

## FORENSIC ENGINEERING NEWS AND VIEWS

December 2022

### President's Box



By Rene Caskanette

Our company is having another year of growth and success thanks to our customers, new and old. I give thanks once again to our partners in industry who keep us busy in our 25th year of operation. It is a pleasure to help those who are in distress after a loss of property or life, it makes the job worthwhile.

Our new team members have integrated well into our support team and expert team, and we are currently planning more manpower additions in 2023 to ensure we can continue to provide the high level of service we are known for, with fast and accurate reports and drawings.

As another holiday season approaches, we can all be thankful for the privilege of living in a peaceful part of the world. Those of us born here may not always appreciate our good fortune, but when

speaking with those who moved here from war torn areas, a new appreciation can develop.

Looking forward to 2023 and more progress on solving some of the lingering economic challenges, inflation, supply chain delays and manpower shortages in many industries. I know our country has the ability to move ahead through these issues and emerge stronger.

In July we will celebrate our 25th anniversary, a milestone we have worked hard to reach, and a source of pride for me as the company founder. The insurance industry has changed so much over those years in lockstep with societal expectations. It has kept our smaller and nimble firm on top as we quickly adapt to those changes.

Merry Christmas and Happy New Years to all.

### Winter Driving



By Jeff Udall

As the nights get longer and the winter cold sets in, it's time to readjust our driving habits. Snow and ice are on the way. Here are some things to consider when driving in slippery conditions.

Slow down. Increased speed has multiple effects on the outcome of a pending collision. First of all, there is reduced reaction time. Should a hazard appear in front of a driver, they require time to observe, assess, and react accordingly. While this might seem like a short period of time, a second or two can pass before the vehicle starts braking or steering to avoid the hazard. This can be a critical amount of time that could mean the difference between avoidance and impact. Secondly, should a collision occur, the damage and risk of injury increases with higher velocity impacts, as does the liability of the driver. Even driving 'below the speed limit' does not relieve a driver from their responsibility to drive according to conditions.

Put snow tires on all four wheels. People sometimes try to save money by only putting snow tires on the front or rear wheels of their

vehicle. It might sound like a reasonable thing to do if you consider that the front wheels do most of the braking and steering, so having better grip on those tires could be all you need. Or conversely, a rear-wheel-drive car or truck needs traction on the back end. However, this logic breaks down when you consider that the center of mass of a vehicle is between the front and rear wheels that have different traction levels. Braking forces ahead of the center of mass can cause a torsion response that causes the back end of the vehicle to spin out sideways. This can happen easily if braking while turning. The back end can suddenly spin out and the vehicle loses directional stability. If the snow tires are on the rear, then you may have better traction for acceleration of your pickup, but the braking ability is reduced since most of the work is done by the front wheels. The front wheels will lock up easier and the vehicle loses its steering ability. This is compensated by the anti-lock system, but you will never defeat the laws of physics.

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# Sustainable Construction in Small Projects



By *Samrand Abdi*

## What is Sustainable Construction

Sustainable construction means implementing construction activities in a way that reduces the impact of such activities on the environment. The construction industry accounts for 30% of energy usage and almost the same amount of CO2 emission worldwide. It is one of the most significant sources of landfill waste as well. Therefore, it is important to explore possible ways to reduce such a large impact.

Main ways to achieve sustainability with construction activities are:

- Using renewable and recyclable materials
- Reducing on-site waste
- Reducing the embodied energy in building materials
- Reducing the energy consumption of the finished building
- protecting the natural habitats during construction.

Although sustainable construction has been a major topic in large scale projects around the globe for a few decades, in small projects it is still in its infancy. In this article we will touch on some aspects of this topic and explore possibilities for implementing small projects in this way.

## Possible Ways for Sustainable Construction in Small Projects

Sustainability can be achieved through a variety of strategies such as utilizing windows with lower U value numbers, applying insulation to building

envelope with R value numbers above building code requirements, and using more durable materials on exterior cladding. This could include a variety of masonry or vinyl-based materials. We will take a closer look into the materials in the next section.

Another important item is to conduct proper project management regardless of the size of the project. This can help with reduction of energy consumption in transportation of components and materials as well as reduction in construction waste.

Utilizing prefabricated materials which are prepared in controlled environments could also help significantly in achieving sustainability goals. The most common prefabricated materials used in small projects are various types of gypsum boards, chipboards, and other wood-based boards. With a good planning procedure that covers design and shop drawings, the amount of waste among these types of materials can be minimized.

Moreover, using adequate materials for specific applications is critical to enhance their durability. For example, engineered stone countertops can serve much longer than laminate countertops and be cost effective in the long run while providing better conditions from the beginning.

## Materials and Methods

As mentioned above, there are many materials available in the market that could be used to achieve sustainability. Therefore, material selection plays an important role in this regard.

