



What are air-power tools?

The use of portable tools involves many hazards, but air-operated tools present even more danger. Each type of air-power tool requires knowledge of specific operating instructions. Let's look at the general hazards that can occur when using air as power.

The air must be compressed, which involves hazards uncommon to any other power source. If properly designed and installed, the air compressor and air receiving tank should operate efficiently. However, proper maintenance is required to ensure continued safe operation.

How to care for an air compressor

Frequently inspect valves and governor controls on the compressor. Always disconnect the electric supply line to the motor before making any repair.

Never use an air tank without a pressure gauge and safety valve. Safe working pressure should be maintained according to the Ohio Boiler and Unfired Vessels Rules Chapters 4101:4-1 to 4101:4-17, published by the Ohio Board of Building Standards and the American Society of Mechanical Engineers' Code for Unfired Pressure Vehicles.

Never use household hot water tanks as air tanks. They are not designed to meet boiler specifications.

Every air tank should have a drain pipe and valve at the lower part of the tank. Accumulated oil and water should be removed frequently to prevent corrosion of the tank and to reduce the danger of explosion. Because corrosion weakens the tank, regularly inspect the inside.

Soapy water or other non-toxic, non-flammable solutions should be used to clean compressor cylinders, piping and receivers; never clean with gasoline, kerosene or other flammable solvents.

Explosion hazards

When lubricating a compressor, use oils with high flash points; do not use too much oil. Oil should be fed into the cylinder with a visible-flow, force-fed lubricator. Recommended quantities are:

- Small compressors — 1 to 4 drops per minute;
- Medium compressors — 6 drops per minute;
- Large compressors — 10 to 12 drops per minute.

Because the intense heat generated in an air cylinder tends to break down the lubricating oil, use only high-grade mineral oils, not vegetable or animal oils. Carbon deposits caused by oil decomposition can flash into flame or explode. Regular and frequent cleaning of cylinders and valves is recommended.

Keep air intake clean. Regularly remove and clean screens or other types of filters at the air intake. Do not allow explosive fumes or gases to enter the intake.

Cool cylinders reduce the chance of explosion or fire. Keeping the water jacket clean and scale-free requires careful inspection and periodic cleaning with a caustic solution. Carefully follow safety recommendations when handling caustic soda.

Cooler air at the intake results in cooler compressed air inside the tank. Reduced temperature in the compressor reduces the chance of explosion or fire.

Air-hose protection

The flexible air lines of portable air tools can cause tripping hazards. Keep air hoses away from traffic areas. If someone trips over a hose, the operator may drop the tool or fall. In addition, the hose may become weakened and hazardous to use if it is stepped on repeatedly or if it is run over by plant trucks and other equipment.

Some hose lines are shielded by metal or wire wrapping, which offer some protection against abuse. However, the metal wrapping can become dented, restricting the air flow and reducing the tool's efficiency.

If it is impossible to suspend the air line overhead, build a bridge of boards to protect the hose from traffic damage. An automatic hose reel can help take up slack in the line. Do not hang lines over nails, bolts or sharp edges, or place them near oil, hot surfaces or chemicals.

Repair hose line defects immediately. A sudden rupture of a line can cause serious injuries to employees nearby. A ruptured air line also may damage the air tank, increasing the chance of a fire or explosion. If the hose is connected improperly, it can become disconnected and whip around, injuring someone.

Frozen air line?

Safety valves should be located where they will not freeze. To thaw a frozen air line, use hot air or heat radiated from steam pipes. Never use a direct flame because if the flame is held in one place too long, it could damage the pipe, vaporize oil in the line, or if there is a leak in the line, set the oil mist afire.

To eliminate excess water in the air line and reduce the hazard of freezing in cold weather, install an aftercooler and moisture separator between the compressor and tank. Excess moisture in the air line can be detected by the discharge of water at the air tool exhaust.

Broken couplings

By using the following simple method, it's easy to keep accidentally disconnected lines from dangerously whipping about. Attach one end of a short length of chain to the tool housing and the other end to the hose.

Use safety shut-off valves so air flow can be cut off if the line breaks.

Ground air power tools

Before work begins, thoroughly check the working area for live electrical lines; all lines should be located and marked. If the air hose has a built-in braided ground wire attached to the tool and grounded at the compressor, this should protect the worker from shock if contact is made with an energized line.

When air tools are used in a potentially explosive atmosphere, spark-resistant, point-of-operation tools are a safety must. Always mark air hose and pipe lines to ensure workers do not mistake them for oxygen or acetylene lines. Gas-indicator tests and thorough ventilation are not complete safeguards.

