

## **Abrasive Wheel Grinder Safety**

One of the most common pieces of machinery in use in the maintenance shops on campus is the abrasive wheel grinder. These useful machines, used to remove metal from flat and cylindrical surfaces, are available in two types. Some are bench or pedestal grinders that stay in one place. The others are portable abrasive tools that are used for repair jobs elsewhere in the facility.

There is also more than one type of grinder design. On some, the abrasive wheels are mounted so only the exposed flat side is used for grinding. Other machines are designed so that the grinding is done on the circumference of the wheel. Some grinders also have wire brush or buffing wheel attachments.

People who regularly use abrasive wheel grinders may not be aware of their hazards. You have to keep in mind that while these machines have flat surfaces, they are cutting tools. Depending on the operation and equipment, the wheels can revolve at an incredible 10,000 surface feet per minute. You don't want to make contact with something going at that rate of speed!

It's clear that people don't take abrasive wheel safety seriously enough when you look at a list of OSHA's most frequently violated standards. Abrasive wheel violations always rank high—right up there with hazard communication and lockout/tagout. In one recent year, OSHA found 1,704 violations related to abrasive wheel exposure adjustments, with 1,449 of them serious. That was the eighth most frequent violation for the year.

Violations, of course, are only part of the story. What's really important is the fact that you can be seriously injured if you're not careful with these machines.

## **General Hazards**

Just what are the hazards of not meeting abrasive wheel safety standards? Perhaps the biggest hazard occurs when you get too close while operating or adjusting the wheel. A hand or finger that hits the moving wheel surface is in real danger of being mangled or cut off.

Eye injuries are another serious hazard with abrasive wheel grinders. The grinding operation can loosen chips or particles that can fly into the eye. On rare occasions, excessive speed can make an abrasive wheel disintegrate, which could send pieces of metal flying through the work area—and into your eyes.

Yet another hazard is inhaling the dust and fumes generated during grinding, which can lead to respiratory diseases. An additional risk is the noise a grinding operation makes. That noise can damage your hearing if you perform these jobs for any amount of time. Fortunately, there are ways to protect yourself from injury and illness when you work with these powerful machines.

## **OSHA Regulations**

The first protective step is to make sure that abrasive wheel machines and their operators meet the two OSHA standards that govern their use: 29 CFR 1910.243 for portable abrasive wheels and 29 CFR 1910.215, which covers all non-portable abrasive wheel grinders.

The standard for fixed equipment is particularly detailed and even has pages of drawings and diagrams to describe:

- Design specifications for wheels and guards
- Guarding and safe operation
- Repairs and maintenance
- Inspection

Many of these requirements obviously apply to the equipment itself, not to your work procedures. But the incredible level of detail gives you an idea of how much caution abrasive wheel grinders demand.

## **Protection Against Hazards**

The OSHA regulations also contain important protections for anyone who works with abrasive wheel grinders. The key to safety with these machines is “guarding”. OSHA says that, with some specified limited exceptions, both fixed and portable abrasive wheels “shall be used only on machines provided with safety guards.” OSHA defines a guard as “an enclosure designed to restrain the pieces of the grinding wheel and furnish all possible protection in the event that the wheel is broken in operation.”

One of the riskiest parts of grinder operation occurs when you stand in front of the machine's opening. That's why OSHA requires an adjustable guard so you're still protected as the wheel diameter gets smaller. Though this seems a logical form of protection, so many people fail to have it that it's the most common OSHA abrasive wheel violation.

The second most frequent OSHA abrasive wheel violation also relates to an important protection: work rests. OSHA requires offhand grinding machines to have a rest that can support the piece you're working on. The rest can't be more than one-eighth of an inch away from the wheel. Otherwise, there's a risk that the work will jam between the wheel and the rest, which could break the wheel or risk injury to the operator's hand or fingers.

You can't use just anything for a work rest. OSHA requires work rests to be rigid to provide stability. They also have to be adjustable to compensate for wheel wear. When you have to adjust the rest, make sure that the wheel is off. Once the adjustment is complete, be sure to clamp the rest securely.

OSHA also requires you to check the machine's spindle speed before mounting a wheel. You do that to make sure the machine's maximum operating speed is no higher than the speed marked on the wheel. In addition, you have to inspect wheels before you mount them to make sure they haven't been damaged while being moved or stored.

There's a special test you use to make sure a wheel isn't cracked, and it appears in the OSHA standard, too. This "ring test" is very simple to perform. You gently tap a dry clean wheel with a light nonmetallic tool—perhaps a screwdriver handle for light wheels or a wooden mallet for heavier ones. The tap should produce a clear metallic "ping." If the sound is more like a dull thud, the wheel is probably cracked and shouldn't be used.

