NCHRP 20-07 Task 350

# U.S. Bicycle Route Signing

## Final Report

October, 2014

Transportation Research Board

NAS-NRC

Limited Use Document



**Theodore Petritsch**
**Christopher Fellerhoff**
Sprinkle Consulting, Inc.

# Contents

# U.S. Bicycle Route Signing:Recommendations for Marker and Guide Signs for U.S. and Other Designated Bike Routes.

## INTRODUCTION

This document discusses the state of guidance relevant to the practice of marking numbered bicycle routes in the United States at the time of writing. The impetus for this project is the imminent implementation of the U.S. bike route system, the corridors of which may coincide with numbered bike routes designated by states, counties, and municipalities, or with Interstate, U.S., state, and county numbered highways for general traffic, and will certainly intersect with numbered routes both for general traffic and for bicycles. This document distills out what signs are required under current standards, and identifies where additional or modified guidance might be desirable in order to provide sufficient wayfinding for a national bike route system.

This report also contains guidance text consistent with the *Manual on Uniform Traffic Control Devices* ((MUTCD), 2009 Edition, as modified by Revisions 1 and 2) for the use of Bicycle Route marker signs for designated U.S., State, county and other locally-designated bike routes, as well as the guiding sign assemblies to which such signs are integral. It also contains guidance regarding the various guide signs that can be used to help bicyclists navigate turns along those designated routes and otherwise be informed of what significant destinations they will next encounter on their travels.

The following sections discuss the variety of signs and assemblies available to guide travel along a designated bike route. The MUTCD does not presently include detailed guidance on the signing of bike routes. It does include guidance on the sequence of signs and assemblies to be used in the signing of numbered routes for general traffic, such as Interstate, U.S., and state highways, and county roads. Using the general traffic sequence route and guide sign sequence found in Chapter 2D of the MUTCD as a template, the research team has developed a sequence for the marking of designated bike routes that is consistent with the existing standards and guidance of the MUTCD. While the sequence is new, the guidance contained within it does not add new signs, create new standards, violate existing standards or guidance, or otherwise claim authority reserved for the MUTCD. This guidance has been developed to be able to stand alone as a guidance text that is explicitly consistent with the 2009 Edition of the MUTCD, as modified by Revisions 1 and 2 (the version in effect at the time this document was prepared),

The guidance is presented in the following sequence of signs and assemblies:

- Bicycle Route signs, generally;
- Junction assemblies in advance of intersections with other designated routes;
- Advance Route Turn assemblies in advance of intersections where a turn must be made to remain on the indicated route or join an intersecting route;

- Destination signs (which may include distance information) to supply information concerning destinations that may be reached by way of designated or undesignated routes;
- Directional assemblies at intersections to indicate turns or to affirm through movement along a continuing route, the beginning of a new route, or intersection with a different route;
- Confirming assemblies shortly after intersections to identify which routes have continued on different departing legs from the intersection;
- Distance signs after junctions of designated routes, or when leaving incorporated or named built-up areas, to show distances to destinations of interest to bicyclists; and
- Reassurance assemblies at appropriate intervals between intersections in urban areas, and along routes outside of built up or incorporated areas.

Each point of the sequence is introduced by a brief discussion that covers the purpose of the subject sign or assembly and how existing guidance allows for its use to provide guidance regarding a designated bike route, and what potentially desirable applications or uses are precluded by existing standards and guidance.

The brief introductory discussions are followed by MUTCD Compliant Guidance Sections, which describe the recommended and/or allowable uses of the subject signs or assembly. All guidance within this section will be compliant with the guidance of the existing MUTCD. These sections have been crafted as recommended guidance only (i.e., "should" statements throughout for practices to be encouraged, "may" statements for practices noted as permissible). Existing MUTCD standards for minimum sizes specific to bicycle signs are cited within the recommendations below, but no changes to those standards are recommended. The guidance also identifies the circumstances where the use of certain signs or assemblies can be avoided, in the interest of saving costs, reducing maintenance, or reducing the visual clutter associated with multiple signs.

After each MUTCD Compliant Guidance section are lists of recommended subjects for research or action. The topics within these lists may be prohibited or not explicitly permitted by the existing guidance. Items on these lists include topics for consideration by an appropriate AASHTO committee or task force for forwarding, if they concur, to the National Committee on Uniform Traffic Control Devices (NCUTCD), the Institute of Traffic Engineers (ITE), or other appropriate body who could augment or clarify existing guidance to better facilitate the effective signing of designated bike routes. Committees of these bodies are the appropriate venues in which to give these topics full review and to consider the development of proposed revisions of documents they produce, such as the MUTCD, the *Traffic Control Devices Handbook* (TCDH), or the AASHTO *Guide for the Development of Bicycle Facilities.*

## ROUTE SIGNS, LOCATION AND GROUPING

Route signs for bicycling include the U.S. Bicycle Route sign (M1-9), the Bicycle Route Sign (M1-8) and its agency-specific variant (M1-8a). A proposed revision is underway to modify some elements of these signs and how they are defined, including named or graphic-identified routes without numbers. For purposes of this document, "Route signs" should be understood to

mean the M1-series signs for bicycles described in the MUTCD. These route markers for bicycles are the first component of guidance assemblies used at various locations and described in the sections below. Bicycle Route signs and the guidance assemblies to which they are integral may be used to help guide bicyclists as they follow routes designated along roadways and shared use paths. The basic guidance in the MUTCD about numbered bike route signs is contained within Section 9B.21. The Standards within this section pertain only to the content of the M1-8 and M1-9 signs. Their use is optional; a bike route could be identified and numbered in a document and the responsible agency could opt not to mark it by means of posted signs. Once used, however, their use in certain types of assemblies—Junction, Advance Turn, and Directional assemblies—is subject to Standards regarding the placement of such assemblies, found in Sections 2D.30, 2D.31, and 2D.32 of the MUTCD (these standards and other guidance regarding these three assemblies are discussed in detail in subsequent sections of this report, under headings named for the specific assemblies).

The NCUTCD Bicycle Technical Committee (BTC) has also recommended a Non-Numbered Bicycle Route Sign series (M1-x, M1-xa, and M-1xb) (Figure 1). Within the recommended guidance is the statement, "If a bicycle symbol is used on the M1-8a, M1-xa or M1-xb sign, it should have a minimum height of 25% of the sign panel width." However, there is no recommendation on how to inform roadway users that an M1-x, M1-xa, or M1-xb sign is for bicyclists if there is no bicycle or if the text is not clearly pathway related. An option or guidance statement recommending a supplemental bicycle plaque above the sign should be considered (as shown in Figure 2).

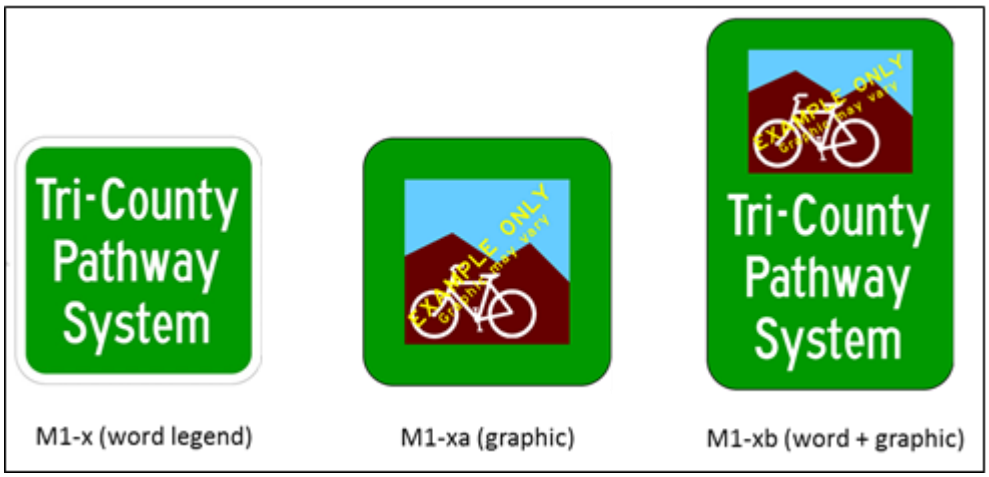


**Figure 1: Proposed Non-Numbered Bike Route Signs**

In the interest of avoiding sign proliferation, it may be desirable to group U.S. Bike Route signs with signs regarding coincident or intersecting designated bike routes, whether U.S., State, or local. It also may be desirable to group U.S. Bicycle Route signs with Route signs for general traffic (Interstate, U.S., State, County, etc.) for the same reason. The MUTCD does not expressly prohibit grouping of Bike Route signs with each other or with other Route signs, but it does not clearly allow it either. The MUTCD states that signs should generally be "individually installed on separate post or mountings,"[1] but with several exceptions,


**Figure 2: M1-xa with Supplemental Bike Plaque**

[1] MUTCD, Section 2A.16 (05)

including where "Route or directional signs are grouped to clarify information to motorists" (emphasis added).[2] The practice of mounting signs individually is guidance ("should"), not a standard, but the exception that seems applicable is explicitly for the benefit of motorists. Mounting multiple designated Bike Route signs together or with Route signs for general traffic would technically be contrary to the guidance. Within Part 9, the MUTCD states, that "Signs for the exclusive use of bicyclists should be located so that other road users are not confused by them."[3] This again is guidance, subject to engineering judgment. If U.S. and other Bicycle Route signs are clearly identified with bicycle emblems, as they should be according to MUTCD, then they should not be confusing to most motorists. However, some engineers may believe that just the addition of extra signs to the post may obscure the primary general traffic Route Sign(s) and decide not to do so. Other sections of this report contain guidance regarding posting locations for numbered bike route markers and assemblies. The distances identified in these sections for each sign or assembly type are for postings independent of route signs and assemblies for general traffic. The distances are typically about half the distance recommended for the equivalent sign or assembly for general traffic, based on the typically slower travel speeds of bicycles. If a decision is made to post bike route signs or assemblies at a location shared with route signs and assemblies for general traffic, then the locations recommended for general traffic purposes in Figure 2D-6 of the MUTCD should be used.

