

Tool Safety and Machine Guarding

1. Purpose

USPL has established the Tool Safety and Machine Guarding policy to reduce the hazards associated with the use of hand and power tools and exposure at the point of operation.

This policy details the requirements for using hand and power tools including, but not limited to, special types of power tools (abrasive wheel machinery, pneumatic and liquid-fuel tools, and pressure washers). This policy also covers the guarding requirements for machinery.

2. Scope

This policy applies to all employees and contractors who use tools and machinery in the workplace for USPL.

The following sections of the safety manual contain related policies and shall be consulted for additional requirements and guidance:

- Authorization to Work
- Compressed Air
- Electrical Safety
- Hearing Conservation
- Hot Work
- Personal Protective Equipment (PPE)
- Respiratory Protection

3. Minimum Requirements

	Minimum Requirements	Supporting Documentation
1.	Employees shall follow safety precautions to minimize hazards associated with the tools they use..	Section 6
2.	Tools and accessories shall be visually inspected for defects or damage before use.	Section 6
3.	Any defective or damaged tool shall be removed from service and designated with a Do Not Use tag or removed from service.	Section 6
4.	Each tool shall be used solely for its intended application and within its capabilities.	Section 6
5.	Tools and accessories shall be used, maintained and stored in accordance with manufacturers' instructions.	Section 6
6.	All the manufacturer's safety guards and safety devices shall be in place and operational.	Section 8
7.	Machine guards shall be installed to protect the operator and other employees in the area from hazards such as those created by point of operation, ingoing nip points, rotating parts, and flying chips and sparks.	Section 9
8.	A Hot Work permit is required for all non-intrinsically safe tools in a classified area.	Section 10
9.	Pneumatically driven nailers, staplers, and other similar tools that have automatic fastener feed and that operate at more than 100 psi shall be equipped with a safety device on the muzzle to prevent the accidental ejection of fasteners.	Section 11

4. Definitions

Abrasive wheel—A power-driven wheel, cylinder, disc, or cone having a surface of abrasive particles held together by mineral, metallic, or organic material (such as resin) and mounted in a portable or stationary machine.

Hand tool—A tool that is manually operated and powered by human force (hammer, screwdriver, pliers, wrench, cutting shears, etc.).

Maximum exposure angle—The largest part of an abrasive wheel that does not need to be covered by a safety guard. The exposure angle is measured by lines starting at the center of the spindle and extending to the ends of the guard at the wheel periphery.

Pneumatic tool—A tool that is powered by compressed air (air chisel, air hammer, impact wrench, nailer, spray gun, stapler, etc.).

Point of operation—The area on a machine where work is actually performed upon the material being processed.

Powder-actuated tool—A tool that uses energy from an explosive charge in a magazine-fed cartridge, usually to drive a stud, pin, or fastener.

Power tool—A tool that is manually operated and usually powered by air or electricity. Special power tools include hydraulic, gasoline-powered, and powder-actuated equipment.

Safety switch—A type of switch that is specifically designed for quickly turning off a power tool. For example, a momentary or constant-pressure safety switch shuts off the power when the user's finger releases the switch button.

5. Roles and Responsibilities

- A. Team Leaders are responsible for the following:
 - 1. Ensuring that employees operate only those tools for which they have received skills training curriculum.
 - 2. Ensuring that machinery guards are adequate and in place.
 - 3. To provide appropriate PPE to employees who use hand and power tools.
 - 4. Implementing and enforcing all other requirements of this policy.
- B. Personnel who use hand and power tools in the workplace are responsible for the following:
 - 1. Ensure that tools are used and maintained in accordance with manufacturers' instructions and USPL policies.
 - 2. Adhere to all other safety requirements of this policy.

6. General Requirements

- A. Employees who use hand and power tools in the workplace are responsible for:
 - 1. understanding the potential hazards associated with each type of tool; and
 - 2. following safety precautions to minimize those hazards.
- B. Personal Protective Equipment (PPE) appropriate to the specific tool and the work task shall be worn.

