

HAND AND PORTABLE POWER TOOL SAFETY GUIDELINES

PURPOSE

The purpose of this guidance document is to promote the safe use of, and to reduce the likelihood of injuries involving hand or power tools.

SCOPE

These requirements apply to all University departments and their employees where the use of hand or power tools are in use or will be used. This will most notably apply to employees involved in industrial, maintenance, construction and manual labor trade areas.

RESPONSIBILITIES

Environmental Health and Safety: EHS is responsible for reviewing hazards associated with hand and portable power tools during annual shop inspections. The tools will be reviewed to make sure they are in good working order, suitable for the jobs they are used for, and do not pose a hazard to the operator. EHS is responsible for reviewing and updating the Hand & Portable Power Tools Guidelines. EHS and supervisors can also work jointly in the development of Job Safety Analysis for hand tools that present a unique hazard to the employee.

Supervisor and Employee: Supervisor led training is required upon employment for employees who operate hand and portable power tools.

- **Select the Right Tool for the Job:** Examples of unsafe practices are: Striking hardened faces of hand tools together (such as using a carpenter's hammer to strike another hammer, hatchet, or metal chisel), using a file for a pry, a wrench for a hammer, using a 'cheater', and pliers instead of the proper wrench.
- **Keep Tools in Good Working Condition:** Wrenches with cracked work jaws, screw drivers with broken points or broken handles, hammers with loose heads, dull saws, and extension cords or electric tools with broken plugs, improper or removed grounding prongs, or split insulation are examples of tools in poor conditions. Tools that have deteriorated in this manner must be taken out of service.
- **Use Tools the Right Way:** Screw drivers applied to objects held in the hand, knives pulled toward the body, and failure to ground electrical equipment are common causes of accidents.
- **Place/Keep/Store Tools in a Safe & Secure Place:** Many accidents have been caused by tools falling from overhead and by knives, chisels, and other sharp tools

carried in pockets or left in tool boxes with cutting edges exposed. Tools should be kept away from work bench edges.

The following procedures are excellent shop practices for supervisors and employees to follow in order to promote a safe working environment where hand and portable power tools are used:

- Establish regular tool inspection procedures and provide good repair facilities to ensure that tools will be maintained in safe condition.
- Establish a procedure for control of tools such as a check-out system at tool cribs.
- Provide proper storage facilities in the tool room and on the job.
- The employer is responsible for the safe condition of tools and equipment used by employees, but the employees have the responsibility for properly using and maintaining tools.

****Failure to observe safe work practices when using hand and portable power tools accounts for most hand and power tool accidents.**

Each supervisor is to make a complete check of his/her operations to determine the need for special tools that will do the work more safely than ordinary tools. This can be completed by developing a Job Safety Analysis which can be used to identify the hazards associated with the job and the appropriate tools that should be used.

Special tools should be kept readily available in a centralized tool room if possible.

The tool room attendant or craft supervisor should be qualified through training and experience to pass judgment on the condition of tools for further use. Dull or damaged tools shall not be returned to stock.

Employees shall not continue use of damaged tools during a job if it is noticed during the job that the tool is damaged.

Proper maintenance and repair of tools requires adequate facilities, work benches, vices, a forge or furnace for hardening and tempering, tempering baths, safety goggles, repair tools, grinders, and good lighting. Employees specifically trained in the care of tools should be in charge of these facilities. If this service is not available, tools should be sent out for repairs.

CARRYING TOOLS

Employees are prohibited from carrying tools, which in any way could interfere with using both hands freely on a ladder or while climbing on a structure. A strong bag, bucket, or similar container is to be used to hoist tools from the ground to the job. Tools are to be returned in the same manner. Employees should never bring tools down by hand, carry in pant/shirt pockets, or dropped tools to the ground.

Loose tools and tools laid inappropriately cause a substantial portion of hand tool injuries. Tools should not be left above where employees are moving or walking. This presents a falling object hazard.

Chisels, screwdrivers, and pointed tools shall never be carried in an employee's pocket. They are to be carried in a tool box/cart, a carrying belt (sharp/pointed end down) like those used by electricians and steel employees, a pocket tool pouch, or in the hand with points and cutting edges pointed away from the body.

Employees carrying tools on their shoulders should pay close attention to clearances when turning around. Tools should also be handled so that they will not strike other employees or pedestrians.

PERSONAL PROTECTIVE EQUIPMENT

Appropriate personal protective equipment (i.e.: safety glasses, face shield, safety goggles, gloves, etc.) should be worn to protect from hazards that may be encountered while using portable power tools and hand tools.