Per the Standard described Section 2D.29 (02) of the MUTCD, where two or more routes follow the same section of highway, route signs for Interstate, U.S., State, and county routes shall be mounted in that order from the left in horizontal arrangements, and from the top in vertical arrangements. Subject to this order of precedence, route signs for lower-numbered routes shall be placed at the left or top. During the development of this report, it was discussed among the research team that this standard could be read to mean that U.S. and other numbered bicycle routes are included among the routes subject to the Standards of Section 2D.29. This could mean that a county highway marker would be placed in a position subordinate to a U.S. Bike Route marker, or that a U.S. Highway marker would be placed in a position subordinate to a U.S. Bike route with a lower route number. The research team asked for an official interpretation from FHWA on this matter. The response indicated that "the sign assembly should assume that the bikeway is secondary to the street or highway."[4]

While the interpretation from FHWA is authoritative and must be the basis of a description of existing guidance, the fact that an interpretation was sought underscores that the current guidance is less clear than it could be, especially regarding the relationship of bike route assemblies to all of the Standards within Part 2 of the MUTCD. In an early draft of this document, the research team held an interpretation contrary to what was ultimately stated by FHWA. The review panel did not come to consensus on this, which occasioned the query to FHWA. Arguments could be made that a U.S. bike route ought to be a higher priority for wayfinding than a county road. Arguments could also be made that the separating wayfinding by mode will most clearly align with the expectations of the traveling public. An appropriate Committee of the NCTUCD should consider where bike route signs should fit in the hierarchy prescribed for groupings of multiple routes in common postings (MUTCD 2D.29, paragraphs 02

[2] MUTCD, Section 2A.16 (05, B)
[3] MUTCD, Section 9B.01 (06)
[4] Email correspondence from Kevin Dunn, P.E., PTOE, Transportation Specialist, Federal Highway Administration, September 25, 2014 (full email exchange with Christopher Fellerhoff of the research team is included as "Appendix C").

and 03) and if clarifications to this this standard are appropriate. An example grouped posting is shown in Figure 3.


**Figure 3: Combined Route and Bike Route Assemblies**

In some instances, bicycles are allowed on Interstate and other freeways or expressways. U.S. and other bike routes may be routed along freeways or expressways as necessary to provide continuity between discontinuous segments of conventional roadways that are designated as bike routes, for which the freeway or expressway provides the only connection between the segments. Detailed guidance should be developed for the TCDH, AASHTO *Bike Guide*, the MUTCD, or other appropriate references on how best to mark bike routes on freeways. The research team has drawn a parallel with guidance for Auto Tour Routes, found in section 2H.07 of the MUTCD (an observation also offered by FHWA in correspondence about this project). The Auto Tour guidance seems to indicate that trips secondary to high-speed motor vehicle trips are not desirable on the primary guide signs of freeways. Thus, it may not be appropriate to post bike route information with general traffic guide signs—especially those mounted over the travel lanes—as bicyclists will not be travelling at high speeds and will be travelling primarily on the shoulder. The Research Team's initial recommendation is that U.S. Bicycle Route markers and assemblies on limited access roadways could include Confirmation assemblies, Reassurance assemblies, Junction assemblies, and Advance turn assemblies pointing to the appropriate exit. Directional assemblies could be located as appropriate at the ends of exit ramps.

## MUTCD Compliant Guidance Text

Route signs for bicycles may be used to establish a unique identification for a U.S., State, or local bike route. Route signs for bicycling include the U.S. Bicycle Route sign (M1-9), the Bicycle Route Sign (M1-8) and its agency-specific variant (M1-8a). Route signs for bicycling are used in various assemblies to guide bicyclists and between designated bike routes. Destination and Distance signs are also available to guide bicyclists towards specific destinations.

Where sign proliferation is a concern, U.S. Bicycle Route signs and assemblies may be posted on a common post with other state or local Bike Route signs. Bike Route signs and assemblies may be posted on a common post with Route signs for general traffic, provided that they do not confuse road users.

Bike Route signs shall comply with minimum height and clearance standards as specified in the MUTCD. If a Bike Route Sign or assembly is added to post with an existing Route sign or assembly for general traffic, then the entire group of assemblies should be re-positioned so that all signs comply with the minimum height and clearance standards of the MUTCD.

If posted on a common post with one or more assemblies providing route information for general traffic, U.S. and other bike route signs and assemblies should be grouped together in a position subordinate to (i.e. below or to the right of) all general traffic route signs .Within a group of bike route signs or assemblies, routes turning to or intersecting from the left should be

grouped together on the left or the top; routes continuing or originating straight ahead should be grouped in the middle, and routes turning to or intersecting from to the right should be grouped on the bottom or to the right. After this directional sort, U.S., State and county routes should be mounted in that order; subject to this order of precedence, route signs for lower-numbered bike routes should be placed at the left or top.

### Recommendations for Further Research or Action

1. An appropriate technical committee of NCUTCD to consider revision of 2A.16.05.B to read "Route and directional signs (including Bicycle Route and Bicycle Directional signs) are grouped to clarify information for roadway users".
2. Development of MUTCD or TCDH text about bike route designation on limited access roadways.
3. An appropriate technical committee of NCUTCD to consider revising Standards of MUTCD Section 2D.29 to specify inclusion of bicycle routes in order for precedence within grouped route postings.
4. An appropriate technical committee of NCUTCD to consider revising guidance in MUTCD to include provision of a supplemental bicycle plaque with M1-x, M1-xa, or M1-xb signs that do not clearly represent that they are for bicycles.

## JUNCTION ASSEMBLIES

Junction assemblies for general traffic give advance notice of where a numbered route intersects another numbered route. Their use is required at every such intersection per a standard of the MUTCD [2D.30 (02)].[5]

Junction assemblies for designated bike routes may be less critical than those for general traffic, as bicycle approach speeds are relatively low, and it may be safe to assume that bicyclists using long distance routes such as the U.S. Bicycle Route system will be not generally be travelling at the higher ranges of bicycle speeds due to their long trip lengths and likely cargo loading. However, at the present time the MUTCD requires their use at every intersection where a numbered routes intersect, including where a numbered route for general traffic (e.g., a U.S. or state highway) intersects a numbered bike route. This would seem to require both informing bicyclists on a designated bike route of the impending junction with the U.S. or State Highway, and informing bicyclists on the U.S. or State Highway (which is not a designated bike route) of the impending junction with the designated bike route.

Junction assemblies may be especially important for bicyclists where making the connection to an intersecting route requires a left turn in a multi-lane roadway, and therefore a well-planned lane change by the bicyclist, but in most other cases the information they provide does not seem critical. An appropriate technical committee of the NCUTCD may wish to consider proposing changes that make the use of Junction assemblies optional for application along designated bike routes. Guidance could then be developed to indicate when Junction signs

[5] The application of this standard to bike route assemblies was confirmed in the previously cited correspondence with FHWA, the full transcript of which is included as Appendix C.

are desirable for bike routes, for inclusion in the TCDH, AASHTO Bike Guide, or MUTCD, as appropriate.

Junction Assemblies may be supplemented by Word, symbol, and/or arrow markings consisting of the word message "JCT" and the appropriate route shield. These may be further supplemented by arrow markings as appropriate. Word/symbol and arrow markings should only be used in designated bike lanes or on the shoulders of routes where bicyclists are expected to use the shoulder, such as limited access roadways or bridges open to bicycles. "JCT" is not among the word markings specified in Section 3B.20.02 of the MUTCD, but the list of markings therein in prefaces with the phrase "Among the word, symbol, and arrow markings that may be used are the following:..." This seems to indicate that additional messages are allowed, including "JCT".

## MUTCD Compliant Guidance Text

Junction assemblies shall be used in advance of an intersection where a designated bike route is intersected or joined by another numbered route, including a designated bike route. Junction assemblies shall consist of a Junction auxiliary sign (M2-1, "JCT", in the color scheme of the associated routes sign— i.e., green and white for most bicycle routes) mounted above the route sign of the bicycle route(s) to be joined or intersected. An example Junction assembly of a bike route is shown in Figure 4. When posted independently of Junction assemblies for general traffic in urban areas, Junction assemblies for bike routes should be installed in the block preceding the intersection, not more than 150 feet [6] from the intersection. In rural areas, independently posted Junction assemblies for bike routes should be placed not less than 200 feet from the intersection. Where two or more designated bike routes are joined or intersected at the same junction point, a single Junction auxiliary sign may be used for the assembly with all the route signs grouped in a single assembly. Table 9B-1 prescribes the minimum size of a Junction auxiliary sign when used in an assembly specifically for bicycle traffic.


**Figure 4: Junction Assembly for a U.S. Bike Route.**

A Combination Junction sign (M2-2) may be also be used when two or more routes are to be indicated. If a Combination Junction sign is used, the numerals should be large enough for clear legibility and should be of a size comparable with those in the individual Bicycle Route signs such as the M1-9 or the M1-8 and M1-8a.[7]

If Junction assemblies are used on roadways with designated bike lanes or where bicyclists are expected to use the shoulder, they may be supplemented by pavement word and symbol markings, consisting of the word marking "JCT" and an elongated route shield

[6] All recommended distances for sign placement, except for Reassurance Assemblies, are derived from half the distances recommended for general traffic guide signs and assemblies in Section 2D of the MUTCD.

7 The Combination Junction sign is not described within Part 9 of the MUTCD; however, where it is described in Part 2, no minimum size is specified, and the guidance states that its size "will depend on the number of routes involved, the numerals should be large enough for clear legibility and should be a size comparable with those in the individual route signs." This would suggest that an M2-2 sign could be scaled to a reduced size appropriate to smaller bicycle route signs, such as the M1-9 or the M1-8 and M1-8a.

referencing the route to be joined. These word and symbol markings may also be supplemented by arrow markings as appropriate. Pavement markings should be an elongated representation of the sign being supplemented. The pavement marking width should be the same as the represented sign. The pavement marking should be elongated relative to the sign for approach viewing and be to be twice the height of the sign.[8]

### Recommendations for Further Research or Action

1. Research to confirm the appropriate elongation factor for pavement markings of bicycle route shields.
2. An appropriate technical committee of the NCUTCD to consider proposing revision to MUTCD to specifically allow use of pavement word and symbol markings to supplement Junction assemblies.
3. An appropriate technical committee of the NCUTCD to consider proposing revision to MUTCD to make Junction assemblies optional in advance of intersections involving designated bike routes, or make applicability of Standard 2D.30 (02) to bike routes explicit if the current requirement is deemed appropriate.

