Shelf Life of Grinding Wheels

It has always been Saint-Gobain Abrasives recommendation that resinoid bonded grinding wheels be used within 2 years from the date of manufacture. This recommendation assumes that resinoid bonded grinding wheels have been stored under ideal storage conditions. It may be true that under ideal storage conditions resinoid bonded grinding wheels can survive without any degradation in strength for well over two years. However, it is always wise to suspect any wheels over two years old and have them reinspected or re-speed tested to determine if there has been any degradation in strength. If the wheels are stored under less than ideal conditions, they may have a much shorter shelf life depending upon the severity of storage conditions. These same comments also apply to rubber and shellac bonded grinding wheels.

As for vitrified grinding wheels, the shelf life is less influenced by humidity and adverse storage conditions as compared to resinoid, rubber or shellac, but even vitrified grinding wheels do not have an infinite shelf life. The best procedure and the best rule of thumb is to have any wheel that is two years old or older re-speed tested and reinspected to ensure it is fit for use. The procedure for having this done and the charges are better explained by our Customer Service Department, but the cost of shipping as well as the cost of reinspection is the customer's responsibility. Also, any wheels rejected or otherwise lost in the reinspection process will also be the responsibility of the customer.

Keep in mind, however, that this procedure is good to verify the reliability of a product but must not be performed until you are ready to consume the wheel. If wheels are sent back after the two year time frame for reinspection and re-testing and then put back on the shelf, there is no telling how long they will be fit for use after that last inspection. Therefore, these wheels must be consumed as soon as is practical.

How to Perform a Ring Test on a Grinding Wheel

One method of grinding wheel inspection is called ring testing. OSHA, ANSI and the grinding wheel manufacturers require this method of grinding wheel inspection. It must be performed BEFORE the wheel is mounted on a grinding machine. Ring testing depends on the damping characteristics of a cracked wheel to alter the sound emitted when the wheel is tapped lightly. It is subject to interpretation by the inspector and is primarily applicable to vitrified bonded wheels. To perform the ring test, wheels should be tapped gently with a light nonmetallic implement, such as the handle of a screw driver for light wheels, or a wooden mallet for heavier wheels.

- **Tap wheels about 45 degrees each side of the vertical line and about 1" or 2" from the periphery. Rotate the wheel 45 degrees and repeat the test.**
- **Large and thick wheels may be given the ring test by striking the wheel on the periphery rather than the side of the wheel.**
- **A sound and undamaged wheel will give a clear tone. If cracked, there will be a dead sound and not a clear ring and the wheel should not be used.**
- **Wheels must be dry and free of sawdust when applying the ring test, otherwise the sound may be deadened. The ring test is not applicable to certain wheels because of their size, shape or composition.**

When is a Grinding Wheel Worn Out?

We are often asked the question, “When is a grinding wheel worn out?” The answer depends on the grinding wheel and the application. Listed below are some of the most common types of grinding wheels and the answer to this question.

Type 1 (Straight Wheels)

ANSI B7.1-2000 says, “The usable portion of an abrasive wheel shall be considered to be that portion which extends beyond the mounting flanges. A wheel shall not be worn down to a size which would allow the mounting flange assembly to contact the work-piece or work-piece holding fixture.” This rule assumes the proper flanges are being used and the correct machine guarding is in place. WARNING: You should never grind with the fine center of a wheel and if you are using a superabrasive (diamond) wheel do not grind with the wheel’s core.

Type 2 (Cylinder Wheels) and Segments

The machine will determine discard size i.e. the down-feed mechanism will keep the wheel from contacting the work-piece. WARNING: Always use proper mounting procedures when using this type of product. Do not loosen mount and lower wheel or segment below the machine’s designed clamping mechanism, i.e. clamping mechanism must have full contact with wheel or segment. This is a major cause of wheel/segment breakage.

Types 5 and 7 (Recessed Wheels)

Wheels that have recesses CANNOT be worn down to their mounting flanges because the edge of the recess will “spall” away. For Types 5 and 7 recessed wheels, factors such as wheel grit size, application and experience will provide the user with the best answer. If you do not know, a good “rule of thumb” is to discard the wheel when you are 1" away from the recess.

