Machine Safety Training

Provided by:

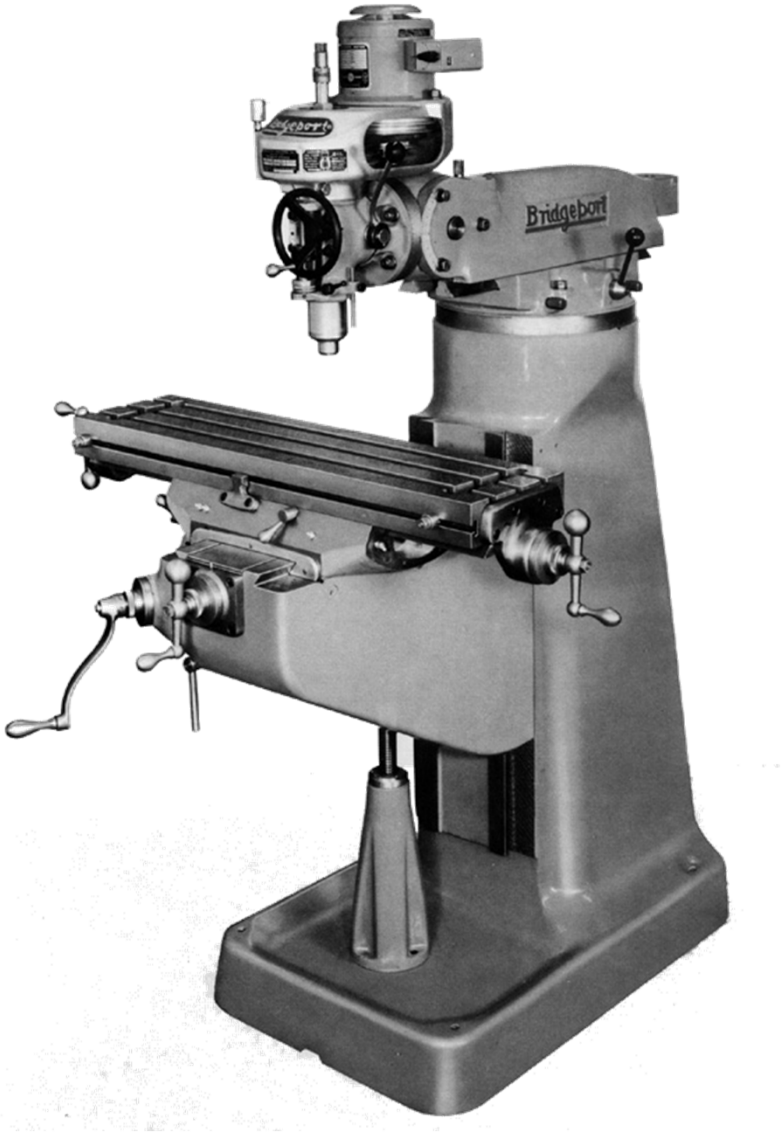
Environmental Health & Safety

Machine Safety Training Purpose

- The purpose of this training is to communicate requirements of WPI's Machine Safety Program
  - The Machine Safety Program intends to ensure compliance with the Occupational Safety and Health Administration (OSHA) as well as implementing best management practices that reduce risk and ensure a safe working/learning environment.

Machine Safety Training Outline

- Machine Safety Program Elements
- Machinery Basics
- Safeguarding Machinery
- Maintenance Requirements
- Emergency Information



Machine Safety Program

- Covered in the next section are the essential aspects of the Machine Safety Program:
  - Authorization & Training
  - Equipment Inspection
  - Basic Safe Operation Principles
  - Proper Attire & Personal Protective Equipment
  - Housekeeping

Authorization

- Authorization at WPI requires two training elements to be completed before receiving permission to work with machinery.
  - Attend Machine Safety Training provided by EHS
  - Attend a hands-on shop and equipment specific orientation/training provided by the shop manger.
- Upon completion of the training sessions the shop supervisor will give permission to use the shop.
  - Machine operator authorization will vary by department and will not be interchangeable among shops on campus
  - Permission may be revoked at anytime at the discretion of the shop supervisor or EHS staff.
- No one shall operate machinery unless they have received authorization to use the specific equipment.

