

Missouri's Experience with a Diverging Diamond Interchange

I-44 & Route 13
Springfield, Missouri

2010 Ohio Transportation Engineering Conference

FIRST IN THE NATION
DIVERGING DIAMOND INTERCHANGE



Where is Springfield, Missouri?



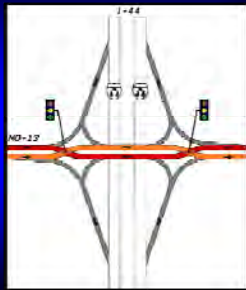



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What is a Diverging Diamond Interchange (DDI)?

- Similar to a standard diamond interchange
- Signals at each end of interchange
- Traffic crosses to opposite sides at the signals
- Eliminates left-turn signal phasing






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How Does The DDI Work?

[3D Animation](#)

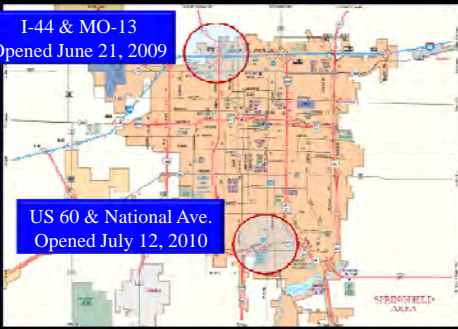
[NPR Animation](#)



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Location of Springfield DDIs



I-44 & MO-13
Opened June 21, 2009

US 60 & National Ave.
Opened July 12, 2010




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The Issues At I-44 & MO-13

- Congestion
- Left-turn traffic backing up and blocking thru traffic
- 73% of crashes were rear-end (40%) and left-turn right angle (33%)
- Limited funds



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Congestion At Interchange

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Congestion At Interchange

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The Practical Solution

- Diverging Diamond Interchange
 - FHWA has adopted the name "Double Crossover Diamond" or DCD

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Distracted Driver Interceptor (DDI)

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How Did We Get Here?

- Considered three options
 - Widen the existing bridge with dual lefts
 - Replace bridge with SPUI over I-44
 - Convert existing interchange to a DDI

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What is a SPUI?


- Single Point Urban Interchange

Source: Bing Maps

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We Chose the DDI Because...

- ...it was **CHEAPER** to build and maintain
 - Utilizes most of existing interchange "footprint"
 - Uses existing bridge – less to maintain
 - No need for additional right-of-way


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How Much Cheaper?


- Construction Cost of DDI: \$3.2 Million
- Construction Cost of SPUI: \$10 Million

- \$6.8 Million savings (68% cheaper)
- This translates to more projects!!


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We Chose the DDI Because...

- ...it was **QUICKER** to build
 - DDI took approximately 6 months
 - SPUI would have taken 1.5+ years with staging
 - Works great for future improvements


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We Chose the DDI Because...

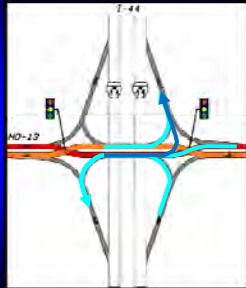
- ...it is **SAFER** and handles traffic better
 - Eliminates left turn movements in front of oncoming traffic = less crossing conflicts
 - Reduces congestion – traffic moves better
 - Has reduced right angle & rear-end crashes
 - Provides safe pedestrian accommodations



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Additional Advantages

- Traffic is better spread out entering freeway
- Oversized loads can make left turns to freeway
- U-turns from/to freeway are easier
- Need less left-turn storage
- Left-turning vehicles only go through one signal


[Video of oversized load](#)





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Drawbacks of the DDI

- Not intended for heavy through movements
- Can't travel from off-ramp to on-ramp
- New to drivers
- Nearby intersections




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Crash Data

- Crash statistics for first 6 months
 - 50% overall reduction of crashes
 - Right angle crashes eliminated (previously 33%)
 - Rear-end crashes reduced (previously 40%)


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Special Feature


- Walkway down the center of bridge to allow pedestrian access





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Pedestrian Access


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Pedestrian Access




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Comparison

- Is it real or is it Memorex?






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Project Challenges

- Utilizing existing bridge (68' Wide)
- No previous guidelines or standards
- Convincing public it would work
- No detour for SB traffic
- Time to complete project


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Weekend Closures

- I-44 & MO-13
 - Used two weekend closures
 - First closure was used to overlay interchange
 - Closure started Saturday at 8:00 PM
 - Interchange opened by Sunday at 5:00 PM
 - Second closure was used to finish final pavement marking, signals, lighting, signing, etc.
 - Closure started Saturday at 8:00 PM
 - Interchange opened on Sunday at 10:00 PM


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Project Timeline

- Construction started: January 16, 2009
- Lane restrictions on bridge: March 4, 2009
- Traffic moved to DDI: June 21, 2009
- Construction completed: July 7, 2009
- Added right-turn signals: August 25, 2009