Type 6 and 11 (Portable Cup Wheels)

Portable cup wheels must be discarded when the machine’s guard prevents proper grinding. In this case a proper guard will determine discard size by preventing additional grinding on the wheel’s rim. WARNING: Never remove a worn cup wheel from its proper grinder and use it on an inline grinder or any other machine. Never grind on the outer periphery of a cup wheel!

Type 6 and 11 (Cup Wheels for Precision Applications i.e. Fixed-Base Machines)

On fixed-base machines with non-portable cup wheels, you should never allow contact with the back of the cup wheel or allow the mounting flange assembly to contact the work-piece holding fixture. WARNING: Maintain a safe distance to prevent accidental contact with the back of the cup or the mounting flange during grinding.

Type 27, 28 and 29 (Depressed Center Wheels)

As with portable cup wheels, the proper guard for Type 27, 28 and 29 (depressed center wheels) will often determine the wheel discard size. If the application allows the wheel to be worn to stub, you must stop before contacting the mounting flanges and should never use the wheel’s hub to grind.

Abrasive Cup Wheel Safety and You!

What Are the Safety Requirements for Abrasive Cup Wheels?

Following OSHA and ANSI safety requirements when using abrasive cup wheels may require a little extra time and increase your cost (in the short run), but if you consider the time lost and medical cost due to an accident, it is really MUCH cheaper to "do it right." Knowing the rules and following those rules does not only make good business sense, but it is the smart thing to do! Following is a check list of the important rules to follow:

Matching the Abrasive Wheel to the Machine:

- **Mismatching the grinding wheel and the machine can be a real "recipe for disaster." Select only grinders with the correct speed, mounting system and guard for the abrasive wheel that you are going to use. Select the proper abrasive cup wheel and machine for the job.**
- **Cup Wheel Speed verses Machine Speed: Use only abrasive wheels with speeds rated at or higher than the speed marked on the grinder.**
- **Use abrasive cup wheels on portable grinders with cup guards only.**
- **Use abrasive cup wheels on grinders with a proper back flange. A 2" flat or non-relieved back flange will provide abrasive cup wheels 6" in diameter and smaller with the required back support. ANSI requires back flange sizes to be as follows:**

Cup Diameter	Minimum Back Flange Diameter
6"	2"
5"	1-3/4"
4"	1-3/8"

Check List for Mounting Cup Wheels:

After you have selected the proper grinding wheel and machine, you are now ready to mount the wheel onto the machine.

- **Check your wheel storage area. Has the abrasive cup wheel been stored in a careful manner (stored in its original package, on a shelf, and away from moisture and temperature extremes)? Improper wheel storage and handling can lead to abrasive cup wheel breakage.**
- **Visually inspect all abrasive cup wheels for any damage as well as the package. NEVER USE A DAMAGED ABRASIVE CUP WHEEL! If anything appears unusual, don't use the cup wheel.**
- **Disconnect portable machines from their power source before you begin mounting or removing abrasive cup wheels.**
- **Inspect the machine and its wheel guard. Never use a machine that has been damaged.**
- **Inspect and clean the machine's back flange and mounting threads.**
- **When mounting or using an abrasive cup wheel, always follow the machine builder's and wheel manufacturer's safety instructions.**
- **Thread wheel on the machine and hand tighten. Don't "power" the wheel on as removal will be difficult and the wheel can be damaged.**
- **Wear all required personal protective equipment such as eye, face, hearing, and respiratory protection, as well as gloves, aprons, arm guards and safety shoes.**
- **Once the wheel has been mounted, test the machine and wheel by placing the open end of the wheel guard under a workbench or into a steel drum and start the machine. Run the machine/wheel at operating speed for one minute. Do not allow anyone to stand near or inline with the guard's opening. If a wheel was damaged during storage or transportation, it will most likely break during this test. If there are any unusual vibrations or noises, STOP; this may indicate a problem that must be corrected.**

Using the Abrasive Cup Wheel:

