

# **CGAM SAFETY HANDBOOK**

## **Utica Campus**

**FOLLOWING IS A BASIC REVIEW OF EQUIPMENT  
SIMILAR TO THAT FOUND IN THE PROJECT BASED LEARNING LAB, MACHINE  
TOOLS LAB, AND AUXILIARY LABS**

**TOPICS COVERED ARE IN THE AREAS OF GENERAL  
MACHINE / EQUIPMENT SAFETY AND PROCEDURES**

**Separate Safety Materials and Training are available for Fire Safety,  
Emergency Response, Evacuations, Chemical Safety, Hazard Communication,  
and Individual Tool Safety.**

**Specific Tool / Equipment Safety is expected to be reviewed by Qualified  
Personnel (e.g. Instructors, Mentors, Supervisors, Machinists) before  
individuals are allowed to operate the equipment**

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## INTRODUCTION

### Guidelines and Procedures

This handbook was assembled to assist students and faculty with the safety guidelines and procedures that shall be followed when using the CGAM area (e.g. machine tools, project based learning lab) and associated spaces. These rules shall apply to the use of these rooms and equipment for classes, clubs or other activities.

Access to the lab(s) is generally **restricted to normal building hours** for Donovan Hall. SUNY Poly (Utica) University Police have the final authority on room occupancy. If you are asked to leave by a campus officer, you must do so at once without argument.

It should be noted that any student or other person requesting use of CGAM rooms is responsible for reading and following these guidelines and procedures. Before a faculty member authorizes use of the room(s), equipment, tools, you will be asked about your knowledge on the safe and proper use of the equipment contained in that lab. **DO NOT misrepresent the extent of your knowledge. This could result in serious injury to you, others in the lab, or damage to the equipment.** If you are not sure how to operate a particular machine or the best way to complete a particular task, **ask for assistance.**

**Failure to follow these guidelines and procedures will result in revocation of authorization for access to CGAM areas and / or equipment and tools.** Reinstatement will only be allowed after the individual has met with both the faculty member and lab technician / machinist and all agree that the person may continue to use the lab/equipment/tool. The privilege of using the CGAM area and equipment can be revoked permanently by faculty, lab technician, or machinist. This can be a result of not following safety guidelines and procedures, and/or for improper professional conduct. The CGAM areas are available for use following completion of the Basic Safety Training course. Room access is available with a Room Access Authorization Form signed by the applicable faculty member and submitted to University Police. Approval to use the CGAM area rooms, equipment, and tools is allowed on a one-semester basis. Approval for subsequent semesters requires completion of a new Room Access Authorization form.

**SPECIAL NOTE:** Your instructor will advise you of any scheduled orientation and safety training sessions which you must attend prior to using these labs. The sessions will be conducted by your instructor and/or the Environmental Health and Safety Officer. Topics covered will include a brief overview of the equipment found in each lab, as well as the location and instruction on use of the room's safety equipment, such as fire extinguishers, fire blanket, emergency eye wash, first aid kit, and emergency power shutoff switches (for the entire room and for individual machines).

## General Safety Rules and Procedures

- There **MUST BE AT LEAST TWO PEOPLE** in the room at all times. Any person within the room must be approved in advance by the responsible faculty member.
- Only the equipment reviewed and on which the requestor has proved knowledgeable is to be used. This is determined from the initial screening interview.
- All injuries, no matter how slight, must be reported immediately to: University Police, 315-792-7111 or Ext. 7111 or Environmental Health and Safety, 315-792-7101 or Ext. 7101, College of Engineering DH1191, Ext. 7234; the machinist or lab technician, and your class instructor.
- Any incident involving hazardous materials, spills and/or waste must be reported immediately to: University Police, 315-792-7111 or Ext. 7111 or Environmental Health and Safety, 315-792-7101 or Ext. 7101; the machinist or lab technician, and your class instructor.
- Report any unsafe condition **IMMEDIATELY**.
- A telephone, is available in all primary rooms for use in reporting emergencies, or contacting faculty and technician for routine assistance.
- Safety glasses with side shields must be worn in any room where work is being performed (attended or unattended). In addition, all persons are required to use the appropriate personal protective equipment that pertains to the machine or tool being used (e.g. welding gloves, helmet, apron, full-face shield, etc...). Note: Chemical splash goggles will be worn when checking battery fluids and/or charging batteries. All Personal Protection Equipment (PPE) must comply with current ANSI standards.
- All machine guards or other types of safety devices will be in operation while anyone is exposed to a particular hazard. Machine guards and safety devices will be used in a manner which will effectively minimize the hazards. If guards are defective, damaged or otherwise ineffective, **the machine will be removed from service until the guards are repaired or replaced.**
- No person shall operate machinery or equipment unless qualified and authorized by appropriate faculty and staff.
- Neckties, articles of jewelry, or loose clothing will not be worn by operators of machines which have moving parts in close proximity to the operator. Long hair, which could be caught by moving parts, should be tied back.