Note: Loose clothing, jewelry, and long hair are dangerous near moving parts. The user shall adhere to the manufacturer's guidelines for the specific tool.

- C. Tools and accessories shall be visually inspected for defects or damage before use.
- D. Any defective or damaged tool shall be removed from service and either designated with a Do Not Use tag or disposed of immediately. *Use of unsafe tools and equipment is strictly prohibited.*
- E. Each tool shall be used *solely* for its intended application and within its capabilities.
- F. Tools and accessories shall be used, maintained and stored in accordance with manufacturers' instructions.
- G. All the manufacturer's safety guards and safety devices shall be in place and operational. Using a tool with these safety devices disabled is strictly prohibited.
- H. Individuals who may be affected by the operation of power tools shall remain at a safe distance.
- I. To reduce the possibility of being injured by a tool, work areas shall be kept clean and free of debris that could cause an employee to slip, trip or fall.

7. Hand Tools

The greatest hazards posed by hand tools are the result of improper use and improper maintenance.

- A. Hand tools shall be used for their intended purpose only.
- B. Hand tools shall be visually inspected before use. If the tool is in poor condition (dirty, dull, worn, rusty, or abused), it shall be removed from service until it can be cleaned or repaired.
- C. Employees using sharp tools shall direct the tools away from themselves, from aisles and from other employees working in close proximity. Use the appropriate personal protective equipment.
- D. Sharp parts on tools shall be closed, secured, retracted, or sheathed when not in use.
- E. Tools shall be stored in a safe, orderly manner.
- F. Sharp points and edges shall be protected from contact.
- G. Iron or steel tools with the potential to produce sparks shall not be used in work environments which have the potential to contain flammable vapors unless a Hot Work permit is completed.

8. Electric Power Tools

- A. Electric power tools shall either be of the approved double-insulated type, or grounded and used with a ground-fault circuit interrupter (GFCI) in accordance with the requirements of section 9 of this policy.
- B. Using the cord to hoist or lower the tool is strictly prohibited.
- C. If possible, secure the material to be worked on freeing both hands to operate the tool.
- D. Electrical cords shall be placed in a manner that protects them from damage and minimizes tripping hazards.
Note: Cords are easily damaged. Never pull the cord to disconnect it from the receptacle.
- E. All power tools shall be turned off and power disconnected when:
 - 1. Being stored.
 - 2. Being adjusted, cleaned, or serviced.
 - 3. Accessories (such as blades, bits, and cutters) are being changed.
- F. All the manufacturer's safety guards and safety devices shall be in place and operational.
- G. A Hot Work permit is required for all non-intrinsically safe power tools used in a classified area.

9. Ground-Fault Circuit Interrupter (GFCI) Protection

The following requirements apply to temporary wiring installations used to supply temporary power to equipment used by personnel during construction, remodeling, maintenance, repair, or demolition of buildings, structures, equipment, or similar activities.

- A. All 125-volt, single-phase, 15-, 20-, and 30-ampere outlets that either are not part of the permanent wiring of the building, e.g. extension cords, or are part of the permanent wiring and used for temporary electric power, shall have ground-fault circuit-interrupter protection for personnel.
- B. All 125-volt and 125/250-volt, single-phase, 15-, 20-, and 30-ampere receptacle outlets that are a part of a 15-kW or smaller portable generator shall have ground-fault circuit-interrupter protection for personnel.
- C. The GFCI shall be tested in accordance with the manufacturer's instructions to ensure its operability. Documentation of this test is not required.

10. Machinery Guarding

Requirements for machine guards vary with the type of tool or machine. Consult the Safety Coordinator for specific requirements.

- A. Manufacturer machine guards shall be maintained to protect the operator and other employees in the area from hazards such as those created by point of operation, ingoing nip points, rotating parts, and flying chips and sparks.

Note: Examples of guarding methods include barrier guards, two-hand tripping devices, electronic safety devices, etc. Barrier guards may be used in lieu of point-specific guards where appropriate.

