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SAFETY POLICY & PROCEDURE

Hand and Portable Power Tools

SPP#1910.241

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SAFETY POLICY & PROCEDURE

1.0 Purpose

The purpose of this safety policy and procedure is to establish guidelines and accountability for hand and portable power tools used by North Carolina Department of Transportation (NCDOT) employees.

2.0 Scope and Applicability

Hand and power tools improve employee efficiency in job performance. The safety objective with these tools is to protect users from inflicting harm on themselves and others. Although it is generally assumed that anyone knows how to use common hand tools, hand tool accidents contribute significantly to NCDOT's compensable disabling injuries. Proper selection, use, care, and supervision of hand and portable power tools can prevent abuse of these tools and eliminate or reduce employee injuries.

This safety policy and procedure provides guidelines for the use of hand and portable power tools. It includes provisions for training and lists the general requirements for all tools. Additionally, it presents specifics on hand tool use, types of portable power tools, and the hazard controls for portable power tools. This document also provides the general requirements for Personal Protective Equipment and tool storage.

This safety policy and procedure also details the areas of responsibility for managers/unit heads, supervisors, employees, Safety and Risk Management, and Central Equipment Unit within NCDOT and applies to all NCDOT employees who work with hand and portable power tools.

3.0 Reference

This safety policy and procedure is established in accordance with Occupational Safety and Health Standards for General Industry (29 CFR 1910.241-244) and Occupational Safety and Health Standards for Construction Industry (29 CFR 1926.300-305).

4.0 Policy

It is the policy of NCDOT to provide a place of employment that is free from recognized hazards that cause or are likely to cause death or serious physical harm to employees or the public. Therefore, hand and portable power tools will not be used until employees receive training in the proper use of these tools. When hazards exist that cannot be eliminated, then engineering practices, administrative practices, safe work practices, Personal Protective Equipment (PPE), and proper training regarding Hand and Portable Power Tools will be implemented. These measures will be implemented to minimize those hazards to ensure the safety of employees and the public.

5.0 General Responsibilities

It is the responsibility of each manager/unit head, supervisor, and employee to ensure implementation of NCDOT's safety policy and procedure on Hand and Portable Power Tools. It is also the responsibility of each NCDOT employee to report immediately any unsafe act or condition to his or her supervisor. Specific responsibilities are found in Section 6.3.

6.0 Procedure

This section provides applicable definitions, establishes general provisions, and identifies specific responsibilities.

6.1 Definitions

Hand Tools

Tools that are manually operated and powered by human force such as screw drivers, pliers, wrenches, and cutting shears, etc.

Pneumatic Tools

Tools that are powered by air such as air wrenches, air grinders, spray guns, and air fasteners.

Power Tools

Tools that are manually operated and powered by electricity, air, gasoline, diesel, or explosives.

UL Approved

Tools approved by Underwriters' Laboratory.

6.2 General Provisions

This section details the provisions of this safety policy and procedure with each provision discussed in a separate subsection. These provisions are:

- Training
- General Requirements for All Tools
- Use of Hand Tools
- Portable Power Tools
- Personal Protective Equipment
- Storage

6.2.1 Training

An effective tool use program should include training in safe work practices to reduce tool injuries and control accidents. For hand tools, employees should be trained in:

- Selecting the right tool for the job
- Knowing the hazards of the tool
- Using tools correctly
- Having a regular tool inspection procedure
- Maintaining tools
- Storing tools properly

Employees who use portable power tools shall be trained in:

- Selecting the right tool for the job
- Knowing the hazards of the tool
- Disconnecting the power before changing accessories

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- Following manufacturer's operating and inspection rules
- Having guards in place
- Maintaining tools
- Storing tools properly

This training shall be performed upon initial employment and/or job reassignment. Periodic refresher training shall also be conducted at the discretion of the supervisor.

6.2.2 General Requirement for All Tools

All hand and portable power tools supplied by NCDOT or employees of NCDOT will be maintained in safe working order.

Hand tools shall be inspected regularly and before using. Tools or handles that are cracked, broken, or deformed shall be removed from service. Impact tools such as wedges, pins, and chisels shall be kept free of mushroomed heads.

Portable power tools shall be inspected regularly and before using. Tools with missing or broken guards, nicked or frayed electrical cords, broken plugs, broken switches, damaged equipment housing, or missing or broken tool retainer shall not be used and shall be tagged and removed from service.

