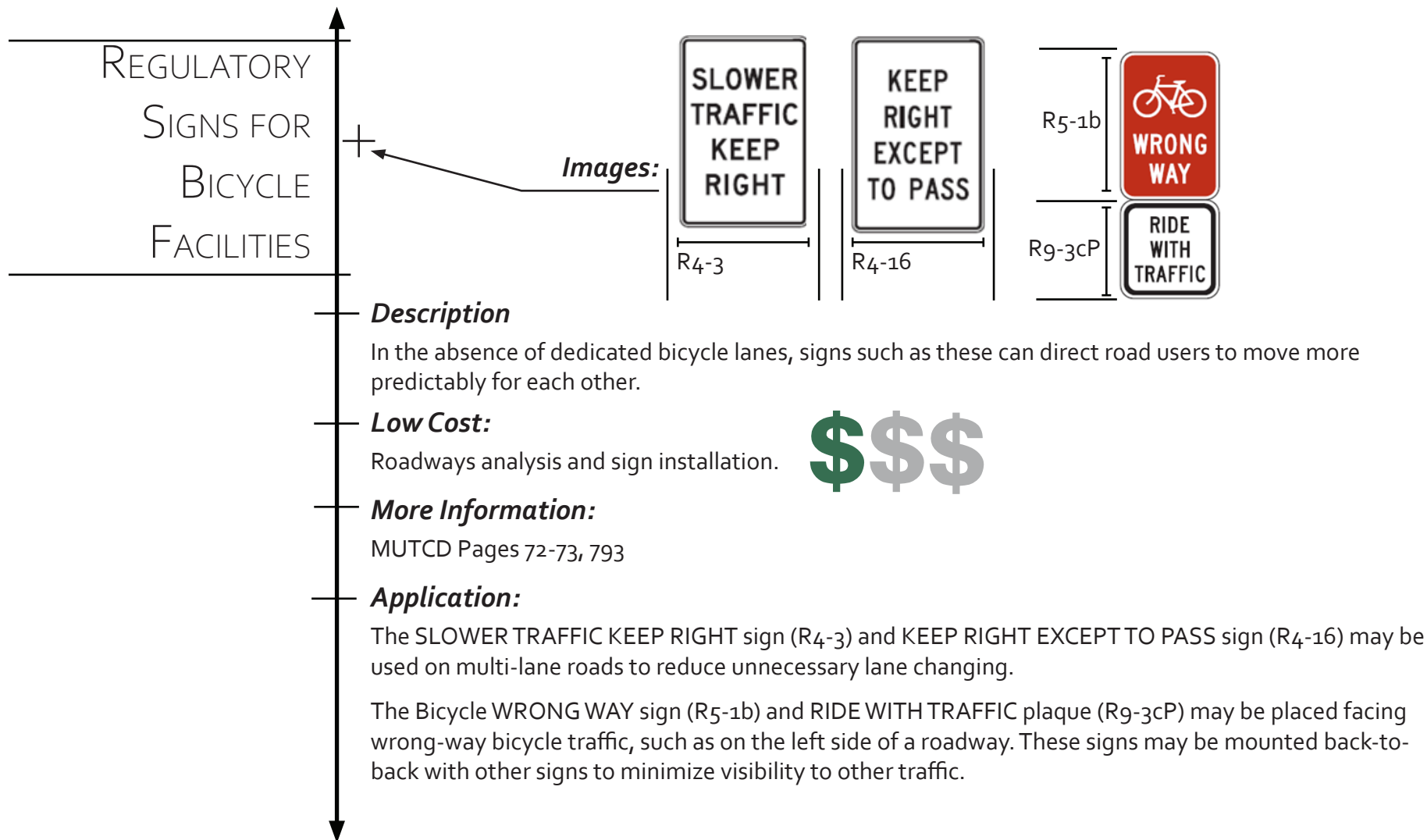
More Information:

MUTCD Pages 791-793

Application:

The BICYCLES MAY USE FULL LANE sign (R4-11) may be used in locations where it is important to inform road users that bicyclists might occupy the travel lane.

Cars parking or pulling over into bike lanes can present a hazard for bicyclists and motorists alike if they force a bicyclist to leave a bike lane unexpectedly. Separated lanes offer more safety, but the clearly stated expectation that bicyclists may use all road lanes may prevent aggressive driving or uncertain user interactions.



WARNING SIGNS FOR BICYCLE FACILITIES

Images:



R7-5



W11-2



W16-7P



R5-4a



W16-1P



W11-1

Description

Warning signs alerts the road user to changing right of way, changing roadway surface conditions, and unexpected entries into the roadway by bicyclists, pedestrians, or other users.

Low Cost:

Roadways analysis and sign installation.



More Information:

MUTCD Pages 796-798

Application:

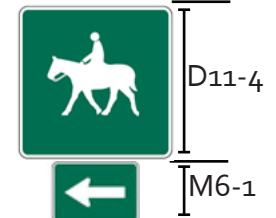
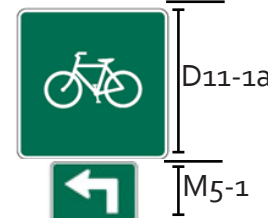
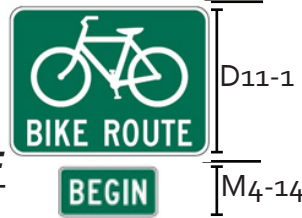
The Bicycle Warning sign (W11-1) and Pedestrian Crossing sign (W11-2) alert the road user to unexpected entries into the roadways, and other crossing activities that might cause conflicts. These conflicts might be relatively confined, or might occur randomly over a segment of roadway. Bicycle warning signs such as PATH NARROWS sign (W5-4a) and HILL sign (W7-5) may be installed on shared-use paths to warn bicyclists of conditions not readily apparent. In situations where there is a need to warn motorists to watch for bicyclists traveling along the highway, the SHARE THE ROAD plaque (W16-1P) may be used in conjunction with the bicycle sign (W11-1).

If used, other advance bicycle warning signs should be installed at least 50 feet in advance of the beginning of the condition.

* Note: these signs may be used with a fluorescent yellow-green background color. The background color should match the color of the warning sign it supplements. The mixing of standard yellow and fluorescent yellow-green backgrounds within a zone or area should be avoided.

MODE-SPECIFIC GUIDE SIGNS FOR SHARED-USE PATHS

Images:



Description

BIKE ROUTE guide signs (D11-1) and related trail signs may be used to clarify where certain types of road users may travel. Bicycle Route Advance Turn and Directional Arrow Auxiliary Signs may accompany such signs.

(Note that the MUTCD covers other, related Route Signs in Sections 2D)

Low Cost:

Path analysis and sign installation.



More Information:

MUTCD Pages 792, 798-805

Application:

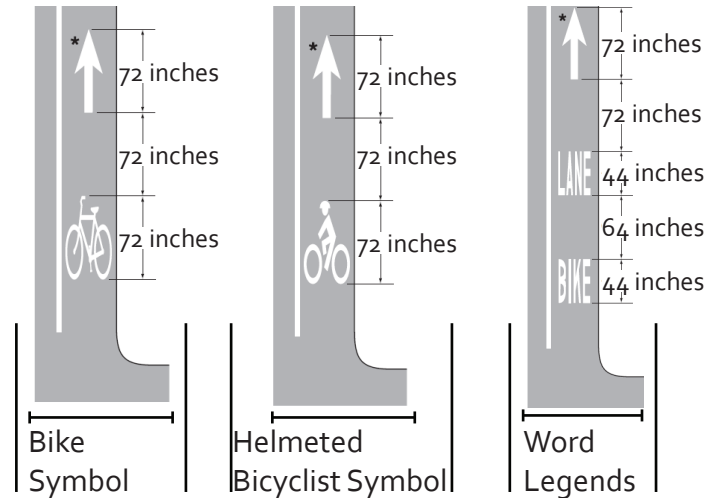
BIKE ROUTE guide signs (D11-1) may be provided along designated bicycle routes to inform bicyclists of bicycle route direction changes and to confirm route direction, distance, and destination.

If used, BIKE ROUTE guide signs may be repeated at regular intervals so that bicyclists entering from side streets will have an opportunity to know that they are on a bicycle route. Similar guide signing may be used for shared roadways with intermediate signs placed for bicyclist guidance.

When some non-motorized user types, such as electric bicycles or scooters, are permitted on a shared-use path, mode-specific guide signs may be placed in combination with each other, and in combination with signs that prohibit travel by particular modes.

BIKE LANE WORD, SYMBOL, ARROW PAVEMENT MARKINGS

Images:



Description

Pavement markings designate that portion of the roadway for preferential use by bicyclists. Markings inform all road users of the restricted nature of the bicycle lane.

Medium Cost:

Roadways analysis and pavement markings.



More Information:

MUTCD Pages 806-810

Application:

Longitudinal pavement markings shall be used to define bicycle lanes.

If used, bicycle lane word, symbol, and/or arrow markings should be placed at the beginning of a bicycle lane and at periodic intervals along the bicycle lane based on engineering judgment.

Rumble strips can also be incorporated longitudinally along roadway shoulders to protect bike lanes.

If the bicycle lane symbol marking is used in conjunction with word or arrow messages, it shall precede them.

A through bicycle lane shall not be positioned to the right of a right turn only lane or to the left of a left turn only lane.

Bicycle lanes shall not be provided on the circular roadway of a roundabout.

See Section 9C of the MUTCD for diagram examples of applications of this and related pavement markings for Bicycle lanes and share use paths.

SHARED LANE PAVEMENT MARKING

Image:

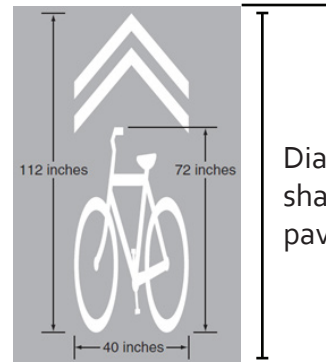


Diagram of a
shared lane
pavement marking

Description

The Shared Lane Marking depicts a bicycle topped by a chevron and is to be placed in roadways where either bicyclists or other road users may need explicit reminder of the right for bicyclist use.

Low-Medium Cost:

Roadways analysis, pavement markings



More Information:

MUTCD Pages 810, 815

Application:

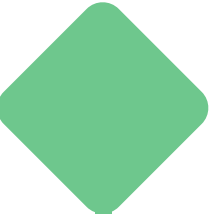
The Shared Lane Marking shown in Figure 9C-9 may be used to:

- Assist bicyclists with lateral positioning in a shared lane with on-street parallel parking in order to reduce the chance of a bicyclist impacting the open door of a parked vehicle;
- Assist bicyclists with lateral positioning in lanes that are too narrow for a motor vehicle and a bicycle to travel side by side within the same traffic lane;
- Alert road users of the lateral location bicyclists are likely to occupy within the traveled way;
- Encourage safe passing of bicyclists by motorists; and
- Reduce the incidence of wrong-way bicycling.


Shared Lane Markings shall not be used on shoulders or in designated bicycle lanes. The Shared Lane Marking should not be placed on roadways that have a speed limit above 35 mph.

See Section 9C of the MUTCD for diagram examples of applications of this and related pavement markings for Bicycle lanes and share use paths


NEXT STEPS




Engage station-level partners, such as station managers and project managers, and regional-level partners, such as the RTC, Visitor Services personnel, Regional Sign Coordinator, etc.



Utilize expertise from internal engineers with traffic engineering experience to determine the needs of bicyclists. This could include a roadway analysis of the roadway geometry, traffic volume, bicycle volume, trail connections, and other environmental factors.




Consult state DOT or local municipality for regulations, design, and placement of signs, pavement markings, and other traffic control devices. Cultivate a relationship through regular contact with local and state DOT representatives to learn more about their best practices and regulations; this relationship can also make it easier to request approval or help from these agencies.



Explore the availability of bicycle counts provided by local and state agencies, as well as bicycle counting opportunities at the Service.



Defer to signage installation section for mounting height and lateral placement.



Determine bicycle needs through anecdotal evidence from project leaders and station-level staff.

05. VISITOR- FOCUSED SIGNS

DESCRIPTION:

Visitor-focused signs are important parts of making the Service's stations visible to visitors who are not familiar with the Service's station and their surrounding area.

Recreational signs are commonly used by the Service and feature recreational destinations that are open to the general public for the purpose of play, amusement, or relaxation. Recreational attractions include parks, campgrounds, gaming facilities, and ski areas. In some cases, these signs may also display the distance to a designated destination. Recreational signs are defined by the MUTCD as directing road users to significant traffic generators, which may include the Service's station. These signs may be used on freeways and expressways where there is direct access to these areas. Recreational signs may also be used off the road network, as appropriate.

Entrance signs are also used by the Service to alert roadway users of a site's primary entrance, often at major public entrance roads. These signs are uniform across the Service and detailed in the 2019 [USFWS Sign Handbook](#). In some cases, exit signs can be used to direct visitors towards the correct location to depart the station.

Less commonly used in the Service are **Tourism signs**, which are defined by the MUTCD as directional or guide signs with one or more sign panels that display the business identification of and/or directional information for eligible business, service, and activity facilities. In most cases, local municipalities, state DOTs, and other partners will champion the fabrication and installation of tourism signs.

The Service should consider the most visited and sought after visitor destinations and attractions in addition to sites that produce visitor confusion for visitor-oriented directional signing. Often, the Service must also consider both State and Federal regulations to be eligible for tourist-oriented directional signing.

CONSTRAINTS

- What are the visitor generators at the Service's station?
- Does the station staff have a good understanding or an inventory of the existing on-site signage?
- Off-site sign placement is ultimately up to the state, county, or municipal DOT. With that in mind, what makes sense to put on signs in these designated areas?
- Is an auto tour route a traffic generator on surrounding roadways to the Service's site?
- Through visitor surveys or discussions with visitors, has there be on-route confusion for how to get to specific sites, such as the visitor center, parking areas, or trailheads?
- Does the station have funding for this signage? Can the station replace signs over the next 5 to 10 years?
- Is there adequate staff available at the station to dedicate to working with the state, county, or municipal DOT?
- Who are the stakeholders that should be involved in these signage discussions? What are their processes?
 - o Are there any other local recreational land managers interested in partnering to obtain a joint recreational sign?

- Is it worth the cost of the signs? Would communication through social media and on-line suffice in relaying directional information for visitors?
- Are there any environmental limitations for this project? What other obstacles exist for the completion of this project?
- Is this project wholly in the Service's station, or does it cross jurisdictions/who do you need to coordinate with?
- Would the proposed project favor one user group over another? How can all user groups be served by the improvements?

