WINTER OPERATIONS:
DRIVER/OPERATOR PROCEDURES:

General Safety
Call-Out Procedures

Operations:
Plowing
Pre-Wetting
Anti-Icing
Bulk Plant
INTRODUCTION:

In snow and ice control, drivers have additional responsibilities. In addition to driving the vehicles, they must simultaneously operate the equipment that is related to their tasks. There are controls for the equipment inside the cabs of the vehicles; the equipment itself is mounted on the vehicles and/or attached in a number of ways. The functions of driving are, therefore, only a part of what the operator must do at this job, since the operation of the equipment is of principal importance during winter conditions.

Operators are the key to a successful winter road maintenance program. They can contribute to an efficient snow and ice plan and can assist in optimizing dollars by:

* Putting material on the road correctly
* Putting down the right amount of material
* Using safe and efficient plowing techniques
* Operating at appropriate speeds
* Driving in a fuel-efficient manner
* Taking care with the snow and ice control equipment, including the truck.

Following is a set of procedures that operators of equipment and drivers of vehicles must follow during winter conditions:
GENERAL OPERATOR SAFETY:

Before any winter maintenance operations can begin, drivers must remember the importance of safety when they are operating the vehicles. This means:

✓ The driver must make sure that the vehicle is in a safe operating condition.
✓ The driver must be aware of the potential for hazards when driving in less-than-ideal conditions.
✓ The driver must be clear on the specifics of his tasks.

The snow and ice control tasks are always challenging at first until the operators get used to the equipment and to negative road conditions. Snow and ice control is not a function that can actually be practised!

By taking the necessary amount of time to make sure that all conditions of professional operating have been met, the operators can be safe and confident, and can operate in the proficient manner that has to be used during these conditions.

All operators should be encouraged to:

▪ Ask questions
▪ Communicate with others
▪ Assist and support other operators
▪ Learn new skills each season
CALL-OUT PROCEDURES:

As outlined in other sections, the SFU call-out system is composed of:

- a ‘board’ of available operators
- Campus Security
- Drivers and Equipment Operators

Security Officers are responsible for calling out drivers when necessary. If drivers are required outside of regular working hours, they are called by Campus Security.

At the onset of adverse weather conditions,

1. Each driver/labourer is called on his cell phone.
2. If contact is not made, then the next driver/labourer is called.

The driver/labourer who is on call is responsible for re-posting the board – he updates it at the end of his shift.

During normal working hours, it is the responsibility of The Superintendent of Buildings and Grounds to organize and dispatch drivers and operators, including the contract grader operator who focuses primarily upon the clearing of parking lot areas.

Once a driver/operator has been advised of the tasks to be done, he has a set of task functions to complete. The operator has the responsibility for:

- ensuring that the equipment is safe, operating, and ready to go
- being aware of the snow and ice control plan for that shift
- carrying out the task in as safe and efficient a manner as possible.

In order to ensure that the specific equipment being used is safe and functioning, the operator must complete a pre-trip inspection before utilizing the vehicle or machine. Pre-Trip Inspection Log Books are kept in the vehicles and must be filled out at each shift.

(Specific information on the required pre-trip inspection is found in DRIVER/OPERATOR PRE-TRIP INSPECTION PROCEDURES.)
PREPARING FOR THE TASK:

There are a number of procedures to be followed before the winter road maintenance task is done. Over and above the pre-trip inspection, the vehicle must have fuel to run, salt to spread, and brine to distribute on the salt and on the road itself.

Driver Fueling and Re-Fueling Procedures:

Fueling of the vehicles should be done at the end of the shift.

The Diesel Fuel Pump is located on the North side of the South Science Building adjacent the loading dock on Science Road.

Gasoline is dispensed from the Gasboy Pump located at Facilities Management.

All fueling must be done with the following safety precautions observed:

- The pump is not to be left unattended while in use.
- There is no smoking around the pumps.
- There is to be no use of cellular phones in the area where vehicles are re-fueling.
- The nozzle should be grounded before the fuel is dispensed. This will prevent static electricity from developing and starting a fire.

*Note: It is best to always re-fuel a diesel engine at the end of the shift. This will prevent condensation from building up in an (empty) tank.

Use of the Salt Shed:

The salt storage facility is located close to Facilities Management. It is there that the product is stored for use on the roadways.

When preparing for snow and ice control tasks, drivers do not load their vehicles with salt – this is done by loader operators only:

- Loader operators must be careful not to strike the tops of the trucks grizzly screens when they are loading salt onto the trucks.
- Loader Operators must ensure that they do not strike the trucks at any time while loading them.
- Loader Operators must ensure that they do not overload the trucks – salt must not be piled above the trucks’ grizzly screens.

