21ST CENTURY SOLUTIONS

INTERSECTION & INTERCHANGE GEOMETRICS

About half of all severe crashes in the U.S. are intersection related. Left-turns represent a large portion of the intersection safety concern. As part of the safety focus area of the Every Day Counts (EDC) initiative, the Federal Highway Administration (FHWA) is promoting several proven techniques to improve the safety of intersections by strategically eliminating or relocating the left-turn conflicts. Transportation agencies that apply the intersection and interchange geometrics under this initiative can reduce crashes and greatly enhance the efficiency of moving traffic, often times with substantial cost savings and accelerated project delivery.

Intersection and Interchange Geometrics is the application of proven techniques that can accommodate traffic volumes more efficiently while improving the safety of motorists, pedestrians and bicyclists. This EDC program is promoting the following:

Diverging Diamond Interchange (DDI): The DDI design eliminates the signalized left-turn phase at the two intersections within the interchange by shifting the crossroad traffic to the left side of the roadway between the ramp terminals. This change in the crossroad configuration improves safety by reducing the number of traffic conflict points and improves traffic flow by reducing the number of signal phases.

Displaced Left-Turn (DLT) Intersection: The DLT intersection enhances safety and operations by eliminating the main intersection conflicts between left-turning vehicles and oncoming traffic. With this intersection geometry, the left-turning traffic makes a coordinated signalized turn in advance of the main intersection into left-turn bays placed on the opposite side of oncoming traffic.

U-Turn Intersections (Restricted Crossing U-Turns, J-Turns, Median U-Turns, and ThrU-Turns): These intersection geometries involve related strategies for modifying some traffic movements at the primary intersection with a U-turn movement. Variations of this strategy are appropriate for a wide range of conditions, including unsignalized rural intersections and high volume signalized arterials.

Modern Roundabout: With proven results for reducing severe crashes, the modern roundabout is a very adaptable intersection geometry. Roundabouts have been successfully deployed across a wide range of contexts including at isolated rural intersections with high approach speeds and in intensely developed urban settings that include extensive pedestrian and bicycle features. Furthermore, in certain environments with constrained right-of-way, the application of mini-roundabouts is gaining acceptance. Mini-roundabouts typically feature a fully traversable central island.

BENEFITS

- **Improved safety.** All of these intersection and interchange geometrics have demonstrated great potential for reducing crashes. For example, an FHWA evaluation of nine restricted crossing U-turn intersections in Maryland showed a before/after crash reduction of 46 percent for total crashes, 42 percent for injury crashes and 70 percent for fatal crashes.

- **Reduced delays.** The Utah Department of Transportation (DOT) found that DLT intersections can effectively reduce intersection delay, improving corridor travel, and saving motorists' time estimated at a value of $3.5 million per year.
- **Reduced construction time and cost.** The Missouri DOT found that employing the DDI design over a Single Point Urban interchange design reduced the construction time and project costs by more than half.
- **Direct and indirect economic benefits to businesses, communities and system users.** According to Utah DOT, building a DLT intersection resulted in substantial fuel savings, which they estimated at 800,000 gallons per year.

CURRENT STATE OF THE PRACTICE

Several State DOTs are using processes and screening tools to ensure appropriate forms of intersections and interchanges are considered early in project development. The intersection and interchange geometric forms being promoted through this EDC initiative have broad applicability and should be considered as potential alternatives in most intersection reconstruction or new construction projects. By considering and evaluating these designs early in the project development process, transportation agencies may find that they are more efficient, economical and safer solutions than conventional designs.

SUPPORT AND AVAILABLE TOOLS

There are a variety of available tools and ongoing efforts to implement and evaluate intersection and interchange geometrics. A few of the noted efforts include:

- FHWA April 2010 Guide *Alternative Intersections and Interchanges: Informational Report, http://www.fhwa.dot.gov/publications/research/safety/09060*
- NHI Training — Alternative Intersections and Interchanges Workshop – Course #380109, *http://www.nhi.fhwa.dot.gov/default.aspx*
- The FHWA Turner-Fairbank Highway Research Center developed a software product called Capacity Analysis for Planning at Junctions (CAP-X) to assist professionals in assessing the traffic operations of a variety of alternative intersection forms. *http://tsi.cecs.ucf.edu/index.php/cap-x*

For additional information, please contact:

Mark A. Doctor, P.E. Intersection and Interchange Geometrics Lead
Safety & Design Engineer, FHWA Office of Technical Services
mark.doctor@dot.gov

Every Day Counts (EDC), a State-based initiative of FHWA's Center for Accelerating Innovation, works with State, local and private sector partners to encourage the adoption of proven technologies and innovations aimed at shortening and enhancing project delivery

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