



America's Small Town Capital

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FRONT PORCH FORUM

Maintenance of Roads & Sidewalks: Weather Challenges on December 18th

The extreme weather conditions which descended on Vermont during the weekend of December 17-18 were considered to be some of the most challenging circumstances for those in the highway maintenance profession. The storm was set up with a modest amount of snow piled in windrows along the roads and sidewalks and a period of very cold air with ground temperatures in the 20°s. As I understand it, the storm came in with a warmer upper atmosphere air trough arriving from the gulf coast with lots of moisture colliding with an arctic cold front from the North West. Precipitation in the form of rain became heavy at times with air temperature at ground level hovering around the lower 30°s. With a ground temperature below freezing, the rain froze on contact. Given the intensity of the rain fall, the ice thickened at the surface, and pre-application of anti-icing materials on the paved surfaces would only be marginally effective because much of the material would wash away and could not be relied on as an effective anti-icing technique.

As the rain increased in intensity, the air temperature rose to above freezing, causing the snow banks to begin to melt which added to the overall free water (liquid) content of the snow pack. As nighttime approached, temperatures quickly dropped to below freezing with snow banks along the streets and sidewalks solidifying and forming dams to obstruct water flow. By this time, the de-icing material had melted through to the pavement which was overly diluted and re-froze negating the previous efforts.

In these circumstances, it becomes necessary for maintenance operations to be an on-going and persistent effort. With icing on every exposed surface, even a full deployment of all available tools and resources to achieve and maintain hazard free sidewalks and roads during or immediately following the storm is, at times, an unrealistic expectation. While the snow pack helped to absorb much of the rain waters, the drop in temperature to single digits on Sunday night / Monday morning presented an additional challenge to winter maintenance crews. There is no disagreement that DPW had trouble keeping up with the changing conditions.

I've posted a detailed response on the City's website (Public Works Page) to the comments recently expressed here on FPF and welcome your questions and comments.

Here's some information about de-icing / anti-icing materials and the Department of Public Works:

Rock salt (halite – sodium chloride) must transform from a solid to a liquid state to be effective at melting ice. Rock salt is hydrophilic, drawing moisture from the atmosphere to begin the melting process. **This chemical transformation does not occur below a temperature of about 15° F.** Until two years ago, Montpelier DPW would switch over to sand as a traction aid when temperatures rendered salt largely useless. In 2014 we began a brine application program utilizing a mixture of magnesium chloride and molasses as a tackifier to "pre-wet" the rock salt. Many agencies around

the country, particularly in the Midwest and western states are now using brines and various liquids effectively and sharing their experiences through networking opportunities. Beet juice, among other organics, is now gaining in popularity as an effective tackifier which contains sugars that help bind the salt material on the road or sidewalk surface, reducing the need for multiple applications while saving costs and avoiding adverse environmental impacts associated with over-usage. Of interest to the public is that the molasses tints the salt with a brownish color which does tend to give it a "dirty" appearance, whereas beet juice would produce a pinkish tint.

Another strategy employed by Montpelier DPW a few years ago to address excessive salt usage was the replacement of the old single-speed salt spreaders with ground speed controlled spreaders. The new spreaders are adjustable by the operator to regulate the total output in pounds per lane mile. In addition to reducing waste at low vehicle speeds while applying materials at the appropriate amount per conditions, the spreaders allow for better control of salt usage and condition monitoring by the supervisor. Although not fully eliminated, the frequency of inadvertent salt dumps during stopping and starting has been significantly reduced with this equipment.

With improved controls and the addition of an organic brine mix, DPW has cut salt usage by approximately 25% from just a few years ago. It's still too early to tell due to variable weather conditions, but the trend is leaning toward even lower usage as more experience is gained and information is exchanged with our networking partners. These efforts allow us to achieve our winter maintenance policy of safe roads at safe speeds while reducing costs and the adverse impacts of salts on our environment. Furthermore, a significant reduction of sand as a traction aid is also being realized. The use of sand during the winter months results in a costly and time-consuming clean-up effort in the spring. Sand contains multiple contaminants and we understand it is also high in phosphorus. **When temperatures dip below 15°F, rock salt is ineffective**, and common practice is to use sand as a temporary traction aid. Use of a magnesium chloride brine solution for pre-treating the salt lowers the effective working temperature to below zero degrees. While sand is sometimes still necessary as a traction aid, such as during the recent rain storm event, we have cut our usage to about a third the previous rate, and strive to use the absolute bare minimum.

Public Works also has a policy preference for scraping even small amounts of snow off roads and sidewalks rather than trying to burn it off with deicing materials. Additionally, streets with low traffic volumes and relatively level surfaces will receive the least amount of deicing material. This material is applied toward the center (crown) of the street and only enough to prevent caking or packing of snow onto the surface is used. While cold packed snow does provide excellent traction for modern snow tires, over time through fluctuating temperatures and melting caused by vehicle exhaust and engine heat, the packed snow will form ice which is extremely difficult to remove once it has fully adhered to the surface. Rutting, washboards and other dangerous conditions can result for both motorists and pedestrians.

