

Interchange Concept Development for the I-75 Mill Creek Expressway Project

Susan Swartz, P.E., AICP and Greg Parsons, P.E., TranSystems Corporation

Old, congested and accident prone are three characteristics typical of many urban interstates in Ohio, originally built to 1950's and 1960's design standards which did not anticipate the traffic volumes we experience today. These characteristics are particularly true of Interstate 75 in Cincinnati. The roadway, dubbed the Mill Creek Expressway, is heavily congested and burdened with accident rates two to three times the statewide average for freeways. By 2030, the entire corridor is projected to operate at Level of Service F based upon traffic volumes alone, not considering the increases in traffic tie-ups resulting from accidents.

Despite capacity needs, the Ohio DOT and the City of Cincinnati have decided, due to public input, physical and fiscal constraints, to add only one through lane in each direction when the roadway is upgraded in 2011. Travel demand modeling indicates that adding one additional lane draws more traffic to I-75, primarily from adjacent arterials. However, if two or more additional lanes are added in each direction, the draw of traffic occurs at a greater volume and from a wider area, even attracting substantial traffic from I-71 across already congested east-west state routes. The Ohio DOT concluded that additional capacity is clearly desired within the system, but that this capacity may better serve the area if provided on adjacent arterials or I-71.

Because of the limited capacity improvement, other features of the project take on an even greater importance, such as eliminating left-hand exit ramps and poor service ramp locations. As a part of the I-75 Mill Creek Expressway Project, six interchanges

are being reconfigured. One such interchange is I-75 at Hopple Street.

The Hopple Street interchange contains a left-hand exit in the I-75 northbound direction. It also has a substandard I-75 eastbound-to-



northbound entrance terminal and the westbound-to-northbound entrance ramp originates from Bates Avenue, not Hopple Street, fragmenting the interchange. Northbound traffic from Bates is restricted by channelizing line to only access I-74 and is not permitted to access I-75 north; however, drivers do not obey the markings. The Hopple Street interchange is an important access point to I-75 for the University of Cincinnati and the Uptown area.

Ten different build alternatives, plus the No Build option, were considered for this location. Interchange intersections were analyzed using Synchro v6 (for signals) and RODEL v1 (for modern roundabouts) using 2030 design year turning movement volumes. Conceptual designs were created using line diagrams (sometimes referred to as "crayon drawings") to illustrate each alternative. Ohio

DOT officials and stakeholders were able to review and evaluate a large array of options at Hopple Street (along with the other five existing interchanges under study) to determine which concepts merited further consideration.

Based upon this early review, eight options were dismissed due to poor operations, geometric constraints, and excessive costs (compared to other functional options), or other concerns. Three options were accepted for additional design development. These included the No-Build alternative plus the following two options:

Tight Urban Diamond

This alternative would involve reconstructing the Hopple Street interchange as a tight urban diamond (TUDI). The completed interchange would provide for full movements at Hopple Street (Bates Avenue ramp would be closed) and replacing loop ramps with straight ramps. The ramp intersections would be closely spaced and signals coordinated. Due to the short distance between the Central Parkway /MLK Drive intersection and the east ramp intersection, the Central Parkway /MLK Drive intersection is proposed to be grade-separated. A connecting roadway from Central Parkway to MLK Drive would be constructed to maintain access between the roadways, forming a single loop arterial interchange.

Advantages of the TUDI alternative are the elimination of low speed ramp curves and left-hand exit, better operation of the Hopple Street/MLK Drive intersection, and creating a single, full movement interchange. Disadvantages of this option are the high cost due to structures, property impacts, and

indirect connection between MLK Drive and Central Parkway.

Offset Diamond Interchange

This interchange alternative provides for a single ramp intersection located on the west side of I-75. As with the TUDI, all movements are supported by this arrangement; however, the I-75 NB direction ramps would fly over the mainline with overhead bridges such that all ramp roadways meet at the single intersection. By doing so, the intersection of Central Parkway/MLK Drive would remain at-grade.

This concept originally considered the use of a modern roundabout for the ramp intersection. After further analysis was performed for the Central Parkway/MLK Drive intersection future condition, an additional through lane each way on Hopple Street was determined necessary to achieve an acceptable level of service. The added lane would then result in the roundabout containing at least three

lanes. Presently, the Ohio DOT will not consider a three-lane modern roundabout at opening day due to driver unfamiliarity; therefore use of the modern roundabout was eliminated from this concept and replaced with a signalized intersection.

Advantages of the Offset Diamond are elimination of the left hand exit, additional distance between the ramp intersections and the MLK/Central Parkway intersection, and provision of full movements at the interchange. This option has fewer impacts to properties on the east side of I-75.

Disadvantages of Offset Diamond are its high cost (although expected to be lower than the TUDI) and lower speed ramps for I-75 northbound. This option also requires more space for ramps, thus shortening distance between Hopple Street ramp terminals and adjacent interchanges at I-74 and Western Hills Viaduct.

Going forward in the Project Development Process, TranSystems and ODOT will continue to evaluate the Offset Diamond Interchange and the Tight Urban Diamond Interchange utilizing refined traffic volumes, simulation models, additional design detail, and environmental studies to compare the two options. Drawings for the I-75 Mainline improvements as well as each of the interchanges under study are available along with project reports at www.i75millcreekexpressway.com. ■

Susan Swartz is TranSystems' National Practice Leader for NEPA/Environmental Planning. Susan is a registered professional engineer in Ohio and a certified planner specializing in project management for major corridor studies.

Greg Parsons is a Senior Transportation Engineer and Lead Geometrics Engineer for TranSystems in Ohio. Greg is a registered professional engineer in Ohio.



Tight Urban Diamond Interchange Alternative



Offset Diamond Interchange Alternative