 CITY OF <i>Salem</i> AT YOUR SERVICE	<b>Public Works Department</b>
	<b>PLAN</b>
<b>Title:</b>	Snow and Ice Control Plan
<b>Document #:</b>	26.1
<b>Approved by:</b>	Mark Becketl, Public Works Operations Manager
<b>Effective date:</b>	April 9, 2019
<b>See also:</b>	PRO 26.2, POL 26.3, PRO 26.4, SOG 26.5,

## 26.1 Snow and Ice Control Plan

A snow and ice control plan establishes policies, procedures, and training to meet specified levels of service and is routinely reviewed.

This plan provides the City of Salem’s level of service goals for winter event response, including: response routes, required resources, roles and responsibilities, annual training requirements, and individual storm response needs.

### 1. Service Level Goal

It is the goal of the Public Works Department to provide pre-event, event, and post-event treatment to public roadways to assist traffic, transit, and first responder movements during winter events to the safest extent possible.

### 2. Prioritization of Snow and Ice Response Routes

Assigned snow and ice response routes will be prioritized by volume of traffic, grade of roadway, terrain, elevation, neighborhood inter-connecting traffic patterns, and locations of government and emergency facilities, with flexibility to adapt to heavy commute patterns, as defined in Public Works Plan 26.8 (Snow Route Assignment).

### 3. Resource Identification and Assignment

Resources necessary for responding to snow and ice events shall be identified and scheduled as follows:

- a. Storm warning notification shall be per Public Works Procedure PRO 26.2 (Storm Warning Notification).
- b. Personnel shall be identified and scheduled for 12-hour shift response

and assigned program responsibilities per Public Works Policy POL 26.3 (Personnel Scheduling) and mobilized for an event per Public Works Procedure PRO 26.4 (Mobilization).

- c. Equipment shall be identified, prepared, and scheduled for winter response per Public Works Procedures PRO 26.6 (Equipment Inspection) and PRO 26.7 (Equipment Calibration).
- d. Snow and ice mitigation materials shall be identified, acquired, stored, and loaded onto response vehicles per Public Works Procedure PRO 26.9 (Loading Procedures) and applied per Public Works Guidelines SOG 26.5 (Snow and Ice Materials) and SOG 26.10 (Spreading and Plowing Procedures).
- e. A snow storage area shall be defined and utilized as needed per Public Works Procedure PRO 26.11 (Snow Storage).
- f. Damages to City or private property during response operations shall be reported and mitigated per Public Works Policy POL 26.12 (Snow Operation Damages).
- g. Response to parked or abandoned vehicles on snow routes shall be per Public Works Policy POL 26.13 (Parking Limitations).
- h. Annual training shall incorporate requirements stated in Public Works Guidelines SOG 26.5 (Snow and Ice Control Materials), Public Works Plan 26.6 (Equipment Inspection), Public Works Policy POL 26.9 (Loading Procedures), and Public Works Procedure POL 26.10 (Spreading and Plowing Procedures).

#### **4. Inter-agency Cooperation and Assistance**

An annual meeting will be hosted by the City of Salem for all adjoining transit, school transportation, municipal, county, federal, and state agencies, to compare and share new technologies, practices, materials, and methods, and to confirm shared and exchanged response routes along the periphery of each jurisdiction.

- a. Shared and exchanged route segments will be confirmed.
- b. Intergovernmental agreements will be verified as active and up to date.
- c. Weather service vendors will be discussed.
- d. Winter weather outlook will be discussed.
- e. Topics of interest will be presented and discussed.
- f. Meeting shall take place each year no later than November 20.
- g. Interagency contact information shall be provided and verified.

**5. Plan Review Requirements**


This plan and associated elements shall be reviewed annually and updated as needed to reflect development and addition of new or altered roadways and high priority facilities.

**6. Annual Training Requirements**

All snow and ice response staff shall attend and participate in training to be held annually on or before the first week of November.

a. Training shall include:

1. Snow plow installation and operation.
2. Towed sander installation and operation.
3. Proper loading procedure for sanding rock.
4. Loading liquid deicer and application system operation.
5. Tire chain installation, removal, and repair.
6. Materials storage facility operation and maintenance.
7. Classroom study of snow and ice routes.
8. Classroom discussion of proper plowing, sanding, and deicing procedures.

