



Summary of Research: Use of Calcium Chloride as a De-Icing Agent

OVERVIEW

- **Key Question:**
 - Does the available literature show calcium chloride to be corrosive and detrimental to both infrastructure and the environment?

- **Summary of Key Points:**
 - Excessive use of de-icing salts¹ can harm the environment and infrastructure.
 - De-icing salts are corrosive and may cause deterioration of roadway surfaces, concrete structures, vehicles and other indoor and outdoor surfaces.
 - Salt impacted runoff and spray can damage or kill nearby grass, trees, crops, or other vegetation.
 - The studies reviewed certainly suggest that calcium chloride specifically can be corrosive and detrimental to both infrastructure and the environment – **oftentimes, more so** than other de-icing options.
 - However, overall, impacts to infrastructure and the environment by de-icing salts depend on a wide range of factors and the location of application.

BACKGROUND

- **De-icing Agents:**
 - Canadians spend over \$1 billion annually on winter maintenance to keep roads, walkways and parking lots safe and passable.
 - De-icing salts (particularly sodium chloride) are the preferred de-icing/anti-icing chemicals for maintaining winter safety because of their cost, effectiveness and ease of handling.
 - Each year, Canada uses approximately 4-5 million tons of de-icing salts.
 - The hidden costs of de-icing salts to the infrastructure and surrounding environment can be substantial; such costs are often ignored in formulating highway winter-maintenance strategies.

¹ The term “de-icing salts” is used within this document as an all-encompassing definition for chloride-based de-icers.

- **City of Edmonton Pilot Project:**

- Anti-Icing Pilot
 - Beginning in 2017, the City of Edmonton (the City) began an anti-icing pilot project using a calcium chloride solution with an added molasses corrosion inhibitor as a de-icing agent as part of winter roads maintenance.
 - During winter 2018-2019, the City will continue the anti-icing pilot that was started in 2017. The brine will be applied to about 3,000 km of roads, or about 40% of Edmonton's arterial and collector roads, during the pilot.
- From a June 11, 2018 City of Edmonton Integrated Infrastructure Services Memorandum:
 - The City of Edmonton Engineering Services developed a program to test CaCl₂ (brine) and granular NaCl (salt) applied to both concrete and asphalt materials.
 - The available research suggests that there is a detrimental effect on concrete and asphalt surfaces related to the application of both sodium chloride and calcium chloride.
 - In conclusion, applying calcium chloride and sodium chloride on the roads may produce impacts to infrastructure in Edmonton. It was concluded that both the chemical and physical (freeze-thaw) reaction need to occur in order for detrimental effects on the samples.
 - The brine-exposed sample was slightly more prone to early degradation, and the degradation that occurred was roughly 20% more detrimental than salt-exposed samples.

- **UDI-ER Concerns:**

- UDI-ER Members have expressed concerns regarding the long-term impacts and potential negative cost implications resulting from continued use of calcium chloride as a de-icing agent by the City.
- As a result, UDI-ER members have requested staff to review the available literature. This research summary (and attached literature review) is the result of the aforementioned request.