- Before any adjusting, repairing or maintenance on equipment (e.g. electrical, mechanical, hydraulic, etc.), the switch or valve controlling the source of power must be properly “locked out.” Only qualified personnel are allowed to adjust, repair, or maintain equipment. **The college lockout/tagout procedures will be followed:**
  - a. Shut off the source of power at the master switch or main disconnect.
  - b. Attach multiple lockout device directly to the disconnect and install safety padlock.
  - c. Test equipment to ensure it is the right switch or valve.
  - d. When work is completed, and only then, remove the lock personally.
- Machinery, equipment and tools in defective or unsafe condition will be repaired and tested, replaced, or taken out of service. Report any problems at once to either the faculty member or technician. Repair work will be performed by qualified persons only. **A NOTICE MUST BE POSTED ON ANY DAMAGED OR DEFECTIVE EQUIPMENT IMMEDIATELY. A supply of such signs will be available in the lab.**
- No alteration or modification will be undertaken on any machinery or equipment for the purpose of adapting it for use other than its originally designed and intended use, unless all safety hazards are first considered by responsible and qualified persons.
- No students will be permitted to operate more than one automated machine tool simultaneously.
- OSHA regulations mandate that air pressure in excess of 30 psi **must not** be used for cleaning machines, and low pressure must be used only with effective chip guarding or personal protection equipment (e.g. safety goggles). **NEVER BLOW COMPRESSED AIR AGAINST YOUR BODY OR THE BODY OF ANOTHER PERSON.**
- Hands or body will not be used as a brake to stop a moving machine part, even when the power has been shut off.
- Devote full-time attention to the work in progress. If the operator must leave the machine, it shall be shut down, unless the machine has been designed to operate in this mode.
- Manual adjusting and gauging (callipering) of work is not permitted while the machine is running.
- Operators shall use proper hand tools for each job.
- Hazardous operations and activities will be isolated to reduce the exposure to others within the room (e.g. using the welding screen).

- No tool or material will be temporarily placed or left on any equipment where it might accidentally contact moving parts.
- All power tools and electrical appliances will be effectively grounded except power tools that are dubbed insulated or two-wire UL-listed appliances.
- **If in doubt about the safe or proper way to do the work, request instructions or assistance.**
- Obey all safety regulations.
- The basic rule of good housekeeping, “a proper place for everything and everything in its place,” will be applied to all activities and operations.
- Floors will be kept free from tripping and slipping hazards, and other hazards such as sharp objects, oil and grease.
- Oily rags or waste will be deposited in a properly labeled, covered metal container.
- There is **NO smoking or eating** permitted within the machine / lab rooms.
- Horseplay and other unprofessional conduct is forbidden.

## **REVIEW OF MACHINES AND EQUIPMENT PROCEDURES**

### **METAL CUTTING SAWS**

Power hacksaws and band saws are commonly used in machine shops for cutting steel, cast iron, copper, aluminum, brass and many other metal alloys. Safeguards and safe practices must be used to avoid accidents while operating these machines. The principal injuries associated with metal cutting saws are hand and finger lacerations and amputations resulting from contact with saw blades and sharp edges of cut material. Saw operators lacking proper eye protection are also subject to eye injuries from flying chips and debris.