DATA NEEDS AND CONSIDERATIONS:

- High visitation sites at the Service's station
- Bicycle and pedestrian routes and connections to trailheads
- Highways with exits close to the Service's station
- Vehicle traffic volume (AADT or vehicles per day)
- Bicycle and pedestrian counts

Note on Tourism Signs

Tourism signs (MUTCD Page #: 320) provide information about private businesses that may be of interest to tourists; all signs include the name of the tourist destination. An example of a tourism sign is found below. Tourism signs installation is ultimately at the discretion of state and county, but for the Service, these signs may be used by concessionaires to promote a service or activity related to the station.¹³



Intersection Approach Sign

¹³ Interstate Logos is an example of a company that provides highway signs that apply to the Service in many states: <https://tods.interstatelogos.com/main/>

DIAGRAM

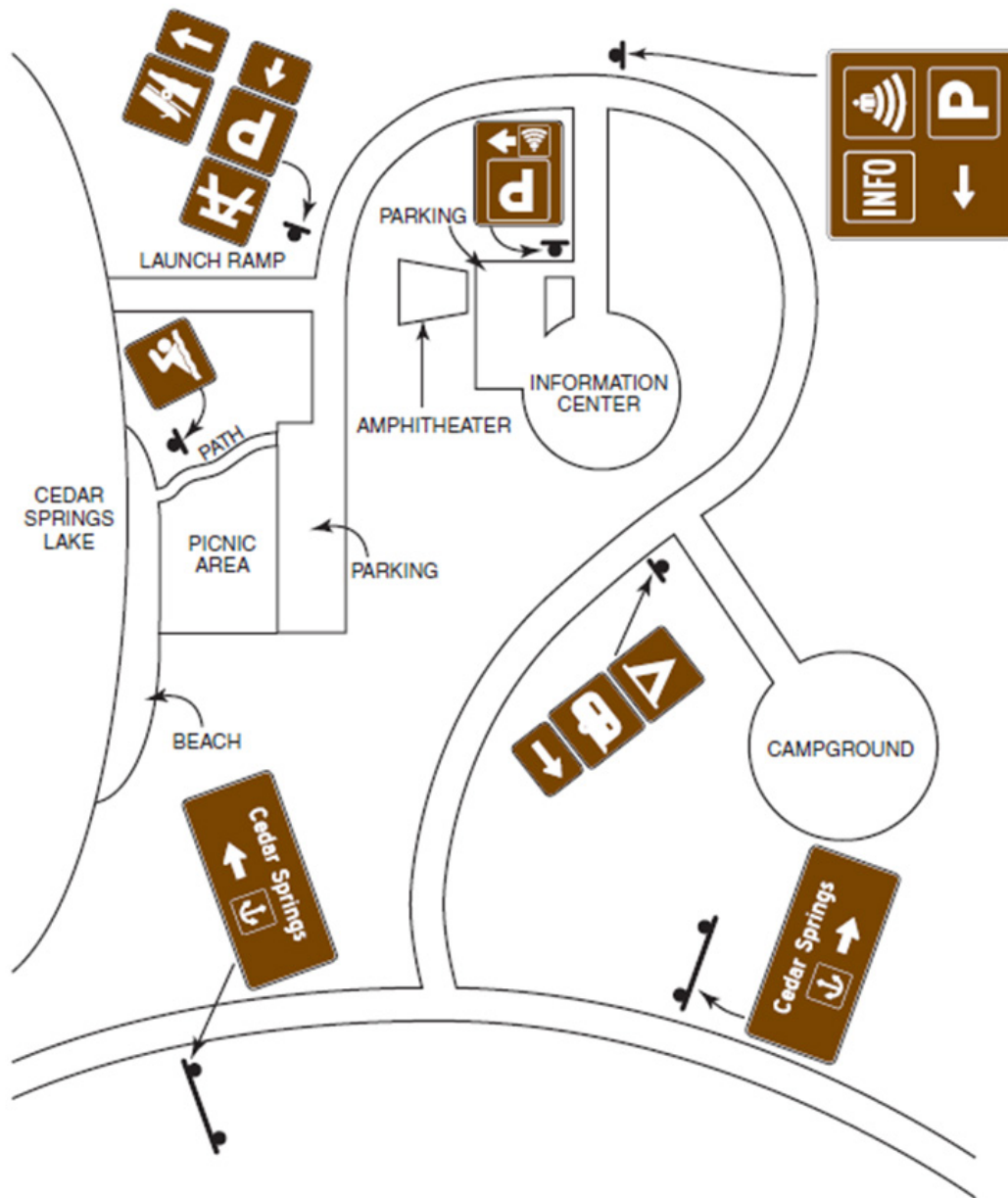
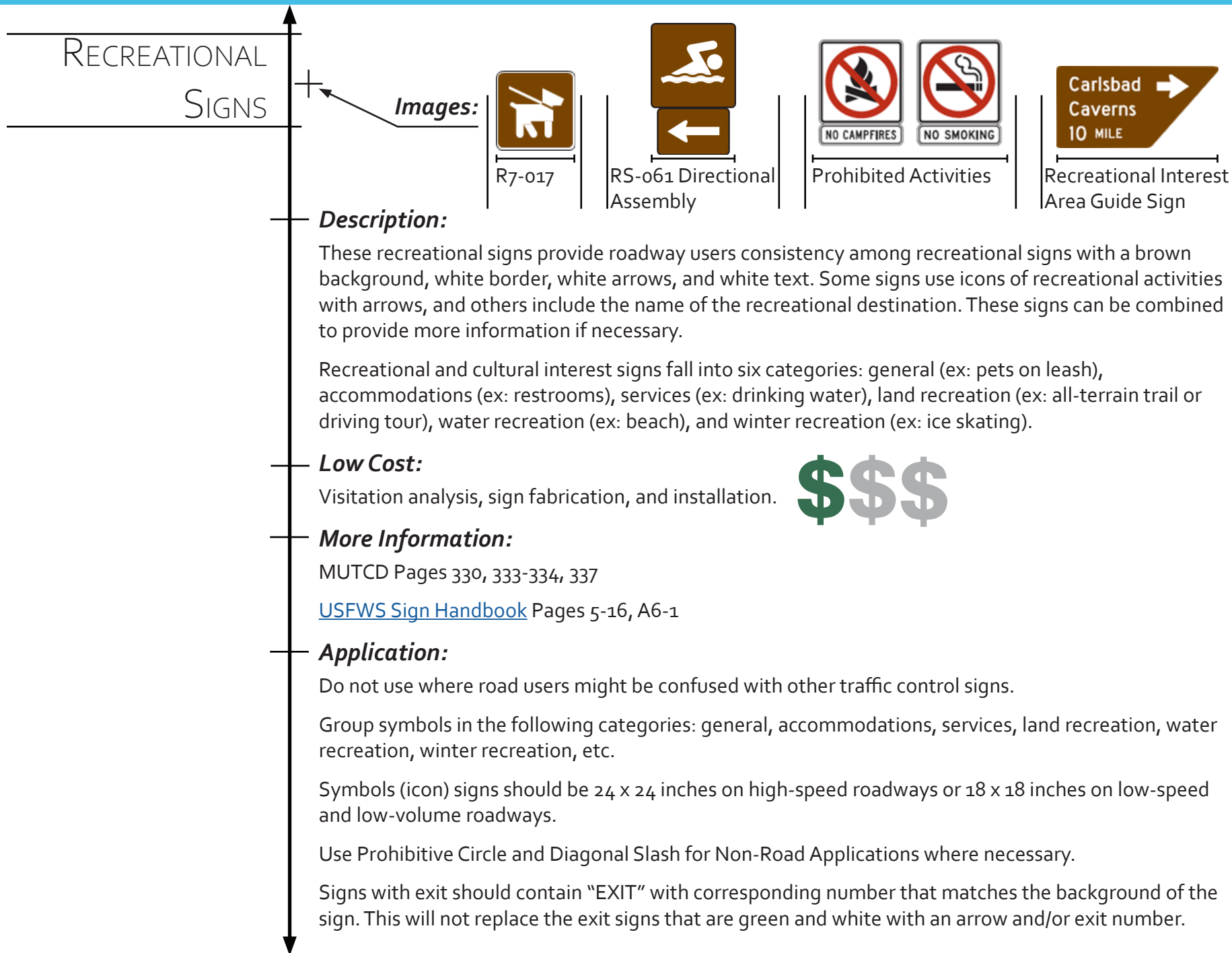
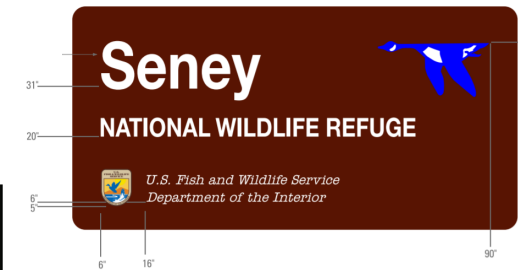


Figure 13: Examples of Recreational Signs with Symbol and Destination Guide Signs (Source: MUTCD, Page 336)

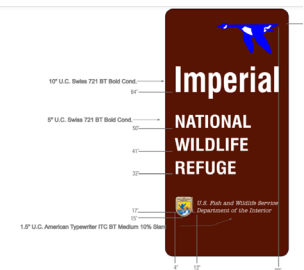


ENTRANCE SIGNS

Images:



Horizontal Orientation (source: [USFWS Sign Handbook](#) page 5-2)



Vertical Orientation source: [USFWS Sign Handbook](#) page 5-3)

Description:

Entrance signs identify Service lands at the primary entrance placed at major public entrance roads.

Entrance signs identify field stations by site name and program identifier. The service logo is placed on the sign to identify the managing agency. Footboards may be added with site information.

Low Cost:

Sign fabrication and installation



More Information:

[USFWS Sign Handbook](#) Pages 2-1, 5-1, 5-2, 5-3

Application:

Entrance signs should be designed alongside visitor services.


Primary entrances should include the following signs:

- Standard 4' x 8' entrance sign, optional footboard
- Hours of operation
- A 3' x 6' welcome sign
- An activities sign


Most entrance signs are placed directly on the Service's land; though, some signs may be within state or local right-of-way.

Place signs on the right side of the roadway wherever possible. An exception would be a two-sided entrance sign to a field station that is placed on one side of the road.


NEXT STEPS



Consult Regional Visitor Services personnel, particularly the Regional Sign Coordinator, to determine the best location and other options for visitor focused signs.



Consult state DOT or local municipality for regulations, design, and placement of signs, particularly for signs that are not on Service right-of-way. Cultivate a relationship through regular contact with local and state DOT representatives to learn more about their best practices and regulations for signs; this relationship can also make it easier to request help or sign approval from these agencies.



Determine visitor wayfinding needs through anecdotal evidence from project leaders and station-level staff, as well as visitor surveys.



Defer to signage installation section for mounting height and lateral placement.

o6. PARKING AREAS AND CONGESTION MANAGEMENT

DESCRIPTION:

Parking areas are inherently mixed-use areas where vehicle users leave their vehicles and become pedestrians or swap modes (e.g., from cars to bikes). As a result, parking areas should be designed to prioritize pedestrian safety and smooth vehicle flow. In addition to cars and bicycles, signage can also pertain to bus, delivery vehicle, and motorcycle parking.

Pullout areas on the side of roads with intended viewing areas come with specific requirements, although they may not always be developed assets. Viewing areas can provide more than one distinct viewing location. For example, a viewing area can provide a distinct viewing location for observing a mountain range and another distinct viewing location for observing a river. Distinct viewing locations within a viewing area can be designated by signs or other markers.

The MUTCD offers limited guidance regarding the design of parking signs and plaques and regarding on-street parking. For example, the MUTCD is limited in that it does not provide guidance for parking or driving aisles within parking areas. While MUTCD general principles and standard traffic control device designs should be used in parking areas, there are some MUTCD provisions that do not easily translate to conditions typically found in parking lots and parking garages.

The [ABA Standards](#) (2015) discusses parking in general in Chapter 5-02, passenger loading in Chapter 5-03, and parking spaces within camping and picnic units in Chapter 10-12.¹⁴

The FWS Sign Handbook also offers accessibility guidance in section A8-7.¹⁵

CONSTRAINTS

- What is the needed amount of parking spaces?
- Is there a need for pedestrian exits/destinations from the parking area?
- What is the intended parking area size and material?
- How much funding is available for this project?
- Is there adequate staff available at the station to take on this project?
- Are there any environmental limitations for this project? What other obstacles exist for the completion of this project?
- Is this project wholly in the Service's station, or does it cross jurisdictions/who do you need to coordinate with?
- Is accessibility for all visitors considered? Would the proposed project favor one user group over another? How can all user groups be served by the improvements?

DATA NEEDS AND CONSIDERATIONS

- Visitation trends
- Vehicle traffic volume (AADT or vehicles per day)
- Bicycle and pedestrian counts

¹⁴ U.S. Access Board. Architectural Barriers Act: Accessibility Standards. (2015). <https://www.access-board.gov/aba/>

¹⁵ U.S. Fish and Wildlife Service Sign Handbook. (2019). <https://www.fws.gov/policy/USFWSsignHandbook2019.pdf>

DIAGRAMS

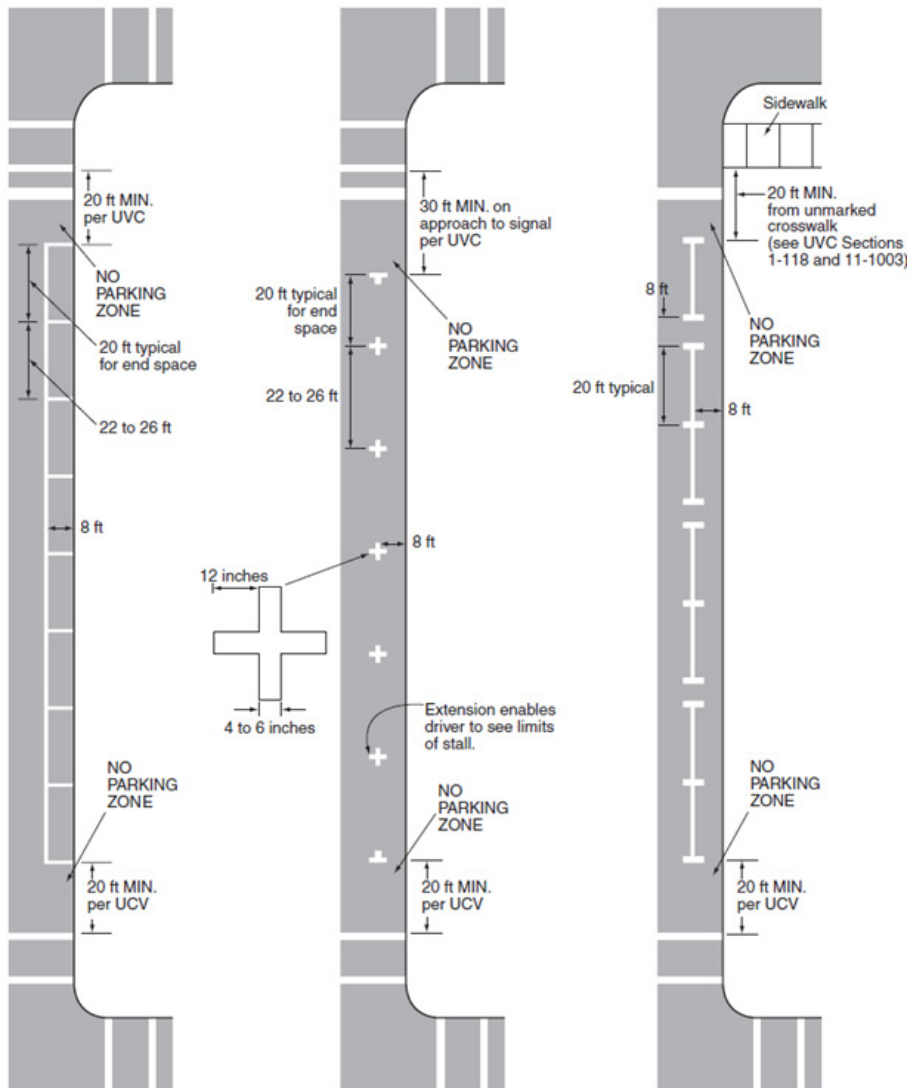


Figure 14: MUTCD diagram of parking space markings (Source: MUTCD, Page 306)

