

Winter Road Maintenance - Improving Safety While Minimizing Environmental Impacts

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Will you be ready this winter to effectively fight snowstorms and transform black ice into safe driving conditions for your community? Here are some guidelines from MDOT's Maintenance Division and Storm Water Management Team to help you win the battle, while also protecting Michigan's valuable water resources. Keep in mind, there are many variables to consider when creating a winter road maintenance strategy, including environmental impacts, pre-season planning, execution and post-season maintenance.

Before The Winter Season

There are many actions you can take to prepare for the winter season. Planning ahead and organizing your resources, including personnel and equipment, is crucial for success.

Level of Service (LOS)

A key component of sensible winter maintenance is to use just enough product to make roads safe and no more. This way, the amount of polluted storm water entering waterways is kept to a minimum. To accomplish this goal, it is vital to devise a winter maintenance strategy dependent on pre-specified criteria for level of service (LOS) based on road classification and traffic volume.

The LOS describes the desired end-of-storm condition and acceptable interim conditions. Roads with the highest LOS, such as bridges and hospital and school routes, require appropriate maintenance services to create a road surface that is bare of snow and ice as soon as possible. Roads with the lowest LOS, such as local residential streets, require snowplowing as necessary to provide a surface that is passable, but still snow covered. For low LOS roads, de-icing chemicals and abrasives should only be applied at dangerous intersections and hills.

Know Your Routes

Before the winter season, it is important to identify environmentally-sensitive areas so you can plan how to mitigate impacts of winter road maintenance activities. One tactic is to reduce the percentage of salt in salt/sand blends in sensitive areas.

Salt Storage and Handling



Blue Water Bridge, Salt Storage and Maintenance Facility in Port Huron. *Photo courtesy of Hubbell, Roth & Clark, Inc.*

Many environmental problems associated with road salt result from improper storage and handling. Salt needs to be covered, preferably in a building, or if not feasible, under a waterproof covering. The salt should be stored on an impermeable pad, such as asphalt. If concrete is used, it must be high quality, air-entrained and treated with sealers to reduce chloride penetration. The storage pad should slope to let water drain away, with runoff discharging into detention

ponds or sanitary sewer systems. Preferably, loading, dumping, and vehicle washing should be done inside the shed and each facility should have a Pollution Incident Prevention Plan (PIPP) to address accidental spills.

Snow Disposal Sites

Suitable sites for snow disposal should be established prior to the winter season. Keeping snow disposal sites away from water bodies or away from direct discharges to water bodies should be considered. Local regulations, policies, and guidelines for water quality protection should be taken into consideration.

Equipment



Application of Anti-Icing Solution

photo courtesy of Cryotech Deicing Technology

It is impossible to fight snow storms without good equipment. Properly managed, the right equipment can increase the effectiveness of snow removal and reduce road salt usage. Before winter, inspect and repair all snow plows, spreaders and controls, and loaders. Pre-order spare parts, especially if parts are not locally available. Calibrate spreaders and spray-nozzles to ensure the right amount of materials are

used. Salt trucks should ideally be equipped with ground speed control that can regulate a consistent flow of material. Consider equipping your trucks with global position satellite (GPS) systems which can monitor and track the route, road temperature, truck speed, and rate and time of chemical application. Also set up stations for emergency repair and refueling.

Communication

Communication is crucial for success when combating snow and ice. Having a pre-established plan and communication network can help operations run smoothly, without extra headaches.

Key components of proper communication include a storm warning system, maintenance crew radio communication, a network to coordinate with police and other public agencies such as the media, training, and record keeping.

During The Winter Season

Gathering Information and Developing a Plan

To effectively tackle the elements, it is important to monitor meteorological conditions, including air temperature, humidity, dew point, precipitation type, wind and pavement conditions and temperature. Road Weather Information Systems (RWIS), originally developed by the Strategic Highway Research Program (SHRP) unit of the National Research Council, can communicate all of this information as it is happening to operators. Operators can make an informed decision about when to use preventive anti-icing chemicals, which chemicals to use, when to plow, when to apply dry or liquid de-icers, when to apply abrasives such as sand, and what application rates are needed. To help highway agencies adopt these technologies, SHRP developed guidelines on purchasing, installing, and using RWIS, and on implementing anti-icing strategies.

Anti-icing Chemicals – Yes or No?

Anti-icing chemicals should not be applied if the pavement temperature is below 15 degrees Fahrenheit and the snow is light and blowing. Chemicals should be applied when the temperature is suitable for them to act rapidly, usually above 23 degrees Fahrenheit. However, if forecasts are predicting the temperature will rise to above 35 degrees Fahrenheit in the next few days, chemicals should not be applied, otherwise the road surface might become slippery.

Chemical Selection

De-icing chemicals are applied to roads after ice has already formed on the surface. The de-icer lowers the temperature at which water freezes, causing the ice to melt. Anti-icing chemicals work on the same principle; however, anti-icers are applied prior to snowfall to prevent snow and ice from bonding to the pavement.

Because it is easier to prevent a bond from forming than it is to break a bond that has already formed, anti-icing techniques are generally more effective and require less volume of chemical spray. Sodium chloride (rock salt) is typically used because of its effectiveness and low cost. However, other more expensive chemicals, including calcium chloride, magnesium chloride, carbohydrate-based solutions (corn or beet byproducts), calcium magnesium acetate (CMA), and potassium acetate, may cause less detriment to the environment, and are sometimes preferred for sensitive areas.

When to Apply Dry or Liquid Chemicals

Chemicals can be applied as liquid, dry solids, or pre-wetted solids. Liquid chemicals are most effective as pre-treatment before the storm starts or in its early stages. If applied too late, the solution may become diluted and less effective. Dry solid chemicals should be applied after the road has been plowed or during freezing rain. If ambient moisture conditions are low, pre-wetting is recommended. Pre-wetting is a technique used to increase the effectiveness of road salt in melting ice. The process involves spraying a brine solution made up of water and salt onto dry salt as it is applied to roads. The salt uses the moisture to begin the reaction that generates heat and melts snow and ice. The combination of brine and salt works faster than salt alone. Unlike granular de-icers, which tend to bounce off surfaces, pre-wetted de-icers remain on the surface and less salt is needed to break the ice's bond with the pavement.

Equipment Washing

It is important to clean equipment after each storm to minimize corrosion. Spreaders should be swept before washing to remove residual solids and excess materials should be re-used. Washing should be done indoors and wash water should pass through oil/grit separators to remove contaminants. Treated wash water can be re-used for brine production.

After The Winter Season

Snow Disposal Site Decommissioning

Before "closing the dump" for the season, the site should be remediated and decontaminated, per local regulations.

Record Keeping and Reporting

To comply with National Pollutant Discharge Elimination System (NPDES) Phase II permits, Municipal Separate Storm Sewer Systems (MS4) communities are required to track and report to the Michigan Department of Environmental Quality (MDEQ) salt, sand, and chemical applications, both in terms of hours spent and quantity used. This not only increases awareness and decreases environmental impacts, but also is invaluable information for planning the next season ahead.