

# Snow and Ice Procedures



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The following is the City of Madison's Streets Division's procedures for scheduling, staffing, and equipment during a snow and/or ice event.

## About Madison

The City of Madison has close to 1,800 lane miles that need to be treated during winter storms.

A lane mile is the same thing as a mile of traffic lane. Imagine a two-lane road that is one mile long. This imaginary street has two lane miles.

Madison has enough traffic lanes to stretch from our city all the way to the Mojave Desert in California.

## Salt Usage

In an effort to protect Madison's drinking water, groundwater, and lake quality, the City of Madison Streets Division limits the amount of salt applied to the streets.

Here is a list of the types of streets that are salted during a winter event. These make up the salt routes referenced throughout this document:

- Main arterials and thoroughfares
- Main connector streets
- Madison Metro bus routes
- Streets surrounding schools, fire stations, police stations, and hospitals
- Major hills and curves

Combined, these streets make up nearly half of all of the lane miles of Madison.

The maximum amount the Streets Division will spread on the roads is 300 pounds per lane mile. Less can and will be spread based on conditions.

When temperatures dip below 20 degrees, salt becomes far less effective at melting snow. During these cold temperatures, the chemical process that allows salt to melt snow begins to slow down significantly. Rather than just adding more and more salt to the roads, and therefore more and more salt to our waterways, the Streets Division will instead spread sand on these major thoroughfares.

## WHY LIMIT SALT USE?

The effects of salt on our environment are very well documented. You can read more about the harm it does to our water systems (including drinking water) and infrastructure on [www.wisaltwise.com](http://www.wisaltwise.com) or elsewhere on the [City of Madison's winter website](#).

## Sand Usage

All other streets in Madison will receive a sand treatment that can provide traction on snowy surfaces. The sand does contain a small amount of salt in order to keep the sand from freezing solid where it is stored.

Following smaller snow events that do not trigger citywide plowing, sand is spread on top of the snow to provide traction on hills, curves, and intersections, as well on spots addressing any slippery spots around Madison.

Following citywide plowing, sand is spread to provide traction over the hard pack of snow that's left behind after plowing.

Sand is also made available for residents at numerous sand barrels positioned around the city, mostly at heavily used crosswalks.

Sand is also available at multiple sand sites. Sand from the barrels and sites are free for residents to use.

When temperatures are below 20 degrees, sand is spread on the salt route streets as noted above.

## Weather Reports

Streets Division staff monitors the weather daily during the winter, and we watch a variety of sources. We use contracted private meteorological services, plus publically available information from the National Weather Service and local media outlets. From a contractor, the Streets Division receives two operational forecasts a day, plus a 24-hour storm alert warning. Pavement temperature sensors are also used to help determine when and how much salt should be applied in response to a snow event.

## Factors to Consider for a Snow Response

Every winter storm presents its own unique set of circumstances that affect how crews will be dispatched to the roads. Here's a partial list of what must be considered:

- When the storm begins
- How long will the storm may last
- Air temperatures before, during, and after the storm
- Road temperatures, before, during, and after the storm
- Wind speed during and after the storm

- Water content of the snow
- Amount of salt on the roads from previous storms
- Type of precipitation (snow, sleet, ice, freezing rain, etc.)
- Intensity of the storm

## **Pre-Treating the Roads**

If roads are dry and temperatures are warm enough, some salt routes are treated with saltwater brine.

The brine is a mixture of salt and water.

When applied before a storm comes, the brine prevents snow from bonding to the pavement.

This means when plows come through later, it can scrape the road cleaner and will result in less overall salt use.

In this application, brine is used at 40 gallons per lane mile.

## **Treating the Roads during Active Snowfalls**

When snow begins to accumulate on the roads, Streets Division crews are deployed. The first crews are dispatched to maintain the salt routes.

The Streets Division will dispatch 32 trucks to spread salt and plow these critical roadways.

Depending on weather conditions, additional “sand first” trucks may also be deployed. Sand first trucks go to the roads that need some material for traction, but do not meet the requirement to be a salt route.

### **SALT ROUTES**

Salt routes are the only streets in Madison that receive a salt treatment.

These roads are salted (as needed) and plowed throughout the entire course of the winter storm.

They are treated multiple times during the course of a storm as the truck loops through their route again and again while the snow is falling. The number of laps through the route a truck is able to complete depends on traffic and weather conditions.

After the snow stops falling, crews will remain on these routes until they are in good winter driving condition.

Salt routes make up roughly half of all the traffic lanes in Madison.

Salt is spread at a maximum of 300 pounds per lane mile. Depending on conditions, less salt may be used. Salt is used only as needed during the events as well.

Before salt is spread from the truck onto the road, it's sprayed lightly with saltwater brine. This step is called "pre-wetting." This step is necessary because wet salt is more apt to stay in place where it is spread. Dry salt bounces on pavement, and it would all end up in the gutter line without helping the traffic lanes. The pre-wetting uses 10 to 12 gallons of brine per ton of salt spread.