Equipment Inspection

- Inspect machinery before using.
  - Do not use broken machinery and report problems to the department/shop supervisor immediately.
  - Review owners manuals or other documentation for proper inspection requirements.
- Ensure all guards, shields and interlocks are in place before operating machinery.

Basic Safe Operation Principles

- Always use care when working with or around machinery
- Become familiar with equipment operation by reviewing an owner's manual or other documentation.
- Do not operate machinery if you are tired or under the influence of alcohol, drugs or some medication.
- When using shop machinery or tools, at least one other authorized person is to be present in the shop.
  - Students may never work alone under any circumstance.
  - Staff/faculty requests to work alone must be approved by the shop supervisor or laboratory supervisor and EHS. Additional work practice controls shall be discussed and implemented in advance with EHS if this is to be allowed.
- Everyone must understand equipment specific emergency procedures before operating machinery.

Machine Operator Responsibilities

- As an operator of machinery it is your responsibility to:
  - Never operate machinery independently or unsupervised prior to receiving equipment specific safety and operational training on the machinery.
  - Never perform maintenance or servicing activities unless you are trained and authorized to do so.
  - Operate machinery in a safe manner so as to not introduce an unsafe condition.
  - Always dress appropriately when operating machinery. The expectation is performance based and requires hair and loose clothing to be secured such that it would never create a hazard.

Machine Operator Responsibilities

- As an operator of machinery it is your responsibility to:
  - Wear appropriate personal protective equipment. Eye protection is the minimum level of protection while operating a machine or if other machinery is in operation.
  - Report any machine safeguarding deficiency to supervisors immediately.
  - Ensure machine safeguards, shields or interlocks remain in place at all times.

Proper Attire

- The following describes the manner in which you'll be required to dress when operating machinery.
  - Wear closed toe/heel shoes
  - Wear long pants & shirt
  - Secure loose clothing
  - Remove neck ties and scarves
  - Secure long hair
    - Hair must be secured such that it could not be caught in moving parts.
  - Remove jewelry
    - rings, bracelets, necklaces, large ear rings

Image of clothing caught in a milling machine

Personal Protective Equipment (PPE)

- Use of eye protection (safety glasses or goggles) is mandatory in all shops when machinery or hazardous materials are being used.
- When PPE is used, it must be used in accordance with the WPI's safety programs and manufacturer instruction.
  - Do not use PPE that may get caught in moving parts and create additional hazards.
    - For example, gloves may become entangled in rotating or moving parts and draw your hand and/or body into the machinery.
    - However, gloves are appropriate for activities such as handling stock materials or hazardous substances.