11. Abrasive Wheel Machinery

Abrasive wheels pose many health and safety hazards. The respirable dust generated by these machines can irritate the nose, throat, and lungs. If the dust is toxic, the hazards become even more acute. Due to the high velocity of the rotating wheel, larger particles can fly from the machine and cause deep wounds. Contact with a rotating wheel can cause abrasions, cuts, and even amputation. A wheel that shatters during use can shoot fragments at a speed of over 300 miles per hour and can severely injure the operator and nearby workers.

- A. Abrasive wheels shall be used only on machines equipped with safety guards.
Exceptions: Safety guards are not required for wheels used for internal work; mounted wheels used in portable work (2 inches or less in diameter); wheels of the cone, plug, and threaded hole type where the work offers protection.
- B. A Hot Work Permit is required for any grinding operation in a potentially flammable atmosphere.
Note: Grinding produces highly heated particles (sparks) that could ignite flammable gases / vapors.
- C. Pneumatic abrasive wheel machines shall be operated within the specified air pressure range.
- D. Abrasive wheel machines shall be operated with the size of wheel shown on the tool.
- E. Any new grinding wheel shall be run at least one minute before use, during which time no one shall stand in front of or in line with the wheel.
- F. Work rests shall be kept adjusted closely to the wheel with a maximum opening of 1/8 inch to prevent work from being caught between the wheel and the rest. *The adjustment shall not be made while the wheel is in motion.*

- G. All abrasive wheels shall be closely inspected and ring-tested before mounting to ensure that they are free from cracks and other defects (see Section 11.4, “Mounting and Inspection”).

11.1 Machine Design and Setup

11.1.2. Safety Guards

- A. To offer the user as much protection as possible without restricting machine operation, safety guards shall meet the following requirements (see Appendix I for illustrations):

Type of Machine	Maximum Exposure Angle
Bench, pedestal, floorstand	90 degrees (one-fourth) of the wheel periphery <i>Exception:</i> 125 degrees when the nature of the work requires contact with the wheel below the horizontal plane of the spindle <i>Note:</i> The exposure shall begin at a point not more than 65 degrees above the horizontal plane of the wheel spindle. <i>Note:</i> These machines shall have an adjustable tongue guard that is set to clear the abrasive wheel by not more than 1/4 inch.
Cylindrical	180 degrees (one-half) of the wheel periphery <i>Note:</i> The exposure shall begin at a point not more than 65 degrees above the horizontal plane of the wheel spindle.
Surface, cutting-off	150 degrees of the wheel periphery <i>Note:</i> The exposure shall begin at a point not less than 15 degrees below the horizontal plane of the wheel spindle.
Portable	180 degrees (one-half) of the wheel periphery <i>Note:</i> The exposure angle for vertical portable grinders (“right-angle head” grinders) shall be located between the operator and the wheel during use. The top half of the wheel of all portable grinders shall be enclosed at all times.

- B. Additional enclosures shall be constructed if necessary to protect adjacent personnel.
Note: Heavy wire screen or sheet steel shall be used.

11.1.3. Mounting Flanges

- A. All abrasive wheels shall be mounted between flanges, which shall not be less than one-third the diameter of the wheel.

Exceptions:

- Mounted wheels
 - Portable wheels with threaded inserts
 - Abrasive discs (inserted nut, inserted washer and projecting stud type).
 - Plate-mounted wheels
 - Cylinder, cup, or segmental wheels mounted in chucks
- B. Blotters (compressible washers) shall always be used between flanges and the wheel to distribute flange pressure uniformly.

11.2. Storage and Handling

- A. Abrasive wheels shall be stored in racks, bins, or drawers that are suitable for the type of wheel.
B. Care shall be exercised in handling wheels, which are breakable and easily damaged.