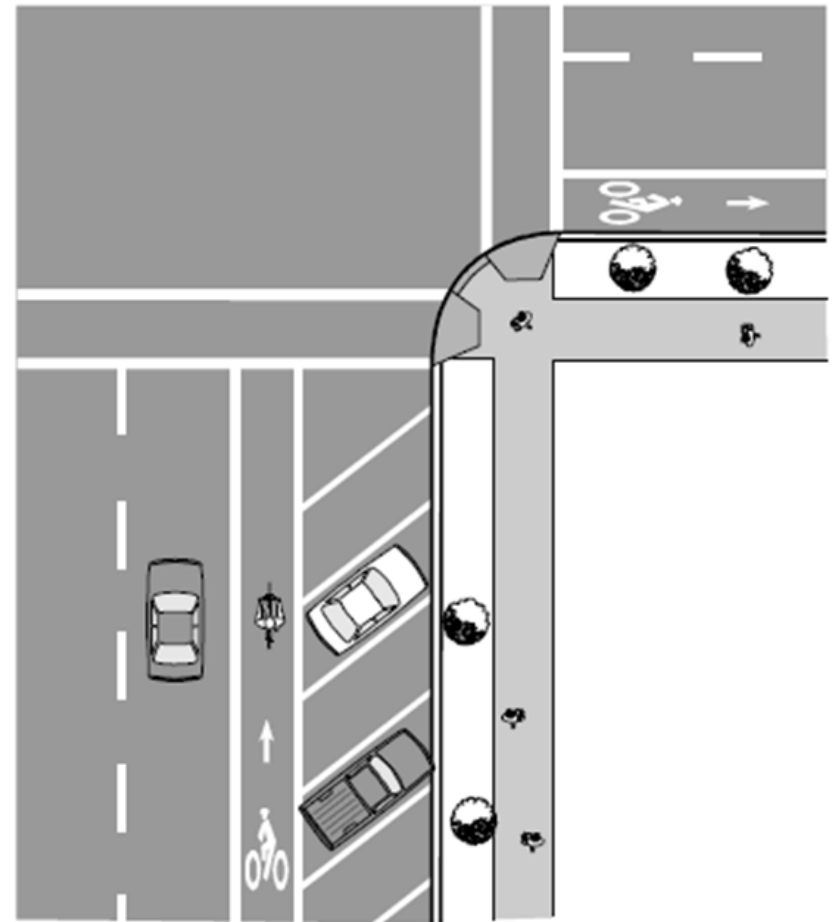
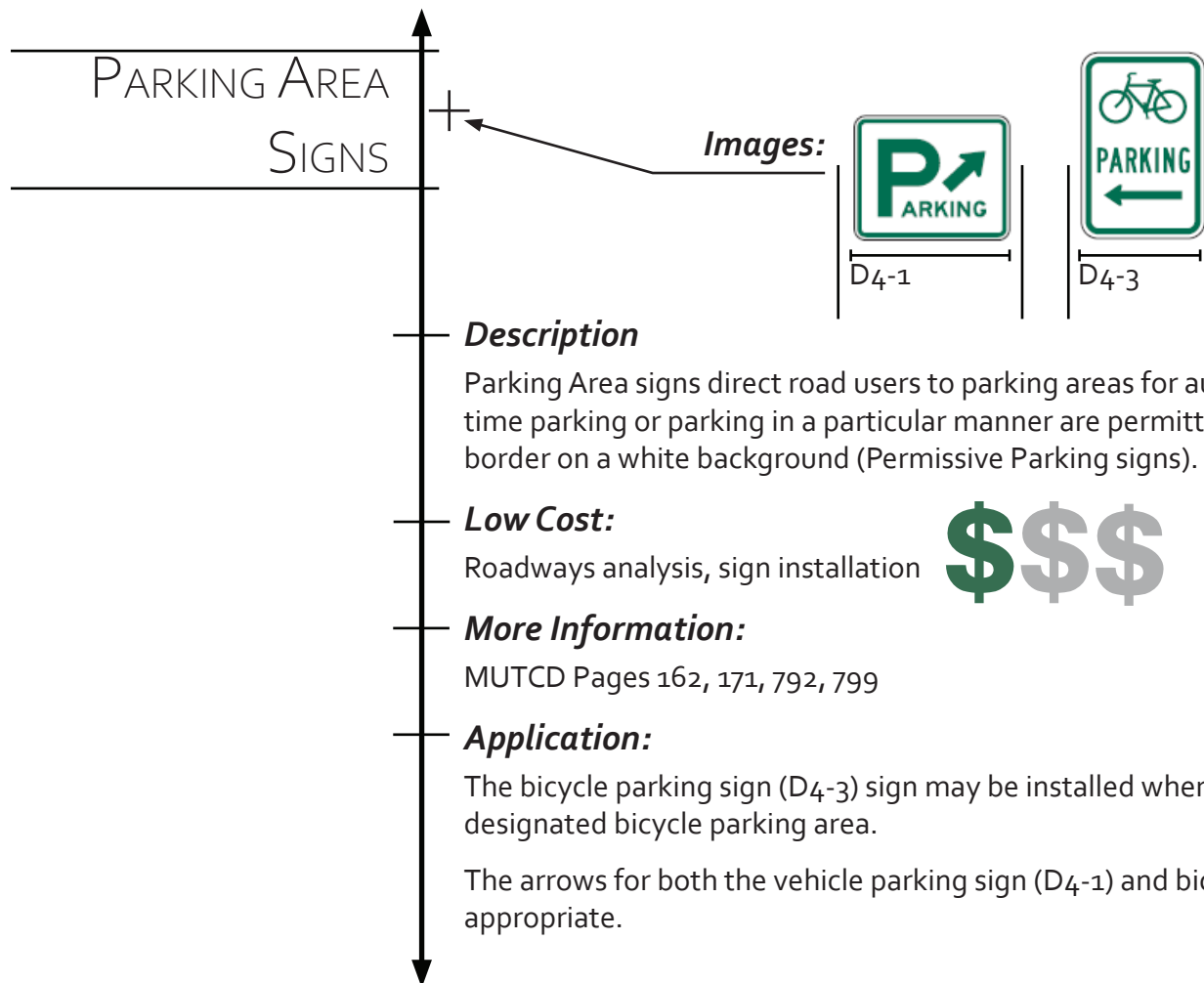


Figure 15: FHWA diagram of diagonal parking (Source: <https://www.fhwa.dot.gov/publications/research/safety/pedbike/o5085/chapt15.cfm>)



NO PARKING AND PARKING RESTRICTION SIGNS

Images:



Description

Signs governing the parking, stopping, and standing of vehicles cover a wide variety of regulations, and the MUTCD offers only general guidance. Where parking is prohibited at all times or at specific times, the basic design for parking signs shall have a red legend and border on a white background (Parking Prohibition signs), except that the R8-3 sign shall have a black legend and border and a red circle and slash on a white background.

Additional emphasis should be provided by the use of object markers, delineators, and/or pavement markings.

Low Cost:

Roadways analysis, sign installation



More Information:

MUTCD Pages 88-92

Application:

Parking restriction signs on roads should display the following information from top to bottom of the sign, in the order listed:

- The restriction or prohibition;
- The times of the day that it is applicable, if not at all hours;
- The days of the week that it is applicable, if not every day.

If the parking restriction applies to a limited area or zone, the limits of the restriction should be shown by arrows or supplemental plaques.

If arrows are used and if the sign is at the end of a parking zone, there should be a single-headed arrow pointing in the direction that the regulation is in effect.

If the sign is at an intermediate point in a zone, there should be a double-headed arrow pointing both ways. When a single sign is used at the transition point between two parking zones, it should display a right and left arrow pointing in the direction that the respective restrictions apply.

Spacing of signs should be based on legibility and sign orientation.

OVERLOOK, PULLOUTS, VIEWING AREAS

Images:



RS-036
Viewing Area



RS-076
Wildlife Viewing



Parking Directional
Assemblies

Description

Pullouts on the sides of roads intended as viewing spots are often undeveloped areas of native terrain. To make the intended uses of these spaces more explicit, they may be marked with Recreational Symbol Sign such as RS-036 and RS-076.

Medium Cost:

Roadways analysis, pavement grading or landscaping, sign installation



More Information:

MUTCD Pages 332-341

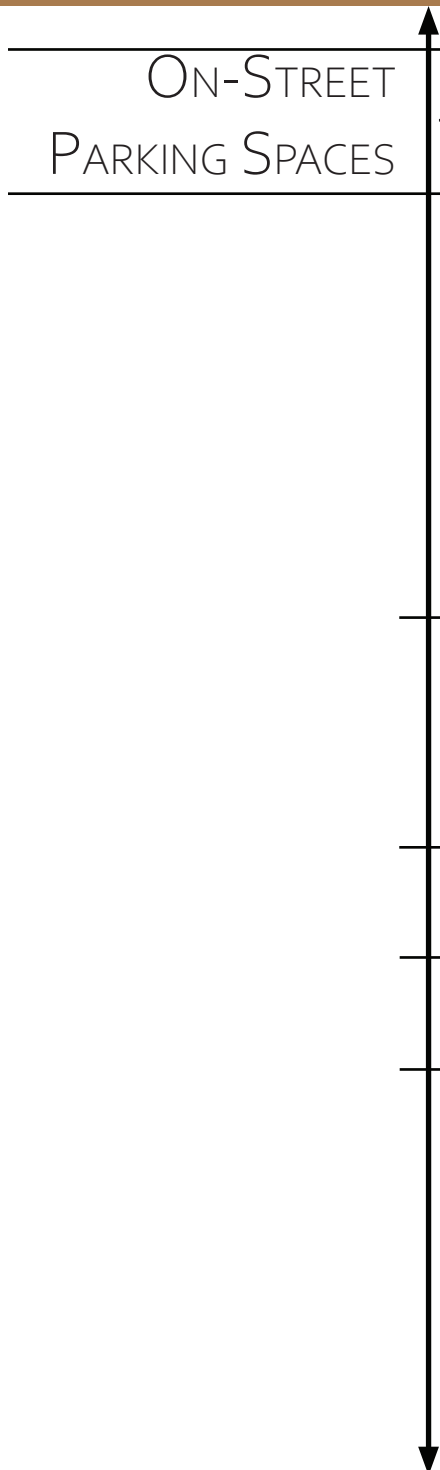
[ABA Standards](#) Pages 81-83

[USFWS Sign Handbook](#) Appendix 6

Application:

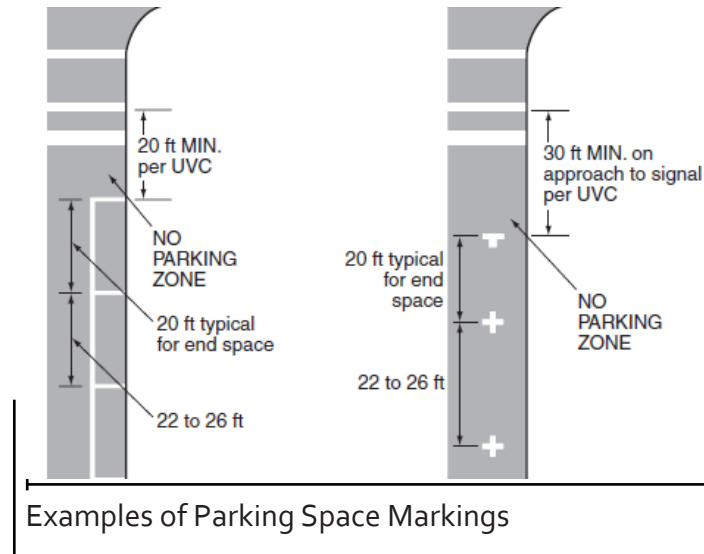
Multiple recreation amenity symbols may be combined with arrows in direction signs or assemblies to provide a complete message to the road or trail users.

At viewing areas not located along trails, at least one outdoor recreation access route (ORAR) must connect accessible parking spaces or other arrival points that serve the viewing area with accessible elements, spaces, and facilities provided within the viewing area.



ON-STREET PARKING SPACES

Images:



Description

Marking of on-street parking space boundaries encourages more orderly and efficient use of parking spaces where parking turnover is substantial. Parking space markings tend to prevent encroachment into fire hydrant zones, bus stops, loading zones, approaches to intersections, curb ramps, and clearance spaces for islands and other zones where parking is restricted.

Low-Medium Cost:

Roadways analysis, pavement marking installation



More Information:

MUTCD Pages 385-387

Application:

Parking space markings shall be white. Blue lines may supplement white parking space markings of each space designated for use only by persons with disabilities.

Parking space can be marked variously per Figure 3B-21 in the MUTCD, with full or partial outlines.

If parking spaces are separated from roadways, they can be considered a “parking area” and thus the MUTCD does not apply. In most such cases, engineering analysis should determine layout.

Depending on the width of the roadway, diagonal parking may be considered to increase parking spaces available at a location.

Note on Parking Areas and Congestion Management

The Service may consider using **Non-Vehicular Warning signs** to alert road users in advance of locations where unexpected entries into the roadway might occur or where shared use of the roadway by pedestrians might occur. If parking areas include trail crossings or access points, principles for such crossings may apply even in parking areas (for which the MUTCD offers limited guidance). If a W11-2 sign has been post-mounted at the crosswalk location where a Yield Here To (Stop Here For) Pedestrians sign is used on the approach, the Yield Here To (Stop Here For) Pedestrians sign shall not be placed on the same post as or block the road user's view of the W11-2 sign.

(See 03. Pedestrian Crossings for more information)

Crosswalks may improve safety in parking areas where visitors must cross the road to get to a particular important spot, such as a trailhead, viewing platform, interpretive sign, etc. or where visibility is obstructed. While the MUTCD does not offer guidance for crosswalks in parking areas, some of its crosswalk marking guidance translates to parking areas. The Service should consider the use of STOP signs or other signs where crosswalks are allowed and may be determined by an engineering roadway analysis. For added visibility, the crosswalk area may be marked with white diagonal lines at a 45-degree angle to the line of the crosswalk or with white longitudinal lines parallel to traffic flow as shown in Figure 3B-16 of the MUTCD.

(See 03. Pedestrian Crossings for more information)

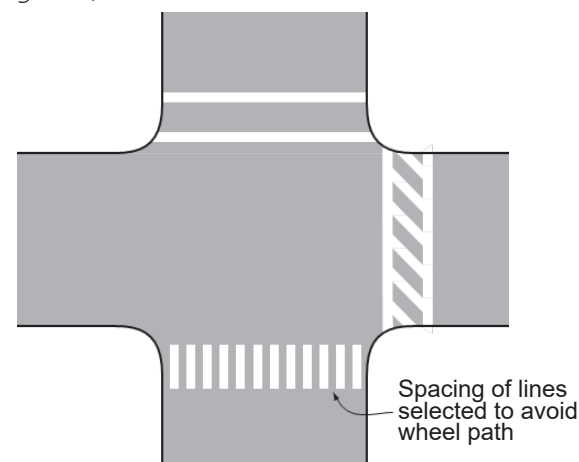
Accessible Parking signs are Permissive Parking signs that designate spaces for use only by persons with disabilities. The International Symbol of Accessibility Parking Space pavement markings do the same without diverting the road user's attention from the roadway surface; symbol messages are preferable to word messages.

