

IDENTIFICATION

TOPIC TITLE: Tools – Hand and Power

MINIMUM TIME: 30 minutes

OBJECTIVES

Terminal Objective:

Given best practices and current OSHA and industry information regarding worksite illnesses, injuries, and/or fatalities, the student will be able to recognize how to protect themselves from hazards associated with the use of tools (i.e., hand and power).

Enabling Objectives:

1. Identify various types of tools commonly used at construction worksites.
2. Describe types of hazards associated with the use of tools.
3. Describe guarding requirements (i.e., techniques and principles) for various types of tools.
4. Describe safe operation methods while working with various types of tools.
5. Recognize employer requirements to protect workers from tool hazards.

INSTRUCTOR MATERIALS AND RESOURCES

- PowerPoint Presentation: *Hand and Power Tools*
- Knowledge Check Answer Key: *Hand and Power Tools*

STUDENT MATERIALS

- OSHA Fact Sheet
- Knowledge Check: *Hand and Power Tools*

TEACHING PROCEDURES ---Preparation, Presentation, Application, Evaluation

Anticipatory Set (Focus Attention/Gain Interest)

Estimated Time: ?? hours

Key Points

Methods

A 22-year-old carpenter’s apprentice was killed when he was struck in the head by a nail fired from a powder-actuated nail gun. The nail gun operator fired the gun while attempting to anchor a plywood concrete form, causing the nail to pass through the hollow form. The nail traveled 27 feet before striking the victim. The nail gun operator had never received training on how to use the tool, and none of the employees in the area was wearing PPE. (OSHA Fatal Facts Report)

Case study
PPT slides #1 – #4

Hand and power tools are a part of our everyday lives and help us to easily perform tasks that otherwise would be difficult or impossible. However, these simple tools can be hazardous, and have the potential for causing severe injuries when used or maintained improperly. Special attention toward hand and power tool safety is necessary in order to reduce or eliminate these hazards. Employees using hand and power tools are exposed to hazards of falling, flying, abrasive or splashing materials, as well as harmful dusts, fumes, mists, vapors or gases. Workers must be provided with appropriate personal protective equipment to guard against injury. All electrical connections for tools must be suitable for the type of tool and the working conditions (e.g. wet, dusty, flammable vapors). Employees should be trained in the proper use of all tools. Workers should be able to recognize the hazards associated with the different types of tools and the safety precautions necessary.

Instructor-led discussion

Presentation (Instruction)

Estimated Time: ?? hours

Key Points

Methods

I. Types of Tools

Instructor-led discussion

A. Manually operated hand tools

PPT slides #5 – #6

1. Wrenches
2. Impact tools – drift pins, wedges, chisels
3. Hammers
4. Screw drivers

B. Power-operated tools

1. Electrical
 - i. Cord or battery
 - ii. Examples – drills, saws, grinders
2. Pneumatic
 - i. Powered by compressed air
 - ii. Examples – nailers, chippers, drills, sanders, and staplers
3. Liquid fuel
 - i. Powered by fuel, usually gasoline
 - ii. Example – chainsaw, weed-eater, drills, blowers, edgers, augers
4. Hydraulic
 - i. Fluid provides medium for power transfer
 - ii. Example – hydraulic jack
5. Powder-actuated
 - i. Operates like a loaded gun
 - ii. Example – nailer, riveter, framing tool, and other fastener tools

II. Hazards Associated with Hand and Power Tools

PPT slides #7 – #11

C. Types of hazards

1. Struck-by hazards from flying, falling, impact, or abrasive objects
2. Electrical shock or electrocution
3. Caught-in hazards with tools that have moving parts
4. Exposure to harmful dusts, fumes, mists, vapors, or gases
5. Tripping or slipping hazards
6. Contact with sharp edges, or protruding objects that cause cuts, punctures, or contusions

D. Exposure to hazards

1. Using the wrong tool for the job
2. Using a tool the wrong way
3. Using damaged or broken tools
4. Using tools that are dull
5. Using spark-producing tools near flammable sources
6. Using power tools with moving parts that are not properly guarded

7. Using electrical tools that are not properly grounded
8. Not wearing appropriate PPE

III. Guarding techniques for hand and power tools

- E. Guard exposed moving parts of power tools.
- F. Guard belts, gears, shafts, pulleys, sprockets, spindles, flywheels, chains, or other moving parts.
- G. Never remove a guard when a tool is in use.
- H. Guard the point of operation, in-running nip points, and rotating parts.
- I. Guard the operator and others from flying chips and sparks.
- J. Appropriate guards must be in place to prevent operator from coming in contact with saw blades.
- K. Guard an abrasive wheel so that the minimal amount of the wheel is exposed, and ensure the guard is properly aligned with the wheel.

