

# Best Practices for Road Weather Management

## Version 2.0

### City of New York, New York Anti-Icing/Deicing System

The New York City Department of Transportation (DOT) developed a fixed anti-icing system prototype for a portion of the Brooklyn Bridge. The system sprays an anti-icing chemical on the bridge deck when adverse weather conditions are observed. Anti-icing reduces the need to spread road salt, which has contributed to corrosion of bridge structures.

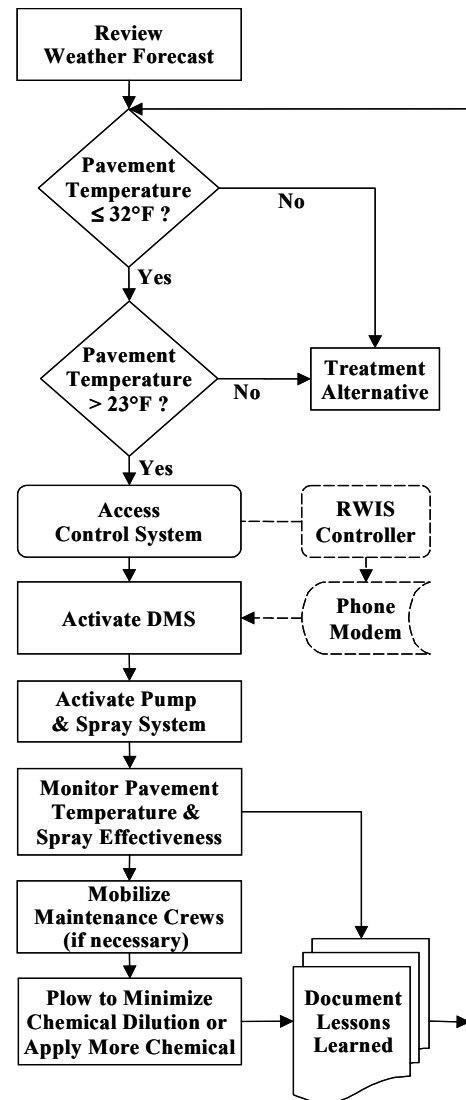
**System Components:** The anti-icing system is comprised of a control system, a chemical storage tank containing liquid potassium acetate, a pump, a network of PVC pipes installed in roadside barriers, check valves with an in-line filtration system, 50 barrier-mounted spray nozzles, and a Dynamic Message Sign (DMS). The DMS displays warnings to alert motorists during spray operations. A Closed Circuit Television (CCTV) camera allows operators to visually monitor the anti-icing system.

Each self-cleaning nozzle delivers up to three gallons (11.4 liters) of chemical per minute at a 15-degree spray angle. This angle minimizes misting that could reduce visibility. Two nozzle configurations were implemented to investigate different spray characteristics. On both sides of one bridge section, nozzles were installed 20 feet (6.1 meters) apart for simultaneous spraying. On another section, sequential spray nozzles were mounted on only one side of the bridge.

**System Operations:** System operators consult television and radio weather forecasts to make road treatment decisions. When anti-icing is deemed necessary, "ANTI-ICING SPRAY IN PROGRESS" is posted on the DMS and the system is manually activated to spray potassium acetate on the pavement for two to three seconds, delivering a half-gallon per 1,000 square feet (1.9 liters per 92.9 square meters).

Operators then review forecasts and view CCTV video images to monitor weather and pavement conditions. If there is a 60 percent or greater chance of precipitation and pavement temperatures are predicted to be lower than the air temperature, maintenance crews are mobilized to supplement anti-icing operations with plowing to remove snow and ice. The operational sequence is depicted in the flowchart.

**Transportation Outcome:** An analysis of maintenance operations found that bridge sections treated with the anti-icing system had a higher level of service than segments treated by snowplows and truck-mounted chemical sprayers. Road segments treated by the anti-icing system have less snow accumulation than sections treated conventionally. Pavement conditions during a snow event in January 1999 are depicted in the figures below.



**City of New York, NY Anti-icing/Deicing System Operational Sequence**

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Evaluation results indicated that the anti-icing system improves roadway mobility and safety in inclement weather. The system was most effective when chemical applications were initiated at the beginning of weather events. If potassium acetate was sprayed more than an hour before a storm, vehicle tires dispersed the chemical necessitating subsequent applications. The system also improves productivity by extending the life of bridges and minimizing treatment costs associated with mobilizing maintenance crews, preparing equipment, and traveling to treatment sites on congested roads.

*Implementation Issues:* Corroded steel grid members were observed in the concrete bridge deck during routine repaving operations in the summer of 1998. The anti-icing system prototype was designed to apply a less corrosive chemical than salt and to minimize the need for road infrastructure repairs. During system design and testing various chemical delivery configurations were examined to determine the appropriate spray pattern, angle, and pressure. Due to concerns about bridge deck integrity, nozzles were barrier-mounted rather than embedded in the road surface.

System performance was evaluated over the 1998/1999, 1999/2000, and 2000/2001 winter seasons. The evaluation included an assessment of the capabilities and reliability of system components, documentation of spray area coverage, a review of road treatment procedures and results, and a cost analysis comparing the anti-icing system to conventional treatment techniques.

The DOT would like to expand the anti-icing system by integrating a Road Weather Information System (RWIS) with the control system, the CCTV camera, and the DMS to improve treatment decision-making. A wireless or fiber optic cable communication network is envisioned for connectivity of these elements. Deployment of the system on the entire Brooklyn Bridge and on other local bridges is also anticipated.

#### Contact(s):

- Brandon Ward, New York City DOT, Project Manager, 212-788-1720, [bward2@dot.nyc.gov](mailto:bward2@dot.nyc.gov).

#### Reference(s):

- Ward, B., "Evaluation of a Fixed Anti-Icing Spray Technology (FAST) System," New York City DOT, Division of Bridges, presented at the Transportation Research Board (TRB) Annual Meeting, January 2002.

**Keywords:** snow, ice, winter storm, anti-icing/deicing system, freeway management, winter maintenance, bridge, forecasts, treatment strategy, chemicals, maintenance vehicle, air temperature, pavement temperature, pavement condition, traveler information, advisory strategy, dynamic message sign (DMS), closed circuit television (CCTV), safety, mobility, productivity



**City of New York, NY  
Bridge Section Treated  
with Anti-Icing System**



**City of New York, NY  
Bridge Section Treated  
with Truck-Mounted Sprayer**