## ADVANCE ROUTE TURN ASSEMBLIES

Advance Route Turn assemblies are used for general traffic to alert roadway users that a turn must be made to remain in an indicated route. Their use is required by a Standard in MUTCD Section 2D.31 (01). The information they provide is important for navigation, but may not be critical in advance for bicyclists, given their slower travel speeds. Advance Route Turn assemblies may be especially important for bicyclists in advance of complicated intersections on wide roadways, such as multilane arterials, or where left turn lanes are added. In these environments, bicyclists may need to change lanes to set up a left turn. At rural intersections, bicyclists will also appreciate Advance Route Turn notice when water or other refreshments are available at only one or two corners (e.g. a rural gas station or convenience store), and a decision to stop or continue along the route may be influenced by awareness of the route turn in relation to the desired services or rest stop. However, at the present time the MUTCD requires the use of Route Turn assemblies at every intersection where a turn must be made to remain on a numbered route.[9] An appropriate technical committee of the NCUTCD may wish to consider proposing changes that make the use of Advance Route Turn assemblies optional for application on designated bike routes. Guidance could then be developed to indicate when Junction signs are desirable for bike routes, for inclusion in the TCDH, AASHTO *Bike Guide*, or MUTCD, as appropriate. If Advance Route Turn assemblies were optional, then the information they convey could still be communicated by means of including the appropriate route shields on a Destination sign (see detailed discussion in next section, "Destination Signs") along with the destinations,

[8] The elongation factor of two recommended for the route shield pavement markings was arrived at by first looking at the Interstate Symbol pavement markings. The Interstate Markings represent an elongation of 2.5 times with respect to the width of the symbol. The lower proportion given here is recommended because of the lower approach speeds of bicyclists. Additional testing might allow for reduced sizes of the pavement marking.

[9] The application of this Standard 2D.30 (01) to bike route assemblies was confirmed in the previously cited correspondence with FHWA, the full transcript of which is included as Appendix C.

arrows and distances (if shown). This option may be especially appreciated in locations where sign proliferation is of particular concern or by agencies looking for cost reduction opportunities.

The MUTCD currently allows for Advance Route Turn assemblies that "supplement the required Junction assembly in advance of intersecting routes."[10] The research team understands this to mean that an assembly communicating the turns necessary to join an intersecting route may be posted at this point of a sequence of guide signs. These advance-turn-to-join-intersecting-route assemblies are not required, while advance-turn-to-continue-on-current-route assemblies are required. Advance Route Turn assemblies may be supplemented by word, symbol, and/or arrow markings consisting of the appropriate cardinal direction text, the appropriate route shield, and arrows indicating the appropriate turns. Word/symbol and arrow markings should only be used in designated bike lanes or on the shoulders of routes where bicyclists are expected to use the shoulder, such as limited access roadways or bridges open to bicycles. These markings should be of an elongated design as discussed in the section on Junction Assemblies above.

## MUTCD Compliant Guidance Text

Advance Route Turn assemblies shall be used in advance of an intersection where a turn must be made to remain on a designated bicycle route, to provide directional information appropriate to the necessary turn.

The Advance Route Turn assembly shall consist of the appropriate Bicycle Route sign (M1-8, M1-8a, M1-x, M1-xa, M1-xb, or M1-9), and an Advance Turn arrow (M5-1, M5-2,) or word message sign. Minimum sizes for the signs that comprise a bicycle specific Advance Route Turn assembly are indicated in Table 9B-1 of the MUTCD. Example Route Turn assemblies for bike routes are shown in Figure 5.


**Figure 5: Advance Route Turn Assembly**

When posted independently of Advance Route Turn assemblies for general traffic in urban areas, Advance Route Turn assemblies for bike routes should be no more than 100 feet from the subject intersection. If used in rural areas, independently posted Advance Route Turn assemblies for bike routes should be at least 150 feet from the intersection, and at least 100 feet from a preceding Junction Assembly and a following Destination sign. An Advance Route Turn assembly should not be placed where there is an intersection between the assembly and the indicated turn.

Advance Route Turn assemblies for bicyclists may be located in a common posting with Advance Route Turn assemblies for general traffic routes, provided that they do not confuse road users. If Route Assemblies for bicyclists are added to an existing Route Turn assembly for general traffic, then the whole grouping must be adjusted to ensure compliance with minimum height and clearance standards of the MUTCD.

If Advance Route Turn assemblies are used on roadways with designated bike lanes or where bicyclists are directed to use the shoulder, they may be supplemented by pavement word

[10] MUTCD 2D.31(02)

and symbol markings, consisting of the appropriate cardinal direction text, and an elongated route shield referencing the relevant routes that is turning and/or the route to be joined, and arrows indicating the appropriate turns. Pavement markings should be an elongated representation of the sign being supplemented. The pavement marking width should be the same as the represented sign. The pavement marking should be elongated relative to the sign for approach viewing and be to be twice the height of the sign.

### Recommendations for Further Research or Action

1. An appropriate technical committee of NCUTCD to consider proposing revision to MUTCD to make Advance Route Turn assemblies optional in advance of intersections involving designated bike routes, or make applicability of Standard 2D.31 (01) to bike routes explicit if the current requirement is deemed appropriate.
2. An appropriate technical committee of NCUTCD to propose revision to MUTCD to specifically allow use of pavement word and symbol markings to supplement Bicycle Advance Route Turn assemblies.

## DESTINATION SIGNS

Destination signs for general traffic serve to "supply the road user with information concerning the destinations that can be reached by way of numbered or un-numbered routes."[11] Destination signs are generally of the D1 series, which includes bicycle-specific varieties that include the bicycle emblem along with destination names and directional arrows for one, two, or three destinations (D1-1b, D1-2b, D1-3b), or also include distance information for one, two, or three destinations (D1-1c, D1-2c, D1-3c). Destination signs, including bicycle specific varieties may also include Route shields and cardinal directions.

Distance information is allowed to be included on direction signs per Section 2D.37 (02), however distance information is also ordinarily provided by means of Distance signs (D2 series) after intersections or on departure from developed areas (see below). The typical installations shown in MUTCD Figure 2D-6 do not usually include the distance information on directional signs, as distance signs after the intersection usually provide this information, and sometimes for multiple destinations. Nevertheless, there may be a benefit to encouraging the use of distance information on directional signs in situations where the distance may influence the route choice (e.g. pointing out a route that is shorter or more bicycle-friendly than a more obvious or better known route), or when there are not good locations for a distance sign after the intersection. Further, there is not presently a bicycle-specific distance sign provided by the MUTCD, so the Bicycle Destination sign is currently the only place where a bicycle-specific distance may be noted.

Destination signs for general traffic may include Route shields and cardinal directions, guidance which covers the D1 and D2 series generally, including the bicycle destination signs (D1-Xc). [12] Thus, U.S. (or State or Local) Bike Route shields may be displayed on Bicycle

[11] MUTCD, 2D.36 (01)
[12] MUTCD, 2D.36 (02).

Destination signs. This option may be helpful should future guidance make the use of Junction and/or Advance Turn assemblies optional for marked bike routes.

If Route shields and cardinal directions are included on Destination signs, then the Route number within the shield and the cardinal direction text should be at least 2 inches high, and the height of the sign then scaled accordingly.

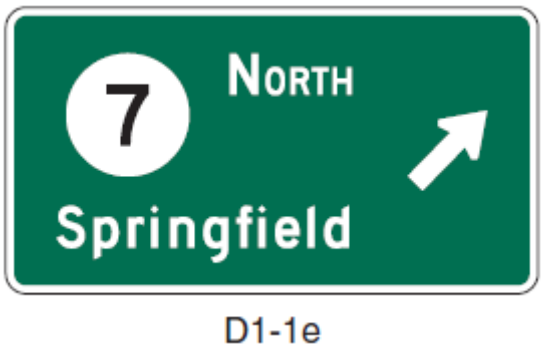


**Figure 7: Exit Destination Sign for Circular Intersections (D1-1e)**

If one or more shields and their cardinal directions are added to a Destination sign, the sign may be laid out as shown in Figure 6, with the relevant shields and cardinal directions displayed (according to the order of precedence described earlier), with the shield(s) to the left of the destination, and to the right of left or ahead arrows. It has been suggested by this project's review panel that the layouts shown for the D1-1e sign (Figure 7) or the Entrance Direction sign for Interchanges (Figure 8), may also be used. In these sign layouts, Route shields and cardinal directions are displayed—with the cardinal direction next to rather than atop the Route shield, but with straight or horizontal arrows rather than diagonal arrows. While the research team finds no prohibition against this layout, the graphic examples of its use are limited to specific applications for circular intersections and Interchanges: the D1-1e is defined as an "Exit destination" sign and only discussed within Section 2D.38, which addresses Destination signs at circular intersections; Entrance Direction signs are not given an alphanumeric sign designation, and are only shown within MUTCD Figures 2D-13, 2D-14, 2D-15, and 2D-16, and discussed only within Section 2D.45, "Signing on Conventional Roads in Approaches to Interchanges." The appropriate technical committee of the NCUTCD should consider proposing revisions to the MUTCD that clarify (with example graphics) which layouts of shield-and-cardinal-direction-bearing destination signs are approved for use in applications other than circular interchanges of interchange approaches. An example Bicycle Destination sign laid out in the manner of a D1-1e is shown in Figure 9.


**Figure 6: Destination Signs with Shields and Cardinal Directions**


**Figure 8: Entrance Direction Sign from MUTCD Figure 2D-13**

The existing MUTCD neither prohibits nor explicitly allows the combination of a Bicycle Destination sign and a Destination sign for general traffic, for example by having one of the lines on a multi-line destination sign be bike-specific, or by including both a general traffic route shield, such as a U.S. or state highway, and the shield or symbol of a designated bike route on the same line associated with a common destination. An appropriate technical committee of the NCUTCD should consider proposing a revision to allow such a combination. Examples of how this might be done are shown in Figures 10 and 11.

