Abrasives

An abrasive is a material or tool that is used to shape or finish a workpiece through rubbing, which leads to part of the workpiece being worn away by friction. While finishing a material often means polishing it to gain a smooth, reflective surface, the process can also involve roughening as in satin, matte or beaded finishes.

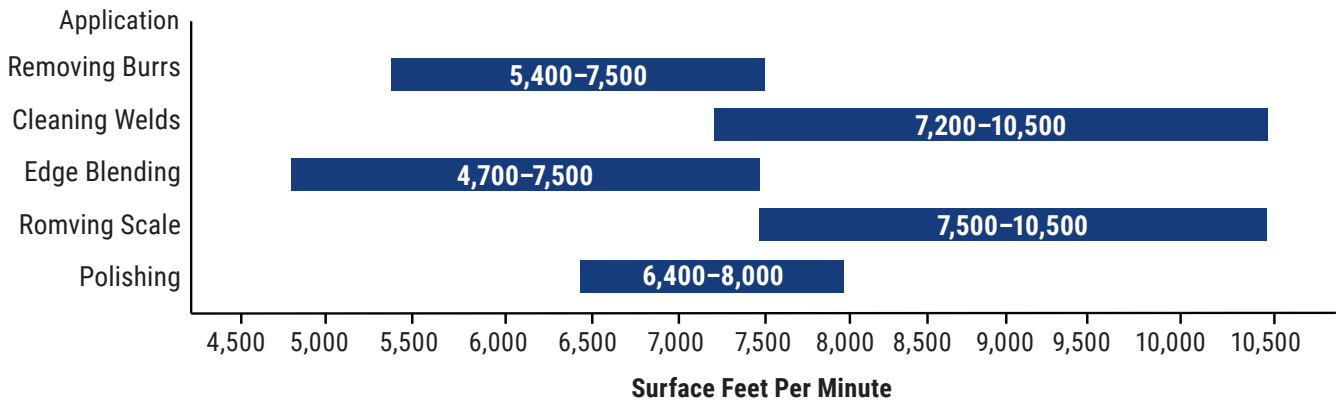
Abrasives are extremely commonplace and are used very extensively in a wide variety of industrial, domestic, and technological applications. This gives rise to a large variation in the physical and chemical composition of abrasives as well as the shape of the abrasive.

Wire Brushes

Brushing Speeds

- Power brushes, like cutting tools, operate most effectively when the speed and pressure of the operations are properly matched to the demands of the application. In most operations, the highest speed and lightest pressure will ensure the fastest brushing action and longest brush life.
- Increasing brush speed increases the face hardness and brushing action; therefore, a fine wire brush rotating at a higher speed will often produce the same results as a coarser wire brush rotating at a slower speed. Finer wire operating at a higher speed is generally preferred and will provide a longer brush life.
- MSFS – Maximum Safe Free Speed (in RPM) is the maximum speed at which the brushes may be used safely and not necessarily the optimum speed for a given application. Operating speed should be determined by the application, but should not exceed the MSFS (in RPM) for which the brush is rated.
- Make sure the spindle size and motor of the machine are large enough to accommodate the diameter of the brush to be used.

Recommended Surface Speeds for Brushing Applications



Surface Speeds for Wire Brush Use

Important: When running a wire brush, a rule of thumb is to run it a "mile a minute" or a minimum of 5,000 Surface Feet per Minute (SFPM). Normally, higher surface speeds result in faster cycle times and longer brush life. However, never exceed the Maximum Safe Free Speed (MSFS) or RPM of the brush.

SFPM = (Diameter (in) × π × RPM)/12

Example: A 6" diameter wheel running at 3,450 RPM has a surface speed of 5,400 SFPM.

See the RADNOR® wire brush selection of pages 199–201.

