ANTI-ICING WITH STRAIGHT LIQUID CHEMICALS

The strategy of anti-icing is to be proactive in the application of chemicals to prevent the formation or development of bonded snow and ice to the pavement surface. This tactic is used to "buy time" prior to the onset of a snow and ice event or anticipated black ice conditions. When the event actually begins, conventional reactive strategies are then used.

This strategy can be particularly useful on A1 type highways where conventional methods may be slowed due to high traffic volumes. These methods are also useful for unique trouble areas such as bridge decks, high elevations, and shaded areas that freeze quicker than adjoining segments.

Anti-icing can be done by applying conventional solid and pre-wetted solids. This tactic is prone to wasting material, particularly if the pavement surface is dry. High volumes and speeds will scatter most of the material off of the travel lanes. The preferred material for anti-icing is the use of salt brine or liquid chemicals such as magnesium chloride sprayed directly on the pavement surface using a tank and spray bar system. Various slide in tank and spray bar systems are now available.

Liquid Chemicals:

Liquid ice control chemicals are made up of solid ice control chemicals in a water solution. After application, the water evaporates and a residual dry chemical is left on the pavement surface. This material is not prone to scattering or dispersal from traffic conditions.

Salt brine is most effective at a 23% solution. It can be produced in house by agitating solid NACL in water. It is also a byproduct of the oil and gas industry and can be acquired in certain geographic areas at little or no cost.

Liquid Magnesium Chloride, Liquid Calcium Chloride, Potassium Acetate, Calcium Magnesium Acetate, and a variety of proprietary formulas that contain anti-corrosion inhibitors and agricultural byproducts are also available. Although generally higher in cost than salt brine, they can be more effective at lower temperatures.

Application Criteria:

Straight liquid chemical applications can be made up to 3 days prior to the onset of a winter weather event if the chemical is allowed to dry on the pavement surface. Rain events and particularly high traffic volumes will lesson the anti-icing effects. Table A gives a general range of application rates. The rates to achieve effective results can vary significantly with the type of liquid chemical used and pavement temperatures. Too little material will not produce desired results. Too much material can result in hazardous slippery conditions before the material has fully dried. It is recommended that new users start at the lower end of the range and gradually increase application rates until desired results are achieved. It is also very critical that liquid spray units are calibrated at the beginning of each snow and ice season. This can be accomplished

by collecting liquid at the spray bar over a pre-measured distance. Because results are very sensitive to application rates, calibration is critical.

Liquid chemicals should only be applied as an anti-icing strategy when the pavement temperatures are 20^0 F or higher. Application of salt brine at lower temperatures would require excessive application rates and may be prone to rapid refreeze. Liquid chemicals such as magnesium chloride and other proprietary products may be used at lower temperatures, but again, application rates may negate any cost benefit. Conversely, liquid applications should not be made if pavement temperatures are much above freezing. Above 38^0 F and at high humidity, liquid chemicals will not properly dry on the surface and can result in hazardous slippery conditions.

De-icing:

Straight liquid chemicals may be applied as a de-icing strategy during low moisture, light snowfall at pavement temperatures above 20^o F. Cycle times should be minimized as dilution of straight liquids occurs much quicker than solid chemical applications. At temperatures near freezing, it can be very effective at melting thin ice in the absence of precipitation.

Liquid chemicals are more sensitive to temperature and dilution than solid abrasives. If used as a de-icing strategy, more caution is required to avoid refreeze without the friction enhancement characteristics of a solid material.

Table A

SUGGESTED APPLICATION RATES FOR STRAIGHT LIQUID ANTI-ICING			
Temperature ^{0} F	*Application Rate gals/lm		
	23% Salt Brine	27% Mag Chloride	32% Calcium Chloride
32^0 F	30	28	33
20^0 F	40	30	36

* *Application rates as high as 60 gal/lm have been successfully used in salt brine straight liquid applications. It is strongly recommended however, to start with the application rates as illustrated by this table to avoid the potential for hazardous conditions as a result of friction loss from the chemical application itself. If desired results cannot be achieved at these rates, incremental adjustments can be made upward until results are achieved.*