MACHINE SHOP USAGE REGULATIONS

WVU Department of Physics

Safety training in the shop is required by regulation. It applies only to the shop in which the user is trained and does not necessarily satisfy the requirement in any other shop, nor does training in any other shop satisfy the requirement for this shop.

INTRODUCTION

The WVU Department of Physics and Astronomy and Eberly College operate a User Machine Shop in White Hall. From time to time, faculty and students will need to fabricate devices for experiments for courses or research.

To be able to use any piece of equipment in the shop you must do four things:

1. Have in your possession and wear at all times in the shop a pair of the appropriate safety glasses

2. Carefully read and understand this guide.

3. Fill out the one page safety questionnaire **Machine Shop Usage Safety Agreement.**

4. Take the **Machine Use Training** with one of the Shop Personal and receive an Authorization to Use for each machine you wish to use. Your name will be posted when authorization is granted.

5. Training is to be scheduled through the shop supervisor.

The Machine Use Training is a class where you will be taught the procedures for specific machines. This is required for each machine in the shop. After you have completed the Machine Use Training for a particular machine your name will be added to the certification list, which will be your permission to use that particular equipment. Use of a machine without certification is NOT authorized and WILL result in loss of shop access and use privileges.

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GENERAL INFORMATION

Project Storage

Projects and materials are not to be stored or left in the shop area, even for a short time. Any projects or materials left in the shop will be removed or discarded. If you want to keep it, please take care of it!

Use of Materials

If you didn't buy it or bring it, it isn't yours! Generally the shop does not supply materials for your projects. If you need materials, talk to your supervising faculty. Some materials are available from the Research Machine Shop. Some odds and ends are stored in the User Machine Shop, but before using or cutting something, please obtain permission from the shop supervisor or other shop personnel.

Tool Checkout

All hand tools may be checked out by approved users using the posted sign-out sheets.

SHOP SAFETY INFORMATION

Personal Responsibility - Safety First. - You are ultimately responsible for all that you do! Follow all safety and operation guidelines and check lists posted for each machine. Training is available for every piece of equipment available for your use. If you are unfamiliar with a machine or operation, please ask for assistance. Attempting to use machine tools without proper training may result in serious injury. You will be held responsible for damage caused by your neglect.

Eye Protection - Safety glasses with side shields or goggles must be worn at all times while in the shop areas. Approved eye protection will be labeled as meeting the ANSI Z87 safety standard. Ordinary prescription glasses do not qualify as approved eye protection and must be supplemented by goggles or safety glasses designed to fit over glasses. Face shields are not approved primary eye protection and should only be worn over approved safety glasses or goggles. It is your responsibility to provide your own eye protection. Do not expect to work in the shop facilities if you do not have your own eye protection! Both safety glasses and goggles are available at many local retailers.

Proper Apparel and Dress - Long sleeves, loose clothes, neck ties, jewelry, long hair, open toed shoes, shorts, etc. can be hazardous in many shop situations. Before operating a piece of equipment, ensure that these types of hazards are not present. Rotating machinery can not tell the difference between metal, cloth, or flesh. Loose apparel and long hair can be easily drawn into machinery and you with it. Remember, shop machines are powered by several horsepower and will not stop for flesh that gets in the way.

Working Alone - University policy, in accordance with state and federal regulations, requires that two persons be present in a shop facility when equipment is in operation***. At no time are you allowed to work alone in the shop area during non work hours (this means that another adult must be in the shop area with you). Shop hours are 7:00am to 3:00pm, Monday through Friday.***

Machine Guards - Machine guards are to be used at all times. If there is an operation that requires the removal of a guard, you must obtain permission from the Shop Supervisor.

Specific Shop Policies Each machine may have posted rules, regulations, guidelines and check lists for its use. Please review the posted policies for the most current information.

Housekeeping Requirements Every user of tools and machines is responsible to maintain and clean up after working in the shop area. This includes:

1. Before using a tool or machine, follow the proper preconditioning procedure.
2. After using a tool or machine, follow the proper cleaning and maintenance procedure.

3. Return all tools and tooling to their proper storage locations (please clean tools before putting them away).
4. Remove all chips, dust, cuttings, and turnings from machines, tools, work surfaces, and tables. Use rags and brushes to remove chips. Never use your hands or fingers to remove chips cuts caused from such can cause very serious infections. Never use compressed air! Use the shop vacuum cleaner instead.
5. Clean all floor space of chips, dust, cuttings, and turnings. If oil is on the floor wipe it up with a rag and use an appropriate cleaning solution to degrease the floor. Soap and water is available at the sink in the Research Machine Shop.
6. The shop is to be cleaned bi-weekly by ALL users. There is a schedule posted in the shop. A copy of the schedule is distributed to the faculty at regular intervals. It is the responsibility of the users to know when they are scheduled to clean. The shop manager will send an email to the corresponding faculty a few days before the scheduled cleaning day as a reminder.