PPT slides #12 – #14

III. Precautions for safe use of hand and power tools

A. Basic hand and power tool safety practices

1. Always keep tools in good condition with regular maintenance.
2. Use the right tool for the job.
3. Examine each tool for any damage before using it and, if the tool is damaged, don't use it.
4. Follow manufacturers' instructions when using tools and use them the right way. This includes using the guards that are part of a tool.
5. Always wear the right PPE and use it properly.

B. Precautions for all hand and power tools

1. Keep the floors in the work clean and free from any debris that could cause tripping or slipping.
2. Keep work areas well lit.
3. Use the proper PPE, such as safety glasses, respiratory protection, and gloves, for protection from falling, flying, abrasive, and splashing objects or materials and from harmful dusts, fumes, mists, vapors, or gases.
4. Keep all cutting tools sharp.

PPT slides #15 – #28

5. Keep all tools clean and well-maintained.
6. Inspect all tools for defects and remove any broken or damaged tools from service.
7. Use tools only for the purposes for which they were designed and use tools the right way.

C. Precautions for power tools

1. Disconnect tools from power source when not in use, before servicing and cleaning them, and when changing accessories such as blades, bits, and cutters.
2. Keep all people not involved with the work at a safe distance from the work area.
3. Secure work with clamps or a vise so that both hands are free to operate the tool.
4. Avoid accidental starting; do not hold fingers on the switch button while carrying a tool that is still attached to its power source.
5. Power tools must be fitted with guards and safety switches.
6. Be sure to maintain good footing and balance when operating power tools.
7. Wear proper clothing for the task; do not wear loose clothing, ties, or jewelry when working in an area or a tool that has moving parts.
8. Safeguard exposed moving parts of power tools, including belts, gears, shafts, pulleys, sprockets, spindles, drums, flywheels, chains, or other reciprocating, rotating, or moving parts of equipment.

D. Electric tools

1. Electric tools that are damaged must be removed from service and tagged "Do Not Use."
2. To protect a worker from shock, electrical tools must:
 - i. have a three-pronged plug that is used with a grounded receptacle;
 - ii. be double-insulated; or
 - iii. be powered by a low-voltage isolation transformer
3. Never remove the third prong (grounding pin) from a three-prong plug. An adapter may be used to accommodate a two-prong receptacle, but it must be

attached to a known ground.

4. Do NOT:
 - i. pull cords to disconnect tool from outlet
 - ii. use cords to hoist or lower tools
 - iii. carry portable tools by the cord
 - iv. run cords across walkways and traffic areas
5. Keep cords and hoses away from heat, oil, and sharp edges.
6. Store electrical tools in a dry place and do NOT use in damp or wet locations, unless they are approved for that purpose.
7. Use Ground Fault Circuit Interrupter (GFCI) or Assured Equipment Ground Conductor (AEGC) program.

E. Abrasive wheels and tools

1. Equip with guards that:
 - i. cover the spindle end, nut, and flange projections;
 - ii. maintain proper alignment with the wheel; and
 - iii. do not exceed the strength of the fastenings.
2. Before an abrasive wheel is mounted:
 - i. inspect it for damage; and
 - ii. sound- or ring-test it to ensure that it is free from cracks or defects.
3. Follow manufacturer recommendations for operating speeds.
4. Allow the abrasive wheel to accelerate to operating speed before beginning grinding or cutting work to prevent disintegration or explosion during start-up.
5. Do not stand in front of the grinding wheel as it comes up to speed; use eye and/or face protection.
6. Properly adjust the work rest (1/8" opening) on grinding tools and use it to support the work and prevent it from being jammed.

1910.215(d)(1)

1910.215(a)(4)

F. Pneumatic tools

1. Use same precautions with air hose as with electric cords
2. Check that the tool is fastened securely to the air hose to prevent them from being disconnected and use a positive locking device as an added safeguard.

3. Pneumatic tools that shoot nails, rivets, staples, or similar fasteners must be equipped with a special device to keep fastener from being accidentally ejected.
4. Screens must be set up to protect nearby workers from being struck by flying fragments.
5. Do not use compressed air for cleaning off clothing and never point compressed air guns at anyone

G. Fuel-powered tools

1. Handle, transport, and store gas or fuel in approved flammable liquid containers only.
2. Shut down the engine and allow it to cool before refilling a fuel-powered tool tank.
3. Provide satisfactory ventilation or appropriate respiratory protection when using these tools inside a closed area.

