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I-435 and Front Street Diverging Diamond Interchange

Missouri Department of Transportation

KCITE – 2012 Excellence in
Transportation Award



I-435 and Front Street Diverging Diamond Interchange

Missouri Department of Transportation

Project Development Team

Design: Missouri Department of Transportation Staff

General Contractor: Clarkson Construction Company

Transportation Demand Management and Community Outreach Consultants: Wilson & Company; Vireo

Project Summary

The I-435 at Front Street diverging diamond interchange (DDI) is a groundbreaking innovation, the first of its kind designed in North and South America.

Although the diverging diamond concept originated on intersecting local routes in France, the Missouri Department of Transportation pioneered the application for major highway interchanges when this project was proposed and design begun in 2005.

I-435 and Front Street was identified in a Major Investment Study in 1998 as a location that needed improvement. The surrounding area is very industrial and crucial to regional truck travel. Numerous interchange types and scenarios were explored but none were able to significantly improve the interchanges performance except the DDI concept.

Initially planned for construction in 2007, the project was postponed for more than three years while the Christopher S Bond Bridge and ancillary interchanges were constructed at the other end of Front Street several miles to the west. MoDOT determined that the Bond Bridge construction would disrupt Front Street and trans- river mobility too much to also embark on another major project so close at the same time.



Existing Front Street

Once I-435 and Front Street DDI construction began in early 2011, MoDOT had already completed and proven the viability of the first DDI constructed in the with the interchange at Route 13 and I-44 in Springfield. Front Street and I-435 added another triumph to MoDOTs list of DDI victories.

Project Design



Project Signage

The diverging diamond interchange is a revolutionary innovation that moves traffic much more safely and quickly where there are major turning movements at high-volume highway intersections. By switching the flow of traffic to the left side at the between the ramps of the interchange on the cross route, traffic is offered a free left turn without crossing the path of opposing traffic or stopping again at a second traffic signal.

Vehicles approaching the interchange that intend on turning

right still have a free right turn available prior to the signal where the crossover to the left side begins.

Adding the free left turn to the interstate moves traffic more safely and quickly, and significantly reduces congestion and backups caused by the left-turn phase of traditional traffic signals.

Engineers see distinct advantages in the DDI design at I-435 and Front Street because of the large volume of left turning traffic, particularly the number of large trucks that are common in the industrial area.

The I-435 and Front Street DDI not only proved to be far superior to all other interchange improvements considered at the former diamond interchange, it was built for \$8.1 million, at a small fraction of the cost of reconstructing the interchange as a larger, conventional diamond or a single-point urban interchange that were estimated around \$30 million or more.

Construction was not only far less disruptive – it was done entirely under traffic, without major lane or ramp closures. The DDI concept proved effective evening during construction when traffic conditions improved after the traffic pattern was changed to a single lane DDI before the entire project was complete.

Project Challenges

Because this project was a retrofit of an existing urban interchange, project challenges included maintaining access to existing development especially to the KCP&L power plant and Bayer facility since the interchange is their only point of access for emergency services.



Under Construction but Open to Traffic

Additionally, an extremely aggressive construction schedule was planned to complete construction.

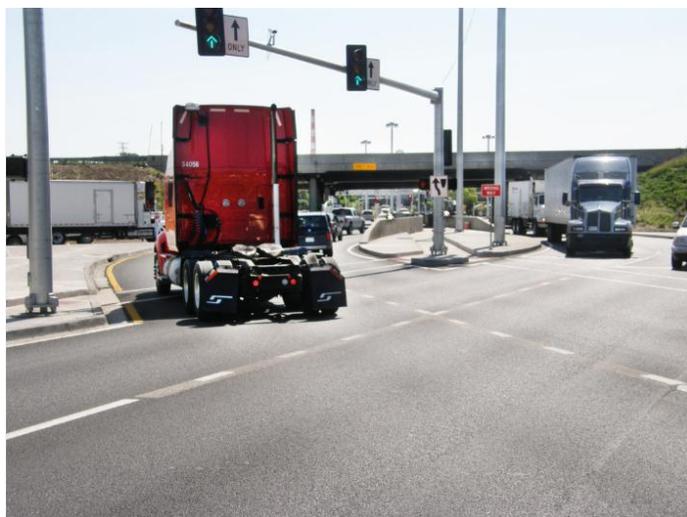
Drainage design was also a major challenge as the interchange lies in the Missouri River flood plain. Front Street at this location is major utilities corridor as well which only added to the complexity of the project.

One of the most difficult challenges posed was maintaining access to a safety-sensitive “box canyon” industrial neighborhood to the



Under Construction but Open to Traffic

east of the project. The neighborhood included a chemical plant, an electrical generating plant and a major truck refueling station whose only access was through the job site. MoDOT worked with Vireo (then known as Patty Banks Associates) to establish transportation demand strategies and access plans to ensure needed access for emergency responders during all facets of construction.



Construction Complete

Months of community outreach and planning were critical to the success of the project. Several stakeholder meetings were held with major employers to explore and devise transportation demand strategies, and a Website was created to provide up-to-date information about the project and transportation options. The Kansas City

Area Transportation Authority partnered with MoDOT to offer assistance to commuters, helping to consolidate trips in and out of the area during particularly congested times in the project.

Due to the desire to not weather the construction and cause additional time delays, this project was set on a very aggressive construction schedule. With a notice to proceed date of 04/04/2011 and an original completion date of 12/01/2011, the project was expected to be a functioning diverging diamond interchange in eight months to meet customer expectations.

As with most urban retrofit projects, numerous utilities were impacted, including unforeseen impacts involving water lines, phone lines and gas and electrical lines that served the surrounding businesses. One utility impact included a one week window to complete lining an existing 20” water main based on supply demands and the 8” temporary lines not managing adequate flow.

Project Construction

When Clarkson Construction Co. began construction of the I-435 and Front Street DDI in April 2011, it faced the daunting responsibility to maintain access through the jobsite as a conventional interchange up to the moment that it was switched to a DDI, then implement the changeover under traffic in a matter of minutes. Weeks of notifications to trucking organizations, customers of a truck refueling station in the middle of the project, and to businesses in the area preceded the weekend changeover from conventional diamond interchange to diverging diamond interchange.



Construction Complete



Construction Complete

Finally completed in May 2012, the I-435 and Front Street diverging diamond interchange now functions smoothly, a sterling example of innovative thinking, public involvement and collaborative planning with stakeholders in mind.