- **Cup wheels are designed to be used on their rims, grind only on the wheel's rim. Never grind on the outside of the wheel.**
- **Never abuse the wheel. Don't bump or drop the wheel. If the wheel is damaged, remove and discard it.**
- **Introduce the wheel to the work gently. Don't jam the wheel into the workpiece or force grind causing the grinder motor to slow noticeably.**
- **During work stoppages, store the wheel and the machine carefully. If the machine/wheel is allowed to fall off the work bench onto the floor or the wheel is struck by an object, the wheel may get damaged and break on start-up. If the machine/wheel has been out of your sight, visually inspect the wheel and the machine before using them and repeat the "start up sequence."**
- **Avoid daydreaming or operator's carelessness. ALL ABRASIVE CUP WHEELS CAN BE BROKEN IF NOT USED PROPERLY.**

What You Should Know About Grinding Wheel Guards

Reports indicate customers in the grinding wheel industry break approximately one grinding wheel per day. Most of these breakages are caused by human error, do not result in personal injury, and generally go unreported. Grinding wheel guards are one of the key components in keeping these grinding wheel mishaps from becoming a personal injury.

Dangerous Conditions Caused by the Ineffective Use of Grinding Wheel Guards:

Incorrect: Cup wheels such as Type 6 and 11 used on a portable angle grinder with a Type 27, 28 and 29 depressed center grinding wheel guard.

Explanation: While a properly adjusted Type 27, 28 and 29 guard works with a Type 27, 28 or 29 wheel, it offers little or no protection with a Type 6 or 11 cup wheel. The cup wheel "hangs" below the guard meant for a Type 27, 28 or 29 wheel and in the event of a wheel breakage; it offers little or no protection.

Incorrect: Type 01 straight cutting off wheels used on a portable angle grinder with a Type 27, 28 or 29 depressed center grinding wheel guard.

Explanation: Type 27, 28 and 29 guards are open on the bottom to allow for side grinding with raised hub/depressed center wheels. When side grinding with the Type 27, 28 or 29 wheel, the workpiece acts as a portion of the guard, protecting the operator in the event of a wheel breakage. Cutt-off wheels are not designed for use on their side and must be used on their outer periphery only. Guards for cutt-off wheels must cover a full 180° area on all sides of the wheel. When using a cut-off wheel with a Type 27, 28 or 29 guard, there is no guard on one side of the wheel, protecting the operator in the event of a wheel breakage. Do not use cut-off wheels on angle grinders without the proper guard.

Incorrect: Floorstand grinders that use foundry wheels 24" and larger, equipped with the old style guards that have not been retrofitted are dangerous. These guards are not equipped with a self-closing device and when a wheel breakage occurs, it can result in serious injury or death.

Explanation: Since 1993, ANSI requires that all floorstand grinders using foundry wheels 24" and larger must be equipped with self-closing, or automatically closing guards. Self-closing or automatically closing guards save lives!

In Summary: Grinding wheel guards designed for one type of machine used on another type of machine, or the wrong guards for the type of wheel, are dangerous.

Ineffective Grinding Wheel Guards:

- The most ineffective guard is the one that has been removed from its machine and is sitting in storage. The removal of a wheel guard on a machine in operation is not only extremely dangerous, but illegal.
- Using a damaged wheel guard is extremely dangerous to the safety of the operator and bystanders. Guards that are cracked, deformed, bent, or severely worn must be replaced. Once a guard has been damaged, it may become ineffective in a future wheel breakage. If a wheel breakage occurs, the guard must be inspected and if there is any sign of damage, the guard must be replaced.
- Machines with missing wheel guard fasteners are also very dangerous. Sometimes during routine machine maintenance the guard fasteners are damaged and not replaced when the machine is reassembled. During a wheel breakage, the missing fasteners may allow the guard to move, become unattached from the machine or open. This improperly attached guard may become a new hazard to the operator, exposing him/her to being injured by the guard or not containing the wheel fragments in the event of a wheel break.
- A guard made of paper, tin, cloth, wood or other materials not designed to contain wheel fragments may fail when struck by a wheel fragment. Always use the guard that is recommended for the machine and its operation. Never paint or disguise the wrong material for a proper guard.
- Guards that have been altered or cut back are dangerous. An example of this type of activity is the reduction in size of a Type 27, 28 or 29 guard, from its original state (designed to cover the wheel and the plane of rotation between the machine and the operator for at least 180°) to only 90° coverage of the wheel. The potential danger to the operator is nearly as bad as having no guard in place.