11.3. Mounting and Inspection

- A. Before mounting, the wheel shall be carefully inspected to ensure that it is free from cracks and other defects.
- B. The wheel shall be “sounded” using the following procedure, known as the “ring test.”
 1. Make sure the wheel is dry.
 2. Tap the wheel gently with a light, nonmetallic implement (e.g., screwdriver handle) about 45 degrees to each side of the vertical centerline and about 1 or 2 inches from the periphery (see Appendix II, “Tap Points for Ring-Testing Abrasive Wheels”). A sound, undamaged wheel will have a clear, metallic ring; a cracked wheel will have a dead sound.
 3. Rotate the wheel 45 degrees and repeat the test.
- C. Before a wheel is mounted, the machine’s spindle speed shall be checked to ensure that it does not exceed the maximum operating speed marked on the wheel.
- D. Wheels shall fit freely on the spindle and remain free under all grinding conditions. The machine spindle shall be of nominal (standard) size, and the wheel hole shall be oversized to assure safe clearance.
- E. All contact surfaces of wheels, blotters, and flanges shall be flat and free of foreign matter.
- F. Wheels shall be mounted in accordance with the manufacturer's recommendations.

Note: Typical guidelines for mounting wheels include the following:

- The inside diameter of the wheel shall match the size of the spindle.
- Shock-absorbing washers shall be installed next to wheel blotters to help prevent vibration and breakage.
- Both wheel flanges shall have the same hole and outside diameter.
- The length of cone and plug wheels shall be suited to the length of the spindle (neither too short nor too long).
- Spindle nuts shall be tightened just enough to grip firmly—over tightening can damage wheels.

12. Pneumatic Tools

The main danger associated with the use of pneumatic tools is getting hit by a tool attachment that has not been properly secured or by one of the fasteners released by the tool. With large tools such as jackhammers, noise is also a hazard.

- A. Operators of noisy tools, such as jackhammers, shall wear proper hearing protection (see the Personal Protective Equipment Matrix for specific requirements).
- B. Pneumatic tools shall be operated properly and within the limits recommended by the manufacturer (including pressure ranges for hoses, pipes, valves, filters, and other fittings).
- C. All pneumatically driven nailers, staplers and other similar tools that have automatic fastener feed and that operate at more than 100 psi shall be equipped with a safety device on the muzzle to prevent the accidental ejection of fasteners.

Exception: This does not apply to tools that operate with the muzzle in contact with the work surface.

- D. All pneumatically driven nailers, staplers, and other similar tools shall be treated as loaded guns and shall never be pointed toward anyone.

12.1 Air Hoses

- E. Pneumatic tools shall be carefully checked to ensure that they are securely connected to the air hose.
 - 1. As an additional safeguard, pneumatic tools shall be secured to the hose or whip by some positive locking device to keep the tool from becoming accidentally disconnected.
- F. All hoses exceeding 1/2 inch (inside diameter) shall have a safety device at the source of the supply or branch line to reduce pressure in case of hose failure.
- G. Using the hose for hoisting or lowering the tool is strictly prohibited.
- H. Hoses shall be laid out in a manner that protects them from damage and minimizes tripping hazards.
Note: Keep hoses away from heat, oil, and sharp edges.
- I. Safety clips or retainers shall be installed on pneumatic impact (percussion) tools to prevent the ejection of attachments during tool operation.
- J. The manufacturer's safe operating pressures for hoses, valves, pipes, filters and other fittings shall not be exceeded.

13. Liquid-Fuel Tools

Fuel-powered tools are usually operated on gasoline. The most serious hazard associated with the use of these tools comes from fuel vapors, which can ignite or explode and which also give off dangerous exhaust fumes. Employees shall be careful to handle, transport, and store gas or fuel according to the requirements of the Flammable Liquids Storage and Handling policy.

- A. All fuel-powered tools shall be shut down and cool while they are being refueled or serviced.
- B. When a fuel-powered tool is used inside a closed area, the operator shall ensure the space is adequately ventilated.

14. Pressure Washers

The high-pressure spray from a power washer has a velocity high enough to cut through concrete. Thus it can cause serious wounds and can also dislodge fragments from facades and other surfaces that may inflict injuries. Electric pressure washers pose a shock hazard; gasoline-powered pressured washers have the same risks as any liquid-fuel tool. Falls due to slippery work areas are also a potential hazard.