6.2.3 Use of Hand Tools

Figure 1 illustrates some of the many hand tools that are used in NCDOT. Misuse of common hand tools such as screwdrivers, hammers, punches, cutting tools, tap and die tools, saws, files, hands snips and cutters, wood chisels, axes, hatchets, knives, shovels, and rakes is a source of many injuries. Supervisors may mistakenly assume that everyone knows the proper use of common hand tools.

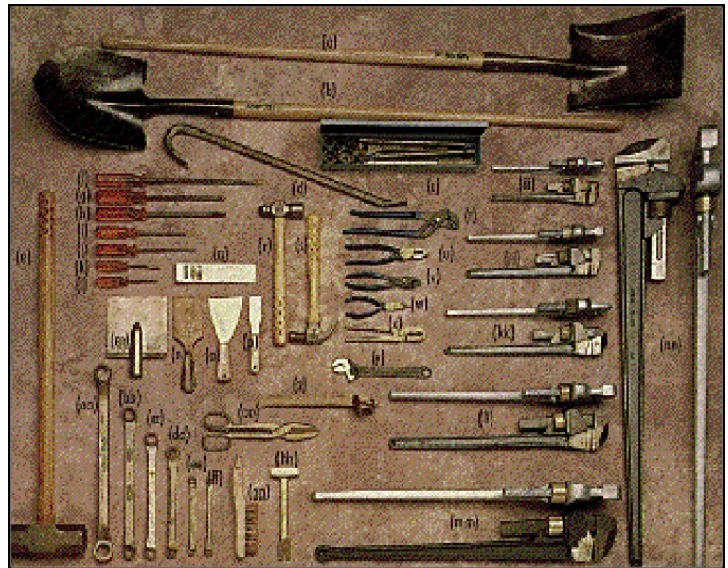


Figure 1

Figure 2 illustrates floor jack stands and hydraulic floor jack which must be inspected prior to use with periodic inspection documented every 6 months.



Figure 2

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Appendix A presents specific **safe work practices** for hand tools in the following major hand tool categories:

- Metal-Cutting Hand Tools
- Wood-Cutting Tools
- Miscellaneous Cutting Tools
- Torsion Tools
- Shock Tools
- Spark-Resistant Tools

Tool safeguards are generally accomplished through a number of safety features found on tools. Safety features such as tool guards and handle design can help prevent injuries.

Figure 2 presents a handle design tool safeguard feature.

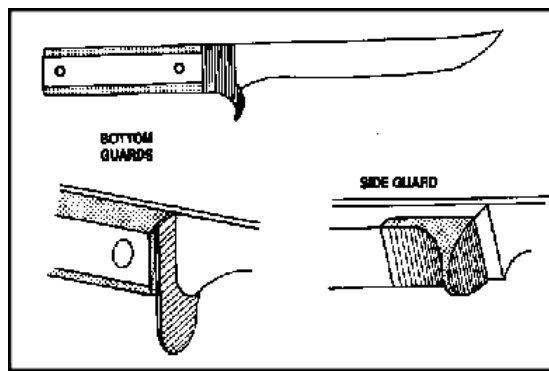


Figure 2

6.2.4 Types of Portable Power Tools

Portable power tools are divided into 3 primary groups according to the power source:

- Electrical
- Air-Powered
- Special Powered

Electrical tools in NCDOT include drills, circular saws, reciprocating saws, miter-box and shop saws, stationary band saws, jig/saber saws, rotary die grinders, soldering irons, percussion tools, grinding wheels, buffers, wire brushes, sanders, and routers. Employees must recognize and protect themselves from shock, noise, cuts, burns, and other potential hazards by using proper guards and safety equipment and devices.

Air-powered tools include air hoses, grinders, and pneumatic-impact tools.

Workers should ensure hoses do not present a tripping hazard and prevent accidental disconnection of hoses from the tools. Air-powered grinders require the same type of guarding as electrical grinders.

Compressed air used for cleaning shall utilize an air blow-off gun restricting air pressure to less than 30 PSI. Figure 1 shows a compressed air nozzle gun for cleaning which restricts air pressure below 30 PSI.



Figure 1

Pneumatic-impact tools (nailers, drills, impact wrenches, staplers, jackhammers, etc.) require two safety devices: an automatically closing valve and a retaining device to hold the tool in place to prevent it from being fired accidentally. Additionally, employees must check noise levels to determine if hearing protection is needed and guard their eyes against flying debris.

Special powered tools include hydraulic, gasoline-powered, and powder-actuated equipment. Hydraulic tools cause injuries because high pressure leaks or ruptures in hoses may force oil under the skin of employees' hands or arms.

