State of Missouri
2010 Governor's Award for Quality and Productivity
Executive Summary

Team Name: Diverging Diamond Interchange (DDI) Team

Nominator: Kevin Keith, Interim Director

Nominating Department: Missouri Department of Transportation

Category: Innovation

Executive Summary:
On June 21, 2009, the Missouri Department of Transportation opened the first diverging diamond interchange in the western hemisphere at the intersection of Route 13 and Interstate 44 in Springfield, Missouri.

The DDI is an innovation introduced from Europe that is a new tool in the toolbox of transportation-design solutions. Its configuration increases capacity and enhances safety within an interchange by eliminating left-turning movements at the interchange ramp access points, requiring a crossover at a signalized point, creating the diverging nature of the interchange. The groundbreaking project was built to reduce congestion on heavily traveled Missouri Route 13 at Interstate-44 while providing a unique pedestrian/bicycle crossing down the middle of the bridge. The innovative design was chosen for three reasons. First, the DDI could be built in less time than a more traditional interchange reconstruction. Second, the DDI would cost much less money than a more traditional interchange project. And finally, the configuration would be safer.

These goals became MoDOT's motto for the project:

- Quicker
  - The DDI project was completed in six months instead of 12 to 18 months. The time savings can be attributed to the configuration which allowed for retention of the existing Kansas Expressway Bridge.
- Cheaper
  - The total cost of the DDI project was $3.2 million. Because the existing bridge was able to be retained, MoDOT saved approximately $6.8 million to use on other road and bridge improvements.
- Safer
  - Drivers faced only six months of construction-related backups, which reduced the risk to safety.
  - In the first eight months since the project's completion, the DDI has reduced congestion-related crashes by 50 percent by eliminating left-turn conflicts and reducing bumper-to-bumper congestion. Additionally, none of these crashes have been attributed to the design of the DDI. Drivers are able to make "free" lefts onto the interstate eliminating backups on Route 13, which at times reached up to a mile during normal peak travel times.
  - Pedestrians and bicyclists have a much safer way across the bridge, due to a walkway protected by a wall on either side, which runs down the middle of the bridge on the Kansas Expressway. With crosswalks at the signals on each end of the bridge, pedestrians visiting retail and residential areas to the south and the recreational areas to the north are safely accommodated.

The DDI has worked remarkably well since it was opened to traffic in June 2009. Traffic has moved smoothly through the interchange and the significant backups have been eliminated even during peak morning and

afternoon rush hours and during major traffic-generating events at the nearby Ozark Empire Fairgrounds and Dickerson Park Zoo.

More diverging diamond interchanges are being built throughout Missouri. The innovation is also catching on nationally, as many other state transportation departments are looking to replicate MoDOT's innovative project and have begun designing and building diverging diamond interchanges. Additionally, Popular Science magazine named the interchange one of its 100 Best Innovations for 2009.

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NOMINATION FORM

I. GENERAL INFORMATION

Department: Missouri Department of Transportation

1. **Project or team name.**
   Diverging Diamond Interchange

2. **List the name of all team members, job titles, state agency department, and/or community organization.** [please list alphabetically by last name]
   Land Survey Supervisor John Avers
   Traffic Operations Engineer Leo Cologna
   Senior Highway Designer Ray Cook (lead designer)
   Central Office Bridge Project Manager Chad Daniel
   Senior Community Relations Specialist Angela Eden
   Community Relations Manager Bob Edwards
   District Design Engineer Ron Effland
   Intermediate Construction Inspector Jason Evenden (Lead Inspector)
   Assistant Right-of-Way Manager Becky Goad
   District Utilities Engineer Mike Hodges
   District Engineer Kirk Juranas
   District Information Systems Manager Lisa Mattocks
   District Construction and Materials Engineer Jim McDiarmid
   District Planner Manager Frank Miller
   Assistant District Engineer Andy Mueller
   Transportation Project Designer Stacy Reese
   District Traffic Engineer Joe Rickman
   Project Manager Don Saiko
   Assistant District Engineer Matt Seiler
   Resident Engineer Johnny Teegardin
   Right-of-Way Manager Connie Wilson

3. **Describe the project** (*200 words or less*)
   On June 21, 2009, the Missouri Department of Transportation opened the first diverging diamond interchange in the western hemisphere at the intersection of Route 13 and Interstate 44 in Springfield, Missouri.