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Lessons Learned

- Revised overhead truss signs on Rte. 13




Before
After


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Lessons Learned

- Added additional pavement marking




Before
After


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Lessons Learned




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Lessons Learned

- Revised overhead truss sign on WB off-ramp




Existing Condition


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Lessons Learned

- Revised overhead truss sign on WB off-ramp



Day of opening

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Lessons Learned

- Revised overhead truss sign on WB off-ramp




After modifications to truss sign

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Lessons Learned

- Added route shield to pavement – May 2010



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Lessons Learned


- Concrete barrier for pedestrian walkway
- Eliminated glare screen



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Lessons Learned

- Signalize right-turn movements



Before - Yield After - Signal

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Lessons Learned

- Signalize right-turn movements




Before - Yield Video After - Signal Video

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Public Comments

A THORN: "To MoDOT for creating the most screwed-up, confusing intersection at Kansas Expressway and I-44. I just traveled through there for the first time and everyone had their blinkers on and no one could figure out which way to go. What a stupid waste of taxpayer dollars ... where is your brain?"

Judy Nichols , Springfield
Springfield News Leader – July 10, 2009



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Public Comments

"Judy, I go through this intersection twice a day and have yet to see any problems. It works flawlessly, if you have an IQ over 40."

"I have used the new intersection at Kansas and I-44. There is a slight trick to it: Follow the signs."


Responses to Judy on blog
Springfield News Leader – July 10, 2009


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Public Comments

"I was really surprised at how well the whole interchange works. When it was presented to the community I was very skeptical that it would work. I drive through there every morning and have yet to sit in backed up traffic."

Unknown Author
KSPR 33 News Blog – July 5, 2009


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Springfield Police Quotes

"It's wonderful. We love it."

"We've seen a drastic reduction in crashes."

"The reconfiguration has alleviated the traffic congestion."

Sergeant Tom Royal
Springfield Police – Traffic Division


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National Media

"Kudos to MODOT for such a simple and elegant solution"





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"Looks pretty strange, but if it improves traffic flow, and safety, how can anyone complain?"


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MoDOT Public Perception Survey

- Mailed out 400 random surveys
- Included 8 surrounding zip codes
- 75 respondents ~ 19% return


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...and the Results

- 96.7% - Safer
- 95.1% - More convenient
- 95.2% - Less congested
- 86.9% - Easier to drive
- 89.4% - Right transportation solution

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Performance Evaluation

- HDR, Inc. was selected
- Compare crashes before and after
- Public perception (surveys)
- Report will be completed January 2011

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FHWA Evaluation

- North Carolina State University selected
- Compare before/after crash data of 6 DDIs
- Study will look 2 years after completion
- Study will look at traffic simulation software
- Public perception

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Other Recent Locations

- Springfield, Missouri
- American Fork, Utah
- St. Louis, Missouri
- Alcoa, Tennessee
- Kansas City, Missouri

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Springfield, Missouri #2

- Route 60 & National Ave.
 - Opened to traffic on July 12, 2010



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Springfield, Missouri #2

- Cost Share Project - \$9.7 Million
 - Cost includes engineering/right of way
 - Cox Hospital contributed \$3 Million
 - MoDOT and City of Springfield split the remaining
 - Construction cost was \$7.5 Million

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Springfield, Missouri #2

- Route 60 & National Ave.



August 31, 2009
Source: City of Springfield

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Springfield, Missouri #2

- Access Road for Cox South Hospital



August 25, 2010
Source: City of Springfield

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Springfield, Missouri #2

- Access Road for Cox South Hospital Video



Drive through video courtesy of HDR, Inc.

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Weekend Closure

- National Ave. & US 60
 - Used one weekend closure
 - Closure started Friday at 9:00 PM
 - Interchange opened on Monday at 4:00 AM



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American Fork, Utah

- I-15 & Main Street (Pioneer Crossing)
 - Opened to traffic on August 23, 2010



August 24, 2010
Source: Utah DOT

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St. Louis, Missouri


- I-270 & Dorsett
 - Opens to traffic October 2010




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Alcoa, Tennessee

- US 129 Bypass & Bessemer Street
- Construction began April 2010
- Opens to traffic November 2010



Source: City of Alcoa, TN


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Kansas City, Missouri

- MO-150 and Botts Road
- Bid letting was August 20, 2010
- Breaking ground November 2010
- Scheduled completion Sept. 2012





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States Considering DDI

- 35 States and Australia have contacted me
 - Spoken to over 200 individuals
 - Several states have visited and toured
 - Maryland
 - Kentucky
 - Virginia - FHWA
 - Georgia
 - Missouri
 - Oregon
 - Tennessee
 - Michigan
 - Iowa
 - Wyoming


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States Considering DDI





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Available Information for the DDI

<http://epg.modot.org> www.modot.mo.gov




Aerial video
July 8, 2009


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Questions or Comments

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