



21ST CENTURY
SOLUTIONS

INTERSECTION & INTERCHANGE GEOMETRICS

Exchange

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Wednesday, December 4, 2013. Nisky Center. St. Thomas, USVI.



Good Afternoon!





Acronyms

AASHTO	American Association of State Highway and Transportation Officials
CAP-X	Capacity Analysis for Planning at Junctions
DOT	Department of Transportation
DLT	Displaced Left-Turn Intersection
DDI	Diverging Diamond Interchange
EDC	Every Day Counts
FHWA	Federal Highway Administration
LTAP	Local Technical Assistance Program
NHI	National Highway Institute
SPUI	Single Point Urban Interchange
VIDPW	Virgin Islands Department of Public Works



Introduction

- 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 EDC initiative, the 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
 - greatly enhance the efficiency of moving traffic, often times with substantial cost savings and accelerated project delivery



Intersection & Interchange Geometrics Definitions

- The application of proven techniques that:
 - can accommodate traffic volumes more efficiently
 - improving the safety of motorists, pedestrians and bicyclists





Types of Intersection & Interchange Geometrics

1. Diverging Diamond Interchange (DDI)
2. Displaced Left-Turn (DLT) Intersection
3. U-Turn Intersections (Restricted Crossing U-Turns, J-Turns, Median U-Turns, and ThrU-Turns)
4. Modern Roundabout



1. Diverging Diamond Interchange (DDI)

- 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

IMPACT:

- It improves safety by reducing the number of traffic conflict points and improves traffic flow by reducing the number of signal phases



Source: http://www.modot.org/southwest/major_projects/greene/DivergingDiamondPhotos.html



1. Diverging Diamond Interchange (DDI) cont.

- 2013 AASHTO top 10 DDI Projects



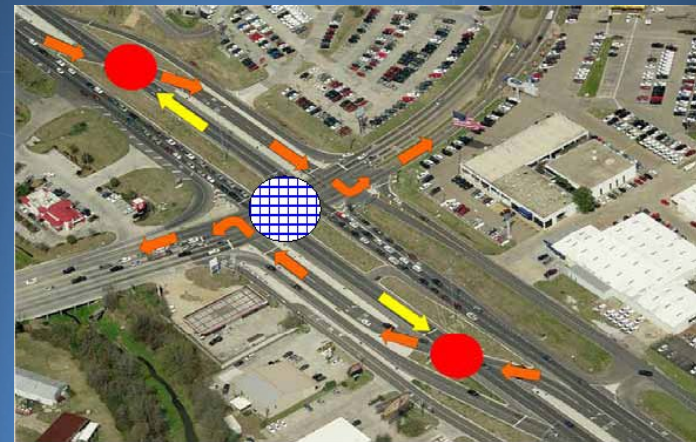


2. Displaced Left-Turn (DLT) Intersection

- 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

IMPACT:

- Enhances safety and operations by eliminating the main intersection conflicts between left-turning vehicles and oncoming traffic



Source: <http://www.fhwa.dot.gov/publications/research/safety/09060/002.cfm>



2. Displaced Left-Turn (DLT) Intersection (cont.)



DLT intersection at the intersection of Indian Head Highway (MD 210) and Berry Road (MD 228) in Accokeek, MD.

Source: FHWA



DLT intersection at the intersection of U.S. Route 30 and Summit Drive in Fenton, MO.

Source: FHWA



3. U-Turn Intersections (Restricted Crossing U-Turns, J-Turns, Median U-Turns, and ThrU-Turns)

Types

- Restricted Crossing U-Turns
- J-Turns
- Median U-Turns
- ThrU-Turns

- These intersection geometries involve related strategies for modifying some traffic movements at the primary intersection with a U-turn movement

APPLICATIONS:

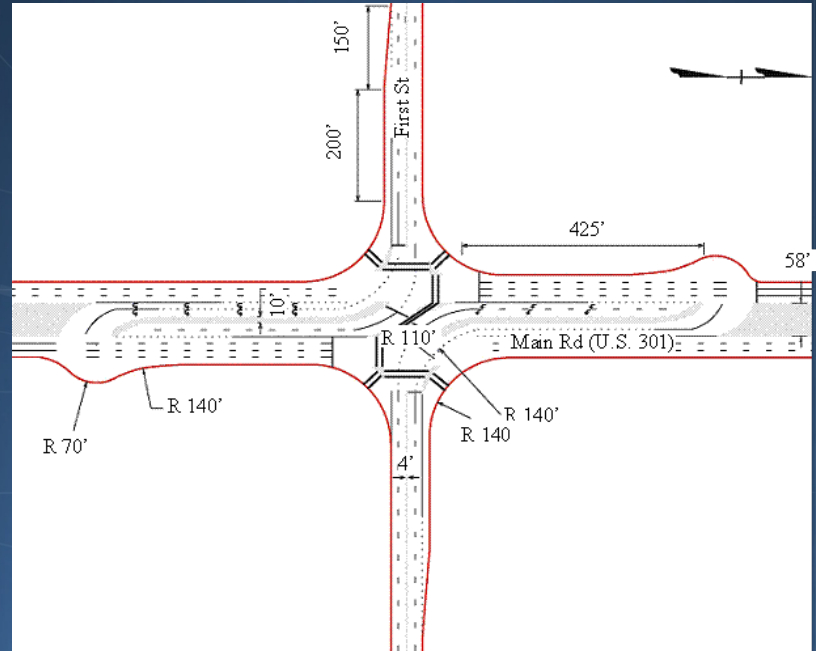
- Unsignalized rural intersections
- High volume signalized arterials