Compressed air

Compressed air in the hands of a practical joker is deadly. Compressed air that enters the body can in some cases rupture the area, causing intense pain. A single burst of air can destroy an eye or burst an ear drum.

Never use compressed air to clean up a work area; it can send dust and chips flying. Do not use compressed air to dust off clothing or hair; compressed air for approved cleaning purposes will not exceed 30 psi. If compressed air is misused to dust off clothes or hair, particles may become embedded in the skin. Serious ear or eye injuries can easily result from this unsafe practice. As a safety measure, use key-locked valves to limit access to air power.

When air tools are not in use or when repairs are made, turn off the valve on the line feeding the tool and bleed the line.

Protective clothing

Air-power tool operators should avoid wearing loose clothing, ties and jewelry. The use of safety glasses, goggles, face shields, safety shoes, helmets, masks and respirators depend upon the job assignment. See personal safety recommendations for the specific type of tool. If the job location requires that a worker wear a safety belt, the air tool should have a means of support independent of the worker.

Operator fatigue

General fatigue can be reduced by counter balancing an air tool that is used repeatedly. Take care to avoid overbalancing the tool, requiring excess downward force to actuate.

Select and position the air tool to avoid flexing or twisting the wrist. The force needed to actuate each tool should be minimized.

If the line is temporary, a rope sling can be helpful. However, assembly line or bench work calls for permanent counterbalance devices.

Handling is safer with the manufacturer's recommended pressure.

Use the right tool

When in doubt about which tool to use for the job, consult the air-tool manufacturer, who considers every safety angle before making a recommendation.

Accidental operation

Accidental starting rarely occurs when the air tool's control trigger is inside the handle. If outside the handle, however, a device should be provided to reduce the danger of accidental starts. Without a guard, accidental pressure of any kind may set off the tool; this can even happen when the operator is carrying the tool.

Safety check list

Before starting an air-power tool:

- Check the tool for loose parts. Tighten if necessary;
- Check the air strainer in the tool. Clean if necessary;
- Lubricate the tool with a high-grade light machine oil. Place a few drops into the hose connection, unless an air line lubricator is being used. A few drops every hour are required if the tool is operated continuously.
- Check all fittings for proper connection;
- Be sure the control valve is in the closed position. An open valve can result in a whipping tool;
- Check air pressure at the tool retainer device.

Without it, the tool may be ejected with force, possibly causing injury or damage to property;

- Check equipment for the tool-retainer device. Without it, the tool may be ejected with force, possibly causing injury or damage to property;
- Check the provided guard equipment. Be sure it is properly installed;
- When changing tools, close the stop valve in the air-supply line. Never kink the hose to save steps or time.

Safe air-tool operators are efficient workers. These operators:

- Know their tools;
- Can recognize defects at a glance;
- Report all defective equipment;
- Do not improvise make-shift tools;
- Use the guards supplied by manufacturers;
- Know the danger of loose spindles in the bearings;
- Can spot signs of failure in drill steel;
- Check polishing and other wheels for balance before using them;
- Avoid using flammable or toxic solvents to clean tools;
- Seek and find the safe way to care for and work with air-power tools.

Safe handling of air-power, wheel-tool grinders

Grinders are high-speed tools. The correct-size wheel and proper mounting are vital for safety.

Check the maximum safety speed, which is indicated on the wheel and machine. Speed indicated on the wheel should be equal to or more than the spindle speed.

Always select the size of wheel that is indicated on the tool. Never use a wheel larger than the tool is designed to handle; a larger wheel could increase the surface speed so much that the wheel would fly in pieces.

Check air pressure from time to time. Excessive pressure is dangerous. Insufficient pressure creates flat spots on the wheel which eventually lead to wheel breakage.

Only experienced workers who are familiar with sound-testing wheels of various materials, correct choice of flanges and safe wheel speeds should mount abrasive wheels.

Grinder wheels should be guarded so just enough of the wheel is exposed to do an efficient job. The guard should easily adjust so the worker will adjust it, rather than remove it. If the guard must be removed to perform a job, use large wheel flanges (refer to Ohio Code, 4121:1-5).

Do not begin grinding on a newly mounted wheel until one minute after it reaches maximum speed. For safety, the operator should stand to one side in case the wheel is defective.

Oil and water can throw a wheel out of balance. Keep extra wheels in storage racks, where they are protected from contact with other wheels, objects and fluids. Never leave wheels on the floor.