 CITY OF <i>Salem</i> AT YOUR SERVICE	<b>Public Works Department</b>  <b>PLAN</b>
<b>Title:</b>	Equipment Inspection
<b>Document #:</b>	26.6
<b>Approved by:</b>	Mark Bectel, Public Works Operations Manager
<b>Effective date:</b>	April 22, 2019
<b>See also:</b>	Driver's Vehicle Inspection Report; Snow and Ice and Leaf Haul Equipment Preparation Email; Studded Tire List 2018; Teardown Email 2019; Fleet Teardown Completion Email 2019

**Action By:**

Supervisor


**Action:**

1. Updates snow and ice response vehicles and equipment list prior to October 15 of each year.
2. Contacts Fleet Services to schedule equipment for snow and ice season preparation by October 15 each year. Prioritizes those vehicles involved in the Fall Leaf Haul program that begins November 1 each year. Also prioritizes the deicing tankers. Includes list of vehicles needing studded tires to be installed.
3. Works with Fleet Service Coordinator to address any maintenance issues or needed repairs. Verifies calibration of deicing and sanding equipment per Public Works Department Procedure 26.7 (Equipment Calibration).
4. Informs manager of equipment readiness and repair needs. The goal is to have majority of response vehicles and equipment ready by November 1, and all vehicles and equipment fully prepared by November 15.

Fleet Service Coordinator

5. Receives communication from Supervisor about upcoming snow and ice vehicle and equipment set up and maintenance needs. Schedules service staff to begin preparing, testing, and performing preventive maintenance on all snow and ice equipment for program beginning October 15.
6. Keeps Supervisor apprised of progress and any issues needing resolution.
7. Ensures all plow bumpers, frame mounted deicer tanks, towed sanders, snow plows, spray bars, switches, pumps, and slip-in deicer tanks are tested, calibrated, and installed as needed.

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|-----------------------|--|
|                       | 8. Updates Supervisor on completion of pre-season inspection and installs.   |
| Snow and Ice Operator | 9. Assists in installing plows, towed sanders, or spray bars as needed for response.                                 |
|                       | 10. Conducts pre-trip inspections of all vehicles and related response equipment prior to beginning assigned routes. |
|                       | 11. Completes a post-trip inspection and reports any maintenance or repair concerns to Supervisor.                   |

 CITY OF <i>Salem</i> AT YOUR SERVICE	<b>Public Works Department</b>
	<b>PROCEDURE</b>
<b>Title:</b>	Equipment Calibration
<b>Document #:</b>	26.7
<b>Approved by:</b>	Mark Becketl, Public Works Operations Manager
<b>Effective date:</b>	April 25, 2019
<b>See also:</b>	

**Action By:**
**Action:**

Supervisor

1. Contacts Fleet Services Coordinator and sets schedule for pre-season calibration of deicer spray systems, towed sanders, and snow plow controls.
2. Confirms availability and directs staff to assist in delivery of vehicles and equipment to Fleet Services.
3. Confirms with the Street Maintenance Operations Manager that all equipment is calibrated and ready for use prior to start of snow and ice season (October 15).


Fleet Services Coordinator

4. Receives communication from Supervisor about equipment calibration checks during pre-season set up.
5. Schedules equipment and shares schedule with Supervisor.
6. Corrects as needed and confirms calibration of deicer spray systems. Confirms gate opening on towed sanders is calibrated per manufacturer's specifications and adjustment mechanism performs properly. Confirms snow plow controls are properly set and function per specifications.
7. Notifies Supervisor when all equipment calibrations are completed.

Snow and Ice Responder

8. Operates equipment and adjusts as needed for spreading of snow and ice control materials.
9. Checks application rate of materials throughout shift.

10. Notifies Supervisor of any calibration issues and follows instructions for turning in equipment to Fleet Services for re-calibration.

 CITY OF <i>Salem</i> AT YOUR SERVICE	<b>Public Works Department</b>
	<b>GUIDELINES</b>
<b>Title:</b>	Snow and Ice Control Materials
<b>Document #:</b>	26.5
<b>Approved by:</b>	Mark Bechtel, Public Works Operations Manager
<b>Effective date:</b>	April 17, 2019
<b>See also:</b>	Deicer Facility Instructions; Deicer Facility Operating Procedures; Sand Shed Flood Response Instructions; Sand Shed Spill Response Instructions

## **Purpose/Scope**

Guidelines establish the identification, acquisition, application, and storage of appropriate materials to control snow and ice.