By contrast, the methods and techniques employed for the winter maintenance operations for gravel roads are markedly different than paved roads. First, deicing agents cannot be effectively utilized on a gravel surface for several reasons, such as causing the gravel to go into solution eliminating any traction. Typically, the gravel is allowed to solidify as it becomes saturated which provides a durable surface until the spring melt. After a gravel road is plowed clear of snow, sand is applied to provide traction, and sunlight and heat from vehicles cause the sand to become embedded into the road surface. Unlike a paved road, when rain is in the forecast many agencies will avoid plowing a gravel road with the hope that the snow will help absorb the rain water. After the rain stops, the loose wet snow can be plowed off to the sides and sand is then applied and the process begins anew. However, when temperatures are above freezing or the rain is persistent, water will coat the sand and multiple reapplications are necessary. Also, if temperatures are extremely cold, the sand can fail to be embedded in the frozen surface and will blow off to the sides of the road, leaving dangerously icy surfaces, especially in shaded areas, as can now be seen in the towns surrounding Montpelier. Also, traffic travelling over unplowed wet snow will cause rutting which then freezes into

place. Often the deeper ruts will persist for the remainder of the winter or until the next thawing cycle.

In response to comments about the windrow of snow that plow trucks leave in the driveways, anybody who has ever shoveled a driveway has probably cursed the plow operator for doing this. The most frustrating time is just after the driveway has been cleared and the job is thought to have been finished, when the plow returns to deposit another windrow. The absolute worst circumstance is when the windrow is high in free moisture content and then freezes in place. Our plow operators also have to clear their own driveways at home and most know what difficulty they are causing, while also understanding - probably better than most - that there is not a thing they can do about it. Some residents have asked that we lift the plow as we pass by a driveway but that only leaves the snow in the street making the job of street clearing incomplete and potentially hazardous. Where driveways are closely spaced in neighborhoods, lifting of plows is even more problematic. Plows are only capable of pushing and have control only of the direction in which the snow is pushed. The only means to avoid driveway windrows would be use of snow blowers instead of plows. A front end loader equipped with a snow blower would travel at a fraction of the speed of a snow plow. Loaders are also prohibitively expensive pieces of equipment and most towns only have one or maybe two in their fleet. Consequently, a conversion to exclusive snow removal by blowers for the purpose of avoiding driveway windrows would take multiple days to clear the streets as opposed to hours, unless several loaders could be purchased and equipped with blowers. Until such time as a viable alternative method can be developed, the age-old problem of driveway windrows will remain a reality of life in Snowbelt states. We regret the inconvenience, but if there was something that could be done to prevent it, it was implemented long ago.

The Department of Public Works is committed to doing the best job we possibly can to maintain the streets, sidewalks and parking lots under all circumstances and will rise to meet the challenge. There are times when even our best efforts are not good enough, but we learn from those circumstances and adjust our operations to do better the next time.

In response to other Front Porch Forum comments during the week of December 19th, we offer the following responses:

It was stated that DPW salt usage is as much as 3 times that of the Vermont Agency of Transportation (VTrans). While this may have been a true statement prior to the conversion to manually-operated spreader controls, the DPW salt application rate is currently the same as VTrans, at about 200 tons per lane mile, which is our highest rate. VTrans prepared a salt application chart indicating that they will sometimes use a larger amount when conditions warrant, but they also regulate usage very closely which is also true for DPW (posted on DPW page of web site). For our residential streets, the application rate is closer to 100 tons / lane mile because we frequently apply salt only in one direction along the centerline of the street.

With regard to budgetary needs of DPW, our approach to winter maintenance is the same as the VTrans policy as stated above; safe roads at safe speeds during storms, and not a bare-roads policy. We give preference to higher traffic areas, intersections, hilly streets, and the school areas. We attempt to have all streets and sidewalks restored to unrestricted normal use through clean-up operations within 48 hours after the conclusion of storm events. At the present time, our staffing is sufficient to achieve these goals the majority of the time, but each storm brings new challenges and we prepare for those extreme events. As such, we have cross-trained our utility operations personnel to provide back-up when needed. Additionally, our fleet management program has been fully funded and with our skilled mechanics performing regular preventive maintenance and available 24/7 for emergency repairs, our crews have the correct equipment for the job which is dependable and safe. Costly equipment repairs have now decreased significantly because of the collective efforts of our mechanics and the use of fleet management software. As for the budgetary decrease, Public Works agencies across the country pride themselves on being innovative and efficient which is

also true for our department. We're managing overtime to the extent possible, and as noted above, we're budgeting for less rock salt and sand. Also, fuel costs are now significantly lower than in recent years which is being reflected in our budgets, and we hope those lowered costs persist.

Another comment regarded the alleged lack of snow bank clearing at the bus stops. This is a rather curious comment because DPW began regularly removing the snow banks in front of City Hall about a year after the Greyhound stop was located here. The bus makes daily stops so we maintain the loading platform (sidewalk and street) throughout storm events. As for the GMTA stops, they maintain their own stops and have not requested any special assistance from DPW.

As Director of Public Works, I have the responsibility of maintaining our streets and sidewalks and am always willing to answer questions, listen to and address complaints and am available and to hear ideas about how we might be able to do something better or differently. Our residents and visitors should feel free to contact me, and all of you should know that I appreciate constructive criticism. Winter can be a brutal time of year for even the hardest among us, and we sincerely want to do our part to reduce some of the hardships we all have to endure during these cold dark days.

Respectfully,

Thomas J McArdle
Director of Public Works