#### **Safeguards and Safe Practices**

1. Both bandsaw wheels must be fully enclosed to prevent contact and serious injury.
2. Adjust the telescoping guard on the bandsaw blade guide so the length of exposed blade does not exceed 3/8 inch greater than the thickness of stock being cut. Make adjustments only when the power is off and the machine is completely stopped.

3. When using horizontal bandsaws and power hacksaws, always mount the work securely while the machine is stopped.
4. Cracked saw blades are hazardous and must not be used. The cracked portion of a blade will often make a characteristic clicking sound as it passes through the work. When blade clicking occurs, the operator should immediately shut off the machine's power, step away from the saw until all motion ceases and then replace the blade.
5. Follow the manufacturer's instructions for tensioning band saw blades. Too much tension can cause blade breakage.
6. In situations where the work binds or pinches the blade, always shut off the machine and wait until all motion has ceased **BEFORE** attempting to back the work away from the blade.
7. Saw curves gradually on vertical bandsaws because sharp twists and forcing the work can break the blade.
8. When using horizontal bandsaws and power hacksaws, always support the material being cut so the protruding end of long stock cannot fall and cause injuries.
9. To avoid injury, always roll long sleeves above the elbow and secure long hair before operating a power saw. Moreover, gloves, neckties, loose clothing, rings and other jewelry **shall not** be worn while operating these machines. Gloves may be worn when handling rough stock but must be removed **BEFORE** machine startup.
10. Keep the work area around the machine free of stock, scrap and chips.
11. Use a brush when cleaning metal-cutting saws. Power saws must be shut down and fully stopped **BEFORE** cleanup.
12. Machine maintenance must only be performed **AFTER** the electrical power has been "locked out" and all motion has ceased.
13. Always wear a safety glasses while operating metal-cutting saws.

## **DRILL PRESSES**

Metalworking drill presses are vertical spindle or upright drilling machines used for boring, reaming and tapping holes in metal. Proper safeguards and safe work practices are necessary to avoid accidents while operating these machines. The injuries commonly associated with drill presses occur when the operator's hands are caught between the

work and the machine or when spinning stock strikes the operator. Tool breakage can also result in severe eye injuries when adequate eye protection is not worn.

**Safeguards and Safe Practices:**

1. Always use clamps or a drill press vise to hold the work. If the work slips in the vise or the clamp holding the work becomes loose, shut the machine down and then tighten the vise or clamp. NEVER attempt to hold the work by hand or tighten a vise or clamp with the machine in motion.
2. Use the proper drill bit for the job and make certain that the drill speed is not excessive for large diameter bits.
3. The chuck key must be removed from the chuck before the machine is started.
4. All tools and other loose materials should be removed from the drill press table before work begins.
5. Always use sharp drill bits. Using dull tools is hazardous because excessive force needed for cutting may cause the bit to stick or break.
6. If a drill bit sticks in the stock, always shut off the power and turn the stock by hand.
7. A drill press must be shut down and have its power “locked out” before attempting to clean, lubricate or repair the machine.
8. Always use a brush when cleaning off a drill press table.
9. The floor around a drill press should be kept free of scrap, tools and other objects which could be a stumbling hazard.

**The most common hazards to be aware of during drill press operation include:**

1. Contacting the rotating spindle or the tool – Do not touch the tool while using a quick-change clutch.
2. Being struck by a broken drill/using dull drills – A frequent cause of breakage is using dull tools. A thin drill, smaller than 1/8 inch diameter, will often break and cause injury. A larger drill may “fire up,” freeze in the hole, and then break.
3. Being struck by insecurely clamped work – A frozen tool may cause unclamped or insecurely clamped work to spin and injure the operator.
4. Catching hair, clothing or gloves in the revolving parts.

5. Sweeping chips or trying to remove long, spiral chips by hand.
6. Leaving key or drift in chuck.
7. Being struck by flying metal chips.
8. Failing to replace guard over speed change pulley or gear.

## **LATHE**

To prevent accidents, an engine lathe must be correctly operated by qualified personnel.