H. Powder-actuated tools

1. Need to be treated with extreme caution, like a loaded gun
2. Must be trained. Only employees who have been trained in the operation of the particular tool in use shall be allowed to operate a powder-actuated tool.
3. Wear suitable ear, eye, and face protection.
4. Select either a high-velocity or low-velocity powder level that is appropriate for the tool and task without applying excessive force.
5. Test the tool each day before loading to ensure the safety devices are working properly.
6. Inspect tool before each use to make sure that it is clean, the moving parts operate freely, the barrel is free from obstructions, and the proper shield, guard, and attachments are in place.
7. Immediately remove from service any defective tool and do not use until properly repaired.
8. Do not load tools until just prior to use.
9. Never point the tool (loaded or empty) at any employee.
10. Keep hands clear of the open barrel end.
11. Never leave loaded tools unattended.
12. Do not drive fasteners into very hard or brittle materials; and, avoid driving into easily penetrated materials unless

10-hour Construction Outreach

<p>they are backed by an impenetrable backing.</p> <p>13. Do not drive fastener into a spalled area.</p> <p>14. Do not use tools in an explosive or flammable atmosphere.</p> <p>15. Use manufacturer-recommended correct shield, guard, or attachment on tools.</p> <p>16. Store tool unloaded and in a locked box.</p> <p>IV. Employer Requirements</p> <p>A. Comply with OSHA standards related to hand and power tools, including:</p> <ol style="list-style-type: none"> 1. Training requirements 2. Inspection requirements <p>B. Comply with manufacturers' requirements and recommendations for all hand and power tools.</p>	<p>PPT slide #29</p>
<p><i>Application (How students apply what they learn)</i></p> <p>Key Points</p>	<p><i>Estimated Time: ?? hours</i></p> <p>Methods</p>
<p>Have students inspect various hand and power tools (or pictures of tools) and report on any safety issues that they find, as well as how they would fix the problem.</p>	<p>PPT slides #30 – #33</p>
<p><i>Evaluation/Summary</i></p> <p>Key Points</p>	<p><i>Estimated Time: ?? hours</i></p> <p>Methods</p>
<p>Knowledge Check: <i>Hand and Power Tools</i></p>	<p>Questioning</p> <p>PPT slides #34 – #38</p>

References

OSHA Standard:

https://www.osha.gov/pls/oshaweb/owasrch.search_form?p_doc_type=STANDARDS&p_toc_level=1&p_keyvalue=Construction

- 1926 Subpart I - Tools - Hand and Power
 - 1926.300 - General requirements.
 - 1926.301 - Hand tools.
 - 1926.302 - Power-operated hand tools.
 - 1926.303 - Abrasive wheels and tools.
 - 1926.304 - Woodworking tools.
 - 1926.305 - Jacks-lever and ratchet, screw, and hydraulic.
 - 1926.306 - Air receivers.
 - 1926.307 - Mechanical power-transmission apparatus.

OSHA Publications

<https://www.osha.gov/pls/publications/publication.athruz?pType=Industry&pID=94>

- *Amputation* Fact Sheet
(English: [PDF](#))
- *Amputations: Safeguarding Equipment and Protecting Employees from Amputations*
(OSHA 3170 - 2007) (English: [HTML](#) [PDF](#))
- *Hand and Power Tools*
(OSHA 3080 - 2002) (English: [HTML](#) [PDF](#))

<https://www.osha.gov/pls/publications/publication.arthruz?pType=Industry&pID=317>

- *Nail Gun Safety: A Guide for Construction Contractors*
(OSHA 3459 - 2011) (English: [EPUB](#) [MOBI](#) [PDF](#))
(OSHA 3505 - 2012) (Spanish: [EPUB](#) [MOBI](#) [PDF](#))

OSHA References/Resources

- *Woodworking eTool* (2002), OSHA eTools, <https://www.osha.gov/SLTC/etools/woodworking/index.html>
- *Carbon Monoxide in Construction: Portable Gas-Powered Equipment* (2011), OSHA video, https://www.osha.gov/dts/vtools/construction/carbonmonoxide_fnl_eng_web.html
- *Workbench Grinder Wheel Explodes: 1 Fatality* (2005), OSHA video, https://www.osha.gov/video/shipyard_accidents/07_improper_equipment_use.html