

# How to Specify and Maintain Snow and Ice Control Equipment

*Winter storms, though routine in much of North America, are high-tempo, emergency operations for which government fleets must prepare and support.*

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## At a Glance

**E**mergency operations can be conducted more effectively by following these guidelines:

- Standardize the attachments.
- Identify your specific needs.
- Keep up with maintenance schedules.
- Thoroughly clean equipment post-season.

**F**or those parts of the country that experience snow and ice each winter, considerable resources must be committed to prepare for and conduct emergency operations to keep roadways relatively safe. Snow and ice storms halt or slow the flow of traffic, put lives at risk, facilitate more crashes that damage personal and public property, and suspend local economies as they inhibit the flow of goods and services. Preparing for and mitigating the impacts of winter storms is expensive but a government agency can't afford not to do it either.

## Planning Considerations

All planning for emergency operations must occur in the context of orga-



nizational culture/climate and in light of strategic objectives. These may change as new officials are elected and economic conditions alter priorities. As such, plans need to be regularly examined to determine if they are still viable.

The answers to a few fundamental questions generally dictate how an organization prepares for and operates in response to winter storms. What is the average frequency, duration, and severity

of winter storms in your area? What is the worst case you can reasonably expect? Does your organization fight storms proactively at the risk of unnecessary expense or does it take a more cost conservative, reactive approach? What is the political "pain threshold" and what are the costs to meet that implied performance level? What does your risk management expert say about your liability exposure?

Knowing the answers to these questions establishes the framework for deciding what equipment to buy and how it will be used.

As with most public works activities, there exists a partnership between operating agencies and fleet management to accomplish the mission of keeping roadways open and safe in a winter storm. Operational requirements and techniques continually push the evolution of snow and ice fighting equipment. In turn, the availability of new technology with obvious advantages can drive the widespread adoption of operational techniques.

Fleet and operations managers should regularly investigate new winter storm fighting equipment and techniques jointly. The goal is to acquire equipment that performs well and can also be easily configured, maintained, and repaired to facilitate quick responses and maximize availability. Standardization and interchangeability of chemical agent spreading components and plowing attachments go a long way toward accomplishing these goals.

Generally speaking, electrical, mechanical, and hydraulic system simplicity helps achieve reliability. However, more advanced technology may produce enough savings in chemical use or improve driver and vehicle utilization enough to justify the incremental expense of purchasing, calibrating, maintaining, and repairing it. The cliché about getting the “most bang for your buck” and ensuring that the “juice is worth the squeeze” definitely apply here.

### Standardize When Possible

Trucks used for winter storm operations must usually perform other functions the rest of the time. The objective is to make these multi-purpose vehicles easily convertible. To do that, the cab/chassis must be specified with the necessary mounting hardware, electrical connectors, hydraulic fittings, and controls to mate with plows and chemical spreading/spraying attachments. Standardizing the attachments used is desirable to make it possible to interchange them between trucks. Standardization allows fleets to order new plows and salt



*Tire inflation and fluid levels should be checked often during winter operations to ensure that all equipment functions at optimal levels.*

spreaders with every new truck and keep the attachments when the trucks are disposed of so there are spares on hand for mid-storm swapping.

### High vs. Low Tech Approaches

Some fleets can accomplish their winter storm mission using a low-technology approach. This includes fixed-angle plows mounted on the front of trucks and augers with spinners mounted behind a dump truck's tailgate to spread salt. Salt distribution is calibrated by adjusting the hydraulic pressure valve feeding the auger/spinner and either opening a door in the tailgate or the tailgate itself while driving at a fixed speed.

Other fleets require articulating plows and V-bed spreaders with calcium chloride pre-wet systems operated by programmable, electronic ground speed controls to meter chemical distribution automatically. These advanced systems adjust for the vehicle's actual speed and desired lane(s) width to be treated.

