# Machine Shop Safety Manual Online

# Purpose

This manual outlines the College (Division) of \_\_\_\_\_\_\_\_\_\_\_\_, Department of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ guidelines for the operation, maintenance, safety, and training for its machine shop and associated machinery and equipment. This manual is intended to assure that:

* Employees and students are provided training and information on how to protect themselves from machinery and equipment hazards,
* Recommended maintenance is conducted,
* Only persons trained and knowledgeable in the use of a specific piece of machinery and equipment use that machinery and equipment,
* All work is performed in accordance with standard operating procedures, and
* All work is performed in accordance with manufacturer’s guidelines and recommendations.

This manual includes provisions to assist with protecting employees and students from hazards. To meet this objective:

* Risk Management and Safety will survey workplaces to identify shop areas covered by this manual and establish an audit system to measure the effectiveness and use of the manual and its components.
* The College (Division) of \_\_\_\_\_\_\_\_\_\_\_\_, Department of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ has identified \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, (if a second is needed) as Shop Safety Coordinator(s) who will manage this manual for the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ machine shop located in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and create written practices and procedures for machinery and equipment.
* The Shop Safety Coordinator(s) will provide training to individuals who will work in shop areas and implement written practices and procedures for machinery and equipment.

**Scope and Application**

These requirements apply to the College (Division) of \_\_\_\_\_\_\_\_\_\_\_\_, Department of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and their employees and students in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ machine shop located in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Responsibilities**

This manual includes provisions to assist with protecting employees from the hazards associated with the operation and maintenance of machinery and equipment. To meet this objective the following responsibilities have been established:

Risk Management and Safety

* Observe and document location of applicable machine shops.
* Review hazards associated with shop machinery and equipment during workplace inspections.
* Review and updating the university’s shop machinery and equipment program.
* Develop and provide training to individuals designated as Shop Safety Coordinators.
* Work with Colleges/Schools/Departments/Divisions and Shop Safety Coordinators in establishing appropriate PPE.
* Work jointly with Shop Safety Coordinators in the development of safety protocols for shop machinery and equipment that present a unique hazard to employees and students.
* Assist Colleges/Schools/Departments/Divisions and Shop Safety Coordinators in establishing operational and safety guidelines for machinery and equipment utilized within their machine shop.
* Evaluate the effectiveness and use of the manual and its components.

College/School/Department/Division

* Keep all machinery and equipment used by employees or students in good condition.
* Identify a Safety Coordinator for each shop to manage their shop(s).
* Provide training to employees or students who will work with machinery and equipment.
* Document employee and student training.
* Document those employees and students permitted to use machinery and equipment and the supervision required.
* Document and provide required PPE.
* Establishing operational and safety guidelines for machinery and equipment utilized within the machine shop.
* Surveying workplaces to identify machinery and equipment covered by this program.

Shop Safety Coordinator(s)

* Provide employees and students with hands on training on the specific machinery and equipment within their machine shop.
* Ensure the proper use of PPE.
* Ensure that guards and switches on machinery and equipment are in place and functioning.
* Ensure unsafe machinery and equipment is not used.
* Ensure that related programs, such as [Lockout/Tagout](https://cws.auburn.edu/rms/ConMan/ConMan_FileDownload.aspx?FileName=LOTO%202.pdf) and [Hot Work](http://www.auburn.edu/administration/rms/pdf/hot-work-permit.pdf), are followed where appropriate.
* Establish regular machinery and equipment inspection procedures and providing repair when machinery and equipment are damaged or malfunctioning.
* Document inspection, maintenance and care of machinery and equipment.
* Implement the operational and safety guidelines for machinery and equipment.
* Ensure housekeeping is conducted.
* Development of Standard Operating Procedures for the equipment under his/her purview.

Employees and Students

Only trained, qualified, and authorized employees and students will be permitted to use machinery and equipment. Employees and students are responsible for:

* Operating machinery or equipment only after being trained by the Shop Safety Coordinator(s).
* Following standard operating procedures for the machinery and equipment.
* Become acquainted with all work hazards.
* Ensuring that all safeguards are utilized.
* Dressing appropriately (no loose jewelry, clothing, or unsecured long hair).
* Utilizing appropriate PPE.
* Reporting to their Shop Safety Coordinator any machinery and equipment that needs to be serviced.
* Following all safety guidelines for the use of machinery and equipment and according to manufacturer’s instructions.
* Participating in training.
* Reporting injuries to the Shop Safety Coordinator so that an [Employee Accident Report](http://www.auburn.edu/administration/rms/pdf/oji-contact.pdf) can be completed.