Guards Not Properly Adjusted:

- A wheel guard that is set too high on a portable angle grinder will allow the wheel to hang below the guard. This improper setting may render the guard useless in the event of a wheel breakage.
- The wheel guard of a portable machine positioned improperly. A guard used on a portable machine must be positioned so it is located between the operator and the grinding wheel. Also, bystanders must not be positioned in front of the wheel guard's open area.
- Failure to maintain the proper setting of the adjustable tongue guard (AKA spark arrester) on bench, pedestal, or small floor stand grinder. OSHA requires a maximum clearance of 1/4" between the grinding wheel and the tongue guard. If a wheel breakage should occur, maintaining the proper distance will help to contain the wheel fragments and reduce the probability of an injury.

Proper Grinding Wheel Operating Speeds and Safety!

As abrasive wheel producers have known for many years, most grinding wheel breakages and injuries are caused by one major oversight. That oversight is operating a grinding wheel in an over-speed condition. As you all know, operating a grinding wheel at speeds in excess of 1.5 times the wheel's rated speed can result in an immediate wheel breakage. Common examples of this type of over-speed occur when operators:

- **Mount grinding wheels on sanders (Pistol Grip Air Sanders)**
- **Mount grinding wheels directly on electric motors**
- **Mount grinding wheels on the wrong size machine for the grinding wheel**
- **Fail to properly maintain their machine: especially governors on pneumatic machines and linkage on floorstand machines**
- **Use the incorrect air, hydraulic or electric power supply**
- **Use the improper speed setting on their machine**

What you may not be cognizant of is that slight over-speed can cause damage to a wheel. If an operator continues to use this damaged wheel, it may break. In a reinforced wheel for example, cracks may form, be forced open and jam or catch the wheel on the workpiece resulting in a wheel breakage. The use of a 9" Type 27 Wheel on a 7" angle grinder is very dangerous! Normal stresses that occur during grinding along with the additional stress caused by over-speed are additive. The act of operating a wheel in a slight over-speed condition is very dangerous. We must understand and communicate this danger.

One of the major forces at work on a grinding wheel is called "centrifugal force." To demonstrate this force take a piece of string and tie a small weight to one end. Hold the other end of the string so the weight will travel in a circle. Rotate the weight and you will feel a pull on the string. The weight tries to fly off in a straight line, but the string holds it and compels it to travel in a circle. This pull on the string is called "centrifugal force." Warning: If you attempt this experiment take all the proper precautions related to the object used to avoid injury to yourself or others.

If you swing the weight at a speed of 50 revolutions per minute and could measure the pull on the string at this speed, then increase the swing to 100 revolutions per minute and again measure the pull, you would find the pull was not merely two times greater, but was actually four times greater than it was at one half the speed. Therefore, the force increases exponentially with the speed or RPM.

Centrifugal force increases in proportion to the square of the velocity. Think again of the weight and the string. We find that the square of 50 is 2,500, (50 x 50 = 2,500); and the square of 100 is 10,000, (100 x 100 = 10,000). As 10,000 is four times as great as 2,500 so is the pull on the string at 100 revolutions per minute four times as great as it was at 50 revolutions per minute.

Centrifugal force applies to grinding wheels in the same manner as the weight to the string. Increasing the RPM or speed beyond the maximum safe operating speed (MOS) may be more dangerous than might be expected. Placing and operating a 9" Type 27 grinding wheel with a maximum operating speed of 6,600 RPM on a 5" right angle grinder with a rated speed of 10,000 RPM represents an over-speed of approximately 1.515 times the wheel's designated speed. The resulting rotational stress caused by the centrifugal force would be approximately 2.3 times greater than the maximum allowed. Add this additional stress to the stresses that occur during normal grinding and even the strongest wheel may break.

