FHWA Request to Experiment
Green-Colored Bicycle Boxes, with Advanced Lane Use Signage
Dashed Bicycle Lanes on Narrow Roadways
Priority Shared-Lane Markings

Submitted by the City of Bloomington
Bloomington, Indiana
October 5, 2014

Background

The City of Bloomington, Indiana has a long history of accommodating the needs of non-motorized modes of transportation through the most safe, practical, and appropriate means available. The City is currently recognized as a Silver-rated Bicycle Friendly Community by the League of American Bicyclists with high marks for engineering and planning. As we continue to address the wide range of traveling needs of the community, challenges have become more complex as most of our infrastructure is already built-out. This greatly limits our ability to retrofit facilities to meet some standards to accommodate bicycles.

The City has successfully implemented many standard bicycle facilities that conform to current MUTCD specifications. A recent technical analysis of 27 on-street bicycle facilities projects by Burgess & Niple and Alta Planning & Design (Technical Team) identified opportunities to incorporate bicycle facilities that either comply with MUTCD standards, or in a few instances will require a request to experiment through FHWA because of the limitations in dealing with existing infrastructure in an urban context. These instances ultimately are aimed at providing safe, cost effective, and practical solutions. Specifically, these instances will require the use of green-colored bicycle boxes with advanced lane use signs, dashed bicycle lanes on narrow roadways, or priority shared-lane markings.

These few instances were carefully considered by the City and our Technical Team before facilities were identified as improvements slated for implementation. Fortunately, these few instances utilize strategies being used by many cities and therefore we are benefiting from their past efforts and modifications. Therefore, the City of Bloomington will need to seek FHWA experimentation approval for various roadway treatments on our bicycle network detailed below.

Summary of Proposed Changes

The City of Bloomington is requesting permission to experiment with green-colored bicycle boxes. The City is also requesting to install green-colored bicycle lanes per the Interim Approval for Optional Use of Green Colored Pavement for Bicycle Lanes (1A-14) 2011 MUTCD. The proposed measures are part of ongoing resurfacing projects or annual capital improvements identified in the Bikeways Implementation Plan. Currently, the following locations are utilizing green-colored pavement for bicycle lanes:

- Smith Avenue between Washington Street and College Street
- Adams Street/5th Street/ 3rd Street E/N bound bicycle lane intersection approach

The use of green-colored bicycle boxes with advanced signing and green-colored bicycle lanes is intended to increase vehicle driver awareness of bicyclists at intersections or other locations of potential conflict. They also are intended to increase compliance with

control devices and provide the safest, most visible positioning for bicyclists within the roadway. The use of dashed bicycle lanes on narrow roadways is also intended to increase vehicle driver awareness of bicyclists along narrow low-vehicle volume roadways not wide enough for standard bicycle lanes. The dashed bicycle lanes also are intended to improve bicyclist positioning within the roadway as the safest, most visible, and predictable location.

Request to Experiment

The bicycle box, also known as the advance stop line, has been used in the United States since 2000 and in Europe and Asia since the late 1990's. More and more cities are using bicycle boxes, including prominent locations such as Portland, OR, New York City, NY, and Minneapolis, MN. The city of Indianapolis, Indiana, like Bloomington hopes that our experimentation request will further the development of bicycle box standards. The City of Bloomington has implemented, without prior approval to experiment, bicycle boxes at the following signalized locations:

- 7th Street and Walnut Street (two existing)
- 7th Street and College Avenue (two existing)
- Covenanter Drive and College Mall Road (one existing)
- 3rd Street and Jordan Avenue (one existing, but green-colored treatment has not yet been installed)
- 3rd Street and Hawthorne (one existing)

The green-colored bicycle boxes connect seamlessly with the same green-colored treatment of the terminating portions of bicycle lanes approaching signalized intersections. This allows a smooth transition for bicyclists to position themselves in advance of vehicles to avoid right-hook conflicts, to better position themselves for travel through the intersection, and to reenter the bicycle lane once through the intersection. To better educate all road users about this treatment, the bicycle symbol will be painted within the bicycle box and a sign will be posted prior to the approach notifying motorists where to stop. A typical layout for these locations is included (see Exhibit 1).