Injuries may occur on lathes because operators fail to keep the center holes of taper work clean and true and the lathe centers are true and sharp. Injuries are also likely to result from:

1. Contact with projections on work or stock, face plates, chucks, or lathe dogs, especially those with projecting set screws.
2. Flying metal chips.
3. Hand braking the machine.
4. Filing right-handed, using file with unprotected tang, or using the hand instead of a tick to hold an emery cloth against the work.
5. Calipering or gauging the job while the machine is in operation.
6. Attempting to remove chips when machine is in operation.
7. Contact with rotating stock projecting from turret lathes or screw machines.
8. Leaving chuck wrench in chuck – Using a spring-loaded wrench can eliminate this hazard.
9. Catching rings, loose clothing or wiping rags on revolving parts.
10. Wearing gloves and catching gloves on revolving parts.

## **MILLING MACHINE**

Many milling machine accidents occur when operators unload to make adjustments. Other causes of injuries include:

1. Failure to draw the job back to a safe distance when loading or unloading.

2. Using a jig or a vise that prevents close adjustment of the guard.
3. Placing the jig- or vise-locking arrangement in such a position that force must be exerted toward the cutter.
4. Leaving the cutter exposed after the job has been withdrawn.
5. Leaving hand tools on the worktable.
6. Failing to securely clamp the work.
7. Reaching around the cutter or gob to remove chips while the machine is in motion.
8. Removing swarf (fines, turnings or particles) by hand instead of with a brush.
9. Adjusting the coolant flow while the cutter is turning.
10. Calipering or measuring the work while the machine is operating.
11. Using a rag to clean excess oil off the table while the cutter is turning.
12. Wearing gloves, rings, ties or loose clothing.
13. Using incorrectly dressed cutters.
14. Incorrectly storing cutters.
15. Attempting to remove a nut from machine arbor by applying power to the machine.
16. Striking the cutter with hand or arm while setting up or adjusting stopped machine.
17. Misjudging clearances between the arbor or other parts.
18. Cleaning the machine while it is in motion.
19. Catching fingers, gloves or clothing in power clamps.

## **GRINDING MACHINES PEDESTAL & BENCH**

### **Abrasive disks and wheels**

#### **Hazards associated with grinding machines include:**

1. Entanglement – hand, finger, hair, clothing caught in moving wheel surface.
2. Eye injuries from chips and particles.

3. Respiratory injuries from fumes and dust.
4. Hearing injuries from excessively loud equipment (e.g. >85 dB).

**Risk of injury increase when the following occur:**

1. Failure to use eye protection in addition to the eye shield mounted on the grinder.
2. Incorrectly holding the work.
3. Incorrect adjustment or lack of work rest.
4. Using the wrong type, poorly maintained or imbalanced wheel or disk.
5. Grinding on the side of a wheel not designed for side grinding.
6. Taking too heavy a cut.
7. Too quickly applying work to a cold wheel or disk.
8. Grinding too high above the wheel center.
9. Failure to use wheel washers (blotters).
10. Vibration and excessive speed that lead to bursting a wheel or disk.
11. Using bearing boxes with insufficient bearing surface.
12. Using spindle with incorrect diameter or with the threads cut so the nut loosens as the spindle revolves.
13. Installing flanges of the wrong size, with unequal diameters, or unrelieved centers.
14. Incorrect wheel dressing.
15. Contacting unguarded moving parts.
16. Using controls that are out of operator's normal reach.
17. Using an abrasive saw blade instead of a grinder disk.
18. Failure to run a wet wheel dry (without a coolant) for a period of time before turning off the machine. The wet wheel can become unbalanced if coolant is allowed to accumulate on a portion of the wheel. This unbalanced condition can cause the wheel to disintegrate upon restarting.

19. Using an untested, broken or cracked grinding wheel.
20. Reaching across or near the rotating grinding wheel to load, unload or adjust the machine during set up.
21. Using equipment not supplied by adequate dust handling and fume removal provisions, and not using or improperly using dust masks.
22. Not using ear protection (e.g. ear plugs) when operating tool.

### **Adjusting Safety Guards – Bench and Stand Grinders:**

The maximum distance between the wheel periphery and the tongue or end of the peripheral band at the top of the opening **WILL NOT EXCEED 1/4 INCH.**

### **Work Rests:**

The work rest shall be clamped at **NOT MORE THAN 1/8 INCH FROM THE WHEEL.**

The work rest position should be checked frequently. The work rest height must be on the horizontal center line of the machine spindle.