### **1. Identification and Acquisition of Snow and Ice Control Materials**

Materials to be utilized for snow and ice control shall be identified through current industry standards and practices. Rigorous review of available materials will be conducted annually prior to snow and ice season to ensure industry standards and best practices are being followed. Materials currently utilized include: (1) a liquid deicer based on magnesium chloride solution and produced by a regional vendor; and (2) ¼"-10 graded sanding rock produced by a local sand and gravel vendor.

Acquisition of liquid deicer will be through a statewide purchasing contract held by the Oregon Department of Administrative Services or through direct contract with a vendor. Acquisition of sanding rock will be through a direct contract with a sand and gravel vendor.

### **2. Application of Snow and Ice Control Materials**

Application of snow and ice control materials will be through properly maintained and calibrated application equipment mounted on or towed by City vehicles operated by trained and experienced operators:

#### **A. Liquid Deicer:**

1. Will be applied at the approved rate via spray bars mounted directly to vehicles or mounted to Epoke towed sanders. See Public Works Procedure PRO 26.7 (Equipment Calibration) and Public



Works Policy PRO 26.10 (Spreading and Plowing Procedures).

2. Will be applied pre-event, mid-event, and/or post-event as needed per forecast weather and current road conditions.
3. Can be utilized in conjunction with sanding rock.

**B. Sanding Rock:**

1. Will be applied at rate as established by traction needs of the motoring public and road surface conditions as determined by operator. See Public Works Procedure PRO 26.7 (Equipment Calibration) and Public Works Policy PRO 26.10 (Spreading and Plowing Procedures).
2. Can be applied in conjunction with liquid deicer as road surface conditions warrant.

**3. Proper Storage of Snow and Ice Control Materials**

Snow and Ice materials shall be stored in facilities approved by the Oregon Department of Environmental Quality (DEQ) and Federal Environmental Protection Agency (EPA) to prevent loss or migration of material into storm drain facilities or off-site deposition due to flooding.

**A. Deicer Facility:**

- a. The storage facility shall consist of approved polyethylene storage tanks residing within a DEQ-approved secondary containment facility and marked with material identification and appropriate Hazardous Materials placards.
- b. The storage facility shall provide a primary means of material circulation and the capability to load and unload deicer to and from application equipment.
- c. The storage facility shall have a secured control cabinet to operate the system accessible only by authorized and trained operators or facility maintenance staff.
- d. The storage facility shall be inspected annually prior to November 1<sup>st</sup> to ensure tanks, plumbing, pump, controls, and the containment facility are in good operating condition.
- e. The Control Cabinet shall include a log book to record withdrawals and fills.
- f. The Control Cabinet shall include comprehensive instructions in the proper operation of the facility stored within the control cabinet.
- g. The secondary containment facility shall have a secured drainage system that allows discharge of clean rain water into the storm drain system. Discharge of contaminated rain water or concentrated liquid

deicer shall only be allowed into the sanitary system after notification of the City's sewage treatment plant and the Environmental Services Section.


- h. Operators of the deicer facility shall coordinate with Environmental Services Section and have a technician available to inspect and monitor any release of contaminated rainwater or concentrated liquid deicer into the sanitary system at approved discharge rates.
- i. The deicer facility shall have backup extraction systems available in case power to facility fails during an event.
- j. Operation and maintenance responsibilities shall be assigned to a Project Leader with oversight assigned to a supervisor.
- k. Monitoring of the deicer facility capacity and operation will be conducted through remote uplink to the City's Supervisory Control and Data Acquisition system (SCADA). This information will be available to supervisory and lead staff and will include alarm notifications should the pump fail or if the facility records a significant loss of stored material. Alarm notifications will include email alerts to City-issued phones carried by supervisors and lead staff, Public Works Dispatch, and Facilities Services staff.