(Find more information about accessible parking in 10. Accessibility in Transportation)

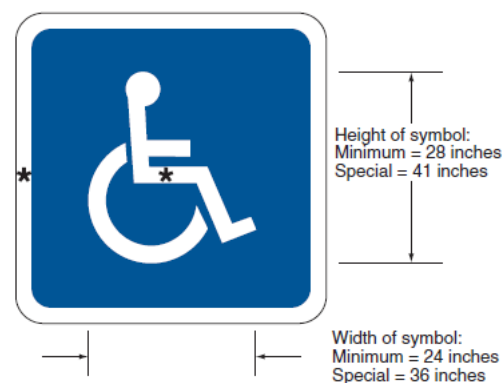
W11-2 Sign



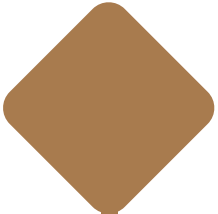
Examples of Crosswalk Markings (MUTCD Figure 3B-19, page 284)




International Accessible Parking Space Marking (MUTCD Figure 3B-22, page 387)




NEXT STEPS




Engage station-level partners, such as station managers and project managers, and regional-level partners, such as the RTC, Visitor Services personnel, Regional Sign Coordinator, etc.




Consult NPS guidance on congestion management, which can be found in the NPS Congestion Management Toolkit.



Utilize expertise from internal landscape architects and/or engineers with traffic engineering experience to determine the needs related to parking management and congestion. This could include a roadway analysis of the roadway geometry, traffic volume, bicycle/pedestrian volumes, trail connections, and other environmental factors. If using non-standard Service signs, seek approval for the sign from the Visitor Services personnel and/or the Regional Sign Coordinator.



Consult state DOT or local municipality for regulations, design, and placement of signs, pavement markings, and other traffic control devices. Cultivate a relationship through regular contact with local and state DOT representatives to learn more about their best practices and regulations; this relationship can also make it easier to request approval or help from these agencies.¹⁶



Defer to signage installation section for mounting height and lateral placement.

07. WARNING AND SAFETY COMMUNICATION

DESCRIPTION:

Safety is a priority for all transportation infrastructure in the Service and is a national goal of the U.S. Department of Transportation and a major goal of the Service's National Long Range Transportation Plan.¹⁷ An important part of providing the community with safe transportation infrastructure is communicating potentially dangerous situations with warnings and installing infrastructure elements that protect travelers from danger with safeguards.

The Service's staff must consider many different situations where the safety of the public and staff can be improved. In some instances, improved safety may be in the form of temporary traffic control (TTC), for example when maintenance or utility work is needed or there are special events. In other instances, permanent transportation elements that improve safety communication may be required for the Service's boundaries, changes in horizontal alignment (curves, winding roads, hairpin turns, etc.), changes in road surface type such as transitioning from pavement to gravel surfaces, and delineators for guardrails, gates, and bridges.

Warnings and safety communication may have additional regulations on a state-by-state basis. The Service should establish relationships with points of contact at local and state DOTs as well as consult local and state guidance on safety signage, pavement markings, and roadway geometry.

FHWA's Gravel Roads Construction and Maintenance Guide may offer additional guidance related to warning and safety communication, particularly for low volume roads.¹⁸

CONSTRAINTS

- What are locations with reported safety concerns or incidents?
- Is there adequate staff available at the station to take on this project?
- Are there any environmental limitations for this project? What other obstacles exist for the completion of this project?
- Is this project wholly in the Service's station, or does it cross jurisdictions/who do you need to coordinate with?
- Would the proposed project favor one user group over another? How can all user groups be served by the improvements?
- Has a RSA been conducted in the areas of safety concerns?
 - If yes, what are the recommended actions?
- Are there any transportation assets that present potentially dangerous situations (e.g., bridges, sharp curves)?
 - If yes, is this road open to the public?
- Has the Service identified funding for these safety-focused improvements?

¹⁷ FWS Plan 2035, National Long Range Transportation Plan. (2016). <https://ecos.fws.gov/ServCat/DownloadFile/118522?Reference=76318>

¹⁸ FHWA Gravel Roads Construction and Maintenance Guide. (2015). <https://www.fhwa.dot.gov/construction/pubs/ots15002.pdf>

- Is there a need for maintenance on a public road?
 - o If yes, will the roadway geometry allow for warning signs and cones to direct traffic?
- Is safety signage and other warnings prioritized?
 - o Is the signage or warnings overcrowded?
 - o Could the number of signs be confusing?
- If a temporary work zone warning is needed:
 - o What will be the time duration of the work?
 - o Where is the work zone located (on the roadway, on the shoulder, or beyond the shoulder)?
 - o What is the speed and traffic volume of the roadway?

DATA NEEDS AND CONSIDERATIONS

- Crash data
- Road geometry and sight lines
- Vehicle traffic volume (AADT)
- Type and timing of road work (specifically for Work Zones)

TEMPORARY TRAFFIC CONTROL AND WORK ZONES

Images:



R8-3



R8-3a



R7-1



R7-6

Description

Work zone warning areas have signs and channelizing devices (usually cones or lights) that alert road users to areas on a roadway with maintenance, construction, utility, etc. These areas can benefit from TTC to help road users navigate unexpected or unusual situations.

Options for temporary traffic controls would be changeable message signs, traffic barriers, barrier terminals, regulatory signs, warning signs, arrow boards, or temporary markings.

Well-designed TTC plans for planned special events will likely be developed from a combination of treatments from several of the typical applications.

Low Cost:

Temporary traffic control plan creation, sign procurement and installation, potentially pavement markings



More Information:

MUTCD Pages 325, 552, 576, 584, 588, 601, 612 552

Application:

Work zone warnings could include a single sign, flashing lights, cones, and/or a series of signs. Signs can be posted on existing posts, temporary vehicles, or temporary mounts.

All workers in ROW who are exposed either to vehicles and construction equipment should wear high-visibility safety apparel.

Recommended planning of the work zone site: most TTC zones are divided into 4 areas: (1) the advance warning area, (2) the transition area, (3) the activity area, and (4) the termination area.

- **Advance warning area:** section that alerts drivers of upcoming work zone with signs and/or lights.
- **Transition area:** section that redirects road users out of their normal path.

TEMPORARY TRAFFIC CONTROL AND WORK ZONES (CONT.)

- **Activity area:** section of road where the work activity takes place.
- **Termination area:** section that returns road users to their normal driving path.

The Service should do a quick assessment for the work zone area:

- Can this location allow for the 4 TTC zones?
- Do you need signs, cones, flashing lights, temporary mounts?
- Do you have safety apparel?
- Can the route be closed and marked by a sign for a detour?

For any planned special event that will have an impact on the traffic on any street or highway, a temporary traffic control plan should be developed in conjunction with and be approved by the agency or agencies that have jurisdiction over the affected roadways.¹⁹

The design and application of TTC devices used in TTC zones should consider the needs of all road users (motorists, bicyclists, and pedestrians), including those with disabilities. Where pedestrian or bicycle routes are closed, alternate routes shall be provided.

Methods of mounting signs other than on posts are described on page 582 of the MUTCD. Flags and/or flashers are allowed where applicable.

Additional Information on Work Zones:

<https://ops.fhwa.dot.gov/wz/>

¹⁹ Foldable versions of Temporary Traffic Control and Work Zone signs are available through General Services Administration (GSA) for quick storage in vehicles: www.gsa.gov

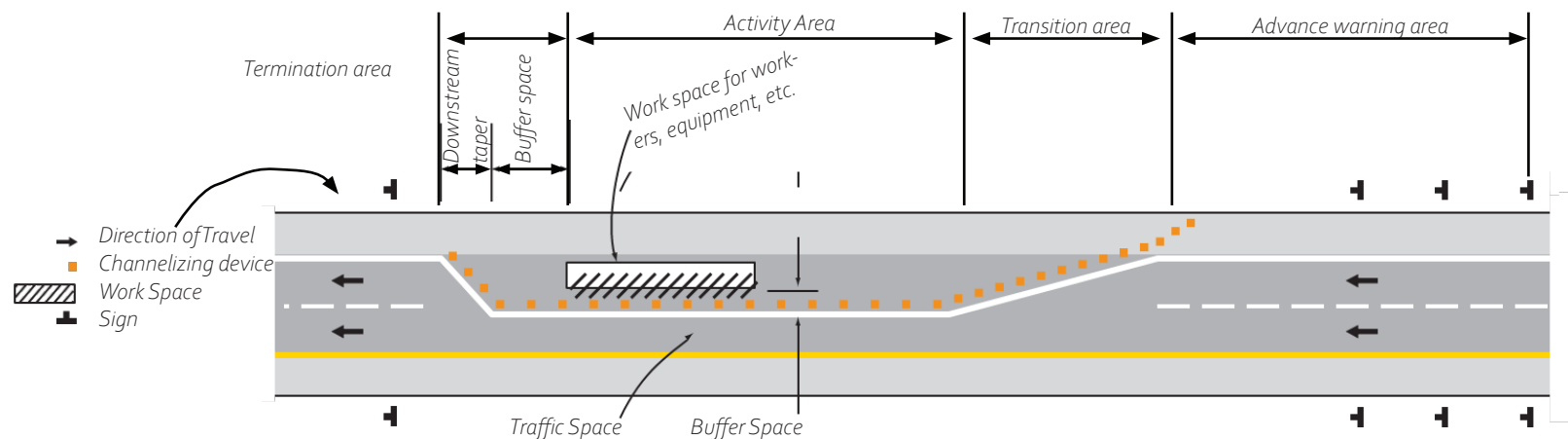


Figure 17: Component Parts of Temporary Traffic Control Zone (source: MUTCD page 553)

ANIMAL CROSSING SIGNAGE

Images:



W11-3
(Deer)



W11-16
(Bear)

Description

Non-Vehicular Warning Signs may be used to alert road users in advance of locations where unexpected entries into the roadway might occur or where shared use of the roadway by animals or other roadway activities.

Conflicts with animals may be relatively confined, or may occur randomly over a segment of roadway.

Low Cost:

Sign procurement and/or fabrication and temporary sign installation



More Information:

MUTCD Page 130

Application:

The MUTCD provided little application instruction for animal-related crossing signage.

At times fencing or other barriers parallel to or along the roadway can help direct wildlife to cross in a specific area along the roadway that is highly visible. Warning signage would be provided ahead of this location in both directions.

The Service may consult with station-level biologists to understand if a roadway separates specific animal habitats and if warning signage can improve both roadway user safety and wildlife safety.

The Service may use the Wildlife-Vehicle Collision (WVC) database to understand areas of high wildlife collisions. This may help to inform best sign locations. ²⁰

²⁰ The WVC database and tool are still under development by the Service and several partners. To learn more about the status of this tool, contact the FWS Transportation Branch.



REFUGE BOUNDARY SIGNS

Images:



Examples from page 5-8,9
of [USFWS Sign Handbook](#)

Description

These signs are located along the boundary lines of the Service's sites. The signs are 11" x 14" and aluminum with a white background and black or blue text. Usually there is the Service's branding.

Boundary signs are located on the Service's site boundary used at: Research areas, National Fish Hatcheries, National Wildlife Refuges, Waterfowl Production Areas, conservation easements, and other service lands.

Low Cost:

Sign fabrication and installation



More Information:

MUTCD Page 27

[USFWS Sign Handbook](#) Page 5-5

Application:

Install all boundary signs on boundary lines so they are visible from one to another or at intervals no greater than 1/8-mile.

Mount sign so lower edge is 5 feet above ground level.

Mount using vandal-resistant or vandal-proof hardware.

When placed along public roads (county or state), place on the right of way or easement line. If the signs would not be visible, obtain permission from the road agency to place them closer.

Station managers must approve of any boundary sign requests made for their station.

HORIZONTAL ALIGNMENT SIGNS

Images:



W1-5



W1-1



W1-1a



W1-8

Description

Horizontal alignment signs include curves, winding roads, chevrons, hairpin turns, etc. These alignment warning signs alert road users of a change in direction of the roadway and the need for road users to lower their speed. In some cases, these signs have warning lights to alert road users at night. Without these signs, a road user may not notice the turn or curve in the roadway's alignment, and may continue straight instead of turning with the curve or may not reduce speed and may involuntarily leave the roadway.

Low-Medium Cost:

Roadway analysis; Sign fabrication and installation



More Information:

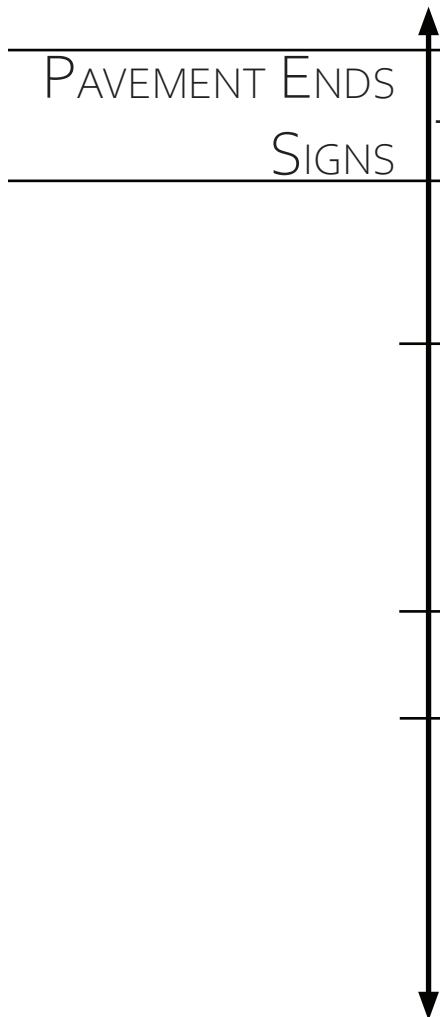
MUTCD Page 110

Application:

Horizontal alignment signs should be used in advance of a curve on roadways with more than 1,000 AADT (functionally classified as arterials or collectors). These signs are used when the advisory speed has been lowered more than the road's posted speed limit. For roads with AADT lower than 1,000, engineering judgement can be used.

Advisory Speed: speed is determined by an engineering assessment that follows established engineering practices.

Horizontal alignments often require several signs in combination to communicate curves in advance and then create more visibility for the road users as they advance through the curve.



PAVEMENT ENDS SIGNS

Images:



W8-3

Description

PAVEMENT ENDS sign (W8-3) are implemented to alert visitors of areas where paved surfaces change to either a gravel treated surface or an earthen road surface.

Low Cost:

Sign fabrication and installation







More Information:

MUTCD Page 122

Application:

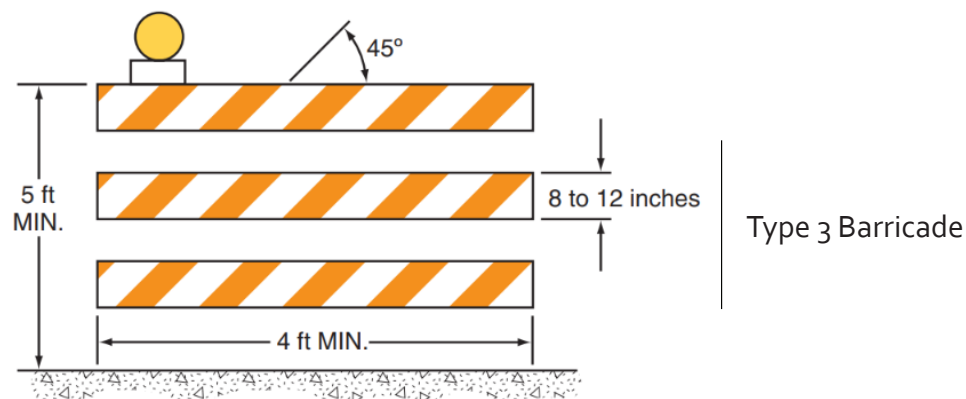
A PAVEMENT ENDS sign should be used where a paved surface changes to either a gravel treated surface or an earth road surface.