**Training**

Prior to using machinery and equipment employees and students must be trained to use the correct machinery and equipment for each job and must attend specific training for each machinery and equipment to be used. No one will be permitted to use any machinery and equipment without receiving proper training. Instruction on the following shall be included in the training program:

* Selecting the right machinery and equipment for the job.
* Hazards and their controls.
* Common causes of injury.
* Safety precautions.
* Personal Protective Equipment.
* Inspection/Maintenance.
* Safe operation.
* Lockout/tagout

All users of machinery and equipment must complete applicable training and follow the safety requirements of this manual.

**Machine Shop**

Operating Requirements

All machinery and equipment shall be operated in accordance with the manufacturer’s operation manual and standard operating procedures. If there are questions as to the proper and safe use of machinery and equipment, the manufacturer’s manual and/or the Shop Safety Coordinator will be consulted. *The user shall not use machinery and equipment if he/she is unsure how to use it in a safe manner*.

Inspection and Maintenance Requirements

Machinery and equipment will be inspected and maintained according to the manufacturer's recommendations. This information, along with safety-related guidelines, can be found in the operator's manual. If a manual is not available, the manufacturer shall be contacted to obtain one. The manufacturer's manual may be located on their websites as well.

User Inspections

* Visually inspect all machinery and equipment before use to ensure that the machinery and equipment are in safe and usable condition.
* All damaged and/or defective machinery and equipment will be immediately reported to the Shop Safety Coordinator

Shop Safety Coordinator(s)

* Responsible for inspection and maintenance of all machinery and equipment used at quarterly intervals and in accordance with the manufacturer’s specifications.
* Remove machinery and equipment from use that is unsafe or not operating within manufacturer’s specifications.
* Document inspections and repairs of machinery and equipment.

Care and Use

The user shall become familiar with the machinery and equipment by reading the manufacturer operation manual before use. Unusual working conditions will require additional instructions from the Shop Safety Coordinator. Conduct a pre-use inspection of the machinery and equipment. Modifications to machinery and equipment without the manufacturer’s prior written approval are prohibited.

Nameplates and Marking

Machinery and equipment ratings and capacities may be found on a tag affixed to the machinery and equipment. If no tag is found, report it to the Shop Safety Coordinator. These tags contain important information such as UL testing, load, and operating specifications.

Housekeeping

Keep floors, machines, and other surfaces must be kept free of dirt, wood and metal chips, sawdust, oil and grease and other debris.

If floor surfaces are wet or slippery or become wet during work activities, they should be protected with a non-slip coating or covering.

Stop machine before cleaning.

Keep machine and hand tools clean.

Use brush and not cloth to remove chips.

Use cloth to clean oily surfaces.

Do not place tools and materials on machine table.

Never place tools or materials on floor close to machine.

Return stock to storage rack after cutting.

Never use compressed air to remove chips from machine.

Electrical

Where machinery is hard-wired into the electrical system, an accessible and labeled disconnect (if not obvious) shall be provided.

Where machinery is cord-and-plug connected to the power supply, proper grounding shall be maintained.

Exposed energized electrical hazards, such as missing knockouts, covers, damaged cords, etc., shall be corrected immediately.

Proper [lockout/tagout procedures](https://cws.auburn.edu/rms/ConMan/ConMan_FileDownload.aspx?FileName=LOTO%202.pdf) shall be followed for all servicing and maintenance of machinery and equipment.

Material Storage and Handling

Stock materials will be stored in such a manner as to prevent falling, slipping, or rolling.

Material shall not be stored on the floor, and may not be stored where they will impede egress from the area.

Shelves or cabinets will be used, as appropriate, to store materials.

Mezzanines used to store materials shall be load rated and marked accordingly. Mezzanines shall not be overloaded.

Chemicals/Gases

Chemicals will be stored in [safety cabinets](http://www.grainger.com/Grainger/wwg/search.shtml?searchQuery=chemical+cabinets&op=search&Ntt=chemical+cabinets&N=0&GlobalSearch=true&sst=subset) approved for that use, as appropriate.

