Calibration

Overview

Calibration is the process of measuring and recording how much material is discharged at each setting. Annual calibration is a winter maintenance industry standard. Calibrated equipment provides insight on application rates. Calibrated equipment standardizes operations and allows implementation of the advice given on application rate charts. All equipment can be calibrated: both manual and ground speed controls, liquid and granular equipment, from push spreaders to plow trucks.

To be on the varsity team of winter maintenance, calibrate each piece of equipment for each material and for every setting you intend to use.

When considering calibration, there are two major categories of spreaders:

- *Manual controlled spreaders* – Discharge rate is determined by gate opening and speed of travel. Target discharge rate is difficult to control as the equipment slows down or speeds up.
- *Ground speed-controlled spreaders* – Discharge rate is determined by selecting a target rate (entering the rate into a computer in the cab). The computer communicates with the distribution system to constantly adjust so that discharge is always at a targeted rate.

Most equipment used today in sidewalk and parking lot winter maintenance is a manual controlled spreader. The calibration process produces a calibration chart. This chart will be unique to each spreader and provide an application rate based on setting and speed.

By calibrating equipment, the shop talk changes from “use setting No. 4” to “aim for 6 lbs./1000 sq. ft.” Setting a target application rate and understanding which setting can deliver that application rate is exactly where the conversation needs to be to reign in salt use in winter applications.

Ground speed-controlled technology is available for motorized equipment including ATVs and trucks. These spreaders are more accurate and take less effort to calibrate than manual controlled spreaders. Look for opportunities to upgrade manual-controlled spreaders to ground speed-controlled spreaders. It is the future of this industry.

Calibration of Push Spreader

Every year, calibrate push spreaders for each setting and material type. Push spreaders can get banged around in the back of the truck. They may require recalibration mid-winter.

Step by step instructions on calibrating and creating calibration charts for push spreaders can be found at Wisconsin Salt Wise’s calibration page and on the next two pages.

Step by Step Calibration of a Push Spreader

The process for calibrating a push spreader includes pushing the spreader on each setting and weighing the amount of the material that comes out. This should be calculated for each setting and for each different material used. Record the results in the table on the next page in the corresponding column.

Tools you will need:

- The material(s) you are spreading
- Tarp (10 feet or longer)
- Scale
- Broom
- Shovel

If the spread pattern is wider than the tarp, it is wider than a sidewalk. If you are intending to use a spreader for narrow area, such as a sidewalk, install a shield on the spreader before calibrating and while using it.

Calibration steps

1. Fill the push spreader with the material you are applying.
2. Record the lever position/setting for the gate/chute (**B**). If there are no numbers for the positions, make permanent marks on the equipment to identify the positions. These calibration steps should be repeated for each position so you know how much material is being applied at each setting.
3. Lay down a tarp and measure out a 10-foot long stretch (hint: use tape on the tarp so you can easily see the 10-foot area). A longer test area can be used. The longer the test area, the more accurate the results will be. If a longer test area is used you will need to adjust this in the table on the next page.
4. Using a constant speed (**A**), apply one pass of material to the 10-foot test area. Measure the width the material is spread or bounces, in feet (**D**).
5. Sweep up and weigh the material that is within the marked 10-foot stretch (**C**)
6. To improve accuracy, repeat this two more times at each setting and calculate the average weight of material applied.

After the first pass, you can put a bag around the discharge point to catch and easily weigh the discharged material. The first pass needs to be unbagged to determine the spread width.

Calculating application rate

*Test Area Length = 10 feet**

If your test area is longer than 10 feet, use that number in your calculation for column **E** (e.g. if your test is 20 feet long, the calculation for coloumn **E** would be (Dx20).

A	B	C	D	E	F	G
Speed (mph)	**Lever position or gate setting**	**Weight of material spread in test area**	**Spread width (feet)**	**Coverage area (sq. ft.)** (Dx10)*	**Application rate (lbs./1000 sq. ft.)** C÷E x 1,000	**Application rate (lbs./ lane mile) (12 ft width)** F x 63
2						
3						
4						
5						
6						
7						
8						
9						
10						

Figure 1: Calibration chart for a push spreader (a larger version of this blank chart can be found the Resources Chapter)

Create a chart for each spreader

After creating a calibration chart, make one copy for the office and one smaller card for the spreader. Laminate and attach the card to the equipment. Teach the operator how to use the card in association with the application rate chart. See Chapter 10 for the application rate chart.

Setting	Square feet	Pounds	Pounds/1000 sq. ft.
3	130	3.1	196
4	130	6.2	390
5	130	8.5	536

Attach a laminated card (example left) to each spreader (right). Each spreader will have its own unique card.