RPM	Diameter							
	2"	3"	4"	6"	8"	10"	12"	16"
1,000	525	785	1,050	1,575	2,100	2,625	3,150	3,925
1,500	785	1,175	1,575	2,350	3,150	3,925	4,725	5,900
1,750	915	1,375	1,850	2,750	3,650	4,550	5,500	6,800
2,500	1,300	1,950	2,625	3,925	5,250	655	7,850	9,825
3,000	1,575	2,350	3,125	4,725	6,275	7,850	9,425	11,775
3,450	1,800	2,700	3,600	5,400	7,200	9,000	11,000	13,500
4,000	2,100	3,150	4,175	6,275	8,375	10,475	–	–
6,000	3,125	4,700	6,275	9,425	–	–	–	–
10,000	5,250	7,850	10,500	–	–	–	–	–
15,000	7,850	11,775	15,750	–	–	–	–	–
20,000	10,450	15,700	20,950	–	–	–	–	–

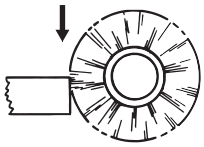
Brushing Pressure

Avoid excessive pressure when using a wire brush. Excessive pressure causes over-bending of the filaments and heat build-up resulting in filament breakage, rapid dulling and reduced brush life.

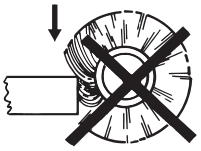
Instead of greater pressure, try the following:

1. A brush with more aggressive action (increase filament diameter, decrease trim length, different brush type, i.e. knot type instead of crimped type)
2. Higher surface speed (increase RPM or brush diameter)

Correct
Wire tips doing the work



Incorrect
Excessive pressure causes wire breakage



Important Note: Never exceed the recommended Maximum Safe Free Speed or RPM rating of the brush.

Stainless Steel Wire Brushes

There is an increasing need for stainless steel wire brushes in a variety of industries, such as the nuclear, aircraft, electronics, chemical, shipbuilding and missile industries.

Using a stainless steel brush when brushing aluminum, stainless steel and other high strength alloys eliminates the danger of "after rust." When these alloys are brushed with carbon steel wire, a deposit of carbon material remains which can cause rust.
Type 302 stainless steel brush wire is austenitic.

Once a stainless steel brush has been used on carbon steel, it should never be used on stainless steel since rusting can occur. To avoid contamination, all stainless steel brushes should be stored away from areas (such as steel work benches) where carbon steel particles might come in contact with the brush. It is recommended that a stainless steel surface be passivated with a solution of 10-20% nitric acid after brushing to ensure its resistance to corrosion.

Determining Wire Material

Most stainless steel types look alike. How can you determine whether or not you really have Type 302 stainless steel wire in your brush? Stainless steel wire has magnetic properties as a result of the wire drawing process. Type 302 stainless steel will lose its magnetic properties if a wire strand is heated red with a match. If the wire strand retains its magnetic properties after heating, it is not Type 302.

Care of Stainless Steel Wire Brushes

For critical operations, stainless steel wire brushes should be degreased before beginning the operation. Brushes that are stored after use should also be degreased and stored in plastic wrapping. If stored unprotected for any length of time, the brush could collect foreign matter due to its magnetic properties and leave "after rust" when reused.

Carbon Steel vs. Stainless Steel

Wire Type	Composition	Features
Carbon Steel	Hard Drawn, Heat Tempered Wire	• Excellent Cutting Action • Good Fatigue Resistance
Stainless Steel	Type 302 Stainless Steel Wire	• Eliminates the Danger of "After Rust" When Brushing Aluminum, Stainless and Alloys

Wire Size Recommendations

- Very fine to fine wire for light-duty applications
- Medium to coarse wire for heavy-duty applications
- The finest wire which will accomplish the job to maximize brush life

Abrasiveness	Gauge	Diameter
Coarse	20	0.035"
	24	0.023"
Coarse	25	0.020"
	30	0.014"
Medium	33	0.0118"
	34	0.0104"
Fine	35	0.0095"
	38	0.008"
Very Fine	43	0.006"
	47	0.005"

American Steel Wire Equivalent Gauge (Formerly Washburn and Moen)

Power Brush Troubleshooting Guide

There are many variables in power brush applications. If the power brush you are using does not accomplish the desired results, select a solution from the suggestions below for your specific application.

