Deicing v. Anti-icing

- Anti-icing is proactive.
- Deicing is reactive.
Reactive Practices

- Winter highway maintenance practices have traditionally been based on a reactive strategy of deicing.
  - Deicing with sodium chloride, abrasives/sand and salt mixes or straight abrasives.
  - Much more salt is needed to deice than anti-ice
    - 4 times the amount of salt needed for deicing compared to anti-icing.

Anti-Icing

- Anti-Icing is the application of a freezing point depressant to a pavement before or at the start of a winter event. The chemical inhibit the formation of the snow/ice bond to the pavement. It can help prevent frost and/or black ice situations due to pavement/due point temperatures.
**Anti-icing vs. Deicing**

- **Proactive-** Anti-icing the snow and ice from bonding to the pavement.
- **Reactive-** Deicing is designed to melt through snow and ice to break its bond with the road surface.
  - Studies have shown that it takes at least 4 times more salt to deice than to anti-ice.

**Road Salts**

- In the United States, approximately 10 to 25 million tons of sodium chloride is used annually depending on winter conditions (source National Research Council).
- Studies have shown that 55% of road salts end up in our drainage systems and waterways. The remaining 45 percent infiltrates through soils into groundwater aquifers. Once salt reaches groundwater, it remains there for decades (source: EPA 901-F-05-020)
**Why Anti-ice?**

- Keeps accumulating snow in a plowable condition.
- Requires less chemical.
- Improves roadway friction and lowers accident rates.
- Can provide bare pavement for some events.
- Reduces the need for abrasives.
- Minimizes environmental impacts.

**Accumulated snow is not in a plowable condition**
Anti-Icing Prevents the Snow and Ice Bond to the Pavement

Anti-icing vs. Deicing

- Anti-icing provides a Cost Benefit ratio of 11 to 1. It is 11 times more costly to deice than anti-ice.
Solid & Pre-wetted Solid Chemicals

Solid Sodium Chloride loses its effectiveness (has difficulty going into solution) when temperatures fall below 26 degrees Fahrenheit; therefore, at lower temperatures, solid sodium chloride should be pre-wetted. Pre-wetting will also help keep material from bouncing off the pavement.
Solid & Pre-wetted Solid Chemicals (con’t)

- Solid salt doesn’t work until it is a liquid. Pre-wetting accelerates solids going into solution especially at lower temperatures.
- Pre-wetting results in less bounce and loss of material from the roadway when spreading solids.
- A Michigan Study showed that approximately 30% of solid chemicals applied to roadways are displaced due to bounce or turbulence from wind and vehicles.
- Pre-wetting can reduce chemical application rates because more material is staying on the road. (O’Keefe and Shi, 2005).

Sand and Abrasives

- The use of dry sand/abrasives for snow and ice control has very little value in providing lasting friction enhancement and they do not melt snow/ice. There benefit is temporary.
- Sand/Abrasives, although not a chemical, have a negative impact on the environment (affects air & water quality, fish and aquatic resources) and require cleanup. An Oregon DOT study found that 50 to 90 percent of applied remains in the environment even after attempts to clean up.
Most organizations, after switching to prewetted salt, fail to reduce their chemical application rates. Since more salt is staying on the pavement, applications rates can be reduced by as much as 30 percent.
Plowing

Plow Blade Height Above Pavement

- Plow blades should be in direct contact with the pavement.
  - Remove as much dilution potential as possible prior to spreading anti/deicing chemicals.
  - Will result in less chemical usage and a higher level of service.
Snow Plowing
(Superelevated Curves)

- Snow or ice accumulation on the high side shoulder of super-elevated ramps and super-elevated curves, especially those without reverse shoulder slopes, is a significant hazard to motorists. Snow stored on the high side of curves is subject to melting and refreezing, creating sheets or patches of ice on the once cleared road surface.

Snow Plowing
(bridges)

- During snow removal efforts, snow often gets plowed against bridge barriers, parapets and rails. Hard-packed snow piled at two-thirds the height of the bridge parapet or rail changes its shape and creates the potential for vehicle ramping.
  - Use Tandem Plowing when possible
  - Straighten plows where possible
  - Haul snow away.
Snow Plowing (bridges)

- Snow and ice on a bridge parapet, rail or curb should be removed completely. Otherwise, when the temperature rises and melting occurs, moisture from the remaining snow may run back across the pavement and create “freezeback” conditions.

Snow Plowed Barrier Curb
1. What is most important is what is going to happen to precipitation when it hits the pavement.

2. Directly Influences bonding between road surface & precipitation.

3. Influences chemical effectiveness.

4. Pavement temps should be monitored. Pavement temp forecasts.
Mobile Infrared Pavement Temperature Sensor

Miscellaneous

- Snow and Ice Control Plans
- Spreading with the truck body raised.
- Calibration of spreading equipment.
Questions?

Thanks for Attending

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