

**GEORGIA INSTITUTE OF TECHNOLOGY**  
**ENVIRONMENTAL HEALTH AND SAFETY**  
**MACHINE GUARDING GUIDELINES**

**PURPOSE**

To ensure that employees and students at Georgia Tech are protected from injuries related to any hazardous machine part, function, or process during operation or maintenance.

**SCOPE**

These guidelines apply to all Georgia Tech employees and students who may work with, or adjacent to, equipment or machines that may pose a safety hazard.

**RESPONSIBILITIES**

**Supervisor**

- Ensure that employees receive training in machine guarding.
- Ensure that no modifications are made to machine guards without the manufacturer's prior approval.
- Prevent employees and shop operators from removing manufacturer provided guards from any piece of equipment.
- Supervisors will ensure the following requirements are met:
  - Removal of damaged or unprotected equipment from service
  - Periodic inspections of machines and machine guarding devices
  - Maintenance of all safety equipment
  - Ensure that only qualified and trained employees operate the equipment

**Employee**

- Attend Machine Guarding training.
- Operate and maintain machine guards in a safe manner according to training.
- Report all machine guarding issues to supervisor.
- Follow lock out/tag out procedures

**Environmental Health and Safety**

- Assist in the coordination of the appropriate training for qualified and authorized employees.
- Provide machine guarding safety guidelines that are necessary for the practical safeguarding of employees in their workplace.
- Conduct periodic inspections of work sites to ensure that machine guarding safety guidelines are being followed.

**GEORGIA INSTITUTE OF TECHNOLOGY**  
**ENVIRONMENTAL HEALTH AND SAFETY**  
**MACHINE GUARDING GUIDELINES**

**DEFINITIONS**

**Abrasive Wheel** – Power-driven wheel consisting of abrasive particles held together by inorganic or organic bonds. Metal, wooden, cloth or paper wheels or discs having a layer or layers of abrasive on the surface and natural sandstones (quarried) are not included.

**Authorized Employee** – One to whom the authority and responsibility to perform a specific assignment has been given by the employer.

**Block** – A short block of wood, provided with a handle similar to that of a plane and a shoulder at the rear end that is used for pushing short stock over revolving cutters.

**Brake** – The mechanism used on a mechanical power press to stop and/or hold the crankshaft, either directly or through a gear train, when the clutch is disengaged.

**Brake Monitor** – A sensor designed, constructed, and arranged to monitor the effectiveness of the press braking system.

**Danger Zone** – Any place in or about a machine or piece of equipment where a person may be struck by or caught between moving parts, caught between moving and stationary objects or parts of the machine, caught between the material and a moving part of the machine, burned by hot surfaces or exposed to electrical shock.

**Full-revolution clutch or stroking action** – A type of clutch that, when tripped, cannot be disengaged until the crankshaft has completed a full revolution and the press slides a full stroke.

**Guard** – A barrier that prevents entry of the operator's hands or fingers into the point of operation, pinch or nip point, or moving parts. Guards can be fixed, interlocked, adjustable, or self-adjusting.

**Guarded by location** – A guarding method where the moving parts are so located by their remoteness from floor, platform, walkway, or other working level, or by their location with reference to frame, foundation or structure as to remove the likelihood of accidental contact.

**Interlock** – A device that prevents the operation of a machine while the cover or door of the machine is open or unlocked, and which will also hold the cover or door closed and locked while the machine is in motion.

**Non-kickback fingers** – A device mounted on a circular rip saw to oppose the thrust or tendency of the saw to pick up the material or to throw it back toward the operator.

**Part revolution clutch** – A type of clutch that can be disengaged at any point before the crankshaft has completed a full revolution, and before the press slides a full stroke.

**GEORGIA INSTITUTE OF TECHNOLOGY**  
**ENVIRONMENTAL HEALTH AND SAFETY**  
**MACHINE GUARDING GUIDELINES**

**Pinch point** – Any point other than the point of operation at which it is possible for a part of the body to be caught between moving parts, between moving and stationary parts, or between the material and moving parts of a machine tool.

**Point of operation** – The point(s) where material is positioned, inserted, or manipulated, or where work such as shearing, punching, shaping, cutting, boring, forming, or assembling is being performed on the stock.

**Power-operated presses** – Power-operated presses include all mechanically powered machines that shear, punch, form, or assemble metal or other materials by means of tools or dies attached to or actuated by slides, commonly referred to as mechanical power presses (punch presses), press brakes, hydraulic power presses (punch presses), and rivet setting machines.

**Presence-sensing device** – A device that senses the presence of a person or body part in an area where the danger zone is accessible; and activates a control circuit to stop the machine. Presence sensing devices are typically photoelectric (optical) devices such as light curtains, radiofrequency (capacitance) devices, or electromechanical devices.

**Push stick** – A narrow strip of wood or other soft material with a notch cut into one end and that is used to push short pieces of material through saws.