In short, NEVER over-speed a grinding wheel. Always compare the speed marked on the wheel or package to make sure the machine's speed is at, or below, the speed or MOS of the grinding wheel. Speed can kill, NEVER over-speed a grinding wheel.

What are the Major Causes of Grinding Wheel Breakages?

A grinding wheel is a safe tool when used properly. All grinding wheels are tested in accordance with ANSI B7.1 before SGA ships them. However, after the grinding wheels are shipped they may be subjected to any number of abuses and misuses. Listed here are some of the major causes of grinding wheel breakages.

- **Using a grinding wheel damaged during transportation, storage or as a result of careless or improper handling. Inspect all grinding wheels before mounting them on a machine. NEVER MOUNT A DAMAGED GRINDING WHEEL.**
- **Selecting the wrong grinding wheel for the job. DON'T GRIND MATERIAL FOR WHICH THE WHEEL IS NOT DESIGNED.**
- **Incorrect machine. NEVER MOUNT A GRINDING WHEEL ON A MACHINE NOT DESIGNED AND GUARDED FOR THAT GRINDING WHEEL.**
- **Machine speed higher than the grinding wheel speed. NEVER OVER-SPEED A GRINDING WHEEL.**
- **Poor machine maintenance. FAILURE TO PROPERLY MAINTAIN A GRINDING MACHINE CAN CAUSE GRINDING WHEEL BREAKAGES RESULTING IN SERIOUS INJURY OR DEATH.**
- **The improper mounting of grinding wheels. See ANSI B7.1 and literature provided for proper mounting procedures.**
- **Operator carelessness. ALL GRINDING WHEELS CAN BE BROKEN IF NOT USED PROPERLY.**
- **Lack of knowledge or training. IF YOU DO NOT KNOW HOW TO USE A GRINDING WHEEL OR THE GRINDER, GET HELP!**
- **Poor wheel balance caused by the failure to turn off coolant before stopping the grinding wheel. Always spin coolant out of a grinding wheel before shutting the operation down.**
- **Jamming the work into the grinding wheel.**
- **Force grinding, so that the motor slows noticeably or the work gets hot.**
- **Grinding on the wrong surface of a grinding wheel, i.e. grinding on the side of a Type 1 straight grinding wheel.**

For additional information on this topic or any other grinding wheel safety information, please review ANSI, OSHA and literature provided by the grinding wheel and machine manufacturer. You may also contact the Saint-Gobain Product Safety Department at Tel. (508) 795-2690 or Fax. (508) 795-5120 for additional product safety information.

Safety on the Web

As part of Saint-Gobain Abrasives' ongoing commitment to safety, each month a new safety article is published on the Norton website. Topics include proper abrasive storage, equipment maintenance, proper wheel mounting, using blotters, ring testing a grinding wheel, wheel dressing and much more. Visit the Norton website at **www.ind.nortonabrasives.com** and check the "News" section for the newest article. Or click on "Safety" to review our archived safety articles.

www.**nortonabrasives.com**

Starting a Grinding Wheel

ANSI's Procedure for Starting an Abrasive Wheel

In the past several years we have heard of wheel breakages and accidents involving abrasive wheels breaking on start-up. This article is designed to remind users of the proper procedure when starting a machine with a new abrasive wheel mounted on it, or starting a machine after the machine and wheel have been stored for a period of time, or remounting a wheel.
ANSI B7.1-2000 requires the following procedure when starting a newly mounted grinding wheel.

9.8 Starting the Wheel (Requirements)

All abrasive wheels shall be run at operating speeds with the safety guard in place or in a protected enclosure for at least one minute before applying work. During this time no one shall stand in front of or in line with the wheel. (See section 4, page 50 for safety guard requirements.)

This provision shall apply each time one of the following conditions occur:

a. a new wheel has been mounted;

b. a used wheel has been remounted.