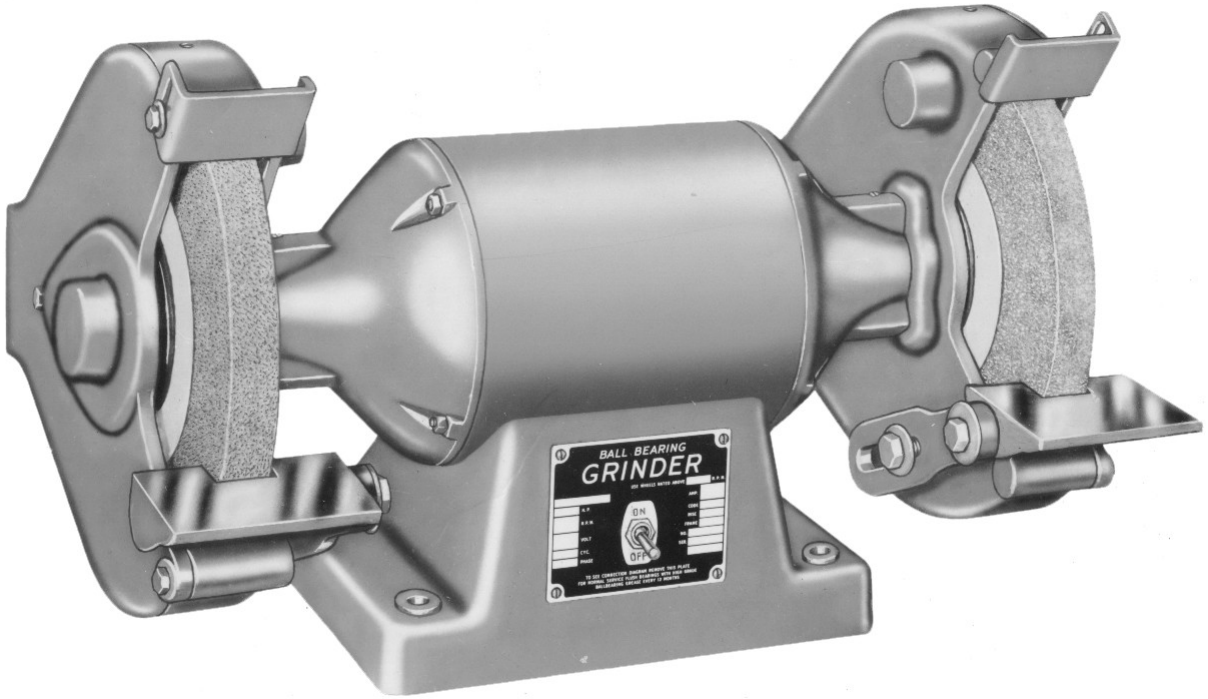


Housekeeping

- A clean shop is a safe shop and housekeeping will help avoid accidents.
- Ensure that all floors, work surfaces, and other horizontal surfaces are kept clean and free of debris and dust.
  - Whenever feasible (e.g. after each project) vacuum debris and dust in shops to minimize airborne hazards. Sweeping is another acceptable alternative, but using compressed air is not allowed for cleaning. Minimize dust generation when sweeping.
- Ensure egress and emergency equipment is not blocked.
- After use, promptly return tools, stock and chemicals to their designated storage location.
- Ensure that machinery and the shop are secure and locked when leaving.

Machinery Basics

- Machinery Hazards
- Point of Operation
- Power Transmission Apparatus
- Operator Controls
- Machine Motions
- Machine Actions



Machinery Hazards

- All machinery has inherent hazards. The following are a few types of the injuries that can occur as a result of a machine accident.
  - Bruises
  - Cuts/Lacerations
  - Eye Injuries
  - Amputations
  - Injury to bystanders
  - Death
- For these reasons it is important to operate machinery with respect and follow all requirements of this program.

Machinery Overview

- All machines consist of three fundamental areas:
  - Point of operation
  - Power transmission apparatus
  - Operating controls
- Despite all machines having the same basic components, their safeguarding requirements widely differ due to varying physical characteristics and operator involvement.
  - In most cases machine guarding cannot protect the operator from all hazards, thus operator training, authorization and experience is an important part of the machine safety program.

Point of Operation

- The point of operation is the area on a machine where work is performed during any process such as:
  - Assembling
  - Boring
  - Cutting
  - Forming
  - Punching
  - Shearing

Power Transmission Apparatus

- The power transmission apparatus is all components of the mechanical system which transmit energy to the part of the machine performing the work.
- These components include:
  - flywheels
  - pulleys
  - belts
  - connecting rods
  - couplings
  - cams
  - spindles
  - chains
  - cranks
  - gears

Operating Controls

- Operating controls are used to initiate a response from machinery. The response may cause motions or actions which may result in potential for injury.
- Operating controls can be simple or complex.
- Some examples of operating controls include:
  - On/off switch/button
  - Emergency shut off switch/button
  - Levers
  - Wheels
  - Joysticks
  - Brake lever/pedal

Machinery Motions & Actions

Motions

- Machinery motions are the act or process of changing position or place.
- The following are four of the basic types of motions.
  - Rotating
  - In-Running Nip Points
  - Reciprocating
  - Transversing

Actions

- Machinery actions are the way or manner of moving.
- The following are four of the basic types of actions.
  - Cutting
  - Punching
  - Shearing
  - Bending

Safeguarding Machinery

Safeguard Design Requirements

Safeguard Types

Safeguarding Machinery

- Safeguard minimal requirements:
  - Prevent contact:
    - The safeguard should prevent hair, clothing, hands, arms, and any other part of a worker's body from making contact with dangerous moving parts.
  - Remain Secure:
    - Workers should not be able to easily remove or tamper with the safeguard. Guards and safety devices should be made of durable material that will withstand the conditions of normal use.
  - Protect from falling objects:
    - The safeguard should ensure that no objects can fall into moving parts.