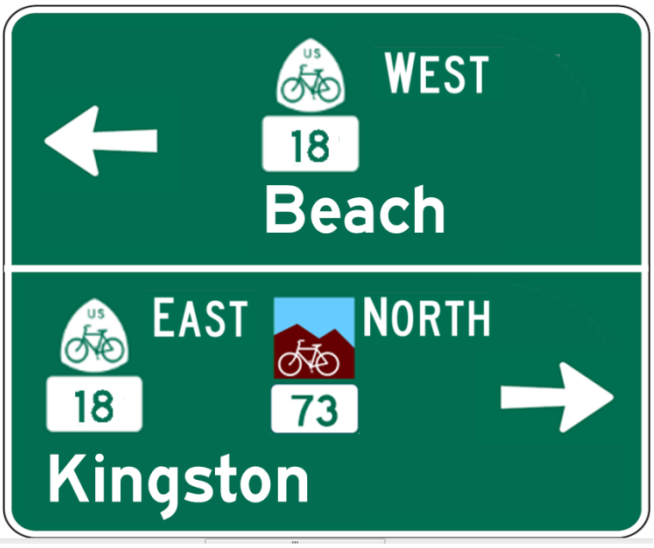


**Figure 9: D1-1e Sign, modified to display bike route information.**

In Figure 10, a general traffic route and a bike route to a common destination continue from a common point, but via different routes (such as an arterial roadway and a shared use path), but they are approximately the same length, so the distance does not bear on the route choice and has not been displayed.


**Figure 10: Potential Combined General Traffic and Bicycle Destination Sign**

In Figure 11, a general traffic route and a bike route to a common destination continue from a common point (again, perhaps via a State highway and a shared use path), but are of substantially different lengths, and another general traffic route serves a different destination. In cases such as this, providing the distance information may assist bicyclists in making route choices.


**Figure 11: Potential Combined General Traffic and Bicycle Destination Sign (with Distances)**

The interplay of optional mileage information with the potential of including both bicycle route and general traffic route information on a common Destination sign could be confusing to some users—especially if distance is only shown for one mode. Any consideration of explicit approval for a combined Destination sign should include human factors testing to determine whether displaying mileage on only some lines of a multi-line Destination is confusing to the public, and appropriate guidance should be crafted in light of the findings.

## MUTCD Compliant Guidance Text

Destination signs may be used to inform bicyclists of destinations that can be reached by designated bike routes or with a direct but undesignated connection that is more accommodating

to bicycles than a more obvious primary route for general traffic. Destination signs for bicycles should be considered when a preferred bicycle route differs from the primary route that general traffic would use to reach the same destination.

Destination signs may be either of the general type or the bicycle specific type. The general signs feature with the destination and directional arrow (D1-1), or may also show a numeric distance (D1-1a). Sizes for Destination signs for general traffic are indicated in MUTCD Table 2D-1.

Bicycle Destination signs include a bicycle symbol and the destination and directional arrow (D1-1b), or may also include a numeric distance (D1-1c), and may be smaller than those for general traffic, as indicated in MUTCD Table 9B-1.

U.S. (or State or Local) Bike Route shields may be displayed on Bicycle Destination signs, and should be considered on approaches where Junction and/or Advance turn signs have not been used for the relevant designated bike routes. If Route shields and cardinal directions are included on Destination sign, then the Route number within the shield and the cardinal direction text should be at least 2 inches high, and the height of the sign then scaled.

When posted independently of Destination signs for general traffic in rural areas, Bicycle Destination signs should be placed at least 100 feet before the intersection (and closer if in urban areas), and should be no closer than 100 feet to a preceding Junction or Route Turn assembly. If U.S. or other designated bicycle route planning precipitates the installation of Destination signs that will also serve general traffic, then the full-sized signs should be used and be located according to the guidance found in section 2D.40 of the MUTCD.

Destination signs for bicyclists should not duplicate destinations already posted for the benefit of general traffic at the same intersection, unless a preferred bicycle route to that destination requires a different movement at the intersection.

Destination signs and Bicycle Destination signs may show distances to the named destinations. Distances will also often be shown on the Distance signs found after intersections or on the departure from developed areas (see below). Destination signs and Bicycle Destination signs should not duplicate information found on distance signs. Distance information should be shown on Bicycle Destination signs if they direct bicyclists to a route that serves the same destination as a primary route for general traffic, but via an alternate route that has been deemed preferable for bicyclists. Displaying distance information on both the Destination sign (for general traffic) and on the Bicycle Destination sign will allow bicyclists to compare distances as they make their route choices, especially in the case of a common destination that is at a different distance via the bike route than by the general traffic route.

## Recommendations for Further Research or Action

1. An appropriate technical committee of NCUTCD to clarify of the “horizontal rectangle” limitation on a destination sign, especially if route shield symbols and text need to be in-line. A typical example within D1 series would be helpful, as circular intersection exit and freeway entrance destination signs are not clearly applicable because of their specific use.
2. An appropriate technical committee of NCUTCD to consider if bicycle-specific line can or should be included on a multi-line Destination sign.

3. An appropriate technical committee of NCUTCD to consider evaluating the use of word, symbol, and arrow pavement markings at intersections, whether within bike lanes and shoulders and in shared lanes from which bicyclists may be turning.

## DIRECTIONAL ASSEMBLIES

Directional assemblies are posted for use by travelers at an intersection where a turn is required to continue on a numbered route or join an intersecting route. Example Directional assemblies for bike routes are shown in Figure 12.


**Figure 12: Directional Assemblies**

Directional Assemblies are required, per the Standard described in MUTCD Section 2D.32 (01), at all locations where continuing numbered routes turn or where two numbered routes intersect.[13] This includes intersections where only one of the intersecting numbered routes is a bicycle route.

While there has been discussion previously that the mandatory Junction or Advance Route Turn assemblies may not always be appropriate for application to bicycle routes, the requirement for Directional Assemblies is appropriate for application to bicycle routes. Many bicyclists, especially those on long distance tours, hauling cargo, or moving at slower speeds, may reserve their navigational decisions until they come to a stop at a route intersection. It is crucial that all route information be clearly visible and legible from the roadway at the intersection.

The existing guidance for Directional Assemblies also encourages the posting of assemblies showing the straight-through movement of the continuing route when other assemblies are present indicating the turns necessary to join an intersecting route. This practice should also be encouraged when posting information regarding designated bicycle routes.

The protocol for guide signs posted for benefit of general traffic indicates that the preferred posting of Directional Assemblies is the near right corner of the intersection, with the far right corner as a second option (using oversized signs), and allows for use of other locations if neither the near nor far right location is practical, based on engineering judgment to determine the "best possible combination of view and safety."[14] At intersections where Directional assemblies for both general traffic and bicyclists are needed and are posted separately, Directional Assemblies for bicycle routes should be given priority for near corner placement, as the signs of the bicycle-oriented assembly may be smaller due to MUTCD sign size standards.

Directional assemblies could also be supplemented by word, symbol, and/or arrow markings –either in the bike lane or shoulder, or in any shared lane from which a bicyclist may

[13] The application of this standard to bike route assemblies was confirmed in the previously cited correspondence with FHWA, the full transcript of which is included as Appendix C.

[14] MUTCD 2D.22 (03).

be turning. An appropriate technical committee of NCUTCD could evaluate the manner in which use of such markings might be used at intersections.

## MUTCD Compliant Guidance Text

Directional assemblies shall be placed at intersections where continuing designated routes turn, or where additional designated routes are intersected or joined. Directional assemblies shall indicate the turn of the continuing route and the directions of the joined or intersecting routes. Directional assemblies should indicate the straight through movement of the continuing route only when there are other directional assemblies showing turns necessary to follow joined or intersecting routes (through movements are otherwise only confirmed by optional Confirmation Assemblies after the intersection).

Directional assemblies shall consist of the appropriate Route signs, supplemented by Directional Arrow auxiliary signs (M6-1, 2, 3, 4, 5, 6), and Cardinal Direction auxiliary signs (M3-1, 2, 3, 4), if needed. Minimum sizes of these auxiliary signs, when used for bicycle route assemblies, are indicated in MUTCD Table 9B-1.

Directional assemblies should ordinarily be placed at the near right corner of the intersection, but may be placed in other highly visible locations if the near right corner is not practical at a particular intersection.

Directional assemblies for bicyclists may be located in a common posting with Directional assemblies for general traffic routes, provided that they do not confuse road users. If Directional Assemblies for bicyclists are added to an existing Directional assembly for general traffic, then the whole grouping must be adjusted to ensure compliance with minimum height and clearance standards of the MUTCD.

If Directional assemblies for bicyclists are posted separately from Directional assemblies for general traffic, consideration should be given to placing Directional assemblies for bicycles on the near right corner, because of their smaller size, even if that requires placing Directional assemblies for general traffic on the far right corner or in another location.

## Recommendations for Further Research or Action

1. An appropriate technical committee of NCUTCD to clarify guidance regarding posting numbered bike route signs on common post with numbered routes for general traffic.
2. An appropriate technical committee of the NCUTCD could evaluate the manner in which use of word, symbol, and/or arrow markings might be used at intersections.
3. An appropriate technical committee to consider or making applicability of Standard 2D.32 (01) to bike routes explicit if the current requirement is deemed appropriate.

## CONFIRMING ASSEMBLIES

Confirming assemblies inform bicyclists of which route they have chosen as they depart the intersection, either confirming that they successfully made their intended maneuver, or letting them know if they are on a different route so that they may correct the situation in a timely manner.

Confirming assemblies are recommended on the departing legs of all intersections of designated bike routes.


**Figure 13: Confirming Assemblies**

### MUTCD Compliant Guidance Text

Confirming assemblies should be used on the departing legs of intersections of designated bike routes.

Confirming assemblies should consist of the route sign for the designated route, supplemented by a Cardinal Direction auxiliary sign (M3-1, 2, 3, 4). Minimum sizes for these auxiliary signs are indicated in MUTCD Table 9B-1. When posted independently of Confirming assemblies for general traffic, Confirming assemblies should be placed 25 to 100 feet beyond the intersection of designated routes. Example Confirming assemblies for bike routes are shown in Figure 13.

Confirming assemblies for bicyclists may be located in a common posting with Confirming assemblies for general traffic routes, provided that they do not confuse road users. If Confirming Assemblies for bicyclists are added to an existing Confirming Turn assembly for general traffic, then the whole grouping must be adjusted to ensure compliance with minimum height and clearance standards of the MUTCD.

If Confirming assemblies are used on roadways with designated bike lanes or where bicyclists are directed to use the shoulder, they may be supplemented by pavement word and symbol markings, consisting and an elongated route shield referencing the relevant route(s) being confirmed and text indicating the appropriate cardinal direction(s).

### Recommendations for Further Research or Action

1. An appropriate technical committee of NCUTCD to clarify guidance regarding posting numbered bike route signs on common post with numbered routes for general traffic.
2. An appropriate technical committee of NCUTCD to propose revision to MUTCD to specifically allow use of pavement word and symbol markings to supplement Bicycle Route Confirming Assemblies.