[Incompatible chemicals](https://cws.auburn.edu/rms/ConMan/ConMan_FileDownload.aspx?FileName=PARTIAL%20LIST%20OF%20INCOMPATIBLE%20CHEMICALS.pdf) will not be stored together.

Safety Data Sheets for all chemicals used will be maintained in the shop area.

[Compressed gas cylinders](https://cws.auburn.edu/rms/ConMan/ConMan_FileDownload.aspx?FileName=Gas%20Cylinder%20Safety.pdf) will be stored, used, and handled in accordance with safe work practices.

Flammable and Combustible Liquids

Flammable and combustible liquids include, but are not limited to, materials such as gasoline, oils, some paints, lacquers, thinners, cleaners, and solvents. To determine if a material or product is flammable or combustible, the Safety Data Sheet will be reviewed or manufacturers label on the product will be read.

Cloth or paper rags, or material that has been saturated with flammable or combustible liquids will be stored in an [approved oily waste can](http://www.grainger.com/Grainger/wwg/search.shtml?searchQuery=oily+rags+can&op=search&Ntt=oily+rags+can&N=0&GlobalSearch=true&sst=subset). All employees and students should be aware of the oily waste can location(s). These materials shall be removed on a daily basis and placed into a 55-gallon metal drum with tight fitting lid located in an approved storage location. Risk Management and Safety at 844-4805 will be contacted for approval of the storage location and to arrange disposal of the drum when full.

Always remove/replace clothing that has become saturated with a flammable or combustible liquid-even if it is just a little. Saturated clothing can easily ignite if exposed to an ignition source, such as radiant heat, flame, sparks or slag from hot work, or an electrical arc.

Access

The shop area will be accessed only by those persons who have received training consistent with this manual.

Layout/Egress

Aisles and walkways will be kept free of debris and obstructions and a clear path will be maintained to the exit.

All exits shall be properly identified with signage.

Machinery will be placed so that a clear and safe operating area is maintained for each machine.

Environment

The shop area will have adequate lighting to perform the work safely.

Sufficient ventilation will be provided for welding and cutting areas.

Noise control or hearing protection may be necessary.

Harmful dusts, mists, and fumes shall properly controlled or employees and students shall be protected.

Procedures

No person will work in a shop area alone.

Hours of operation shall be established.

A Shop Safety Coordinator will be present during all hours of operation.

Emergency contact numbers, and a means for summoning help, will be readily available.

Shop Guidelines

The Shop Safety Coordinator(s) shall establish shop specific information such as hours of operation, controls over who can access the space, and general housekeeping rules and post this information near the shop entrance. Shop guidelines and rules will be clearly posted.

**Machinery**

General Machinery and Equipment Hazards

Several general types of hazards exist on many types of machinery. Shop and machine users must be provided protection from these hazards.

[*Point of Operation*](http://www.brisbanesaw.com.au/images/King_Table_Saw_Large_2.jpg)*:* refers to the area where work (e.g. cutting, shearing, shaping, boring) is performed on a stock material. The machine shop does not have or does have machinery which has point of operation guarding that must be in place during operation. Machinery which requires point of operation guarding includes \_\_\_\_\_\_\_\_\_\_\_

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If a guard is missing or needs repair contact the Shop Coordinator.

[*Nip or Pinch Point*](http://www.lombardilaw.com/upload/L_44209201.jpg)*:* refers to an area other than a point of operation where a belt contacts a pulley or one or more rotating parts come together where it is possible for a part of the body to get nipped or pinched by the moving parts. The machine shop does not have  or does have  machinery which has nip or pinch points which require guarding during operation. Machinery which requires nip or pinch points guarding includes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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If a guard is missing or needs repair contact the Shop Coordinator.

[*Power Transmission*](http://www.ehss.vt.edu/images/MAC_belt.jpg)*:* refers to areas where power is transferred from one part to another such as a drive shaft, belt, or chain. Belts, pulleys, flywheels, rotating parts etc. must be guarded to prevent entanglement and amputations. Older machinery is notorious for not providing this type of guarding. The machine shop does not have or does have machinery which has power transmission points which require guarding during operation. Machinery which requires power transmission guarding includes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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If a guard is missing or needs repair contact the Shop Coordinator.