Parts of tools or machines produced by breakage or wear should be collected and brought to the attention of the lab supervisor so that the equipment and tooling can be maintained for safe operation.

Machine Operation - Only one person is to operate a machine at one time. It is extremely hazardous for more than one person to work the controls of a machine. If assistance is needed to support the material being processed, the assistant should only provide support and allow the operator to provide all motion to the work piece or machine. Also, never walk away from a machine leaving it running, even for a moment. Never leave a machine running unattended.

Horseplay - Horseplay of any kind can be extremely hazardous in a shop area and is forbidden at all times.

Correct Tools - Always use the correct tool for the job. If you are not sure what is needed, please ask for assistance.

Sharp Tools - Sharp tools are safer, provide better results, and require less effort to accomplish a task. If you suspect that a tool is dull, ask for assistance to have it sharpened or replaced. If you have to apply a great deal of force then you should suspect there is something wrong and get assistance! Never hammer on machining equipment, machine tools, or the work piece while it is installed on a machine tool.

Safety Equipment - Know the location of safety equipment. Fire extinguishers, eyewash stations, emergency showers, telephones, etc. are useful only if you know where they are.

Emergency Situations - Think first in an emergency! Call "9-911" from a university phone if there is any question about the seriousness of an emergency. Your first responsibility is to get as much assistance as possible to the situation while providing emergency care to the best of your knowledge.

Fire Alarms - If the fire alarm sounds, immediately turn off all equipment you are operating and exit the building.

First Aid - Immediately report all accidents to a lab supervisor or a faculty member. Minor first aid is available for simple cuts or abrasions. The WVU Physics Department is not responsible for medical services required by accidents within its shop areas unless specific liability is established. You should make medical care decisions based on the assumption that you will be responsible for payment.

Material Spills - If you spill liquids or materials on the floor, immediately clean them up. If the materials are hazardous in nature, immediately notify the supervisor or a faculty member to determine what course of action should be taken. If no one is available to assist you please call WVU emergency services at 9-911

Speeds and Feeds - Choosing and setting the correct speeds and feeds is critical to many machine operations. If you do not know how to determine these parameters, ask for assistance.

Unusual Noises - If you hear something unusual or suspect something has changed, stop what you are doing and investigate. Ask for assistance. Pay close attention to what you are doing at all times. It pays to be curious!

Broken or Damaged Tools - Immediately report broken or damaged equipment or tools to the lab supervisor or other shop personal. It is expected that tools will break occasionally and equipment will suffer from wear and tear.

It is important that these items be brought to our attention promptly so we can properly maintain the equipment and tooling. Place dull or broken bits and cutters in the garbage.

SPECIFIC SAFETY RULES

GRINDING

Pedestal Grinders - The pedestal grinder is for sharpening lathe tools **ONLY**! Do not grind non-ferrous (aluminum, brass, zinc, copper, etc.) metals. These materials fill the pores of the grinding wheel face and destroy its ability to cut. They may be sanded on the belt or disc sander.

Tool Sharpening (or work piece grinding) - Cool your work piece frequently to prevent the tool or work piece from overheating and losing its temper. A properly cooled work piece will have no signs of color change

LATHE OPERATION

Mounting Chucks - Always protect the bed of the lathe when mounting a chuck by using a board or a chuck cradle set on the bed ways. Do not remove or mount chucks unless you have been instructed on how to do it properly.

Chip Removal - Never remove chips with your hand or with the compressed air blow-gun. Use the machine shop vacuum, a brush, rag, wire, or pair of pliers to remove chips.

Rotating Parts - Lathe operations involve rotating chucks and work pieces. Use extreme caution to keep away from the rotating parts. Never touch the work piece or make measurements while the part is turning. Remove long, stringy chips only when the lathe is stopped. It is a good idea to turn the spindle by hand, before turning the power on, to insure that there is no interference between the rotating parts and the machine. Note: If the lathe chuck jaws are opened too far, they can come out of the chuck during lathe operation causing serious injury.

Changing Speeds and Feeds - Never change gears while the lathe is running. If you cannot get the machine to go into gear, rotate the spindle or lead screw by hand to align the gear set and allow the gears to engage.

Chuck Keys - Always remove the key from the chuck even if you will be using it again soon. This needs to become a habit. **NEVER LEAVE A KEY IN A CHUCK**, even for a moment.

