



Intersection and Interchange Geometrics

PROJECT CASE STUDY

For North Carolina, Implementation of Superstreets Means Travel Time Improvement, Reduction in Collisions, and Fewer Injuries and Fatalities

Increasing traffic delays at intersections are a common problem faced by Departments of Transportation (DOTs) across the nation. North Carolina is making strides in tackling delays in suburban, high-volume arterial areas through the implementation of "superstreets," also known as restricted crossing U-turns (RCUTs). These arterial surface roads can move high-traffic volumes with less delay by re-routing left-hand turns and crossing maneuvers coming from the side streets. Instead, at an RCUT, drivers make a right turn onto the major highway and then make a U-turn through a median.

While this may seem time-consuming, studies show it can result in significant time savings. At signalized intersections, the overall time savings efficiencies are due to the ability of the major highway to have a greater percentage of green time to allow the heavy through volumes of traffic to proceed. At unsignalized intersections, traffic from the minor street may actually save time since drivers are not stuck waiting for the long traffic gaps needed to go across the busy thoroughfare or make the left-hand turn. North Carolina has deployed the superstreet concept at intersections across the state, including a corridor of signalized intersections along U.S. Route 17 near Wilmington.



BENEFITS OF SUPERSTREETS

Safety

- ▶ Fewer conflict points: 14 compared to 32 conflict points for conventional intersections
- ▶ Reduced likelihood of crashes: 46 percent fewer crashes and 63 percent fewer resulting injuries and fatalities
- ▶ Fewer threats to crossing pedestrians

Travel Time

- ▶ Reduction in travel time by 20 percent
- ▶ Increased roadway capacity: Superstreets buy more years after the conventional intersection hits capacity before a major upgrade is needed

Economic Development

- ▶ Preserves the existing facility
- ▶ Provides good access to both sides of the main road for development
- ▶ Accommodates semi-trailer combinations

Researchers at North Carolina State University conducted the largest-ever study of superstreets and their impacts, and found that the superstreet traffic design “results in significantly faster travel times, and leads to a drastic reduction in automobile collisions and injuries.” Although the superstreet concept has been around for more than 20 years, the NC State study is the largest analysis ever performed of the impact of superstreets in real traffic conditions.

The operational analysis involved calibrating and validating VISSIM models of three existing superstreets in the State, and comparing that with results from models of equivalent conventional sites. The superstreet outperformed the conventional design at each location studied, reducing the overall travel time per vehicle traveling through the intersection. The study also found an average of 46 percent fewer reported automobile collisions and 63 percent fewer collisions that resulted in injury or fatality, when compared to similar intersections that use conventional traffic designs.

The US-23/74 superstreet in Haywood County was studied for 12 years: 6 years before the superstreet installation and 6 years after. There was a 16.8 percent reduction in total collisions, including a 41.1 percent reduction in fatal injury collisions, when comparing the second six-year period to the first. Additionally, the NC State study presented significant performance and operational results, and showed a 20 percent overall reduction in travel times. Because of this direct positive impact on travel, DOTs are able to wait longer to make more significant changes to the intersections, resulting in cost savings. The travel time savings and extra capacity at higher volumes can buy an agency more years of acceptable operation. The study also showed that superstreets result in lower vehicle emissions due to the reduction in congestion and prolonged vehicle idling.

Keys to Success

- ▶ **Active and ongoing stakeholder engagement and buy-in.**
- ▶ **Decisions supported by credible and reliable models and data.**
- ▶ **Coordination among planning, design, safety, and operations.**
- ▶ **Supporting Policies: Capability to fund improvements, multi-agency agreements, and policies where roadways cross jurisdictional boundaries; driver education campaign.**
- ▶ **Complementary Strategies: Intersection pedestrian treatments, access management.**

ADDITIONAL RESOURCES

- ▶ Hummer, Joseph, Rebecca Haley, Sarah Ott, “Superstreet Benefits and Capacities,” North Carolina State University, December 2010: <https://trid.trb.org/view/1102462>
- ▶ Hummer, Joe and Matt Shipman, “No Left Turn: ‘Superstreet’ Traffic Design Improves Travel Time, Safety”, NC State University Newsroom, Jan 10, 2011: <http://news.ncsu.edu/releases/wmshummersuperstreets>
- ▶ Haley, Rebecca, Sarah Ott, Joseph Hummer, Robert Foyle, Christopher Cunningham, Bastian Schroeder, “Operational Effects of Signalized Superstreets in North Carolina,” North Carolina State University, Jan 24, 2011: <https://trid.trb.org/view.aspx?id=1092928>
- ▶ North Carolina Department of Transportation: <https://www.ncdot.gov/projects/us-1-15-501-moore/Pages/default.aspx>
- ▶ “An Update on Superstreet Implementation and Research,” NC State University: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.518.9610&rep=rep1&type=pdf>

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