Carnegie Mellon University Environmental Health & Safety FIRE | LAB | WORK	**Environmental Health and Safety (EHS)** **Hand and Power Tool Program**
Date of Issuance:	**Revision Date:** Initial
Revision Number: Initial	**Prepared by:** EHS, Facility Management and Campus Services (FMCS)

1. Purpose

The purpose of the Hand and Power Tool (Program) is to promote safe work practices among Carnegie Mellon University (CMU) employees while using hand and power tools. The Program establishes and maintains effective safeguards to protect employees from hazards associated with machines and tools, helping to prevent accidental injuries to arms, hands and other body parts.

2. Scope

This Program establishes the minimum requirements for hand and power tools and machine guarding. This Program applies to all employees who operate machinery and use power tools at CMU. Students who use hand and power tools should reference the Student Shop Safety Program.

3. Definitions

a. **Authorized Employee**: A person who has received Tool Safety training and is qualified to use hand and power tools during work activities.
b. **Competent Person**: A person who has been identified by CMU, EHS, and FMCS to have the skills and training required to identify and correct hazards associated with hand and power tools as well as perform the task of replacing damaged or missing parts.
c. **Grinder**: A machine which involves a rotating wheel or disc used for shaping, smoothing, or polishing handheld parts.
d. **Abrasive Wheel**: A wheel or disc made of abrasive material for grinding, cutting, or polishing metal and other materials.
e. **Flanges**: Discs or plates between which abrasive wheels are mounted.
f. **Machine Guard:** A barrier designed to protect operators and other employees from hazards associated with machine operations.
g. **Hand Tool**: Any tool powered by human effort rather than a motor or other power source. This includes, but is not limited to, tools such as: hammers, wrenches, pliers and screwdrivers.
h. **Power Tool**: Tools that are powered by an external source such as electricity, batteries, or compressed air rather than being operated solely by human effort. This includes, but is not limited to, tools such as: drills, saws, grinders and pneumatic tools (e.g., nail gun).
i. **Hazard:** Any condition or practice that could cause injury or illness.

j. **Point of operations:** The point of a tool at which cutting, shaping, boring, or forming is accomplished on the tool.
k. **Bite:** The nip point between any two running rolls.
l. **Incident**: A work-related event in which an injury, illness (regardless of severity), or fatality occurred or could have occurred (near miss).
m. **Near-miss:** An incident in which no property was damaged, and no personal injury was sustained, but where, given a slight shift in time or position, damage or injury easily could have occurred.

4. Roles and Responsibilities

a. **Environmental Health and Safety:**
   i. Assist with the coordination of authorized and effective hand and power tool training;
   ii. Maintain training records to include the name of the employee and the date training was completed;
   iii. Complete periodic inspections of workspaces where hand and power tools are used;
   iv. Investigate any incident or near miss involving machinery or hand and power tools and obtain a root cause of the incident; and,
   v. Put into place any corrective actions to prevent future incidents or near-misses.

b. **Facility Management and Campus Services:**
   i. Assist with the coordination of authorized and effective hand and power tool training;
   ii. Ensure all hand and power tools are inspected to be free of any defects on an annual basis or in accordance with the manufacturer's guidelines;
   iii. Assist in identifying competent persons to complete inspections or replacements of abrasive wheels;
   iv. Establish a process for removing tools from service immediately if they are found to be defective;
   v. Report all incidents or near misses to EHS by email: safety@andrew.cmu.edu and complete the injury or Near Miss form if an incident occurs (https://www.cmu.edu/hr/assets/workers-comp/workers-comp-forms.pdf).

c. **Authorized Employees:**
   i. Review, understand and follow all guidelines provided in this Program;
   ii. Notify your direct supervisor if you are unable to fully comply with this Program for any reason (i.e., incorrect personal protective equipment (PPE), missing or damaged guarding, etc.);
   iii. Complete all required training and evaluations before operating hand and power tools;
   iv. Ensure hand and power tools, as well as other equipment, are inspected prior to use for any defects or hazards;
   v. Use hand and power tools in a safe manner and ensure compliance with manufacturer guidelines;
   vi. Tag out any defective equipment immediately to prevent further use with a Lockout tag;

vii. Stop work and request guidance and direction from your direct supervisor at any time when: a hazardous situation is encountered, those involved do not feel safe, there is a lack of adequate training or required equipment or any similar situation is present;
viii. Stop work and report any incident or near miss to your supervisor, or the supervisor on duty, immediately; and,
ix. Assist EHS in any investigation into incidents or near misses, with or without injury.

d. **Campus Design and Facility Development:**
   i. Contact EHS via safety@andrew.cmu.edu any time that an incident or near miss involving a hand or power tool occurs. Supply near miss or incident investigation documentation and corrective action suggestions to EHS.