At the end of shift, if salt remains in the box of the truck, drivers spin off the rest of the salt into the salt shed, after which the loader operators will re-pile it.
Use of the Bulk Brine Plant:

Salt brine is used on campus as a pre-wetting agent (it pre-wets the salt as it comes out onto the road), and as an anti-icing product when it is dispensed directly onto the road’s surface.

The brine is brought on campus and is stored at the Brine Bulk Plant, located across from Facilities Management.

There is a set of procedures in place for loading and unloading the product onto the trucks. A system is used for filling the trucks or putting materials back to the bulk tank for further use. Drivers who use this computerized system receive proper training before loading, using, or unloading salt brine.

Loading:

Drivers must position their vehicles downhill from the tank in order to use gravity’s assistance in loading.

Unloading:

Extra liquid is put back into the bulk tank when it is not needed. In this case, the vehicles must be positioned uphill from the bulk tank when drivers are unloading excess liquid (back to the bulk plant tank).

Nozzles and valves must be used correctly and truck tanks must not be overfilled.

The Anti-Icing equipment allows for a hand sprayer to be used to dispense salt brine to areas other than the roadway (eg: sidewalks). Again, training is provided to operators who will do this function.
TREATING THE ROADS:

Pre-Salting:

If operators are salting a roadway, there are several factors which affect how they apply the material. First, there is the practice of “getting under the storm”. Simply, this is pre-salting.

Using this strategy prevents or reduces the build-up of ice on the road’s surface. The driver makes a light application of salt to the bare pavement before the storm arrives.

Another way to pre-salt the roadway is through the use of salt brine. This is in practice at the University and is an effective way to prevent or lessen the build-up of ice on the surface of roads, before and during snow and ice conditions.

Applying Salt to the Roadway:

With an application of pure salt, a brine (salt water solution) is formed, and this can assist in preventing or lessening slippery conditions.

Normally, salt is applied by a spinner which places the salt all across the road. If the road has a crown, then the spinner is not normally used, since then most of the salt would be lost.

Straight salt is applied at a much lower rate than other materials. On the road salt is used not as an abrasive but as a reactant and so a little can go a long way. Salt is much more expensive than sand, so efficient use of it must be made – as well, environmental concerns are now a significant issue. If the salt is used properly, it can last longer and be very effective on its own and along with mechanical movement (cars driving over it).

The rates for salt application are determined by the weather in which it is being applied. If the storm is bad, more salt may be used; if drivers are out pre-salting in anticipation of a storm, less may be used, as it is only a stopgap measure before a fullblown storm arrives.

There are a number of situations which will dictate exactly how salt should be applied:

- If the road is level and has no crown, the salt should be applied to the travel part of the road.
- If the road has a crown, the salt should be applied to the crown. This way, the salt can melt and turn into a brine, which will run down to the level and do its job.
- If the road has a “super-elevation” or is banked in the corners, the salt should be applied in those upper corners. Then the salt will run downhill, doing its job.
Lane Position:

If possible, drivers are to position their trucks to salt both of the lanes where it is safe to do so.

Usually, it is not desirable to have a vehicle do this; however, with some units the discharge is in the centre of the back of the unit. It is best then to have the vehicle straddle the centre line in order to have the material end up on the crown of the road. If a driver does place the vehicle in this position on the road, he must exercise extreme caution.

Applying Salt to Hills:

Other concerns when distributing material relate to road grade. Some roads, of course, are more of a challenge than others. Road grade is defined as the rise or fall of the roadway profile per 100 units of length—we use the term to indicate how steep a road is, and it is expressed in a percentage.

In snow and ice control operations a hill that is over 5% in grade is considered critical. On hills as steep as this and steeper, coming to and from the University, drivers must focus on applying additional material to the crest of the hill—the highest point—and at the bottom.

### Areas for Application of Salt

<table>
<thead>
<tr>
<th>Road Type</th>
<th>How Salt Should be Applied</th>
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<tbody>
<tr>
<td>Level road, with no crown</td>
<td>To the travel part of the roadway</td>
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<tr>
<td>Road with a crown</td>
<td>To the crown only</td>
</tr>
<tr>
<td>Road with a super-elevation in corners</td>
<td>To the upper corners</td>
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<tr>
<td>Road that has a significant grade</td>
<td>To the crest and the bottom</td>
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ANTI-ICING PROCEDURES:

The purpose of anti-icing is to pre-apply chemical to the roads to prevent the build-up of ice. This process can also be used during a storm to help keep the roads bare and wet.

