TORONTO

STAFF REPORT
INFORMATION ONLY

Use of Salt on City Sidewalks

Date:	September 12, 2007
To:	Public Works and Infrastructure Committee
From:	General Manager, Transportation Services
Wards:	All Wards
Reference Number:	P:\2007\Cluster B\TRA\Scarborough\pwi07054

SUMMARY

This information report addresses the issues surrounding the use of rock salt as a de-icer on city sidewalks during the winter months. It is in response to a request from Councillor Mihevc for a study and report on best practices for the sidewalk application of salt, in an effort to balance pedestrian safety in the winter with environmental concerns.

Sodium chloride, commonly known as rock salt, is the most readily available de-icer and balances both cost effectiveness and respect for the environment. While alternatives exist, their widescale use would be prohibitively expensive given the quantities required by a city as large as Toronto and, in some cases, pose a greater threat to the environment that sodium chloride.

Financial Impact

There is no financial impact associated with receipt of this report.

ISSUE BACKGROUND

On December 1, 2001 Environment Canada published the results of a five-year assessment on the effects of road salts on the environment. The assessment concluded that road salts were, in fact, having an adverse effect on freshwater ecosystems, soil, vegetation, and wildlife. In response to the report, Environment Canada assembled the multistakeholder-working group that would go on to develop the "*Code of Practice for the Environmental Management of Road Salts"* released in April 2004.

The main objective of the Code of Practice is to ensure environmental protection while maintaining roadway safety. Under the Code, all public entities that use 500 tonnes of road salts per year or more and/or have any environmentally vulnerable areas must prepare a salt management plan within a year of the official release of the Code. The Transportation Association of Canada has also prepared and released a "*Syntheses of Best Practices"* in the fall of 2003 which is intended to be used in conjunction with the Environment Canada's Code of Practice.

In a proactive response to both the growing environmental concerns regarding road salt, and the assessment undertaken by Environment Canada, Transportation Services began the preparation of a Salt Management Plan in 2001. The Plan was completed in April 2002 and filed with Environment Canada in 2005. The City of Toronto was the first agency in Canada to prepare a Salt Management Plan, and many other municipalities and provincial agencies have subsequently used Toronto's plan as a model best practice for their own jurisdictions.

Through the ongoing initiatives outlined in the Salt Management Plan, Transportation Services continues to implement better handling and application practices that strive to reduce the amount of salt entering the environment.

COMMENTS

With respect to salt application on City of Toronto sidewalks, the objective is similar to that of roadways – utilize this de-icing material in sufficient quantities to be effective in creating a safe travelling surface for users; however, avoid over-application and practice responsible storage and handling procedures in order to reduce negative impacts on the environment and infrastructure.

Current Application Rates

The City of Toronto does not generally use 100% salt on sidewalks in the winter time. Salt/Sand mixtures are used as required after ploughing to provide grit and traction on sidewalks. Typically, sidewalks are ploughed in response to significant snow storms. If required, sidewalks are de-iced as necessary on the second day after a storm. The standard application rate, introduced in 2003, is an 80:20 salt to sand blend placed at an application rate of 100 kg/sidewalk km. The City of Toronto has approximately 7,100 kilometres of sidewalk of which 6,000 kilometres receive mechanical sidewalk clearing and salting when snow accumulations reach 8 centimetres. Approximately 600 tonnes of salt is spread on sidewalks in response to each mobilization, and approximately 7,000 tonnes is spread over an average winter season.

Winter Program Review

Transportation Services is currently undertaking a pedestrian-focused winter services program review. This project was undertaken for the purpose of:

- Harmonizing pedestrian focused winter maintenance services across the City
- Establishing levels of service for sidewalk salting and ploughing
- Reducing operating costs

- Improving efficiency and effectiveness
- Determining resource requirements (i.e., equipment, staff)

This review began in April 2007 and will be completed in April 2008. The review will focus on the following activities:

- Mechanical clearing of snow from the sidewalk including the application of salt as required to provide safe and passable conditions
- Manual clearing of snow from the sidewalk by shovel or hand operated snow blowers including the application of salt as required to provide safe and passable conditions
- Manual clearing of snow from walkways and steps inaccessible to mechanical equipment, by shovel or hand operated snow blower including the application of salt as required to provide safe and passable conditions and skid resistance on steps
- Clearing of snow from bus stops, crosswalks, Wheel-Trans and wheelchair accessible ramps including the application of salt as required to provide safe and passable conditions
- The clearing of snow for specified seniors and the physically challenged

Although several staff reports to Council have addressed sidewalk clearing levels of service, there has not been a comprehensive review of pedestrian focused winter services since amalgamation.

The most significant task in this review is the preparation and tendering of sidewalk winter maintenance contracts which must come into effect November 2008. These new contracts will include contingency items that allow Transportation Services to explore alternative de-icing materials and sidewalk ploughing techniques. The use of alternative materials, both liquids and solids is not new to roadway de-icing, and specialized equipment has been developed to assist in the application of them. However, the equipment that has traditionally been used for sidewalk de-icing has not yet evolved to the same extent as roadway de-icing. Staff has met with vendors that are manufacturing liquid applicators for sidewalks, but there is still much development to be done so that liquids can be applied on a sidewalk with the same precision as they can on a roadway. Current contracts include a sidewalk broom that can be used to clear snow from sidewalks although it is not effective at combating snow accumulations of 8 centimetres, which is our current threshold for mobilization of this service.