Rules for all Machines

The owner's or operator's manual will be in the shop area with the machine. A standard operating procedure indicating safety features and their appropriate use will be made available to the user.

The area of operation will be free and clear of obstructions. Space will be provided between each machine and other objects, including other machine operating areas, as needed, to allow safe operation of the machine.

A general checklist for machinery is available [here](https://cws.auburn.edu/rms/ConMan/ConMan_FileDownload.aspx?FileName=Shop%20Inspection%20Checklist.pdf).

Older Equipment

One issue with older shop equipment is that it may not have appropriate guarding when compared to newer standards and design requirements. Machine guarding issues are not grandfathered by OSHA and must be addressed before the machine is used. Check with the manufacturer first to see if a retro-fit kit is available. If so, it will be purchased and installed. If a retro-fit kit is not available, a guard may have to be manufactured and installed. In general, the guard must sufficiently cover the hazard without creating an additional hazard.

Older machinery typically has insufficient guarding or other issues that would prohibit safe use and must be secured by a positive means to prevent accidental use while it remains onsite. "Positive means" will include placing a "Do Not Use" tag on the machine that specifies the problem (ex. missing guard) and applying an energy isolating device and lock on the cord-and-plug, or cutting the plug off of the machine to prevent someone from using the machine easily.

Machine Specific Information

Machinery and equipment must be inspected and maintained according to the manufacturer's recommendations. This information, along with safety-related guidelines, can be found in the operator's manual. If a manual is not available, the manufacturer should be contacted to obtain one. Many manufacturers’ post their operator's manuals on their websites.

Some machine-specific information is available below.

[Abrasive Wheel Machinery](https://cws.auburn.edu/rms/ConMan/ConMan_FileDownload.aspx?FileName=Abrasive%20Wheel%20Equipment.pdf)

[Band Saw](https://cws.auburn.edu/rms/ConMan/ConMan_FileDownload.aspx?FileName=Band%20Saw.pdf)

[Belt Sander](https://cws.auburn.edu/rms/ConMan/ConMan_FileDownload.aspx?FileName=Belt%20Sander.pdf)

[Bending Machine](https://cws.auburn.edu/rms/ConMan/ConMan_FileDownload.aspx?FileName=Bending%20Machine.pdf)

[Buffing Machine](https://cws.auburn.edu/rms/ConMan/ConMan_FileDownload.aspx?FileName=Buffing%20Machine.pdf)

[Drill Press](https://cws.auburn.edu/rms/ConMan/ConMan_FileDownload.aspx?FileName=Drill%20Press.pdf)

[Milling Machine](https://cws.auburn.edu/rms/ConMan/ConMan_FileDownload.aspx?FileName=Milling%20Machine.pdf)

[Pedestal Grinding Machine](https://cws.auburn.edu/rms/ConMan/ConMan_FileDownload.aspx?FileName=Pedestal%20Grinding%20Machine.pdf)

[Planer](https://cws.auburn.edu/rms/ConMan/ConMan_FileDownload.aspx?FileName=Planer.pdf)

[Radial Arm Saw](https://cws.auburn.edu/rms/ConMan/ConMan_FileDownload.aspx?FileName=Radial%20Arm%20Saw.pdf)

[Table Saw](https://cws.auburn.edu/rms/ConMan/ConMan_FileDownload.aspx?FileName=Table%20Saw.pdf)

[Turning Machine](https://cws.auburn.edu/rms/ConMan/ConMan_FileDownload.aspx?FileName=Turning%20Machine.pdf)

**Machine Shop Safety Controls**

Many control systems exist to provide protection from hazards. Users must be provided protection from all hazards during their work in the machine shop.

Engineering controls must be given first priority. If engineering controls are not feasible, then an appropriate administrative control must be used. If an administrative control will not control the hazard, then PPE will be utilized by the machine user.

Engineering

Engineering controls include guards, ventilation systems, and dust collection systems.

Guards

There are three main types of guards. At least one type of guard can provide protection from most machine hazards.