For example, if grinding must be done on the side of a straight wheel, when cleaning grooves, be careful of wheel cramping caused by dangerous side pressures.

A wheel that is too hard has less economy and wheel life than a softer wheel, which increases safety even though it cuts more slowly.

Constant-contact pressure switches and guarding the switch against accidental contact are required.

Buffers and sanders

If used by a careless or untrained operator, painful skin burns can result. Work movement should be directed away from the operator.

Sanders

Frequent, if not daily cleaning is required because of the heavy dust involved with sanding operations. Use a brush to clean sander parts. Low pressure air can be used if proper protection is provided for the operator and nearby workers.

Wood sanding involves many fire hazards. Adequate ventilation, dust-collecting equipment or a vacuum bag are essential. Fire extinguishers for class "A" fires should be available and workers should be trained to use them.

Personal protection recommendations

Grinding-wheel operators should use goggles or face shields, and knee-length canvas or leather aprons.

The safety requirements for operators of sanders and buffers include dust-type goggles or plastic-face shields, and if harmful dusts are present, approved respirators.

Loose or frayed clothing is hazardous for operators of any revolving tool because it can catch in the wheel. Clothing stained with oil or any flammable solvent is also dangerous; sparks from the wheel can ignite it.

Safe handling of air power torsion tools

The main causes of injuries to operators of torsion tools are:

- Contact with the tool;
- Breakage of the tool;
- Chips striking the eyes.

Drills

Air drills vary in size, capacity and speed. They require alert handling because of the usual high operating speed. The throttle valve gives the operator some control of speed and power. Guards for drills, in most cases, are impractical. As an alternative, the operator should be thoroughly trained in the proper operation of this tool. In addition, the operator should review these safe working rules periodically.

Some protection against injury from broken drills is offered by a sleeve that fits over the drill which also serves as a limit stop. Chuck guards help keep clothing from catching. Using drill bits no longer than the job demands is also a good safety practice.

When drilling holes that are deeper than the fluted drill, keep chips cleaned out of flutes to prevent jamming or breaking. Breakage occurs more often when the tool is dull. Small drills tend to break more often than larger drills. Larger drills tend to heat up causing them to jam and break.

If a bit jams in a hole, the operator can be thrown off balance and injured. If footing is lost, the sudden jerk could cause a broken arm; if control of the tool

is lost, the sudden jerk could cause a broken arm or the handle may strike the operator.

Jamming also is caused by improperly ground bits—those with one flute longer or deeper than the other. Feeding the tool too fast and tipping it, instead of keeping it perpendicular to the surface also are hazardous practices.

When using a larger portable drill or reamer, two operators are safer than one. Never use a length of pipe to hold the control valve down. If the operators lose control of the tool, the damage and injuries could be disastrous. The hand-control valve is designed for safety. As soon as the handle is released, whether accidentally or on purpose, the tool action ceases.

Screwdrivers, nut setters, wrenches

The type of job determines the correct tool choice. Tool manufacturers will help match the proper tool to the job. A good fit between bit or socket and tool results in fewer accidents and better tool performance.

Personal safety recommendations

Never wear loose clothing when operating a torsion tool. When operating a drill or reamer, put on eye and face protection before starting the tool in case a chip is lodged in the drill's flutes.

Safe handling of air power impact tool

Pneumatic-impact, tool safety demands the use of two indispensable devices.

The first is the control-valve trigger located inside the handle, which minimizes the possibility of accidental operation and ensures the tool will stop when the operator releases the trigger.

The second is the tool retainer. Without this device, the air hammer or rivet set could become a deadly weapon. The air piston would project the tool-like shot. Even when equipped with the retainer, never point an impact tool at anyone.

Several types of safety tool retainers are used today — knurled screw-on collar, spring clip, spring-insert lock and heavy, steel-tension spring (one end snaps into a notch on the hammer barrel, the other grips a shoulder on the hammer head).

Regularly tighten bolts on the housing of pneumatic tools. Loose bolts can cause injuries, poor tool performance and damage to the tool mechanism.

Physical repercussions

Prolonged work with air-power tools may cause the worker physical discomfort and sometimes even physical disability. Those who work constantly with heavier tools may experience injury to wrists and elbow joints.

Working with tools that stroke or rotate rapidly, or with tools that are poorly designed or poorly positioned, may result in impaired circulation and pain in the fingers, especially in cold weather. The most common ailment of this kind is known as vibration white finger (Raynaud's disease).

Preventive measures include the use of sponge rubber and cork holders. Bicycle grips on tool handles produce good results.

