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UNITED  
ROTARY BRUSH CORPORATION



Looking for ways to improve snow and ice removal on ***your*** runways?



## Airport Broom Performance

# 10 Key Characteristics for Effective Snow and Ice Removal

### Background

Brooms first began to be used for airport snow removal in Canada in the mid-1950s. Convinced sweeping could be used in conjunction with plowing to make runways safer for the new high-speed jet airplanes, Transport Canada issued a request for development and testing of a runway sweeper.

United Rotary Brush was one of the early—and only successful—broom manufacturer respondents to this RFP and has worked with Canada's Department of National Defense (DND) and sweeper manufacturers for the past several decades to refine the testing and qualification procedures.

DND specifications continue to be the standard of reference for the industry today.

### Overview

Effective removal of snow, ice and slush from runways is essential to efficient airport operations.

The presence of snow, ice and slush can cause serious safety concerns. Lack of traction can impede acceleration on takeoff, interfere with deceleration at landing, and interfere with directional control. In addition, frozen debris can cause severe damage to tires, engines and airframes.

These conditions also raise business concerns. Flight delays or cancellations interfere with airline schedules, not only at the airport selected, but throughout the system. Such interruptions have dramatic impact on airline customer satisfaction and are increasingly the focus of passenger advocacy groups. In addition, cancelled flights represent lost revenue, both to the airlines and airports involved.

Following are **10 key issues** to consider as you select the brushes for your operation.





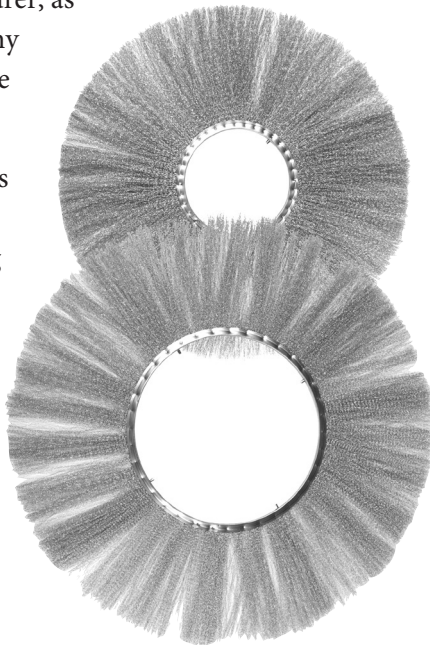
The two most common anchoring techniques for wire brooms are heat-sealed and hand-woven. While proponents of each method advocate for benefits of that approach, it's important to consider anchoring in conjunction with the next two issues to determine how, collectively, these steps concentrate—or diffuse—stress on the bristles. The more stress is diffused, the greater the resistance to breakage.

Although some manufacturers may anchor poly bristles with a retaining wire, most use the heat fusion process that was originally developed by United Rotary Brush.

### 3 Retaining Wire(s)

Once the bristles are anchored to the ring, retaining wire(s) are added to hold them in place. Depending upon the manufacturer, as few as one to as many as seven wires can be used.

Some manufacturers have also experimented with adding welds to hold the retaining wire in place. A weak weld can seldom be caught by visual inspection; accurate quality control requires more advanced screening, such as with ultrasonic or x-ray techniques. Finally, the weld can create a focal point for stress, or potential weak spot, on the bristle.



### 4 Balance

The process of forming the wafer ring creates a “heavy spot” which must be marked on the completed section. DND standards require that this mark must be within 1 hour (30 degrees) either way. During installation, these heavy spots must be offset to ensure the broom spins smoothly. (See point 7 below for additional information.)

Most manufacturers work to far more stringent standards to help manage imbalance and thus minimize the potential for broom skips or, even worse, equipment damage. For example, United Rotary Brush grades the out-of-balance of each wafer to ensure each shipment falls within a 36 inch/ounce variance. Narrowing the range of variance helps lessen the potential range of imbalance at installation.

## ENVIRONMENTAL/USAGE ISSUES

### 5 Equipment Changes

Over the past few years there have been a number of significant advances in snow removal equipment. Three of these have particular significance to broom selection and use.