### **Abrasive Wheel Dressing:**

Abrasive wheels that are not true or not in balance will produce poor work. They can damage the machine and injure the operator. Wheels that are too worn or out of balance should be taken out of service.

### **Surface Grinder:**

The following hazards are associated with surface grinders:

1. Insecurely clamped work and unenergized magnetic chucks are common sources of injury. Work can be thrown with considerable force.
2. If the operator takes too deep a cut or too quickly traverses the table or wheel, the wheel can overheat at the rim and crack.

Adjust and turn on magnetic chucks before applying the wheel. Have control of the work speed and depth.

## **HAND AND PORTABLE POWER TOOLS**

### **Safe Practices:**

1. Select the right tool for the job.
2. Keep tools in good condition.
3. Use tool correctly.

### **Common Hazards/Unsafe Practices of Hand Tools:**

1. Striking hardened striking faces of hand tools together (e.g. using any hammer to strike another hammer).
2. Using a claw hammer to strike a steel chisel.
3. Using a file or screwdriver for a pry, a wrench for a hammer, or pliers instead of the proper wrench.
4. Screwdrivers applied to objects held in the hand.
5. Knives pulled toward the body.
6. Unsafe tools include:
  - Wrenches with cracked or worn jaws
  - Screwdrivers with broken tips, or split/broken handles
  - Hammers with chipped, mushroomed or loose heads, or broken/split handles
  - Mushroomed heads on chisels
  - Dull Saws
  - Extension cords or electric tools with broken plugs, improper or removed grounding system, split insulation, or improper cord cap.

### **Portable Power Tools:**

A portable power tool presents similar hazards as a stationary machine of the same kind, in addition to the risks of handling. Typical injuries are burns, cuts and strains. These can be caused by electric shock, particles in the eyes, fires, explosion of vapors of gases and falling tools.

Because of the extreme mobility of power-driven tools, they can easily come in contact with the operator's body. Furthermore, the source of power (electrical, mechanical, air or hydraulic) is brought close to the operator, thus creating additional potential hazards. Caution should be exercised whenever handling portable tools. The source of power should always be disconnected before accessories on a portable tool are changed. Guards

should be replaced or put in correct adjustment before the tool is used again.  
Power/extension cords should be checked for split insulation and/or broken plugs.

## **ELECTRIC WELDING**

Following is a list of the primary areas of consideration regarding electric welding:

1. Machinery and equipment – Welding machinery and equipment must be maintained in accordance with manufacturer's specifications, and be inspected on a regular basis. Check the cables, ground clamps, electrode holder, gauges, and switches to make sure that all are working properly before proceeding to weld.
2. Fumes, gases and dust – Fumes produced by the electric welding process can be toxic and require local source extraction. **An assessment of the work to be performed should be done before each job is undertaken.** Fumes generally contain particles from the electrode material being welded, other finishes or protectants that have been applied to the metal, and gases used in the process. Welding fumes can have acute effects on the respiratory system.

**Whenever electric arc welding is done, the following rules must be enforced:**

1. TURN ON THE FUME HOOD
2. If the machine or floor are wet, they must be thoroughly dried before starting.
3. Coiled welding cable must be spread out and the ground lead must be firmly attached to the work.
4. Cables must be regularly inspected for damage and loss of insulation, and must be repaired immediately.
5. Ground and electrode cables may only be joined together with connectors specifically designed for connecting welding cables.
6. Cables with splices within ten feet of the operator may not be used. Cables should not be coiled around the operator's body.
7. Shields or screens must protect others in the vicinity from ultraviolet radiation produced by the arc.
8. Personal protection equipment must be worn by the operator. Helpers and other persons close by who are not separated and protected by PPE or screens **must wear appropriate shaded eye protection.**
9. Electrode holders which are not in use must be placed in a safe place (**away from conductive objects**).

10. Do not change the polarity switch when your machine is under load.
11. Electric flow – It is important that a welder check possible sources that could interrupt the current flow and endanger the welder because electricity flows back to the source by the path of least resistance. Check the immediate area for hazards such as water, condensation, oils, greases, pains and other items that may be present. Also, be sure to check the area for tripping hazards.