## **Post-Storm Treatment**

Following a winter storm, the Streets Division deploys trucks to spread sand on snowy neighborhood streets. This process is called "area sanding."

Typically, this work is performed during normal business hours (7:00am to 3:00pm) but can also be performed at other times in the day (such as during the overnight hours). Actual deployment of the crews depends on the specifics related to the winter storm.

Sand is used at hills, curves, and intersections. Sand is also spread on other slippery spots that may develop on residential streets.

The number of trucks deployed for area sanding will depend on weather and road conditions.

## **Citywide Plowing**

When three or more inches of snow have accumulated on the roads, and the storm is at or near its end, citywide plowing operations will begin.

Salt routes are maintained through the course of the storm, and they will most likely be cleared before residential plowing operations begin.

When the storm is at or near its end is the biggest factor when determining the start time for citywide plowing. Most often, these operations occur during the overnight hours so plowing vehicles do not interfere with traffic.

When citywide plowing commences, it can take 12 to 16 hours to complete the first phase.

More hours after the initial plowing are needed to perform the clean-up work, such as pushing back snow that has been blocked by parked cars or other obstructions.

The highest priority for citywide plowing is to serve each public street.

Carriage lanes, alleyways, and other non-street facilities (like bus stop pads) that are the Streets Division's responsibility to clear are also likely to be serviced during citywide plowing operations, depending on personnel availability.

## **SNOW EMERGENCY DECLARATION**

A Snow Emergency declaration will oftentimes accompany citywide plowing operations. The Streets Division Superintendent is responsible for making the declaration.

A Snow Emergency is a notification to residents that everyone parking on the street must follow overnight alternate side parking rules in order to help make the citywide plowing operations more efficient and complete.

A Snow Emergency declaration can happen any time the accumulated snow on the roads requires citywide plowing.

A Snow Emergency will usually last for two nights to help plow both sides of the street. They can be extended or shortened depending on weather conditions.

More information about winter parking, including the alternate side parking rules, can be found in the [parking sections of the City of Madison Winter website](#).

## **EQUIPMENT FOR PLOWING**

Citywide plowing is an immense operation. The Streets Division is the primary agency for plowing responsibilities with assistance from the Parks Division and Engineering Division.

The Streets Division retains the services of heavy equipment contractors to assist with plowing. The contractors are only part of the citywide plowing operation and do not spread salt or sand onto the road.

Counting contractors and all city vehicles, over 150 pieces of equipment can be deployed to plow each street in Madison.

This equipment includes plow trucks, loaders, graders, tractors, and one-ton trucks. More detail about the specific trucks used for plowing can be found in this document.

## **PLOWING ASSIGNMENTS**

When citywide plowing operations commence, the city is divided into over 60 sub areas.

Each of these sub-areas are assigned equipment from the city fleet or a contractor.

Equipment from the entire snowplowing fleet is divided amongst the sub-areas, and they are all deployed at the same time.

No Madison neighborhood is assigned to be last.

### **PLOWING CUL-DE-SACS, CIRCLES, DEAD-ENDS, ETC.**

This style of residential street is a challenge for snowplowing services. They are time consuming, and they offer very little space to push snow out of the road.

Oftentimes, this style of residential street needs to wait for a loader to plow this area. A loader is articulated in the middle, meaning it can handle the tight turns of these streets better than typical plow trucks.

These streets will be plowed within the same 12 to 16 hour windows as all other Madison residential areas. With hundreds of cul-de-sacs in Madison, and fewer available loaders than plow trucks, sometimes residents on these dead-end areas will see that the through-streets of a neighborhood plowed have been plowed, most likely by a traditional plow truck, and then a gap of time until the loader is available to plow the cul-de-sac.

### **WAITING UNTIL THE STORM ENDS**

Plowing the city too soon will result in multiple hours of additional work to plow streets a second or third time. Plowing too late can cause many issues as well. Streets Division staff strives to find the right balance for each plowable event to maximize operational efficiency and keep the roads safe.

### **WHAT PLOWED ROADS LOOK LIKE**

Following a plowing operation, residential streets will have a layer of tightly compacted snow left on them.

This is normal.

The layer of snow is for a couple reasons. First, plow trucks cannot push down to the road surface very well. They can push snow forward and to the side out of the road.

Also, roads are slightly curved to help with drainage, and there are imperfections and variability in the road surfaces. Plows are flat on the bottom. Placing a flat plow on top of a curved and inconsistent surface will allow for some snow to pass underneath the plow.



## SLUSH ON THE ROADS

When temperatures rise close to and above freezing, the hard pack on the road thaws. As traffic drives through this loosening snow, it churns and creates slushy spots. The Streets Division works to push this slush from the roads as appropriate.