1. [Fixed Guard](http://www.ehss.vt.edu/images/MAC_guard.png): refers to a guard that is a permanent part of the machine, but is not dependent upon moving parts of the machine to perform its guarding function. A fixed guard that can be manually set into the appropriate position before machine operation is sometimes referred to as an "adjustable guard". A fixed guard that completely separates the user from the hazard is often called an "enclosure guard". The equipment in the shop which has or requires fixed guards includes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. [Interlocked Guard](http://calwestrepairs.com/images/hds_lathe1.jpg): refers to guards that are connected to a mechanism that cuts power to the machine when the guard is tripped or moved out of position. The equipment in the shop which has or requires interlocked guards includes \_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. [Self-adjusting Guard](http://www.brisbanesaw.com.au/images/King_Table_Saw_Large_2.jpg): refers to a guard that adjusts automatically to the thickness and movement of the stock material. An example is a floating guard on a table saw that raises up and floats along the top of the stock while the stock is guided across the saw. The equipment in the shop which has or requires self-adjusting guards includes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Ventilation

When chemical or flammable liquid work is performed, ventilation may be required in addition to the building ventilation. This may include fume hoods or other types of local exhaust ventilation.

Dust Collection

Dust collection systems remove sawdust or other particles from the shop area. The particles are generally collected in a bag or other container for disposal. Where woodworking or other dust generation activities are conducted a dust collection system will be put in place.

Administrative

Administrative controls include training, standard operating procedures, access to machines and the shop, maintenance activities, and shop guidelines. The shop will establish these guidelines, put them in writing, and post them at the entrance to the shop.

Personal Protective Equipment

Employees and students who use machinery and equipment and who are exposed to the hazards of falling, flying, abrasive and splashing objects, or exposed to harmful dusts, fumes, mists, vapors, or gases will be provided with the appropriate equipment needed, including PPE, to protect them from the hazard. All uses of machinery and equipment shall be evaluated by Risk Management and Safety so that proper PPE can be selected.

When PPE is required, as suggested by the manufacturer or required by Risk Management and Safety, employees and students using such equipment will be trained. More information regarding recommendations and guidelines for requiring specific PPE can be found at Risk Management and Safety’s [PPE Program](https://cws.auburn.edu/rms/ConMan/ConMan_FileDownload.aspx?FileName=PERSONNAL%20PROTECTIVE%20EQUIPMENT.pdf).

General Safety Guidelines:

The following general guidelines are specified for the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ machine shop:

* + No long sleeve shirts.
  + No loose shirt tails (tuck into pants).
  + No neck ties, scarves, or hood strings.
  + No loose jewelry (i.e. necklaces, bracelets, watches, rings, etc.).
  + No gloves (recommended for material handling only; not during machinery use)
  + No open-toed shoes (i.e. sandals, flip flops).
  + Long pants recommended.
  + Hearing protection is highly recommended and may be required in some instances.
  + Hair below the collar of the shirt must be secured (tied back and tucked in shirt or covered by a hat).
  + Long beards must be covered.
  + Safety glasses must be worn at all times.
  + Face shields required when using grinders.
  + Other machine-specific clothing/equipment as recommended by the manufacturer.
  + Students are not permitted to use any machinery and equipment without the presence of a Shop Safety Coordinator.
  + No one shall wear headphones/earphones while operating machinery and equipment.

Guards: Hazardous moving parts on machinery and equipment must be safeguarded. For example, belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, or other reciprocating, rotating, or moving parts of equipment shall be guarded if such parts are exposed to contact by the user. Safety guards shall never be removed when machinery and equipment is being used.

**Machine Shop Definitions**

*Fixed Guard* refers to a guard that is a permanent part of the machine, but is not dependent upon moving parts of the machine to perform its guarding function. This may include some guards that can be manually set into appropriate positions and fixed into place.

*Interlocked Guard* refers to guards that are connected to a mechanism that cuts power to the machine when the guard is tripped or moved out of position.

*Nip or Pinch Point* refers to an area other than a point of operation where a belt contacts a pulley or rotating parts come together where it is possible for a part of the body to get nipped or pinched in the moving parts.

*Point of Operation* refers to those activities (e.g. cutting, shearing, shaping, boring) performed on a stock material.

*Power Transmission* refers to areas where power is transferred from one part to another such as a drive shaft, belt, or chain.

*Self-adjusting Guard* refers to a guard that adjusts automatically to the thickness and movement of the stock material. An example is a floating guard on a table saw that rises up and floats along the top of the stock while the stock is guided across the saw.

*Shop Safety Coordinator* means the departmental person(s) responsible for ensuring compliance with this program.