#### B. Sanding Rock Storage Facility

- a. The facility shall be constructed and maintained to FEMA floodplain requirements to prevent migration of sanding rock into storm drain system or off-site during flood events.
- b. Flood migration barriers across opening of facility will be removed only for removing or adding sanding rock material. The barrier shall be replaced immediately upon completion of tasks per the Sand Shed Flood Control Instructions. The Sand Shed Flood Control Instructions shall be posted on the exterior of the facility immediately to the right of the opening.
- c. Loading sanding rock material against walls of the facility will only be allowed as high as engineered specifications allow. This elevation will be marked to prevent overburdening walls.
- d. A spill kit for spills of sanding rock and deicer shall be maintained in the facility just inside on the left side of the opening. The Spill Response Plan shall be posted on the exterior of the facility to the immediate left of the opening.
- e. Any spillage of sanding rock outside facility shall be cleaned up as soon as possible.
- f. Operation and maintenance of this facility will be assigned to a supervisor.

## 4, Proper Training on Operation and Use of Storage Facilities

Training shall be conducted annually for all staff in the safe and proper use of snow and ice mitigation materials and the safe and proper operation and maintenance of the storage facilities. Training will be documented and will occur each year no later than November 15.

 <p>CITY OF <i>Salem</i> AT YOUR SERVICE</p>	<b>Public Works Department</b>
	<b>PROCEDURE</b>
<b>Title:</b>	Spreading and Plowing Procedures
<b>Document #:</b>	26.10
<b>Approved by:</b>	Mark Bechtel, Public Works Operations Manager
<b>Effective date:</b>	May 1, 2019
<b>See also:</b>	

**Action By:**

O & M Supervisor

**Action:**

1. Oversees and conducts annual training of response staff in application of liquid deicer, sanding rock, and snow plowing techniques.
2. As Snow and Ice Response Shift Supervisor, responsible for directing resources in route clearing/treatment of roadways. This includes assigning multiple plow and sander trucks to clear major multi-lane streets in tandem
3. Ensures proper application of materials and snow plowing techniques are followed and reported by staff during event.

Snow and Ice Responder

4. Receives route assignment from supervisor/team lead.
5. Conducts pre-event and event response treatment per the following guidelines:

**Anti-icing/Deicing of Roadways**

- a. Liquid anti-icer application shall occur as conditions allow and must be through properly maintained and calibrated application equipment.
- b. Pavement must be clear of flowing water/runoff.
- c. Forecasts for rain are minimal prior to freezing temperatures occurring.
- d. Anti-icer is best applied to dry pavement if possible to prevent bonding of snow and/or ice to road surface.
- e. All horizontal and vertical curves, bridges, stop-controlled intersections, and areas of noted traction issues, shall be treated.

- f. Spot spraying on level and straight segments of roads should be at 50 to 100 foot intervals and allows tracking by traffic to fill in the unsprayed areas.
- g. Major and commercial driveways should be considered when treating travel lanes to assist traffic movements.
- h. Only treat intersections in one direction by stopping application prior to crosswalk or stop bars on side streets. Do not apply both directions through the intersection as this can cause a buildup that actually may inhibit traction for the motoring public.
- i. If forecasts call for moderate snow or ice accumulation, may treat entire street surface.
- j. Deicing will follow same guidelines as anti-icing except where there is a need to clear the roadway. Standard application rate is 8 gallons per lane mile.
- k. Heavy ice/snow pack may require heavier applications of deicer utilizing knife sniveys on application equipment, where installed, or by making multiple passes with fog sniveys to apply enough material to break up pack.
- l. Deicer may be used in conjunction with sanding rock to coat and burn the rock into the snow/ice pack so it remains available for traction assistance as the pack breaks up.
- m. Liquid anti-/deicer may be applied with on board spray systems on dedicated deicer tankers, inserted tanks with accessory spray bars, through spray bars on towed sanders, or through stand-alone spray bars attached to rear of dump trucks equipped with deicer saddle tanks and plumbing.
- n. Do not apply liquid deicer in the Downtown Business Core per Snow and Ice Response Routes.

### **Sanding of Roadways**

- a. Sanding rock shall be applied through properly maintained and calibrated towed sanders.
- b. Sanding rock shall be applied when accumulations of snow and/or ice interfere with traction for the motoring public.

