Snow and Ice Control Environmental Best Management Practices

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Overview of WM Operations
WM Practices - Plowing

- The physical removal of snow from the road using a snowplow
Sanding

- The application of sand, cinders, ash, etc. to improve friction on the roadway.
Anti-icing

- The practice of preventing the formation or development of bonded snow and ice by timely applications of a chemical freezing-point depressant.
Deicing

- The practice of breaking the bond between snow and ice and the pavement surface through the application of a chemical freezing-point depressant.
Pre-wetting

- The application of liquid to solid material prior to placement on the road surface.

Examples
- Salt brine ➔ sand
- Salt brine ➔ rock salt
Winter Maintenance Products

- Sand
- Treated sand (sand + 10% salt (s,l))
- Chlorides – NaCl, MgCl$_2$, CaCl$_2$ (s,l)
- Ag-based – beet, corn (l)
- Acetates & formates (s,l), glycols (l), and glycerin (l)
Product Application Rates

- **Sand** – 100 to 1000 lbs/l-m (32°F and colder)
- **Salt/sand** – 400 to 1000 lbs/l-m (32 to 0°F)
- **NaCl** (32 to 15°F)
  - Solid – 100 to 800 lbs/l-m
  - Liquid – 10 to 40 gal/l-m
  - Pre-wet – 8 to 20 gal/l-m
- **MgCl₂** (32 to -5°F) and **CaCl₂** (32 to -15°F)
  - Solid – 100 to 500 lbs/l-m
  - Liquid – 10 to 40 gal/l-m
  - Pre-wet – 8 to 20 gal/l-m
Anti-icing

“the snow and ice control practice of preventing the formation or development of bonded snow and ice by timely applications of a chemical freezing-point depressant”

- Improves
  - LOS, mobility, safety

- Reduces
  - Cost, product use, need abrasives, plowing.
  - Side benefit of reducing impacts to the environment, infrastructure, and vehicles.
Pre-Wetting Solid Material

Adding liquids to solid products or abrasives.

- Benefits
  - Eases product management and distribution
  - Accelerates break-up of snow/ice and enhances melting
  - Minimizes bounce and scatter, improves performance
  - Improves longevity on the road = less frequent applications
Pathways of Deicer Migration off the Roadway
Impacts of Salt and Chloride Based Deicers
Impacts of Sand and Abrasives
Calibration

- Is a must to realize saving gained from investment in new technology
- Train how to calibrate and keep records
- When to calibrate:
  - When first acquired,
  - points throughout a season,
  - whenever a new material is used,
  - after repairs,
  - if there appears to be a discrepancy in material usage.
Material Storage

- All products should be stored in a manner to minimize any loss of product.
- Cover and store materials on an impermeable surface.
- Use secondary containment for liquids.
Weather Forecasts and Information Services

- Winter maintenance costs decrease as the use of weather information increases.
- Accurate and timely forecasts have been shown to save 11–25% (labor) and 4–10% (material), but using a bad forecast can increase costs.
Post Storm Operations

So there are deicing chemicals and sand out on the road and in the environment, what do we do now...

- Clean it up
- Capture it
- Dispose of it
Summary of Environmental BMPs for Snow and Ice Control

- Regulate the application of snow and ice control materials to prevent over application.
- Use specialized equipment to apply the right amount, in the right place, at the right time.
- Use the appropriate snow and ice control materials for the given conditions.
Summary of Environmental BMPs for Snow and Ice Control

- Cover and store snow and ice control materials on an impermeable surface, secondary containment for liquids.
- Calibrate equipment.
- Train operators in proper application, calibration, and cleaning procedures.
- Use “good housekeeping” – clean, organized, and well maintained.
Conclusions

- Deliver the right type & amount of materials in the right location at the right time.
  - Improves -> effectiveness & efficiency
  - Reduces -> material usage, costs, environmental footprint.

The Triple Bottom Line

For WM = Balancing LOS versus sustainability.
Thank you

☐ Questions?

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Resources

Snow and Ice Control Environmental Best Management Practices Manual
*Available in the next few months at www.clearroads.org.

NCHRP Synthesis 449 Strategies to Mitigate the Impacts of Roadway Deicers on the Natural Environment
(http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_449.pdf)

NCHRP 25-25(04) Revised Chapter 8 Winter Operations and Salt, Sand and Chemical Management
(http://environment.transportation.org/environmental_issues/construct_maint_prac/compendium/manual/8_0.aspx)

NCHRP Toxicity of Chloride Based Deicers on the Natural Environment
(http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP25-25%2886%29_FR.pdf)

Salt Bounce and Scatter Study