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LRRB
LOCAL ROAD RESEARCH BOARD

TECHNICAL SUMMARY

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PROJECT COST:
$90,578

Survey participants were shown paired images of different bike lanes and asked to select the lane that seemed safer.

DEPARTMENT OF TRANSPORTATION
OFFICE OF RESEARCH & INNOVATION

Separated Bike Lanes: Filling the Gaps in Design Guidance

Researchers gathered current design guidance for separated bike lanes and queried experts and users to understand design challenges and preferred features. They developed methods to assist designers in managing the complex urban contexts in which bicycle facilities must be constructed.

What Was the Need?

In recent years, many U.S. cities have been installing separated bicycle lanes (SBLs) as part of their nonmotorized transportation networks. SBLs are bicycle pathways that employ paint and a vertical element as a buffer to separate motor vehicle traffic from bicycle traffic. They reduce crash risk, increase safety and comfort, and encourage more people to use bicycles as transportation. While demand for SBLs in the U.S. has increased, research on the most effective designs and strategies has not kept up with need. Although several organizations have published useful design information and the Federal Highway Administration (FHWA) offers the Bikeway Selection Guide, there are substantial knowledge and design gaps in these available resources.

MnDOT and the Local Road Research Board (LRRB) wanted to create an SBL guide that would gather design elements of greatest overall interest to practicing engineers, as well as investigate design issues and other aspects of concern to engineers that were not adequately covered or were missing from existing guidance entirely.

What Was Our Goal?

The project's goal was to produce supplemental guidance addressing SBL design options, as well as to investigate and present context-related aspects and challenges associated with SBL designs in Minnesota. The overarching objective was to provide engineers and policymakers with the current SBL design guidance they needed to inform their decision-making regarding bicycle infrastructure installations and improvements.

What Did We Do?

Topic areas selected as the design guide's focus included:

- Buffer design.
- Mixing zone design (intersections, areas of bike/vehicle interaction).
- Bus stops on SBLs.
- Winter maintenance.
- Summer maintenance.
- Relative costs and benefits.

The research team first conducted a synthesis of available literature about SBL design, understanding that SBL and bikeway design overall are evolving areas with research in progress and industry guidelines actively advancing. Nevertheless, the team's synthesis of available design guidance was extensive and served to identify knowledge gaps in need of further investigation.

Then the team identified active stakeholders to provide representative perspectives, particularly addressing safety, comfort and connectivity—three guiding principles of SBL design. Researchers first interviewed professionals from local agencies operating SBLs, focusing on designs used and implementation and maintenance concerns. Additionally, Twin Cities transit drivers were asked

continued

"The results of this project provided substantial information that will help planners and designers to create the safest and most effective bicycle facilities in a wide range of urban contexts."

—Paul Oehme,
Public Works Director,
City of Lakeville

"Our research confirmed that the majority of potential cyclists prefer design options that maximize separation from vehicles. The implication is that designs that reduce risk by maximizing separation are also most likely to promote new demand: More cyclists lead to more new facilities."

—Greg Lindsey,
Professor,
University of Minnesota
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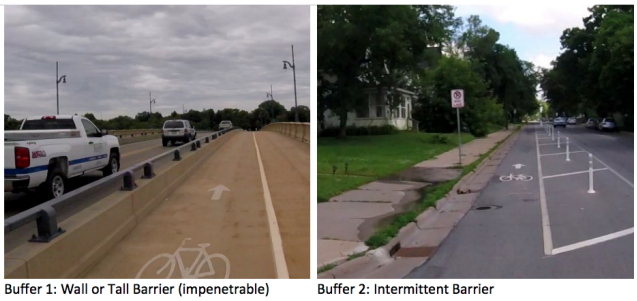
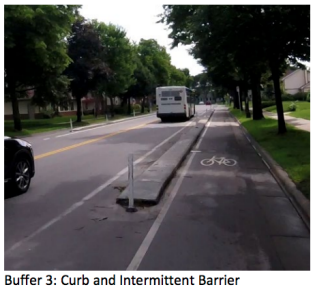

Buffer 1: Wall or Tall Barrier (impenetrable)

Buffer 2: Intermittent Barrier


Buffer 3: Curb and Intermittent Barrier


Buffer 4: Grade Separation

Four separated or buffered bike lane designs, shown at left, were included in the online user survey about bike lane preferences. The lanes' separation strategies ranged from intermittent flexible posts (top right) to a complete grade separation from the main roadway (bottom right).

about challenges SBLs present to bus drivers. Researchers also interviewed the leaders of four bicycle advocacy organizations for their perspectives on bicycle users' experience.

An online user survey completed by hundreds of Minnesota bicyclists examined bicyclists' perceptions of the safety and comfort of different SBL designs, including intersection and bus stop strategies. Survey questions also investigated winter riding and winter lane maintenance—key areas of guidance shown to be missing in researchers' review of current SBL design.

What Was the Result?

The compendium of SBL design guidance gathered from this effort will be valuable into the future. The existing guidance emphasizes strongly the SBL as the highest quality bikeway facility available. In addition, researchers' interviews and the survey generated valuable and actionable information about SBL designs and bicycle travelers. Interviews with planners and designers showed that design refinements were most needed for buffers, mixing zones and bus stops to increase bicycling safety, comfort and the likelihood that bicycling would be chosen for transportation.

The user survey revealed that cyclists are not a homogeneous group. Some are confident and proficient in traffic, but many are interested but concerned users. Design considerations must cater to these riders whenever possible to foster greater demand. While designs that avoid traffic altogether are not feasible, designers should keep in mind always that people who cycle prefer to minimize interactions with traffic between origin and destination.

The project showed that SBL design is a highly local, decidedly context-specific infrastructure problem. There is no one best SBL design. The need for separation is the guiding concept; all else is context—including intersections, bus stops, parking, alleys and driveways, snow removal and stormwater flow—as designers brainstorm, making trade-offs among constraints to reach variations approaching separate SBLs. In support of this need, researchers developed a set of four trade-off matrices to help designers manage complex contexts and create the safest bike facilities they can.

What's Next?

The project collected extensive data and provided new strategies for framing the SBL design problem. Design practitioners must keep in mind that enormous flexibility exists within the still evolving design guidance to create bicycle networks everywhere.

This Technical Summary pertains to Report 2021-12, "Guidance for Separated/Buffered Bike Lanes With Delineators," published June 2021. The full report can be accessed at mndot.gov/research/reports/2021/202112.pdf.