

Bicycle-in-Lane Sign Use and Comprehension

Requested by

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The Caltrans Division of Research and Innovation (DRI) receives and evaluates numerous research problem statements for funding every year. DRI conducts Preliminary Investigations on these problem statements to better scope and prioritize the proposed research in light of existing credible work on the topics nationally and internationally. Online and print sources for Preliminary Investigations include the National Cooperative Highway Research Program (NCHRP) and other Transportation Research Board (TRB) programs, the American Association of State Highway and Transportation Officials (AASHTO), the research and practices of other transportation agencies, and related academic and industry research. The views and conclusions in cited works, while generally peer reviewed or published by authoritative sources, may not be accepted without qualification by all experts in the field.

Executive Summary

Background

Caltrans is seeking Federal Highway Administration (FHWA) approval to use a Caltrans-designed yellow warning sign advising drivers that bicycles are likely to be in the traffic lane. (An example of this sign is included in **Next Steps** on page 2 of this report.) Prior to approved use of the warning sign, Caltrans is required to research drivers' understanding of and response to the sign. To obtain funding for further research, Caltrans needs to be aware of any comparable signs already in use by other states and of any studies that have been undertaken to ascertain the effectiveness of such a sign—both in driver comprehension and in achieving safety goals. The purpose of this Preliminary Investigation is to demonstrate due diligence in identifying completed studies and research of these issues.

Summary of Findings

We gathered information in three topic areas related to the implementation of bicycle warning signs:

- National Guidance.
- State Practices and Guidance.
- Research.

National Guidance

FHWA's 2009 Manual on Uniform Traffic Control Devices (MUTCD) does not offer a warning sign exactly meeting this need, but does provide a regulatory sign indicating that bicycles are legally allowed in the lane. The MUTCD also allows other warning signs such as the Bicycle Warning sign and the SHARE THE ROAD supplemental plaque.

State Practices and Guidance

We have provided a representative sampling of state documents describing signage (and in some cases, pavement markings) for use in situations where bicycles will be in traffic lanes. These typically include the Bicycle Warning sign and SHARE THE ROAD plaque. We were unable to locate any use of the new design being considered by Caltrans or another sign designed to fit the exact purpose of that sign.

Research

A North Carolina study of SHARE THE ROAD signs concluded that the plaque was not effective. Researchers recommended using an alternative “Coexist” design or the Bicycle Warning sign without the plaque.

Gaps in Findings

A review of online documentation from other states did not produce other designs for a warning sign fulfilling this function. Similarly, studies of the effectiveness of such signs were not found.

Next Steps

Below is an image of the proposed yellow warning sign. New testing would be required to gauge the readability and safety effectiveness of the sign.



National Guidance

Manual on Uniform Traffic Control Devices, Federal Highway Administration, 2009.

The FHWA sets signage policies in the MUTCD. Chapter 9B, Signs, includes relevant sections about bicycles in the roadway:

Section 9B.06 Bicycles May Use Full Lane Sign (R4-11)

<http://mutcd.fhwa.dot.gov/htm/2009/part9/part9b.htm#section9B06>

The MUTCD does not offer a warning sign like the proposed sign, only the Bicycles May Use Full Lane regulatory sign (R4-11), shown in Figure 9B-2 at

<http://mutcd.fhwa.dot.gov/htm/2009/part9/part9b.htm#figure9B02>.

Section 9B.18 Bicycle Warning and Combined Bicycle/Pedestrian Signs (W11-1 and W11-15)

<http://mutcd.fhwa.dot.gov/htm/2009/part9/part9b.htm#section9B18>

The MUTCD includes a Bicycle Warning sign (W11-1), shown in Figure 9B-3, which “alerts the road user to unexpected entries into the roadway by bicyclists, and other crossing activities that might cause conflicts.” Though this sign is typically used at bike crossing points, this use is not indicated in the MUTCD; the sign merely cautions drivers to watch for bicycles. This sign can be viewed at

<http://mutcd.fhwa.dot.gov/htm/2009/part9/part9b.htm#figure9B03>.