Employees that use hand and power tools and are exposed to the hazards of falling, flying, abrasive and splashing materials, or exposed to harmful dusts, fumes, vapors, or gases shall be provided with the specified personal protective equipment necessary to protect them from the hazard.

USE OF HAND TOOLS

Hand tools are non-powered, which includes axes, wrenches, screw drivers, hammers, etc. The greatest hazards posed by hand tools results from misuse and improper maintenance.

Employee instruction/training programs shall provide detailed training in the proper use of hand tools for the specific area of operations in which they will be working in. Attention will be given to tool selection, tool use, and proper personal protective equipment that are required to be used when operating the specific tool as outlined in the following sections:

Metal-Cutting Hand Tools

Chisels

- Factors determining the selection of cold chisels are the materials to be cut, the size and shape of the tool, and the depth of the cut to be made.
- The chisel should be made heavy enough so that it will not buckle or spring when struck.
- A chisel no larger than the material should be selected so that the blade is used rather than the point or corner. Also, a hammer heavy enough to do the job should be used.
- Employees are required to wear safety goggles when using a chisel and should set up a shield or screen to prevent injury to other employees from flying chips. If a shield does not give protection to all exposed employees, then all employees in the work area are required to wear glasses with side protection.



Tap and Die Work

- Tap and die work should be firmly mounted in a vise.
- Only a T-handle wrench or adjustable tap wrench should be used.
- When threads are being cut with a hand die, hands and arms should be kept clear of the sharp threads coming through the die, and metal cuttings should be cleared away with a brush.



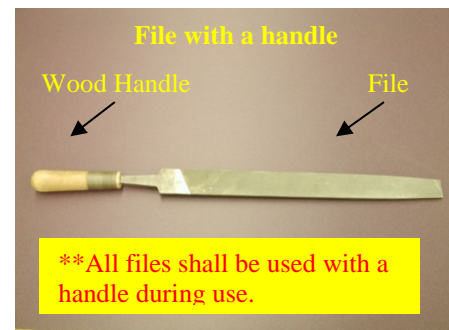
Hack Saws

- Hacksaws should be adjusted in the frame to prevent buckling and breaking, but should not be tight enough to break off the pins that support the blade.
- Install blade with teeth pointing forward.
- Pressure should be applied on the forward stroke not on the back stroke.
- If the blade is twisted or too much pressure is applied, the blade may break and cause injury to the hands or arms of the user.



Files

- Selection of the right kind of file for the job will prevent injuries and lengthen the life of the file.
- The file should never be cleaned by being struck against a vise or other metal object due to file chips becoming possible flying debris.
- A file-cleaning card or brush should be used.
- A file is not to be hammered or used as a pry. Use of a file in this manner frequently results in the file chipping or breaking causing injury to the user.
- A file should not be made into a center punch, chisel, or any other type of tool because the hardened steel may fracture in use.



- A file is never to be used without a smooth, crack-free handle; if the file were to get hung up, the tang may puncture the palm of the hand, the wrist, or other part of the body.
- Under some conditions, a clamp-on raised offset handle may be useful to give extra clearance for the hands.
- Files are not to be used on lathe stock turning at high speed (faster than three turns per file stroke) because the end of the file may strike the chuck, dog, or face plate and throw the file (or metal chip) back at the operator hard enough to inflict serious injury.

Tin/Sheet Metal Snips

- Tin snips should be heavy enough to cut the material so easily that the employee needs only one hand on the snips and can use the other to hold the material.
- The material is to be well supported before the last cut is made so that cut edges do not press against the hands.
- Jaws of snips are to be kept tight and well lubricated.



- Employees are required to wear safety goggles when trimming corners or slivers of metal because small particles often fly with considerable force.
- Employees are also required to wear gloves when making cuts.

Cutters

- Cutters used on wire, reinforcing rods, or bolts should have ample capacity for the stock; otherwise, the jaws may be sprung or spread.
- Chips may fly from the cutting edge and injure the user.
- Frequently lubricate cutters.
- To keep cutting edges from becoming nicked or chipped, cutters are not to be used as nail pullers or pry bars.
- Cutter jaws should have the hardness specified by the manufacturer for the particular kind of material to be cut.



- By adjustment of the bumper stop behind the jaws, cutting edges are to be set to have a clearance of 0.003 inch when closed.

Wood Cutting Hand Tools

Edged tools are to be used so that if a slip should occur, the direction of force will be away from the body. For efficient and safe work, edged tools are to be kept sharp and ground to the proper angle. A dull tool does a poor job and may stick or bind.

Wood Chisels

- Inexperienced employees shall be instructed in the proper method of holding and using chisels. Handles are to be free of splinters.
- The wood handle of a chisel struck by a mallet is to be protected by a metal or leather cap to prevent it from splitting.
- The work to be cut must be free of nails to avoid damage to the blade or cause a chip to fly into the user's face or eye.