Sidewalk Survey

As part of the Winter Program Review, Transportation Services distributed, through the Ontario Good Roads Association, a winter sidewalk survey to all municipalities in Ontario. The results of this survey were returned in August, 2007 and are still being reviewed by staff. The survey solicited information from other municipalities on their levels of service for sidewalk clearing, whether or not they had a program to assist senior citizens or the disabled, the type of equipment used and the type of materials applied.

A cursory review shows that approximately 50% of respondents are using 100% salt on their sidewalks and approximately 50% are using a mixture of salt and sand. Where the mixture of salt and sand is used, the blending ratio ranges from 75:25 to 95:5 in favour of salt. The City of Toronto applies its salt and sand mixture to sidewalks at a ratio of 80:20. There is a trend towards the use of 100% salt in larger municipalities and towards the use of a sand and salt mix in smaller and more northern municipalities where salt is less effective due to colder temperatures. Only one respondent uses any kind of alternative de-icer (salt brine) on sidewalks. Of those municipalities that used 100% salt, many reported that this was only the case on their arterial roads or in business areas that experienced a high level of pedestrian traffic. Others applied salt only when the temperatures were favourable (i.e. above -9°C).

Staff will continue to review the results of the survey and compare City of Toronto's program and current level of service against emerging trends among other municipalities.

Pilot Projects

Through the Salt Management Plan, Transportation Services has been aggressively pursuing the use of liquids as an integral part of our winter maintenance program. Beginning with the outfitting of three trucks with liquid capability in 2002, there are now approximately 96 trucks equipped to carry liquids. This number will increase to over 200 units in 2008.

The move towards the introduction of liquids first began as a limited pilot project. Since 2002, Transportation Services has continued to be actively engaged in the pursuit of pilot projects that utilize both innovative de-icing techniques and alternative de-icing chemicals. These pilot projects have primarily been conducted through our Winter Maintenance Depots. Staff are currently in the process of preparing new winter contracts for roadway and sidewalk operations that will begin in 2008. Pilot projects exploring the use of salt brine in a direct liquid application will be undertaken during the winters of 2007/2008 and/or 2008/2009. Alternative de-icing materials for sidewalks will be considered as part of the new winter maintenance contracts.

Alternative De-icers

There are several alternative de-icers on the market that have been used as part of pilot projects by Transportation Services. Sodium chloride has been used for quite some time, and its properties are very predictable. Many of the alternative de-icers that are available have varying chemical properties and react differently at different temperatures. In 2004/2005 Transportation Services began pilot projects using magnesium chloride (MgCl) as a de-icing agent for the roadway. Although prohibitively expensive to be used on a large scale, this pilot project did produce favourable results in limited spot applications. Unfortunately, it was suspended as a result of possible negative impacts to concrete (i.e., accelerated spalling) on bridge decks and structures. Clearly, if this was substantiated over the long term, it would make magnesium chloride unsuitable for concrete sidewalk application.

Salt vs. Sand

Just as ploughing cannot remove all of the snow and ice from the roadway, ploughing cannot remove all of the snow and ice from the sidewalk. This is especially true in areas that experience heavy pedestrian traffic where snow has been packed down prior to the plough's arrival, or where there has been a succession of smaller snowfalls that accumulate to produce the amount of snow required to mobilize mechanical sidewalk ploughing. A de-icing agent is nearly always necessary to penetrate hard packed snow and to break the bond between the snow and the sidewalk.

Sand may provide temporary traction for pedestrians, but it will eventually wash off, blow off, or be swept off at the end of the winter season. In the event that sand washes off as a result of rain, like any applied material, it inevitably ends up in adjacent streams, rivers and lakes. It has also had a significant detrimental impact of clogging storm sewers, drains and gutters. Post-winter cleanup has virtually been eliminated with the reduction in the amount of sand used both on the roadway and the sidewalk. Sand that remains on the sidewalk must be swept up at the end of each winter season and disposed of as solid waste. As sand is typically applied at rates 3 to 4 times that of salt, this could mean that up to 28,000 tonnes of sand would enter the roadside and watercourse environment yearly. A recent Oregon DOT study found that 50 – 90% of all winter sand remains in the environment beyond post-winter cleanup.

PM_{10} Airborne Particles

As part of the Clean and Beautiful City initiative, Transportation Services has recently purchased 10 PM_{10} street sweepers, and is in the process of converting the entire fleet of sweepers, in an effort to improve the quality of Toronto's air. Airborne particulate matter of less than 10 micrometers in diameter has been shown to pose the greatest health concern, as it can pass through the nose and throat and get into the lungs. The use of sand for snow and ice control can result in an increase in PM_{10} particles and would have a detrimental effect on air quality. Sand is ground up into fine particles and dust by vehicles and pedestrian traffic, and subsequently can become airborne. The City of Denver, Colorado has suspended the use of winter road sand entirely because of the adverse effects on air quality.

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