A Study of the Operational Flexibility of DDIs
“Real Minnesota Examples”

22nd Annual CTS Transportation Research Conference

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May 24, 2011
Presentation Purpose

• Provide an introduction to DDIs
• Raise awareness of DDIs
  – Advantages/Disadvantages
  – Potential Applications
  – Operational Flexibility
• Test sites: “Real Minnesota Examples”
  – TH 212 at CR 140 (Chaska, MN)
  – TH 52 at 55th Street (Rochester, MN)
  – I-494 at 34th Avenue (Bloomington, MN)
What is a DDI?

• Alternative Interchange Concept
  – Diverging Diamond Interchange (DDI)
  – Double Crossover Diamond (DCD)
  – “Another tool in the toolbox!”

FHWA Resources
safety.fhwa.dot.gov
What is a DDI?

• MO-13 at I-44 (Springfield, MO)
  – Opened June 21, 2009
  – Retrofit to existing diamond interchange
  – Address safety and congestion issues
  – First DDI in the Nation!
## Advantages/Disadvantages

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td>Improved safety</td>
<td>Driver unfamiliarity</td>
</tr>
<tr>
<td>Simplified signal operations</td>
<td>Closely spaced adjacent intersections</td>
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<tr>
<td>Increased capacity</td>
<td>No u-turn accommodation</td>
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<tr>
<td>Reduced infrastructure needs</td>
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</tbody>
</table>
Typical DDI Layout

2-phase signal control

Existing structure

2-phase signal control

Diverge = 6
Merge = 6
Crossing = 2
Conflict points = 14
Potential Applications

- Heavy left-turn volumes
- Low or unbalanced thru-to-thru volumes
- Heavy off-ramp volumes
- Diamond interchanges experiencing a high crash rate
- New infrastructure or ROW acquisition is cost prohibitive (retrofit)
Operational Flexibility

• Two-phase controller(s)
  – Reduces phase lost time
  – Reduces cycle length
• Time of day phasing plans
  – Coordinate thru-to-thru movements
  – Coordinate off-ramp movements
Operational Flexibility

Coordinate thru-to-thru moves
Operational Flexibility

Coordinate off-ramp moves
Microsimulation Software

• VISSIM (PTV America, Inc.)
  – Unconventional geometry
  – Placement of control conditions
  – Merge/weave sections
  – Driving behavior calibration
  – Routing selection
  – Driver decision distances
Test Site:
TH 212 at CR 140 (Chaska, MN)

• Existing Conditions
  – 2-lane bridge overpass

• Study Conditions
  – Estimated design year volume = 17,400 ADT
  – Westbound crossover use existing bridge
  – Eastbound crossover construct new bridge

Source: Google Maps
Test Site:
TH 212 at CR 140 (Chaska, MN)

Existing interchange configuration

Source: Bing Maps
Test Site:
TH 212 at CR 140 (Chaska, MN)

Coordinated thru-to-thru moves
Test Site:
TH 212 at CR 140 (Chaska, MN)

• Acceptable operations
• A.M. Peak = coordinate thru-to-thru moves
• P.M. Peak = coordinate off-ramp moves
Test Site:
TH 52 at 55th Street (Rochester, MN)

- **Existing Conditions**
  - Diamond interchange
  - 6-lane bridge
  - Signalized ramps
  - Closely spaced adjacent intersections

- **Study Conditions**
  - Estimated design year volume = 40,000 ADT
  - Use existing bridge

Source: Google Maps
Test Site:
TH 52 at 55th Street (Rochester, MN)

Existing interchange configuration

Source: Bing Maps
Test Site:
TH 52 at 55\textsuperscript{th} Street (Rochester, MN)

Coordinated thru-to-thru moves
Test Site:
TH 52 at 55\textsuperscript{th} Street (Rochester, MN)

- Acceptable operations
- P.M. Peak = coordinate thru-to-thru moves
- Closely spaced frontage roads impact operations & signal timing
Test Site:
I-494 at 34th Avenue (Bloomington, MN)

• Existing Conditions
  – Diamond interchange
  – Signalized ramps
  – Hiawatha LRT corridor

• Study Conditions
  – No impact to existing bridge

Joint Study:
Kimley-Horn & Associates, Inc.
SRF Consulting Group, Inc.

Project Partners:
Metropolitan Airports Commission
City of Bloomington
Minnesota Department of Transportation
In consultation with the Metropolitan Council

Source: Google Maps
Test Site:
I-494 at 34th Avenue (Bloomington, MN)
Test Site:
I-494 at 34th Avenue (Bloomington, MN)

Coordinated off-ramp moves
Coming to a community near you...

- TH 52 at Elk Run Development (near Pine Island, MN)
  - 2011-2012 construction
  - Safety improvement
  - Congestion relief
  - Business development
- Hwy 15 at Stearns CR 120 (Sartell/St. Cloud, MN)
  - 2012-2013 construction
  - Safety improvement
  - Congestion relief
  - Business development
Thank You!

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