

Shop Safety Procedure



Equipment/Task Name:	BENCH AND PEDESTAL GRINDERS
Equipment/Task Hazard Class:	4 http://ehs.yale.edu/forms-tools/tool-classification-matrix
Shop Name:	
Shop Hazard Class:	

Purpose

Grinders are used for removal of small amounts of material from work pieces. Drill bits and lathe cutting tools can be sharpened and modified with proper use of a grinder. For purposes of this procedure, the term grinder will be used to describe both bench and pedestal versions.

Hazards

As with all shop tools there are many potential hazards associated with their use and exposure. Bench grinders with 120 volt motors greater than ½ horsepower are Class 4 tools (<http://ehs.yale.edu/forms-tools/tool-classification-matrix>). There are a number of particular hazards associated with the operation and use of bench grinders.

High speed rotating grinding wheels and shafts

- Large amounts of energy embodied in rotating wheels
- Wheel explosion hazard
- Potential for loose items to become entangled in rotating parts
- Strangulation hazard

Flying objects

- Grinding wheel can catastrophically fail throwing high velocity objects into space and operator. Refer to the “Ring Test Procedure” included with in the Diagrams/Illustrations section of this procedure.
- Work pieces, tooling, drill bits, or clamps can become disengaged and rotate or be flung across the room

Crushing/pinch point hazards

- Work piece can get loose and jamb between improperly adjusted work rests or guards
- Clothing, jewelry or body parts can be drawn into spinning wheels

Hot components

- Grinding generates significant heat, burn and/or fire hazards
- Grinding generates flying sparks

Hazards (cont'd)
<p><u>Dust Exposure</u></p> <p>Dust generation produced from the abrasive surface and machining of the work piece may present physical and health hazards. Minimization practices may include dust collection equipment and general housekeeping practices. Proper operation and maintenance of dust collection equipment is essential to effective dust minimization. Consult the Safety Data Sheet for the work piece material and grinding wheel material if you have any questions.</p>
Limitations
<ul style="list-style-type: none"> • Grinder should not be used when working with non-ferrous materials such as brass, aluminum, copper, plastics or wood. The material can become imbedded in the grinder wheel creating pressure that could shatter the wheel. • Very small items should not be ground without proper fixturing as your hand will be at risk of contact with the grinding wheel, flying objects and burns as a large amount of heat is generated during the grinding process.
Required Personal Protective Equipment
<ul style="list-style-type: none"> • Refer to the Shop Safety Postings and instructions provided by the Shop Supervisor. • Safety glasses must be worn at all times, even if a face shield is used or an equipment mounted eye shield is in place. • Face shield if the grinder is not equipped with eye shields. • Shop specific required PPE:
Required Training
<ul style="list-style-type: none"> • Applicable Shop Rules <ul style="list-style-type: none"> ○ Student Shop Rules (http://ehs.yale.edu/forms-tools/shop-rules-student-accessible-shops) ○ Professional Shop Rules (http://ehs.yale.edu/forms-tools/guidelines-professional-shops) • For Class 2 through 5 <u>Student Shops</u>, review and signing of the Yale University Shop/Tool Use Safety Agreement (http://ehs.yale.edu/forms-tools/shoptool-use-safety-agreement). • Shop Supervisors or Instructors must evaluate the tool user based on successful demonstration of the Training Competencies listed below as applicable. <p><u>Training Competencies:</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Dress appropriately and don correct personal protective equipment. <input type="checkbox"/> Inspect grinder and adjust guards and tool rest for the selected grinding operation. <input type="checkbox"/> Good judgment in grinder start-up process. <input type="checkbox"/> Good judgment in holding/fixturing work piece. <input type="checkbox"/> Proper technique in the actual work piece grinding process including proper pressure, cooling, movement and temperature control. <input type="checkbox"/> Clean and prepare the tool for the next user. <input type="checkbox"/> Demonstrate all the above training competencies for grinding operations for the types of materials to be used. Grinding operations may include reconfiguring lathe cutters for turning operations, sharpening blades or drill bits, and deburring of non-tooling work pieces. <ul style="list-style-type: none"> • Shop specific training requirements:
Authorized Tool Users
<p>Shop Supervisor, Shop Monitors and those authorized by shop supervision to operate the tool.</p>

Tool Safety Rules

- Observe and follow all Yale Professional or Student Shop Rules as posted.
- Understand and follow manufacturer operating procedures.
- Inspect the tool for damage prior to use.
- Verify all guards are in place and adjusted properly.
- Do not bypass any safety devices.
- Only use the tool when it is secured to the floor via a pedestal or work bench.
- Always stay at the machine while it is running.
- Clean the tool after use.
- Report any malfunction or damage to the Shop Supervisor after tagging the tool “Out of Service, do not use”.
- Only grind materials designated acceptable for the particular machine.
- Let the abrasive do the work, do not force work piece into grinding wheel.

Shop specific rules:

Proper Setup and Use

Prior to approaching the bench grinder you should have determined:

- Is the work piece intended for grinding made of an appropriate Iron based (ferrous) material suitable for material removal on a grinding wheel?
- Is the work piece large enough to be held safely in the user’s hands or should an appropriate tool-holder or fixture be used?
- If the work piece is a cutting tool for another machine, is there enough material left to be reground/ sharpened for the intended usage?
- Is all personal protective equipment (safety glasses with wrap around side shields and complete face-shield) in place? The operator should prepare for grinding by removing all loose clothing, jewelry and securely tie back all long hair.
- What is the best method and plan for grinding the work piece?
- Are dust controls needed and functional?
- Is the area around the bench grinder and operator clear of spills/debris?

