

Department of Transportation and Infrastructure

Snow Response 2022-2023



Preface

Snow operations fall within the purview of the Department of Transportation & Infrastructure (DOTI) and align with the mission statement of the Street Maintenance Division of keeping Denver connected through clean, clear, and safe travel ways. DOTI staff takes pride in performing snow removal services in an efficient, effective, and fiscally responsible manner by utilizing a response plan that is proven for Denver typical winter weather conditions.

Average winters in Denver are relatively mild. In January and February, the average daily high temperatures are in the mid 40's. Denver averages approximately 60 inches of snowfall per year and most snowstorms are in the 3-inch range. In the mountains ~50 miles west of Denver, annual snowfall in the 250 to 300-inch range is common. The significant number of sunny days that Denver experiences greatly enhances melting of snow on city streets. The additional melting of snow reduces the cost of emergency snow response in comparison with other cities that experience similar snowfall amount but have different climate conditions.

Denver's main streets are the highest priority as they carry the bulk of the City's traffic. Moreover, residential service and protective bike lanes are also priorities. Lastly, DOTI has a website that provides information about the City's snow response efforts:
www.denvergov.org/snow

Objectives of the snow response plan include improving the safety and mobility of the transportation system by plowing city streets, keeping priority streets passable, and minimizing traffic disruption. Each snow season helps improve the subsequent years' snow response plan as past experiences are evaluated and improved.

Operational Overview

Plow operations within Denver's city limits are performed by four agencies: Department of Transportation and Infrastructure (DOTI), Colorado Department of Transportation (CDOT), Denver International Airport (DEN), and Denver Parks & Recreation.

- DOTI provides snow response as follows:
 - Clearing ~2,050 lanes miles of main streets with stripes
 - Clearing ~235 miles of bike lanes and protected bike lanes
- DOTI in conjunction with Parks and Recreation provide snow response as follows:
 - Clearing ~1,260 center lane miles of residential streets
- Denver International Airport provides snow removal services in the airport service area, including Pena Boulevard and other streets within DEN's jurisdiction
- The Colorado Department of Transportation (CDOT) provides snow removal services on interstates and border highways that run through Denver.

*Note: State highways within city limits, including Colorado Boulevard, Colfax Avenue, Federal Blvd, and Alameda Avenue west of 1-25 are also maintained by DOTI although they are CDOT assets.

Vehicles & Equipment

The City and County of Denver maintains several types of vehicles and tools to effectively perform snow operations. More specifically, the following are available for snow operations.

- 70 heavy duty tandem trucks equipped with large plows
 - 10 units have liquid material distribution tanks
 - 60 units have dry material spreaders
- 36 light plows
- 8 motor graders
- 4 loaders
- 3 toolcats
- 6 Snowblowers

All the heavy plow trucks are equipped with radios and GPS to ensure full-time communications with supervisors and the Home Base Communication Center. The snow control team at Home Base is also in communication with Denver Police, Fire Department dispatchers, and Street Maintenance leadership.

Provided Services

Residential Snow Program (RSP)

Denver's Residential Snowplow Program was created during the blizzards of 2006-2007 to keep residential streets passable. The program covers ~1,260 center lane miles of residential streets utilizing a fleet of 4x4 pickup trucks with plows. RSP does not utilize de-icing materials.

RSP deploys to produce passable streets with consideration given to the amount of snowfall accumulation that is forecasted and temperatures following the storm. RSP services assist motorists by providing a path to main streets.

- Plowing of the residential streets occurs between the hours of 3am and 3pm. A second shift of residential plow drivers may be deployed to provide 24-hour coverage, based on the forecasted storm event.
- When deployed, the residential plows take one pass down the center of every side street per 12-hour shift.
- The residential plows can be helpful in clearing a path for motorists to get to the main streets and prevent deep ice rutting.
- The residential plows shave off the top few inches of snow and will not expose bare pavement
- The residential plows do not carry de-icing materials

On-Street Bicycle Lanes

Most of Denver's on-street bicycle lanes are located on roadways with stripes and are routinely plowed every time snow accumulates. Staff will make every effort to plow through the bike lane to the curb. During swift, heavy snowfalls, bike lanes may become snow packed. These snowy/icy conditions may linger in the bike lane several days after a storm depending on temperatures, particularly in shady locations.

Throughout the winter season, bicyclists should be prepared to ride in a shared lane condition; utilizing the outermost lane available and may consider alternate transportation options based on health, ability, weather conditions and equipment. Bicyclists may need to consider alternate routes and utilize the City's trail system. People are also encouraged to winterize their bikes and have the right tires for navigating winter conditions.

Protected Bike Lanes

The Department of Transportation and Infrastructure plows the City's protected bikeways and many pedestrian bridges. The City utilizes smaller equipment with brooms, plow attachments, and material spreaders that can distribute deicing materials as appropriate for the protected bike lanes based on weather conditions.

Off-Street Bicycle Trails

Denver Parks and Recreation maintains the City's network of off-street bicycle and multi-use trails. Any snow accumulation on a trail greater than one inch will be plowed to the channel side (or down slope side) within 12 hours after the end of a snow fall event. Snow that cannot be accessed by machine will be removed manually. Ice accumulation on the trail will be treated with gravel and/or environmentally safe chemical products.

