



TECHNICAL SUMMARY

Technical Liaison:

Paul Stine, MnDOT
Paul.Stine@state.mn.us

Project Coordinator:

Bruce Holdhusen, MnDOT
Bruce.Holdhusen@state.mn.us

Principal Investigators:

David Noyce, University of
Wisconsin—Madison
Howard Preston, CH2M HILL

LRRB PROJECT COST:

\$117,700



Bicycle boulevards are nonstandard design elements that may be appropriate for certain Complete Streets projects.



RESEARCH SERVICES & LIBRARY

OFFICE OF TRANSPORTATION
SYSTEM MANAGEMENT

Safety Impacts of Implementing Complete Streets

What Was the Need?

Complete Streets—the idea that transportation networks should be designed for all modes of transportation rather than just focusing on cars—is a significant and growing movement in Minnesota and nationwide. Incorporating Complete Streets principles is now required for all MnDOT projects, and local transportation agencies are encouraged to design Complete Streets policies appropriate for their communities as well.

Transportation design of the past several decades has generally prioritized motor vehicles, with wide lanes and shoulders, at the expense of implementing facilities for other modes of travel. As a result, applying Complete Streets principles on existing roads can be difficult. Right of way constraints often make it impossible to simply acquire more space for facilities. Accommodating other users often involves removing motor vehicle lanes (a “road diet”) or narrowing lanes to reduce vehicle speeds and provide space for other facilities.

While these changes are popular with Complete Streets advocates, they may conflict with [State Aid Design Standards](#). To ensure their effectiveness, the operations and safety implications of these nonstandard design solutions needed to be investigated.

What Was Our Goal?

This project’s goal was to evaluate the safety and operations impacts of reconstruction projects intended to accommodate various road users.

What Did We Do?

Researchers hosted a workshop for 18 stakeholders, including representatives of the research team, MnDOT, the Minnesota Complete Streets Coalition, the University of Minnesota, Hennepin and Kandiyohi counties, and the cities of Bloomington and Roseville. During this workshop, stakeholders identified Complete Streets project locations suitable for evaluation and then developed a list of common issues and concerns related to Complete Streets implementation.

Nine sites that had been reconstructed with features such as narrowed lanes, parking lanes, pedestrian terraces or curb extensions were identified for study. Two more sites were added later to more comprehensively examine bicycle facilities. These sites are primarily, but not exclusively, located within the Twin Cities area. Researchers collected both qualitative and quantitative data about operations and safety at each site, such as frequency and type of crashes, vehicle volume, driver behavior in mixed-modal flows and surrounding land use.

Two methods to evaluate safety were used at each site. A simple before-and-after analysis calculates the percentage difference between the number of crashes before and after implementation of the Complete Streets project. An empirical Bayes analysis incorporates data from similar sites in this calculation. Empirical Bayes analysis is generally preferred for realistic safety analysis to overcome the regression-to-the-mean effect in which

Investigators reviewed 11 urban roadways where reconstruction projects had incorporated features to accommodate all modes of travel in accordance with Complete Streets principles. Crash data and anecdotal evidence did not indicate any significant safety issues from the Complete Streets implementations.

"We've spent the last 30 years at the state and county levels trying to make lanes bigger because we were driven by capacity. This project shows that we can pull back to some degree, reducing lane widths and cross widths, to accommodate other vehicle types without negatively impacting safety or operations."

—David Noyce,
Professor, University of
Wisconsin–Madison
College of Engineering

"The Complete Streets implementations that were selected for this research are examples where engineers looked at the users of an existing roadway and accommodated them as well as possible in an often limited space."

—Paul Stine,
MnDOT State Aid
Operations Engineer

Produced by CTC & Associates for:

Minnesota Department
of Transportation
Research Services & Library
MS 330, First Floor
395 John Ireland Blvd.
St. Paul, MN 55155-1899
651-366-3780
www.mndot.gov/research



The reconstruction of Franklin Avenue (right) in Minneapolis incorporated a road diet, reducing four vehicle travel lanes to two with a turn lane at intersections and bicycle lanes on each side.

the small number of crashes at any one site can make statistically insignificant changes appear to be significant trends.

What Did We Learn?

Overall, the 11 study sites did not display any significant safety issues from Complete Streets implementation, and in general, safety was improved. While data limitations made it impossible to quantitatively analyze the effect of Complete Streets on traffic operations, anecdotal review and comments from local officials suggest that there were no significant operational impacts.

Several of the individual sites did not produce conclusive results because of the limited periods for which data was available or the small overall number of crashes. Viewing them collectively, however, significantly increases the researchers' confidence that Complete Streets projects did not have negative safety impacts.

Of particular interest are the several sites that included road diets, such as the Franklin Avenue project in Minneapolis. In this 0.9-mile project, four travel lanes were reduced to two. Several facilities were added, including a turn lane at intersections, bicycle lanes on each side of the road, bicycle boxes at one intersection, and physical space or delineation between bike lanes and right turn lanes. Safety data related to bicycles at these sites followed the same general pattern of all sites in the project: no indication of negative safety impacts overall, although some sites had limited available data.

What's Next?

This research suggests that accommodating all modes of travel can be accomplished without negatively impacting safety or operations, and that even nonstandard design elements should be considered to do so. This information will likely help to guide engineers as they implement Complete Streets projects on existing roadways.

Specific plans for using this research are under consideration. This and the growing body of Complete Streets research will ultimately help advise revisions to Minnesota State Aid standards and design guidance.

Another recently completed MnDOT project, Complete Streets from Policy to Project, examines Complete Streets from a planning perspective.

This Technical Summary pertains to the LRRB-produced Report 2013-31, "Implications of Modifying State Aid Standards: Urban Construction or Reconstruction to Accommodate Various Roadway Users," published December 2013. The full report can be accessed at <http://www.lrrb.org/PDF/201331.pdf>. More information about MnDOT's Complete Streets initiative is available at <http://mndot.gov/planning/completestreets>.