## DISTANCE SIGNS

Distance signs provide information to the traveler regarding the distance to upcoming communities or other destinations of interest to travelers (the exact language in the MUTCD is

"significant geographical identity"). The typical route assembly illustration in the MUTCD shows distance signs being used on the departing legs of intersections.

Bicycle specific distance-only signs (i.e., reduced size D2-1, 2, or 3 signs with bicycle symbols) are not presently provided for in the MUTCD. Full size distance signs could be-used along bicycle routes where they are not otherwise posted. Distance signs may show up to three destinations. If the designated bicycle route is the most important routing along the given roadway (and thus the rationale for placing a distance sign), but a full size distance sign is used, the existing guidance for selecting place names to be indicated may select sites at distances greater than might be most useful to bicyclists.

A bicycle-scale version of the D2 series sign should be considered for indicating distances to bicycle specific destinations along a route departing an intersection or locality, to allow for posting of distance information scaled to bicycling travel and for use on shared use paths. For example, the guidance in section 2D.41 recommends that the top position on a distance sign be "the next place on the route having a post office or railroad station, a route number or name of an intersected highway, or any other significant geographical identity." Certainly distances to intersecting designated bike routes are of interest and should be considered for positing on a bicycle scale sign. But a significant geographical identity for bicycle travel may be the next named place where water may be procured or a rest may be taken, which could be well below the scale of a place with a post office or railroad station. The option to include a bicycle-line on a multi-line Distance assembly otherwise intended for general traffic should also be considered.

Distance signs are recommended in the following locations:

- on the departing legs of rural intersections of designated bike routes,
- after overlapping routes depart one another,
- as a designated route passes the developed margin of a community,
- after passing the first named place on a previous Distance sign on the same continuing route.

If used after an intersection of designated bike routes, Distance signs should be placed approximately 300 feet after the intersection, per existing guidance for Distance signs for general traffic. If bicycle-specific signs within the D2 series are developed, then a shorter typical distance, such as 150 feet, would be appropriate for bicycle-specific applications.

Sizes for Distance signs are prescribed in Table 2D-1 of the MUTCD. If bicycle-specific Distance signs are approved in the future, they may well be smaller than the existing sizes indicated for general traffic use.

## MUTCD Compliant Guidance Text

There is not presently an approved Distance sign for bicycle-specific use (i.e. bearing a bicycle emblem and of a reduced size).

If the presence of a designated U.S., State or local bicycle route is the primary precipitating factor for installing a Distance sign along a given roadway (e.g. the bike route to destination is routed on different roadways than the primary route for general traffic), or the route is common to all modes but is not on a numbered U.S. or other route which would

normally display Distance signs, a full size Distance sign may be used for benefit of all travelers including bicyclists on the designated bicycle route. See Table 2D-1 of the MUTCD for minimum sizes of Distance signs.

Distance signs may be installed in the following locations:

- on the departing legs of rural intersections of designated bike routes,
- after overlapping routes depart one another,
- as a designated route departs the developed margin of a community,
- after passing the first named place on a previous Distance sign on the same continuing route.

It should be noted that the MUTCD guidance on Distance signs recommends that the top position on a distance sign be "the next place on the route having a post office or railroad station, a route number or name of an intersected highway, or any other significant geographical identity."[15] These destinations may be at distances greater than what is useful information to bicyclists.

If used after an intersection of designated bike routes, Distance signs should be placed approximately 300 feet after the intersection. [16]

### Recommendations for Further Research or Action

1) An appropriate technical committee of NCUTCD to consider proposing 1-, 2-, and 3-line bicycle specific D2-series signs (i.e., smaller scale and bearing a bicycle symbol), and if a bicycle specific line could be added to a multi-line Distance sign for general traffic. Guidance should include a bicycle-specific logic for selecting destinations listed on Distance signs and a posting location based on bicycle travel characteristics.

## REASSURANCE ASSEMBLIES

Reassurance assemblies are used to keep travelers informed of their routes.

Reassurance assemblies are composed of the same elements as Confirming assemblies: the Route sign for the designated bike route, supplemented by a Cardinal Direction auxiliary sign (M3-1, 2, 3, 4).

Reassurance assemblies should be placed at appropriate intervals to communicate the continuing route between intersections at which any of the previously described assemblies would appear. In an urban area, that could be as close as every three blocks, and as leaving the developed margin of a community. In rural areas, Reassurance assemblies should be placed at

[15] MUTCD 2D.41 (04)
[16] As there is presently no bicycle-specific Distance sign, this distance is the one indicated for purposes of informing general traffic in Section 2D.42 (02) of the MUTCD. The distance recommended for a future bicycle-specific sign may be shorter, but this longer distance should not seriously inconvenience bicyclists.

least once every five miles, or at the midpoints between named places between five and ten miles apart.[17]

Reassurance assemblies are recommended for U.S. and other designated bike routes.

## MUTCD Compliant Guidance Text

Reassurance assemblies should be used at regular intervals along continuing U.S. and other designated bike routes when there has not been an intersection of bike routes which necessitates the use of Confirming assemblies.

If posted independently of Reassurance assemblies for general traffic, locations to consider posting reassurance assemblies for bike routes include the following:

- At intervals of 3-5 blocks in urban areas;
- At intervals no greater than five miles in rural areas, or at the midpoint between named places, whichever is shorter;
- Within 150 feet of passing a major roadway intersection;
- Departing highway rest areas and destinations that serve as rest areas for bicyclists (e.g. parks with restroom facilities, picnic tables, water, etc.);
- When leaving the municipal limits or developed margin of a community.

Reassurance assemblies should consist of the route sign for the designated route, supplemented by a Cardinal Direction auxiliary sign (M3-1, 2, 3, 4). Minimum dimensions for the Cardinal Direction Auxiliary signs for bike route application are indicated in MUTCD Table 9B-1.

Reassurance assemblies for bicyclists may be located in a common posting with Reassurance assemblies for general traffic routes, provided that they do not confuse road users. If Reassurance Assemblies for bicyclists are added to an existing Reassurance assembly for general traffic, then the whole grouping must be adjusted to ensure compliance with minimum height and clearance standards of the MUTCD.

If Reassurance assemblies are used on roadways with designated bike lanes or where bicyclists are directed to use the shoulder, they may be supplemented by pavement word and symbol markings, consisting of an elongated route shield referencing the relevant route(s) being reassured and text indicating the appropriate cardinal direction(s).

## Recommendations for Further Research or Action

1. An appropriate technical committee of NCUTCD to propose revision to MUTCD to specifically allow use of pavement word and symbol markings to supplement Bicycle Route Reassurance Assemblies, and to also consider use of pavement word and symbol markings for reassurance purposes and independently of sign assemblies and at more frequent intervals.

[17]Recommended intervals for Reassurance assembly placement is based on the shorter distances of the recommended ranges for general traffic reassurance assemblies in the TCDH (3 blocks in urban, 5 miles in rural). 5 mile intervals would approximate 30 minutes of travel for a slower-moving bicyclist.

## SUMMARY GRAPHICS

Figures 14 and 15 illustrate a bike route intersection scenario, first as could be done under existing guidance (Figure 14) and then as might be done if changes recommended in this report are enacted (Figure 15).

In both figures, two U.S. Bike Routes and a numbered regional bike route pass through the same intersection. For the sake of simplicity, no information about routes for general traffic is shown in the illustrations. From the "northbound" approach (coming from the bottom page) the bicyclist needs to be made aware of the following routings:

- Straight through Numbered Route (USBR 18);
- Junction of a Numbered Route along Numbered Route (USBR 79 intersecting USBR 54); and
- Turning Numbered Route (Regional BR 54).

Figure 14 shows options available under current guidance.

The signs in the "Required" column are signs that are required if USBR application is to be consistent with the route signing direction given in Section 2D of the MUTCD:

- Advance information about the Junction with USBR 79;
- Advance information about the right turn to stay on Regional BR 54; and
- Information at the intersection showing the turns to join USBR 79 and Regional BR 54.

The additional signs in the "Optional" column (shown with the required signs to illustrate the full groupings) are signs that are not required but consistent with application as allowed by the MUTCD:

- Advance information confirming the through movement to remain on USBR 18;
- Advance information alerting the turns necessary to join USBR 79;
- A Bicycle Destination sign naming the destinations that may be reached via various movements from the approaching intersection (with optional distances); and
- Confirming signs appropriate to each route departing the intersection.

The "Consider as Alternative" column shows three signs, all of which are believed to be consistent with the MUTCD. The design of the alternative signs provides no informational advantage over the use of the Advance Turn Assembly combined with the Bicycle Destination sign, but it would eliminate one sign assembly. With the inclusion of distance information, or if Distance signs (D2 series signs) are provided after the intersections (which may be present for general roadway traffic), no information would be lost to the cyclists. As the Standards are currently applied, these combined signs would not remove the required Junction and Advance Route Turn signs from the sequence, but they could consolidate the information presented on the optional signs. The three alternative sign options are as follows:

- A Bicycle Destination sign with route shields;
- A Bicycle Destination sign with route shields, laid out in the manner of a D1-1e sign; and
- A Bicycle Destination sign with route shields, laid out in the manner of a D1-1e sign, with distances.

Figure 15 shows a potential scenario of reduced signs that could be possible if several of the recommendations of this report to make Junction and Advance Route Turn assemblies optional for bike route applications are enacted. The following signs could convey much of the same information via fewer signs:

- A consolidated Bicycle Destination sign, with route shields and distances, conveys the information presently conveyed by Junction and Advance Route Turn assemblies;
- Directional assemblies are still placed at the intersection; and
- Confirming signs appropriate to each route are still recommended departing the intersection.

The only required signs in this potential future scenario would be the Directional Assemblies necessary to indicate a turn of a continuing route or the directions needed to join an intersected or beginning route.