Gasoline-powered tools are commonly used in logging and construction activities. The chain saw is a common gasoline-powered tool in NCDOT. Mowers, trimmers, and other various gasoline-powered tools are also used in NCDOT.

Powder-actuated tools are commonly used for fastening fixtures and materials to metal, precast or prestressed concrete, masonry block, brick, stone, and wood surfaces. Blank cartridges provide the energy and are ignited by a percussion primer.

Gasoline-powered and powder-actuated tools present serious hazards and must be operated only by trained personnel and adequately guarded to prevent fires and injuries. Similar precautions are used for impact wrenches as for any electrical or hydraulic equipment.

6.2.5 Hazard Control for Portable Power Tools

Portable power tools are designed for particular tasks and if used for other purposes other hazards may be created. Additionally, the extreme mobility of these tools and their power sources creates significant hazards.

Therefore, controls should be in place to minimize or eliminate the hazards associated with portable power tools. The commonly used controls on portable power tools include:

- Start switch lockouts
- Interlocks
- Dead man switches
- Vibration minimization (as applicable)
- Tool guards
- Safeguarding energy sources

Start switch lockouts prevent inadvertent operation. A tool cannot operate until a keyed switch selects the operating mode.

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Interlocks on tools protect operators and others. For example, a riding mower has a switch under the operator's seat that shuts off the blades or engine when the operator stands up.

Dead man switches shut off power to the tool when the switch is released. Drills, saws, mowers, hedge trimmers, and other portable power tools have these controls.

Vibration minimization is usually a tool design function. If extreme vibration of the tool is a problem to the employee, using isolation pads within the machine or between the handles and operator may be an option.

Tool guards should be provided where possible. Tools such as circular saws, belt sanders, and abrasive wheel grinders should be equipped with guards that effectively prevent the hands and fingers of the operator from coming into contact with blades and nip points.

Guarding may not be possible on some equipment such as chain saws. In those cases, other safety features should be in place (e.g., blade brake, anti-kickback design, etc.).

Safeguarding energy sources must be practiced with all the power tools. Electrical safeguards, controls for handling gasoline and other flammable liquids, and controls for air and fluids under pressure must all be in place.

Appendix B details selected portable power tools safe practices. These practices include hazard control techniques and should be followed by employees who use these types of tools.

6.2.6 Personal Protective Equipment

Employees using hand and power tools are to be provided with Personal Protective Equipment (PPE) when exposed to falling, flying, abrasive and splashing objects, or harmful dusts, fumes, vapors, or gases.

The PPE should be matched against the particular hazard to provide the required level of protection. See [SPP # 1910.132, Personal Protective Equipment](#), for details on matching PPE against the particular hazard.

6.2.7 Storage

Hand and portable power tools shall be stored on racks, tool cribs, or bins. Tools shall be stored in such a manner that sharp edges do not protrude out of tool cribs or bins or damage other tools. Each day, tool storage areas should be locked with a complete audit of all tools.

Special tools may require unusual storage. See manufacturer's instructions for those requirements. For example, powder-actuated hand tools should be stored under lock and key.

6.3 Specific Responsibilities

6.3.1 Managers/Unit Heads

Managers/Unit Heads will identify the employees affected by this safety policy and procedure. Managers/Unit Heads will obtain and coordinate the required training for the affected employees. Managers/Unit Heads will also ensure compliance with this safety policy and procedure through their auditing process.

Managers/Unit Heads will ensure that hand and portable power tools are being inspected by supervisors.

6.3.2 Supervisors

Supervisors will ensure that only trained employees operate and use hand and portable power tools.

Supervisors will inspect hand and portable power tools during Facility and Jobsite Audits as well as observe the storage and use of such tools by employees.

Supervisors will enforce the use of PPE while employees operate hand and portable power tools.

Supervisors will ensure that guards and switches on portable power tools are in place and functioning.

Supervisors will ensure that portable power tools are used and maintained in accordance with this safety policy and procedure.

Supervisors will communicate to managers/unit heads hand and portable power tool needs such as storage facilities and bins, upgrading, replacement parts, and new tools.

6.3.3 Employees

Employees shall inspect all tools prior to their use and shall report any broken or damaged tools to their supervisors.

Employees shall not operate any hand and portable power tool unless they have been trained on that specific tool.

Employees shall wear all required PPE when using tools.

6.3.4 Safety and Risk Management

Safety and Risk Management will provide prompt assistance to managers/unit heads, supervisors, or others as necessary on any matter concerning this safety policy and procedure. Safety and Loss Control will assist in developing or securing required training. Safety and Risk Management will work with Purchasing and Central Equipment Unit to ensure that all newly purchased hand and portable power tools comply with this safety policy and procedure and current safety regulations.

