



Department of the Air Force
HQ AEDC (AFMC)
Arnold AFB, TN 37389

Safety, Health, and Environmental Standard

Title: PORTABLE POWER TOOLS

Standard No.: D8

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The provisions and requirements of this standard are mandatory for use by all personnel engaged in work tasks necessary to fulfill the AEDC mission. Please contact your safety, industrial health and/or environmental representative for clarification or questions regarding this standard.

Approved:

Contractor ATA Director
Safety and Health

Air Force Functional Chief



Safety, Health, and Environmental Standard

PORTABLE POWER TOOLS

1.0 INTRODUCTION/SCOPE/APPLICABILITY

- 1.1 Introduction – This standard is safety and health guidance for portable power tools and their use, purchase, care, inspection, maintenance and replacement at AEDC.
- 1.2 Scope – The standard implements the requirements set forth by Occupational Safety and Health Administration to protect employees from hazards encountered in a manner capable of causing injury or impairment in the function of any part of the body through physical work contact.
- 1.3 Applicability – This standard is applicable to the five primary portable tool groups of **handheld electric (including cordless/rechargeable)**, pneumatic, gasoline, hydraulic power, and gas/powder-actuated.

2.0 BASIC HAZARDS/HUMAN FACTORS

Portable power tools can be hazardous if not properly selected, maintained, used, or stored. Basic hazards include potential for electrical shock, burns, eye injuries from flying particles, hearing loss from noise, stored energy, compressed gas/air, explosives and severe injuries from improperly guarded parts.

3.0 DEFINITIONS

AC Power – Alternating Current, usually 60 cycles, provided through use of an existing building wiring or a by portable generator(s). Usually 125 volts, but can be 250 volts.

Battery Charger – Device used to put energy into a secondary cell or rechargeable battery by forcing an electric current through it.

Double-Insulated Portable Electric Tool – A portable electric tool that has two separate insulation systems and only a two-wire cord. Such tools are usually marked with a symbol or with the words DOUBLE INSULATED.

Explosive (Powder-Actuated) Power Tools – Explosive-actuated fastening tool which is actuated by explosives or any similar means and propel a stud, pin, fastener, or other object for the purpose of affixing it by penetration to any other object.

Gas-Actuated Tool – A tool such as an air nailer that is operated by propane gas.

Gasoline Power Tool – A tool such as a chain saw that is powered by a gasoline internal combustion engine.

Ground Fault Circuit Interrupter (GFCI) – An electrical safety device designed to instantaneously disconnect a circuit when it senses a ground fault condition through a person or grounded object, thus minimizing the chance of electric shock and fires.

Grounded-Type Portable Electric Tool – A portable electric tool that has an additional wire in the supply cord that grounds the non-current carrying metal surfaces.

Hazardous Classified Locations – Areas containing potentially explosive or highly flammable substances (as defined in National Electric Code Article 500).

Hydraulic Power Tool – Any portable tool powered by hydraulic action supplied by a separate power source such as gasoline or electricity.

Operating Contractor – A long-term contractor directly accountable to the Air Force for the AEDC mission; term used to identify the AEDC Operation, Maintenance, Information Management and Support Contractor.

Outside Contractor/Subcontractor – An organization employed by a contractor or the Air Force to do construction, maintenance, repair or other work at AEDC. There is no employment relationship, control or supervision of the subcontractor's employees by AEDC contractors. Also referred to as the construction contractor.

"Pigtail" Adapter – A connecting device having a three-prong female receptacle and a two-prong male plug plus a flexible wire grounding connector.

Pneumatic Power Tool – A tool such as a jackhammer or air nailer that is operated by compressed air.

Portable Electric Tool – For the purpose of this standard, a hand-held tool designed to produce reciprocating, oscillating, or rotary force through a motor and a series of gears and is powered by an AC voltage or battery charger.

Safety Can – An approved closed container, of not more than five-gallon capacity, having a flash-arresting screen, spring-closing lid, and spout cover, and so designed that it will safely relieve internal pressure when subjected to fire exposure.

UL – Abbreviation for Underwriters' Laboratories.

Wire sizes – Wire sizes in this standard refer are in accordance with American Wire Gage (AWG) standards.

4.0 REQUIREMENTS/RESPONSIBILITIES

4.1 Requirements

4.1.1 Portable Electric Power Tools (Corded and Cordless) and Battery Chargers

4.1.1.1 Quality – Portable electric shall be accepted, certified, listed, labeled, or otherwise determined to be safe by a nationally recognized testing laboratory such as, but not limited to, Underwriters' Laboratories, Inc. (see symbol shown below) and Factory Mutual Engineering Corp; or shall otherwise meet safety provisions of the National Electric Code.