Parking Lanes

Denver does not restrict on-street parking during snow storms therefore, it is common for snow accumulate in the parking lane in areas of town where on street parking is heavily utilized.

After a snow event and plows are done clearing the streets, the City may deploy graders and loaders to commercial districts in the overnight hours to help break up and remove snow and ice in the parking lane. The south sides of east/west streets tend to receive less sun and may remain icy if cold weather persists after a storm.

Deployment Overview

Snow Routes

Denver's Department of Transportation and Infrastructure maintains a map that delineates snow routes and prioritizes roadways by degree of traffic need. Priority "A" roadways are typically arterial roads that move higher volumes of vehicles than Priority "B" roadways. Most snow routes include Priority A and B roadways. In most snow storms, A and B priority streets are addressed with the same frequency. In larger snow storms, however, drivers may spend more time on Priority "A" roadways (main arterials) and move to Priority "B" roadways after Priority "A" roadways are passable.

Denver also addresses hospitals, fire stations and police stations in its snow routes. Additionally, staff plows around the perimeter of public schools to facilitate student drop-off and pick-up activities.

Denver employs a curb-to-curb plowing policy. However, when snowstorms present large accumulations of snow during a short period, plowing effort are concentrated to maintain a minimum of one lane in each direction on two-way streets, and one lane on one-way streets. Once the snow accumulation rate has decreased, a curb-to-curb plowing policy goes into effect throughout the city.

Deployment Strategy

DOTI deploys the large plows when snow starts to accumulate on the City's main streets. During snowplow operations staff operating the City's large plows divide into six districts. Four districts cover the central quadrants of the city: North West, North East, South West, and South East. The fifth district is dedicated to serving streets in central Denver also known as the Central Business District and adjoining area. Lastly, a sixth district provides services in far northeast Denver that includes Montbello and Green Valley Ranch.

- Denver's response to main streets is primarily staffed by the Street Maintenance Division of DOTI, with oversight from the Department's Executive Management team
- The City's large plows focus on main routes and are plowed as follows:
 - Districts 1-3, 5-6 by Street Maintenance staff
 - District 4 by Wastewater staff
- The City's smaller plows are operated by Transportation Operations and Denver Parks and Recreation staff. The focus for this team is residential areas.

Deployment Phases

Denver's overall strategy is to respond to most snowstorms with the full deployment of snow response staff and equipment and ratchet down operations as conditions improve. If initial forecasts only call for isolated flurries or snow showers with limited accumulation, other deployment alternatives are considered including a partial deployment of the fleet and/or placing staff on standby.

Phase I

Phase I includes pre-snowstorm meetings, equipment readiness and any initial deployment of snow removal forces based on current or forecasted conditions.

Phase I of Denver's snow response program is initiated when a significant chance of snow is forecast with anticipated accumulation in the Denver area. Once a significant forecast is realized, the Director of Street Maintenance analyzes all factors that may have a bearing on preparations. The Director then alerts the Executive Director and Operational Deputy Manager that snow response operations will be implemented. The Snow Manager notifies the needed supervisors and their crews that their services will be required for snow duty. Crews already on duty may be diverted from their normal assignments. The number of employees alerted depends upon the anticipated magnitude of the predicted storm.

During Phase I, equipment and materials are prepped for emergency snow response. A limited number of trucks may be assigned to pre-selected routes based on the amount of traffic the routes receive, as well as other factors. During Phase 1, drivers may focus on arterials because they carry the greatest volume of traffic and provide citywide access for emergency vehicles. Viaducts and bridges are also a top priority because cold air circulates underneath and creates icy conditions. Lastly, hills are another high priority because of the slip hazards they create.

Phase II

Phase II includes the full deployment of Denver's snow removal resources.

Phase II of Denver's Snow Response Plan is implemented when the Department has fully deployed its fleet of large plow trucks and drivers to clear routes, plow, and apply de-icing materials as needed. These snow response activities operate continuously until all designated streets have been addressed and accumulation has ended.

Phase III

Phase III focuses on cleanup operations, mitigation of the storm's effects and evaluating citywide need for ice removal needs.

Cleanup operations are an essential part of Denver's Snow Response Plan to help return the streets to normal condition. In some cases, snow may have to be removed and taken to preestablished disposal areas. Post event activities include responding to ice removal complaints and sweeping to remove deicing materials from the roadways. Typical road conditions during Phase III are yellow and green.

Clearing Strategies & Materials Application

Most main streets designated as plow routes are cleared curb-to-curb and are treated with deicing agents during snow response operations. On applicable east/west streets, operators are instructed to plow the majority of the snow to the north side of the street to enhance melting after the storm. North/south running streets are generally plowed evenly in both directions. Snow is plowed to minimize excessive pile up of snow.

The application of appropriate deicing materials depends upon the characteristics of the snow storm. The purpose of deicers is to minimize the bond of frozen material to the pavement surface and make it easier to remove with successive plow passes. The primary goal of deicer is to inhibit the bond of ice to the pavement and aids in melting of snow.

