

# Best Practices for Road Weather Management

## Version 2.0

### South Carolina DOT Low Visibility Warning System

As a result of a federal court decision the South Carolina Department of Transportation (DOT) was required to incorporate fog mitigation technologies during construction of the Interstate 526 Cooper River Bridge. The DOT deployed a low visibility warning system on seven miles (11.3 kilometers) of the freeway to inform drivers of dense fog conditions, reduce traffic speeds, and guide vehicles safely through the fog-prone area.

**System Components:** Warning system components include an Environmental Sensor Station (ESS), five forward-scatter visibility sensors spaced at 500-foot (152.4-meter) intervals, pavement lights installed at 110-foot spacing (33.5-meter), adjustable street light controls, eight Closed Circuit Television (CCTV) cameras, eight Dynamic Message Signs (DMS), a Remote Processing Unit (RPU), a central control computer, and a fiber optic cable communication system. The ESS measures wind speed and direction, air temperature, and humidity. The on-site RPU transmits field sensor data to the control computer, which is located in a DOT district office.

**System Operations:** The central computer's decision support software predicts or detects foggy conditions, correlates environmental data with predetermined response strategies, and alerts traffic managers in the district office. When alerted by the computer, system operators view images from the CCTV cameras to verify reduced visibility conditions. Operators may accept or decline response strategies recommended by the computer system. Potential advisory and control strategies include displaying pre-programmed messages on DMS, illuminating pavement lights to guide vehicles through the fog, extinguishing overhead street lights to minimize glare, and closing the freeway and detouring traffic to Interstate 26 and US Highway 17. When warranted, Highway Patrol officers erect barricades to close the freeway. Response strategies for various visibility ranges are shown in the table.

**South Carolina DOT Low Visibility Warning System Strategies**

Visibility Conditions	Advisory Strategies	Control Strategies
700 to 900 feet (213.4 to 274.3 meters)	"POTENTIAL FOR FOG" and "LIGHT FOG CAUTION" on DMS	"LIGHT FOG TRUCKS 45 MPH" and "TRUCKS KEEP RIGHT" on DMS
450 to 700 feet (137.2 to 213.4 meters)	"FOG CAUTION" and "FOG REDUCE SPEED" on DMS	Pavement lights illuminated
		"FOG REDUCE SPEED 45 MPH" and "TRUCKS KEEP RIGHT" on DMS
300 to 450 feet (91.4 to 137.2 meters)	"FOG CAUTION" on DMS	Pavement lights illuminated and overhead street lighting extinguished
		"FOG REDUCE SPEED 35 MPH" and "TRUCKS KEEP RIGHT" on DMS
Less than 300 feet	N/A	Pavement lights illuminated and overhead street lighting extinguished
		"DENSE FOG REDUCE SPEED 25 MPH" and "TRUCKS KEEP RIGHT" on DMS If warranted, "PREPARE TO STOP", "I-526 BRIDGE CLOSED AHEAD USE I-26/US 17", and "ALL TRAFFIC MUST EXIT" on DMS

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*Transportation Outcome:* The low visibility warning system enhances mobility by providing traveler information and clearly delineating travel lanes with pavement lights. Regarding safety, no fog-related crashes have occurred since the system was deployed.

*Implementation Issues:* The owner of a paper mill near the Cooper River Bridge site filed a lawsuit against the South Carolina DOT as they planned construction of the bridge in the mid-1980s. The bridge was to be built at the same height as the paper mill's smoke stacks. After reviewing various fog mitigation techniques recommended by a consulting firm, a federal judge required that a low visibility warning system be included in the bridge construction project.

The warning system began operating in 1992. Initially, there were several system reliability problems related to the harsh, outdoor environment. In order to prevent unnecessary activations system software was calibrated to average visibility distance observations and disregard low readings caused by smoke plumes from the paper mill. Components of the microwave communication system, which was originally deployed, were struck by lightning and ultimately replaced by the fiber optic cable communication system. The DOT permitted the installation of privately owned communication cables in the state's right-of-way in exchange for dedicated fibers from the project site to the district office.

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*Keywords:* fog, visibility, low visibility warning system, freeway management, traffic management, advisory strategy, motorist warning system, traveler information, control strategy, speed management, access control, decision support, environmental sensor station (ESS), closed circuit television (CCTV), dynamic message sign (DMS), vehicle guidance, lighting, high-profile vehicles, safety, mobility