An Advisory Speed plaque (MUTCD Page 112) may be used when the change in roadway condition requires a reduced speed. The Service should assess station roads where a change in paved surfaces may be abrupt, or partially visible to visitors.

SIGNS FOR BRIDGES	<div> <div>  </div> <div>  </div> <div>  </div> <div>  </div> </div> <div> <div>Images:</div> <div>OM3-L OM3-R</div> <div>R12-1</div> <div>W12-2</div> <div>R11-2C</div> </div>
	<div> <div>Description</div> <div> <p>A bridge is a structure that carries a road, path, railroad, or canal across a river, road, railroad, or other obstacle. A bridge can introduce risk to roadway users because it can present a change in the type of infrastructure, and sometimes there are limitations that the roadway user must adhere to that differ from a typical roadway. Relevant bridge-related signs include object markers (OM-3L, OM-3R), load limitations (R12-1), and BRIDGE OUT (R11-3b).</p> </div> <div> <div>Low Cost:</div> <div> <p>Roadway and Bridge analysis; sign fabrication and installation</p> <div> <div>\$</div> <div>\$</div> <div>\$</div> </div> </div> <div> <div>More Information:</div> <div> <p>MUTCD Page 135, 97-99, 120, 583</p> </div> </div> <div> <div>Application:</div> <div> <p>Object Markers: Object Markers must be installed on both approaches to the bridge and on either side of the roadway. Therefore on any bridge, there must be four object markers. The alternating black and retroreflective yellow stripes are positioned to slope down at an angle of 45 degrees toward the center of the roadway to show where vehicles can travel over the bridge.</p> <p>Load Limitations: In some cases, there may be permanent or temporary limitations to the weight or "load" allowed on a bridge. Load Limitation signs must be posted on both approaches to the bridge. The sign, WEIGHT LIMIT XX TONS, may be used to indicate vehicle weight restrictions including load. A variation of this sign is WEIGHT LIMIT with images of trucks and their corresponding tons (R12-5).</p> <p>Clearance: The Low Clearance (W12-2) sign are used to warn roadway users of bridges or underpasses with clearances less than 12 inches above the statutory maximum vehicle height. The actual clearance should be displayed on the Low Clearance sign to the nearest 1 inch without going over the actual clearance height. In areas that experience changes in temperature causing frost action, a reduction, not exceeding 3 inches, should be used for this condition.</p> <p>Bridge Out: In some instances, a bridge may be closed, which requires a warning to roadway users. The BRIDGE OUT sign should be used when a bridge can no longer be used. These are paired with barricades to prevent roadway users from entering an unsafe bridge. The BRIDGE OUT sign should be a 48" x 30" horizontal rectangular white sign with a black border and the words "BRIDGE OUT" in black on two lines. Variations of this sign are ROAD CLOSED (R11-2) or BRIDGE CLOSED (R11-4).</p> </div> </div> </div> </div>

BARRICADE FOR CLOSED BRIDGES

Image:



Description

Barricades are used when bridges are closed in combination with a BRIDGE OUT (R11-3b) sign. A barricade is a portable or fixed device that has rails with markings. It is used to control road users by closing, restricting, or delineating all or a portion of the roadway. Warning lights may be added to these channelizing devices.

Low Cost:

Temporary barricade installation



More Information:

MUTCD Page 604-606

Application:

FWS bridges use Type 3 Barricades for full or partial closures of roads and bridges.

Type 3 Barricades used at a road closure may be placed completely across a roadway or from curb to curb.

When used, stripes on barricade rails are alternating orange and white reflective 6" wide stripes sloping downward at an angle of 45 degrees. The stripes should be positioned to slope downward toward the center of the barricade or barricades.

The minimum length for Type 3 Barricades is 48 inches. Each barricade rail is 8 to 12 inches wide.

Barricade rails should be supported in a manner that will allow them to be seen by the road user, and in a manner that provides a stable support that is not easily blown over or displaced.

In situations where barricades may be susceptible to overturning in the wind, ballasting should be used. Sandbags may be placed on the lower parts of the frame or the stays of barricades to provide the required ballast.

DELINEATORS FOR GUARDRAILS

Image:



Example

Description

Delineators are guidance devices that are useful where the alignment is confusing or unexpected, such as at curves and lane-reduction transitions. Delineators are effective guidance devices at night and during adverse weather; they are visible when the roadway is wet or snow covered.

In addition, a series of delineators can be mounted on a guardrail to show the continuance of change in horizontal alignment. A guardrail is a safety barrier intended to shield a road user who has left the roadway. This roadway element is not defined by the MUTCD.

Low- Medium Cost:

Roadway analysis; delineator installation



More Information:

MUTCD Page 424

Application:

Fabricated of retroreflective materials that reflect light from 1,000 feet (under normal weather conditions) when illuminated by the high beams of standard automobile lights.

Minimum dimension of 3 inches.

Delineators are mounted directly above or immediately behind or on the innermost edge of the guardrail. Placement at a constant distance from the roadway edge.

Delineators are particularly useful in states that receive high snow fall or often have low visibility.

It should be noted that it is standard practice in the Service to only install guardrails where absolutely necessary, generally in cases where a recovery back to the road is not possible. (i.e. steep cliffs).

Often, the Service's Regions are informed when there are issues with delineators or guardrails, particularly when installed along bridges. FLH is a partner who may identify and notify the Service of these issues.

Additional Resources on Guardrails: https://safety.fhwa.dot.gov/roadway_dept/countermeasures/reduce_crash_severity/guardrail_ispe.cfm

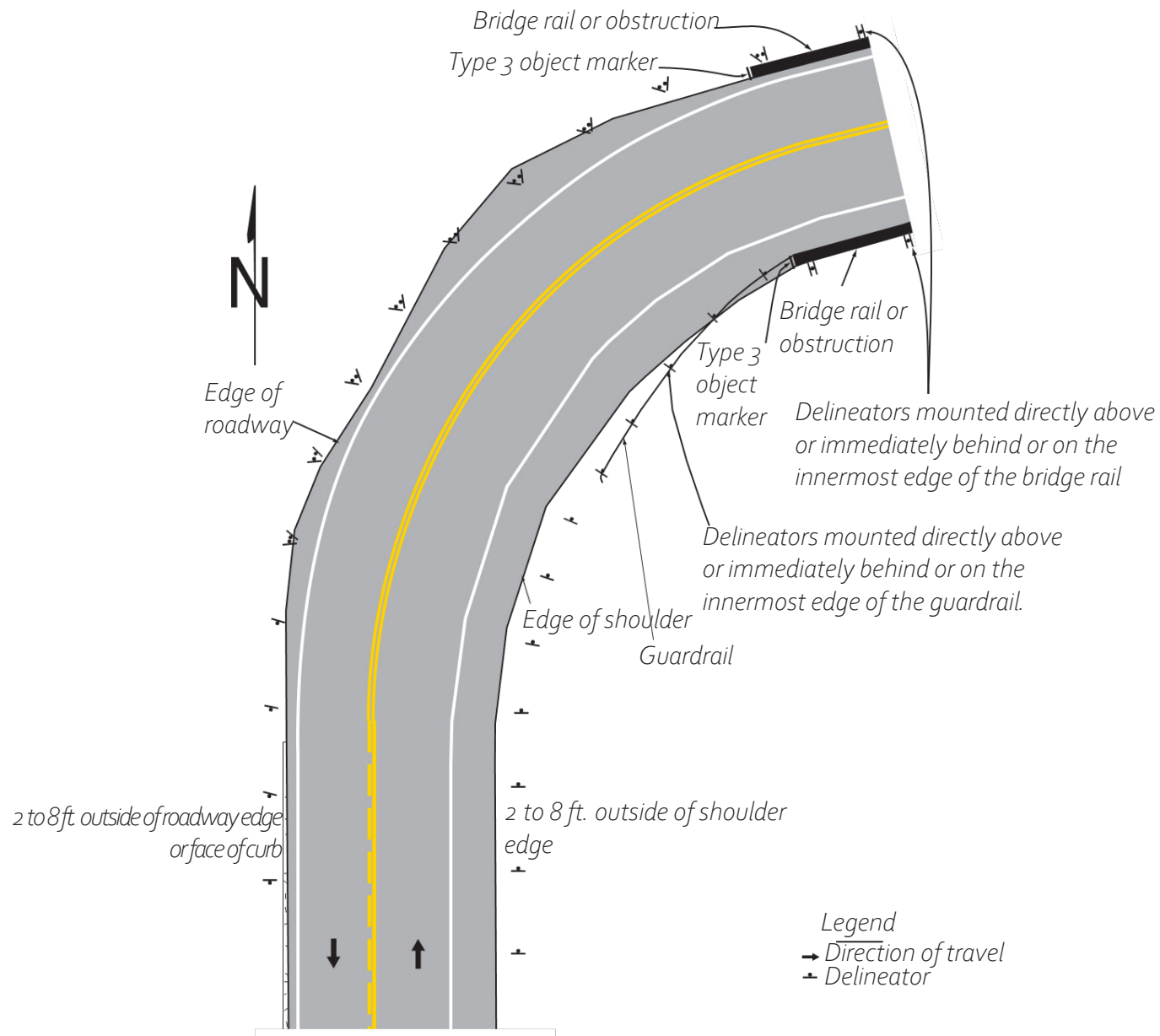
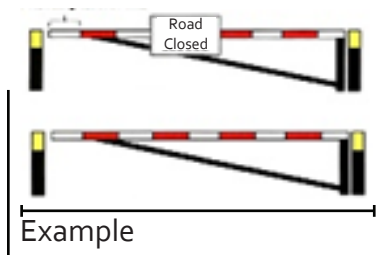


Figure 18: Examples of Delineator Placement (source: MUTCD page 425)

GATES

Image:



Description

A gate is used to obstruct traffic; road users must stop when the gate arm is placed in a horizontal position perpendicular to traffic. There are different types of gates:

- Gate has an arm that is moved from a vertical to a horizontal position.
- Gate is rotated in a horizontal plane from parallel to traffic to perpendicular to traffic.
- Gate consists of a segment of fence (on rollers) that swings open and closed.
- Gate has a segment of fence (on rollers) that is retracted to open and then extended to close.

The gate must include retro-reflectivity and at times can include red lights.

Medium-High Cost:

Gate fabrication and installation



More Information:

MUTCD Page 101

Application:

Gate arms (if used) shall be fully retro-reflectorized on both sides and have vertical stripes alternately red and white at 16-inch intervals measured horizontally.

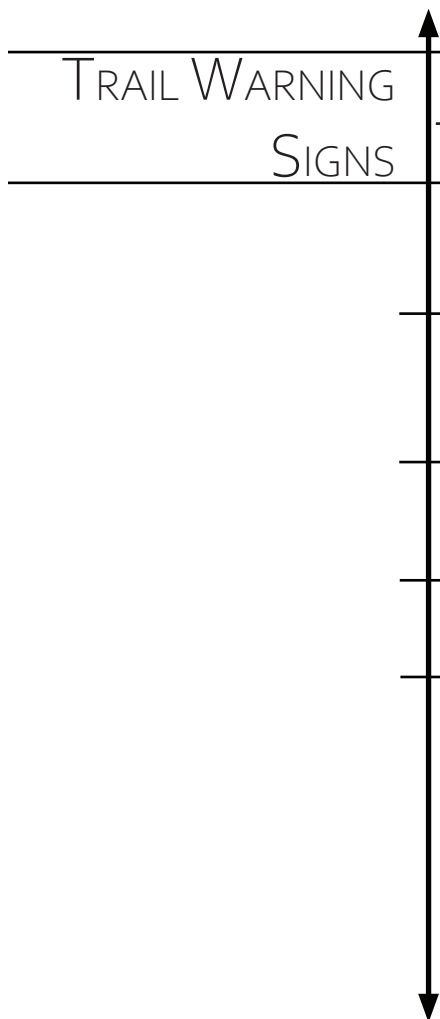
If red lights are attached to a traffic gate, the red lights should be steadily illuminated or flashed only during the period when the gate is closed and when the gate is in the process of being opened or closed.

The gate arm shall extend across the approaching lane or lanes of traffic to effectively block vehicle and/or pedestrian travel (as appropriate).

When gate arms are in the vertical position or rotated to an open position, the closest part of the gate arm and support shall have a lateral offset of at least 2 feet from the edge of the traveled way.

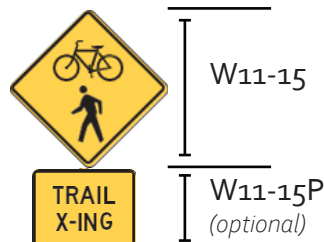
When a gate that is rotated parallel to traffic (gate is open), the outer end of the gate arm should be rotated to the downstream direction (from the perspective of traffic in the lane adjacent to the gate support).

Gates in particular have been noted as being challenge in terms of following protocol and abiding by guidelines. The Service should come to consensus on signage on and at gates.



TRAIL WARNING SIGNS

Images:



Description

Warning signs and object markets for bicycle facilities follow the same yellow color code as those for motorists and include signs indicating trail crossings and railroads ahead.

Low Cost:

Roadways analysis, sign fabrication and installation, potential markings



More Information:

MUTCD Page 797

Application:

If the sign applies to both motorists and bicyclists, all dimensions for placement and sign size should be followed for motorists in section 2 of the MUTCD. If the sign is for a shared use path, refer to figure 9B-1 and table 9B-1 in the MUTCD for sign placement and dimensions, respectively.

In conjunction with signage, markings for bicycle lanes and shared use paths could be considered. On roadways, a through bicycle lane shall not be positioned to the right of a right turn only lane or to the left of a left turn only lane.

Note on Warnings and Safety Communication Signs

The Service may consider additional signage to warn or inform roadway users of changing conditions. “Pavement Ends” (W8-3 on MUTCD Page 537) signs, or “Speed Reduction” (W3-5 and W3-5a on MUTCD Page 124) are examples of changing conditions that can help alert roadway users of conditions that could surprise them or introduce risk to their safety.

W8-3



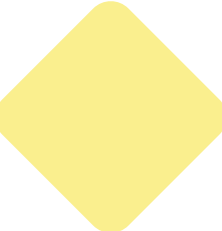
W3-5




W3-5a




NEXT STEPS



Engage station-level partners, such as maintenance, biologists, project managers, etc., and regional-level partners, such as the RTC, Visitor Services personnel, Regional Sign Coordinator, etc.



Utilize expertise from internal engineers with traffic engineering experience to determine the needs related to warnings and temporary traffic control. This could include a roadway analysis of the roadway geometry, traffic volume, and other environmental factors.



Consult state DOT or local municipality for regulations, design, and placement of signs, pavement markings, and other traffic control devices. Temporary detours or road closures should be communicated to agencies impacted by this work. Cultivate a relationship through regular contact with local and state DOT representatives to learn more about their best practices and regulations; this relationship can also make it easier to request approval or help from these agencies.