The Anti-Icing agent at SFU is salt brine. A bulk plant for its use has been set up on campus. Operators who use this facility and this method must participate in theory and practical training in the use of the material and the equipment which distributes it.

The salt brine is taken from a large tank. The system involves the use of tanks on the anti-icing vehicle – the 5-ton truck– and there is a pump that sprays a pre-measured amount of liquid onto the roads.

This system is activated by the operator turning on the computer’s switch in the cab of the truck. There are settings on the system, and the adjustment allows for the appropriate distribution rates. The operator’s main task is to drive the truck while the liquid is sprayed onto the road’s surface according to the setting and the truck’s speed. If the driver speeds up, the computer speeds up the application rate to maintain the pre-set amount. If the driver drives too fast, usually an alarm will sound, indicating that the computer cannot keep up the proper application rates.

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 is not blown away—it makes good contact with the road surface.

The benefits of this anti-icing process are twofold:

1. The load goes further than a load of solids
2. The vehicle speed can be considerably higher than when spreading materials from a hopper system.
PRE-WETTING:

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

Tanks of the liquid 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 material on the road; The pre-wet material works more quickly and effectively than a dry product. And if done properly, pre-wetting can save materials.

The pre-wetting equipment can be activated when the spreader is being turned on by a simple switch. 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

When a load of salt is pre-wet with brine it is applied the same way as a straight salt application—1 to 2 meters width on the road.

**Straight Salt or Pre-Wet Salt Spreadwidth**
PLOWING:

As the operator of a snowplow, the driver has a major responsibility:

*The objective is to move snow out of the way in a safe and timely manner.*

- The driver must be a competent, skilled driver of the vehicle.
- The driver must be very knowledgeable about the equipment that is on the vehicle.

The driver must also be aware of the hazards associated with the *equipment* on the vehicle. With a front mount plow, there is a hazard in simply having this attachment on, whose length goes beyond the front bumper.

As well, difficulties can be encountered in tight areas and around corners.

Front Mount Plows…

- Can handle any amount of snow;
- Articulate for better results;
- Ride on shoes or castors.
- Can push snow further than can underbody plows.

However, Front Mount Plows:

- Require extra attention by the operator
- Require a longer turning radius
- Must be checked frequently for damage.
Operations – Plowing, cont.

Attaching and Setting Up the Plow—

Hooking up a front mount snow plow is usually a job for 2 persons. Drivers must be very careful when doing this—the plow can slip.

The plow should be hooked up so that its push frame is mounted as close as possible to 19 inches from the ground. This will maximize the pushing power of the truck. If the plow is mounted too high, the truck has to push down, and this is dangerous, because the truck can ride easily over the top of the plow if the plow were to dig in or hit something solid. If the plow is mounted too high, the truck has a tendency to push the plow up over the top of the snow.

The plow frame must be connected at the right height and all of the lights connections must be made.

The front mount plow has an attack angle—the angle at which the plow cuts into the snow—of about 45°. If this angle is changed to one that is less than that, the snow plow has to push hard and the snow will quickly pile up in front of the plow. If the angle is higher than 45°, the plow will not be as wide, and more passes will be required to do the same amount of work. In areas where there is heavy snow, drivers may have to deviate from the normal angle to push through the deep snow. However, this should be done only under supervision.

- The front mount plows stick out to the right side when carried: drivers must keep about 2 feet away from any hazards that are to their right.

- The left side of the plow, when turned all of the way to the right, should be in line with the left side of the truck.

The front mount plows on many vehicles are articulating—they can turn in both directions, and they allow the operator to plow either to the left, or more commonly, to the right side of the road. The advantage of the front mount articulating plow is that it can be effective in ‘tight’ areas such as alleyways, where space is limited.

Plow Kick-Out Springs:

The front mount plow has a safety device, a kick-out spring, that will prevent the plow from stopping the truck if the truck hits something solid. On the SFU trucks there are two types of these springs – one is a flipover; the other is a bottom kick-out. If the truck strikes an object, these springs allow the cutting edge to ride upwards behind the moldboard of the plow.
Vehicle attachments, such as plows, coupled with a spreading program, can make for effective snow and ice control. At SFU, the front mount plows are used in conjunction with the spreading of an anti-icing agent; therefore, the snow is pushed out of the way by the plow, and remaining snow and the road surface is treated with the anti-icing agent (usually salt) in order to obtain the optimum result.

Plowing Preliminaries:

1. The front mount plow should *never be used on a gravel road that is not completely frozen*. Because that surface will be soft, the plow will dig into the road surface and this can cause the truck to ride up over top of the plow.

