DDI’s Can Move More Than Cars!

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Overview

• How did we get to the DDI concept?
• What’s different about a DDI?
• What’s unique about US 36/McCaslin?
• Does it work?
Vicinity Map
Pre-DDI Conditions

Operational Issues

- SW Loop causes uneven lane utilization
- High NB Left-turn movement experiences long queues backing up to Marshall
- Close spacing between EB ramp and Marshall creates weaving problems
2011-12 Study Recommendation

6-lane Diverging Diamond

- New, innovative concept
- Provides capacity for long term with existing bridge
- Addresses McCaslin-Marshall Weave Issue
- $12.3 Million ($4.5 M for Bus Improvements)
What’s a Diverging Diamond Interchange?
DDI History

- Originated in France in the 1970’s (Versailles)
- Gilbert Chlewicke in 2003 presented a paper on new Interchange Design
- Joe Bared attended and pushed the concept with FHWA
- Missouri DOT constructed the first USA DDI in Springfield in 2009
- US 36/McCaslin was the 57th DDI to open in the US
- There are now 66 DDI’s in operation
What is a DDI

- Intersection of a freeway with an arterial
- Arterial through movements cross over from the right side to the left side of the road
- Left-turns onto freeway are free-flowing
- Left-turning vehicles only have to travel through one traffic signal
- Crossover intersections are two-phase
DDI Safety Benefits

- Fewer conflict points (14 for DDI, 26 for conventional)
- Conflict points spread out throughout interchange
- Traffic calming features
- Wrong way entry to ramps extremely difficult
- Pedestrian crossings are shorter
DDI Operational Benefits

- Reduces delay, especially for locations with heavy left-turn movements onto freeway
- Increases left turn lane capacity without needing more lanes
- Better signal network synchronization
- Lanes with multiple assignments in all directions
- Better storage between the ramp terminals
DDI Cost Benefits - Retrofit

- Existing bridge can usually be used
- Additional right-of-way rarely needed
- Construction time is reduced
- Maintenance of traffic is simplified during construction
DDI Cost Benefits – New Interchanges

- Fewer lanes than other interchange forms
- Less bridge structure
- Less right-of-way than a cloverleaf form
US 36/McCaslin Interchange
Unique Features of US 36/McCaslin

- Accommodation of Buses
- Accommodation of Pedestrians
- Accommodation of Bicyclists
- Aesthetic Treatments
As-Built
Accommodation of Regional Buses

Disadvantages of previous configuration:
- Delays due to crossing McCaslin Blvd.
- Ramps shared with general traffic
Accommodation of BRT Buses

- Solution: bus slip ramps/underpasses separate buses from general traffic

- Now buses have dedicated ramps to allow through movements
Accommodation of BRT Buses

- Travel time savings for Flatiron Flyer riders:
  - One minute per rider
  - 10,000 riders per day
  - Riders save approximately 170 hours per day total
US 36 Express Lanes Project

- Reconstruct 16 miles of US 36, including building one express lane in each direction
- Bus Rapid Transit, HOV, SOV
- New commuter bikeway
Accommodation of Local Buses

- Location of Bus Stops on Bridge (Far Side)
- Bus Shelters
Accommodation of Local Buses

- Bus stops on bridge
- Bus Shelters
- Illuminated walkway protected by barriers
Pedestrians: Center or Outside?
Accommodation of Pedestrians

Solution: Center Walkway

- Improved sight lines
- Barrier Separation
- Pedestrians cross with traffic
- Vehicles don’t cross pedestrian paths on bridge
- Signals at two freeway off-ramps
Accommodation of Bicyclists

McCaslin Corridor

- Bike lanes in Louisville
- Bike lanes in Superior (Morgul-Bismark)
- No bike lanes on existing bridge
Accommodation of Bicyclists

Solution:

- Bike lanes cross with traffic to middle adjacent to center walkway
- Bicyclists stopped at one crossover signal can “sail” through second crossover
- Center walkway provides comfortable alternative to novice cyclists.
Accommodation of Bicyclists

US 36 Bikeway

- Bikeway Underpass of Westbound Off-Ramp
- Was shifted under McCaslin because of predictable costs
- Combined Bus/Bikeway Underpass of Westbound On-Ramp
Accommodation of Bicyclists
Aesthetic Treatments

- Basket Handles
- Arch
Aesthetic Treatments

Basket Handles Arch
Aesthetic Treatments

- Decorative Fencing
- Decorative Crosswalks
- LED Streetlights
- Decorative Pedestrian Streetlights
- Decorative Island Splashblocks
So, Does it Work?  
Fine Tuning
Signal Timing Issues

• Cycle Length
  – 6:30 AM to 8 PM: 100 second cycles to match adjacent intersections
  – 8 PM to 6:30 AM: 80 second cycles

• Yellow/All Red
  – Extended to 7.5 seconds for south crossover

• Detection
  – Not needed during peak periods
  – Used at night
Public Reaction

- Initial Driver Confusion
- Construction Delays (Oct 2015 to Jan 2016)
  - Two weekend closures
  - Daily Lane Closures
  - Lots of complaints
- Post 1/22/2016
  - Many positive comments
  - Few complaints
  - Mostly Left-Turn Yield
  - Drivers get the hang of it
Conclusions

- Traffic Flows Better Than Expected
- Significant Reduction in Accidents
- US 36 Bikeway has become popular
- Architectural Statement
- Significant Increase in Bus Ridership
Credits

Public Agencies
• City of Louisville
• Town of Superior
• Colorado Department of Transportation
• Regional Transportation District

Private Partners
• Plenary Roads Denver
• Ames-Granite (Contractor)
• Felsburg Holt Ullevig (Designer)
• HDR (Engineer)
Credits

ITE Members

- Alex Ariniello (Superior)
- Jeff Ream (Felsburg Holt Ullevig)
- Bart Pryzybl (Apex Design)
- Laycee Kolkman (HDR)
- Tim March (WL Contractors)

Link to video
https://www.dropbox.com/s/2pvk4k2jxgckveb/DDI%20Summer%202016.mp4?dl=0