Saws

- Saws should be carefully selected for the work they are to do.
- For crosscut work on green wood, a coarse saw (4 to 5 points per inch) is to be used.
- A fine saw is better for smooth, accurate cutting when using dry wood.
- Saws are to be kept sharp and well set to prevent binding.



Axes

- The employee is to make sure that there is a clear circle in which to swing the axe before chopping materials.
- All vines, brush, and shrubbery within the range should be removed, especially overhead vines that may catch or deflect the axe.
- Axe blades are required be protected with a sheath or metal guard wherever possible.



- When the blade cannot be guarded, it is safer to carry the axe at one's side.
- The blade on a single-edged axe shall be pointed down.

Hatchets

- Hatchets shall not be used for striking hard metal surfaces since the tempered head may injure the user or others by flying chips.
- When using a hatchet in a crowded area, employee shall take special care to prevent injury to themselves and other employees.
- Using a hatchet to drive nails is prohibited.

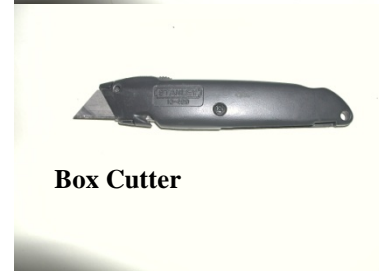
Miscellaneous Cutting Hand Tools

Scrapers, Knives, Scalpels/X-acto Knives, & Box Cutters

- Are to be used only by experienced employees.
- These tools are to be kept sharp and in good condition.
- The principal hazard in the use of knives is that hands may slip from the handle onto the blade or that the knife may strike the body or the free hand.
- A handle guard or a finger ring (and swivel) on the handle eliminates these hazards and is required to be used.
- Employees who must carry knives with them on the job shall keep them in sheaths or holders.
- Never carry a sheathed knife on the front part of a belt, but carry it over the right or left hip, toward the back. This will prevent severing a leg artery or vein in case of a fall.
- Knives should be stored safely and must never be left lying on benches or in other places such as being hidden under a product, under scrap paper or wiping rags, or among other tools in work boxes or drawers where they may cause hand injuries. Safe placing and storing of knives is one of the most important keys to knife safety.
- Supervisors must make certain that employees who handle knives have ample room in which to work so they are not in danger of being bumped by other employees.
- Knives are to be kept separate from other tools to protect the cutting edge of the knife as well as to protect the employee.



X-acto Knife



Box Cutter



Pocket Knife



Various Scrapers

- Horseplay such as throwing knives, "fencing", trying to cut objects into smaller and smaller pieces, and similar practices are prohibited around any knife operations.
- Supervisors shall assure that nothing is cut that requires excessive pressure on the knife.
- Knives shall not be used as a substitute for can openers, screwdrivers, or ice picks.

Torsion Tools

Open-End or Box Wrenches

- Open-end or box wrenches shall be inspected to make sure that they fit properly and that the jaws are not sprung or cracked.
- When defective, the wrench is required to be taken out of service until repaired.



Socket Wrenches

- Socket wrenches are safer to use than adjustable or open-end wrenches.
- Socket wrenches give great flexibility in hard-to-reach places. The use of special types shall be encouraged where there is danger of injury.



Adjustable Wrenches

- Adjustable wrenches are used for many purposes, but are not intended to take the place of standard open-end, box or socket wrenches.
- They are used mainly for nuts and bolts that do not fit a standard wrench.
- Pressure is always applied to the fixed jaw.



Pipe Wrenches

- Pipe wrenches, both straight and chain tong, shall have sharp jaws and be kept clean to prevent slipping.
- The adjusting nut of the wrench is to be inspected frequently, and taken out of service if cracked. A cracked nut may break under strain, causing a piece of pipe (also called a 'cheater') slipped over the handle shall not be used to give added leverage because this can strain a pipe wrench to the breaking point.



- The handle of every wrench is designed to be long enough for the maximum allowable safe pressure.
- A pipe wrench should never be used on nuts or bolts, the corners of which will break the teeth of the wrench, making it unsafe to use on pipe and fittings, and it also damages the nuts/bolts.
- A pipe wrench shall not be used on valves, struck with a hammer, nor used as a hammer.

Pliers

- Side-cutting pliers sometimes cause injuries when short ends of wires are cut.
- A guard over the cutting edge and the use of safety glasses will help prevent eye injuries.
- The handles of electricians' pliers are to be insulated. In addition, employees shall wear the proper electrical rated gloves if they are to work on energized lines.
- Pliers shall not be used as a substitute for a wrench.