The dashed bicycle lane or advisory bicycle lane is a new method being studied for locations where sharrows don't offer the best solution nor do bicycle lanes because of limitations to travel lane widths. The City of Bloomington has implemented, without prior approval to experiment or is considering, dashed bicycle lanes at the following locations:

- 7th Street between Union Street and Hillsdale Drive (existing)
- 12th Street between Walnut Street and Woodlawn Avenue (proposed)

The dashed bicycle lane offers a safe and practical solution for locations where growing numbers of bicyclists are using our local bikeways network, but approved MUTCD devices may not address various unique site and use constraints. Sharrows, when used on narrow local streets, are hindered by edge-to-edge pavement widths less than 20'. Similarly, bike lanes are not necessarily warranted for low traffic volumes on narrow streets or are not deployed because of not meeting minimum design standards (width). In a few instances, the dashed bicycle lane offers the best of both applications. The dashed line gives a delineated location for bicyclists to ride as if it were a bike lane and is consistent with a minimum 4' offset for sharrows. Because of the nature of the travel lanes and low vehicular traffic volumes, the queuing nature of the wider center travel

lanes allows safe travel for all users of the roadway under passing situations. A typical layout for these locations is included (see Exhibit 2).

The priority shared-lane marking is an enhancement to the MUTCD approved shared-lane marking or sharrow. The priority shared-lane marking has two parallel skipped white lines surrounding the sharrow marking. This sharrow enhancement further guides the proper location for safe bicycle travel while considering on-street parking whether or not a parked vehicle is present as well as vehicular positioning within the travel lane or parking space. When few or no vehicles are parked the tendency by some bicyclists, and expectation by some motorists, may be to ride within legal on-street parking areas. The use of the priority shared-lane marking is aimed to reduce unpredictable weaving in and out of the travel lane by bicyclists that are often dependant upon the presence of parked vehicles. It also aims to provide additional spatial guidance for motorists for either parking or travel lane positioning. A typical example for these locations is included (see Exhibit 3).

The priority shared-lane marking is a new method being studied for locations where sharrows don't offer the best solution when dealing with on-street parking. These are being used along our Neighborhood Greenways, also known as Bicycle Boulevards that have low vehicular traffic volumes. The City of Bloomington has implemented, without prior approval to experiment, priority shared-lane markings intermittently/as necessary along the following locations:

- 7th Street between Indiana Avenue and Adams Street (existing)
- Clifton Avenue between 1st Street and 2nd Street (existing)
- Rose Avenue between Hunter Avenue and 3rd Street (existing)
- Covenanter between College Mall Road and High Street (existing)
- Hawthorne Drive between Sheridan Drive and 3rd Street (existing)
- Union Street between 7th Street and 10th Street (existing)

Variables to be Studied and Observed

Level 1 Study Methodology - Motorist and bicyclist behavior and interaction will be observed by City staff after the installation of green-colored bicycle boxes and advance stop signing.

The following information will be collected to help determine the effectiveness of the green-colored bicycle boxes and signage:

1. Vehicle volume
2. Bicycle volume
3. Percent of stopping vehicles encroaching into the bicycle box
4. Percent of vehicles encroaching into the bicycle lane
5. Number of bicyclists who use the bicycle box
6. Before and after number of crashes (numbers, types, modes)
7. Right-hook crashes or near-misses observed
8. Vehicle compliance with turn on red prohibition
9. Optional bicyclist survey regarding comfort, yielding behaviors, acceptance, symbol recognition, comprehension, etc.

Level 2 Study Methodology - Motorist and bicyclist behavior and interaction will be observed by City staff after the installation of green-colored bike lanes and priority shared-lane markings.

The following information will be collected to help determine the effectiveness of the green-colored bicycle lanes and priority shared-lane markings:

1. Vehicle volume
2. Bicycle volume
3. Percent of vehicles encroaching into the green-colored bicycle lane (where applicable)
4. Before and after number of crashes (numbers, types, modes)
5. Optional bicyclist and motorist survey regarding comfort, yielding behaviors, acceptance, symbol recognition, comprehension, etc.

Timeline

1. September 2014: Submit a request to experiment to FHWA Indiana Division
2. September – October 2014: Compile historical intersection data for before implementation period, which includes vehicle volume, bicycle volume, and number of crashes. Initiate after data collection, as outlined in the previous section for at least two intersections.
3. January 2015: Submit evaluation and initial progress report to the FHWA Indiana Division
4. April – June 2015: Collect data
5. July 2015: Submit evaluation and annual progress report to the FHWA Indiana Division.
6. August 2015 - August 2018: Continue semiannual data collection and annual reporting based on direction from the FHWA Indiana Division.

