

# Best Practices for Road Weather Management

## Version 2.0

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### City of Charlotte, North Carolina Weather-Related Signal Timing

In North Carolina, the City of Charlotte Department of Transportation (DOT) manages the operation of 615 traffic signals with a computerized control system. In the central business district weather-related signal timing plans are utilized at 149 signals to reduce traffic speeds during severe weather conditions. Weather-related signal timing can also be employed at over 350 intersections controlled by closed-loop signal systems.

*System Components:* The traffic signal control system is comprised of signal controllers located at City intersections, a Closed Circuit Television (CCTV) surveillance system, twisted pair cable and fiber optic cable communication systems, and a signal system control computer in the Traffic Operations Center (TOC). Images from over 25 CCTV cameras on major arterial routes are transmitted to the TOC and displayed on video monitors. Various timing plan patterns, which are stored in the computer, can be selected and downloaded to field controllers via the communication systems.

*System Operations:* System operators assess traffic and weather conditions by viewing CCTV video images and receiving weather forecasts. Forecast data is available through radio and television broadcasts, the National Weather Service (NWS) website, and a private weather service vendor. When heavy rain, snow, or icy conditions are observed operators access the signal computer and manually implement weather-related timing plans. To slow the progression speed of traffic these signal timing plans increase the cycle length—which is typically 90 seconds—while offsets and splits remain the same. During off-peak periods operators may also select peak period timing patterns, which are designed for lower traffic speeds.

System operators monitor roadway operations after weather-related signal timing plans have been executed. If warranted by field conditions, operators can increase cycle lengths to further reduce traffic speeds. When road weather conditions return to normal, operators access the central computer to restore normal time-of-day/day-of-week timing plans.

*Transportation Outcome:* By selecting signal timing plans based upon prevailing weather conditions traffic managers have improved roadway safety by reducing speeds and minimizing the probability and severity of crashes. Travel speeds decrease by five to ten mph (eight to 16 kph) when weather-related signal timing is utilized.

*Implementation Issues:* The City's TOC is typically staffed during AM and PM peak periods. However, traffic managers may extend the hours of operation when adverse weather is predicted or observed. System operators may be required to come in early or stay late depending upon the timing and nature of a storm event.

The signal operations staff is very experienced. Most system operators have worked for the City of Charlotte for over ten years. Decisions to execute weather-related signal timing are based upon operator observations, knowledge, and judgment. Road weather conditions are closely monitored to determine the type of storm and its area of influence. Operators modify signal timing only when weather impacts are widespread and affect a significant portion of the City's intersections.

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Renovation of the TOC is expected to be complete by the end of 2002. The signal system control computer will be replaced, a new projection screen and new video monitors will be installed, a six-workstation control console will be positioned in the control room, and a fiber optic cable communication link will be established with the North Carolina DOT Traffic Management Center. This link will allow the City to access video from roughly 30 state-owned CCTV cameras as well as facilitate data sharing and coordination between the city and the state.

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