
HAND, ELECTRIC AND PNEUMATIC PORTABLE TOOLS

A. Introduction

Hand and power tools are a common part of our everyday lives and are present in many city departments. These tools help us to easily perform tasks that otherwise would be difficult or impossible. However, these tools can be hazardous and have the potential for causing severe injury when used or maintained improperly. Special attention toward hand and power tool safety is necessary in order to reduce or eliminate these hazards.

B. General Safety Precautions

Five basic safety rules can help prevent hazards associated with the use of hand and power tools:

- Keep all tools in good condition with regular maintenance.
- Use the right tool for the job.
- Inspect tools for safe condition prior to use and do not use damaged tools.
- Operate all tools in accordance with the manufacturer's instructions.
- Most tools require the use of personal protective equipment (PPE). Ensure that you and employees nearby don the correct PPE for the job and tools being used.

Other Safety Precautions:

- Review the job for potential safety hazards and utilize appropriate precautions.
- Do not remove safety guards or operate tools without safety guards.
- Protect all tools from unnecessary damage especially during use and when stored.
- Utilize safe work practices to protect all employees working nearby.
- Any tool that is damaged or malfunctioning is to be immediately tagged and removed from service. Report all unsafe tools to your supervisor immediately.
- Tools shall be inspected at regular intervals and be repaired in accordance with the manufacturer's specifications.
- Compressed air shall not be used for cleaning purposes except where pressure is reduced to 30 psi and only when appropriate equipment, such as glasses with side shields are used.
- Employees who use hand and power tools and who are exposed to the resulting hazards such as particulates, mists, or vapors must utilize the respective personal protective equipment.

C. Hand Tools

Hand tools are tools that are powered manually. They include anything from axes to wrenches. The greatest hazards posed by hand tools result from misuse and improper maintenance.

Some examples:

- Using a screwdriver as a chisel may cause the tip of the screwdriver to break and fly, hitting the user or other employees.
- If a wooden handle on a tool such as a hammer or an axe is loose, splintered, or cracked, the head of the tool may fly off and strike the user or other employees.
- A wrench must not be used if its jaws are sprung, because it might slip.
- Impact tools such as chisels, wedges, or drift pins are unsafe if they have mushroomed heads. The heads might shatter on impact, sending sharp fragments flying.

Appropriate personal protective equipment, e.g., safety goggles, face shields, gloves, etc., should be worn due to hazards that may be encountered while using portable power tools and hand tools.

Floors shall be kept as clean & dry as possible to prevent accidental slips with or around hand tools.

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

D. Power Tools

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 when operating a power tool:

- Never carry a tool by the cord or hose.
- Never disconnect it from the receptacle by abruptly pulling on the cord.
- Keep cords and hoses away from heat, oil, and sharp edges.
- Disconnect tools when not in use, before servicing and when changing accessories such as blades, bits and cutters.
- Employees observing the work 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. Do not hold a finger on the switch button while carrying a tool that is plugged in.
- 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.
- Always keep good footing & maintain good balance while operating a powered hand tool.
- The proper apparel should be worn. Loose clothing, ties, or jewelry can become caught in moving parts.
- All damaged portable electric tools shall be removed from use and tagged "Do Not Use".

E. Guards

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.

Machine Guards, as necessary, must be provided to protect the operator and others from the following:

- Point of operation.
- In-running nip points.
- Rotating parts.
- Flying chips and sparks.

Safety guards must never be removed when a tool is being used. For example, 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 veering position when the tool is withdrawn from the work.

F. Electric Tools

Employees using electric tools must be aware of several hazards. Electrical shocks, which can lead to injuries such as heart failure and burns are among the major hazards associated with electrical powered tools. An electrical shock can also cause the user to fall off a ladder or other elevated work surface and be injured due to the fall.

To protect the user from shock and burns, electric tools must have a three wire cord with a ground and be plugged into a grounded receptacle, be double insulated, or be powered by a low voltage isolation transformer. Three wire cords contain two current carrying conductors and a grounding conductor. Any time an adapter is used to accommodate a two-hole receptacle the adapter wire must be attached to a known ground. The third prong must never be removed from the plug.