E 9.8 Starting the Wheel (Explanatory Information)

An abrasive wheel may be damaged in shipment or storage, or the wheel may be subjected to improper, excessive stresses during mounting. Wheels which have been damaged or are under excessive stress, are likely to fracture within the first minute of rotation at operating speed. While this procedure is most important at the time when an abrasive wheel is mounted or remounted, damage may also occur to a wheel during a shut down of the machine on which it is mounted. The user should evaluate the circumstances and length of machine shut down to determine additional times that the operating rule should be followed.

See photograph of newly mounted portable abrasive wheel being tested.

Improper wheel mounting is a major cause of wheel breakages. Always use proper mounting procedures as outlined in ANSI B7.1, machine manufacturer's instructions and those supplied with the abrasive wheel. Be safe, know and follow the rules!

For additional information on this topic or any other abrasive product safety information, please review ANSI, OSHA and literature provided by the grinding wheel and machine manufacturer. You may also contact the Saint-Gobain Product Safety Department at Tel. (508) 795-2317 or Fax. (508) 795-5120 or contact your Saint-Gobain Abrasives, Inc. representative with any abrasive safety related questions.

CONVERSION TABLE – WHEEL SPEEDS

REVOLUTIONS PER MINUTE FOR VARIOUS DIAMETERS OF GRINDING WHEELS TO GIVE SURFACE SPEED IN FEET PER MINUTE AS INDICATED

(FOR WHEEL MARKING PURPOSES THE CALCULATED RPM FIGURES LISTED BELOW ARE ROUNDED OFF TO THE NEXT 5)