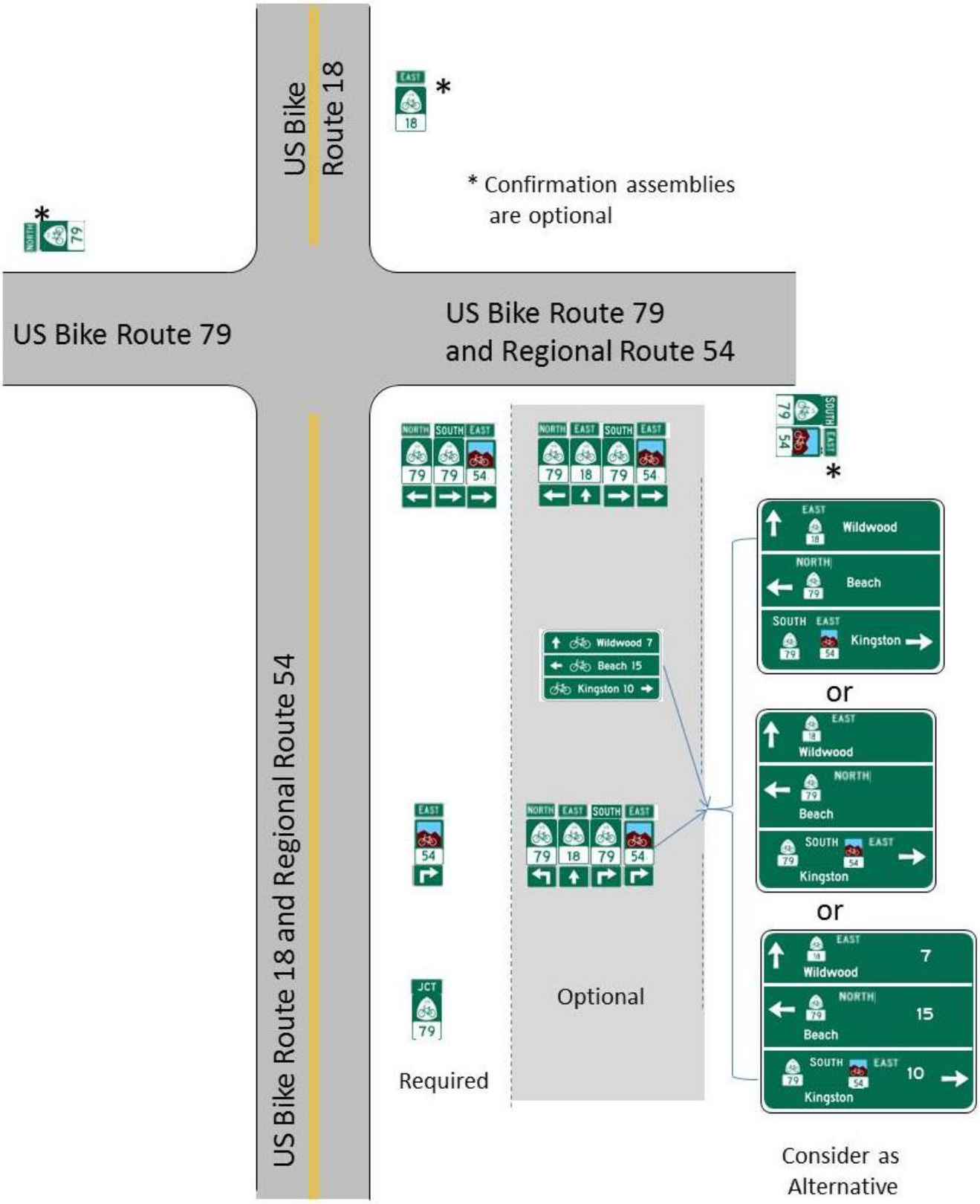


**Figure 14: Signing Options Consistent with Existing Guidance**

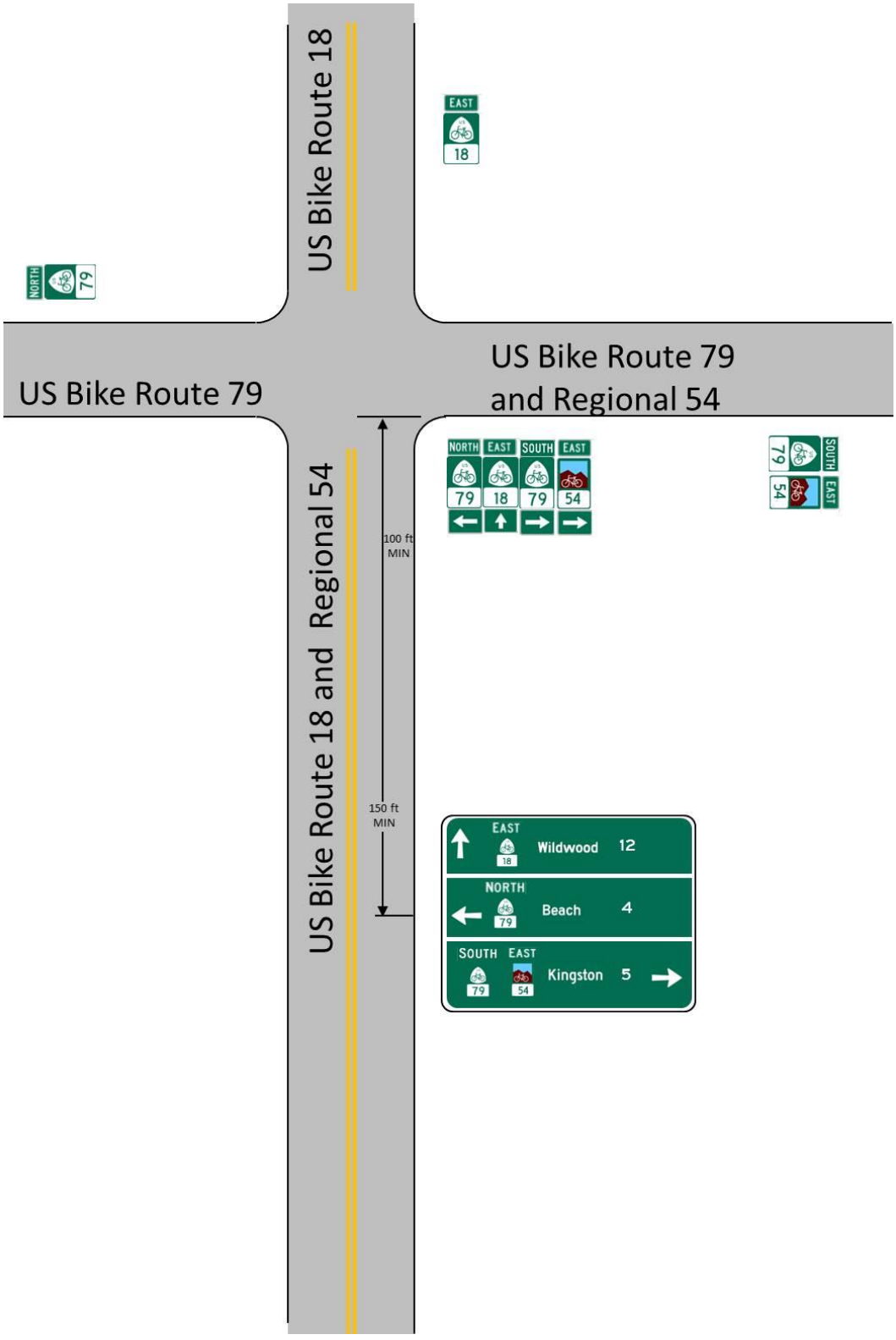


**Figure 15: Potential Reduced Signing with Revised Guidance**

# Appendix A: Review of Existing Federal, State, Local, and International Guidance.

## General Observations

Most of the route signing guidelines reviewed suggest including signs in advance of junctions, at junctions, and shortly after junctions. Occasional signs along the route to reassure bicyclists that they are still on the correct facility are also recommended. Given this similarity in the recommended placement of signs, the potential for interagency agreements and sign proliferation is similar for all the options.

## Federal U.S. Bicycle Route Signing Guidance

The existing U.S. Bicycle Route Signing Guidance is contained within the *Manual on Uniform Traffic Control Devices*[18] (MUTCD) and the *Traffic Control Devices Handbook*[19] (TCDH).

According to the TCDH, it is important to provide the following information at appropriate locations:

- advance notice of a turn, change in alignment , or decision point (and Advance Route Turn assembly);
- directional guidance to relevant destinations (Directional assembly);
- confirmation the selected route is correct (Confirming assembly); and
- reassurance the traveler is following the correct route to the desire destination (Reassurance assembly).

This review will address signing for each of the above locations. Where there is not bicycle-specific information in the MUTCD or TCDH, general guidance will be applied.

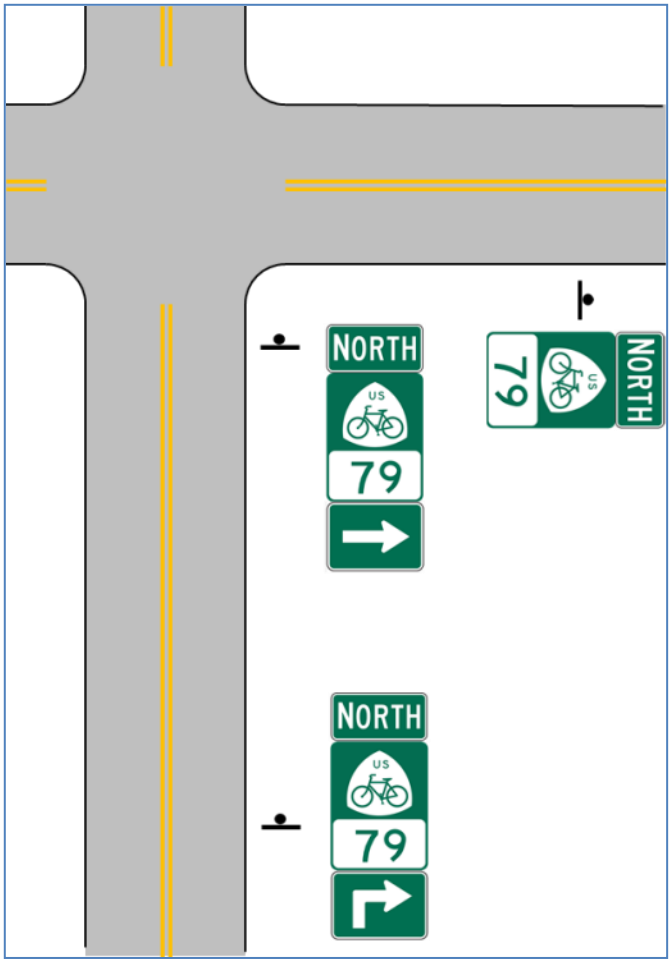


**Figure 1 Basic U.S. Bicycle Route Signing at an Intersection (for one direction of travel only)**

[18] Federal Highway Administration, *Manual on Uniform Traffic Control Devices*, FHWA, Washington, DC, 2009.
[19] Institute of Transportation Engineers, *Traffic Control Devices Handbook*, ITE, Washington, DC, 2001.