Special Cutters for Banding Wire/Strap

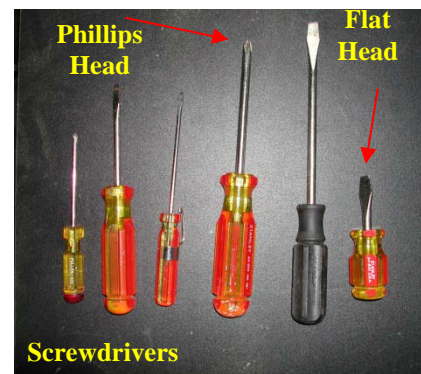
- Special cutters include those for cutting banding wire and strap. Claw hammers and pry bars shall not be used to snap metal banding material.

Pipe Tongs

- Employees must neither stand nor jump on the tongs nor place extensions on the handles to obtain more leverage. Larger tongs should be used if an employee encounters either scenario.

Screwdrivers

- The practice of using screwdrivers for punches, wedges, pinch bars, or pry-bars shall not be allowed.
- Cross-slot (Phillips head) screwdrivers are safer than the square bit type, because they have fewer tendencies to slip. The tip must be kept clean and sharp, however, to permit a good grip on the head of the screw.



- (For use on metal surfaces)The part to be worked upon must never be held in the hands; it should be laid on a bench or flat surface or held in a vise.
- No screwdriver used for electrical work shall have the blade or rivet extending through the handle. Both blade and handle shall be insulated except at the tip.



Shock Tools

Hammers

- A hammer is to have a securely wedged handle suited to the type of head used. The handle shall be smooth, without cracks or splinters, free of oil, shaped to fit the hand, and of the specified size and length. Employees shall be warned against using a steel hammer on hardened steel surfaces. Instead, a soft-head hammer or one with a plastic, wood, or rawhide head should be used. Safety goggles or safety glasses shall be worn to protect against flying chips, nails, or scale.



Riveting Hammers

- Riveting hammers, often used by sheet metal employees, must have the same kind of use and care as ball pen hammers and should be watched closely for cracked or chipped faces.



Carpenter's or Claw Hammers

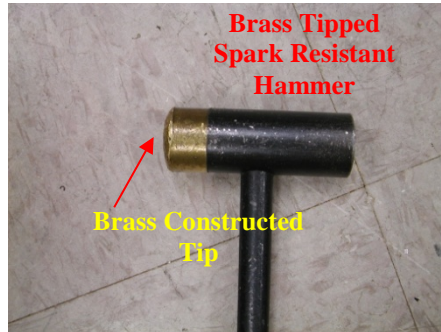
- The faces shall be kept well dressed at all times to reduce the hazard of flying nails while they are being started into a piece of wood.
- A checker-faced head is sometimes used to reduce this hazard.



****When nailing is being conducted in a work area, eye protection is advised to be used by all employees nailing and all employees working in the same area.**

Spark-Resistant Hand Tools

Around flammable substances, sparks produced by iron and steel hand tools can be a dangerous ignition source. Where this hazard exists, spark-resistant tools made from brass, plastic, aluminum, or wood will provide for safety.



POWER TOOL PRECAUTIONS ([OSHA 1926.302](#))

Power tools can be hazardous when improperly used. There are several types of power tools, based on the power source they use: electric, pneumatic, liquid fuel, hydraulic, and powder-actuated.

The following general precautions should be observed by power tool users:

- Never carry a tool by the cord or hose.
- Never yank the cord or the hose to disconnect it from the receptacle.
- Keep cords and hoses away from heat, oil, and sharp edges.
- Cords are required to be free of frays/cuts. If the cord is damaged, the equipment shall be removed from service immediately.
- Disconnect tools when not in use, before servicing, and when changing accessories such as blades, bits and cutters.
- All observers should be kept at a safe distance away from the work area.
- Secure work with clamps or a vise, freeing both hands to operate the tool.
- Avoid accidental starting. The employee should not hold a finger on the switch button while carrying a plugged-in tool.
- Tools should be maintained with care. They should be kept sharp and clean for the best performance. Follow instructions in the user's manual for lubricating and changing accessories.

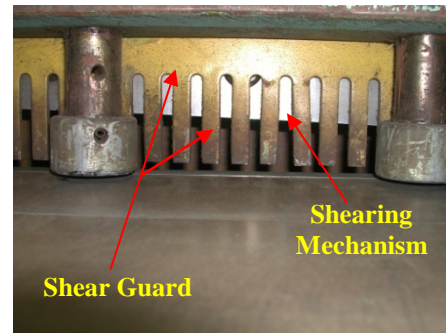
- Be sure to keep good footing and maintain good balance.
- The proper apparel should be worn. Loose clothing, ties, or jewelry can become caught in moving parts.

