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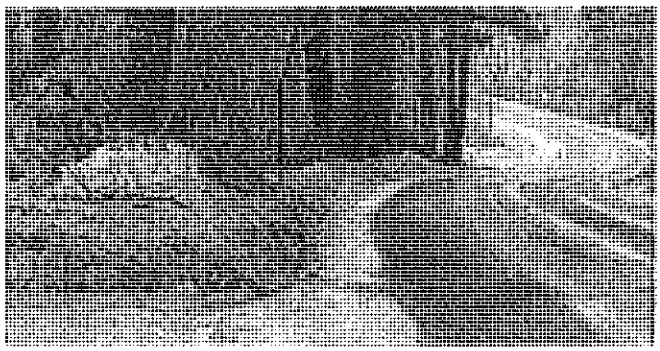
Pros and Cons of Sand on Ice and Snowpack



This picture was taken in March after a season of spreading sand on a hill. Sand remains on the road and roadsides. A catch basin at the bottom of the hill empties into a wetland.

Many highway departments apply sand on snow and ice covered roads to increase friction and improve road safety. Yet, significant friction increases occur in only a few situations. This article will describe those situations and the affects of sand on the environment.

Environmental Concerns

Agencies tend to spread sand many times throughout the winter months. Sand is expensive. It also can create large debris deposits on roadways. Environmental concerns dictate that sand be swept up each spring. Sweeping sand also picks up other debris and various compounds. Agencies must dispose of the material as a solid waste.

Sweeping picks up only a small percent of the total sand applied during a typical winter. The rest remains in the environment, much of it in catch basins or on or around roadways. Sand retained in catch basins should be periodically removed. This material, too, must be disposed of as solid waste. (A pending New Hampshire Department of Environmental Services fact sheet will address disposal of street sweepings and catch basin materials.)

Much of the sand not retained in catch basins stays in drainage pipes, decreasing their capacity. The rest is carried to outfalls, becoming sediment in ditches and water bodies.

Some of the sand on roadsides ends up in the ground, diminishing soil quality. Much of it becomes sediment, in many instances carried into streams, rivers, ponds, or lakes.

Study Results

Studies show that the effects of sanding are temporary, whether spread dry or prewetted. Abrasives do little to improve driving conditions on roads with high traffic volume. When dry sand is spread, 30% of it immediately scatters. Over time, cars usually displace most of the remaining sand. As few as 8 to 12 vehicles can sweep it from snow covered highway surfaces. Even with light traffic, friction gained from dry sand is quickly diminished.

University of Iowa (UI) researchers have drawn conclusions about methods to prewet abrasives with a chemical deicing brine. One method is to prewet abrasives in the stockpile to prevent their freezing. Such prewetting has little effect on the ability of the abrasives to remain on the pavement surface when delivered.

Some agencies prewet abrasives while loading trucks. Researchers found no evidence that such prewetting increases abrasives staying on the road surface.

The final prewetting method is to add about 10 gallons of sodium chloride or calcium chloride brine per ton of abrasives at the truck spinner or tailgate. Studies indicate that prewetting salt and other solid chemicals helps to keep them on the road surface when first delivered. It is less clear that prewetting helps it to stay there. The researchers drew the same conclusions for sand.

In summary, none of the prewetting methods appears to help sand stay on roads.

Recommended Practices

The UI study examined abrasive use on Iowa county roads. The researcher concluded that sand has varying levels of effectiveness on different classes of roads. He recommended the following changes in practice, which are summarized in Table I.

- **High Speed Urban Roads.** For urban streets with posted speed limits above 30 mph, there is no significant value in placing abrasives. Research recommends plowing and applying chemicals to achieve bare pavement.
- **Low Speed Urban Roads.** For urban streets with posted speed limits less than 30 mph, there is less abrasive dispersion. Abrasives should be limited to parts of the road where motorists must brake, accelerate, or maneuver. Even then, abrasives should be applied only when it will likely take a long time to provide bare pavement.
- **Urban Intersections.** Urban intersections are relatively low-speed traffic locations. Abrasives could be placed if needed. However, they should be used only when an intersection might be snow or ice-covered beyond a normal period.
- **Rural Roads.** Both paved and gravel roads can expect to see high-speed traffic. Abrasives will not stay on the road for any reasonable amount of time. Abrasives should be applied on hills and curves only on low-speed low-volume roads. Paved rural roads should be plowed and chemical applied to achieve bare pavement. The recommended gravel rural roads approach should be simply to groom the snow pack.
- **Rural Intersections.** Again, gravel versus paved roads must be considered. An intersection should be considered "paved" only if all intersecting roads are paved. Road segments where motorists must stop or yield are low-speed traffic locations. Abrasives could be placed if needed. The preferred approach for paved roads is to plow and apply chemicals to achieve bare pavement. On gravel parts of intersections, abrasives may be applied over that part of the road where speeds less than 30 mph are expected.

Table 1
Recommended Abrasives Applications

Road Type	Use of Dry Abrasives
High Speed Urban Roads	Inappropriate
Low Speed Urban Roads	Only in certain locations, and when snow pack will persist
Urban Intersections	Only when snow pack will persist
Rural Roads, Paved	Inappropriate
Rural Roads, Gravel	Only on low speed sections (perhaps hills and curves)
Rural Intersections	Only on low speed approach length of gravel roads

Sand remaining on gravel roads after spring thaw is a poor wearing course material. Some New Hampshire road mangers report significant friction increases from spreading crushed aggregate on gravel hills and curves. Several have successfully used 5/8-inch minus aggregate. In addition to safer roads in the winter, these are better wearing course materials after the spring thaw. Following the UI recommendations above, managers should consider such material at gravel road intersections.