The good news is that wood, which is a widely used material in small projects, can be regarded as a highly sustainable material. Nevertheless, it could always help to use specific types of wood to improve sustainability of material sources. The best construction woods with higher sustainable status come from hardwood trees, such as oaks, hickories, birch, and cherry, among others. These trees can be harvested when they are 14 to 20 inches in diameter. Some trees take 50 years to reach a size that makes them good for their lumber — for example, Douglas firs. Although this is a fair timespan for the construction industry, it is worth it to search for trees with lower growth cycles to be utilized for construction. An example could be Empress Splendor which is one of the fastest-growing trees in the world. As a hardwood, it can grow 10-20 feet in its first year and reaches maturity within 10 years.

Recycled materials, such as recycled metals and plastics are also becoming very popular to manufacture building materials. So, it is important to manage construction waste in a way that

recyclables can be separated and transferred to adequate locations for recycling rather than be discarded into landfill.

Although traditional concrete and brick units that are commonly used in construction contribute hugely to greenhouse gas emission because of the methods used for their production, it could be argued that durability of such materials in the building largely offsets that disadvantage. Nonetheless, new methods are also being explored by providers to reduce the emission in producing masonry units. It is recommended to study the provider's manuals to find out if these methods are utilized.

In addition, some institutions such as UL, offer services for environmental claim validations that provide independent verification that products live up to their marketing claims.

As mentioned, sustainable construction is also about using building methods that enhance renewable and sustainable efforts. Some of these methods include:

- Cutting materials precisely in order to reduce waste
- Waste management, such as separating and recycling waste
- Adaptive reuse projects that transform old buildings
- Managing construction sites to improve the environment (examples include treating water on-site, no smoking, recycling food containers, etc.)
- Conserving Energy (examples include using local products for shorter transportation, doing construction in cooler seasons to reduce use of A/C, transporting items in collective shipments, etc.)

## Building Code

The Ontario building code and the national building code establish the minimums required in any aspects of construction, but the owners can achieve qualities well above those minimums especially with regards to sustainability. This falls to the expertise of the architect and engineers to interpret code requirements and assist the owners with finding methods that can provide higher qualities.

## Budgeting

Although some of the methods and materials that are more beneficial in creation of a sustainable building may come with relatively higher costs,

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# Winter Maintenance Assessments



By Micheka Kostyniuk & Alex Caskanette

A simple slip and fall on ice can be a life altering event and can result in permanent injury. We regularly perform winter maintenance assessments for private and public properties including sidewalks, parking lots, roadways, and walkways. Proper winter maintenance requires the monitoring of changing weather conditions, prompt and competent service, and using a sufficient amount of de-icing agent in the correct locations.

The most common de-icing agent that we are all familiar with is rock salt (NaCl). Other de-icing agents include magnesium chloride (MgCl) and calcium chloride (CaCl). Although rock salt is more corrosive and less effective at lower temperature than the other de-icing agents mentioned above, it is the most common because it is the least expensive.

Excessive use of rock salts can harm the environment and infrastructure. Salt is highly corrosive and can damage concrete structures, roadways, and vehicles. It can also cause adverse environmental effects when overapplied, since

the salt can kill vegetation and contaminate groundwater aquifers.

So how does de-icing with salt work? Salts requires time, temperature, and moisture to function. Solid rock salt mixes with water to form a brine. This water can come from snow, ice, rain, or humid air. When the moisture is absorbed by the salt, it forms a brine solution. A brine is essentially salty water. The brine solution depresses the point at which water will freeze. As the concentration of salt in the solution increases, the freeze point of water decreases. The generalized phase diagram of rock salt can be observed in **Figure 1**.

As moisture is absorbed into the salt and the brine forms, the ultimate concentration of 23.3% is reached. As additional moisture is absorbed into the brine from melting snow/ice, the concentration dilutes. Eventually the solution will dilute to the point where there is so little salt remaining that the brine is basically just water again, and it will re-freeze, rendering it ineffective.

As the concentration of the brine is higher, it is more effective at lower temperatures. At a concentration of 23.3%, salt works at temperatures as low as  $-21.1^{\circ}\text{C}$ . As it gets diluted, the effective temperature for the salt increases.

Salt is not effective at temperatures below  $-21^{\circ}\text{C}$ . At temperatures below  $-21^{\circ}\text{C}$  a different de-icing agent is required. Realistically, salt has minimal effectiveness between temperatures of approximately  $-9^{\circ}\text{C}$  and  $-21^{\circ}\text{C}$ . Although, it can still be effective if used properly in this temperature range, but does require more regular monitoring/maintaining. Salt is most effective at temperatures above  $-9^{\circ}\text{C}$ .