   The groundbreaking project was built to reduce congestion on heavily traveled Kansas Expressway (Route 13) at Interstate 44 while providing a unique pedestrian/bicycle crossing down the middle of the bridge. The innovative design was chosen, for three reasons: timeliness (quicker), monetary savings (cheaper), and safety (safer).

   The diverging diamond interchange has worked remarkably well since the project's completion. Traffic has moved smoothly through the interchange and significant backups have been eliminated even during peak morning and afternoon rush hours and during major traffic-generating events.

   More diverging diamond interchanges are being built in Missouri. The innovation is also catching on nationally, as many other state transportation departments are looking to replicate MoDOT's innovative project and have begun designing and building diverging diamond interchanges. Additionally, Popular Science magazine named the interchange one of its 100 Best Innovations for 2009.

   The first-in-the-USA design clearly works well. Its speedy construction, monetary savings and safety features will benefit many communities as it is replicated across the country.

4. **Nomination category.**
(*Check only one)*

☒ INNOVATION ☐ CUSTOMER SERVICE

☐ EFFICIENCY/PROCESS IMPROVEMENT ☐ TECHNOLOGY IN GOVERNMENT

5. **Describe why you selected this nomination category.**
The innovation category is intended to commend the work of a team for their development and implementation of a new process/product/service or a better application to an existing process/product/service which create an "added value" to state government. The diverging diamond interchange provides Missourians with an innovative solution to traffic congestion and safety concerns for multiple modes of transportation. The out of the box thinking of the DDI Team resulted in efficient use of tax payer funds and improved travel times, both of which have a direct, positive impact on our customers.

II. BACKGROUND

1. **When did the team begin?**
Design for the project began in April 2007

2. **When did the team implement this project?**
The project was submitted for letting in September 2008. The construction of the project began in January 2009 and was completely finished in July 2009.

3. **How long has the project been implemented?**

☐ 0 - 3 Months ☐ 4 – 6 Months ☐ 7 - 9 Months

☐ 10 – 12 Months ☒ 12 or more ☐ On-going Project

III. RESULTS/ACCOMPLISHMENT

1. **What did the team accomplish?** (*150 words or less*)
Based on the goals of the project, the accomplishments of the team have proven to be more successful than originally anticipated.
   - Quicker: The DDI project was completed in six months instead of the typical 12 to 18 months.
   - Cheaper: The total cost of the DDI project was $3.2 million for the project, compared to the typical $10 million.
   - Safer: Congestion-related crashes have reduced by 50 percent by eliminating left-turn conflicts and reducing bumper-to-bumper congestion. A pedestrian walkway runs down the middle of the bridge on Kansas Expressway, with crosswalks at the signals on each end of the bridge resulted in a much safer way to cross the busy bridge.

The diverging diamond interchange has worked remarkably well since the project's completion. Traffic has moved smoothly through the interchange and the significant backups have been *eliminated* even during peak morning and afternoon rush hours and during major events.

2. **Which of the following describes the benefits of the accomplishment?** (Check all that apply and provide an explanation)

☒ cost reduction ☒ time savings

☐ improved process ☒ other: describe

Cost Reduction – The total cost of the DDI project was $3.2 million. Because the existing bridge was able to be retained under this innovative configuration, MoDOT saved approximately $6.8 million to be used on other road and bridge improvements. A more typical design would have required a new bridge and cost approximately $10 million.

Time Savings – The DDI project was completed in six months instead of 12 to 18 months. The time savings can be attributed to the characteristics of this particular configuration, retaining the existing Kansas

Expressway Bridge over I-44. Conversely, in order to build a single-point urban interchange, a new, much larger bridge would have been needed.

