Innovation in Interchange Design –

The Diverging Diamond

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Interchange Considerations

- Traffic & Operations
- Safety
- Pedestrians
- Site Conditions – Access Management
- Maintenance of Traffic - Constructability
- Right of Way & Potential Impacts
- Costs
Traditional Interchange Designs

- Conventional Diamond Interchange
- Partial Cloverleaf Interchange
- Single Point Urban Interchange (SPUI)
- Tight Urban Diamond Interchange
The Diverging Diamond
Two Phase Signal Operation - Signal Phase 1
Two Phase Signal Operation - Signal Phase 2
Safety Benefits

- Reduction in Potential Vehicle-to-Vehicle Conflict Points
  - Traditional Diamond Interchange
    - 26 Conflict Points
  - SPUI
    - 18 Conflict Points
  - DDI Interchange
    - 14 Conflict Points
Pedestrian Accommodations

- Advantages:
  - Shorter distance for pedestrians to cross
  - Outside Crossings are more familiar to pedestrians
  - Four of the crossings maybe protected

- Disadvantages:
  - Pedestrians cross free flowing traffic
  - Potential for eight unprotected crossings
Pedestrian Accommodations

- Advantages:
  - At least four of the crossings will be protected.
  - Could potentially only have two unprotected crossings.

- Disadvantages:
  - Unfamiliarity with untraditional center crossing.
  - More lanes to cross at the center median.
  - May increase signal timing to allow for pedestrians to clear.
Access Management

Typical Requirements

**GUIDELINES FOR LIMITATION OF ACCESS AT DIAMOND TYPE INTERCHANGES**

*By Local Planning Commission Subdivision Control*

- 500’
- 600’
- 500’
- etc.

- Existing R/W
- 225’
- 200’
- 24’

All R/W 10’

*Diamond Interchange Access Spacing*

**GUIDELINES FOR LIMITATION OF ACCESS AT CLOVERLEAF-TYPE INTERCHANGES**

*By Local Planning Commission Subdivision Control*

- 1000’
- 600’
- 600’
- etc.

- Existing R/W
- 225’
- 200’
- 24’

All R/W 10’

*Cloverleaf Interchange Access Spacing*

FHWA Requirements coming in the future for DDIs
Maintenance of Traffic
Constructability
Right of Way
Diverging Diamond Simulation

- Drive Thru Movie Diverging Diamond – Pioneer Crossing - Utah
Advantages

- Provides for two phase signals with short cycle lengths
- Substantially reduces the number of conflict points
- Geometry reduces speeds and results in less severe crashes
- Increases the capacity of turning movements to and from the ramps
- Improves pedestrian safety
- Minimizes ROW impacts
- Cost effective
Disadvantages

- Drivers may not be familiar with configuration
- Problematic for high-speed arterials
- Operational issues with closely spaced intersections
- Operational issues with high thru volumes >650 veh/hr/ln
- Exiting traffic cannot re-enter the freeway in the same direction and can impact emergency vehicles and accident bypass
DDI Locations

- I-44/Missouri 13 – First Diverging Diamond Interchange – Springfield, Missouri
  - Open to traffic: June 21, 2009

- US 60 James River Freeway at National Avenue - Springfield, Missouri
  - Open to traffic: July 12, 2010

- I-15 at American Fork Main Street - American Fork, Utah
  - Open to traffic: August 23, 2010

- I-270 & Dorsett Road - Maryland Heights, Missouri
  - Open to traffic: October 17, 2010

- US 129 Bypass / SR 115 at Middlesettlements Road / Bessemer Street - Alcoa, Tennessee
  - Open to traffic: December 17, 2010
DDI Locations

I-44/Missouri 13

US 60 James River Freeway at National Avenue

I-270 & Dorsett Road
DDI Summary

- **Operations**
  - Free lefts and right turns
  - 2 phase signals

- **Safety**
  - Reduced conflict points
  - Accommodates pedestrian movement

- **Flexibility & Costs**
  - Minimizes ROW impacts
  - Ease of MOT
  - Standard bridges
Questions?