

0-6861: Improving Safety and Efficiency of Signalized Intersections during Inclement Weather

Background

Because it affects driver behavior, vehicle performance, pavement friction, and roadway infrastructure, weather can have a significant impact on not only traffic safety and operations, but also mobility and productivity (Figure 1). While it is known that weather conditions can affect travel speeds, traffic volumes, and start-up lost times, few agencies adjust their traffic signal timing plans to account for less than ideal conditions during adverse weather conditions. The goal of this research project was to provide the Texas Department of Transportation (TxDOT) with feasible, implementable guidelines for designing and deploying special traffic signal timing plans for inclement weather conditions.

What the Researchers Did

As part of this project, the research team examined available technologies for detecting adverse weather at signalized intersections and provided technical guidance on strategies for modifying traffic signal operations during various types of weather events. The research team developed a realistic and practical architectural framework for collecting and disseminating weather information to improve signalized intersection operations. The team deployed the architecture at intersections in



Figure 1. Drivers Navigate a Flooded Intersection.

Dumas, Burleson, and Clear Lake; and conducted simulation and field studies to explore the benefits of providing weather-responsive traffic signal operations. The research team also provided guidance for operating traffic signals and developing traffic signal timing plans for large-scale evacuations, such as hurricane evacuations in coastal regions.

Research Performed by:

Texas A&M Transportation Institute

Research Supervisor:

Kevin Balke, TTI

Researchers:

Srinivasa Sunkari, TTI
Hassan Charara, TTI
Nadeem Chaudhary, TTI
David Florence, TTI
Geza Pesti, TTI
Charles Stevens, TTI
Johnathan Tydlacka, TTI

Project Completed:

12-31-2016

What They Found

Using a combination of simulation and field studies, the research team found that agencies can achieve slight improvements by adjusting their traffic signal timing plans during adverse weather conditions. Agencies can detect when adverse weather conditions are impacting traffic operations at intersections by integrating a pavement-condition-monitoring system at their traffic signal cabinets. Weather-responsive traffic signal timing plans should be implemented only at critical intersections or systems where traffic operations are severely impacted by weather events. These intersections typically are high-volume, high-speed intersections whose operations are severely impacted due to reduced speeds.

The research team also found that because weather conditions can vary widely across the state, weather-responsive timing strategies need to be implemented on a district-by-district basis.

What This Means

Implementing weather-responsive traffic signal timings can improve operations and safety on some corridors of regional significance and on corridors with high accident experiences during weather conditions. Implementing weather-responsive traffic signal timing will require TxDOT to install pavement-condition sensing technologies and integrate them with traditional traffic signal control equipment. TxDOT should include information on how to develop weather-responsive traffic signal timing plans and weather-monitoring technology as part of its training materials on traffic signal operations.

For More Information

Project Manager:

Sonya Badgley, TxDOT, (512) 416-4657

Research Supervisor:

Kevin Balke, TTI, (979) 845-9899

Technical reports when published are available at <http://library.ctr.utexas.edu>.

Research and Technology Implementation Office
Texas Department of Transportation
125 E. 11th Street
Austin, TX 78701-2483
www.txdot.gov
Keyword: Research