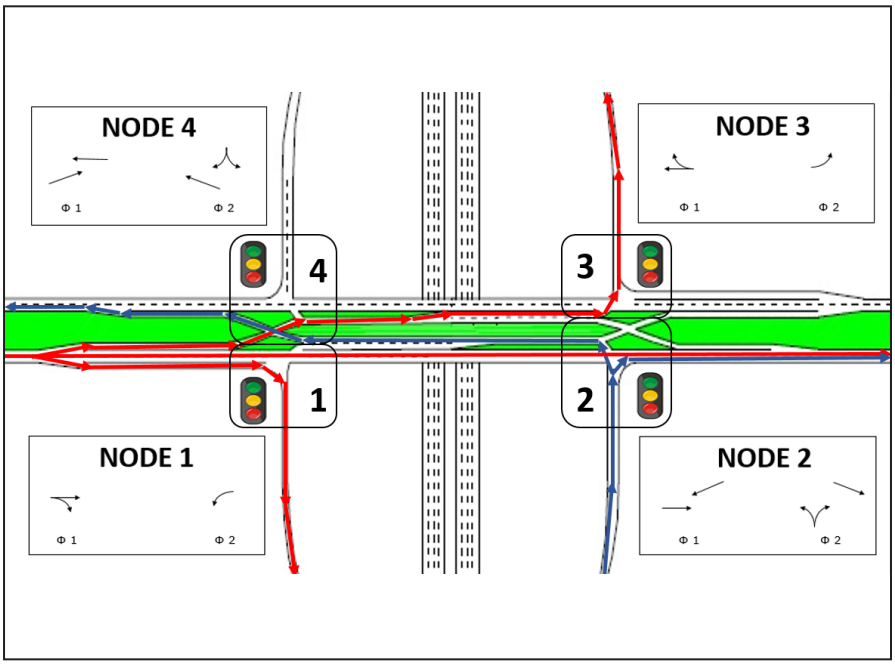
MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 22-461 (project 573) | June 2022

Proposing the Super DDI Design to Improve the Performance of Failing Service Interchanges in Denver Metro, Colorado



the ISSUE

Most of the existing conventional diamond Interchanges (CDI) in the United States were designed and constructed about 60 to 70 years ago. Considering the growing traffic demands, safety, and limited budgets, the investigation of new alternative interchange designs has become a vital task for highway engineers.

the RESEARCH

This study introduces two versions of the Super Diverging Diamond Interchange (Super DDI) design and evaluate the vehicular operation, safety, and pedestrian performance using real-world locations. As part of a comprehensive research effort to improve the performance of failing service interchanges in the Mountain-Plains region, the study identified three interchanges in Denver, CO, as the potential candidates to model for future retrofit. Four interchange designs (i.e., existing CDI, DDI, Super DDI-1, and Super DDI-2) were tested where three alternative designs were considered to make a reasonable comparison with the existing CDI. The analysis was conducted using the combination of VISSIM (2020 version), Synchro (version 11), and Surrogate Safety Assessment Model (SSAM) analysis tools. The study first applied Synchro to attain optimum signal timing and cycle length. Signal data were then imported into VISSIM to estimate the performance of each interchange design. After that, VISSIM trajectory files generated from each simulation were analyzed through the SSAM to determine the types and number of conflicts for each design.

MOUNTAIN-PLAINS CONSORTIUM REGION 8

A University Transportation Center sponsored by the U.S. Department of Transportation serving the Mountain-Plains Region. Consortium members:

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Project Title

Proposing the Super DDI Design to Improve the Performance of Failing Service Interchanges in Mountain-Plains Region (MPR)

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the **FINDINGS**

The results indicated that Super DDI designs outperformed the DDI when considering adjacent signals and when higher traffic demand exists, while DDI performed similarly or sometimes insignificantly better compared with Super DDI if no adjacent intersections were located in the vicinity and if the demand was lower than DDI's capacity. Therefore, it might be concluded that Super DDI designs should perform better in urban (or populated suburban) areas due to the higher traffic demand and a greater number of adjacent intersections compared with rural areas. On the other hand, the analysis of pedestrian performance showed that a relatively safe condition is expected for pedestrians in the proposed new Super DDI designs compared with CDI and DDI.

the **IMPACT**

Findings from this study are expected to help transportation managers and policymakers take necessary actions and decide on management strategies for implementing appropriate alternative interchanges.

For more information on this project, download the Main report at https://www.ugpti.org/resources/reports/details.php?id=1080

For more information or additional copies, visit the Web site at www.mountain-plains.org, call (701) 231-7767 or write to Mountain-Plains Consortium, Upper Great Plains Transportation Institute, North Dakota State University, Dept. 2880, PO Box 6050, Fargo, ND 58108-6050.

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