Problem	Recommended Solutions
Brush works too fast	• Select a brush with longer filaments • Select a brush with a smaller diameter wire • Select a brush with a narrower face • Select a brush with a smaller outside diameter • Operate the brush at a slower RPM
Brush works too slow	• Select a brush with shorter filaments • Select a brush with a larger diameter wire • Select a brush with a wider face • Select a brush with a larger outside diameter • Operate the brush at a faster RPM
Brushing action rolls or peens the burr over instead of removing burr	• Select a brush with a wider face • Select a brush with a larger diameter wire • Select a brush with shorter filaments • Operate the brush at a faster RPM • Select a brush with longer filaments
Finer final finish required	• Select a brush with smaller diameter wire • Operate the brush at a higher RPM • Select a brush with a wider face • Replace the wire brush with an abrasive nylon brush
Coarser final finish required	• Select a brush with shorter filaments • Select a brush with a narrower face • Operate the brush at a slower RPM • Select a brush with a larger diameter wire
Non-uniform brushing action	• Select a brush with longer filaments • Select a brush with a narrower face • Automate the operation to reduce human variables

Flap Discs

Two Basic Flap Disc Designs

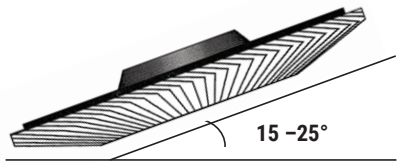
Type 29 Conical — The most aggressive choice

- Conical flap discs have flap angles at 10 degrees and may be used on both conical and flat surfaces
- The angle provides greater surface contact and, as a result, tends to be the most aggressive choice
- The best choice when speed is a primary consideration

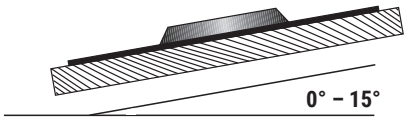
Type 27 Flat — The choice for the best finish

- Type 27 flap discs have a flat design and is used primarily on flat surfaces
- The best choice for smooth finishing
- Available in jumbo sizes with extra-large flaps lasting up to 40% longer than standard flap discs
- Choice will also depend on user preference of grinding angle (severe angle will weaken the edges)

Grind At Steeper Angles



Grind At Flatter Angles



Burrs

Operating Guidelines

- Avoid using so much pressure that the grinder speed is reduced.
- Maximize the area of contact with the work piece to improve finish.
- Avoid contact between the work piece and the shank of a burr.
- Replace dull burrs with a new or re-sharpened tool before it becomes damaged.
- Periodically dipping the burr in a wax is a common method to improve performance.
- For long shanks burrs, make sure burr is engaged with work piece before spinning to avoid bending the shank.
- Check die grinder air pressure, fittings, and seals often to ensure maximum power and RPM.
- Correct speeds are vital to achieve desired finish and removal rates.

Source: MasterCut Tool Company

General Burr Speed Recommendations

Burr Diameter	RPM
1/8" or 3mm Solid Carbide	45,000–50,000
3/16" Solid Carbide	35,000–40,000
3/16" Carbide Head Brazed to 1/8" or 3mm Steel Shank	30,000–35,000
1/4" or 6mm Solid Carbide	30,000–35,000
1/4" Carbide Head Brazed to 1/8" or 3mm Steel Shank	25,000–30,000
5/16" Carbide Head Brazed to 1/4" or 6mm Steel Shank	25,000–30,000
3/8" Carbide Head Brazed to 1/4" or 6mm Steel Shank	25,000–30,000
7/16" Carbide Head Brazed to 1/4" or 6mm Steel Shank	20,000–25,000
1/2" Carbide Head Brazed to 1/4" or 6mm Steel Shank	20,000–25,000
5/8" Carbide Head Brazed to 1/4" or 6mm Steel Shank	15,000–20,000
3/4" Carbide Head Brazed to 1/4" or 6mm Steel Shank	15,000–20,000
1" Carbide Head Brazed to 1/4" or 6mm Steel Shank	12,000–18,000

Source: MasterCut Tool Company

Find a wide variety of shapes and sizes of RADNOR burrs on pages 190–196.

Carbide Burr Applications

Materials	Double Cut	Single Cut	Aluma Cut
Aluminum			✓
Brass, Bronze and Copper	✓	✓	
Fiberglass	✓		
Cast Iron	✓	✓	
Plastics			✓
Steel, 40-55 rc	✓	✓	
Steel, 55-60 rc	✓	✓	
Steel, Carbon	✓	✓	
Steel, Nickel Chrome	✓	✓	
Steel, Stainless	✓	✓	
Steel, Weldments	✓	✓	
Titanium	✓	✓	
Zinc			✓

Burr Application Guide