5. Procurement of Hand and Power Tools

a. Any time that a hand or power tool is purchased, it shall meet the requirements and approval of the current edition of 29CFR 1910.243 and 1910.244, which outline the general requirements for safe use. Please see the summary below that summarizes OSHA 29 CFR 1910.243 and 1910.244 requirements:
   i. Employers must ensure that hand and power tools are maintained in safe working condition.
   ii. Power tools must be equipped with proper safety features, such as guards, to protect the operator from potential hazards like flying debris, sparks, or accidental contact with moving parts.
   iii. Broken or malfunctioning tools must be repaired before they can be used again.

6. Training and Certification:

a. All authorized employees must successfully complete general hand and power tool training through SciShield that consists of the following applicable topics:
   i. Operating instructions, warnings and precautions for the type of tool the operator will be authorized to use;
   ii. Hand and power tool controls: where they are located, what they do and how they work;
   iii. Operating limitations;
   iv. Any other operating instructions, warnings or precautions listed in the operator's manual; and,
   v. PPE requirements for the safe operation of the hand or power tool
b. Once the general hand and power tool training is completed, employees should be provided with tool-specific training under the direct supervision of employees who have the knowledge, training and experience to train others and evaluate their competence. The trainer must be certified to provide the training. OSHA identifies a certified instructor as someone who can demonstrate the ability to train employees through knowledge, training, experience, or a recognized degree, certificate or professional standing. Training operations must not endanger the trainee or other employees.

c. Operators shall not be permitted to operate hand and power tools before successful completion of the required training outlined in this Program.

7. Safe Working Procedures:

General Hand and Power Tool Requirements

a. Inspect all hand and power tools prior to each use to ensure they are in good condition and that guarding is in place.
   i. Power tools must be fitted with guarding and safety switches. Power tools can be hazardous when they are used improperly.
   ii. Never remove safety guards from any hand or power tool when it is in operation.
   iii. Remove any damaged hand tools from service and tag them out if any damage is found.
b. Carry tools by the appropriate handle. Carrying tools by the cord or hose can cause damage to the tool.
c. Use the proper tool for the task being performed.
d. Do not hold fingers on the power switch while carrying a power tool to avoid accidental startup.
e. Disconnect power tools when they are not in use, before completing servicing on them and when changing out parts such as wheels or blades.
f. Follow manufacturer guidelines when changing parts on the power tools.
g. Ensure both hands are being used to operate the tool by securing the work with a clamp or vice.
h. When using tools such as saws or blades, make sure to direct the tool away from other employees working in the same space.
i. Appropriate PPE shall be worn to protect against hazards that may be encountered while operating hand or power tools.
j. Avoid wearing loose clothing or jewelry around power tools as they can be pulled into the equipment.
k. Use hand and power tools in accordance with the manufacturer's operating manual and guidelines outlined in this program.
l. Carry tools in a secure way such as the use of a tool belt or toolbox.
m. Ensure the use of non-sparking tools when working in an area where flammable vapors or dust could be present.
n. If grinding is performed outside of a designated hot work area, a hot work permit shall be required.
o. After using a tool, ensure it is clean and return to the designated location for storage. Keep the cords away from sharp edges or heat.