**Qualified Employee** - An employee who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his or her ability to solve or resolve problems related to the subject matter, the work, or the project. This person is also familiar with the construction and operation of the equipment and the hazards involved.

**Ring test** – An inspection of an abrasive grinding wheel prior to mounting to make sure the wheel has not been damaged in transit, storage, etc. The wheel should ring, when tapped gently with a light nonmetallic implement. If the wheel sounds cracked (dead), the wheel will not be used.

**Safety Device** – Used for power presses. A safety device is an attachment that:

- Restrains the operator from inadvertently reaching into the point of operation, or
- Prevents normal operation if the operator's hands are inadvertently within the point of operation, or
- Automatically withdraws the operator's hands if the operator's hands are inadvertently within the point of operation as the dies close, or
- Prevents the initiation of a stroke, or stops a stroke in progress, when there is an intrusion through the sensing field by any part of the operator's body or by any other object.

**Slide** – The main reciprocating press member. A slide is also called a ram, plunger or platen.

**GEORGIA INSTITUTE OF TECHNOLOGY**  
**ENVIRONMENTAL HEALTH AND SAFETY**  
**MACHINE GUARDING GUIDELINES**

**Spreader** – A device mounted on a circular saw to prevent material from squeezing the saw or being thrown back on the operator.

**GENERAL REQUIREMENTS**

The general requirements to ensure operator safety are described below.

**Personal Protective Equipment:**

If an employee is operating a machine which exposes them to any hazard i.e. falling, flying, abrasive, and splashing objects, harmful dusts, fumes, mists, vapors, or gases, they shall be provided with the appropriate personal protective equipment (PPE) necessary to protect them from the hazard. Refer to the Georgia Tech PPE guidelines at:

<http://www.safety.gatech.edu/general/Personal%20Protective%20Equipment%20Procedure.pdf>

In addition, the following requirements should be used in the selection and use of PPE when operating machinery:

- The type of PPE needed depends on the machine being used and the job it is used for. At a minimum, eye protection must be worn at all times. A face-shield may be used in addition to safety glasses or goggles. A face-shield will protect the face and neck from hot metal fragments created during such tasks as grinding.
- Use hand protection to reduce cuts, abrasions, and blisters.
- Safety shoes with a reinforced toe assist in eliminating injuries caused by a dropped tool or stock.
- Ear protection may be necessary due to the increased noise levels produced by energized equipment. If noise levels are 90 dBA or higher then hearing protection must be utilized (e.g. ear plugs or ear muffs).
- Respirators, protecting against dust and fumes might be necessary if a hazardous atmosphere is created while working with the machine and material (e.g. creating wood dust from sawing or sanding).
- All uses of machinery should be evaluated so that proper PPE is selected. If you are unsure what PPE to use for a specific job, consult your supervisor or the EH&S General Safety Office.
- Employees must not wear loose fitting clothing, rings, bracelets, or other apparel that can become entangled in moving machinery, power transmission apparatus, or moving parts. Also, hair-nets or caps should be worn to keep long hair under control and safely away from moving machinery and parts.

**GEORGIA INSTITUTE OF TECHNOLOGY**  
**ENVIRONMENTAL HEALTH AND SAFETY**  
**MACHINE GUARDING GUIDELINES**

**Work Capacity**

Machines must be used only for work within the rated capacity specified by the machine manufacturer. If an employee needs to clear jammed work or clean around the machine, it should be completely stopped and the main power turned off. In some cases, the equipment will also have to be locked or tagged out of service as required by industry standards. Refer to the Georgia Tech Lockout-Tagout Procedure at:

<http://www.safety.gatech.edu/general/Lock%20out%20Tag%20out%20Procedure.pdf>

**Housekeeping**

Cleanliness around machinery must be maintained at all times. During cleaning, chips or other particles can be removed by brushes or compressed air. If compressed air is used, the nozzle pressure at the discharge end of the air-line should not exceed 30 psi. Compressed air may not be used to blow chips or other debris from an employee's body or clothing. Floors and aisles should be kept in good repair and free from potential hazards and other unsafe conditions such as protruding nails, splinters, holes, unevenness, and other tripping hazards. Floors in working areas should also be provided with an effective means to prevent employees from slipping.

**Operation**

A machine should never be left unattended with the control switch in the "on" position. Also, no blades, cutter heads, or collars should be placed or mounted on a machine arbor unless it has been accurately sized and shaped to fit the arbor. If blades are dull, badly set, improperly filed, or improperly tensioned, they should be immediately removed from service. Sharpening or tensioning saw blades or cutters must be done only by qualified employees.

**Electrical Safeguards**

All machinery must be installed according to the National Electric Code (NEC) and to the manufacturer's requirements. If machines have exposed non-current carrying metal components, they have the potential to become energized and should be grounded. Control switches should be available to employees at their operating positions so they do not need to reach over moving parts of machinery. Also, machine controls must not be wedged for continuous operation.

Machines that are not adequately safeguarded to protect the employee during an under-voltage situation or a power failure must have an under-voltage protective device installed. This device prevents the machine from starting up after a power interruption, which may, in some cases, expose the employee to the hazards of moving parts.