Safeguarding Machinery

- Safeguard minimal requirements (continued):
  - Create no new hazards:
    - A safeguard defeats its own purpose if it creates a hazard of its own such as a shear point, a jagged edge, or an unfinished surface which can cause a laceration.
  - Create no interference:
    - Any safeguard which impedes a worker from performing the job quickly and comfortably might soon be overridden or disregarded.
  - Allow safe maintenance & lubrication:
    - If possible, the machine should be able to be lubricated without removing the safeguards.

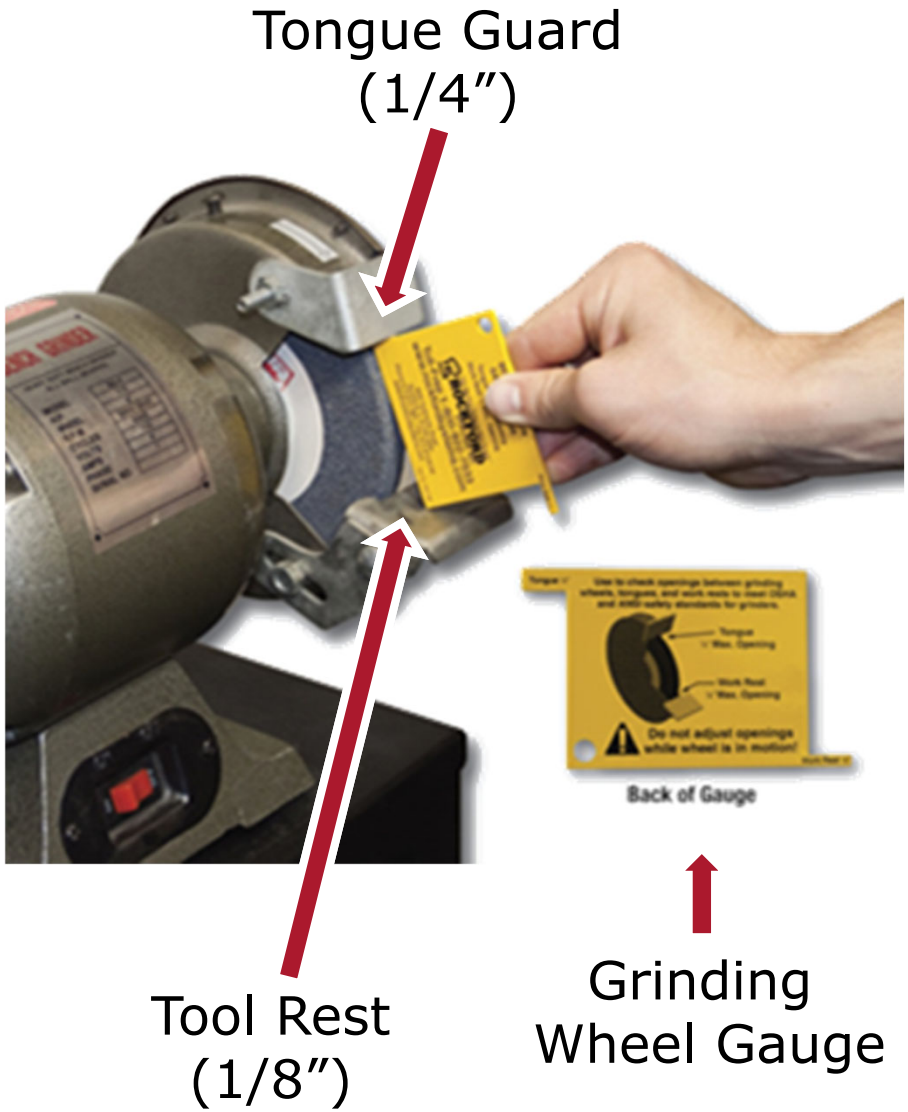
Machine Guard Design

- Every point of operation guard shall meet the following design, construction, application, and adjustment requirements:
  - It shall prevent entry of hands or fingers into the point of operation by reaching through, over, under or around the guard.
  - It shall, in itself, create no pinch point between the guard and moving machine parts.
  - It shall utilize fasteners not readily removable by operator, so as to minimize the possibility of misuse or removal of essential parts.
  - It shall facilitate machine inspection.
  - It shall offer maximum visibility of the point of operation consistent with the other requirements.