All portable electric tools that are damaged shall be removed from use and tagged "Do Not Use".

GUARDS ([OSHA 1910.243](#))

Hazardous moving parts of a power tool need to be safeguarded. For example, belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, or other reciprocating, rotating, or moving parts of equipment must be guarded if such parts are exposed to contact by employees. Guards, as necessary, should be provided to protect the operator and others from the following:

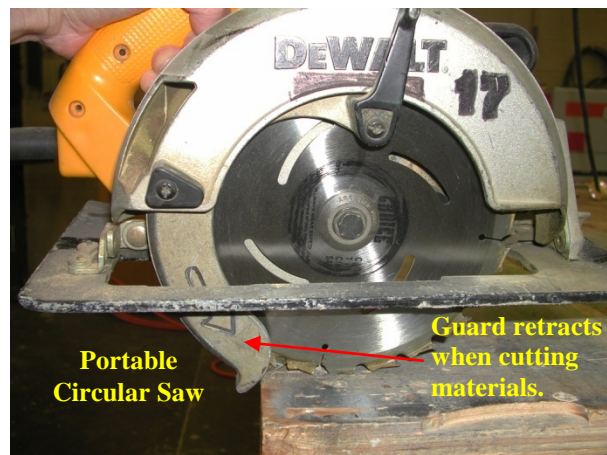
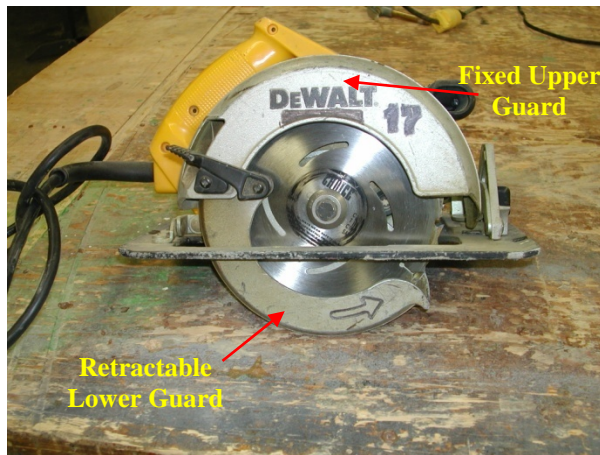
- point of operation,
- in-running nip points,
- rotating parts, and
- flying chips and sparks.



Safety guards shall never be removed when a tool is being used.

***See Machine Guarding section EHS Policy (GS 90) for further machine guarding information.**

Example with pictures to illustrate: A portable circular saws must be equipped with guards. An upper guard must cover the entire blade of the saw. A retractable lower guard must cover the teeth of the saw, except when it makes contact with the work material. The lower guard must automatically return to the covering position when the tool is withdrawn from the work.



SAFETY SWITCHES

The following tools are required to be equipped with a constant pressure switch or control that will shut off the power when the pressure is released if they do not have a positive accessory holding means:

- All hand-held powered circular saws having a blade diameter greater than 2 inches.
- Electric, hydraulic or pneumatic chain saws.
- Percussion tools.

****All hand-held gasoline powered chain saws shall be equipped with a constant pressure throttle control that will shut off the power to the saw chain when the pressure is released.**

The following tools are required to be equipped with a constant pressure switch or control, and may have a lock-on control provided that turnoff can be accomplished by a single motion of the same finger or fingers that turn it on:

- All hand-held powered drills.
- Tappers.
- Fastener drivers.
- Horizontal, vertical, and angle grinders with wheels greater than 2 inches in diameter.
- Disc sanders with discs greater than 2 inches in diameter.
- Belt sanders, reciprocating saws, saber, scroll, and jig saws with blade shanks greater than a nominal one-fourth inch (1/4").
- Other similarly operating powered tools shall.

Other hand-held powered tools such as circular saws having a blade diameter greater than 2 inches, chain saws, and percussion tools without positive accessory holding means must be equipped with a constant pressure switch that will shut off the power when the pressure is released.

ELECTRIC TOOLS

Employees using electric tools must be aware of several dangers. The most serious of these dangers is the possibility of electrocution.

Among the chief hazards of electric-powered tools are burns and slight shocks which can lead to serious injuries or even heart failure. Under certain conditions, even a small amount of current can result in fibrillation of the heart and eventual death. A shock also can cause the user to fall off a ladder or other elevated work surface.

To protect the user from shock, tools must have a three-wire cord with a ground prong and be grounded, double insulated, or powered by a low-voltage isolation transformer.