## **SOLDERING**

### *Gases, Fumes and Dust*

Soldering "smoke" is a mixture of very fine particles (fumes) and gases. Many of the substances in smoke (e.g. antimony and silver) are toxic and are respiratory irritants. Inhalation of solder smoke should be avoided. Fume extractors should be used and soldering should only take place in well-ventilated areas. In the absence of a fume extractor, a NIOSH-approved respirator with 3M 60923 Organic Vapor and Acid Cartridges may be used. Circuit boards are made from fiberglass and other composite materials that can produce hazardous dust when cut or drilled. As such they should not be cut or drilled within the classroom.

### *Hazardous Metals*

Circuit boards, electrical assembly materials and products may contain harmful metals or chemicals. Lead is commonly used in circuit assembly techniques and the flux used to make solder connections also contains harmful chemicals. Students should wash hands after handling electrical components, printed circuit boards and wire, and after every class. Students should always wash their hands before eating whenever they have been present in the lab.

### *Heat*

The intense heat of the soldering iron tip can cause burns. Molten solder is dangerous and can come in contact with the eyes or skin if not handled correctly. The soldering iron tip should never be used to pry or force anything, as this could result in a sudden forceful release of momentum causing molten solder to fly off of the iron tip. Eye injuries and / or burns can occur from contact with the iron itself or with molten solder. Eye protection and appropriate clothing is recommended to prevent contact between molten solder or the iron and the user's or a bystander's body.

### *Fire*

The heat generated by the soldering iron is enough to start a fire. Soldering should never occur in the immediate vicinity of flammable gases or liquids. Soldering shall only be performed in areas that are free of combustible materials including trash, wood, paper, textiles, chemicals, flammable dusts, liquids and gases. Fire extinguishers shall be nearby.

### *Electrical Hazards*

Almost all physical computing projects require electricity in some capacity. Whenever possible, students will be using low voltage electricity (under 24 volts DC) for their projects. All low voltage electricity must be converted from the 120 volt supplied by the wall sockets into low voltage electricity using UL-Rated power supplies. Any modification of a power supply or converter must be done with prior instructor consent and under instructor supervision. Approved power supplies include computer USB ports and both the wall-mount and variable power supplies specified by the instructor. Any work on projects requiring the use of electricity at a voltage of 24 volts or higher must take place only under the direct supervision of the instructor and in accordance with instructor specified safety procedures. No student, at any time, shall modify or plug in any project to the wall that does not utilize a UL-Approved voltage converter. High voltage electricity supplied from wall sockets (120 volts or higher) can be fatal and must be respected. Low voltage electricity (under 24 volt) can be hazardous as well. Do not touch exposed electrical circuits when they are turned on. Rubber soled shoes must be worn at all times within the classroom. Open liquid containers are not permitted within the classroom and any spills must be promptly cleaned up. Flammable liquids are not permitted within the classroom.

### **General Safety Precautions**

- Soldering irons will be turned off AND unplugged after each use and remain unplugged;
- During and after use, all irons must be placed within an iron stand and never placed directly on any table top or surface;
- All soldering irons must be returned to the workbench area after use;
- Only solder provided by the instructor will be used;
- All power supplies shall be turned off AND unplugged after use;
- Keep work area clean. Combustible materials shall be removed from the work area prior to soldering activities;
- Follow operating instructions on all equipment;
- Keep a fire extinguisher in work area;
- Fume extractors must be used when soldering and in accordance with instructor demonstrated setup;
- In the absence of a fume extractor, a NIOSH-approved respirator with 3M 60923 Organic Vapor and Acid Cartridges may be used;
- Do not wear sandals or open-toed shoes;
- No food or drink is allowed in the classroom during lab time;

