

APWA **REPORTER**

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Alternative intersection design delivers

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For most people, being the first to try something is daunting, intimidating, and even downright scary. But the City of Fairfield, Ohio, didn't have much choice in becoming the first community in the country to implement an alternative intersection design known as QRI, or quadrant roadway intersection.

The intersection of Route 4 and the Route 4 Bypass in Fairfield had a history of congestion-related accidents and troublesome traffic delays. In fact, the crash rates at the intersection were five times the statewide average. After establishing project goals and evaluating ten design options, the QRI solution—although unique—was the best fit to provide for the community's needs. The innovative design met the required criteria from all the project's stakeholders: the Federal

Highway Administration (FHWA), the Ohio Department of Transportation (ODOT) and the City of Fairfield.

The primary objective of a QRI is to reduce delay at a severely congested intersection by removing left-turn movements. At a QRI, all four left-turn movements from the conventional four-legged intersection are rerouted to use a connector roadway in one quadrant (see Figure 1). The new intersection benefits the traveling public, as it is expected to reduce accidents and enhance traffic flow to and from Route 4, which handles traffic of 40,000 vehicles per day.

The project team exhausted all other design options in an attempt to use a more conventional intersection design. None of the conventional options were viable for traffic flow, or cost effective with

regard to construction and right-of-way. However, once the project stakeholders granted approval of the QRI design, there were very few technical problems with this project.

Implementing the QRI design did provide some valuable lessons learned for employing alternative intersection designs.

Lesson Learned #1: Avoid opening before all lanes and movements can be opened

In an effort to provide as many available lanes of traffic as possible, portions of the newly constructed QRI roadway were opened before all lanes on the receiving roads were complete. As a result, the public's first experience with the new intersection configuration was with it operating at less than full capacity. Despite appropriate signage, the partially completed improvements led to

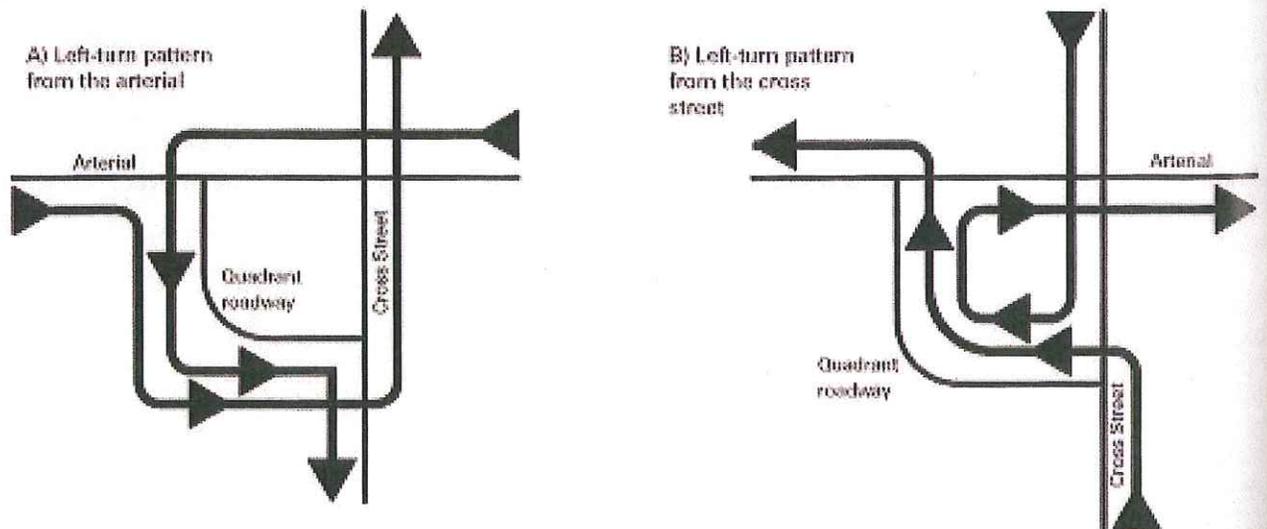


Figure 1: These graphics show the connector road and how all four of the left-turning movements are rerouted to use it.

initial confusion and frustration with the intersection. The temporary lane configurations and use of three traffic signals at the expanded intersection increased the importance of the temporary signal timing during construction.