2. The cutting edge of the front mount plow sometimes will skate across the ice surface, and can veer into oncoming traffic—this is dangerous!

   *Drivers must take corners slowly!*

3. Drivers must try to *avoid making left hand turns* with the front mount plow. There will be a snow trailer coming off the plow—called a *windrow*, and these formations should not be left on the roadway.

4. Drivers must remember to *dump the snow off the front mount plow* before making right-hand turns—this is because snow in the plow will cause the front end of the truck to shift as the driver is rounding the corner.

5. Front mount plows are used for widening streets. They can be straightened to direct snow when in intersections, but they definitely need to swing wide at intersections.

Plowing Procedures...

The First Pass:

This pass should expose the centerline (or where the centerline would be). If it does not do this, the product coming down after cannot do its job properly.
Operations – Plowing, cont.

The Second Pass:

The second pass should be done on every road that has had the first pass. If not, traffic will move over to drive on the plowed side. The second pass keeps the roadway more clear, and it prevents water from building up in wrong areas of the road. *If there are severe storm conditions, and only one pass along a roadway can occur, then the second pass will need to be done later, as priorities change.

The Third Pass:

The third pass clears off the parking area of the road—unless there are 2 travel lanes. It can be a dangerous pass because of curbs and traffic islands. *This is not a priority during snow and ice conditions.

The Fourth Pass:

The fourth pass is somewhat like the third. However, its purpose is to expose parking lanes and curbs, so it can be somewhat dangerous due to hidden hazards. This pass is usually the final one, so it must be done well, with all of the snow pushed out of the way.
Simultaneous Plowing and Salting:

- When operators are plowing, the spreader must be spreading only to the width of the plow.

- Operators must try to not plow off the material that they have just spread.

- Operators must shut off the spreader when stopped at an intersection.

- Operators must increase the amount of material that they put down when plowing an intersection.

- The speed that operators use when plowing and spreading together must be consistent with the correct speed for spreading—no faster than 25 km per hour.

- If operators are applying brine and are plowing at the same time, they should spray only to the lane width.

- The operator should always work from the inside or centre lane out when both plowing and applying materials. This prevents the operator from having to ‘double-handle’ the snow with extra passes later when the roads are being widened.

- If the traffic is light, two lanes can be done at a time. Operators should not attempt to do more lanes that this because the material then becomes too sparse on the road and may not be effective.
Stopping Operations:

*Drivers must always have on the truck rotary light whenever they are operating.*

Stopping for any reason also requires the rotary light to be on. When stopping for any reason, all drivers must:

1. Have on a safety vest and hard hat.
2. Be sure that the truck’s rotary light is on.
3. Be pulled as far off the roadway as possible.
4. Check what needs to be checked.
5. Quickly check the vehicle running lights—clean them if necessary.
6. Exercise extreme caution
7. Call the foreman and report the location, providing an estimate of the length of the stop. Re-contact should be made when the driver is again mobile.

Passing Other Vehicles:

Drivers should always try to turn off the spinner when passing other vehicles. This is to prevent those drivers’ vehicle from getting damaged. The material will still be spread onto the roadway.

In some situations, such as when salting the steep hill, in intersections, or in other hazardous areas, the driver cannot turn off the sander. If this is the case, the driver must reduce his speed—this will eliminate the bouncing of the material, the effect of which can break headlights and windshields.

All spreaders are designed to be shut off quickly. Some machines have a hydraulically-driven spreader with a lever that can shut off everything quickly. Sometimes referred to as an Interrupter Lever, this feature can be used when drivers are passing vehicles.

Many of the spreaders are computerized and have many good features such as ‘Pause’ that allows for the material spreader to be shut off quickly, similar to the interrupt lever on the hydraulic system.

Intersections:

Intersections are extremely dangerous during storm conditions. Extra material, no matter what an operator is applying, should always be put down in intersections. Because of the potential for accidents, it is best to *do intersections, particularly traffic-controlled ones, one lane at a time.* This way, the operator is likely making more passes, but is operating more safely—staying in his lane and allowing for other vehicles to get through. This definitely applies at the intersection of Gagliardi Way and Burnaby Mountain Parkway.
Conclusion:

There are many tasks involved in the maintenance of the roads at the University.

Drivers and operators must always keep their objectives in mind and must work carefully and with diligence. As well, any problems with the equipment or tasks must be reported to the Snow Foreman or to the Superintendent of Buildings and Grounds in order that they can be addressed.

The Snow and Ice Control operator has a very important job to fulfill, and all systems are in place in order for him to do this.