Other: Safety – Due to the selection of this design, drivers faced only six months of construction-related, work zone backups, which reduced the risk to the traveling public. In the first eight months since the project's completion, the diverging diamond has reduced congestion-related crashes by 50 percent by eliminating left-turn conflicts and eliminating bumper-to-bumper congestion. Additionally, none of the crashes have been attributed to the design of the DDI. Drivers criss-cross at a traffic signal at each end of the bridge on Kansas Expressway and drive on the left-hand side of the bridge. Drivers who wish to turn left onto Interstate 44 may do so without having to face oncoming through traffic, eliminating the risk of head-on collisions. With drivers able to make "free" left turns onto the Interstate, left-turning traffic no longer blocks through traffic, which eliminates backups on Route 13 that at times reached up to a mile during normal peak travel times.

In addition, a pedestrian walkway protected by a wall on either side runs down the middle of the bridge on the Kansas Expressway, with crosswalks at the signals on each end of the bridge. Pedestrians and bicyclists have a much safer way across the bridge in order to accommodate the retail and residential areas to the south and the recreational areas (fairgrounds and zoo) to the north.

3. **Explain how the accomplishments of the team are beyond regular duties and responsibilities** (*150 words or less*).

Due to the financial hardships and tightened budgets within all of state government, innovative ideas that result in less cost and increased safety while providing equivalent level of service are more important than ever. The DDI is an innovative design introduced from Europe that is a new tool in the toolbox of transportation-design solutions. Its configuration increases capacity and enhances safety within an interchange by freeing the left-turn movements at the interchange ramp access points, requiring a crossover at a signalized point, creating the diverging nature of the interchange.

This specific design was the first diverging diamond interchange in the nation. As such, the designers required more innovative, out-of-the-box thinking that is continuously encouraged by leaders within the department. The success of the configuration has been extensively researched by other transportation entities and is now being replicated throughout the United States.

IV. MEASUREMENT/EVALUATION

1. **Describe how the success of the project was measured and what outcomes were achieved.** (description should not exceed *300-500 words)*

Safety is a top priority at MoDOT. As such, MoDOT is dedicated to providing a safe transportation system for all modes of transportation. The configuration chosen on this specific project was designed to have a positive impact on traffic flow – which, in turn, impacts safety. Its configuration increases capacity and enhances safety within an interchange by freeing left-turn movements at the interchange ramp access points, requiring a crossover at a signalized point, creating the diverging nature of the interchange.

Due to the selection of this design, drivers faced only six months of construction-related, work zone backups, which reduced the safety risk to workers and the traveling public. In the first eight months since the project's completion, the diverging diamond has reduced congestion-related crashes by 50 percent by eliminating left-turn conflicts and eliminating bumper-to-bumper congestion. Additionally, none of the crashes have been attributed to the design of the DDI. Drivers' criss-cross at a traffic signal at each end of the bridge on Kansas Expressway and drive on the left-hand side of the bridge. Drivers who wish to turn left onto Interstate 44 may do so without having to face oncoming through traffic, eliminating the risk of head-on collisions. With drivers able to make "free" left turns onto the interstate, left-turning traffic no longer blocks through traffic which eliminates backups on Route 13 that at times reach up to a mile during normal peak travel times. The DDI has virtually eliminated all congestion at this intersection.

In addition, a pedestrian walkway protected by a wall on either side runs down the middle of the bridge on the Kansas Expressway, with crosswalks at the signals on each end of the bridge. Pedestrians and bicyclists have a much safer way across the bridge in order to accommodate the retail and residential areas to the south and the recreational areas (fairgrounds and zoo) to the north.