Either approach or a hybrid of the two can be successful depending on its fit with organizational philosophy and physical environment. For example, pre-wetting rock salt with liquid calcium chloride lowers the active temperature at which the salt melts snow and ice. This is important in regions where temperatures typically reach the 20s, but is largely irrelevant and a waste of money if winter road surface temperatures stay well below that. Power articulated plows are worthwhile if truck operators must regularly

reconfigure them to push snow to the left or right but are a waste of money if snow can always be pushed to the right.

### Picking an Appropriate Plow

Snow plows come in many shapes, sizes, and configurations. Which type is right for your fleet depends on how they will be used, including how fast trucks need to drive while plowing.

Front-mounted plows are the most common. They add considerable weight to the steer axles, sometimes requiring heavier suspension systems and tires than would otherwise be necessary. These plows add length to the truck, increasing the turning radius and making them less maneuverable. They can also disrupt the flow of air through the radiator or pack it with overspray. This last point is counter-intuitive but is all the more important to consider with newer EGR diesels running hotter than pre-model year 2002 emissions engines.

Most front-mounted plows are adjusted so that a thick, replaceable rubber “blade” skims over the road surface. Expendable skid shoes are often used to help the plow float over uneven sections of roadway. Metal blades can be used when plowing packed snow or thick ice and sleet, but extra caution is needed to avoid striking obstacles like manhole covers and railroad tracks.

Belly plows are sometimes used when maneuverability on residential streets is needed. This configuration allows placing considerable downward pressure on



**Identifying where a plow will be used, such as in a parking lot or on a residential street, is the first step in selecting the most appropriate model. The choice of a front-mounted, belly, or wing plow depends on its application within your fleet.**

the blade to remove ice – this same feature will also result in eating into very expensive mold boards once the expendable blade is worn through if drivers and maintenance personnel are not vigilant. Belly plows have the added disadvantage of not being as useful with deep snow removal because of the limited clearance under a truck.

Wing plows are sometimes used alone or to augment front plows, making it possible to plow multiple lanes simultaneously. These add an additional layer of mechanical complexity and are generally less structurally stable than front or belly plows.

### **Chemical and Traction Material Spreaders**

Many fleets spread liquid brine solutions or calcium chloride in advance of winter storms. This strategy is particularly useful in treating bridges and overpasses, which are generally the first surfaces to freeze.

Fleets accomplish this mission using tank inserts with dump, roll-off or flat-bed trucks, or using dedicated liquid distribution trucks that might double as water flusher trucks in other seasons.

Spreading rock salt, sand, or other traction materials is accomplished using a spinner fed from a dump bed or special hopper insert using an auger, chain or rubber conveyer, and gravity. These devices are generally powered by hydraulic truck take-offs but can come with dedicated small engines or even be

powered by a pulley system driven by a trailing tire in contact with the road.

Rear auger mounted units cost much less and require less off-season storage space compared to V-bed inserts with conveyors. However, they also require lifting the dump bed to shift the salt load into the auger, increasing the chances of a bridge or overpass strike.

As an aside, some V-bed trucks with integrated conveyor systems have come into use for pot-hole filling operations. Fleets using these systems have found a reduction in worker injuries compared with having to shovel the mix from high dump truck beds.

Fleets that choose to douse rock salt (sodium chloride) with liquid calcium chloride do so by driving the truck under spray nozzles or using truck-mounted tanks to spray the salt as it is dispensed to the spinner. The latter method certainly results in far less chemical waste and corrosion of the truck and attachments.



**Applying liquid solutions to bridges and overpasses before a storm can help prevent or reduce freezing.**

These units may be regulated by manual or electronically controlled hydraulic flow, pre-wetting, and gate controls. Fleets using the electronic ground speed control units experience even distribution patterns at variable truck speeds while saving significantly on salt.

### **Corrosion and Visibility Considerations**

Distributing salt and, particularly, liquid calcium chloride results in increased corrosion to trucks and attachments. The most nagging problem this creates is breaks in electrical connectors for lights and control/sensor units. Special precautions must be taken in new vehicle specifications and subsequent modifications and repairs to maintain water-tight seals around all wires, electrical connectors, and light/sensor housings.