Defer to signage installation section for mounting height and lateral placement.

o8. RAILROAD CROSSINGS

DESCRIPTION

Traffic control for roadway-rail and trail-rail grade crossings includes all signs, signals, markings, illumination, and other warning devices and their supports along roadways/trails either approaching or at highway-rail and trail-rail grade crossings. The purpose of this traffic control is to promote a safer and more efficient operation of both rail and highway or trail traffic at at-grade rail crossings.

Planning for rail crossings can be particularly difficult as each project requires coordinating with the relevant rail operator, most of which have their own unique protocols. This work is complex, and finding the right people with whom to coordinate can be difficult; there may be no incentives for rail operators to collaborate with the Service's project managers. That complexity aside, there are standards for road infrastructure approaching railroad crossings that should be applied.

The appropriate traffic control system to be used at a rail crossing should be determined by an engineering study involving both the highway agency and the railroad company. The engineering study may include the Highway-Rail Intersection (HRI) components of the National Intelligent Transportation Systems (ITS) architecture,²¹ which is a U.S. DOT accepted method for linking highway, vehicles, and traffic management systems with rail operations and wayside equipment. Because at-grade rail crossings are a potential source of crashes and congestion, engineering studies evaluating whether the crossings should be eliminated can be as valuable as studies to determine how such crossings should be improved. Any grade crossing that cannot be justified should be eliminated and either redesigned

to discourage illicit crossings or to allow safer crossing via an overpass or underpass.

CONSTRAINTS

- Who operates the railroad? Are they open to coordinating projects?
- Does this rail line go along a body of water? Are crossings over a bridge or via an underpass?
- Are there any environmental limitations for this project? What other obstacles exist for the completion of this project?
- Is this grade crossing a safety concern? Have there been crashes that have occurred here?
- How frequently do trains pass? How long do trains prevent other vehicles from crossing here? Can visitors be stranded for long periods of time?
- How much funding is available for this project?
- Is there adequate staff available at the station to take on this project?
- Is this project wholly in the Service's station, or does it cross jurisdictions/who do you need to coordinate with?
- Would the proposed project favor one user group over another? How can all user groups be served by the improvements?

DATA NEEDS AND CONSIDERATIONS

- Number and angle of approaches

²¹ U.S. DOT National ITS Reference Architecture. https://www.its.dot.gov/research_archives/arch/architecture_plan.htm

- Approach speeds
- Sight distance available on each approach
- Assignment of right-of-way

DIAGRAMS

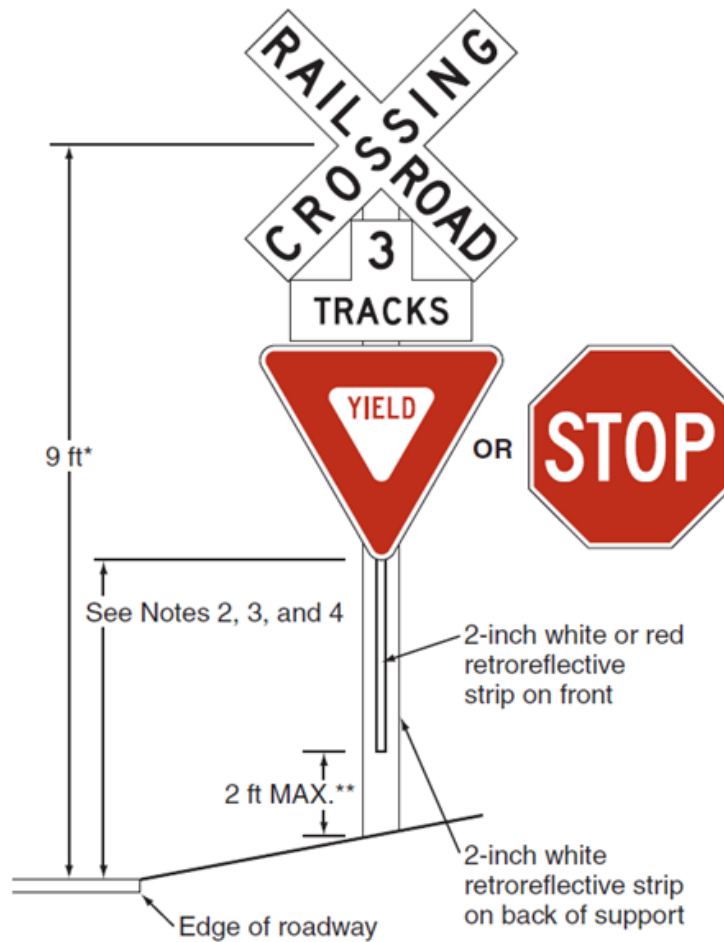


Figure 19: Crossbuck Assembly with YIELD or STOP Sign on the Crossbuck Assembly (source: MUTCD page 754)

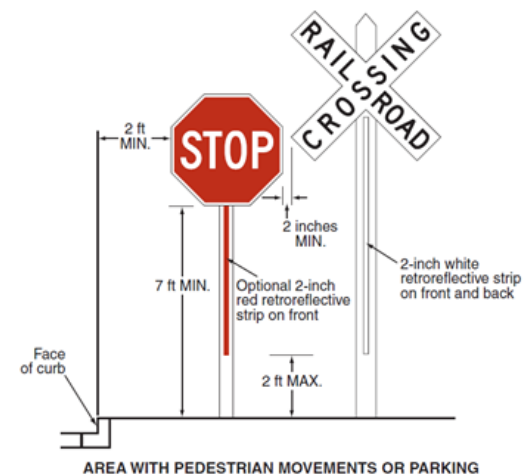
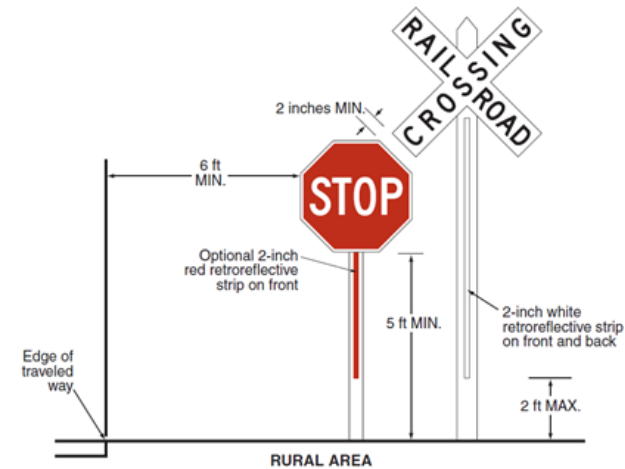


Figure 20:: Crossbuck Assembly with YIELD or STOP Sign on a Separate Sign Support (source: MUTCD page 756)

WARNING SIGNS FOR GRADE CROSSINGS (CROSSING SHAPE)

Images:



W10-1



W10-2



W10-3



W10-4



W10-11

Description

Regulatory signs call attention to an intersection that might not be readily apparent to road users.

*Note that the W10-11 sign is a rotated W10-3; other signs can be oriented or revised as needed to better portray the geometrics of the roadways and the tracks.

Low Cost:

Roadways analysis, sign installation



More Information:

MUTCD Pages 758-759

Application:

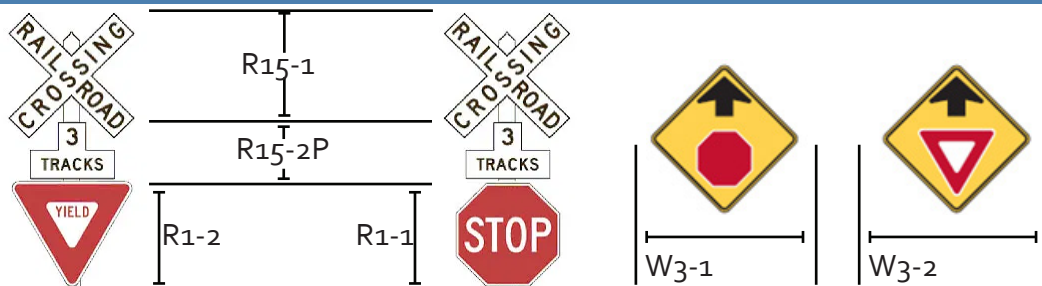
A Highway-Rail Grade Crossing Advance Warning (W10-1) sign shall be used on each highway in advance of every highway-rail grade crossing, and every highway-LRT grade crossing in semi-exclusive alignments, except in the following circumstances:

- On an approach to a grade crossing from a T-intersection with a parallel highway if the distance from the edge of the track to the edge of the parallel roadway is less than 100 feet and W10-3 signs are used on both approaches of the parallel highway. In similar cases, W10-2, W10-3, or W10-4 signs on each approach of the parallel highway may be appropriate to warn users.
- On low-volume, low-speed highways crossing minor spurs or other tracks that are infrequently used and road users are directed by an authorized person on the ground to not enter the crossing at all times that approaching rail traffic is about to occupy the crossing;
- Where physical conditions do not permit even a partially effective display of the sign.

If the distance between the tracks and the parallel highway, from the edge of the tracks to the edge of the parallel roadway, is 100 feet or more, a W10-1 sign should be installed in advance of the grade crossing, and the W10-2, W10-3, or W10-4 signs should not be used on the parallel highway.

CROSSBUCK SIGN COMBINATION

Images:



Description

In most States, the Grade Crossing (Crossbuck) (R15-1) sign requires road users to yield the right-of-way to rail traffic at a highway-rail or low-volume road-rail grade crossing. If there are two or more tracks, the supplemental Number of Tracks (R15-2P) plaque shall display the number of tracks and shall be installed below the Crossbuck sign.

At all grade crossings where YIELD or STOP signs are installed, Yield Ahead (W3-2) or Stop Ahead (W3-1) signs shall also be installed if the YIELD or STOP sign is not visible for a sufficient distance to permit the road user to respond to the device (see MUTCD Table 2C-4 for details).

Low Cost:

Visitation analysis, sign fabrication and installation



More Information:

MUTCD Pages 542-543, 751-759

Application:

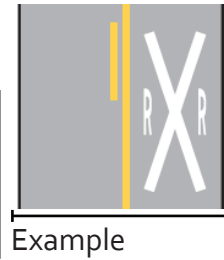
At all public highway-rail grade crossings that are not equipped with the active traffic control systems described in Chapter 8C, except crossings where road users are directed by an authorized person on the ground to not enter the crossing at all times that an approaching train is about to occupy the crossing, a Crossbuck Assembly shall be installed on the right-hand side of the highway on each approach to the highway-rail grade crossing.

A grade crossing Crossbuck Assembly shall consist of a Crossbuck (R15-1) sign, and a Number of Tracks (R15-2P) plaque if two or more tracks are present and either a YIELD (R1-2) or STOP (R1-1) sign installed on the same support or installed on a separate support at a point where the vehicle is to stop; the YIELD or STOP sign is considered to be a part of the Crossbuck Assembly. If used at a passive grade crossing (one without active flagging or automatic gates), a YIELD or STOP sign should be installed.

Where restricted sight distance or unfavorable highway geometry exists on an approach to a grade crossing that has a crossbuck assembly (R15-1), or where there is a one-way multi-lane approach, an additional crossbuck assembly shall be installed on the left-hand of the road.

GRADE CROSSING PAVEMENT MARKINGS

Image:



Description

The Grade Crossing pavement marking provides advance notice for road users. The risk of rail crossings merit combined road signs and markings.

Low-Medium Cost:

Installation



More Information:

MUTCD Pages 765-766

Application:

When used, a portion of the pavement marking symbol should be directly opposite the Advance Warning Sign (W10-1).

If needed, supplemental pavement marking symbols may be placed between the Advance Warning Sign and the grade crossing, but should be at least 50 feet from the stop or yield line.

For narrow roads, this marking has an alternate form with narrower "X" and the letters "RR" below.

Pavement markings are only effective on paved roadways.

HAZARD WARNING SIGNS FOR GRADE CROSSINGS

Images:



W10-11a



W10-11b

W10-5



W10-5P



W10-9P



W10-13P



Description

These Grade Crossing Advance Warning signs provide contextual warnings for road users intending to cross rail roads.

Low Cost:

Roadways analysis, sign installation, pavement markings

More Information:

MUTCD Pages 752, 759-764



Application:

Railroad crossings are complicated and can be hazardous in multiple complex ways. Engineering assessments of such crossings shall determine which hazards ought to be of most concern to road users and apply these as necessary. This may also require coordination with Rail Operators.

- The Storage Space signs (W10-11 and W10-11a) should be mounted in advance of the grade crossing at an appropriate location to warn drivers of the space available for highway vehicle storage between the highway intersection and the grade crossing.
- Where trains are permitted to travel at speeds exceeding 80 mph, a TRAINS MAY EXCEED 80 MPH sign (W10-8) should be installed facing road users approaching the highway-rail grade crossing.
- The NO GATES OR LIGHTS sign (W10-13P) plaque may be mounted below the Grade Crossing Advance Warning sign (W10 series) at grade crossings that are not equipped with automated signals.
- If the highway profile conditions are sufficiently abrupt to create a hang-up situation for long wheelbase vehicles or for trailers with low ground clearance, the Low Ground Clearance Grade Crossing sign (W10-5) should be installed in advance of the grade crossing.
- The NEXT CROSSING, USE NEXT CROSSING, and ROUGH CROSSING signs (with appropriate arrows), or a supplemental distance plaque should be placed below the W10-5 sign at the nearest intersecting highway where a vehicle can detour or at a point on the highway wide enough to permit a U-turn.

GATES AND FLASHING-LIGHT SIGNALS

Description

Active traffic control systems inform road users of the approach or presence of rail traffic at grade crossings.

These systems include four-quadrant gate systems, automatic gates, flashing-light signals, traffic control signals, actuated blank-out and variable message signs, and other active traffic control devices. These systems are complicated and will require in-depth engineering studies for placement, as well as coordination with rail operators for signaling.

Medium- High Cost:

Engineering study, signal installation, pavement markings, road redesign, and construction



More Information:

MUTCD Pages 769-772

Application:

Post-mounted and overhead flashing-light signals may be used separately or in combination with each other.

Also, flashing-light signals may be used without automatic gate assemblies.