Some winters, thawing is followed by freezing temperatures before the slush can be pushed from the roads. In these instances, the Streets Division will put sand down to help with traction and attempt to plow down any icy ruts where possible.

### Post-Plowing Evaluation

Upon completion of the citywide plowing, the salt routes are again assessed. If they need additional attention to be safe for commuting, salt trucks will be deployed to plow and spread salt where needed. Very often, they are clear from snow due to the salt application and traffic volume.

Area sanding trucks are deployed to neighborhood streets.

After plowing, roads will have a hard pack layer of snow left on them. This is normal, as explained above.

Since there is the layer of snow on the roads, sand is used where needed, such as intersections, hills, and curves, so drivers can get traction.

### Clean Streets Clean Lakes Plowing

Residents within the Snow Emergency Zone also have to abide by a once-weekly four-hour parking restriction.

The date and time vary depending on block, so those parking in these areas must abide by the posted parking signs.

During that four hour window when parking is restricted, plow trucks work to push the snow back to the curb to keep the streets wide and safe.

Failure to observe these parking rules can result in being ticketed and towed.

## Snow Removal

During heavy winters, snow accumulation at the curb along with parked vehicles can create dangerously narrow streets. Or certain intersections become blocked with high mounds of snow.

In order to fix this, the Streets Division performs snow removal operations.

The snow is scooped with a loader and the dropped into a truck to be hauled to a designated snow dump site. Loaders can also use a large snow blower attachment to pull snow from the road and discharge it into a haul truck. This is a slow, multi-vehicle operator.

In areas narrowed due to parked cars, an operation called “post and tow” is used. Temporary no parking signs are posted. Per ordinance, the signs must be up 48 hours before they can be enforced.

Once the signs are enforceable, violators of the no parking signs are towed away.

After the cars have been cleared, the snow can be removed by a loader, placed into a haul truck, and taken to a snow dump facility.

## Winter Maintenance of Bus Pads, Crosswalks, & City-Maintained Sidewalks

City-maintained sidewalks, crosswalks, crossovers, and bus pads are maintained primarily during normal business hours with the goal of having these areas cleared 24 hours after a snow has stopped. However, the timing of the storm and other related complications may cause delays.

There are a considerable number of these facilities scattered around Madison. Therefore, plowing these other areas is a responsibility shared by Engineering, Parks, and the Streets Division.

Depending on staffing availability during citywide plowing, Streets Division crews may be dispatched to maintain the carriage lanes, sidewalks, bus pads, and other facilities that are their responsibility.

## Winter Maintenance of Shared-Use Paths and On-Street Bike Lanes

Shared-use paths, more commonly referred to as bike paths, are maintained primarily by the Engineering and Parks Divisions.

More information about the winter maintenance of the paths and lanes can be found on the [Bike Madison website](#).

## The Equipment

**Plow trucks:** These are the standard vehicles that are most visible during winter events. These are five-ton trucks equipped with plows and spreader units. Plows simply push snow forward and to the curb, and also spread salt and/or sand where necessary.

**Spreader unit:** These are V-shaped metal containers on the back of plow trucks. They hold salt or sand. When it is time to spread salt, a conveyor carries the salt first to an area where it is sprayed with a saltwater brine as it drops down onto a spinning plate that disperses the salt on the road.

**Brine insert tanks:** These are large tanks that are inserted into plow trucks instead of a spreader unit. Presently, the city has 6 tanks that can be used this way, each with a 1,000 gallon capacity.

**Radius dump system (RDS) trucks:** These are special plow trucks where the entire truck bed acts like a spreader unit. The conveyor is actually built into the truck bed. The RDS units Madison uses are custom-built to hold many more gallons of brine than a typical plow truck. This additional brine capacity will help in pre-treatment procedures.

**Loaders:** These are special trucks used mostly to load other vehicles (hence the name). They are also effective snow plowing machines because they are articulated in the middle, and can handle the tight turns of cul-de-sacs better than plow trucks. Loaders can be equipped with plow blades to better push snow. They can be equipped with industrial snow blowers to help move heavy snow build-ups along the road during snow removal operations. And its bucket attachment is useful for loading other vehicles with salt and sand, or used to scoop or push snow.

**Grader:** These are very large pieces of equipment that most people would think is a tractor-style vehicle. It has a plow blade attached to middle of the vehicle instead of on the front like all other winter equipment. Graders are useful because they are the only vehicle than can provide the down pressure needed to peel up the hard pack of snow on roads—but they are very big and not appropriate for every Madison street.

**Tractor:** These are small vehicles that are used as leaf-pushers in the spring & fall and mowers in the summer. These vehicles plow the bus pads, shared-use paths, and city-maintained sidewalks around the city.

**One-ton Trucks:** These are big pick-up truck style vehicles. They are used on carriage lanes and alleys, and can be used on other paths. They also have spreader units to spread sand where necessary.