## Appendix A

### MACHINE SHOP OVERVIEW

1. Any person within the room **must** have approval in advance. Access is provided through University Police. All requests for access shall be submitted to the University Police. Approved Access Authorization Form signed by a faculty member and the Dean is **required**.
2. Access to the lab is **restricted to normal building hours** for Donovan Hall – unless otherwise approved in advance. University Police must be notified by the appropriate lab instructor.
3. There **MUST BE AT LEAST TWO PEOPLE** in the room at all times.
4. No person shall operate machinery or equipment unless qualified and authorized to do so by the faculty and Dean. **If in doubt about the safe and proper use of machinery, request instructions and/or assistance.**
5. All injuries, no matter how slight, must be reported immediately to: University Police, 315-792-7111 or Ext. 7111 or Environmental Health and Safety, 315-792-7101 or Ext. 7101, College of Engineering DH1191, 315-792-7234 or Ext. 7234; machinist 240, and your class instructor, advisor.
6. **Report any unsafe condition immediately.**
7. Personal protection equipment must be used. All employees and students are required to use eye protection, hand protection and other protective equipment as necessary.
8. Mechanical safeguards are provided or available for machine tools and equipment. These guards must be in place at all times. If removal is necessary for repairs, they must be replaced before the equipment is again put into service.
9. Before adjusting, repairing or performing maintenance on equipment (electrical, mechanical, hydraulic, etc.), disconnect the power source (Lockout/Tagout).
10. When lifting, lift slowly and avoid twisting. If the object is bulky or weighs over 35 lbs., request help.
11. Use only the proper tools for the job. Tools should be in good condition. Any defective tool or device should be reported immediately. (See #6 above.)
12. Keep the work area clean. Use a brush to remove chips or sawdust from machines or equipment. Compressed air will only be used as a last resort and set at less than 30 psi.

13. Compressed air **will not** be used for any purpose which causes an air stream to blow in the vicinity of people.
14. Obey all safety regulations.
15. Horseplay, tricks or practical jokes are prohibited.

**THE BEST SAFETY DEVICE IS A SAFETY CONSCIOUS WORKER**

## Appendix B

### BASIC MACHINE SHOP SAFETY

- **Safety Glasses**

**EVERYONE MUST WEAR SAFETY GLASSES IN THE MACHINE SHOP**

Even when you are not working on a machine, you must wear safety glasses. A chip from a machine someone else is working on could fly into your eye.

- **Clothes and Hair**

Check your clothes and hair before you enter the Machine Shop.

- IF YOU HAVE LONG HAIR OR A LONG BEARD, TIE IT UP. If your hair is caught in spinning machinery, it will be pulled out if you are lucky. If you are unlucky, you will be pulled into the machine.
- NO LOOSE CLOTHING - Ties, scarves, loose sleeves, etc. are prohibited.
- GLOVES only for certain jobs (e.g. welding, handling sharp material)
- REMOVE JEWELRY
- WEAR APPROPRIATE SHOES - No open-toed sandals are allowed. Wear shoes that give sure footing. If you are working with heavy objects, steel-toed shoes are recommended.

- **Safe Conduct in the Machine Shop**

- Be aware of what is going on around you. For example, be careful not to bump into someone while they are cutting with the bandsaw. (They could lose a finger!)
- Concentrate on what you are doing. If you get tired, leave.
- Don't hurry. If you catch yourself rushing, slow down.
- Don't rush speeds and feeds. You will end up damaging your part and perhaps the machine itself.
- Listen to the machine. If something doesn't sound right, turn the machine off.
- Don't let someone else talk you into doing something dangerous.
- Don't attempt to measure a part that is moving.

- **Machining**

**IF YOU DON'T KNOW HOW TO DO SOMETHING, ASK!**

BEFORE YOU START THE MACHINE:

- Study the machine. Know which parts move, which are stationary and which are sharp.
- Double check that your work piece is securely held.

- Remove chuck keys and wrenches.

**DO NOT LEAVE MACHINES RUNNING UNATTENDED!**

**CLEAN UP MACHINES AFTER USE**

A dirty machine is unsafe and uncomfortable to work on.

## Appendix C

### MACHINE KNOWLEDGE CHECKLISTS

**Before beginning work** on any equipment, be sure you are familiar with the following basics:

#### **KNOW WHERE THE EMERGENCY STOP BUTTON IS FOR ALL EQUIPMENT**

##### **Horizontal/Vertical Bandsaw, Reciprocating Saw**

You should know:

- ✓ the location and proper use of the on/off switch
- ✓ how to properly set the blade guard
- ✓ how to preset the speeds for material thickness and type
- ✓ how to use the hand-feed bar or material guide
- ✓ how to set up and secure a vice or clamp to the saw table when necessary
- ✓ proper set up of material stops and gauges
- ✓ how to set up and use the cooling system

Note: If the blade needs to be changed due to worn teeth, breakage or the wrong blade for the material, please contact the machinist.