Three-wire cords: These cords contain two current-carrying conductors and a grounding conductor. One end of the grounding conductor connects to the tool's metal housing. The other end is grounded through a prong on the plug. Anytime an adapter is used to accommodate a two-hole receptacle, the adapter wire must be attached to a known ground. The third prong should never be removed from the plug.



Double insulation: This is a more convenient method. The user and the tools are protected in two ways: by normal insulation on the wires inside, and by a housing that cannot conduct electricity to the operator in the event of a malfunction.

The following general practices should be followed when using electric tools:

- Electric tools should be operated within their design limitations.
- Gloves and safety footwear are recommended during use of electric tools.
- When not in use, tools should be stored in a dry place.
- Electric tools should not be used in damp or wet locations.
- Work areas should be well lighted.
- Frayed cords are required to be taken out of service and replaced.
- Electric cords shall be inspected periodically and kept in good condition. Heavy-duty plugs that clamp to the cord should be used to prevent strain on the current-carrying parts, if the cord is accidentally pulled.
- Although no guards are available for drill bits, some protection is afforded if drill bits are carefully chosen for the work to be done, such as being no longer than necessary to do the work.
- Where the operator must guide the drill by hand, the drill is required to be equipped with a sleeve that fits over the drill bit. Oversized bits shall not be ground down to fit small electric drills; instead, an adapter should be used that will fit the large bit and provide extra power through a speed reduction gear; however this again is an indication of improper drill size. When drills are used, the pieces of work are to be clamped or anchored to prevent whipping.

- Electric saws are usually well guarded by the manufacturer, but employees must be trained to use the guard as intended. The guard should be checked frequently to be sure that it operates freely and encloses the teeth completely when it is cutting.
- Circular saws shall not be jammed or crowded into the work. The saw is to be started and stopped outside the work.

POWERED ABRASIVE WHEEL TOOLS

Powered abrasive grinding, cutting, polishing, and wire buffing wheels create special safety problems because they may throw off flying fragments.

Before an abrasive wheel is mounted, it should be inspected closely and sound- or ring-tested to be sure that it is free from cracks or defects. To test, wheels should be tapped gently with a light non-metallic instrument. If they sound cracked or dead, they could fly apart in operation and so must not be used. A sound and undamaged wheel will give a clear metallic tone or "ring."



To prevent the wheel from cracking, the user should be sure it fits freely on the spindle. The spindle nut must be tightened enough to hold the wheel in place, without distorting the flange. Follow the manufacturer's recommendations. Care must be taken to assure that the spindle wheel will not exceed the abrasive wheel specifications.

Due to the possibility of a wheel disintegrating (exploding) during start-up, the employee should never stand directly in front of the wheel as it accelerates to full operating speed.

Portable grinding tools need to be equipped with safety guards to protect employees not only from the moving wheel surface, but also from flying fragments in case of breakage.

In addition, when using a powered grinder:

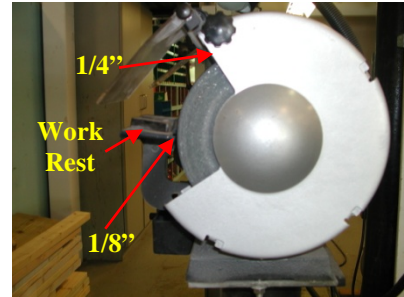
- Always use eye protection.
- Turn off the power when not in use.
- Never clamp a hand-held grinder in a vise.

ABRASIVE WHEEL USE:

- Floor stand and bench mounted abrasive wheels, used for external grinding shall be provided with safety guards (protection hoods). The maximum regular exposure of the grinding wheel periphery and sides shall be not more than 90 degrees except that, when work requires contact with the wheel below the horizontal plane of the spindle, the angular exposure shall not exceed 125 degrees.