Section 2C.51 SHARE THE ROAD Plaque (W16-1)

<http://mutcd.fhwa.dot.gov/htm/2003r1/part2/part2c.htm#section2C51>

A supplemental plaque has been approved to augment the Bicycle Warning sign:

In situations where there is a need to warn drivers to watch for other slower forms of transportation traveling along the highway, such as bicycles ... a SHARE THE ROAD (W16-1) plaque ... may be used.

This sign, shown in Figure 2C-11, can be viewed at <http://mutcd.fhwa.dot.gov/htm/2003r1/part2/part2c.htm#figure2C11>.

Bicycle Facilities and the Manual on Uniform Traffic Control Devices, Planning, Environment & Realty Program, Federal Highway Administration, October 6, 2011.

http://www.fhwa.dot.gov/environment/bikeped/mutcd_bike.htm

This FHWA web site lists various bicycle facilities along with their status in the MUTCD and whether FHWA experiments are in progress. Some of the bicycle facilities listed in the table and their status follow:

- **Shared bike lanes and right turn lanes:** Can be implemented at present time if shared lane markings are used, but currently is experimental if any other pavement markings are used. FHWA experiments are in progress.
- **Shared lane markings:** Can be implemented at present time.
- **Defining orange pavement markings for temporary traffic control usage to draw attention to the changed conditions, including for bike lanes, pedestrian crosswalks, yield markings, etc.:** Not allowed by the MUTCD. No experiments are being conducted regarding this treatment.

State Practices and Guidance

Maryland

Maryland SHA Bicycle and Pedestrian Design Guidelines, Maryland State Highway Administration, undated.

<http://www.sha.state.md.us/OOTS/Chapter%204%20-%20Other%20On-Road.pdf>

Chapter 4 of the Maryland SHA Bicycle and Pedestrian Design Guidelines recommends SHARE THE ROAD warning signage, which is MUTCD Bicycle Warning sign W11-1 with a SHARE THE ROAD plaque below. It also allows for shared lane pavement marking.

New Jersey

New Jersey Bicycling Manual, New Jersey Department of Transportation, 2011.

<http://www.state.nj.us/transportation/commuter/bike/pdf/bicyclingmanual.pdf>

Page 51 of the New Jersey Bicycling Manual shows the types of warning signs used in the state for bicycle facilities. These include the Bicycle Warning sign and the SHARE THE ROAD plaque as well as shared lane pavement markings (see page 53 of the manual).

New York

New York State Supplement to the Manual on Uniform Traffic Control Devices for Streets and Highways, New York State Department of Transportation, 2011.

<https://www.nysdot.gov/divisions/operating/oom/transportation-systems/repository/B-2011Supplement-adopted.pdf>

This supplement mentions Section 9B.06, Bicycles May Use Full Lane Sign (R4-11), of the MUTCD 2009 edition, but on page 185 specifies that:

... the R4-11 sign shall not be used in New York, as its message is not an accurate reflection of Section 1234 of the New York State Vehicle and Traffic Law, and could mislead inexperienced bicyclists into occupying inappropriate, and unsafe, positions within a roadway. On roadways where space is limited and interactions between motorists and bicyclists have proven problematic, it is preferable to either provide positive guidance to bicyclists in the form of Shared Lane Markings (see Section 9C.07) and/or warning to motorists in the form of the SHARE THE ROAD (W16-1P) plaque (see Section 2B.19).

North Carolina

Share the Road Signing Program, Division of Bicycle and Pedestrian Transportation, North Carolina Department of Transportation, undated.

<http://www.ncdot.org/bikeped/safetyeducation/signing/>

From the web site: The North Carolina Department of Transportation Division of Bicycle and Pedestrian Transportation first installed “Share the Road” warning signs along designated bicycle routes in 1987. The design chosen utilized an approved yellow and black diamond-shaped bicycle warning sign (W11-1) with a supplementary “Share the Road” plaque. In 2000, the Secretary of Transportation decided to use a reflectorized bright yellow/green version of the sign to increase visibility. This design was adopted as a national standard in an update to the MUTCD in the 1990s.