Before performing maintenance or major adjustments to moving parts that require panels and guards be removed, all machine energy sources or energy isolating devices must be locked and/or tagged out. Refer to the Georgia Tech Electrical Safety Guidelines at:

<http://www.safety.gatech.edu/general/Electrical%20Safety%20Guidelines.pdf>

Also, the Georgia Tech Lockout-Tagout Procedure is located at:

<http://www.safety.gatech.edu/general/Lock%20out%20Tag%20out%20Procedure.pdf>

**GEORGIA INSTITUTE OF TECHNOLOGY**  
**ENVIRONMENTAL HEALTH AND SAFETY**  
**MACHINE GUARDING GUIDELINES**

**MACHINE INSTALLATION REQUIREMENTS**

Machines designed for fixed locations should be securely fastened to the floor or other suitable foundation to eliminate all movement or “walking.” Small units should be secured to benches, tables, or stands of adequate strength and design. Weight limitation of floor or foundation should be considered prior to machinery installation.

Machines should be arranged in a manner that permits an even flow of materials. Adequate space should be provided to allow material handling with the least possible interference from or to operators or other machines. Machines should be located so it will not be necessary for an operator to stand in or near an aisle. Additionally, the layout of machines should allow for easy maintenance and repair.

EH&S will determine the requirements for exhaust systems. Normally, machines that develop fine dust and fumes that are hazardous to employees should be equipped with effective hoods and connected to local exhaust ventilation (LEV) systems.

**MAINTENANCE REQUIREMENTS**

Qualified employees will adhere to the following protocol during the routine maintenance of machine guards and machinery:

- Lock and tag out power supply prior to repairing the guard
- Use only replacement parts equivalent with those in the original design
- Do not alter the guard or guard parts
- Do not add any parts not supplied by the manufacturer nor delete any parts supplied by the manufacturer
- Keep the machine and its guards in clean and safe operational condition

**INSPECTION REQUIREMENTS**

A planned inspection and maintenance program should be implemented consistent with the machine manufacturer’s recommendations. Only trained and qualified employees will be permitted to inspect, maintain, and repair machine guards in accordance with manufacturer’s specifications. No repairs will be made unless the machine is locked out.

**CARE AND USE OF MACHINE GUARDS**

Most machine guards are designed to be “fixed” to the machine. These guards must not be removed unless authorized by the manufacturer or by a qualified employee. Machine guards may be removed if they are designed to be removed for cutting device changes or to make small cuts. ONLY qualified repair operators will remove all other guards.

All irregularities in the operation of machine guards will be immediately reported to the supervisor. Malfunctioning machine guards affect the safe operation of machinery and will render the machine unfit for service until such irregularities are corrected.

**GEORGIA INSTITUTE OF TECHNOLOGY**  
**ENVIRONMENTAL HEALTH AND SAFETY**  
**MACHINE GUARDING GUIDELINES**

If at any time a machine guard is in need of repair, defective, or unsafe, remove the machine from service until its guard(s) has been restored to a safe operating condition. Place an “Out of Service Tag” on the machine labeled with the employee’s name, date, and a description of the problem. Provide this information to the shop supervisor.

**New and Rented Equipment**

Prior to initial use, all new or rental machines will be inspected by a qualified employee to ensure compliance with the provisions of this safety program. For new equipment, an initial inspection will verify that the equipment is suitable for its intended use. All machines should meet the design and construction requirements identified in general industry standards.

**PROGRAM DOCUMENTATION**

**Operation and Maintenance (O&M) Record**

An O&M record for each machine should be maintained. The record should contain information necessary to inspect, test, and evaluate the machine guard. A typical record would contain the following types of documentation, as applicable:

- Manufacturer’s operation and maintenance manuals
- Documentation for replacement parts and guards
- Documentation from the manufacturer authorizing modifications to the guard
- Inspection procedures and inspections records
- Records of repair, modification, and overhaul.

For rental equipment/machines, ensure that a suitable maintenance and inspection program is established for the duration of that rental period.

**TRAINING**

Machine guarding training is available to Georgia Tech employees and students. This program is designed to explain different aspects of machine guarding and to teach safe techniques for operating machinery. EH&S may assist supervisors and facility managers in coordinating training for their employees.

**REFERENCES**

1. OSHA 29 CFR 1910.211-.217 and .263 Subpart O
2. ANSI B11.19-2003 Performance Criteria for Safeguarding
3. Georgia Tech Environmental Health and Safety Website – [www.ehs.gatech.edu](http://www.ehs.gatech.edu)
  - a. Georgia Tech Lockout/Tagout Procedure
    - <http://www.safety.gatech.edu/general/Lock%20out%20Tag%20out%20Procedure.pdf>
  - b. Georgia Tech Electrical Safety Guidelines
    - <http://www.safety.gatech.edu/general/Electrical%20Safety%20Guidelines.pdf>