- A. Operators shall wear eye and face protection and any other PPE appropriate to the job.
Note: Boots or shoes with nonslip soles are advisable for slippery floor surfaces.
- B. Operators shall keep their hands and feet clear of the spray nozzle and direct the spray away from air hoses, safety lines, equipment, glass and other fragile objects and other people. *The gun or wand assembly shall never be pointed toward a person.*
- C. Hoses shall be laid out in a manner that prevents kinking, minimizes tripping hazards, and protects hoses from damage by foot traffic or heavy equipment.
- D. Do not leave the machine unattended while pumping is in progress.
- E. The engine shall be shut off when the machine is not in use.
- F. After the engine is stopped, the high pressure trapped in the system shall be released before the hoses are disconnected.

15. Powder-Actuated Tools

The use of powder-actuated tools comes with several hazards. The explosion would be a fire and explosion hazard in a flammable atmosphere. The fastener travels at a velocity high enough to cause serious injury.

- A. Only employees who have been trained in the operation of the particular tool in use shall be allowed to operate a powder-actuated tool.
- B. The tool shall be tested each day before loading to see that safety devices are in proper working condition. The method of testing shall be in accordance with the manufacturer's recommended procedure.
- C. Any tool found not in proper working order, or that develops a defect during use, shall be immediately removed from service, tagged "out of service" and not used until properly repaired.
- D. The employee shall wear the appropriate PPE including a face shield.
- E. Powder actuated tools shall not be loaded until just prior to the intended firing time.
- F. Neither loaded nor empty tools are to be pointed at any person. Body parts shall be kept clear of the open barrel end.
- G. Loaded tools shall not be left unattended.
- H. Fasteners shall not be driven into very hard or brittle materials including, but not limited to, cast iron, glazed tile, surface-hardened steel, glass block, live rock, face brick or hollow tile.
- I. Driving into materials easily penetrated shall be avoided unless such materials are backed by a substance that will prevent the pin or fastener from passing completely through and creating a flying hazard on the other side.
- J. No fastener shall be driven into an area of the material that is loose or separated from the original material. This would cause an unsatisfactory fastening.
- K. Powder actuated tools shall not be used in an explosive or flammable atmosphere.
- L. All tools shall be used with the correct shield, guard or attachment recommended by the manufacturer.
- M. Powder-actuated tools used by employees shall meet all other applicable requirements of ANSI, A10.3-1970, Safety Requirements for Explosive-Actuated Fastening Tools.

16. Hydraulic Tools

The fluid used in hydraulic powered tools can pose a fire risk. The high pressure at which some of this type of equipment operates can be dangerous.

- A. The manufacturer's safe operating pressures for hoses, valves, pipes, filters and other fittings shall not be exceeded.
- B. The fluid used in hydraulic powered tools shall be fire-resistant fluids approved under Schedule 30 of the U.S. Bureau of Mines, Department of the Interior and shall retain its operating characteristics at the most extreme temperatures to which it will be exposed.

17. Training

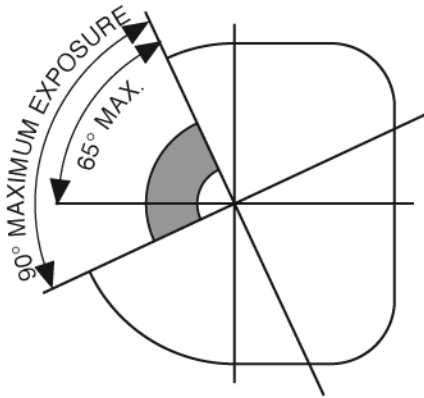
- A. Employees who use hand and power tools in the workplace shall participate in the Hand and Power Tool Safety Program's training sessions on the proper use and handling of tools and equipment.
- B. Any employee who uses special-purpose power tools and equipment shall be specifically trained in its use.