3.1 Restricted Crossing U-Turns



U.S. Route 15 RCUT intersection in Emmitsburg, MD.
Source: FHWA



Typical RCUT plan view with crossovers on mainline approaches.
Source: FHWA



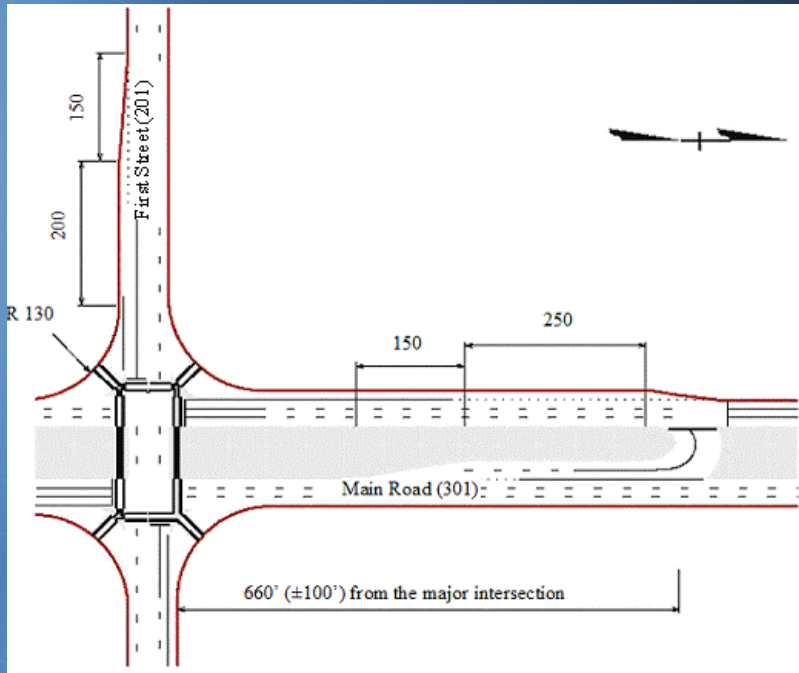
3.2 J-Turns



Source: <http://www.doorcountydailynews.com/shared/inc/client/28/articles/images/4081352320-JTurnImagefromDOTvideo450x227.JPG>



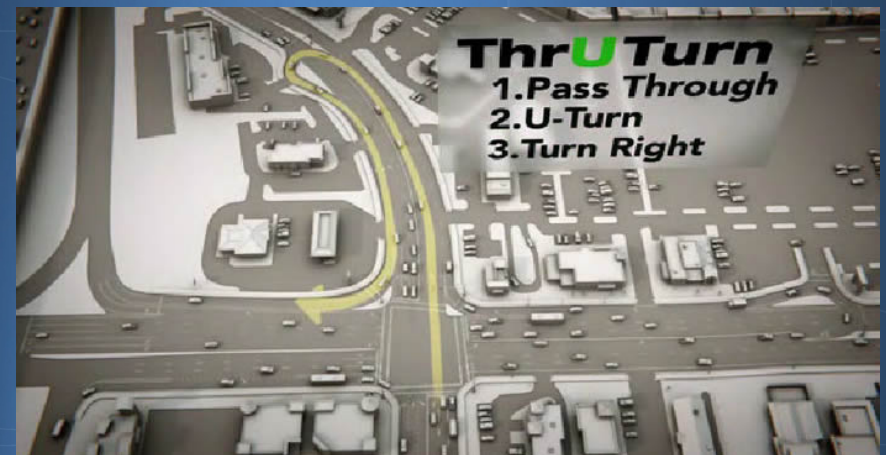
3.3 Median U-Turns



Source: <http://www.fhwa.dot.gov/publications/research/safety/09057/img/image001.jpg>