Calibration of Motorized Equipment

Calibration of manual controlled motorized equipment

Every year, calibrate motorized equipment (i.e. ATVs or trucks) for each setting and material type intended to be spread. At each setting, collect the material for one minute of the equipment running, then weigh the material that was discharged. The pounds discharged per minute for each setting is used to calculate the pounds per mile at each speed (see Figure 2). If service areas are measured in 1,000 sq. ft. instead of pounds per mile, use the additional conversion in Figure 3 after calculating pounds per mile.

Creating calibration charts

A calibration chart documents how much material is going out of the spreader for each setting and each speed. The material is discharged for one minute then collected, weighed and recorded for each setting. From this number, the amount of material discharged per mile can be calculated based on the speed of travel. Using the multiplication factors in the top row, the pounds per mile can be calculated. Blank charts are available in the Resources chapter.

For example:

- Setting 1: **39** pounds per minute discharged
- Travelling **10** miles per hour
- Takes **6** minutes to travel 1 mile

Calculation:

- 39 X 6 = 234 pounds per mile rate

Setting	Lbs./Minute	3 MPH Walking (x20)	5 MPH (x12)	**10** MPH **(x6)**	15 MPH (x4)	20 MPH (x3)
1	**39**	1,170	468	234	156	117
2	86	2,580	1,032	516	344	258
3	127		**Fill in the whole chart**			
4	153					

Figure 2: Calibration example for calculating pounds/mile

To determine pounds per 1,000 square feet, divide the numbers in the above chart by 63.

For example:

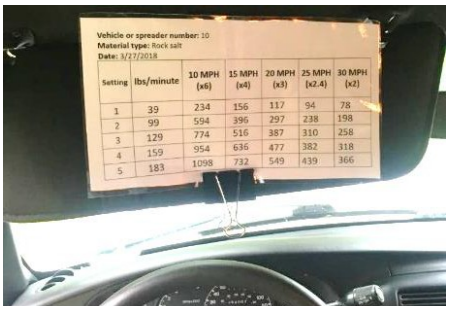
- Rate is 234 pounds per mile (this number is calculated in Figure 2)

Calculation:

- 234 ÷ 63 = 3.7, rounded to 4 for easy use

Setting	Lbs./Minute	3 MPH Walking	5 MPH	10 MPH	15 MPH	20 MPH
1	39	59	7	4	3	2
2	86	129	16	8	6	4
3	127		**Fill in the whole chart**			
4	153					

Figure 3: Calibration example for calculating pounds/1,000 sq. ft.


Vehicle or spreader number: 10
Material type: Rock salt
Date: 3/27/2018

Setting	lbs/minute	10 MPH (x6)	15 MPH (x4)	20 MPH (x3)	25 MPH (x2.4)	30 MPH (x2)
1	39	234	156	117	94	78
2	99	594	396	297	238	198
3	129	774	516	387	310	258
4	159	954	636	477	382	318
5	183	1098	732	549	439	366

Put a calibration card on visor for easy access.

After creating a calibration chart, make one copy for the office and one smaller card for the truck or ATV. Place the card on the visor for easy access. Teach the operator how to use the card in association with the application rate chart. See Chapter 10 for the application rate chart.

Calibration of ground speed-controlled equipment

Ground speed controls are more accurate and require less time calibrating than manual controls. Run the spreader for one minute and weigh the material that comes out. This is called a catch test. Only one setting needs to be calibrated for each type of material that will be applied. Enter the data from the catch test into the computer. The system will take care of the rest. Since each computer-controlled system has a unique calibration mode, check with your vendor for specific calibration instructions.


Above, an operator is performing a catch test with a scale box.

$ Tip ***Scale boxes that can be zeroed out instead of emptied between catch tests can save you time and strain on your back.***

Liquids

It is just as important to calibrate liquids as well as solid materials. Liquids are calibrated in gallons/minute. They can be calibrated much like solid materials. First, run the equipment for a timed interval. Then, collect the liquid in containers and measure the amount in the containers.

In addition to catch tests, applying a test pattern gives easy insight into nozzle problems.

Individual catch test buckets give nozzle discharge plus total discharge

Equipment Discharging at a Rate that is too High

After calibrating, the equipment may still be discharging too much, even at the lowest setting, to be able to use the application rate charts found in Chapters 9 and 10. To solve this, investigate equipment modifications or equipment upgrades. Be aware that after-market modifications may void equipment warranties. When purchasing new equipment, select equipment that can accurately deliver low application rates. Obtaining or modifying equipment that can apply materials at lower rates is a challenge. This is because for years the industry was asking for equipment to apply high application rates. We are experiencing the growing pains of a changing industry.

Credit: https://www.wisaltwise.com/documents/PDFs/Madison-Parking-Lot-Manual-Final-7-19-2019.pdf