8. Power Tool Safeguards

a. **Electric power tools:**
   i. Shall have a cord with grounding or must be double insulated.

ii. Must contain a Ground Fault Circuit Interrupter (GFCI) if the tool is being used outdoors or in wet environments.
iii. Have means to prevent the automatic startup of equipment after a power failure.
iv. Must be stored in a dry location when not in use and are not to be used in wet locations unless approved for that purpose.

b. **Pneumatic power tools:**
   i. Shall have a muzzle to prevent the tool from accidentally discharging if it is being used to drive nails or staples at or over 100 PSI.
   ii. Must be disconnected from the air supply and safely bled off before adjusting or servicing pneumatic power tools.
   iii. Must be checked to see that the hose is fastened securely to the tool to prevent the hose from coming loose.
   iv. Eye protection must be worn for employees working with pneumatic tools.
   v. Hearing protection must be used when tools are noisy.

c. **Hand-held power tools with operating controls and switches:**
   i. Must be equipped with a constant pressure switch or control that shuts off when pressure isn't being applied. This helps prevent the accidental startup of equipment.
   ii. May be equipped with a lock-on control if it allows for the worker to shut off the equipment in a single motion using the same finger or fingers.
   iii. Other power hand tools such as saws must be equipped with a constant pressure switch.

d. **Grinding Tools:**
   i. Must minimize the exposure to pieces of abrasive wheels.
   ii. Work rest must be adjusted to 1/8" or less from the wheel, tongue must be adjusted to ¼" opening or less, and the shield must be properly adjusted.
   iii. Guarding must be adjusted to the constantly decreasing diameter of the abrasive wheel.
   iv. A pneumatic grinder must have a limiter for shaft speed specified by the manufacturer, and the maximum speed must be marked on the equipment.
   v. The wheel must be replaced if the edges become chipped, grooved or if any other damage is found to the wheel.
   vi. The tool must be replaced if the wheel has become too small in diameter to allow proper tool rest or upper tongue guard adjustment.

e. **Hand-held Grinders:**
   i. Must have a "Deadman" switch that automatically interrupts power to the drive when the operator removes force.
   ii. All guards must be in place prior to the tool being used.
   iii. Portable grinders shall not be used by being clamped into place on a workbench to be used as a fixed piece of equipment.

f. **SawStop:**
   i. Has a blade detection mechanism that detects when a finger or other object meets the blade.

ii. Has an immediate brake activation, which quickly stops the blade and lowers it below the table. This helps to minimize the risk of injury.
iii. The brake is part of a replaceable system that must be replaced after activation along with the blade.

9. Maintenance:

a. Inspect all power and hand tools prior to use and periodically to ensure there is no damage, guards are in place and have not been altered/removed, and there is no damage to the cords.
   i. Ensure to inspect for:
      1. Cracks, chips or other visible damage;
      2. Loose or missing parts or guarding; and,
      3. Proper function of safety features, including guards and switches.
b. Ensure the tools or equipment are properly cleaned after each use. This includes the removal of dust, debris and other residue that could impact the safe operation of the tool and lead to an accident.
c. Ensure tools are stored in designated areas that protect them from damage and environmental factors. Tools shall be stored so that there can be no accidental falls or contact with personnel working in the same area.
d. Any repairs to a power tool such as a grinder, or the changing of a wheel/disc, must be performed in accordance with hazardous energy control procedures (https://www.cmu.edu/ehs/Workplace-Construction/lockout-tagout-tryout.html) and manufacturers guidelines.
e. Defective tools or equipment found during inspections must be removed from service immediately and tagged out of service accordingly.
f. Only authorized personnel are authorized to perform work or repair on tools and equipment. All repairs must meet the manufacturer's safety standards and specifications.

10. Revisions

Date	Documented Changes	Initials
	Initial	

Appendix A- Ring Test Instructions

Purpose: The ring test is a method that is used to check the integrity of an abrasive wheel prior to it being placed into service. It is outlined by ANSI in the ANSI standard B7.1-1988.

1. When installing a new abrasive wheel, the user is responsible for ensuring the abrasive wheel meets the ANSI standard. Any abrasive wheel without the ANSI label shall be removed from service immediately. Each wheel must be labeled with its maximum operating speed.
2. Abrasive wheels must be dry, free of any damage or defects, and free of excess debris or dust prior to performing the ring test to ensure the test is accurate.
3. To perform a ring test, the wheel should be tapped gently with a tool such as a screwdriver handle for light wheels, or a wooden mallet for heavier wheels.
4. Tap wheel about 45 degrees on each side of the vertical line and about 1 to 2 inches from the side of the wheel. Rotate the wheel 45 degrees and repeat the test.

A sound and undamaged wheel will give a clear tone. If it is cracked or otherwise damaged, there will be a dead sound and not a clear ring. Do not use any abrasive wheel that does not provide a clear tone. Ensure proper PPE is used when performing the ring test. Be sure to keep records of ring tests.