WINTER OPERATIONS:
EQUIPMENT and MATERIAL:

Description of Vehicles
Description of Machines
Description of Equipment
Equipment Functions/Applications

Overview - Materials Used at SFU:
Straight Salt
Brine

Overview - Methods of Application
Clean-up Procedures
INTRODUCTION:

There are a number of vehicles and machines that are used in Snow and Ice Control at the University. In addition to their snow and ice control functions, these vehicles and machines are used in a variety of applications at times other than in winter, so their use, care, and maintenance are ongoing.

The Snow and Ice Control plan makes use of these vehicles and machines in conjunction with a set of winter attachments and with materials used to reduce the effects of snow and ice.

Each of the vehicles has a specific function within snow and ice control.

Driver/Operator Qualifications:

It is very important that drivers of vehicles and operators of equipment are fully qualified to utilize that equipment:

- Operators must hold the appropriate class of driver’s licence
- Operator licences must be in good standing
- Operators must hold the required licence endorsement(s)
- Operators must have received adequate training – theory and practical - on the equipment to be operated. Assessments should be on file.
- Operators must participate in annual re-certification procedures

Following is a brief description of the vehicles and machines in use, information regarding how they are used, and requirements of operators who operate them.
1. University-Owned Equipment:

One-Ton Truck (Brine):

This truck is equipped with
- A tanker for anti-icing activities
- Computerized control for anti-icing

It is used for
- Applying liquid de-icers to the roadway
- Spraying sidewalks if necessary (has a hand nozzle)

In order to operate this vehicle, the driver must have
- Class Five driver’s licence
- Snow and Ice Control certification – Level 1
- Annual practical training – driving and computer functions
- Bulk Plant Operations training

One-Ton Truck:

This truck is equipped with
- A slide-in spreader
- An articulating front mount plow

It is used for
- Applying straight salt to the roadways
- Plowing snow

In order to operate this vehicle, the driver must have:
- Class Five driver’s licence
- Snow and Ice Control certification – Level 1
- Annual practical training – driving and computer functions

Single-Axle 5-Ton Truck:

This truck is equipped with
- Air Brakes system
- Front Mount plow
- Slide-in spreader, with Dickie-John computer system
- Pre-Wetting system

It is used for
- Applying straight salt or pre-treated salt to the roadway
- Plowing snow

In order to operate this vehicle, the driver must have:
- Class 5 driver’s licence w/air brakes endorsement (Restriction 15)
- Snow and Ice Control certification – Level 1
- Annual practical training – driving, plowing
Single-Axle 5-Ton Truck:
This truck is equipped with
  ▪ Air Brakes system
  ▪ Front Mount plow
  ▪ Slide-in spreader, with Dickie-John computerized system

It is used for
  ▪ Applying straight salt to the roadway
  ▪ Plowing snow

In order to operate this vehicle, the driver must have:
  ▪ Class 5 driver’s licence w/air brakes endorsement (Restriction 15)
  ▪ Snow and Ice Control certification – Level 1
  ▪ Annual practical training – driving, plowing and computer functions

Kubota Tractor:
This tractor is equipped with
  ▪ Small front plow
  ▪ Small salt spreader

It is used for
  ▪ Clearing walkways
  ▪ Spreading salt on walkways

In order to operate this machine, the operator must have:
  ▪ Class Five driver’s licence
  ▪ Snow and Ice Control Certification - Level 1
  ▪ Familiarization training

John Deere Front End Loader:
This loader is equipped with
  ▪ 4-in-1 front bucket

This loader is used for
  ▪ Loading trucks with salt
  ▪ Clearing parking lots and parkades

In order to operate this machine, the operator must have
  ▪ Class Five driver’s licence
  ▪ Practical loader training
  ▪ Snow and Ice Control certification – Level 1
2. Contracted/Rental Equipment:

**Grader and Loader:**

These are currently supplied by Columbia Bitulithic Ltd. Equipment and its operators are provided under an annual retainer to the University (at specified hourly rates).

The machine is useful for clearing parking lots and other areas outside of normal University hours.

During severe snow storms it may also be used to assist with clearing snow from main arterial roadways.

**Bobcat and Loader:**

These are currently supplied by Jerry Williams Excavating Ltd. The bobcats are utilized for cleaning and the upper level Visitor Parkade (they have no salting capabilities).

**Toolcat C/W, with Plow, Spreader, and Bucket**

This equipment is supplied by Surfwood Supply Ltd. It is operated by University staff during the rental period from November to the end of March.