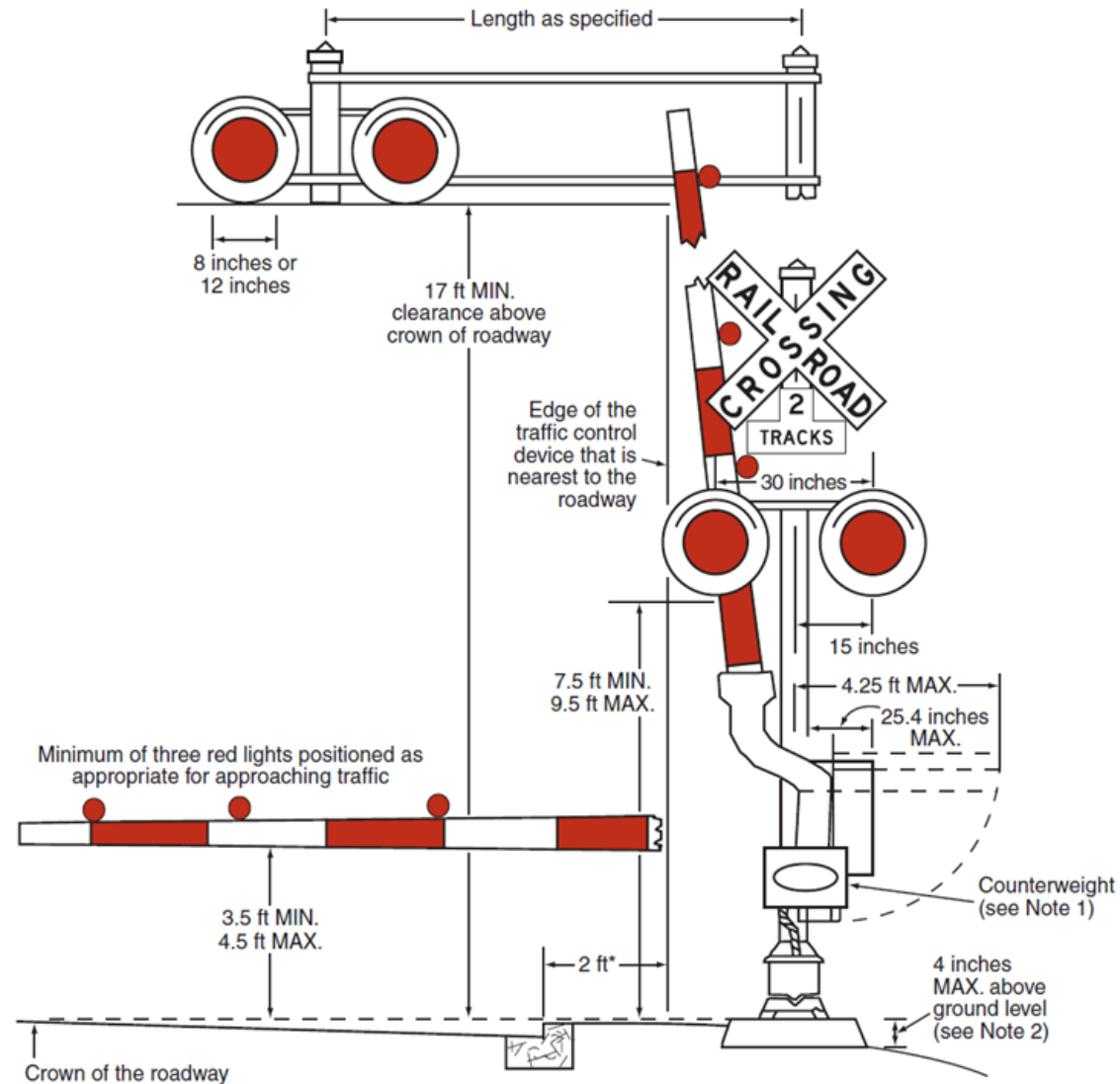
Equipment housings (controller cabinets) should have a lateral offset of at least 30 feet from the edge of the highway, and where railroad or LRT property and conditions allow, at least 25 feet from the nearest rail.

Traffic control signals or flashing-light signals may be used where the crossing is at a location other than an intersection, where LRT speeds do not exceed 25 mph, and when the roadway is a low-volume street where prevailing speeds do not exceed 25 mph.

If a pedestrian route is provided, sufficient clearance from supports, posts, and gate mechanisms should be maintained for pedestrian travel.

A lateral escape route to the right of the highway in advance of the grade crossing traffic control devices should be kept free of guardrail or other ground obstructions. Where guardrail is not deemed necessary or appropriate, barriers should not be used for protecting signal supports.

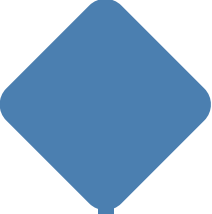
Figure 8C-1. Composite Drawing of Active Traffic Control Devices for Grade Crossings Showing Clearances




*For locating this reference line on an approach that does not have a curb, see Section 8C.01.

Figure 21: Composite Drawing of Active Traffic Control Devices for grade crossings showing clearances
(Source: MUTCD page 770)


NEXT STEPS



Explore information on ground clearance requirements at grade crossings is available in the “American Railway Engineering and Maintenance-of-Way Association’s Engineering Manual,” or the American Association of State Highway and Transportation Officials’ “Policy on Geometric Design of Highways and Streets”.

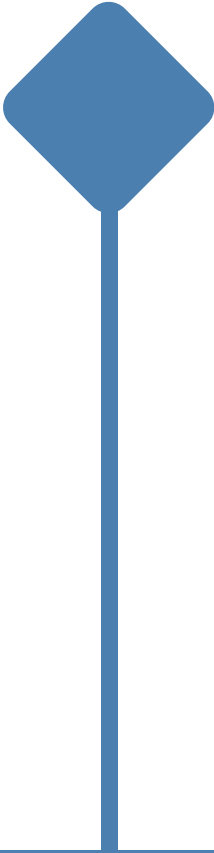


Consult state DOT or local municipality for regulations, design, and placement of signs, pavement markings, and other traffic control devices. Cultivate a relationship through regular contact with local and state DOT representatives to learn more about their regulations related to railroad crossings; this relationship can also make it easier to request approval or help from these agencies.

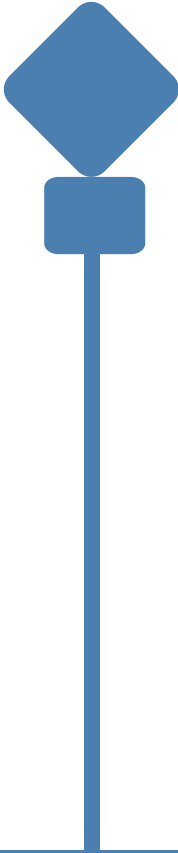


Defer to signage installation section for mounting height and lateral placement.

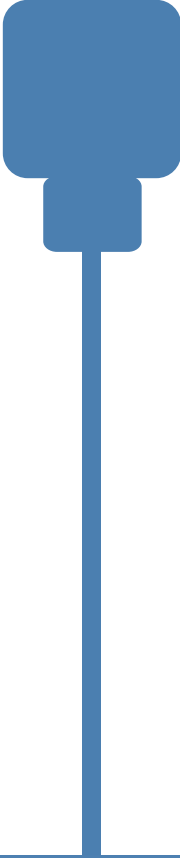
NEXT STEPS (CONT.)



Utilize expertise from internal engineers with traffic engineering experience to determine the appropriate traffic control system to be used at a highway-rail grade crossing. This should include input the railroad company. Needs will likely vary with railroads and light rapid transit, road volume, and road location.



Establish a point of contact at the railroad company; FHWA or State DOT Railroad Offices can be helpful in finding contacts. The Service should anticipate collaboration with Railroad officials in regards to regulations and standards for signals and signs.



Engage station-level partners, such as the station manager, project managers, etc., and regional-level partners, such as the RTC, Visitor Services personnel, Regional Sign Coordinator, etc.

09. ACCELERATION AND DECELERATION INFRASTRUCTURE

DESCRIPTION

Acceleration and deceleration infrastructure provides roadway users dedicated facilities to merge into traffic or to make a turn while also preventing bottlenecks caused by drivers attempting to enter or exit lanes that are part of an intersection. This type of infrastructure generally refers to auxiliary lanes, turn lanes, or the extra lanes constructed between on and off ramps or large intersections. The function of auxiliary lanes is to give drivers more room to speed up and down before or after an intersection, before two roads merge into one, or when otherwise exiting or entering a roadway. Projects pertaining to acceleration and deceleration infrastructure may include pavement markings, turn lanes, and signage related to merging.

In the Service's scope of work, these projects will likely be infrequent, however there may be instances where the Service will serve as a partner for projects initiated by a state or county, particularly through the Federal Lands Access Program.

CONSTRAINTS

- Is this intersection a safety concern? Have there been crashes that have occurred here?
- Is implementing an intersection control at a particular location a high priority issue at the station?
- How much funding is available for this project?
- Is there adequate staff available at the station to take on this project?

- Are there any environmental limitations for this project? What other obstacles exist for the completion of this project?
- Is this project wholly in the Service's station, or does it cross jurisdictions/who do you need to coordinate with?
- Would the proposed project favor one user group over another? How can all user groups be served by the improvements?

DATA NEEDS AND CONSIDERATIONS

- Crash data at this intersection
- Right-of-way ownership and management
- Vehicle traffic volume (AADT or vehicles per day)
- Number and angle of approaches
- Approach speeds
- Bicycle and pedestrian counts
- Sight distance available on each approach

DIAGRAMS

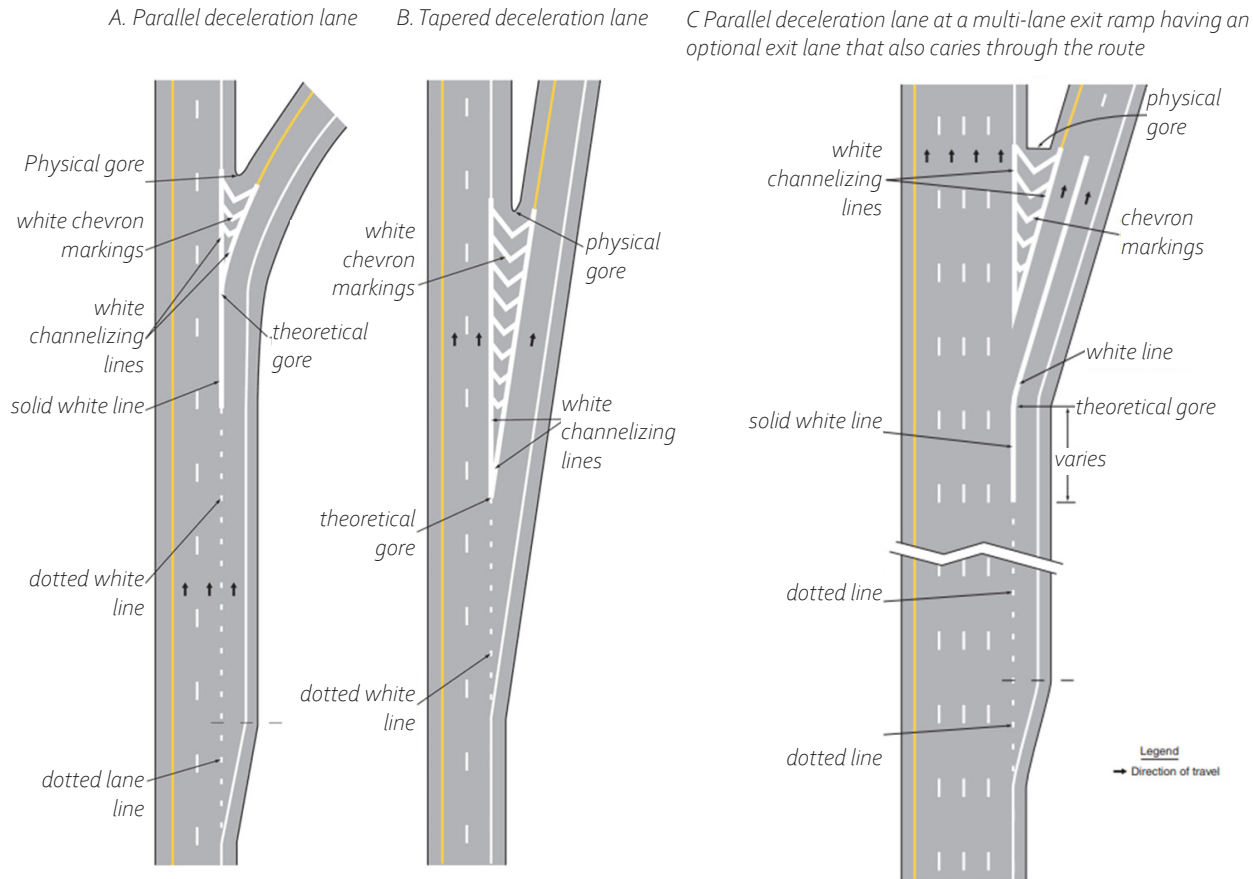


Figure 22: Examples of dotted line and channelizing line applications for exit ramp markings
(Source: MUTCD Pages 358-359)

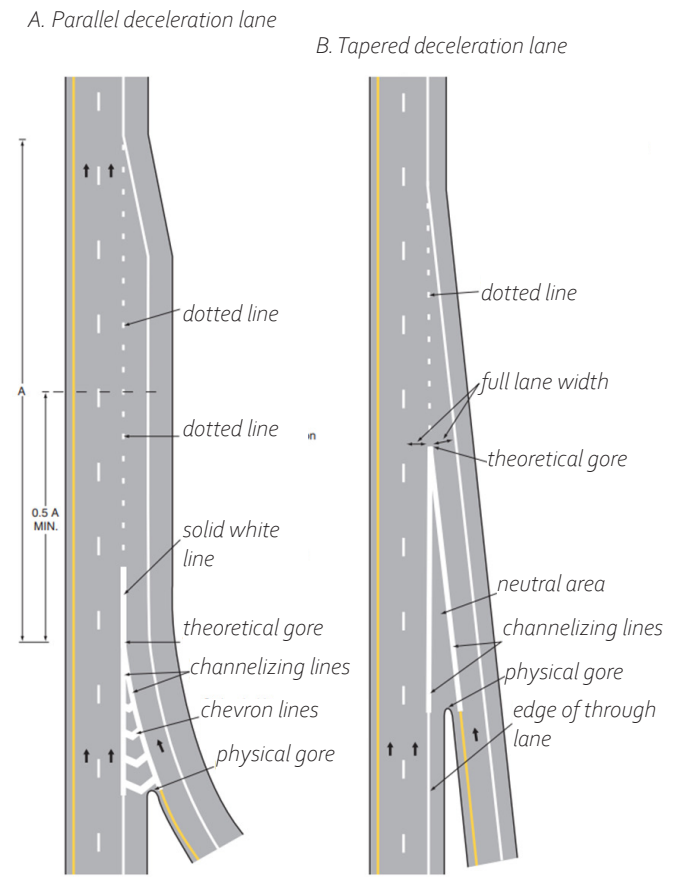


Figure 23: Examples of dotted line and channelizing line applications for entrance ramp markings
(Source: MUTCD Page 360)

MERGING AND PASSING SIGNS

Images:



W4-1



W4-2



W4-3

Description

A Merge sign (W4-1) may be used to warn road users on the major roadway that merging movements might be encountered in advance of a point where lanes from two separate roadways converge as a single traffic lane and no turning conflict occurs. A Merge sign may also be installed on the side of the entering roadway to warn road users on the entering roadway of the merge condition.

Low Cost:

Sign Installation



More Information:

MUTCD Page 125

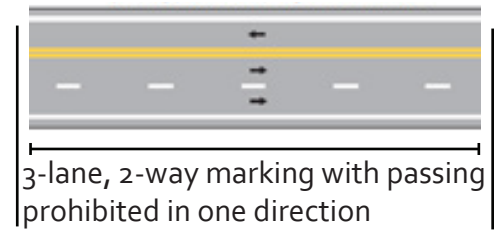
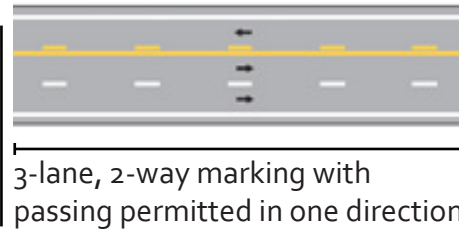
Application:

The Merge sign should be installed on the side of the major roadway where merging traffic will be encountered and in such a position as to not obstruct the road user's view of entering traffic.