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

- Operate electric tools within their design limitations.
- Use gloves and appropriate safety footwear when using electric tools.
- Store electric tools in a dry place when not in use.
- Do not use electric tools in damp or wet locations unless they are specifically designed for that purpose.
- Keep work areas well lighted when using electric tools.
- Ensure that cords from electric tools do not present a tripping hazard.

G. 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 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 they 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 workers not only from the moving wheel surface, but also from flying fragments in case of breakage.

Power grinder safety precautions:

- Always use eye protection.
- Turn off the power when not in use.
- Never clamp a hand-held grinder in a vise.
- Never use a cutting wheel (1/8 inch or thinner) for grinding.

H. Pneumatic Tools

Pneumatic tools are powered by compressed air and include chippers, drills, 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 being used with the tool. Eye protection is required and face protection is recommended for employees working with pneumatic tools. Working with noisy tools, such as jackhammers, requires proper, effective use of hearing protection.

When using pneumatic tools, employees are to 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 must be used and 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 any nearby workers from being struck by flying fragments around chipper, 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.

I. Liquid Fuel Tool

Fuel powered tools are usually operated with gasoline. The most serious hazard associated with the use of fuel powered tools comes from fuel vapors that can burn or explode and also give off dangerous exhaust fumes. The employee must be careful to handle, transport and store gas or fuel only in approved flammable liquid containers, according to proper procedures for flammable liquids. **SMOKING IS NOT PERMITTED when using or refueling these types of tools.**

Before refilling a fuel-powered tool tank the user must shut down the engine and allow it to cool to prevent accidental ignition of hazardous vapors. When a fuel-powered tool is used inside of a closed area, effective ventilation and or proper respiratory protection (atmosphere supplying) must be utilized to avoid breathing carbon monoxide. Fire extinguishers must be available in the area.

J. Powder-Actuated Tools

Powder-actuated tools operate like a loaded gun and should be treated with the same respect and precautions. They are so dangerous that only specially trained employees are to operate them.

Powder-Actuated Tool Safety:

- These tools should not be used in an explosive or flammable atmosphere.
- Before using the tool, the worker should inspect it to determine that it is clean, that all moving parts operate freely, and that the barrel is free from obstructions.
- The tool should never be pointed at anybody.
- The tool should not be loaded unless it is to be used immediately. A loaded tool should not be left unattended, especially where it would be available to unauthorized persons.
- Hands should be kept clear of the barrel end. To prevent the tool from firing accidentally, two separate motions are required for firing: one to bring the tool into position, and another to pull the trigger. The tools must not be able to operate until they are pressed against the work surface with a force of at least five pounds greater than the total weight of the tool.
- Suitable eye and face protection is essential when using a powder-actuated tool.
- If a powder-actuated tool misfires, the employee should wait at least 30 seconds, and 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, and then carefully remove the load. The defective cartridge should be put in water.

- The muzzle end of the tool must have a protective shield or guard centered perpendicularly on the barrel to confine any flying fragments or particles that might otherwise create a hazard when the tool is fired. The tool must be designed so that it will not fire unless it has this kind of safety device.
- All powder-actuated tools must be designed for varying powder charges so that the user can select a powder level necessary to do the work without excessive force.
- If the tool develops a defect during use it should be tagged and taken out of service immediately until it is properly repaired.

Powder-Actuated Tool Fasteners

When using powder-actuated tools to apply fasteners, there are some precautions to consider. Fasteners must not be fired into material that would let them pass through to the other side. The fastener must not be driven into materials like brick or concrete any closer than 3 inches to an edge or corner. In steel, the fastener must not come any closer than one-half inch from a corner or edge. Fasteners must not be driven into very hard or brittle materials that might chip or splatter, or make the fastener ricochet. An alignment guide must be used when shooting a fastener into an existing hole. A fastener must not be driven into a spalled area caused by an unsatisfactory fastening.

K. Hydraulic Power Tools

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

L. Jacks

All jacks, including 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.