**Emergency Parts Suppliers:**

The following organizations provide equipment parts to the University:

- Coquitlam Automotive
- Del Equipment
- Freightliner
- Avenue Farm Machinery
- Barnes Wheaton
- Metro Motors
- Danco
- Spray Air (Brine equipment)
## Snow and Ice Equipment Overview:

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### JOHN DEERE LOADER RENTAL LOADERS

- **4-in-1 front bucket**
- Clearing parking lots and walkways
- Loading trucks with salt
- Applications: Clearing parking lots and walkways; spreading salt on walkways
- Operator Requirements: Class 5 driver’s licence; Practical loader training; Snow and Ice Control certification – Level 1

### KUBOTA TRACTOR

- **Small front plow**
- Applications: Clearing walkways; spreading salt on walkways
- Operator Requirements: Class 5 driver’s licence; Practical tractor training; Snow and Ice Control certification – Level 1

### SINGLE AXLE 5-TON TRUCK

- **Air Brakes system**
- Applications: Applying liquid de-icers to the roadway; Spraying sidewalks
- Operator Requirements: Class 5 driver’s licence; Snow and Ice Control certification – Level 1

### 5-TON TRUCK

- **Front Mount Plow**
- Applications: Applying straight salt or pre-treated salt to the roadway; Plowing snow
- Operator Requirements: Class 5 driver’s licence; Practical training – driver and computer functions

### 1-TON TRUCK

- **Articulating front mount plow**
- Applications: Applying straight salt to the roadway
- Operator Requirements: Class 5 Driver’s licence

### 1-TON BRINE TRUCK

- **A tanker for anti-icing**
- Applications: Spraying sidewalks
- Operator Requirements: Snow and Ice Control certification – Level 1
Vehicle Attachments:

The University utilizes a number of attachments to vehicles and equipment in order to complete the Snow and Ice Control task. Following is a brief description of each:

Front Mount Plows:

These are the most common plows in use. They are a reasonable size and can be easily attached to the trucks. The front mount plow can be used in almost all situations. Since it is a plow that pushes rather than scrapes, it can be easier to operate than some plows.

For smaller trucks like the 1-ton, the front mount plow is the only plow that can be used, due to the restricted space underneath these vehicles.

Operators of this type of plow must be aware of the hazards associated with its use. There is a hazard in simply having this attachment on, an accessory whose length goes beyond the front bumper. Working in tight areas and turning corners presents challenges.

Spreaders:

Spreaders are the attachments that dispense material by a chain onto the roadway. The ones in use here are slide-in style—they go right into the box of the truck. The spreaders can be controlled from the cab. They have chains which are driven by the hydraulic pump on the truck. The spinner at the back of the spreader is also powered by that hydraulic pump. The spreaders allow for the operator to control both the chain and the spinner from inside the cab. The operator can set the rate and the spreader will speed up and slow down with the speed of the vehicle.

At SFU, these attachments are used to dispense salt. They are also used in conjunction with the pre-wetting system, which is attached and which wets the material (salt) coming out of the spreader before it contacts the road surface.

Anti-Icing Equipment:

At the University an anti-icing process is used: Salt brine is pre-applied to the roadways to prevent the build-up of ice. This process is also used during a storm to help keep the roads bare and wet. The salt brine is applied from a large tank and a pump that sprays a pre-measured amount of liquid onto the roads. With the use of this system,

- the load goes farther than a load of solids
- the speed can be considerably higher than when spreading materials within a hopper system.
Anti-Icing, cont.

The Anti-icing system is activated by the driver using a computer switch in the cab and then adjusting the settings to allow for the proper distribution rates. As the driver is driving, the liquid is sprayed according to the computer setting and the truck speed. If the driver speeds up, the computer speeds up the application rate to maintain the preset amount. If the driver over-speeds, usually an alarm will sound, indicating that the computer cannot keep up the proper application rates at that rate of speed.

The sprayed brine can go to the sides and behind the vehicle to allow for better coverage. The spray bars are located close to the ground so that the material makes good contact with the road surface and is not blown away easily.

Pre-Wetting Equipment:

Pre-wetting is another process used in snow and ice control. It is done through equipment that has been installed on the hopper of the spreader. Pre-wetting is the application of a liquid, in this case, salt brine, to a load of dry material. At SFU, this system is used extensively.

Tanks of the salt brine are mounted to the side of the hopper. The load is sprayed through nozzles located in the hopper chute. The material that goes onto the road is then wet, which helps keep the materials on the road and makes them work more quickly and effectively. If done properly, pre-wetting can save materials.

The pre-wetting equipment is activated easily; it comes on when the hopper is turned on. Pre-wetting in this way

- makes salt and sand stick to the road surface
- makes a material that reacts quickly
- is easy to do
- makes re-application less necessary
- uses less material
- does not blow off of the road as easily

There is a set of procedures to be followed when using the anti-icing and pre-wetting equipment. These are outlined in the training programs in which operators participate.
Materials Used in Winter Road Maintenance at SFU:

There are a number of materials that are used in snow and ice control. Their common characteristic (with the exception of straight sand*) is that they are salt-based. The use of salt, in one form or another, is still the most effective way of breaking down ice. There is a variety of liquids in use and there are various mixtures of materials in use.