The TCDH suggests that Advance Route Turn, Directional and Confirming assemblies would be used for a U.S. Bicycle Route. Such and application for a single route at a junction would be as shown in Figure 1.

The MUTCD directs that for multiple routes, multiple assemblies should be mounted in groups on a common support (Section 2D.29). Applying roadway signs hierarchies to bike sign assemblies: U.S., State, regional routes, and local routes would be mounted in that order from the left in horizontal arrangements and from the top in vertical arrangements. Subject to this order of precedence, route signs for lower-numbered routes shall be placed at the left or top. Two examples of Directional assemblies are provided in Figure 2[20,21].

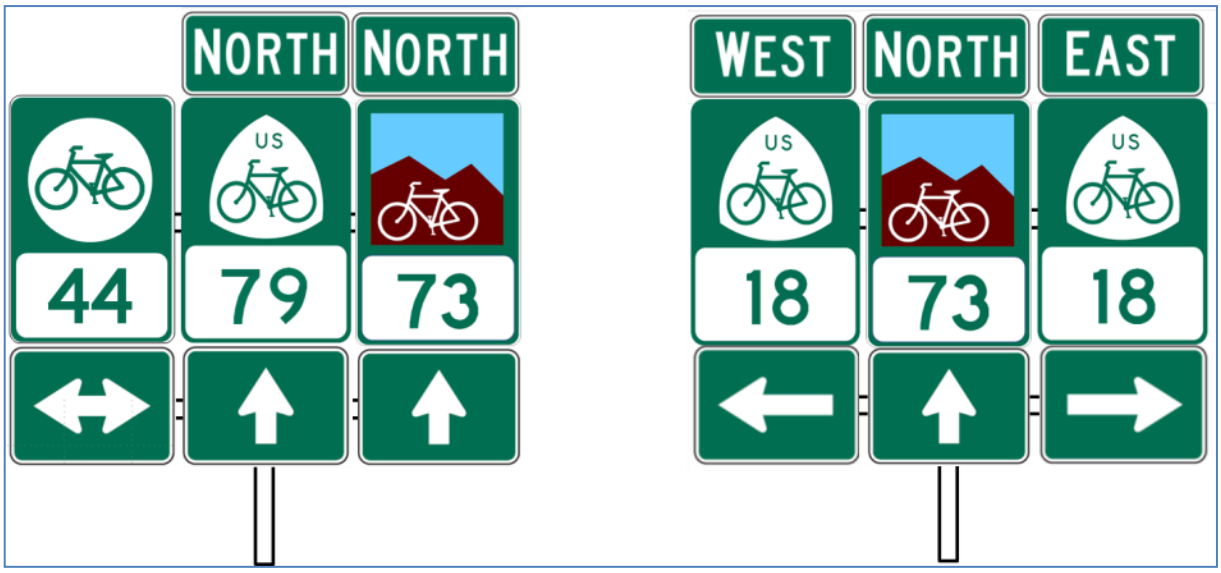


**Figure 2 Directional Assemblies for Multiple Routes**

Given the required sign dimension for bike route signs on roadways, the assemblies shown in Figure 2 would measure 54 in x 39 in. Directional assemblies for Multiple Routes

Reassurance assemblies would be placed at periodic locations along the route. The MUTCD does not provide quantitative guidance on the spacing of Reassurance assemblies. It states,

> "*If used, Reassurance assemblies should be installed between intersections in urban areas as needed, and beyond the built-up area of any incorporated city or town.*

[20] The FHWA has issued an interim approval for a revised M1-9 sign design. This revised sign design is used in the figures in this document.
[21] The National Committee on Uniform Traffic Control Devices Bicycle Technical Committee has developed a proposal to revise design of M1-8 sign to allow for State symbols and pictographs. The proposed sign designs are shown here.

> *Route signs for either confirming or reassurance purposes should be spaced at such intervals as necessary to keep road users informed of their routes." (2D.34)*

The TCDH provides more specific recommendations:

> *"Reassurance assemblies should also be located at intervals of 5 to 10 mi. in rural areas and every three to five blocks in urban areas as needed to keep the driver informed." (pg. 144)*

*Evaluation of Existing U.S. Bicycle Route Signing Recommendations*

These recommendations represent the existing guidance for signing the U.S. Bicycle Route System and are consistent with the existing MUTCD and TCDH guidance.

"Where U.S. Bicycle Routes are not on State maintained roads, coordination will be needed with the maintaining authority." There is potential for the proliferation of signs. How much proliferation of signs occurs will be a function of how often the route changes roadways, the frequency of bicycle route junctions, the frequency roadway route junctions, and the frequency of reassurance assemblies.

Excessive numbers of signs at a single junction might be a more significant problem. An example of a junction of bicycle and roadway routes is provided in Figure 3.

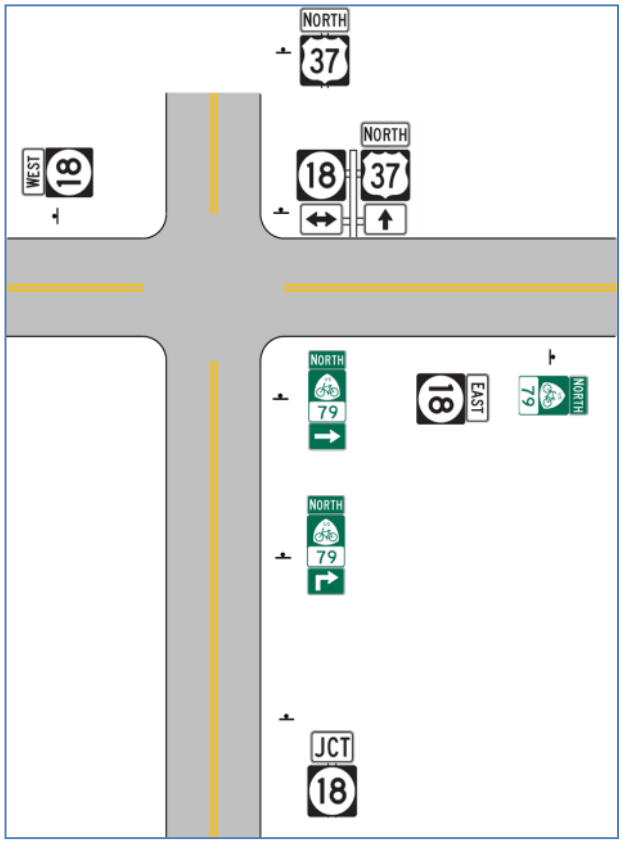


**Figure 3 Overlapping Bicycle and Roadway Routes at a Junction (for one direction of travel only)**

If those installing the signs decide combining signs would not confuse road users, combined assemblies could be used. A Directional Assembly and a Junction Assembly have been depicted in Figure 4. The use of the Combination Junction Sign (M2-2) sign appears to be allowed by the MUTCD. This has also been shown in Figure 4.

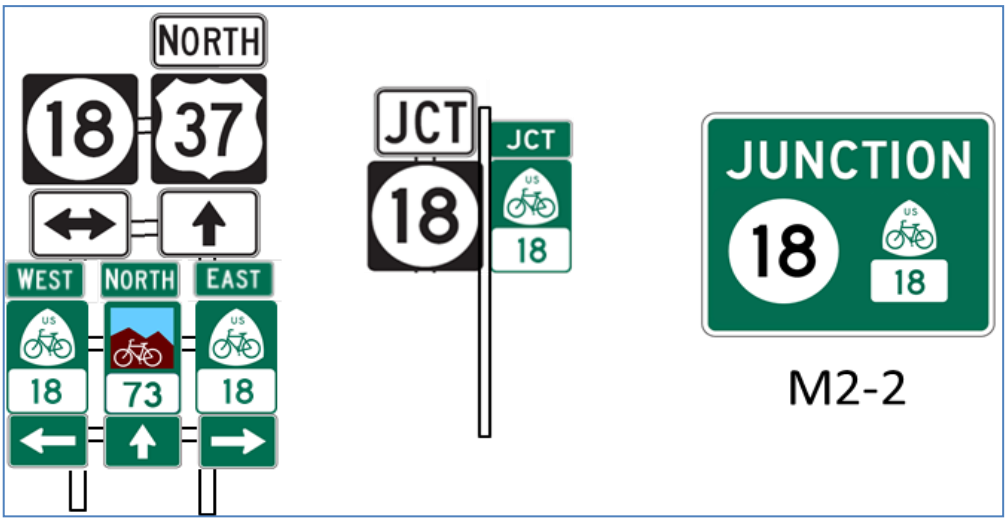


**Figure 4 Combined Sign Assemblies**

If it is determined that this approach is acceptable, it has two advantages. It would reduce the proliferation of sign assemblies and it would reduce costs.

## Destination and Distance Signs

Destination and distance signs are typically not signed on the same assemblies as route signs for designated (numbered or named) routes.

While not addressed in Part 9 of the MUTCD, Section 2D.36 of the MUTCD provides the following option:

> *"Route shields and cardinal directions may be included on the Destination sign with the destinations and arrows."*

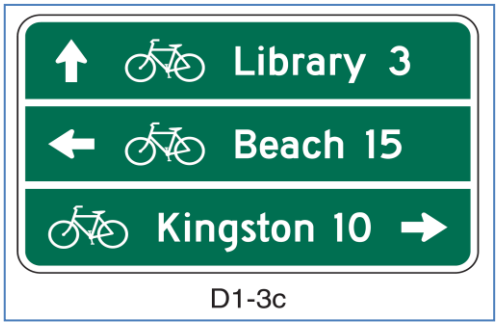


**Figure 5 Example of a Destination Distance Sign from the MUTCD**


**Figure 6 Modified Destination Distance Sign with Route Shield**

If one were to apply this option to the D1-3c for bicycles the result might be as shown in Figure 6. The MUTCD states that for general use the minimum shield size is twice the letter height or not less than 18 inches. Two-inch lettering is specified for this type of sign.[22] The shield in the Figure 6 sign is twice the height of the capital letters. Figure 7 shows a route sign with multiple symbols for one direction.