Diam. of Wheel in Inches	Surface Speed in Feet Per Minute (SFPM)																				
	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,500	8,000	8,500	9,000	9,500	10,000	12,000	12,500	14,200	16,000	16,500	17,000	19,685	20,000
	Revolutions Per Minute (RPM)																				
1	15,279	17,189	19,098	21,008	22,918	24,828	26,737	28,647	30,558	32,467	34,377	36,287	38,196	45,836	47,745	54,240	61,116	63,025	64,935	75,190	76,395
2	7,639	8,594	9,549	10,504	11,459	12,414	13,368	14,328	15,278	16,238	17,188	18,143	19,098	22,918	23,875	27,120	30,558	31,510	32,465	37,595	38,195
3	5,093	5,729	6,366	7,003	7,639	8,276	8,913	9,549	10,186	10,822	11,459	12,096	12,732	15,278	15,915	18,080	20,372	21,010	21,645	25,065	25,465
4	3,820	4,297	4,775	5,252	5,729	6,207	6 685	7,162	7,640	8,116	8,595	9,072	9,549	11,459	11,940	13,560	15,278	15,755	16,235	18,800	19,100
5	3,056	3,438	3,820	4,202	4,584	4,966	5,348	5,730	6,112	6,494	6,876	7,258	7,640	9,168	9,550	10,850	12,224	12,605	12,985	15,040	15,280
6	2,546	2,865	3,183	3,501	3,820	4,138	4,456	4,775	5,092	5,411	5,729	6,048	6,366	7,639	7,960	9,040	10,186	10,505	10,820	12,530	12,730
7	2,183	2,455	2,728	3,001	3,274	3,547	3,820	4,092	4,366	4,638	4,911	5,183	5,456	6,548	6,820	7,750	8,732	9,005	9,275	10,740	10,915
8	1,910	2,148	2,387	2,626	2,865	3,103	3,342	3,580	3,820	4,058	4,297	4,535	4,775	5,729	5,970	6,780	7,640	7,880	8,115	9,400	9,550
9	1,698	1,910	2,122	2,334	2,546	2,758	2,970	3,182	3,396	3,606	3,820	4,032	4,244	5,092	5,305	6,030	6,792	7,000	7,215	8,355	8,490
10	1,528	1,719	1,910	2,101	2,292	2,483	2,674	2,865	3,056	3,247	3,438	3,629	3,820	4,584	4,775	5,425	6,112	6,300	6,495	7,520	7,640
12	1,273	1,432	1,591	1,751	1,910	2,069	2,228	2,386	2,546	2,705	2,864	3,023	3,183	3,820	3,980	4,520	5,092	5,250	5,410	6,265	6,365
14	1,091	1,228	1,364	1,500	1,637	1,773	1,910	2,046	2,182	2,319	2,455	2,592	2,728	3,274	3,410	3,875	4,366	4,500	4,640	5,370	5,455
16	955	1,074	1,194	1,313	1,432	1,552	1,672	1,791	1,910	2,029	2,149	2,268	2,387	2,865	2,985	3,390	3,820	3,940	4,060	4,700	4,775
18	849	955	1,061	1,167	1,273	1,379	1,485	1,591	1,698	1,803	1,910	2,016	2,122	2,546	2,655	3,015	3,396	3,500	3,605	4,175	4,245
20	764	859	955	1,050	1,146	1,241	1,337	1,432	1,528	1,623	1,719	1,814	1,910	2,292	2,390	2,715	3,056	3,150	3,245	3,760	3,820
22	694	781	868	955	1,042	1,128	1,215	1,302	1,388	1,476	1,562	1,649	1,736	2,084	2,170	2,465	2,776	2,865	2,950	3,420	3,470
24	637	716	796	875	955	1,034	1,115	1,194	1,274	1,353	1,433	1,512	1,591	1,910	1,990	2,260	2,546	2,625	2,705	3,135	3,185
26	588	661	734	808	881	955	1,028	1,101	1,176	1,248	1,322	1,395	1,468	1,762	1,840	2,090	2,352	2,425	2,495	2,890	2,940
28	546	614	682	750	818	887	955	1,023	1,092	1,159	1,228	1,296	1,364	1,637	1,705	1,940	2,182	2,250	2,320	2,685	2,730
30	509	573	637	700	764	828	891	955	1,018	1,082	1,146	1,210	1,274	1,528	1,595	1,810	2,056	2,100	2,165	2,505	2,545
32	477	537	597	656	716	776	836	895	954	1,014	1,074	1,134	1,194	1,432	1,495	1,695	1,910	1,970	2,030	2,350	2,385
34	449	505	562	618	674	730	786	843	898	955	1,011	1,067	1,124	1,348	1,405	1,595	1,796	1,855	1,910	2,210	2,245
36	424	477	530	583	637	690	742	795	848	902	954	1,007	1,061	1,273	1,330	1,510	1,698	1,750	1,085	2,090	2,120
38	402	452	503	553	603	653	704	754	804	854	904	955	1,006	1,206	1,260	1,430	1,608	1,660	1,710	1,980	2.010
40	382	430	478	525	573	620	669	716	764	812	860	908	956	1,146	1,195	1,355	1,528	1,575	1,625	1,880	1,910
42	366	409	454	500	545	591	636	682	732	775	818	863	908	1,090	1,140	1,295	1,464	1,500	1,545	1,790	1,820
44	347	390	434	478	521	564	608	651	694	737	780	824	868	1,042	1,085	1,235	1,388	1,432	1,475	1,710	1,735
46	333	375	416	458	500	541	582	624	666	708	750	791	832	1,000	1,040	1,180	1,332	1,370	1,410	1,635	1,660
48	318	358	398	438	478	517	558	597	636	676	716	756	796	956	995	1,130	1,272	1,315	1,350	1,565	1,590
53	288	324	360	395	432	468	503	539	576	612	648	683	720	864	900	1,025	1,152	1,189	1,225	1,420	1,440
60	255	287	319	350	387	414	446	478	510	542	574	606	638	774	795	905	1,020	1,050	1,080	1,255	1,275
72	212	239	265	291	318	345	371	398	424	451	477	504	530	637	665	755	849	875	905	1,045	1,060

For intermediate diameters not listed use the formula listed in Section 1.2.10 page 3 of ANSI B7.1 (SFPM = .262 x wheel diameter in inches x RPM.)

To convert meters per second (m/s) to SFPM: m/s x 196.85 = SFPM. To convert SFPM to m/s: SFPM/196.85 = m/s. To convert RPM to SFPM: Wheel Diameter x RPM x 0.262 = SFPM