At the University, two materials are used on the roadways: straight salt and salt brine. These are both known as reactants, materials which cause a chemical reaction to occur when they are placed upon the road’s surface.

Straight Salt:

Salt is applied to the roadways through the spreader on the back of the vehicle. At temperatures of -6° and above, salt is very effective in breaking down snow and ice.* As well, the mechanical movement of traffic over a salt-treated roadway can create an additional benefit – the vehicles “working” the material can make the salt work even more effectively.

Unfortunately, straight salt can have a negative effect on the environment – it can bounce off the roadway and remain at the roadside, where it can cause damage.

In order for it to be used effectively, salt must be applied:

- At the correct application rate
- In the correct places – crown, super-elevated corners, and travel part of the roadway
- At the correct vehicle speed - this is very important.

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*Salt is not as effective when temperatures drop to -6 or colder. However, if anti-icing and pre-wetting procedures have been used, this can be mitigated.
Salt Brine:
Salt brine is mixed (approximately 23% salt to water) at the Bulk Plant on campus. It is carried in tanks on the vehicles and is distributed prior to a storm and/or during a storm. It is effective in that

- Brine works in a similar way to straight salt, breaking down ice and exposing the road surface.
- Unlike some products, salt brine is not slippery once it is down
- It does not have to be agitated – the salt will stay suspended in the liquid
- Brine is quite cost-effective
- It can be made on-site
- The Brine system requires very little maintenance

The following materials are not in use at SFU:

- Sand
- Salt/Sand mixes
- Calcium chloride
Equipment Clean-up Procedures:

The importance of cleaning the equipment used in snow and ice control cannot be overemphasized. Since the main ingredient in snow and ice control materials is salt, there is always a strong possibility of damage to equipment and components.

Clean equipment lasts longer in general:

- Equipment that spreads salt or sand or a combination requires a good washdown with lots of water to ensure that there is no salt and sand residue in the equipment. Salt causes rust very quickly. If salt remains long enough it will cause the equipment to seize up – then the auger chains and the spinner may be a problem during the next use.

- Spreading units that use chains for augers must be cleaned very well to ensure that they will operate the next time.

Cleaning the vehicles takes some time at the end of the shift, and must be done right. The cleaning time should be no less than about 30 minutes, depending on the size of the equipment that is being operated (larger will obviously take longer).

A pressure washer is available for the operators to use for this task.

—if the weather is very cold and the water is freezing, it may be safe to not rinse the equipment, since that cold temperature will also not encourage rust to form. This situation is not a common one at SFU.

Procedures:

The spreader must be operating while the equipment is being cleaned. This is so that the chain will cycle through several times during the washdown procedure.

The chain guide (this is where the chain fits under the spreader) is another area that requires careful washing, as the salt can easily build up. This may be a challenge as the water has to be sprayed in this area for an extended period of time to make sure that all of the salt is cleaned out.

The truck frame must be hosed down to get rid of any leftover salt; as well, the operator must wash down the bulkhead so that there is not a build-up of material at the front of the box - that extra weight will put stress on the sprockets. The operator may have to do this more than once per shift if there is a notable amount of salt at the front of the box. Shoveling the material into the hopper is usually the best course of action for this.

The inside of the hopper must be rinsed well. If it is not, and salt builds up inside, the material will not slide down to the auger chain when it is needed.
Clean-up Procedures, cont.

Plows and vehicle chassis must be washed down thoroughly so that the salt does not cause problems with the brakes of the vehicle or any other of the vehicle components. A lubricant containing a rust inhibitor is used to spray the equipment after it has been washed down at the end of the shift.

Some operators may have the misguided idea that as long as the salt is not wet it will not be a problem. However, salt itself will build up moisture from the air and this will cause rusting very quickly.

Conclusion:

At SFU there are a number of vehicles, machines, equipment, and materials in use during the winter season. All of the vehicles, machines, attachments, and products require trained and skilled operators to utilize them.

Because snow and ice control operators are trained in the effective use of salt and other products on the roads, they are aware of the procedures to be used in distributing them correctly. Objectives are set, and equipment and materials are used to reach those.
Materials Suppliers:

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<thead>
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<td>Bulk Salt</td>
<td>McTar Petroleum Company Ltd.</td>
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<tr>
<td>Bag Salt</td>
<td>Univar Canada Ltd.</td>
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<tr>
<td>Brine (Liquid)</td>
<td>Mainroad Contracting Ltd.</td>
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