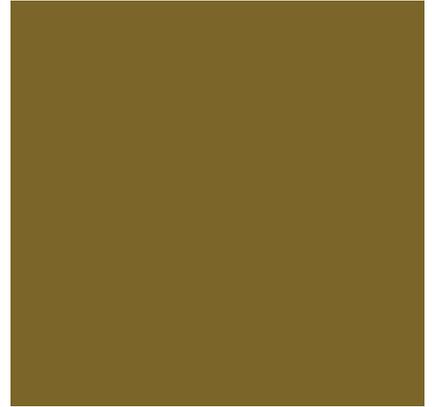




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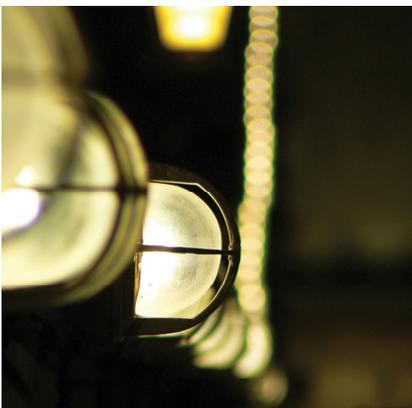


# Smart Purchases Big Impact

**Sustainable Purchasing Guide**

**De-Icers**

*Sustainability... your university, your world*





## Introduction

This section provides information on currently available options for **de-icers** that can help to move the University of Saskatchewan toward its sustainability goals. Living within the boundaries of our sustainability goals requires us to apply two main strategies:

- Dematerialization** requires that we reduce the amount of materials as much as possible; and that we continually move toward the use of 100% recycled content.
- Substitution** requires that we find less harmful materials to replace those that currently damage and are not recyclable.

**Sustainable purchasing** is about including social, environmental, financial and performance factors in a systematic way. It involves thinking about the reasons for using the product (the service) and assessing how these services could be best met. If a product is needed, sustainable purchasing involves considering how products are made, what they are made of, where they come from and how they will be used and disposed.

Finally, remember that this is an evolving document – it will change with new information as our understanding of sustainability impacts and potential solutions improves.

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**Smart Purchases  
Big Impact**

Wherever possible **CHOOSE** products that employ a combination of characteristics listed in the left hand column, and **AVOID** products that demonstrate characteristic in the right-hand column.

CHOOSE	AVOID
<ul style="list-style-type: none"> <li>Eco-Logo certified products</li> <li>Natural Acetate-based de-icers (e.g. CMA)</li> <li>Calcium Chloride</li> </ul>	<ul style="list-style-type: none"> <li>Sodium and Magnesium Chloride</li> <li>Phosphates as a corrosion inhibitor</li> </ul>

### Option: Use Eco-Logo Certified Products

**Strategy: Substitution (SO 1, 2, 3)**

Environmental Choice certified de-icing products are assessed based on their production methods and product contents, and are generally more sustainable than other alternatives. Selecting these products does not eliminate all sustainability impacts, but they are among the best options available on the market at present.

### Option: Reduce or Eliminate the Need For De-Icers

**Strategy: Dematerialization – (SO 1, 2, 3, 4)**

This option represents a planning, design and construction decision rather than a procurement decision. When planning pathways, sidewalks and roadways, it must always be considered that these paved services increase winter demand for de-icing products. There may be locations where paved surfaces can be eliminated or replaced by gravel, grass pavers, or other permeable surfaces.

De-icers should be used only when necessary to help loosen snow and ice and facilitate removal. For use on pathways:

- Never over-apply de-icing products and always remove the slush before it has the opportunity to refreeze
- Mix the de-icers with sand to increase their effectiveness and reduce overall use
- Always read and follow label directions when applying de-icing materials

Calcium chloride works better at lower temperatures than sodium/magnesium chloride and also requires less to be used in order to be effective.

### Option: Use Acetate-Based Rather Than Chloride-Based De-Icers (e.g. CMA)

**Strategy: Substitution – Degradable (SO 2)**

Calcium Magnesium Acetate (CMA) is produced by combining acetic acid (the acid that gives vinegar its sour smell) and limestone. CMA eliminates the use of chlorine, which reduces the build-up of chloride ions in nature.

Although the use of CMA eliminates the use of chlorine, there are other potential impacts to consider. For example, current production methods produce acetate from acetic acid derived from petrochemicals (methanol). Acetate in CMA breaks down to form CO<sub>2</sub>. New production methods for acetic acid are based on corn-based materials. Using CMA produced with corn-based acetic acid would not pose these environmental concerns and is the preferred option if available.



