Diverging Diamond Interchange: An Innovative Geometric Solution

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Existing Interchange
Preliminary Engineering Report Alternative
Value Engineering

20 Alternatives Considered

Evaluation Criteria

- Safety
- Traffic Operations
- Right of Way
- Constructability/Maintenance of Traffic
- Cost
Dumbbell Roundabout
Conventional Diamond

Alternative Concept 19x
Diverging Diamond
Safety

- Fewer Conflict Points
- Normal Diamond has 30 Conflicts; 13 are crossings
- DDI has 14 conflicts; only 2 are crossings
Safety

• The use of raised islands and glare screens discourages wrong-way movements.
• Speed reduction due to reverse curvature decreases the severity of crashes that do occur.
• Driver simulation study yielded no attempt to travel the wrong way.
Traffic Operations

• VISSIM was primary tool used for capacity analysis
  – HCS, Synchro and aaSIDRA used as needed to supplement VISSIM analysis

• Sensitivity analysis conducted to determine the results of 110%, 120% and 130% of Design Traffic
Traffic Operations Sensitivity Analysis—Conventional Diamond vs. DDI

**Operational Advantages**
- Two-Phase signals with short cycle lengths significantly reduces delay
- Increases the capacity of turning movements from the ramps.
- Reduce the number of lanes on the crossroad, minimizing impacts to existing right-of-way.
Level of Service (130%)
Conventional Diamond
Level of Service (130% Traffic)
Diverging Diamond
VISSIM Model
Why the DDI?

- **Benefits**
  - Improved Safety
    - Reduced Conflicts
  - Enhanced Traffic Operations
    - Improved Capacity
    - All movements >LOS D
  - Reduced Cost
    - Fewer Bridges
    - Smaller Footprint
Interchange Cost

- PE Report = $118,070,000
- Dumbbell = $80,630,000
- Conventional Diamond = $60,140,000
- Diverging Diamond = $51,990,000

- Total Cost Savings = $66,080,000
Thank You!

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Proposed Diverging Diamond

• North Intersection

• South Intersection
Safety

- Fewer conflict points

  - Normal Diamond has 30 Conflicts; 13 are crossings

- Roundabout has 20 conflicts; 4 are crossings
Traffic Volumes (130% Traffic)
Diverging Diamond – 2035 Projection
Level of Service (100% Traffic)
Preliminary Engineering Report Alternative
Level of Service (100% Traffic)
Dumbbell Roundabout
Other DDI Projects

• First Diverging Diamond in Indiana
  – Missouri DOT has opened DDI in Springfield, MO
    • I-44/Route 13
  – Utah DOT is currently constructing by Design/Build I-15 and American Fork Main Street Diverging Diamond Interchange and will be completed in late fall of 2010
  – Missouri DOT has another DDI planned (I-435/Front Street)
    • FHWA Case Study
  – Others being considered in Michigan, New York, Kentucky, Louisiana, Ohio and Oregon