When implementing an alternative intersection, it is ideal to employ a maintenance of traffic scheme that uses the existing conventional intersection design until the new intersection can be opened in its full capacity. Public perception and reaction to the new configuration is always going to be apathetic at best, and opening it with limited capacity, traffic barrels and temporary paint markings (while construction activity is still taking place) adds to driver uncertainty and confusion.

If the alternative configuration is introduced after most of these elements have been removed and it is at full capacity, the public's initial understanding and appreciation of the improvements will be greatly enhanced. This may not always be practical, but it should be given serious consideration.

Lesson Learned #2: Changing driver habits needs to be as intuitive as possible

Because the QRI intersection is unfamiliar and somewhat counterintuitive to the public, the City of Fairfield created a public outreach program to educate residents. The education program focused on the need for drivers to adjust the way they make left turns at this location. Instead of turning

at the primary intersection, left turns occur at one of the secondary intersections. The education program included a project website, project boards at the public works office, televised city council and city manager briefings, meetings with local businesses and organizations, newsletter articles and media releases.

Although the design attempted to reduce confusion with overhead signing and in-lane pavement markings, driver habits and inattention created some challenges to smooth travel when the intersection opened. This problem was combated by adding temporary message boards and signage. Permanent advanced, illuminated and non-illuminated, ground and overhead signs were erected prior



Figure 2: Aerial view of the completed quadrant roadway intersection (QRI) in Fairfield, Ohio

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to the QRI opening. The City also increased police involvement in the area to provide travelers with verbal and written warnings as they adjusted to the new intersection.

Lesson Learned #3: Restrict illegal turns with physical barriers

The QRI design removes all traditional left-turn movements from the major intersection, which proved challenging for motorists. When the new intersection first opened, the City of Fairfield documented a large number of illegal turns. These illegal turns reduced significantly after the first week the intersection was open, and decreased 90% within eight months. Still, the use of a physical barrier, such as a concrete median or landscaped island, would have been more effective than adding transverse striping to prior left turn lanes in communicating the left-turn restrictions.

Lesson Learned #4: Sustainability is about more than "green"

Although sustainability typically focuses on the environmental aspects, this was truly a sustainable project. True sustainability centers on the triple bottom line of economic, social and environmental impacts. From an environmental perspective, the QRI design allowed construction to weave between existing wetland areas with minimal impact. The project also used existing local resources, including a large amount of fill obtained from sites around the city, and the existing fiber-connected central traffic system. Many of the existing materials were recycled, and the existing bridge deck was broken up and used as erosion control for another City project. Economically, the design greatly reduced the impact on the commercial properties located on three corners of the intersection. The QRI also reduces travel time

through the intersection, resulting in both economic and environmental benefits. Simplified traffic signals, enhanced traffic flow and aesthetic improvements to the area also have a positive effect on the long-term impacts to the community.

Alternative intersections have the potential to help your community realize many of these same benefits at challenging intersections. FHWA has developed tools to assist in the evaluation of these intersections for your situation. More information on the current research and configurations for alternative intersection designs can be found in the *FHWA Alternative Intersections/ Interchanges: Informational Report (AIIR)*¹.

The City of Fairfield didn't set out to be the first in the country to implement a QRI design. But this alternative intersection design was the only way to achieve acceptable levels of service and safety while considering the social, economic and environmental costs of the project.

Whether it's conventional or alternative, the most important result is to select a design that meets the varying needs of the community. Explore all options, use the available evaluation tools and consider all three elements of the sustainability triple bottom line when selecting the best solution for the challenging intersections in your community. For the City of Fairfield and the Bypass 4 intersection project, it was a QRI. What will it be for your community?

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¹ <http://www.fhwa.dot.gov/publications/research/safety/09060/>