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Additionally, Safety Engineers will provide consultative and audit assistance to ensure effective implementation of this safety policy and procedure.

6.3.5 Central Inventory Unit

Central Inventory Unit or State Contract Supplier shall ensure that the required guards, switches, and warning labels are specified during equipment purchases.

Appendix A: Selected Hand Tools Safe Work Practices

Metal-Cutting Hand Tools

Chisels

- Factors determining the selection of a cold chisel 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 large enough only for the job 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 shall wear safety goggles when using a chisel and should set up a shield or screen to prevent injury to other workers from flying chips. If a shield does not afford positive protection to all exposed employees, then glasses with side protection should be worn.

Tap and Die Work

Tap and die work requires certain precautions. The work should be firmly mounted in the 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

- Hack saws 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. Inasmuch as the extremely hard and brittle steel of the file chips easily, the file should never be cleaned by being struck against a vise or other metal object. A file-cleaning card or brush should be used.
- For the same reason, a file is not to be hammered or used as a pry. Such abuse frequently results in the file's 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.

Appendix A: Selected Hand Tools Safe Work Practices (Continued 2)

A file is never to be used without a smooth, crack-free handle; if the file should bind, 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 3 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 Snips

- Tin snips should be heavy enough to cut the material so easily that the worker 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 shall wear safety goggles when trimming corners or slivers of metal because small particles often fly with considerable force. They shall always wear gloves.

Cutters

- Cutters used on wire, reinforcing rods, or bolts should have ample capacity for the stock; otherwise, the jaws may be sprung or spread. Also, a chip may fly from the cutting edge and injure the user.
- Cutters require frequent lubrication. 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 Tools

Edge 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, edge 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 in dry wood. Saws are to be kept sharp and well set to prevent binding.

Appendix A: Selected Hand Tools Safe Work Practices (Continued 3)

Axes

- An ax person is to make sure that there is a clear circle in which to swing the ax before starting to chop. Also, all vines, brush, and shrubbery within the range should be removed, especially overhead vines that may catch or deflect the ax.
- Ax blades shall be protected with a sheath or metal guard wherever possible. When the blade cannot be guarded, it is safer to carry the ax at one's side. The blade on a single-edged ax 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, employees shall take special care to prevent injury to themselves and other workers. Using a hatchet to drive nails is prohibited.

Miscellaneous Cutting Tools

Planes, Scrapers, Bits, and Drawknives

- Planes, scrapers, bits, and drawknives 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 the 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. Adequate guarding is important.
- Employees who must carry knives with them on the job shall keep them in sheaths or holders. Never carry a sheath knife on the front part of a belt - always 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 must never be left lying on benches or in other places where they may cause hand injuries. Safe placement and storage of knives is important to knife safety.
- Supervisors must ensure that employees who handle knives have ample room in which to work so they are not in danger of being bumped by other workers.
- Supervisors should be particularly careful about the hazard of employees leaving knives hidden under a product, under scrap paper or wiping rags, or among other tools in work boxes or drawers. Knives are to be kept separate from other tools to protect the cutting edge of the knife as well as to protect the employee.
- Horseplay shall be prohibited around knife operations. Throwing, "fencing," trying to cut objects into smaller and smaller pieces, and similar practices are not only dangerous but reflect inadequate supervision.
- Supervisors shall ensure 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

Socket wrenches are safer to use than adjustable or open-end wrenches.

Appendix A: Selected Hand Tools Safe Work Practices (Continued 4)

Open-End or Box Wrenches

Open-end or box wrenches shall be inspected to make sure that they fit properly and are never to be used if jaws are sprung or cracked. When defective they shall be taken out of service until repaired.

Socket 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. They are not intended, however, 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. If it is cracked, the wrench shall be taken out of service. A cracked nut may break under strain, causing complete failure of the wrench and possible injury to the user.
- A piece of pipe "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. Also, a pipe wrench, when used on nuts and bolts, damages their heads. 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, the electricians 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

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. They should use larger tongs.

Screwdrivers

- The practice of using screwdrivers for punches, wedges, pinch bars, or pries shall not be allowed.

Appendix A: Selected Hand Tools Safe Work Practices (Continued 4)

- Cross-slot (Phillips-head) screwdrivers are safer than the square bit type, because they have less tendency to slip. The tip must be kept clean and sharp, however, to permit a good grip on the head of the screw.
- 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 workers, 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.
- Eye protection is required for all nailers and all employees working in the same area.