Oregon

Sign Policy and Guidelines, Traffic Management Section, Project Development Branch, Oregon Department of Transportation, 2007.

http://www.oregon.gov/ODOT/HWY/TRAFFIC-ROADWAY/docs/pdf/english_chapter_8.pdf?ga=t

This document is a combination of State of Oregon revised statutes, administrative rules, FHWA rules and guidelines, and engineering judgment. Warning sign use is discussed in Chapter 8, Section 9B.17, Bicycle Warning Sign (W11-1):

The Bicycle Warning Sign (W11-1) may be used to advise motorists of the possible presence of bicycles on the roadway. The appropriate rider (“XING”, “ON ROADWAY”) should be included with all bicycle warning signs to indicate where the bicycles are likely to be encountered.

Active Bicycle Warning Signs, File Code TRA-16-04-19-01, Traffic Management Section, Traffic Engineering Services Unit, Oregon Department of Transportation, May 24, 2001.

http://www.oregon.gov/ODOT/HWY/TRAFFIC-ROADWAY/docs/pdf/active_warning.pdf?ga=t

This document summarizes the application of active warning signs for bicycles by other agencies—including evidence of their effectiveness and guidelines for installation. Researchers didn’t find any reference to the effectiveness of such signs in the literature, but input from an ITE survey found that the Colorado Department of Transportation and the Nevada Department of Transportation both had—at one location each—a warning sign with flashers placed at the beginning of a tunnel or canyon and activated by a push button.

Vermont

Pedestrian and Bicycle Facility Planning and Design Manual, Vermont Agency of Transportation, 2002.

<http://www.511vt.com/ProgDev/Documents/LTF/FinalPedestrianAndBicycleFacility/Chap8.pdf>

Guidance for using Bicycle Warning and SHARE THE ROAD signs begins on page 8-13 of the manual.

Washington

WSDOT Design Manual, Report No. M 22.01.07, Washington State Department of Transportation, July 2010.

<http://www.wsdot.wa.gov/publications/manuals/fulltext/M22-01/1520.pdf>

Chapter 1520, Section 1520.08, Signed Shared Bicycle Roadway Design (page 5 of the PDF), states:

Signed shared roadways are shared roadways that have been identified as preferred bike routes by the posting of “Bike Route” signs. They provide connections for continuity to other bicycle facilities and designate preferred routes through high-bicycle-demand corridors. Signing shared roadways as

bike routes indicates to bicyclists that there are advantages to using these bike routes as compared with alternative routes. (Signing also alerts motorists that bicycles are present.)

Wisconsin

Wisconsin Bicycle Facility Design Handbook, Wisconsin Department of Transportation, January 2004 (with updates in 2006 and 2009).

<http://www.dot.wi.gov/projects/state/docs/bike-facility.pdf>

According to this handbook, W11-1 Bicycle Warning signs “would be used on a roadway to warn motorists of a path crossing.” (See Figure 4-66 on page 125 of the PDF.)

Research

The “Share the Road” Sign, Wayne Pein, *Bicycling Matters* (blog), April 2006.

http://www.humantransport.org/bicycledriving/library/Share_Road.pdf

This paper, written by a former researcher at the University of North Carolina Highway Safety Research Center, discusses the Share the Road combination sign and proposes that the supplemental SHARE THE ROAD plaque be eliminated because of drivers’ strong potential for misinterpreting this phrase. (“Do motorists interpret the sign to mean ‘share the lane,’ and that they are entitled to pass bicycle drivers within what is rightfully the bicyclist’s lane?”) The author suggests a W11-1 Bicycle Warning symbol alone would better address the need, if it exists at all, or a message such as “using the road,” which is not as liable to misinterpretation. However, the author argues that the benefit of any warning sign for this circumstance is highly dubious. Another option is presented in Appendix B (page 8 of the PDF)—a directive to “Coexist” written between pictures of a bicycle, car, bus and pedestrian on a yellow sign (developed by the Chapel Hill Bicycle and Pedestrian Board).