Another common and potentially more serious corrosion risk is to wheels and brakes. Corrosion to wheel rims can result in catastrophic tire failure while in operation. It can even attack tire steel belts if moisture seeps into the inside of the tire via compressed air condensation or wheel/bead damage.

“Rust-jacking” of brake shoes is another increasingly common form of serious corrosion damage. Chemicals that attack the metal of brake shoes can jack up the friction lining and lead to brake failure.

Vehicles that work snow operations need augmented lighting systems. Additional headlights are needed to replace normal lights blocked by front plows. Flashing/rotating beacons on top, sides and rear help other motorists see and avoid slow moving trucks often during poor visibility conditions.

### **Pre-Season Preparation**

Preparation should begin well in advance of snow season. Fleet maintenance operations should begin by making a systemic inspection of vehicles and attachments. It provides the opportunity to repair or replace obviously worn or damaged hoses, electrical fittings, control knobs, wipers, and tires as well as normal preventive maintenance inspection items. This is also an opportune time to pressure test the cooling system and check batteries and charging systems.

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## ***Have all operators conduct a mock run including mounting and operating all attachments. This allows problems and potential trouble spots to be identified before bad weather hits.***

Conduct a coordinated training session for new vehicle operators and fleet technicians on the proper procedures for mounting, operating, and dismounting winter storm fighting attachments. A few hours spent teaching can save many hours and dollars repairing.

Have all operators conduct a mock run including mounting and operating all attachments. Many fleets also use this mock run to give operators the chance to drive their assigned snow routes and to become familiar with potential trouble spots before bad weather actually hits.

Insist that supervisors inspect every vehicle with their operators once attachments are mounted in order to identify any mechanical or adjustment problems.

Schedule the vehicle and attachment repairs shortly thereafter. Have the operators test the repaired units before stowing them.

### **Mid-Season Checks and Storm Support**

Place special emphasis on operators to check tire inflation and fluid levels during winter months. Windshield washer fluid is particularly critical. Even a diligent CDL holder will skip pre-trip inspections when it's cold outside. Having supervisors and fleet personnel conduct spot checks and disciplining delinquent operators may be necessary.

Bulk and vehicle fuel tanks should be kept topped off when the temperature is fluctuating widely to reduce condensation of water vapor. Anti-gelling fuel additives may be advisable depending on the content of the fuel used, where vehicles are parked, and nightly temperatures.

Winter storm operations usually involve fleet maintenance personnel working before and after vehicle operators have used the equipment.

Even when you prepare well, your shop will likely be overflowing with last minute problems at the beginning of the season's first "snow call." Having maintenance technicians standing by before the

operators begin reduces delays at the outset of a storm.

Shift changes can also be a challenge as one group of operators passes their vehicles to the next group. Many minor problems will inevitably surface at this time. It is a good idea to conduct a changeover of maintenance staff at least one hour before an operator shift change. This permits any handover coordination to be completed in the shop and allows fresh technicians to be standing by before the rush.

After the storm, operators park their vehicles and head home. If you are lucky, they will take the time to tell the shop what new problems have developed before they leave – but don't count on it. Depending on the weather forecast, it may be necessary for fleet maintenance shops to continue operations until all units are fully operational again.

### **Post-Season Maintenance**

Whenever the weather permits following a storm, all vehicles and attachments should be unloaded of chemicals and thoroughly cleaned, inspected, and lubricated. This must certainly be done at the end of the season before attachments are stored.

Anything left with chemicals in it will most likely be destroyed by the time the next winter comes around. Any moving metal parts not thoroughly lubricated will likewise probably never move again.

If you and your customers plan ahead, prepare diligently and work together, you give your organization its best chance of success regardless of what Ol' Man Winter throws your way. **GF**



#### **FOR MORE INFORMATION:**

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