Spark-Resistant Tools

- Spark-resistant tools of nonferrous materials are sometimes advised for use where flammable gases, highly volatile liquids, and explosive materials are stored or used. The intensified sparks from steel tools are capable of igniting substances such as gunpowder, lint, TNT, carbon disulfide, and ethyl ether.
- In certain circumstances, steel coated with aluminum paint can emit sparks when struck with a metal striker (steel, brass, or spark-resistant alloys) and such sparks may ignite mixtures of flammable gases or vapors in air.
- Nonferrous tools reduce the hazard from sparking but do not eliminate it. They must be inspected before each use to be certain that they have not picked up foreign particles which could produce friction sparks.

Appendix B: Portable Power Equipment Safe Work Practices

Electric Tools

- Insulating platforms, rubber mats, and rubber gloves provide an additional factor of safety when tools are used in wet locations, such as in tanks, in boilers, and on floors.
- Only tools in good repair and listed by Underwriters' Laboratories shall be used.
- Protection from electric shock while using portable power tools has been described as depending upon third wire protective grounding. "Double insulated" tools provide more reliable shock protection without third wire grounding. Tools in this category are permanently marked by the words "double insulation" or "double insulated."
 - Double insulated or all-insulated tools do not require separate ground connections; the third wire or ground wire is to be used wherever it is supplied as indicated to be part of the tool's electrical connection.
 - Failure of insulation is harder to detect than worn or broken external wiring. This illustrates the need for frequent inspection and thorough maintenance. Care in handling the tool and frequent cleaning will help prevent the wear and tear that cause defects.
- Double insulated tools shall not be operated on wet surfaces.
- All electric power tools shall be effectively grounded except the double insulated and cordless types.
- 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.
- 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 not cutting and encloses the unused portion of the blade 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.

Appendix B: Portable Power Equipment Safe Work Practices (Continued 2)

Abrasive Wheels and Tools

- All grinding machines shall be supplied with sufficient power to maintain the spindle speed at safe levels under all conditions of normal operation.
- Grinding machines must be equipped with safety guards in conformance with the requirements of American National Standards Institute, B7.1, Safety Code, for the use, care, and protection of abrasive wheels.
- 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.
 - 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 1/8 inch from the surface of the wheel.
 - Tongue guards at the top of the wheel shall be kept at a distance not to exceed ¼" to contain piece of the wheel in event it breaks apart.
- 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 degrees.
- 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 into place. The spindle nut shall be tightened only enough to hold the wheel in place.
- All employees using abrasive wheels shall be protected by eye protection equipment.

Appendix B: Portable Power Equipment Safe Work Practices (Continued 3)

Pneumatic Power Tools

- 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.
- Pneumatic power tools shall be secured to the hose or whip by some positive means to prevent the tools from becoming accidentally disconnected.
- Safety clips or retainers shall be securely installed and maintained on pneumatic impact (percussion) tools to prevent attachments from being accidentally expelled.
- All pneumatically driven nailers, staplers, and other similar equipment provided with automatic fastener feed, which operate at more than 100 psi 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 less than 30 psi. static pressure at the outlet nozzle and the use of proper eye protection.
- The manufacturer's safe operating pressure for hoses, pipes, valves, filters, and other fittings 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 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 into contact with the operator, or other equivalent protection shall be provided.

Gasoline-Powered Tools

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

Appendix B: Portable Power Equipment Safe Work Practices (Continued 3)

Hydraulic-Powered 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.

Powdered-Actuated Tools

- 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 PPE 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 a force at least five 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 eight 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.

Appendix B: Portable Power Equipment Safe Work Practices (Continued 4)

- 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 area caused by an unsatisfactory fastening.
- Power-assisted, hammer-driven tools are used for the same purposes as powder-actuated tools and generally the same precautions are to be followed.

Woodworking Tools

- All employees using woodworking tools shall be protected by eye protection equipment.

All portable, power-driven circular saws shall be equipped with guards above and below the base plate or shoe. The upper guard shall cover the saw to the depth of the teeth, except for the minimum arc required to permit the base to be tilted for beveled cuts. The lower guard shall cover the saw to the depth of the teeth, except for the minimum arc required to allow proper retraction and contact with the work. When the tool is withdrawn from the work, the lower guard shall automatically and instantly return to the covering position.
- All "fixed" power driven woodworking tools shall be provided with a disconnect switch that can either be locked or tagged in the "off" position.
- 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.
- 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.