At the grinder:

- Engage dust collection system if available.
- Visually inspect overall grinder setup for secure mounting and placement for adequate workspace.
- Check for adequate supply of cooling fluid (typically water) if used.
- Wheels should be visually inspected for obvious signs of irregular wear or damage. If irregularities in the outer diameter (wheel face) or sides, chips or cracks are observed then contact the shop manager/instructor and DO NOT turn on the grinder. A “ring test” can also be performed (see attached diagram).
- Prior to using the grinder all guards and shields must be properly adjusted (see attached diagram).
 - Tongue guard: Must be adjusted for wheel wear such that it is less than ¼” away from the outer diameter of the wheel.
 - Work rest: Must be adjusted for wheel wear so that it is less than 1/ 8” from the outer diameter of the grinding wheel and angled to properly support the part that you will be grinding.

Proper Setup and Use (cont'd)

- Wheel spindle and end shield: Must be in place to shield users from rotating wheel retaining nut and also to partially contain wheel parts in the event of a failure.
- Eye shield: Eye shield must be positioned such that it is between your line of site and the workpiece contact with the grinding wheel. Eye shields are not required if a face shield and safety glasses are employed.

While grinding:

Once the operator has inspected and adjusted the grinder:

- STAND off to the side of the grinder and turn grinder power on, allow the grinder to reach operating speed and observe for vibrations or rubbing sounds. TURN OFF IMMEDIATELY if vibration or rubbing sounds are observed and notify the shop supervisor.
- After grinder has operated smoothly at full speed you can approach the front of the grinder with your work piece.
- Using techniques provide by your supervisor or instructor, apply your work piece lightly to the outer diameter of the rotating grinding wheel. Most grinding wheels are not designed for grinding on the side of the wheel- light burr removal is typically acceptable.
- Do not allow excessive heat to build up in your work piece- you should not see your work piece glow red during proper grinding.
- Cool work piece in cooling fluid at intervals to prevent overheating and possible changes in the material properties of your work piece.

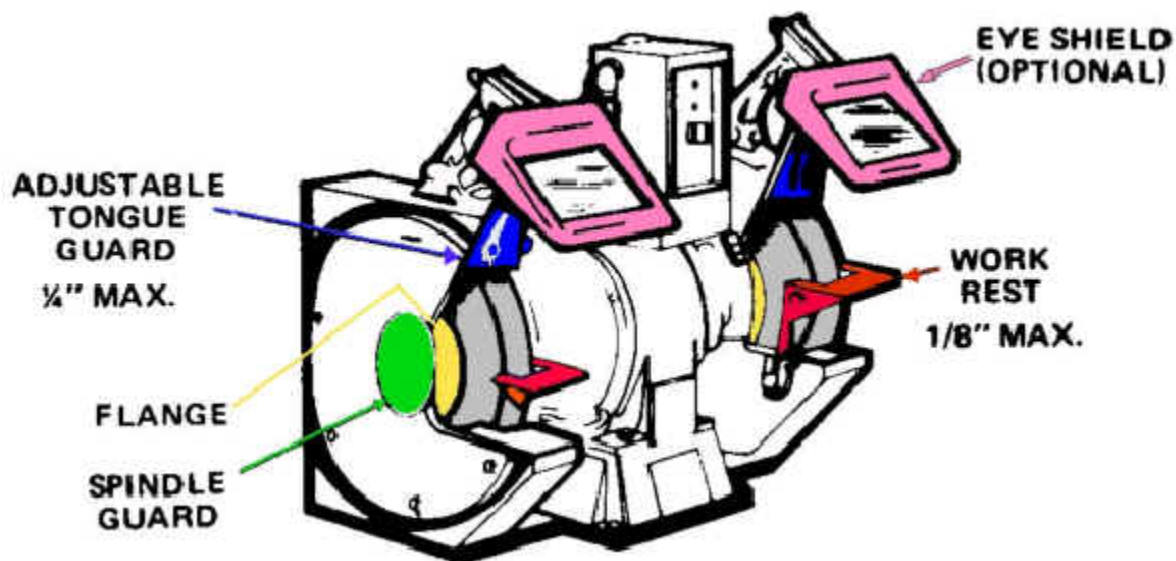
Completion:

- Shut off the grinder and allow it to come to a complete stop.
- Allow work piece to cool prior to inspecting it and be cautious of sharp edges and burrs.
- Disengage dust collection system (if available and as directed by the shop supervisor).
- Clean up machine for next user.
- Report any issues to the shop supervisor.

Shop specific procedures:

Diagrams/Illustrations

Typical Bench Grinder Guards/Components



Diagrams/Illustrations (cont'd)

Ring Test Procedure

The ring test of a grinder wheel requires a certain amount of experience to determine what constitutes a proper sounding ring and what does not. Ring tests should therefore be performed under the supervision of the shop manager or instructor; unless he/she feels you are sufficiently competent to proceed alone.

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. When installing a new grinding wheel following a ring test or when removing a wheel to be tested, Lock Out/Tag Out (LOTO) procedures must be employed. For a grinder serviced by an electric cord supplied with a plug, simply remove the plug and keep it in your custody and control for the duration of the wheel removal and installation procedure.

Ring testing depends on the damping characteristics of a cracked wheel to alter the sound emitted when the wheel is tapped lightly. The ring test of a grinder wheel requires a certain amount of experience to determine what constitutes a proper sounding ring and what does not. Ring tests should therefore be performed under the supervision of the shop manager or instructor; unless he/she feels you are sufficiently competent to proceed alone.

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 shall 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.

For additional information on this topic or any other grinding wheel safety information, please review ANSI (ANSI B7.1), OSHA and literature provided by the grinding wheel and machine manufacturer. A reference video is available at: <http://www.youtube.com/watch?v=52n8-6cooY>.

Creation/Revision Dates:

March 13, 2014

Suggestions, questions, or comments? Please contact your shop supervisor or EHS.