****Safety guards shall be strong enough to withstand the effect of a bursting wheel.**

- Floor and bench-mounted grinders shall be provided with work rests which are rigidly supported and readily adjustable. Such work rests shall be kept at a distance not to exceed one-eighth inch (1/8") from the surface of the wheel.
- The top of the guard that covers the abrasive wheel should be no more than one-quarter inch (1/4") from the abrasive wheel.
- Cup type wheels used for external grinding shall be protected by either a revolving cup guard or a band type guard. All other portable abrasive wheels used for external grinding shall be provided with safety guards (protection hoods), except as follows:
 - When the work location makes it impossible, a wheel equipped with safety flanges shall be used.
 - When wheels 2 inches or less in diameter which are securely mounted on the end of a steel mandrel are used.
- Portable abrasive wheels used for internal grinding shall be provided with safety flanges (protection flanges) except as follows:
 - When wheels 2 inches or less in diameter which are securely mounted on the end of a steel mandrel are used.
 - If the wheel is entirely within the work being ground while in use.
- When safety guards are required, they shall be so mounted as to maintain proper alignment with the wheel, and the guard and its fastenings shall be of sufficient strength to retain fragments of the wheel in case of accidental breakage. The maximum angular exposure of the grinding wheel periphery and sides shall not exceed 180°.
- When safety flanges are required, they shall be used only with wheels designed to fit the flanges. Only safety flanges, of a type and design and properly assembled so as to ensure that the pieces of the wheel will be retained in case of accidental breakage, shall be used.
- All abrasive wheels shall be closely inspected and ring-tested before mounting to ensure that they are free from cracks and defects.
- Grinding wheels shall fit freely on the spindle and shall not be forced on. The spindle nut shall be tightened only enough to hold the wheel in place.
- All employees using abrasive wheels shall wear Personal Protective Equipment specified below:
 - Dust-type safety goggles or plastic face shields should be worn. If dust is created, a respirator the National Institute for Occupational Safety & Health (NIOSH) may be required.



SANDERS

- If a sander is used steadily, it should be dismantled periodically, as well as thoroughly cleaned every day by being blown out with low-pressure air. If compressed air is used the operator shall wear safety goggles or work with a transparent chip guard between his body and the air blast.
- Because wood dust presents a fire and explosion hazard, keep dust to a minimum; sanders can be equipped with a dust collection or vacuum bag. Electrical equipment shall be designed to minimize the explosion hazard. Fire extinguishers approved for Class C (electrical) fires should be available.

PNEUMATIC TOOLS

Pneumatic tools are powered by compressed air and include chippers, drills, nail/staple/screw 'guns', hammers, and sanders.

There are several dangers encountered in the use of pneumatic tools. The main one is the danger of getting hit by one of the tool's attachments or by some kind of fastener the employee is using with the tool.

Eye protection is required and face protection (i.e.: Face Shield) is recommended for employees working with pneumatic tools.

Noise is another hazard. Working with noisy tools such as jackhammers requires proper, effective use of hearing protection.

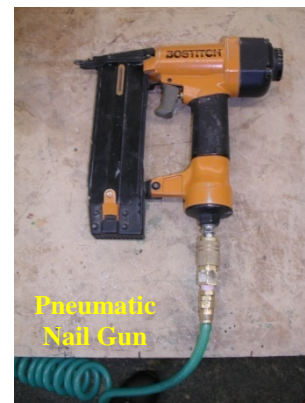
When using pneumatic tools, employees must check to see that they are fastened securely to the hose to prevent them from becoming disconnected. A short wire or positive locking device attaching the air hose to the tool will serve as an added safeguard.

A safety clip or retainer must be installed to prevent attachments, such as chisels on a chipping hammer, from being unintentionally shot from the barrel.

Screens must be set up to protect nearby employees from being struck by flying fragments around chippers, riveting guns, staplers, or air drills.

Compressed air guns should never be pointed toward anyone. Users should never "dead-end" it against themselves or anyone else.

- The operating trigger on portable hand-operated utilization equipment shall be so located as to minimize the possibility of its accidental operation and shall be arranged to close the air inlet valve automatically when the pressure of the operator's hand is removed.
- All pneumatically driven nailers, staplers, and other similar equipment provided with automatic fastener feed, which operate at more than 100 p.s.i. pressure at the tool shall



have a safety device on the muzzle to prevent the tool from ejecting fasteners, unless the muzzle is in contact with the work surface.

- Compressed air shall not be used for cleaning purposes except with an air blow gun limited to 30 p.s.i. static pressure at the outlet nozzle and then only with effective chip guard and personal protective equipment.
- The manufacturer's safe operating pressure for hoses, pipes, valves, filters, and other fitting shall not be exceeded.
- The use of hoses for hoisting or lowering tools shall not be permitted.
- All hoses exceeding 1/2-inch inside diameter shall have a safety device at the source of supply or branch line to reduce pressure in case of hose failure.
- Airless spray guns of the type which atomize paints and fluids at high pressures (1,000 pounds or more per square inch) shall be equipped with automatic or visible manual safety devices which will prevent pulling of the trigger to prevent release of the paint or fluid until the safety device is manually released.
- In lieu of the above, a diffuser net which will prevent high pressure, high velocity release, while the nozzle tip is removed, plus a nozzle tip guard which will prevent the tip from coming in contact with the operator, or other equivalent protection shall be provided.

