DDIs – State of the Practice and the Next Evolution

Smith Siromaskul
CONCEPTUAL OVERVIEW

- East-west traffic crosses paths twice underneath the interchange so vehicles can turn left onto the highway without waiting for oncoming traffic.
- Traffic lights at each crossover point prevent collisions. The crossover points are like typical intersections where you wait for a light to turn green.
- Screens in the median shield drivers from the headlights of oncoming traffic.

NEW KIND OF INTERCHANGE AT KANSAS CITY
NAME: Diverging diamond
LOCATION: I-435 and Front Street
COST: $6 million
COMPLETION: End of 2007
UNIQUE FEATURE: Cars drive British-style on the left side of Front Street under I-435 bridges.
Used for high volumes of turns
Typically requires fewer lanes
Possibly costs less
Generally looks cool
A WORD OF WARNING

» Concept to 15% Design
NON-PERPENDICULAR CROSSING ANGLE

» Crossroad alignment driven by structure cost
» No need to achieve a perpendicular crossing can mean MUCH less right-of-way with a DDI
INTERIOR ANGLE

30° Minimum
PEDESTRIANS – OUTSIDE TREATMENT

- Pedestrian Travel Paths
- Bicycle Travel Paths
PEDESTRIAN TREATMENT

» Common practice to keep pedestrians to outside
» Conflicts with left turn onto entrance ramp
» Unsafe condition with limited sight distance
PEDESTRIAN TREATMENT

» No conflict with left turns
» Barrier-protected sidewalk
» 80-90% public approval
» Significant pedestrian volumes are present
» Turning roadways have more than one lane
» To eliminate weaving issues
OFF RAMP RIGHT TURN OPTIONS
### FL LESSONS LEARNED

<table>
<thead>
<tr>
<th>Model</th>
<th>West Ramp Terminal</th>
<th>East Ramp Terminal</th>
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<tbody>
<tr>
<td></td>
<td>AM Peak</td>
<td>PM Peak</td>
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<tr>
<td></td>
<td>Delay</td>
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<tr>
<td>Synchro</td>
<td>24.2</td>
<td>C</td>
</tr>
<tr>
<td>VISSIM</td>
<td>18.4</td>
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THE NEXT EVOLUTION

» Splintered Diverging Diamond Interchanges
» Here’s where it gets weird...
ONCE UPON A TIME IN FLORIDA
EXISTING VOLUMES
PROJECTED VOLUMES
TYPICAL DDI LAYOUT - UNIVERSITY PARKWAY

» Median pedestrian treatment
» Pavement slope concerns
» Uncertainty of future volumes
DIFFERENCES

» Existing (2012 counts)

» Design Year (2034)
WHAT’S NEARBY

A new plan for University Town Center

Nathan Benson Park rowing venue

Finishing tower
Grandstand and restrooms
30-acre island with boathouse and viewing stands
Camera and coaches’ trail 5 feet from shore
20-foot land berm with 8-foot trail

Honore Ave. entrance

Benderson Development has submitted to Sarasota County a revised plan for the University Town Center on University Parkway at Interstate 75. Construction has been delayed by the collapse of the housing market, and has led Benderson to propose a different mix of residential and commercial units for the site.

SOURCE: Benderson Development
STAFF PHOTO: BARRY MAGARICK
CHOOSING A DESIGN

» Need for excess capacity, within reason
» Mitigation for pavement sloping issues
» DDI Variants
ADVANCED LEFT DDI – SECLIN, FRANCE

- Three structures
- Three roadways (2 EB, 1 WB)
ADVANCED LEFT TURN DDI
Splintered DDI / I-75 at SR 70 – Sarasota, FL
# Finding Flaws in a Diamond

## Scenario

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Typical DDI</th>
<th>Splintered DDI</th>
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<tbody>
<tr>
<td></td>
<td>EB Thru</td>
<td>SB Left</td>
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<tr>
<td>Scenario 1</td>
<td>60.5</td>
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<td>Scenario 2</td>
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<tr>
<td>Scenario 3</td>
<td>171.0</td>
<td>155.5</td>
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Delay in seconds per vehicle through the entire interchange area
**SUMMARY**

Advanced left DDI
- Improves core lane utilization
- Separation of crossroad left queue

» Splintered DDI
» Large number of lanes
» Excessive internal queuing
» Left turns from ramps
» Unbalanced lefts