How to prevent steel breakage

Steel breakage is dangerous. Equipment may end up on the legs or feet of the operator or the operator may be caught off balance and fall. These suggestions can help prevent air hammer breakage:

- Keep hammer and chuck bushings in good condition. Replace excessively worn parts;
- Before exerting undue leverage on any tool, cut off the air supply;
- Keep the tool sharp. Dull tools can cause strain on the steel and premature breakage;
- Before using tools in extremely cold weather, warm them slightly. Hardened steel loses 80 percent of its normal shock resistance at zero degrees Fahrenheit.

Jackhammers

These hand-held, self-rotating drills are sometimes referred to as sinkers.

Thick, rubber-handle grips, which lessen operator fatigue during use, should be standard equipment. To prevent jumping of the drill, collaring of holes should be standard equipment and performed at low speed.

Operators should never guide drills with their feet. They should stand back from the drill in case the drills break or hit a steel-reinforcing rod. If the hazards of silica dust exist, use wet drilling or a portable dust collecting system. When equipment is moved over rough or slippery surfaces, or over abrupt grade changes, workers should watch where they are walking and secure equipment properly to prevent falls and strains.

Special adaptations of the rock drill are used for horizontal and overhead drilling. These are designed to reduce operator fatigue and work hazards.

Riveting gun

Whether the job calls for small cold-steel rivets or the large hot-steel type (up to 1 1/2-inch diameter), heavy riveting guns are efficient tools. Rivet set retainers of clip, spring or collar design are absolutely essential for safe operating of the riveting gun.

Chipping hammers

The lighter tools in this classification are known as scalers, caulking and beading tools. Operators who are using chippers should not work near each other. They should have sufficient working space. Use portable shields to protect others from flying chips. Eye and ear protection are necessary when using this equipment.

Rivet busters or chisels

The rivet buster is either a shearing or cutting chisel. Backing-out chisels are available to push out tight rivets after the heads are off. Always use chisel retainers, usually the collar type. Ample and secure footing is important, especially when working above ground level. This is because the operator may be thrown off balance by the sudden shearing of the rivet.

Tampers

Used to compact excavations or backfill, pneumatic tampers have an up-and-down action that can be hazardous. Operators should keep their feet a comfortable distance from the tampers. They should hold their heads to one-side, out of the way of the tamper action. Operating tampers also can cause strained arms and backs.

When moving heavy, triple-butt tampers (three single tampers specially mounted), use mechanical devices to obtain sufficient help. These triple tools have two handles, which are similar to bicycle handle bars. The handle bars place the operator away from the tamping action in a safer, more comfortable position and also reduce the possibility of strains or injuries.

Personal safety recommendations

Pneumatic hammer and tamper operators should always wear safety shoes. All safety shoes should meet ANSI Z.41 requirements.

Rivet busters should use cup-type goggles and safety shoes. Operators of chippers, riveting guns and air drills should wear goggles; shields should be used to protect individuals nearby.

Safe handling of air-power, circular saws

Pneumatic circular saws, depending upon the blade or cut-off disc, can be used to cut wood, plastic and composition materials, aluminum, sheet metal, steel, cast iron, nonferrous metals, asbestos cement sheets, brick, cement and concrete. No matter what material is being cut, follow these general safety precautions:

- Check for proper air pressure at the saw. Less than 90 psi causes a power loss; more than 100 psi causes excessive wear on moving parts.
- Be sure there is a sufficient volume of air for maximum power. Check the tool's instruction sheet for the required cubic feet of air per minute.
- Make sure the guard is in working order and covering the portion of the blade that is not cutting. Do not clamp the guard in the open position, except for pocket cuts.

- When making the cut, line up the blade with the line of the cut. Start the saw outside the work, then guide it through. Let the blade speed do the job; do not jam or crowd it. Turn the saw off outside the work.
- Do not shut off the saw before work is completed. A diminishing speed tends to damage the work. If it is necessary to stop before completing a cut, be sure to grip the saw firmly. Do not continue work until the blade regains full momentum.
- Before attempting to change a blade, be sure the trigger switch is in the locked position, shut off the air line and bleed the line. When replacing a blade, teeth must point in the direction of the rotation.
- Use only sharp blades. Dull blades affect the quality of the job, waste materials and increase the time needed to complete the job. A good tool makes a safer worker.

Personal safety recommendations

Never wear loose clothing when operating a circular saw. Keep your body out of the line of the cut as much as possible. Eye protection should be worn at all times.