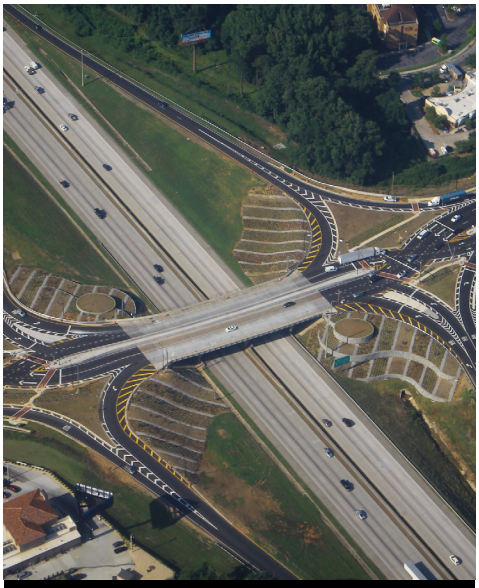

FHWA Research and Technology Evaluation TechBrief

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Innovative Intersection Design

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This document is a technical summary of the FHWA Research and Technology Evaluation: Innovation Intersection Design Final Report (FHWA-HRT-21-024).

Introduction

This brief summarizes an evaluation of the Federal Highway Administration's (FHWA's) Innovative Intersection Design (IID) program. FHWA's IID research and development (R&D) includes diverging diamond interchanges (DDIs), restricted crossing U-turns (RCUTs), displaced left turns (DLTs), median U-turns (MUTs), and mini-roundabouts.

The purpose of the evaluation was to assess the effects of FHWA's investment in IID research on the availability and quality of such research, the adoption of IIDs in the United States, and the impact of those intersections on safety and operational performance.[1]

Background

FHWA began conducting IID research in the early 2000s through the Office of Safety R&D. Safety R&D staff explored the benefits of the various IIDs and published several papers on the topic of IIDs, culminating in the publication of the Alternative Intersections/Interchanges: Informational Report in 2010 (2010 AIIR).[2] Following the publication of the 2010 AIIR, IID activities continued, and the program was chosen for inclusion in Every Day Counts Round 2 (EDC-2).[3] As part of EDC-2, four intersection guides, which were published in 2014, were developed for DDIs, RCUTs, DLTs, and MUTs. FHWA has continued to develop higher quality informational material and refine the state of the practice for IIDs. FHWA has also promoted IIDs through various activities and materials, including workshops and peer exchanges.

Findings

By evaluation area, the overall findings are given in the following subsections.

FHWA Decisionmaking Processes Regarding Selection and Promotion of Research

FHWA's research and technology (R&T) process followed internal and informal procedures to identify intersection safety as a critical area of need and to develop the IID program and portfolio to respond to that need. FHWA promotional activities, specifically EDC, followed standards and procedures for identifying the IID program for inclusion in the EDC-2 program.

Availability and Reliability of IID Safety, Mobility, and Lifecycle Cost Data

FHWA R&T activities from the early 2000s and the 2010 AIIR led to a significant increase in published material on IIDs in the United States. These activities helped both to synthesize the limited safety and design research that existed as well as to create new research by leading to partnerships with outside researchers on IID related topics.

Change in Awareness, Knowledge of, and Attitudes Toward IIDs

FHWA's research, culminating in the 2010 AIIR, increased the availability of information on IIDs in the United States. The Office of Safety R&D worked

closely with the Office of Safety and the FHWA Resource Center to conduct sustained outreach, including making recommendations within FHWA, such as adding certain IIDs as Proven Safety Countermeasures.[4] FHWA's outreach also included trainings, workshops, and peer exchanges, all of which helped increase States' awareness of IIDs as a viable intersection option.

Deployment of IIDs

FHWA actively accelerated the early adoption of IIDs by leading their promotion of IIDs, providing deployment funding, developing safety and performance research, increasing the availability of design specifications, and specifically addressing the needs of the early adopters through workshops and technical assistance. Figure 1 depicts the cumulative number of States deploying at least one IID type, by IID type and year.

Safety, Mobility, and Construction Cost Impacts of IIDs

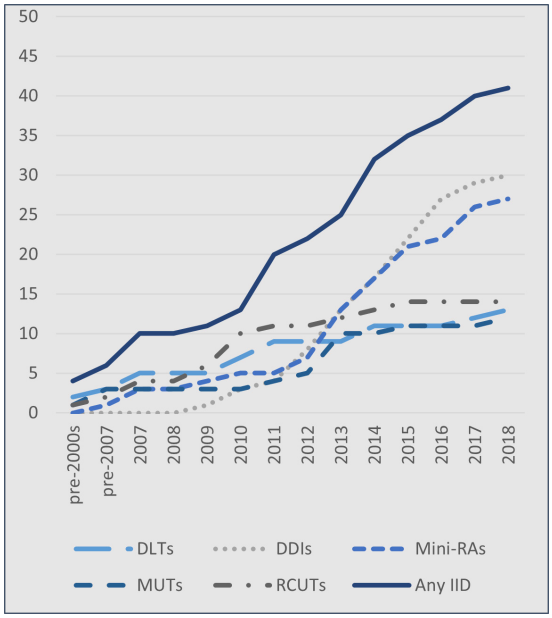
FHWA's IID program generated safety, mobility, and construction cost benefits. Each type of IID included in this evaluation demonstrated the potential for crash reductions, as evidenced by a review of crash modification factors and interviewee feedback. From a mobility standpoint, the literature indicates that each type of IID yielded, on average, reduced delays for vehicles traveling through the intersection. Compared with conventional intersections, the construction costs for most IID types were lower, though these savings depend on site specifics.

Recommendations

To further increase the value of FHWA safety research to FHWA and its wider community of partners and stakeholders, the evaluation report includes the following recommendations for FHWA's consideration:

- Consider working with State or private partners to develop a more reliable, comprehensive national map of intersections that identifies each intersection type and other key features of each intersection that are relevant for researchers and practitioners.
- Promote consistency in nomenclature and definitions, whenever possible, and carefully consider the marketability of various terms.
- Explore the development of an additional level of strategic targeting that considers qualitative aspects of technology diffusion—such as known patterns of information sharing and decisionmaking among States and technology champions—by building on the existing FHWA Focused Approach to Safety, which is a data-driven approach to selecting intersection focus States, and the "lead States" approach.[5]
- Consider standardizing the development and timing of intersection-design guidance for nonpassenger-vehicle road users or groups that may be impacted by IIDs, such as pedestrians, bicyclists, and nonstandard vehicles

Figure 1. Graph. Cumulative number of States deploying at least one IID, by IID type.



Mini-RAs = mini-roundabouts.

Source: FHWA.

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