

Section VI - Materials

Now that priority routes have been defined and their levels of recommended service have been established. How will our goals be achieved? As stated earlier, the effectiveness of our war on winter storms depends on our ability to utilize personnel, equipment, and materials efficiently. This section deals with the basic principles of winter materials.

Dry Chemicals

- * Salt
- * Abrasives

Salt

Sodium Chloride (NaCl) or salt is the most commonly used ice melter. Rock salt melts ice at a temperature of above 20°. There are three processes that can produce it.



Salt Bin

1. **Rock salt** is mined by conventional hard rock mining equipment and techniques.
2. **Solar salt** is produced by the evaporation of seawater. Solar salt contains only a small amount of impurities.
3. **Evaporated solution** or **vacuum salt** nets a very pure form of salt which is made by injecting water deep into underground deposits, under a vacuum drying the solution.

Most of the salt MoDOT uses on our highways is rock salt. Naturally occurring rock salt is the mineral halite. Halite usually contains between 1 percent to 4 percent impurities, mostly gypsum, shale, dolomite, and quartz.

Negative Effects of Salt

Keep in mind that salt accelerates the deterioration of metal and concrete.

The Chloride ion bonds with water molecules increasing its conductivity, which results in accelerated rusting and corrosion.



Deteriorating Bridge

Salt penetrates the pores in concrete and causes the reinforcing steel bars to rust, which breaks up the concrete, forming potholes and blow-ups. Good maintenance practices help minimize the corrosive effects of salt.

To reduce damage to bridges, they must be swept and flushed periodically. Due to the corrosive properties of salt, equipment used in snow removal should be cleaned and washed thoroughly after each storm.

Alternatives to Salt

Abrasives

The department uses various types of abrasives including: cinders, crushed stone, gravel, slag, and natural sands.

Abrasives need to be hard, durable, and of a size that will minimize damage to windshields, provide traction, yet not blow off of the road.



Cinder Stock Pile

Abrasives do not melt ice or snow pack, but improve traction and assist with the break-up of hard-packed snow and ice on the pavement. Generally, abrasives are not used in urban areas because they can be easily picked up and thrown by tires, causing windshield and/or body damage to nearby vehicles.

The maximum aggregate size for abrasives shall not exceed 3/8 of an inch.

Note: *Lead mining chat or Iron Mountain Chips (within established limits) may also be used for anti-skid operations. See the Missouri Standard Specifications for Highway Construction*

for established lead limits for mining by-product aggregate use.

Generally, no advantage is gained by the routine use of abrasives in an anti-icing program. The mixture of abrasives and chemicals has been shown to be no more effective an anti-icing treatment during snowstorms than the same amount of chemical alone. Abrasive applications **should not** be a routine operation of anti-icing programs.

Abrasives are most successful when pre-wetted with salt brine. Pre-wetting loosens the top layer of snow-pack and allows the abrasives to “set” in the snow pack providing better traction, until weather permits routine de-icing.

Liquid Chemicals

There are several types of liquid chemicals used throughout MoDOT.

These chemicals are used to either pre-treat roads prior to a storm or to enhance the performance of dry materials as they are applied to the road. Methods of use can include using the liquid chemical to top soak a load, inject onto the material during spreading operations, or can be mixed into materials at time of storage.



* Salt Brine

Salt brine is made by passing water through a bed of rock salt, which in turn produces a solution.

Production involves loading a tank with salt and running water through it, then collecting the solution in a holding tank. The mixing tank should be kept at least half full with salt to ensure a 26 percent solution is produced. After the brine has been made, it is either pumped directly into trucks, for immediate applications, or pumped into storage tanks for later use.

Stored salt brine must maintain a 23 to 24 percent concentration. This can be checked during production using a hydrometer.

* Calcium Chloride

Calcium Chloride in a liquid state can product heat where rock

salt will need heat to work. This heating is what allows calcium chloride to work in colder temperatures down to -25° F. Calcium Chloride is typically purchased in bulk transport and stored in above ground tanks at the maintenance facilities and is typically used to lower the working temperature of the material spread.

* Geomelt / Beet Juice

A new liquid anti-icing chemical in use that is an all natural product derived primarily from beet juice.

Uses can vary from pre-treatment, anti-icing, de-icing, pre-wet, and pre-treatment for storage and will help keep salt flowable and eliminate chunking of salt during the storage process.

This new product will allow for applications in lower temperatures down to approximately -25° F. and is less corrosive and more friendly to the environment than other chemicals and is in use as an alternative to liquid chemicals such as calcium chloride and has the potential to produce the same results with less negative results.

When Not to Use Liquid Chemicals

The use of liquid chemicals alone is not recommended for anti-icing when the storm starts as rain, freezing rain, or sleet because these conditions require a significant amount of a liquid chemical to produce effective results.

Equipment Used with Liquid Chemicals

Three types of delivery methods are used at MoDOT:

1. Polyurethane tanks with gravity feed spray bars.
2. Slip-in poly tank with a hydraulic pump system for multi-lane application.
3. Saddle tanks attached to spreaders.



Brine Application

Saddle tanks make switching from pre-treating to pre-wetting activities much easier and are generally used with the newer spreader.

Note: *When applying chemicals with any of these methods, check your nozzles frequently because they tend to get plugged from suspended solids in the solution.*