Where two roadways of approximately equal importance converge, a Merge sign should be placed on each roadway.

PAVEMENT MARKINGS

Images:



Description

Lane line markings should be used on all roadways that are intended to operate with two or more adjacent traffic lanes in the same direction of travel. Lane line markings should also be used at congested locations where the roadway will accommodate more traffic lanes with lane line markings than without the markings.

Low Cost:

Pavement marking installation



More Information:

MUTCD Page 356

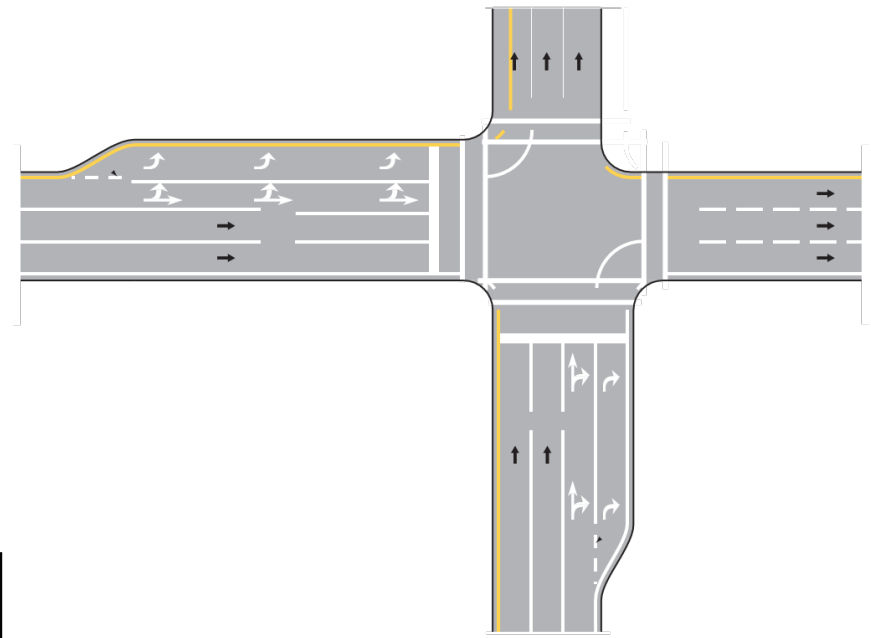
Application:

When used, lane line pavement markings delineating the separation of traffic lanes that have the same direction of travel shall be white. (Figure 3B-3 serves as an example).

A dotted white line marking shall be used as the lane line to separate a through lane that continues beyond the interchange or intersection from an adjacent lane for a deceleration or acceleration lane, or an auxiliary lane 1 mile or less in length between two adjacent intersections.

TURN LANES AND AUXILIARY LANES

Image:



Examples of line extensions through intersections (MUTCD Figure 3B-13 B.)

Description

An auxiliary lane, also referred to as a turn lane, is a lane that continues beyond an interchange from an adjacent auxiliary lane.

High Cost:

Road construction and pavement marking installation

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More Information:

MUTCD Page 372

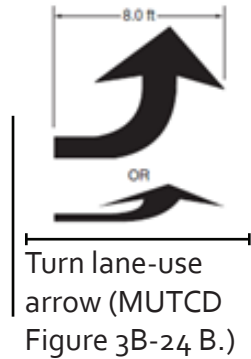
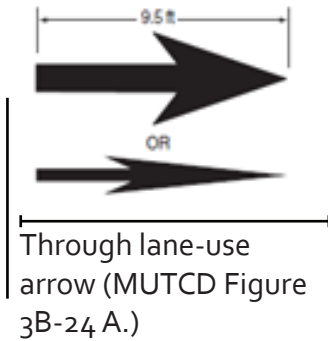
Application:

Constructing a turn or auxiliary lane is intended to reduce bottlenecks at select turns as seen in Figure 3B-13.

Note that the use of these lanes are uncommon on Service roads. Often, these lanes are present on adjoining highway that is owned and maintained by a local or state DOT.

MARKING TURN LANES AND AUXILIARY LANES

Images:



Description

Lane-use arrow markings are used to indicate the mandatory or permissible movements in certain lanes and in two-way left-turn lanes.

Low Cost:

Pavement marking installation



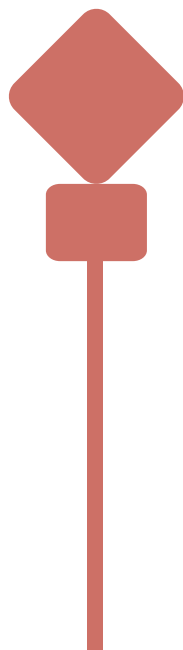
More Information:

MUTCD Page 388

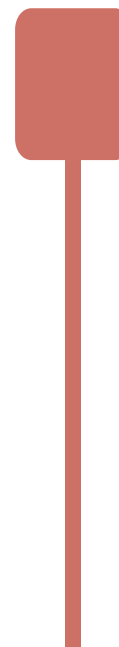
Application:

Lane-use arrow markings (see Figure 3B-24) should be used in lanes designated for the exclusive use of a turning movement. Lane-use arrow markings should also be used in lanes from which movements are allowed that are contrary to the normal rules of the road (see Drawing B of Figure 3B-13).

NEXT STEPS

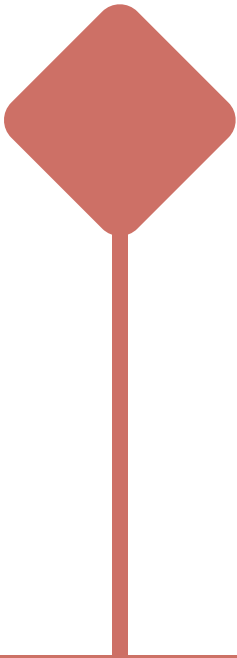


Engage station-level partners, such as station managers and project managers, and regional-level partners, such as the RTC, Visitor Services personnel, Regional Sign Coordinator, etc.

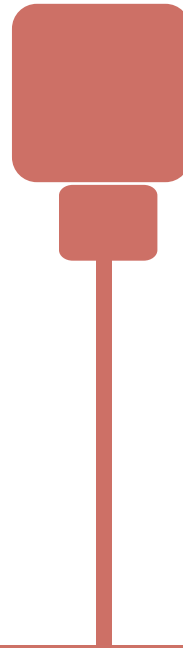


Utilize expertise from internal engineers with traffic engineering experience to determine the needs for acceleration and deceleration infrastructure. This infrastructure is not commonly built on Service right-of-way, so partnerships with external agencies is important.

NEXT STEPS (CONT.)



Consult state DOT or local municipality for regulations, design, and placement of signs, pavement markings, and other traffic control devices. Cultivate a relationship through regular contact with local and state DOT representatives to learn more about their best practices and regulations; this relationship can also make it easier to request approval and partner on mutually beneficial project from these agencies.



Defer to signage installation section for mounting height and lateral placement.

10. ACCESSIBILITY IN TRANSPORTATION

DESCRIPTION

Accessibility often measures the capacity of a location to be reached from different locations; transportation infrastructure can offer different types of transportation modes to be used in reaching a location, thus increasing accessibility. Accessibility often relates to people with disabilities: physical disabilities, such as people using wheel chair, walkers, or oxygen tanks; sensory disabilities, such as audible or visual; developmental disabilities, such as autism or dementia; and mental health disabilities, such as severe anxiety or depression. In the context of the Service's transportation infrastructure, infrastructure improvements for accessibility usually addresses physical and sensory obstacles.

While the MUTCD offers some guidance for transportation infrastructure accessibility, it does not offer guidance for all disabilities (the MUTCD's content on accessibility mainly addresses physical disabilities and sensory disabilities). Furthermore, the MUTCD refers to the Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG), but, as stated previously, the Service mainly uses the ABA for Federal Facilities standards.²² This section will discuss the elements of the MUTCD that cover accessibility and these elements' counterparts in ABA standards.

CONSTRAINTS

- What is the need for accessible amenities on any given transportation facility?

- Does the transportation facility lead to a site or building that complies with accessibility standards?
- Does this project include parking?
 - o If yes, how large is the parking area? How many parking spaces are needed?
 - o If yes, does the parking facility have a route that is accessible by people with physical and sensory disabilities?
- Does this project require pedestrian facilities?
- Is there staff time at the station to dedicate to taking on this project?
- Does this location have any safety concerns?
- Are there any environmental limitations for this project?
What other obstacles exist for the completion of this project?
- How much funding is available for this project?
- Is there adequate staff available at the station to take on this project?
- Are there any environmental limitations for this project?
What other obstacles exist for the completion of this project?
- Is this project wholly in the Service's station, or does it cross jurisdictions/who do you need to coordinate with?
- Would the proposed project favor one user group over another? How can all user groups be served by the improvements?

DATA NEEDS AND CONSIDERATIONS

- Transportation facility geometry
- Number of accessible parking spaces (see Figures 25-26)

22 U.S. Access Board. Architectural Barriers Act: Accessibility Standards. (2015). <https://www.access-board.gov/aba/>

- Inventory the accessibility of the Service's site in its entirety:
 - o Is the destination (building, structure, recreational site, etc.) accessible?
 - o Is there an accessible route to get to the site?
 - o Is there an accessible parking space connected to this route?
 - o Does the infrastructure accommodate physical and sensory disabilities?

DIAGRAMS

Total Number of Parking Spaces Provided in Parking Facility	Minimum Number of Required Accessible Parking Spaces
1 to 25	1
26 to 50	2
51 to 75	3
76 to 100	4
101 to 150	5
151 to 200	6
201 to 300	7
301 to 400	8
401 to 500	9
501 to 1000	2 percent of total
1001 and over	20, plus 1 for each 100, or fraction thereof, over 1000

Figure 25: Minimum number of required accessible parking spaces according to the total number of parking spaces in the entire parking facility.

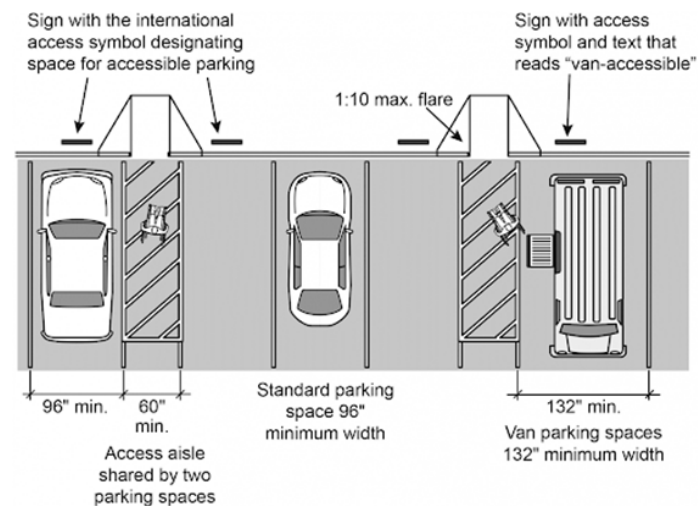


Figure 26: Parking diagram with accessible aisles (Source: [adata.org](https://www.adata.org/))

CURBS AND DETECTABLE WARNING SURFACES

Image:



Example

Description

Detectable warning surfaces designed for the visually impaired are also referred to as tactile paving. Detectable warning surfaces can mark the boundaries between pedestrian and vehicular ways where there is a curb cut or there is not a raised curb. ²³

Medium Cost:

Roadways analysis, detectable warning surface fabrication, and placement



More Information:

MUTCD Page 385

[ABA Standards](#) Pages 113-114

Application:

Curb ramps and the flared sides of curb ramps shall be located so that they do not project into vehicular traffic lanes, parking spaces, or parking access aisles. Curb ramps at marked crossings shall be wholly contained within the markings, excluding any flared sides.

Detectable warning surfaces are generally required at any loading/unloading zones, trail crossings, and sidewalk ends.

Detectable warning surfaces are required where curb ramps are constructed at the junction of sidewalks and the roadway for marked and unmarked crosswalks. Detectable warnings shall consist of a surface of truncated domes with the following guidance: dome base size should be between 0.9 to 1.4 inches, dome spacing should have a center-to-center space of 1.6 to 2.4 inches (base-to-base space of 0.65 inches), and the dome coloring should contrast visually with adjoining surfaces – either light-on-dark, or dark-on-light.

²³ A curb is the edge where a raised sidewalk or road median meets a street or roadway; a curb cut is a small ramp built into the curb of a sidewalk to make it easier for people using strollers or wheelchairs to pass from the sidewalk to the road.

PEDESTRIAN ISLANDS AND MEDIANS

Images:



Example

Description

Raised islands or medians of sufficient width that are placed in the center area of a roadway can serve as a place of refuge for pedestrians who are attempting to cross at a midblock or intersection location. Center islands or medians allow pedestrians to find an adequate gap in one direction of traffic at a time, as the pedestrians are able to stop, if necessary, in the center island or median area and wait for an adequate gap in the other direction of traffic before crossing the second half of the street or highway.

Medium-High Cost:

Roadways analysis, median construction, detectable warning surface fabrication and installation, sign installation, and pavement markings



More Information:

MUTCD Page 431

Application:

The minimum widths for accessible refuge islands and for design and placement of detectable warning surfaces are provided in ADAAG.

Any raised islands in crossings shall be cut through level with the street or have curb ramps at both sides and a level area at least 48 in (1220 mm) long between the curb ramps in the part of the island intersected by the crossings.

If a walk crosses or adjoins a vehicular way, and the walking surfaces are not separated by curbs, railings, or other elements between the pedestrian areas and vehicular areas, the boundary between the areas shall be defined by a continuous detectable warning which is 36 in (915 mm) wide.



Description

An accessibility parking space sign can be paired with the appropriate parking spaces. These parking spaces typically include an adjacent access aisle to accommodate wheel chair boarding and alighting. These parking spaces should also connect to an accessible route.

Medium Cost:

Roadways analysis, sign installation, and pavement markings



More Information:

MUTCD Page 387

[ABA Standards](#) Pages 20, 36, 131-134

Application:

At least one accessible route shall be provided within the site from accessible parking spaces and accessible passenger loading zones.

Parking space signs can be used to designate the spaces for use only by persons with disabilities (3B-22).


The number of accessible parking spaces should correlate with the total number of parking spaces in the lot (see ABA Parking Lot Table above).

Accessible parking spaces may use blue pavement markings. The blue lines may supplement white parking space markings of each parking space designated for use only by persons with disabilities.


Where parking spaces that are reserved for persons with disabilities are designated to accommodate wheelchair vans, a VAN ACCESSIBLE plaque (R7-8P) shall be mounted below the R7-8 sign.

At least one outdoor recreation access route should connect accessible parking spaces or other arrival points serving the viewing area with accessible elements, spaces, and facilities provided within the viewing area.


NEXT STEPS



Engage station-level partners, such as station managers and project managers, and regional-level partners, such as the RTC, Visitor Services personnel, Regional Sign Coordinator, etc.



Utilize expertise from Visitor Services personnel and internal engineers to determine the needs for accessible infrastructure, such as parking spaces, signage, pedestrian islands, and detectable warning surfaces.



Consult state DOT or local municipality for regulations, design, and placement of signs, pavement markings, and other traffic control devices. Cultivate a relationship through regular contact with local and state DOT representatives to learn more about their best practices and regulations; this relationship can also make it easier to request approval and partner on mutually beneficial project from these agencies.



Defer to signage installation section for mounting height and lateral placement.