3.4 ThrU-Turns





4. Modern Roundabout

- Have been successfully deployed across a wide range of contexts:
 - isolated rural intersections with high approach speeds
 - urban settings
 - extensive pedestrian and bicycle features.
- 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





Intersection & Interchange Geometrics Benefits

1. Improved safety
2. Reduced delays
3. Reduced construction time and cost
4. Direct and indirect economic benefits to businesses, communities and system users



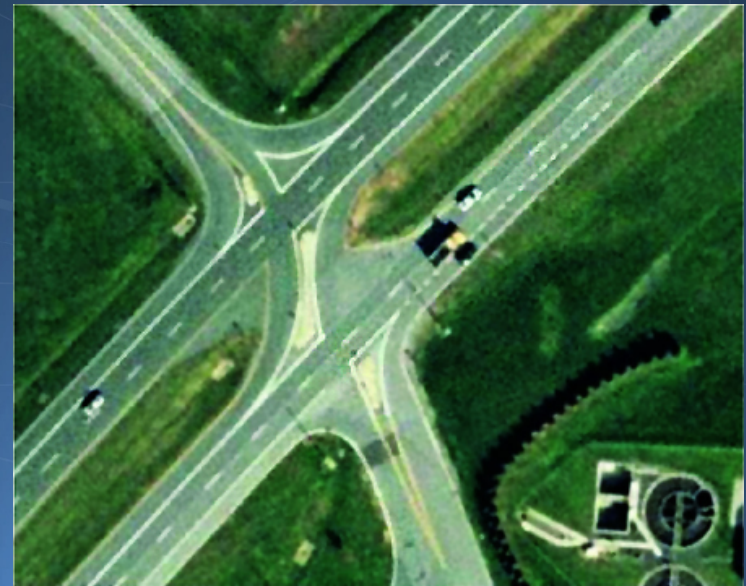
1. Improved safety benefits (Reduce Crash Potential)

Maryland Experience

- Case study: Nine (9) restricted crossing U-turn intersections in Maryland, USA

IMPACTS:

- Before/after crash reduction of 46% for total crashes, 42% for injury crashes and 70% for fatal crashes





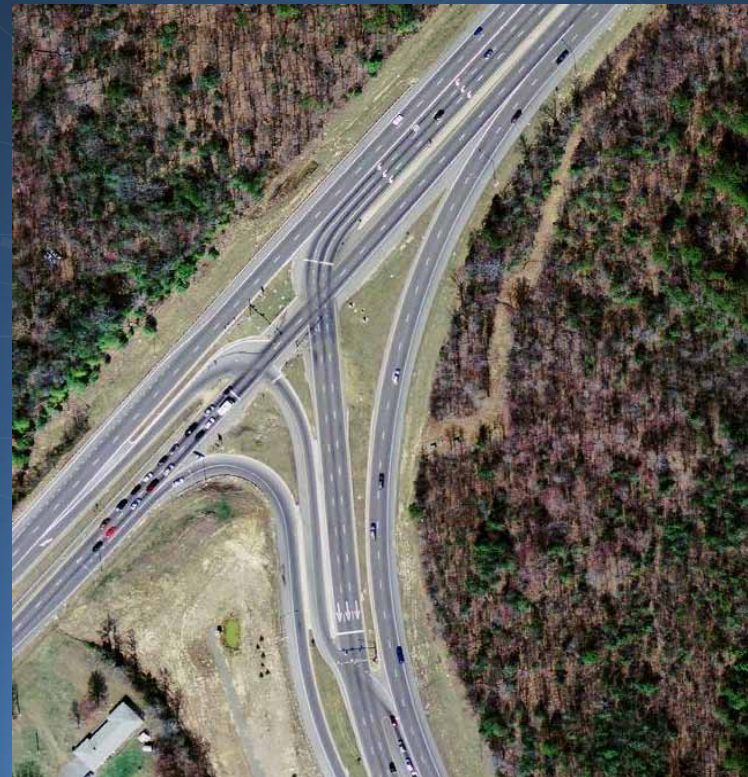
2. Benefits: Reduced delays

UTAH DOT Experience

- DLT intersections can effectively:
 - reduce intersection delay
 - improving corridor travel
 - saving motorists' travel time

IMPACT:

- Overall savings-\$3.5 million/year





3. Benefits: Reduced construction time and cost

Missouri DOT Experience

- The implementation of a DDI design over a Single Point Urban Interchange (SPUI) design reduced the construction time and project costs by more than 50%





4. Direct and indirect economic benefits

Utah DOT Experience

- DLT intersection resulted in substantial fuel savings, estimated at 800,000 gallons per year





Supporting Technical References and Tools

- 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
 - 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>



Intersection & Interchange Geometrics Additional Information

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