Acetate de-icers are corrosive, and so corrosion inhibitors are added. One common corrosion inhibitor is phosphate. Depending on the origin of the phosphorus, it may bio-accumulate on the earth's surface or the extraction process may degrade the earth's surface. Some de-icers are phosphate-free and contain proprietary corrosion inhibitors, though these may present other problems.

## Arriving at the currently preferred options

### 1. Identify the service

De-icers, commonly referred to as 'road salts', are placed on roadways and sidewalks to form a brine solution mixture with a lower freezing point than water. As the brine solution has a lower freezing point, the ice melts away. When de-icers are used to remove ice from roadways or sidewalks, the roadways become less hazardous for vehicles and pedestrians.

### 2. Assess the need

The University of Saskatchewan is responsible for ensuring that campus roads and sidewalks are safe and functional throughout all seasons. People and goods must be able to move safely from place to place. At certain times of year, this may require the ice-melting/anti-slipping services that are provided by de-icers, for vehicles, pedestrians and cyclists.

### 3. Identify the contents

The main components of de-icers are salts. Chlorine de-icers, such as sodium chloride (NaCl), magnesium chloride (MgCl<sub>2</sub>), potassium chloride and calcium chloride (CaCl<sub>2</sub>) are the most common de-icers. Since road salts are corrosive, they also contain additives called corrosion inhibitors.

### 4. Identify sustainability impacts

*i. ....systematically increasing concentrations of substances from the earth's crust?*

- Applying road salts on paved routes systematically increases the concentrations of **chloride** (Cl<sup>-</sup>) ions in the immediate environment. These ions persist in watersheds and, in sufficient quantities, both sodium and chlorine ions have a number of adverse affects on soil, surface and groundwater, vegetation, and wildlife.
- Depending on the means of production, sodium chloride (NaCl) may be industrially mined using large quantities of **fossil fuels**. This also holds true for certain production methods of calcium chloride (CaCl<sub>2</sub>), such as extraction from natural brine mixtures from deep pools.

- Road salts are corrosive and contain corrosion inhibitors. One common corrosion inhibitor is **phosphate** which, depending on the origin of the phosphorus, may lead to systematic increases of substances from the earth's crust.
- Water in brine solutions is evaporated during the production of road salts, which requires large amounts of energy. If the energy is derived from fossil fuel sources, this process contributes to a systematic increase of carbon (CO<sub>2</sub>) in the atmosphere, contributing to climate change.

*ii. ....systematically increasing concentrations of substances produced by society?*

- Depending on the means of production, introduction of ions of Cl may result in increasing concentrations of substances produced by society. For example, **calcium chloride** is produced through a reaction with salt water and lime (CaO), and is thus a synthetic product.
- Road salts contain sodium **ferrocyanides** as a corrosion inhibitor. Under certain conditions, these break down into cyanide and dissipate into nature. Cyanide is toxic even at low concentrations.

*iii. ....systematically degrading nature by physical means?*

- Road salt run-off can **damage** plants and **pollute** water bodies. Excess salts limit plant uptake of nutrients and water, and can result in plant death. Spring melting can carry de-icers used on roads through municipal storm water collection systems into local surface water bodies, thereby contaminating freshwater resources and potentially harming aquatic species.
- **Aquatic ecosystems** can also be damaged by the phosphates in de-icers by promoting algal growth, potentially resulting in eutrophication of impacted water bodies.
- Road salts for de-icing purposes are often mined or extracted from deep pools, and proper steps must be taken to reduce the ecological footprint of the **mining** process by remediating the impacted site after its use.

*continued on page 3...*

#### 4. Identify sustainability impacts (con't)

*iv. ...systematically undermining people's ability to meet their basic human needs?*

- Road salt run-off can pollute **water** bodies, potentially impacting neighbouring communities.

#### 5. Envision sustainable de-icing options

Keeping de-icers within closed technical cycles is difficult, as their use requires them to be introduced into the biosphere. Therefore, sustainable de-icers require that the components naturally break down without concentrating in nature.

#### 6. Identify and prioritize alternatives

Identify the product or service that offers the best pathway toward meeting all four of our Sustainability Objectives by using the following three criteria for assessment:

- a) Does the product or service move us in the right direction with regards to our four Sustainability Objectives?
- b) Does the product or service create a flexible platform for the next step toward sustainability?
- c) Is the decision financially viable?

## Resources and Additional Information

1. Calcium Magnesium Acetate  
<http://greennature.com/article2028.html>



This guide was made possible through the generosity of the Whistler 2012 project, which shared its template and much of its research.