## **Personal Protective Equipment**

There are also other very important safety precautions you must take in order to prevent injury with abrasive wheel grinders. One of the most important is to use assigned personal protective equipment and clothing. You'll probably need:

- Safety eyeglasses with side shields or a full face shield to prevent chips or particles from getting into your eyes
- Gloves to protect your hands from flying particles and sharp edges created during the grinding operation
- A dust mask so you don't inhale dust that could harm your respiratory system
- Hearing protection to prevent hearing damage from all the noise grinding creates

You must also pay attention to your personal clothing. The essential rule is to not wear anything loose that could get caught in the machine. Scarves, ties, loose hair, and dangling jewelry are dangerous. If you're wearing a long-sleeved shirt, button it at the wrist.

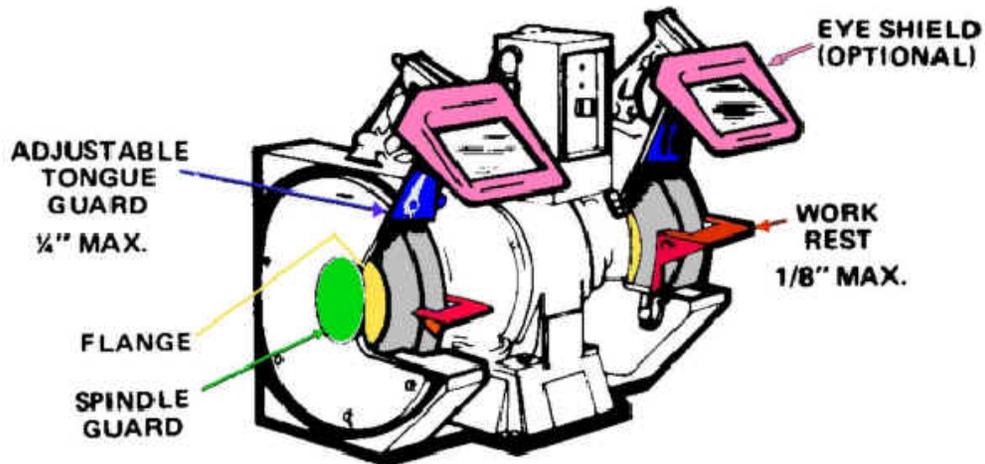
You also have to look out for the wheel itself. Grinding wheels are surprisingly delicate. They can be easily damaged if you handle them carelessly. It's a good idea to store new ones carefully in a dry area close to the grinding operation. When you have to carry one, do it very carefully. Take special care not to drop it or to bump it against anything.

Your own work habits can also reduce the risk of accidents when you work with abrasive wheel grinders. Before starting the grinder, make sure that:

- The work area has good lighting that doesn't create glare or shadows
- The grinder itself is steady or securely mounted, with the wheel mounted securely on the machine
- The wheel is evenly worn, without substantial nicks and scrapes or indications of cracks
- The floor and the work area are clean. Sparks could ignite debris, and water or other spills could cause electrical shock
- The wheel is designed for the machine's size and speed
- The power transmission cover is secure
- The electrical power source is properly grounded and its cord and connections are in good condition
- The work rests are slightly below the wheel's center and within an eighth of an inch of the wheel
- You have firm control of the tool and don't have to overreach
- You've tested the wheel with no load, while standing off to the side, to make sure it's operating safely
- The grinder comes up to full speed before contact with the piece you're working on

### **Final Note**

Abrasive wheel grinders are great machines, but careless operation can injure your hands, fingers, eyes, and respiratory system. The fact that OSHA finds so many abrasive wheel grinder violations every year should be a warning to all of us. Remember that the most common violations—and serious hazards—are failing to properly adjust the safety guards and the work rests. A wheel that fragments at high speed can cause severe personal injury and possibly death.



Standard 29 CFR 1910	Description	YES	NO <sup>2</sup>
	<i>From the Abrasive Wheel standard</i>		
215(a)(2)	Do side guards cover the spindle, nut and flange and 75% of the wheel diameter?		
215(a)(4)	Is the work rest used and kept adjusted to within 1/8-inch (0.3175cm) of the wheel?		
215(b)(9)	Is the adjustable tongue guard on the top side of the grinder used and kept to within 1/4-inch (0.6350cm) of the wheel?		
215(d)(1)	Is the maximum RPM rating of each abrasive wheel compatible with the RPM rating of the grinder motor?		
215(d)(1)	Before new abrasive wheels are mounted, are they visually inspected and ring tested?		
	<i>From other OSHA standards</i>		
22(a)	Is cleanliness maintained around grinders?		
94(b)(2)	Are dust collectors and powered exhausts provided on grinders used in operations that produce large amounts of dust?		
133(a)(1)	Are goggles or face shields always worn when grinding?		
212(b)	Are bench and pedestal grinders permanently mounted?		
304(f)(4)	Is each electrically operated grinder effectively grounded?		
305(g)(1)(iii)(A)	Are fixed or permanently mounted grinders connected to their electrical supply system with metallic conduit or other permanent method?		
305(j)(4)(ii)(F)	Does each grinder have an individual on and off control switch?		

**Foot Notes:**

1 Extracted from OSHA Publication #2209; this check list does NOT include ALL elements of 29 CFR 1910.215; it is only a guide.

2 A mark in this column indicates a need for corrective actions.

Also see [backside](#) for a partial list of accidents which have occurred.