Organizationally, the project produces the desired tangible results – outcomes that our customers expect to see which guide MoDOT decision making – and to the values statements to which MoDOT is committed. This project can specifically be attributed to the tangible results of Uninterrupted Traffic Flow, Safe Transportation System, Innovative Transportation Solutions and Best Value for Every Dollar Spent. Additionally, the values that have been identified as applicable to this project are: "MoDOT will encourage risk and accept failure because we believe in getting better," "MoDOT will empower employees because we trust them to make timely and innovative decisions," "MoDOT will provide the best value for every dollar spent because we're taxpayers too," and "MoDOT will always strive to do our job better, faster, and cheaper because we want to meet more of Missouri's needs." The overall success of the project has surpassed all expectations.

2. **Are the benefits derived from this project:** (Check only one.)

☒ Recurring ☐ One-time

V. RECOGNITION/AWARDS

1. **Has this project ever been nominated for the Governor's Award for Quality and Productivity? If yes, when?**
   No

2. **If yes, for which category was it nominated?**
   N/A

3. **Has this project received any other awards or recognition in the past? If yes, describe.**
   Yes, due to the effective use and innovative planning and implementation, the Diverging Diamond Interchange was named one of Popular Sciences' 100 Best Innovations for 2009. Additionally, the Missouri Valley Section Institute of Transportation Engineers (MOVITE) awarded MoDOT the Transportation Achievement Award for Facilities and the Ozarks Chapter of Institute of Transportation Engineers (OCITE) awarded MoDOT the Transportation Achievement Award – Operations (Public Agency).

VI. NOMINATOR'S INFORMATION

NOMINATING DEPARTMENT
Missouri Department of Transportation

Name	Signature	Telephone Number	E-Mail Address
Kevin Keith		(573) 751-3692	Kevin.keith@modot.mo.gov

VII. DEPARTMENT COORDINATOR INFORMATION

DEPARTMENT
Missouri Department of Transportation

Name	Signature	Telephone Number	E-Mail Address
Justin C. Smith		(573) 526-4313	Justin.smith@modot.mo.gov

VIII. DEPARTMENT DIRECTOR APPROVAL

DEPARTMENT DIRECTOR'S NAME	DEPARTMENT DIRECTOR'S SIGNATURE*
Kevin Keith	

Nomination must be signed ONLY by the Department Director to be eligible for consideration. Nominations not signed by the Department Director will be returned.

How to Drive the Diverging Diamond Interchange

1. As you approach the traffic signal, Route 13 will widen out and curve slightly to the left. You will see oncoming Route 13 traffic on your right at a 25-degree angle.