When describing the use of the


**Figure 7 Destination Sign with Multiple Route Markers**

[22] FHWA, Standard Highway Signs 2012 Supplement, FHWA, Washington, DC, 2012.

D-1 series signs, Directional assemblies are not included in the discussion. In addition, the Directional assembles are not included in the bicycle guide signing figures (Shown in Figure 8).

The NCUTCD BTC has produced recommendations for "Revised M1-8 and M1-8a Numbered Bicycle Route Signs." Within the discussion of pictographs for use on signs, it includes the guidance text"

> *"The pictograph or legend should incorporate a bicycle symbol or word message that clearly identifies the route as a bicycle route or pathway."*

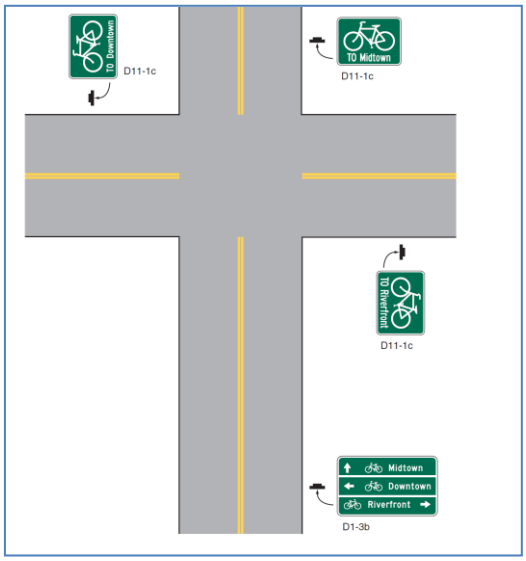


**Figure 8 Example of Bicycle Guide Signing Figure from the MUTCD**

Numerous trail and greenway logos from around the country do not include such a symbol. This suggests two options, incorporation of a bicycle symbol over the logo – the diversity of palettes used on logos may make recognition of the symbol difficult. An alternative would be the inclusion of a bike symbol in addition to the greenway logos. Examples of trail and greenway logos, logos with bike symbols superimposed and a destination sign incorporating the bicycle symbol with logos are provided in Figure 9.


**Figure 9 Greenway and Trail Logos**

## National Association of City Transportation Officials (NACTO)

NACTO's *Urban Bikeway Design Guide* includes modified bicycle distance and direction signs for bicycles. An example is shown in Figure 10. The NACTO document provides for the mode symbol to be placed at the top of the sign and distance and time (calculated upon a 10 mph bicyclist's speed) to be listed below the destination text and arrow. The horizontal white lines separating directional information is absent from the NACTO guide signs.

The NACTO guide states that

> *"there is not standard color for wayfinding signage."*

However, and MUTCD (2D.03) standard statement says,

> *"Except where otherwise provided in this Manual for individual signs of groups of signs, guide signs on streets and highways shall have a white message and border on a green background."*

Thus, if bicycle guide signs are placed on streets or highways, there is a standard color.

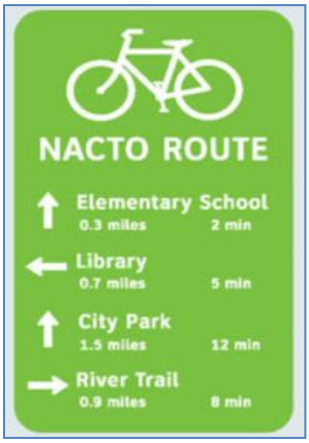


**Figure 10 Example Distance and Direction Sign from the NACTO Guide**

The NACTO guide recommends that confirmation (the author assumes this refers to Reassurance assemblies) signs should be placed every ¼ to ½ mile along off street routes or every 2 to 3 blocks along on street routes.

NACTO recommends Clearview Hwy font[23], but does not suggest a minimum letter height.

## State DOT Guidance

Most states have adopted the MUTCD. However, some have provided supplements to various sections including those referencing bicycle route signs.

### Oregon DOT Guidance

Oregon has adopted a variation on the NACTO signing recommendations. Oregon maintains the horizontal white line separating directional information. The location of the text and arrows is centered for each direction. Additionally, time to destination is provided on the signs.

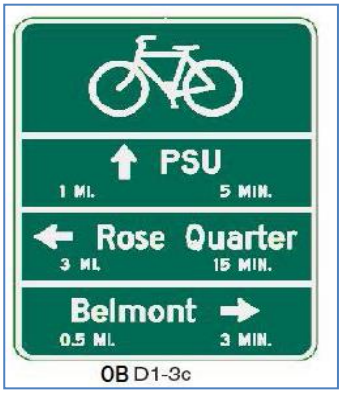


**Figure 11 Oregon Bicycle Sign**

[23] Clearview font is not the official font recommended by FHWA, and may only be used under Interim Approval. The basis of NACTO's recommendation is called in to question on the FHWA/MUTCD Frequently Asked Questions page regarding use of Clearview (http://mutcd.fhwa.dot.gov/resources/clearviewdesignfaqs/).

## Other State DOT Guidance

New York DOT has made revisions to the MUTCD specifying changes to regional and State bike route signs.
The California DOT has allowed for the placement of supplemental plaques providing route names under the D11 series of bike signs.

## Local U.S. Guidance

Most communities have not promulgated their own bicycle route design guidance. Most are similar to either MUTCD or NACTO signing guidance. The examples below represent a sampling of how communities around the US are signing bicycle routes.

## Seattle, WA

Seattle Washington uses bike routes signs similar to the MUTCD signs. Designated routes, such as the Burke Gilman Trail, are signed with a sign of similar design to the MUTCD M1-8. Direction and distance information is provided on signs similar to MUTCD D1-1c series signs.


**Figure 12 Example Sign from Seattle**

No information is provided for the frequency of reassurance assemblies.

## Oakland, California

Oakland, California has developed its own Sign Guidelines for Bicycle Wayfinding Signage. Oakland has specified a modified Bike Route sign to be placed over destination or distance signs (destination and distance are not shown on the same sign) that do not include the bicycle symbol. Oakland also specifies a 2-inch font for text. Several logos are allowed on the signs. These include a 3.2" x 3.2" pictograph for the Bay Trail and a 2" x 3.12 symbol for the Bay Area Parks. An example is shown in Figure 13.


**Figure 13 Sample Oakland Bike Route Sign**

Oakland recommends confirmation (reassurance) signs be placed every ½ to 1 mile along bike routes.

## Eugene, Oregon

Eugene, Oregon generally follows the Oregon MUTCD. However Eugene allows for a maximum of three destinations per sign and does not require the time to destination on the signs. Additionally, the lines are justified; however all arrows are shown on the right. The mode symbol is placed above the list of destination, distance, and direction information.

The Eugene design standard shows that the distance (and time if used) letters are in 1 inch font. Respondent 1 from our the Literature Review stated that "Oregon's scenic bikeways program initially used 12" x 18" signs, but subsequently increased the size of the signs due to requests….we've found that reducing sign size does not work."
The Eugene guidelines show Advance Route Turn assembly, but not a Directional assembly. This would reduce sign proliferation and costs.

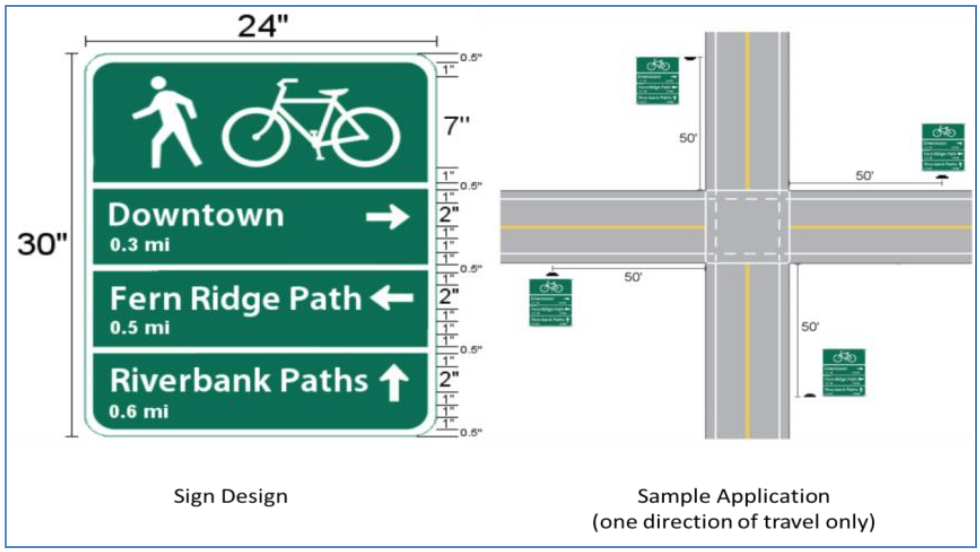


**Figure 14 Example Sign and Application, Eugene, OR.**

## Charlotte, North Carolina

Charlotte, North Carolina has adopted the MUTCD guidance. Charlotte has multiple numbered routes and has signed them with the M1-8a. When two routes meet, two signs are installed.


**Figure 15 Charlotte Bike Route Signs**

# International Guidance for Signing Bike Routes

## Canadian Guidance

Canadian guidance with the exception of several general plans, we were unable to access many Canadian guidance documents. Signing formats appear to vary across provinces. The signing methods range from route assemblies that include individual route signs for each route to signs with multiple routes shown on the same sign.


Toronto (ON)

La Route Verte
(Sherbrooke, QC)

British Columbia
(standard signs manual)

**Figure 16 Canadian Bike Route Sign Examples**

## Non-North American Guidance

Guidance from Europe, Australia, and New Zealand represents variations on pennant (or finger post) style sign assemblies for Directional assemblies and rectangular signs for Advance assemblies, Confirmation, and Reassurance assemblies.

Figure 16 shows examples of fingerboard signs for bike route Directional assemblies. The "6" within the circle of stars represents the international EuroVelo Route. The other pictograms on or below the fingerboards represent national or regional routes.

The fingerboard signs are not a standard length; they are cut to a length appropriate for the length of the place names.

Fingerboard sign Directional assemblies are intended to be installed with multiple signs on a single post. Signs can be placed back to back to serve opposite approach directions. Examples of stacked fingerboard signs are shown in Figure 17.

London Cycling Design Standards recommend confirmation signing every ½ mile.


**Figure 17 International Fingerboard Signs for Bike Routes**


**Figure 18 Stacked Fingerboard Signs**