Underwriters' Laboratories symbol

4.1.1.2 Shock – Tools operating at or above 50 volts shall be provided with UL-listed, or equivalent, 3-wire ground plugs and supply cords, or tools shall be protected by a system of double insulation. A double-insulated tool is marked with the symbol shown below or the words DOUBLE INSULATED and is not required to have a ground wire.



Symbol indicating double insulation

4.1.1.3 Ground-fault circuit-interrupters (GFCIs) – GFCIs shall be used with all portable electrical tools on all 125-volt single-phase 15-, 20-, and 30-amp receptacle outlets. If a receptacle(s) is installed as part of the permanent wiring of the building or structure and is used for temporary electric power, ground-fault circuit-interrupter protection for personnel shall be provided. Cord sets or devices incorporating listed ground-fault circuit-protection for personnel identified for portable use shall be permitted.

EXCEPTION: Receptacles on a portable generator rated not more than 5 kilowatts, do not produce dual voltages, where the circuit conductors of the generator are insulated from earth and the generator frame is insulated from earth and all grounded surfaces.

4.1.1.4 Plugs – When portable electric tool cord plugs are replaced, replacement plugs meeting current National Electric Code requirements shall be used.

4.1.1.5 "Pigtail" Adapters – Adapters are not permitted for connecting a grounded-type tool with a 3-wire plug to a 2-wire nongrounded type 125-volt receptacle.

4.1.1.6 Extension Cords

4.1.1.6.1 Extension cords used with portable electric tools shall be 3-wire type and shall meet requirements of the National Electric Code for hard usage and damp locations. All flexible-electrical extension cord sets shall be constructed of wire size 14 or larger.

4.1.1.6.2 Extension cords crossing vehicle passageways shall be protected by bridging or by raising them high enough to allow unhampered vehicle passage.

4.1.1.6.3 Extension cords should not cross major pedestrian walkways or office aisles if possible. When impossible, cords shall be secured with tape or purchased covers designed to protect from trip hazards.

- 4.1.1.7 Hazardous Classified Locations – Portable electric tools shall not be used in hazardous classified locations, unless specifically designed for use in such locations.
- 4.1.1.8 Switches
- 4.1.1.8.1 All hand-held electric circular saws having a blade diameter greater than 2 inches shall be equipped with a constant-pressure switch or control that will shut off power when the pressure is released.
- 4.1.1.8.2 All hand-held drills, tappers, grinders with wheels greater than 2 inches in diameter, disk sanders with disks greater than 2 inches in diameter, belt sanders, reciprocating saws, saber, scroll, and jig saws with blade shanks greater than a nominal (+.05 inch) ¼ inch, and other similar operating tools shall be equipped with a constant pressure switch or control and may have a lock-on control provided that turn-off can be accomplished by a single motion of the same finger that turns it on.
- 4.1.1.8.3 All other hand-held tools such as, but not limited to, platen sanders, grinders with wheels 2 inches in diameter or less, disk sanders with disks 2 inches in diameter or less, routers, planers, laminate trimmers, nibblers, shears, saber, scroll and jig saws with blade shanks a nominal ¼-inch wide or less, may be equipped with either a positive “on-off” control or other controls described above.
- 4.1.1.9 Repairs – Only qualified Technical/Support Shops electrical craftsmen will be permitted to repair portable electrical tools.
- 4.1.1.10 Controls – The operating control on hand-held power tools shall be so located as to minimize the possibility of its accidental operation, if such accidental operation would constitute a hazard to employees.
- 4.1.1.11 Inspection – Portable electric tools shall be inspected prior to use.

4.1.1.12 Noise Levels – Department of Defense Instruction (DoDI) 6055.12 requires that each tool or piece of equipment producing noise levels greater than 85dBA be marked to alert personnel of the potential hazard. Operating Contractor Safety and Health shall be contacted for sound level reading requirements. AFVA 48-103 shall be used to caution that hearing protection must be worn when this equipment.

NOTE: Stationary equipment in an already designated hazardous noise area is exempt from labeling.