- c. Operator will adjust amount of sand applied through manipulation of towed sander gate opening depending on type and thickness of accumulated snow and/or ice.
- d. Standard sanding rates are 1,600 pounds of sanding rock per lane mile (gate opening #1).
- e. Sand shall be applied to all vertical and horizontal curbs, stop-controlled intersections, bridges, and where needed to provide traction to the motoring public and emergency services.
- f. Sand may be applied in conjunction with sprayed liquid deicer to coat the sand particles helping them to burn into packed snow and/or ice to provide longer cycles of traction assistance before traffic pushes the sanding rock out of the wheel ruts. This is standard procedure when attempting to mitigate freezing rain/sleet accumulations on roadway surfaces.
- g. Sanding rates shall be the same for all street classifications though increased application rates may be necessary on higher volume roads or other circumstances (i.e. high snowfall rates, etc.).
- h. Dumping sanding rock into towed sanders should take place in an area free of overhead hazards. Operators should utilize street lights to assist with visibility during darkness.
- i. Any spillage while filling towed sanders shall be addressed by the operator immediately before leaving site.
- j. Operators can also spread sanding rock by hand to assist drivers who are unable to proceed without traction assistance.
- k. Operator will report amount of material applied to supervisor at end of shift.

### **Plowing Streets**

- a. Snow plows should be operated by experienced operators who have received proper training and been assessed as competent.
- b. All plowing shall be conducted to remove as much accumulation from the road surface as possible and stack it along the edge of pavement or the curbline.

- c. At no time will snow be allowed to be sprayed onto or across sidewalks through plowing activities.
- d. Plowing shall commence whenever more than  $\frac{1}{2}$  inch of accumulation on roadway surfaces has occurred.
- e. When plowing multi-lane streets, if plowing your route alone:
  - I. On two way multi-lane streets, plow the inside (left) lane to the right on the first pass and plow the outside (right) lane to the curblane on the second pass. Then return to clear turn pockets and access to major driveways for shopping centers, etc.
  - II. On one way multi-lane streets, plow the left lane to the left curblane (edge of pavement) then plow the center lane to the right, then finish plowing the right lane to the right to the curblane (edge of pavement).
- f. When plowing multi-lane streets with assistance:
  - I. On a 5 lane street with a center turn median, first plow should plow from the centerline to the right where the second plow picks up their berm and existing snow/ice and also plows to the right. Third plow would then plow this accumulated snow/ice with existing accumulation to the curblane (edge of pavement).
  - II. It is typical to conduct tandem plowing during late night or early morning hours when traffic volume is minimal.
- g. When plowing a two way street with single lanes, follow your route pattern and plow each lane to the right curblane (edge of pavement).
- h. When plowing narrow two way streets with parked vehicles or other obstacles restricting traffic to basically one way at a time, then one pass of plowing to the right shall be made.
- i. When plowing through intersections, straighten the plow blade so as to carry the snow/ice to the far side of the intersection before angling blade again to shed material to the right.

- j. Plowing Downtown Business Core:
  - I. Plow snow to middle of street so as to not block parking access. Clear parking strips as well where possible.
  - II. Snow from parking lanes can also be pushed and stacked to the end of the block for later removal.
  - III. Clear intersections of all snow and stack at corners in the parking lane where possible.
  - IV. Do not apply liquid deicer in downtown core, only sanding rock.
  - V. Resources to remove plowed and stacked snow from business core will be assigned separately as needed.
  - VI. Snow will be transported to an identified and prepared snow melt storage site.



Winter Weather Maintenance and Operations Procedures (for public roads)  
Collection, Reuse, and Disposal of Materials

**Material Collection**

Collection of sanding material is scheduled to occur after a snow and ice event concludes. Collection of sanding material is dependent on where the City crews placed the materials on the established routes. Starting in 2021, the City tracks sanding locations with GPS and the street sweepers are scheduled to pick up the materials based on the location of where they were placed. This provides more accurate information and increased efficiencies for where the materials are placed and to be picked up.

**Material Reuse or Disposal:**

In approved locations, power brooms push the material onto the gravel shoulder where the materials become part of the shoulder.

Temporary satellite sanding site locations are set up for sanding materials to be received so the sweepers can get back on route. Crews then empty the temporary holding sites; the collected material is then hauled away to a location where it is used as fill. If the holding sites are on pavement, then the nearby catch basin(s) are protected with catch basin inserts and biobags to prevent entry of materials into the storm drain system.

If the sanding is too dirty to use as fill, the material is sent to the waste processing station where it gets combined with street sweeping debris.