There are many factors that affect the effectiveness of salt to act as a de-icing agent, some of these factors include:

- Temperature.
- Spreader Rates (too much is wasteful, too little is ineffective).
- Weather (is it sunny or cloudy? day or night?).
- The type of pavement surface (asphalt or concrete).
- The topography of the surface.
- Expected volume of pedestrian or vehicular traffic.
- Proper timing (proactive anti-icing is necessary to achieve safer conditions quickly with less salt).

Can you just throw salt on the surface and everything will be safe? No, not usually. Salt needs to be re-applied regularly to remain effective, as it is diluting during de-icing, and becoming less effective. Salt should not be applied on top of an unplowed surface with hopes that it will help rid the surface of snow/ice.

Salt helps to break up the bond between the snow/ice and the pavement surface improving traction and making the surface safer. Proper winter maintenance requires snow to be plowed from the surface prior to the application of salt. The plowing removes the snow, so that the salt can be effective. Once the salt has had time to work and break the surface bond, the winter maintenance equipment should return to do another pass followed by the application of additional salt. This should be repeated as necessary to get the pavement to a safe and serviceable condition.

The importance of monitoring site conditions is paramount. Local site conditions can have hazards that aren't noticeable by monitoring weather conditions from an office. Having an onsite presence to see firsthand what is going on and planning accordingly is critical. Inspections can be done by trained equipment operators who are out plowing/de-icing, or by patrollers who are touring around to monitor site conditions and dispatch crews as needed.

Poor site drainage is one of the situations that poses the highest risk for slip and falls that can be mitigated or eliminated. Areas prone to icing because of poor drainage require a high level of effort and attention. It is better to eliminate the problem before winter starts.

In addition to de-icing, there is also anti-icing. De-icing is trying to act after the snow/ice has

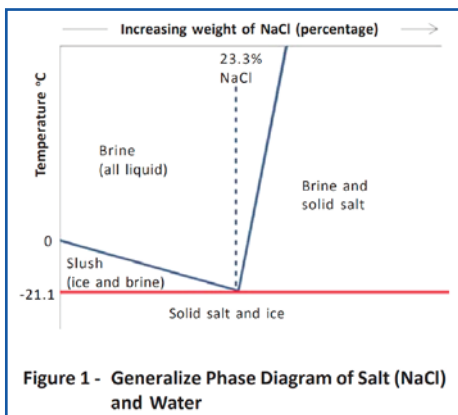


Figure 1 - Generalized Phase Diagram of Salt (NaCl) and Water

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## Winter Driving

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Physics always rules! Newton's First Law (if you recall from your highschool days) states that an object will move at a constant speed in a straight line unless acted upon by a force. For a vehicle, that force can be steering, accelerating, or braking. A vehicle driving down a highway in a straight line is just doing what it wants to do. If you try to change the speed or direction, it requires a force to do that, and that force is at the contact point between the rubber and asphalt. The response of your vehicle to your change of speed or direction relies entirely on that contact point, and if you add some snow or ice in between, Newton says, "Sorry. Your vehicle just wants to go straight at the same speed and you're out of luck."

Keep your windshield clear. Visibility can be challenging at the best of times. There are always obstructions that can hinder a driver's ability to see other vehicles or pedestrians. Things like portable road signs, vegetation, and other vehicles are external obstructions. Interior obstructions can be wide A-pillars at the side of the windshield, or windshield mounted GPS or phones. These things are hazards in everyday driving, not just in the winter. But if you fail to fully clean your windshield of snow or frost, your ability to see and respond to hazards is reduced even greater. Add in the potential glare from the snow on a sunny day, and you could be totally blind to what's in front of you.

Should an accident occur in the winter, a technical reconstruction should consider all these things at the time in order to get a complete picture of the events leading up to the collision. Speed, visibility, traction, response timing, and all interior and exterior conditions come into play. Call us if you have a winter driving claim and we can help sort out the liability.

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## Winter Maintenance Assessments

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accumulated. Anti-icing is a more proactive approach where a liquid brine is applied to the roads before a storm. When applied properly, this liquid brine helps to prevent snow from sticking to the ground so that the first pass with the snow plow is more effective at clearing away snow.

Property owners normally contract snow removal and de-icing work to contractors who specialize

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they will reduce long term costs of building maintenance noticeably. For example, windows with lower U factors or insulations with higher R values. On the other hand, most of the means to achieve sustainability won't impact the overall budget by themselves but would need additional time to be added to project management.

The key in budgeting for such projects is research. More comprehensive research on the project's purposes and requirements before getting into action will result in more saving in the end, and surely better quality and durability of the product.

There are also several rebate programs offered by the government of Ontario and other institutions that can help the owners with the cost.

## Conclusion

It is proven that a sustainable approach to construction projects of any size will be beneficial in terms of improving the environment, however many people may think the impact of a small project is too low to bother with such measures. The fact of the matter is that the combined size of small projects at any given time is significant, therefore it is certainly worth it to see every project through sustainability lens.

Architects and engineers are the best sources to provide owners with required information and useful procedures regarding sustainability.

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