4.1.2 Portable Pneumatic Power Tools

- 4.1.2.1 Retainers – Tool retainers, such as holding wires or safety clips, shall be installed and maintained on pneumatic impact (percussion) tools to keep attachments from being accidentally ejected.
- NOTE:** Hoses with quick disconnects do not require safety clips.
- 4.1.2.2 Hoses – Air hose and hose connections shall be designed for the pressure and service to which they are subjected. Manufacturer's safe operating pressures shall be followed.
- 4.1.2.3 Personal Protective Equipment –
- 4.1.2.3.1 Footguards or safety-toed shoes shall be worn when operating air tamps to comply with Safety Standard F2, Personal Protective Equipment.
- 4.1.2.3.2 Hearing protection shall be provided and shall be used when necessary to comply with Safety Standard F5, Hazardous Noise and Hearing Conservation.
- 4.1.2.3.3 Eye protection shall be provided and shall be used for chipping-type operations. See Safety Standard F2, Personal Protective Equipment.
- 4.1.2.4 Safety Devices –
- 4.1.2.4.1 Pneumatic nailers, staplers, etc., with automatic fastening feeds operating at over 100-psi pressure at the tool shall have a safety device on the muzzle to prevent ejection of fasteners unless muzzle is in contact with work surfaces.
- 4.1.2.4.2 Air hoses exceeding ½-inch inside diameter shall have a safety device at the source of supply or branch line to reduce pressure if the hose fails.
- 4.1.2.4.3 Motor governors on portable air-operated grinders should be inspected by qualified persons at each wheel change or modification.

4.1.3 Portable Gasoline Power Tools

4.1.3.1 All gasoline powered tools shall be stopped and allowed to cool at least five minutes before refueling, servicing, or maintenance. No refueling shall take place within any confined space.

4.1.3.2 UL-listed safety cans of no more than 5-gallon capacity shall be used to transport extra gasoline to job sites.

4.1.3.3 A fire extinguisher of the approved type shall be available within 75 feet of the working area while gasoline tools are being used or refueled.

EXCEPTION: Personnel engaged in outdoor grounds keeping activities to include operation of string trimmers and chain saws shall be excluded from this requirement.

4.1.3.4 *Gasoline-powered tools shall not be used in hazardous classified locations.*

4.1.4 Portable Hydraulic Power Tools

4.1.4.1 Pressure – The manufacturer's safe operating pressure for hoses, valves, pipes, filters, and other fittings must not be exceeded.

4.1.4.2 Fluid – The hydraulic fluid used in these tools shall be a fire-retardant type and must keep its operating characteristics at the most extreme working temperatures expected.

4.1.5 Powder Actuated Tools

NOTE: Powder-actuated tools are not currently used by AEDC employees; however, the section is being retained to facilitate potential future use and for potential use by outside contractors performing work at AEDC.

4.1.5.1 Operators and assistants using tools shall be safeguarded by means of eye protection. Head and face protection shall be used, as required by working conditions.

NOTE: Before operating a powder-actuated tool, the supervisor or other qualified person shall ensure the operator is aware of and understands the physical hazards and proper operation of the tool and the requirements of this standard.

4.1.5.2 Inspection, Maintenance, and Tool Handling

4.1.5.2.1 The muzzle end of the tool shall have a protective shield or guard at least 3 1/2 inches in diameter, mounted perpendicular to and concentric with the barrel, and designed to confine any flying fragments or particles that might otherwise create a hazard at the time of firing.

4.1.5.2.2 The tool shall be so designed that it cannot be fired unless it is equipped with a standard protective shield or guard, or a special shield, guard, fixture, or jig.

4.1.5.2.3 The firing mechanism shall be so designed that the tool cannot fire during loading or preparation to fire, or if the tool should be dropped while loaded.

4.1.5.2.4 Firing of the tool 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.

4.1.5.2.5 The muzzle end of the tool shall be designed so that suitable protective shields, guards, jigs, or fixtures, designed and built by the manufacturer of the tool being used, can be mounted perpendicular to the barrel. A standard spell shield shall be supplied with each tool.

4.1.5.3 Requirements for Loads and Fasteners

4.1.5.3.1 There shall be a standard means of identifying the power levels of loads used in tools.

4.1.5.3.2 Fasteners used in tools shall be only those specifically manufactured for use in such tools

4.1.5.3.3 Cartridges shall be stored in a secure area which has been approved and licensed for explosives storage.

4.1.5.4 Operating Requirements

4.1.5.4.1 Before using a tool, the operator shall inspect it in accordance with the manufacturer's checklist to determine to his satisfaction that it is clean, that all moving parts operate freely, and that the barrel is free from obstructions.