18. References

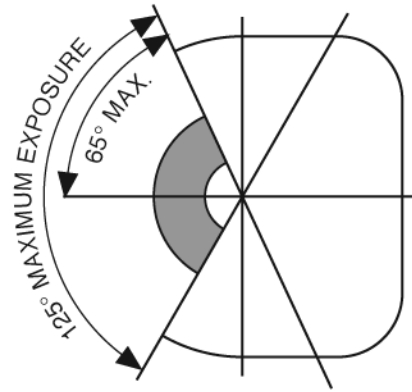
1. Occupational Safety and Health Administration, Department of Labor, 29 CFR, 1910.211–222, 1910.243.M2-1.
2. Occupational Safety and Health Administration, Department of Labor, 29 CFR, 1910.215.
3. Occupational Safety and Health Administration, Department of Labor, 29 CFR, 1910.241–244.
4. Occupational Safety and Health Administration, Department of Labor, 29 CFR, 1926.300–303.
5. Occupational Safety and Health Administration, Department of Labor, 29 CFR 1926.404.

Appendix I Maximum Exposure Angles for Abrasive Wheels

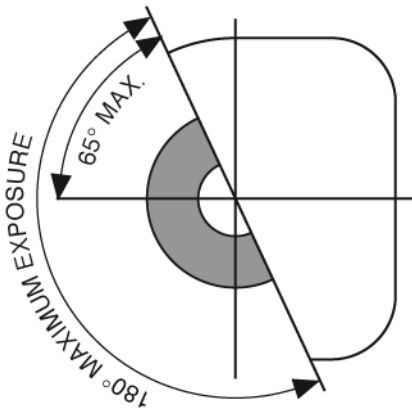
The illustrations below are intended as a general visual reference for basic guard requirements for specific types of abrasive wheel machines. Consult the manufacturer's operating manual for additional information.



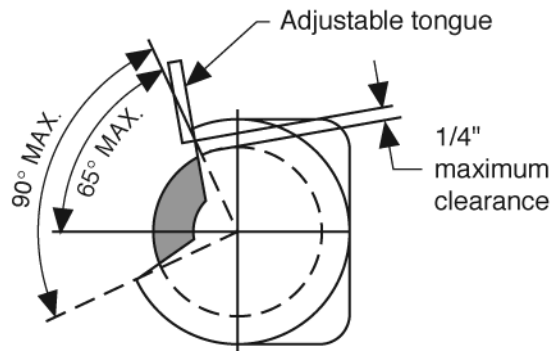
Bench, Pedestal, and Floor Stand Types



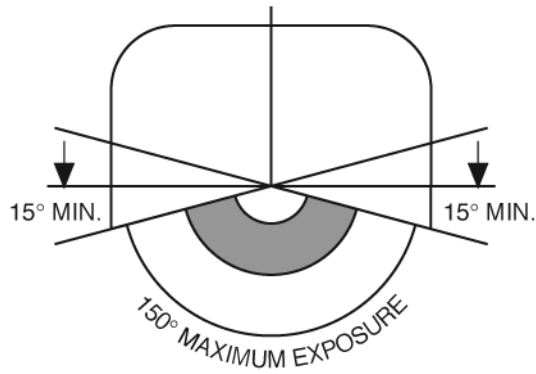
**Bench, Pedestal, and Floor Stand Types
(contact below level of spindle)**



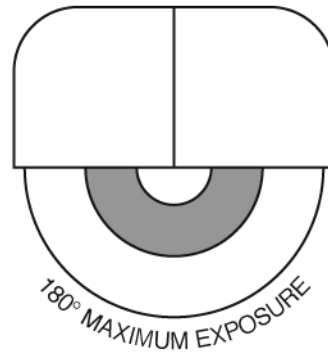
Cylindrical Types



**Bench, Pedestal, Floor Stand, and
Cylindrical Types
(adjustable tongue adjustment)**



Surface and Cutting-off Types



Portable Types

Appendix II Tap Points for Ring-Testing Abrasive Wheels