Types of Machine Guards

- There are four basic types of machine guards
  - Fixed
    - As its name implies, a fixed guard is a permanent part of the machine and is preferred due to its simplicity.
  - Interlocked
    - When this type of guard is opened or removed, the power automatically shuts off.
  - Adjusting
    - Adjustable guards are useful because they allow flexibility in accommodating various sizes of stock material.
  - Self-Adjusting
    - The openings of these guards are determined by the movement of the stock.

Specific Guard Requirements - Abrasive Wheel



- Grinding Wheels Have specific requirements for adjustment
  - Tool rest must be adjusted within and 1/8” of the wheel
  - Tongue guard must be adjusted within ¼” of the wheel
- A gauge for quick measurements can be obtained by calling EHS at (508) 831-5216

Maintenance Requirements

Maintenance & Servicing

Electrical Safety

Equipment Maintenance & Servicing

- As a machine operator you are allowed to make minor tool changes when the machines are powered off.
  - Example minor tool changes include:
    - Drill bit changes
    - Chuck changes
- As a machine operator you are NOT allowed to perform maintenance or servicing activities on machinery.
  - Examples of maintenance and servicing activities include:
    - Saw blade changes (table, band, miter, radial arm, etc.)
    - Sanding belts or pads (if a safeguard must be removed)
    - Abrasive grinding wheel changes
  - Speak with the shop manager about who is authorized to perform maintenance and servicing activities when needed.

LOTO Affected Personnel

- Employees authorized in equipment maintenance & servicing must attend Lockout/Tagout Training.
  - Lockout/Tagout is a procedure used to prevent the accidental release of hazardous energy, or to prevent the hazardous energy from escaping during maintenance or servicing.
  - Lockout/Tagout is a separate course not covered by this training.
- Do not tamper with a padlock or other lockout/ tagout device at anytime as someone may be injured as a result of your action.
- Close coordination with Contractors performing lockout/tagout is mandatory.

Electrical Safety

- The National Fire Protection Association (NFPA) has specific requirements for electrical safety.
  - Electrical and machine control panels often fall under the requirements of NFPA.
  - In most cases only Facilities electrical staff are authorized to open electrical panels.
  - Machine operators shall not open electrical panels to reset circuit breakers.
- If your equipment requires electrical service contact:
  - Facilities Service Center @ (508) 831-5500

Emergency Information

Reporting Emergencies

Accident/Injury Reporting

Reporting Emergencies

- Try to remain calm
- Turn off energy sources immediately
  - If the emergency involves machinery
- Call WPI Campus Police at (508) 831-5555.
  - Provide information on the nature of the emergency
    - Location of the emergency
    - The type and extent of injuries
    - Number of people involved
  - Follow instructions of the Campus Police dispatcher
- If you are able and willing, tend to injured personnel
- Stay in the general area, at a safe distance away, and wait for emergency responders.
- Introduce yourself to emergency responders as they arrive. Emergency responders want to ensure that the information they have is accurate and that conditions have not changed since the initial phone call was made.

Accident / Injury Reporting

- If injured at WPI, no matter how minor the injury, you must report the accident to your supervisor and complete an accident report form.
  - Chemical exposure, bruise, cut, etc.
- Fill out report forms with as much information as possible, get it signed by your supervisor and send to Human Resources within 48 hours.
  - Phone number is (508) 831-5470
  - Fax number is (508) 831-5715
  - www.wpi.edu/+accident

Additional Information

- If you have questions about this training, please contact Environmental Health & Safety:
  - (508) 831-5216
  - Website: http://www.wpi.edu/+ehs