Patent and Copyright Information

The green-colored bicycle box is not protected by any patent or copyright. The dashed bicycle lanes are also not protected by any patent or copyright.

Removal of Experiment

The City of Bloomington understands that the FHWA may require the City to restore the sites of the experiment to a condition that complies with the provisions of the MUTCD within three months following the end of the time period of the experiment. The City of Bloomington also understands that the FHWA's Office of Transportation Operations has the right to terminate approval of the experimentation at any time if there is an indication of safety concerns. The City of Bloomington acknowledges that the FHWA requires the City to terminate the experimentation if the City determines significant safety concerns are directly or indirectly attributable to the experimentation. The City of Bloomington further understands that if, as a result of the experimentation, a request is made that the MUTCD be changed to include the device or application being experimented with, the device or application will be permitted to remain in place until an official rulemaking action has occurred.

Exhibit 1 – Typical Bicycle Box Layout and Design Guidance

Separated Bikeways at Intersections

Bike Box

Level of Protection: ★★★★☆ Ease of Implementation: ★★★☆☆

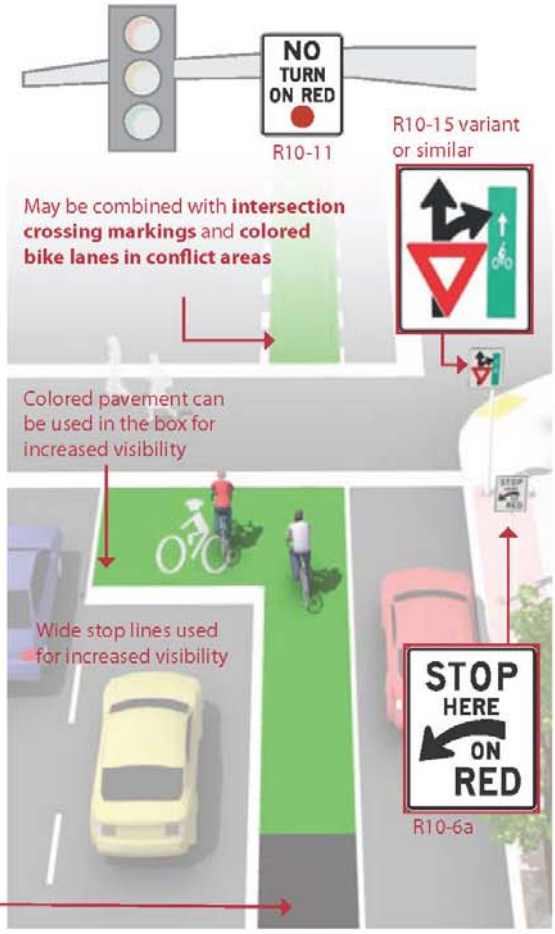
Description

A bike box is a designated area located at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible space to get in front of queuing motorized traffic during the red signal phase. Motor vehicles must queue behind the white stop line at the rear of the bike box.

Bike boxes may be used at signalized major crossings of Neighborhood Greenway routes to promote orderly queuing and visibility of bicyclists.

Guidance

- 14' minimum depth
- A "No Turn on Red" (MUTCD R10-11) sign should be installed overhead to prevent vehicles from entering the Bike Box during a red signal indication.
- A "Stop Here on Red" sign should be post-mounted at the stop line to reinforce observance of the stop line.
- A "Yield to Bikes" sign should be post-mounted in advance of and in conjunction with an egress lane to reinforce that bicyclists have the right-of-way going through the intersection.
- An ingress lane should be used to provide access to the box.
- A supplemental "Wait Here" legend can be provided in advance of the stop bar to increase clarity to motorists.



Discussion

Bike boxes should be placed only at signalized intersections, and right turns on red shall be prohibited for motor vehicles. Bike boxes should be used along designated bicycle routes, or on streets commonly used by bicyclists. Bike boxes are best utilized in central areas where traffic is usually moving more slowly. Prohibiting right turns on red improves safety for bicyclists yet does not significantly impede motor vehicle travel. Engineering judgement and the context of the location should be taken into account when choosing to implement a bike box.

