University of Michigan
Winter Maintenance
U of M Campus Statistics

<table>
<thead>
<tr>
<th>Category</th>
<th>Size/Measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roads</td>
<td>1,352,766 sf, 21 miles</td>
</tr>
<tr>
<td>Sidewalks</td>
<td>4,443,266 sf, 168 miles, 5’ wide</td>
</tr>
<tr>
<td>Steps/handicap ramps</td>
<td>119,819 sf, 11 miles, 24” wide</td>
</tr>
<tr>
<td>Surface lots/docks</td>
<td>9,234,720 sf, 212 acres</td>
</tr>
<tr>
<td>Parking Structures</td>
<td>16</td>
</tr>
<tr>
<td>Total Acres</td>
<td>3200</td>
</tr>
<tr>
<td>Buildings</td>
<td>584</td>
</tr>
<tr>
<td>Students</td>
<td>50,000</td>
</tr>
<tr>
<td>Faculty</td>
<td>7000</td>
</tr>
<tr>
<td>Staff</td>
<td>38,000</td>
</tr>
</tbody>
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Average Materials Used per Year

<table>
<thead>
<tr>
<th>Material</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rock Salt</td>
<td>2,400 tons</td>
</tr>
<tr>
<td>50 lb bagged material</td>
<td>4,000 bags</td>
</tr>
<tr>
<td>Liquid de-icer</td>
<td>300,000 gallons</td>
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</tbody>
</table>
Winter Maintenance Challenges at the University of Michigan

Operational 24/7/365
Intertwined with the City of Ann Arbor
Diverse surface areas to maintain
Increasing expectations
Microclimate’s
Environmental & Infrastructure Sensitivity
Campus Service Level Goals

Keep the University of Michigan campus open to vehicle traffic during any winter storm event.

Pedestrian routes clear of snow 24 hours after typical snow event has ended 48 hours for larger snows (4 inches or more)

Hospital Community and Child Care Centers–Patients, Staff and Visitors are highest priority
Custodial and Grounds Services maintains all general fund building entryways and surrounding walks as well as most other customer accounts (Hospital, Northwood Community Apartments, NCRC, etc.)

Custodial Services also help with snow removal at entryways during their scheduled shifts.

Parking Services maintains all parking structures and about 75% of the parking lots on campus.

Athletics handles their own sidewalks, building entryways and parking lots with some assistance from Grounds.

Some remote sites are contracted (East Ann Arbor Health Center, Wolverine Towers, Varsity Drive, Argus, etc.)
Winter staffing consists of 60 FTE and +/- 10 student/temp workers.

Campus is divided into 5 zones with 2 lead people per zone.

75% of crew is 6am – 2:30pm, 25% skeleton crew off hours and weekends.

Zone routes are prioritized by building hours, events, density of people, special needs and microclimates.
Average Grounds Staffing and Equipment per Zone

5 Pickup Trucks

3 Bobcat Tool Cat utility vehicles with rotary brooms, plows, and liquid deicer tanks.

3 Toro Polortrac with rotary broom, plow and snow blower.

1 Kubota RTV 1100 utility vehicle with plow and salt spreader or sprayer.

9 full time staff, 2 temporary staff – 6 am to 2:30 pm

Additional skeleton crew available afternoons, nights and weekends.
Training - Snow Rodeo

- Staff are trained each fall using a competitive style rodeo.
- Each zone trains and competes as a team.
- 6 teams total
Training - Snow Rodeo

Equipment training consists of:

• Obstacle courses for various types of equipment
• Scoring is based on accuracy and safety (not speed)
• Refresher training on all snow removal equipment
Training - Snow Rodeo

- Salt and the environment refresher presentation
- Knowledge test including weather scenarios
- Salting rate application test
Best Management Practices for Sidewalks and Entryways

Mechanical removal with rotary Brooms, plows or shovels.

Anti-icing and de-icing using liquids

Eliminate melt and refreeze by placing the snow correctly
Why Liquid Deicers on Sidewalks?

Increased Service levels
- Proactively anti-icing before the snow falls.
- Allows for easier and more thorough mechanical removal.
- Even distribution of deicer on walkways.

Protecting the environment and infrastructure
- Using the appropriate amount of deicer limits the amount that enters the environment and damages infrastructure.
Melt and Refreeze areas
Current Liquids in use:

Salt Brine (23% sodium chloride in solution)
- Used when ground temperatures are above 20 degrees as a de-icer after brooming or direct applications for dustings (1/4 inch or less)

90% Salt Brine / 10% Purchased Product
- Engineered corn byproduct mixed with Magnesium Chloride
- Used for all anti-icing and most other de-icing applications
- Works at a lower temperature than straight salt brine
- Less corrosive
Brine Making and Liquid Storage

2 locations (North and Central)
Total storage of 18,000 gallons
Current Granular Bagged Material in use

For Entryways: Blended products are used
- Blend of Magnesium, Sodium and Potassium Chloride
- Good all purpose de-icer used at entryways.
- Less likely to track into buildings and cause slippery floors.
- Blue or Green color for visual appearance.

Non Chloride option: Sodium Formate/Acetate blend
- Non Chloride de-icer used on sidewalks and entryways.
- Used on new concrete for first season if possible
- 7 to 10 times the cost of traditional products
Parking Lots and Structures

Parking Services has 23 FTE's
- 14 dedicated to structures (7 on midnights, 7 on days)
- 7 dedicated to lots (all on afternoons)

Equipment:
- 12 Trucks (2 are small dumps)
- 6 Toolcats
- 1 Skidsteer

Materials Used:
- 14 Structures
  - 8 - Sodium Formate/Acetate blend
  - 6 are coated which allows the use of rock salt
- 200 Lots – Bulk Road Salt

50% of the surface lots are contracted
Challenging weather scenarios

Freezing rain - https://spark.adobe.com/page/O8Ev9Uq0c2WZw/

Large snow events
- Piles of snow in parking areas and plazas
  - Two step process – pile the snow and then haul
  - Running out of areas to pile and haul too
- It just takes longer…

Early and late season snow events
- Most small equipment is also used for lawn care or leaf removal
- Takes 8 hours to “change over” each piece of equipment

Consecutive days of precipitation
- Staff can work 16 hours
- Some staff are put up in Executive Residence
- Equipment needs service or break down
Salt and Sand use vs Snowfall and Events

[Graph showing the relationship between tons of salt and inches of snow over the years, with different colored lines representing different data sets.]
Questions?

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