- 4.1.5.4.2 When a tool develops a defect during use, the operator shall immediately cease to use it, until it is properly repaired.
- 4.1.5.4.3 Tools shall not be loaded until just prior to the intended firing time. Neither loaded nor empty tools are to be pointed at any worker.
- 4.1.5.4.4 No tools shall be loaded unless being prepared for immediate use, nor shall an unattended tool be left loaded.
- 4.1.5.4.5 In case of a misfire, the operator shall hold the tool in the operating position for at least 30 seconds. He shall then try to operate the tool a second time. He shall wait another 30 seconds, holding the tool in the operating position; then he shall proceed to remove the explosive load in accordance with the manufacturer's instructions.
- 4.1.5.4.6 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.
- 4.1.5.4.7 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.
- 4.1.5.4.8 Fasteners shall not be driven directly into materials such as brick or concrete closer than 3 inches from the unsupported edge or corner, or into steel surfaces closer than one-half inch from the unsupported edge or corner, unless a special guard, fixture, or jig is used. (Exception: Low-velocity tools may drive no closer than 2 inches from an edge in concrete or one-fourth inch in steel.)
- 4.1.5.4.9 When fastening other materials, such as a 2 by 4-inch wood section to a concrete surface, it is permissible to drive a fastener of no greater than 7/32-inch shank diameter not closer than 2 inches from the unsupported edge or corner of the work surface.
- 4.1.5.4.10 Fasteners shall not be driven through existing holes unless a positive guide is used to secure accurate alignment.
- 4.1.5.4.11 No fastener shall be driven into a spalled area caused by an unsatisfactory fastening.
- 4.1.5.4.12 Tools shall not be used in an explosive or flammable atmosphere.
- 4.1.5.4.13 All tools shall be used with the correct shield, guard, or attachment recommended by the manufacturer.
- 4.1.5.4.14 Any tool found not in proper working order shall be immediately removed from service. The tool shall be inspected at regular intervals and shall be repaired in accordance with the manufacturer's specifications.

4.1.6 Guarding of Portable Power Tools

- 4.1.6.1 General – Any powered tool designed to accommodate guards shall be equipped with the guards during use. Guards shall be provided for belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, or other reciprocating, rotating, or moving parts if there is contact exposure to employees.
- 4.1.6.2 Saws – Portable circular saws with 2-inch or larger diameter blades shall have guards above and below the base plate or shoe. Upper guards shall cover the saw to depth of teeth, except for minimum arc to allow tilting for bevel cuts. Lower guards shall cover saw to depth of teeth, except for minimum arc to allow proper retraction and contact with work, and they shall automatically and instantly return to covering position as tool is withdrawn from work.
- 4.1.6.3 Sanders – Portable belt sanders shall have guards at each nip point where belt runs on to a pulley to effectively prevent hand contact with the nip point. Unused run of sanding belt shall be guarded against accidental contact.
- 4.1.6.4 Grinders – Portable air grinders shall be guarded as specified in OSHA 1910.243 and AFOSH 91-501, Chapter 18, Machinery.

4.2 Responsibilities

4.2.1 Supervisors shall

- 4.2.1.1 Allow only properly maintained portable power tools to be used on the job and ensure that defective tools are turned in immediately for repair with an appropriate safety information tag attached.
- 4.2.1.2 Periodically inspect non-electric portable power tools. Ensure that portable electric tools are inspected annually by a qualified inspector and that necessary maintenance is performed. For double-insulated tools, this maintenance shall include 500-volt insulation tests.
- 4.2.1.3 Ensure employees operate and inspect portable power tools in accordance with manufacturer's operating instructions and guidelines.

4.2.2 Operating Contractor Safety and Health shall

Perform spot inspections on power tools to ensure safe maintenance and repair standards are met.

4.2.3 Users of portable power tools shall

- 4.2.3.1 Personally check portable power tools for defective cords, plugs, switches, and other accessories before use to ensure they are in safe working order.
- 4.2.3.2 Follow portable power tool requirements provided in the manufacturers' operating instructions
- 4.2.3.3 Use personal protective equipment as required by the task.
- 4.2.3.4 Turn in defective or damaged tools immediately to supervisors for repair.
- 4.2.3.5 Use GFCI-protected outlets for all portable power tools.
- 4.2.3.6 Test GFCI protection for proper operating condition before use.

5.0 REFERENCES

AEDC Safety, Health, and Environmental Standards

- B5, Confined Spaces
- E15, Explosives Safety
- F2, Personal Protective Equipment
- F4, Respiratory Protection
- F5, Hazardous Noise and Hearing Conservation

Air Force Occupational Safety and Health Standard

- 91-501, Air Force Consolidated Occupational Safety Standard

Code of Federal Regulations (CFR) OSHA Standards

- CFR 1910, Safety and Health Regulations for General Industry
- CFR 1926, Safety and Health Regulations for Construction

Department of Defense Instruction (DoDI)

- DoDI 6055.12 Hearing Conservation Program

National Electric Code