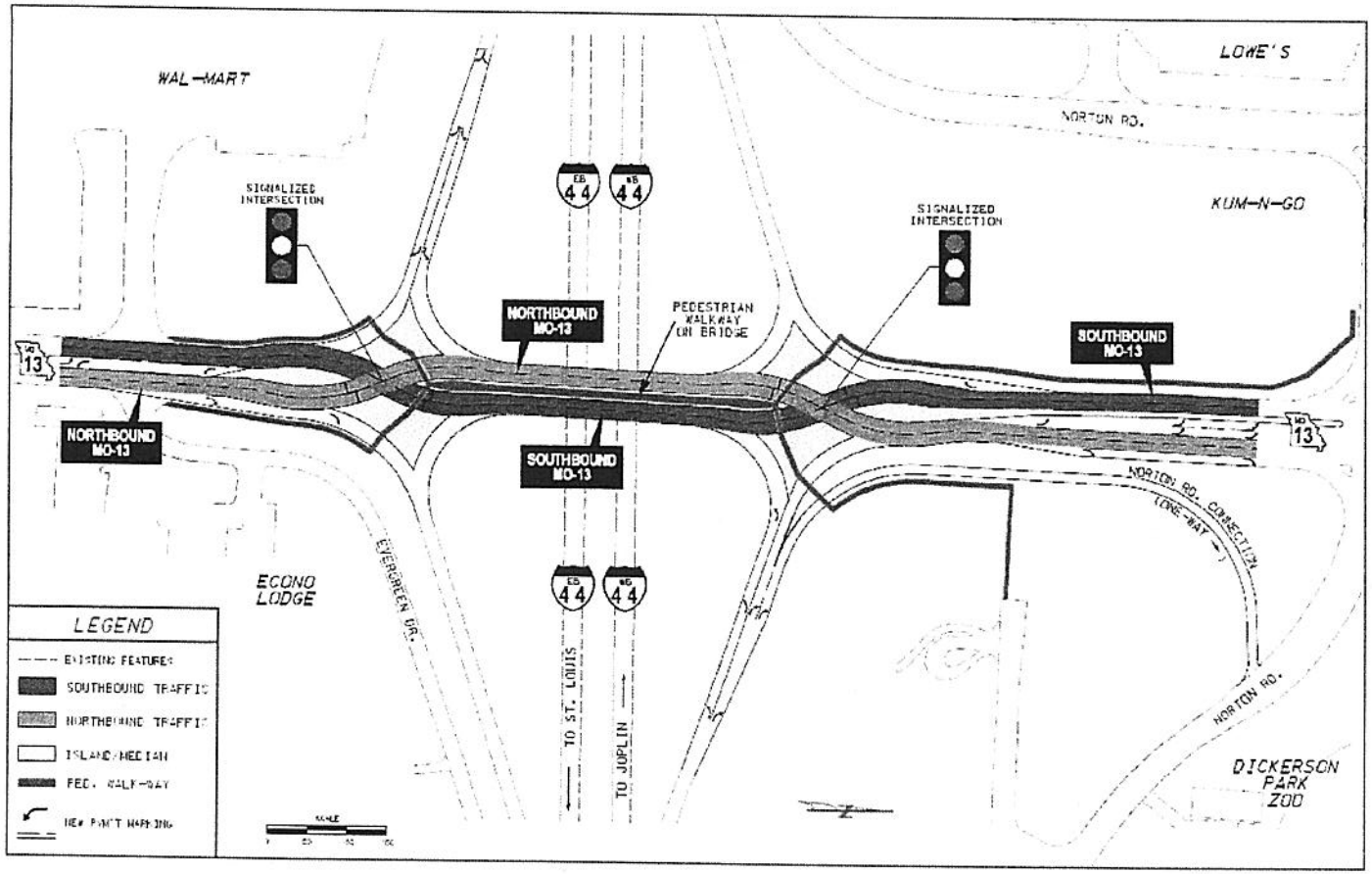
2. As you travel through the signal, you will cross in front of oncoming traffic that is stopped on your right. Then you will be driving on the left side of the bridge, with the opposing lanes on your right, separated by concrete barriers and screening. Pedestrians will use a walkway down the center of the bridge between the barriers.

3. To get to I-44, you will use the left-hand lane. The turn onto the I-44 on-ramp will be a "free left" turn – meaning no need to stop. Just as important, through-traffic behind left-turning drivers will be able to keep moving.

4. If you drive all the way across the bridge and pass through the next signal, you will shift back to the right and oncoming traffic will be on your left, the usual pattern.

5. If you exit eastbound I-44 to go north on Route 13, you will merge into the left lane of northbound Route 13 on the bridge. Likewise, driving westbound I-44 to southbound Route 13, you will merge into the left lane of southbound Route 13 on the bridge.

6. Making a right turn from Route 13 to the I-44 on-ramp in either direction will be the same as it is today. You will have to yield to traffic turning left from the bridge.



Safety Features

- Signs, pavement markings and a raised concrete island at criss-cross points will guide you and help keep you from making a wrong turn into the opposing lanes.
- With no left-turn lanes to fill up on the bridge, two lanes of traffic can keep moving across the bridge, reducing stand-still time and rear-end crashes.
- With "free left" turns at the ramps on either end of the bridge, drivers will not have to cross oncoming traffic or wait for a left-turn arrow to get to the on-ramp of I-44. That should eliminate right-angle crashes for left turns onto I-44.

MoDOT