Deicers

Denver uses liquid and solid deicers in its snow response efforts. Ice Slicer is a naturally mined solid deicer product from Utah that is over 90-percent chloride salts. Its red color comes from 60+ trace minerals found naturally in the deicer. Deicers helps prevent snow

and ice from bonding to the pavement and serve to provide some traction on the roadways during snow events.

Denver uses two liquid deicers; Magnesium chloride and a salt brine. The latter of which is produced in house. The liquid is used downtown instead of a dry material to reduce levels of particulate matter in the air and support the city's air quality efforts.

Pre-Treatment

Denver may apply liquid deicer to main streets before a storm to mitigate snow and ice from bonding to the pavement. This practice of pre-treating /anti-icing the streets is rare in Denver because weather conditions and pavement temperatures must be just right for pre-treating to be effective. Pre-treated roads also need to dry before temperatures drop below freezing or freezing could occur.

Weather Forecasting Services

DOTI utilizes several public and private weather forecast services: National Weather Service (NWS), local radio and television stations, internet resources, and a service provided by a meteorologist under contract with the City and County of Denver. This data is used to determine when snow operations will begin and deployment levels for each storm.

Companies used: Meteogroup, Skyview Weather, National Weather Services, Accuweather, The Weather Channel, Weather Underground, and local TV stations.

Public Information

Denver's Department of Transportation and Infrastructure provides regular updates to the media and the public prior to, and during snow events. The information is shared through media advisories, DOTI social media channels, and a website that is regularly updated during snow events: www.denvergov.org/snow. The city also has a plow tracker that is activated during full deployment snow events and has a 15 min delay to ensure the safety of staff. The plow tracker can be found at www.pocketgov.org/plowtracker

Environmental Impact

The use of dry deicing materials for emergency snow response operations contributes to the airborne fine particulate matter 10 microns or less in diameter commonly referred to as "PM-10". Denver is determined to maintain good air quality and has committed to the following measures to meet recommendations under the state Air Quality Control Division's State Implementation Plan and Denver Regional Council of Government's plan for continuous conformity. All reductions are based of levels established in 1989.

- Use of liquid deicing material on all snow plowing routes in the Central Business District
- Street sweeping after application of material
 - remove residual to achieve a 72% reduction in emissions
- Reduced use of dry deicers
- Increased post-event sweeping practices in the sand box
 - Achieve 64% reduction in emissions
- Reduced use of dry deicers,
- Increased post-event sweeping practices in the remainder of the city,
 - Achieve a 60% reduction in emissions

Sidewalks

Denver requires that property owners clear snow and ice from their sidewalks and adjacent ADA ramps for increased mobility through clear, clean, and safe travel ways. Senior citizens, people with disabilities, parents with strollers, mail carriers and more struggle to negotiate hazardous walkways. Constituents need to do their part to make the community safe and accessible for all.

Timing: After snow has stopped falling, businesses need to begin clearing their sidewalks immediately. Residences need to clear their sidewalks by the next day. Inspectors begin enforcement by checking business areas the same day and residential areas the following day. Inspectors check business areas and residential areas in response to complaints.

Inspectors leave a time-stamped notice at properties with un-shoveled sidewalks. After receiving a notice, businesses have four hours and residences have 24 hours before the inspector's re-check and a potential \$150 fine.

Report A Problem: *If it has been more than 24 hours after a snow event and sidewalks near you are still not shoveled, please contact Denver 311 to provide the address of the unshoveled sidewalk.*

Tips: For tips on how to properly shovel snow and avoid injury, please visit Denver Health's Snow Removal Injury Prevention web page: www.denverhealth.org/blog/2017/01/snow-removal-safety

Ice in the Gutter

Unlike the Midwest and East Coast, Denver's climate provides 300 days of sunshine each year. It is not uncommon for daytime temperatures to reach into the upper 30s, 40s and higher following a snowstorm which causes the snow to melt quickly. The snowmelt runs down the gutter until it is collected by a storm drain inlet or catch-basin (the opening in the curb) that connects to the underground storm drain beneath the street.

Occasionally, Denver will experience an extended cold-spell or period where daytime temperatures are neither sufficient nor lengthy enough to entirely melt the snow. When snow in the gutter partially melts, then freezes at night or in the shadow of trees or structures before reaching a storm drain inlet, icing occurs. Shaded areas are particularly problematic as pavement temperatures in shaded areas have been found to be about 20 degrees colder than areas exposed to the sun. Thus, repeated daytime warming and night-time freezing results in the accumulation of ice in the gutter.

There are many locations throughout Denver where snow and ice accumulate in the gutters. It is most common on the south side of east-west streets but can also occur anytime that the gutter or street is shaded by structures, tall vegetation, trees or fences.

Residents should call 3-1-1 to report ice complaints and request large amounts of ice to be removed by Street Maintenance staff.

Definitions

CBD (bounded by Colfax Ave, Broadway, and the S. Platte River)

Sandbox (bounded by Louisiana, Downing, 38th Ave, and Federal Blvd)