**Power** Sweeper manufacturers have steadily increased broom horsepower and rpm in order to increase the amount of material to be moved and the distance it can be thrown. This puts significantly greater pressure on the broom itself, increasing the risk of fatigue and breakage.

**Size** The push to clear wider runways with fewer swaths has created a need for wider sweepers. However, increasing the width of the broom core also creates a serious challenge to its structural soundness. This can be exacerbated by the balance and power issues already discussed.

**Format** Increasingly, airports in North America are purchasing sweepers that use cassette brooms rather than wafers. Cassette brooms avoid the balance issues discussed above as well as the installation issues discussed below. One of the primary advantages of the cassette broom is that it requires far less time and manpower to change out brushes.



## 6 Storage/Handling Issues

Assembled brooms should be stored in a covered facility to prevent snow and ice from accumulating and freezing within the broom. Operating a broom with such a build-up poses significant risk of equipment damage.

In addition, assembled brooms should not be stored in a load-bearing position for any length of time. Extended steady pressure will bend the broom bristles. While the broom may not be permanently misshapen, the longer the pressure is applied, the longer it will need to spin to return to its original form.

## 7 Installation

Proper installation of wafers onto the core is essential to broom performance. Two areas are particularly important.

**Balance** As noted earlier, a heavy spot will be marked on the inside of each wafer ring. As you place wafers on the core, rotate the heavy mark 90-degrees from the mark on the prior wafer. This will offset the imbalance of any single section.

**Tightness** It's imperative that the filled core is tightly loaded. A general rule of thumb is to plan seven flat wafers per foot. Note: DND testing protocols call for 2" spacers between wafers; some operators use more—or less—spacing to adjust for the severity of conditions.

## 8 Usage Patterns

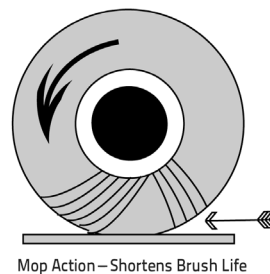
It is the tips of the broom that provide both the cutting and “flicking” actions needed to remove snow, slush and ice. The recommended sweeping path of a properly adjusted broom will clear a 2" to 4" wide pattern, depending upon conditions. Please refer to the chart below for more specific recommendations..

Condition	Broom Pattern
Light Snow 3"-5"	4"-6"
Light Snow 1"-3"	3"-5"
Light Snow <1"	2"-4"
Wet Snow 1"-3"	4"-6"
Wet Snow <1"	3"-5"
Dry Sweeping	2"-4"

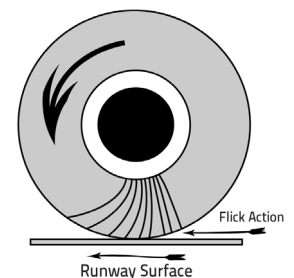
This chart will help you set the proper down pressure for your sweeping conditions.

One of the most common usage problems is applying too much downward pressure in an effort to remove stubborn snow or ice. This bends the bristles more, causing the broom to “mop” the surface rather than cut-and-flick as originally designed. Not only is it less effective, but it's also estimated to decrease broom life by as much as 95%.

Mop Action - Incorrect



Sweep with the tips! Do not mop!



## SERVICE ISSUES

### 9 Ready Availability

Recent winters have reinforced the need for airport preparedness as major winter storms repeatedly pummeled a number of high traffic facilities. Operations managers were forced to rely on a well-stocked broom inventory...*if* they were able to make that investment *and* had adequate storage space available. Only United Rotary Brush offers multiple distribution centers across North America. Ask your broom provider about the minimum and maximum deliverability cycles on replacement brooms.

### 10 Qualified Technical Support

Snow removal equipment is increasingly advanced and complex. Be certain your broom provider has adequate technical staff qualified to work with the full range of equipment manufacturers to ensure unique operational issues can be quickly resolved.

## Conclusion

Most airports invest significant time and resources in snow removal equipment and operations. Sweeper brushes may appear to be a minor portion of this investment, but their impact far outweighs that relative cost. Proper broom selection and usage will not only improve the efficiency of your snow removal efforts, but can also help lower your maintenance costs and extend the life of your equipment.

# That's a return worth investing in!



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