##### **Pedestal Drill Press**

You should know:

- ✓ the location of the power switch
- ✓ how to adjust the drills table for various size heights
- ✓ how to set the depth gauge on the sensitive feed arm
- ✓ how to properly insert and remove drill and other tooling from drill chuck
- ✓ how to properly secure work to the drill table
- ✓ how to adjust the speed of the spindle (belt and pulley change)

Note: If any problem arises, contact the machinist.

##### **Lathe**

You should know:

- ✓ how to operate the power switch
- ✓ location and how to use hand and foot brakes of the lathe
- ✓ how to operate and change feeds
- ✓ how to calculate required speeds and feeds for materials to be used
- ✓ how to adjust gearing of the feeds and speeds for thread cutting

- ✓ how to set up and adjust tool holder, post and carriage for thread cutting, facing, turning, drilling and boring
- ✓ how to implement the use of live and dead centers
- ✓ how to change, adjust, and use various chucks and collets
- ✓ the names and differences in purpose of the various cutting tools, (e.g. cutoff tool, turning bit, boring bar, etc.)

### **Milling Machine**

You should know:

- ✓ location of on/off switch
- ✓ how to change spindle RPM's
- ✓ how to securely clamp the work
- ✓ proper use and storage of cutters
- ✓ how to adjust clearances between cutter and work piece
- ✓ how to use collets for holding cutter

### **Pedestal Grinder**

You should know:

- ✓ location and how to use power switch
- ✓ how to properly adjust the eye guard on the grinder
- ✓ how to properly adjust the work rest/pinch guard on the grinder
- ✓ how to true and clean the grinding wheel
- ✓ how to grind material on the wheel, moving work across the wheel surface and not resting in one place
- ✓ the purpose of the water cup on the grinder pedestal

Note: If an object gets caught between the wheel and its housing, turn the grinder off and contact the technical assistant.

### **Surface Grinder**

You should know:

- ✓ how to properly clamp the work
- ✓ how to adjust depth of cuts and traverse speeds
- ✓ how to adjust and turn on magnetic chucks before applying the wheel

### **MIG Welder**

You should know:

- ✓ how to check that cables, ground clamps, electrode holder, gauges and switches are working properly
- ✓ how to use shields and screens
- ✓ how to check possible sources that interrupts current flow which could cause electricity to flow back

NOTE: Personal protection equipment must be worn by the operator. Helpers and other persons close by who are not separated and protected by PPE or screens **must wear appropriate shaded eye protection.**



## ACKNOWLEDGMENT OF RECEIPT OF CGAM SAFETY HANDBOOK

The ***CGAM Safety Handbook*** has been designed to provide basic / general information on the safe and proper operation of equipment in the CGAM area of Donovan Hall. Common potential hazards and unsafe practices are reviewed, as well as safety guidelines aimed at preventing injury.

It is the student's responsibility to read this handbook and become familiar with proper procedures before attempting to work with the tools in the CGAM area. If you are not sure how to operate a particular machine, tool, or piece of equipment, or the best way to complete a particular task, **ask for assistance**.

**DO NOT attempt tasks which are beyond your capabilities. This could result in serious injury to you, others in the lab, or damage to the equipment.**

Your signature below acknowledges that you have received a copy, read, and understand the ***Handbook*** and that you agree to abide by the safety rules and procedures outlined.

<b>Last Name</b>		<b>First Name</b>	
<b>Signature</b>		<b>Date</b>	
<b>Class Number</b>		<b>Instructor / Advisor</b>	
<b>Group/Club/Job Name</b>		<b>Advisor / Supervisor</b>	
<b>Email</b>		<b>SUNY Poly Card ID #</b> <small>(reverse side of card near strip)</small>	* _____
<b>Year</b>			

(rev. 1/2017)