FUEL POWERED TOOLS

- All fuel powered tools shall be stopped while being refueled, serviced, or maintained, and fuel shall be transported, handled, and stored in approved safety cans.
- Leakage or spillage of flammable or combustible liquids shall be disposed of promptly and safely.
- When fuel powered tools are used in enclosed spaces, the applicable requirement for concentrations of toxic gases and use of personal protective equipment shall apply.



Gas Powered Chop Saw

HYDRAULIC POWER TOOLS

- The fluid used in hydraulic powered tools shall be fire-resistant and shall retain its operating characteristics at the most extreme temperatures to which it will be exposed.
- The manufacturer's safe operating pressures for hoses, valves, pipes, filters, and other fittings shall not be exceeded.



Hydraulic Tube Benders

JACKS

All jacks - lever and ratchet jacks, screw jacks, and hydraulic jacks - must have a device that stops them from jacking up too high. Also, the manufacturer's load limit must be permanently marked in a prominent place on the jack and should not be exceeded.

A jack should never be used to support a lifted load. Once the load has been lifted, it must immediately be blocked up. Use wooden blocking under the base if necessary to make the jack level and secure. If the lift surface is metal, place a 1-inch-thick hardwood block or equivalent between it and the metal jack head to reduce the danger of slippage.

To set up a jack, make certain of the following:

- The base rests on a firm level surface.
- The jack is correctly centered.
- The jack head bears against a level surface.
- The lift force is applied evenly.

Proper maintenance of jacks is essential for safety. All jacks must be inspected before each use and lubricated regularly. If a jack is subjected to an abnormal load or shock, it should be thoroughly examined to make sure it has not been damaged. Hydraulic jacks exposed to freezing temperatures must be filled with adequate antifreeze liquid.



USE AND MAINTENANCE OF POWDER-ACTUATED TOOLS

****Powder Actuated Tools should not be used in an explosive or flammable atmosphere.**

- Only employees who have been trained in the operation of the particular tool in use shall be allowed to operate a powder actuated tool.
- 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.
- Any tool found not in proper working order or one that has developed a defect during use shall be removed from service immediately and not used until properly repaired.
- Adequate eye, head, face and/or personal protective equipment as necessitated by working conditions shall be utilized by the operators and persons working in the area.
- The tool shall be designed so that it cannot be fired unless it is equipped with a standard protective shield or guard or a special shield, guard, fixture, or jib.
- The firing mechanism shall be designed so that the tool cannot fire during loading or preparation to fire or if the tool is dropped while loaded. Firing of the tools shall be dependent upon at least two separate and distinct operations of the operator, with the final firing movement being separate from the operation of bringing the tool into the firing position.
- The tool shall be designed so as not to be operable other than against a work surface and unless the operator is holding the tool against the work surface with force at least 5 pounds greater than the weight of the tool.
- The tool shall be designed so that it will not operate when equipped with the standard guard indexed to the center position if any bearing surface of the guard is tilted more than 8 degrees from contact with the work surface.
- The tool shall be designed so that positive means of varying the power are available or can be made available to the operator as part of the tool or as an auxiliary, to facilitate selection of a power level adequate to perform the desired work without excessive force.
- The tool shall be designed so that all breeching parts will be reasonably visible to allow a check for any foreign matter that may be present.
- Tools shall not be loaded until just prior to the intended firing time. Neither loaded nor empty tools are to be pointed at any employees. Hands shall be kept clear of the open barrel end.



- Loaded tools shall not be left unattended.
- 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.
- 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 missile hazard on the other side.
- No fastener shall be driven into a spalled (cracked/deteriorated) area caused by an unsatisfactory fastening.
- Power-assisted and hammer-driven tools are used for the same purposes as powder-actuated tools and generally the same precautions are to be followed.
- If a powder-actuated tool misfires, the employee should wait at least 30 seconds, then try firing it again. If it still will not fire, the user should wait another 30 seconds so that the faulty cartridge is less likely to explode, than carefully remove the load. The bad cartridge should be placed in water.

ELECTRICAL WOODWORKING TOOLS

- All employees that use woodworking tools are required to done proper eye protection equipment. (i.e. - Safety Glasses, Face Shield, Safety Goggles).
- Disconnect Switches: All "fixed" power driven wood-working tools shall be provided with a disconnect switch that can either be locked or tagged in the "off" position.
- Self-feed: Automatic feeding devices shall be installed on machines whenever the nature of the work will permit. Feeder attachments shall have the feed rolls or other moving parts covered or guarded so as to protect the operator from hazardous points.
- Speeds: The operating speed shall be etched or otherwise permanently marked on all circular saws over 20 inches in diameter or operating at over 10,000 peripheral feet per minute. Any saw so marked shall not be operated at a speed other than that marked on the blade. When a marked saw is re-tensioned for a different speed, the marking shall be corrected to show the new speed.