Additional References and Guidelines

NACTO. (2011). Urban Bikeway Design Guide.
FHWA. (2011). Interim Approval (IA-14) has been granted. Requests to use green colored pavement need to comply with the provisions of Paragraphs 14 through 22 of Section 1A.10

Materials and Maintenance

Because the effectiveness of markings depends entirely on their visibility, maintaining markings should be a high priority.

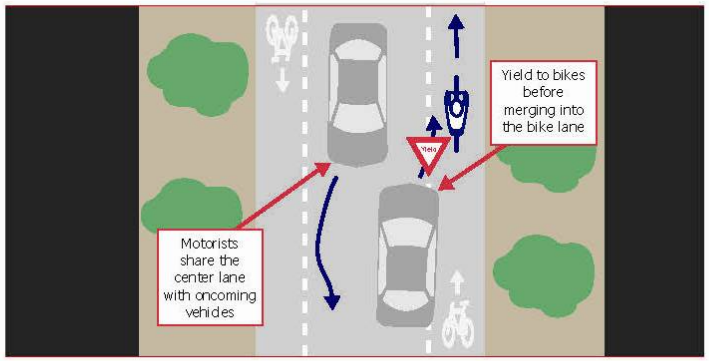
Advisory Bike Lanes

An advisory bike lane is similar to a regular bike lane, but is used on low-volume streets that are narrow. An advisory bike lane is marked with a a dotted line to the left side of the lane. These markings give bicyclists a space to ride, but are also available to motorists if space is needed to pass oncoming traffic.

Advisory bike lanes are currently located on Adams Street between 6th and 7th Streets. At this location, the yellow center line was removed and advisory bike lanes were added to the street. Narrow travel lanes now require motorists to be more cautious when negotiating passing vehicles. Advisory lanes are also present on East 7th Street and Longview Avenue from Union Street to Smith Road.

Advisory bike lanes are similar to regular bike lanes, but include a dashed left line instead of a solid line.

To safely meet oncoming vehicles, motorists may need to merge into the ***bike lane - but, first yield to bicyclists in*** *the bike lane.*



When you drive:

- To safely meet an oncoming motorist you are allowed to merge into **the bike lane. However, you must first yield to bicyclists in the bike** lane.
- Even though the travel area for cars is narrow, it is still a 2-way street.

When you bike:

- Be more prepared for a motorist to enter the bike lane than on typical streets.
- Always use caution and assume turning or merging motorists do not see you.

For questions about information in this packet, please call 812-349-3423.

CITY OF BLOOMINGTON

Exhibit 3 – Typical example of a Priority Shared-Lane Marking

October 5, 2014

Karen Stippich, Traffic Operations Engineer
Federal Highway Administration
575 North Pennsylvania Street, Room 254
Indianapolis, IN 46204

Dear Ms. Stippich,

Please accept this letter as a follow up to the letter dated May 21, 2014 in regards to the use of "bicycle boxes" in Bloomington, Indiana and the need to gain approval by the FHWA as experimental pavement marking traffic control devices under the requirements of the Manual of Uniform Traffic Control Devices (MUTCD). The City of Bloomington requests to enter into an experimentation agreement per the requirements of FHWA and the MUTCD. A proposal is included with this letter, which details the background and need, proposed changes, request to experiment, methods of study, and a timeline.

The City of Bloomington is requesting approval for the use of Green-Colored Bicycle Boxes, Dashed Line Bicycle Lanes and Priority Shared-Lane Markings as detailed in our proposal. The City of Bloomington agrees to maintain records and provide reports for the locations where these markings are being used.

As required in requests to experiment, if approved by FHWA, the City of Bloomington agrees to restore any experimental sites to conform to the requirements of the MUTCD if directed by the FHWA or the City of Bloomington detects any significant safety concerns that are directly or indirectly attributed to the device or application.

We appreciate your time in reviewing this request and understanding on our timing of our request with actual implementation. Please feel free to contact me if you have any additional questions at 812-349-3423 or at micudat@bloomington.in.gov. We look forward to your response and working with FHWA in this experimentation proposal.

Sincerely,

Tom Micuda, AICP
Director, Planning and Transportation Department