Mounting Stock in Chucks - Stock should not protrude from the chuck or collet (unsupported by a center or steady-rest) more than three times the stock diameter. Stock should not extend out the headstock end of the spindle more than twenty times its diameter.

Tool Alignment - Tools should be aligned with the spindle stopped. Proper tool alignment and height is critical for good material removal and part finish. Tools should be mounted with minimum overhang to provide ma ximum rigidity.

MILLING MACHINE OPERATIONS

Variable Speed Heads - On machines equipped with variable speed heads, speed should only be changed with the spindle running. In the case of our *Bridgeport* knee mill the machine must be powered off and rotation stopped before making speed changes.

Climb vs. Conventional Milling - When a milling cutter climb cuts, it tends to pull the work into the cutter. When milling thin sections using large cutters or on milling machines that have excessive backlash in the feed screw, it may be necessary to use conventional milling. Please note, this is the opposite of what is typically in woodworking, which is conventional milling, where the work piece moves against the direction of the cutter.

Removing Chips - Never remove chips with your hands. Use a brush to sweep chips from the part. Caution: the chips produced by milling cutters are very hot and can be thrown some distance.

Measuring - Never measure parts with the spindle turning. (Also, never set a measurement tool on a hard surface such as the bed of the mill).

Removing Mill Tooling - To remove tooling from the spindle, unscrew the draw bar with the wrench while holding the spindle brake on. Loosen the draw bar until it can be turned by hand. Loosen it one full turn by hand and no more. Then, tap the end of the draw bar to loosen the taper while holding the cutting tool with the other hand, as the tool may fall out of the collet. Then finish unscrewing the draw bar until the tool/collet is free. To install a collet/tool in the spindle, first clean the spindle taper and the collet/tool. Insert the collet/tool into the spindle and rotate it until the keyway on the collet/tool lines up with the key inside the spindle. Thread in the draw bar by hand until tight. Tighten with the wrench. Never leave the wrench on the draw bar.

SHEET METAL WORK

Shear Used for cutting sheet metal.

Eye protection must be worn at all times.

Before the machine is used, all cuttings and scrap from the shear table and the surrounding area shall be removed.

Users shall avoid touching knife edges when taking measurements.

The shear table shall be kept free of loose tools and materials.

Safety guards shall not be removed or tampered with.

When clamping, the user shall keep hands away from the hold down.

Only the person operating the machinery shall be in close proximity of the shear.

Scraps shall be removed promptly and deposited in the appropriate scrap bin.

Machine capacity must not be exceeded 16 gauge mild steel or soft aluminum alloy.

Shears must only be used to cut materials specified in the manufacturers instructions.

Force on treadle shall not exceed that which can be applied with one foot (if more force is required then you may have an inappropriate gauge or type of material and you need to consider sawing).

Never jump on the treadle.

Bending Brake - For bending sheet metal only. Be aware that some alloys of aluminum are brittle, not intended for bending, and will break if an attempt is made to bend them. Please ask for assistance.

Eye protection must be worn at all times.

Machine capacity must not be exceeded 16 gauge mild steel or soft aluminum alloy.

Force on the handle shall not exceed that which can be applied with one hand (if more force is required then you may have an inappropriate gauge or type of material).

Operator's hands must be located at a safe distance from the point of operation.

Only the persons operating the machine shall be in close proximity of the bending brake.

Never hammer on this equipment.

Beware: misuse can result in the equipment falling over.

WIRE WHEELS

A face shield is required to be worn over your safety glasses when using a wire wheel.

VIOLATION PENALTIES

Any Violation of Shop Rules ***WILL*** result in a Loss of Shop Access!

1st Violation = 2 Weeks loss of shop privileges

2nd Violation = 1 month loss of shop privileges

3rd Violation = 6 weeks loss of shop privileges

4th Violation = 6 months loss of shop privileges

Machine Shop Usage Safety Agreement

WVU Department of Physics

Safety training in shops is required by regulation. It applies only to the shop in which you are trained and does not necessarily satisfy the requirements of any other shop nor does training in another shop satisfy the requirement for this shop.

Name (PRINT) _____ Email address: _____

Faculty Supervisor: _____

1. What is your personal responsibility regarding safety?

2. What is your personal responsibility regarding the shop facilities and what is your role in maintaining cleanliness and order?

3. What is your personal responsibility to others using the shop facilities?

4. What role does training play in shop safety?

I, _____(print your name), have read the shop policy and safety regulations and understand them as they apply to my work in the shop/lab areas.

1) I agree to abide by the published and posted regulations and accept personal responsibility for my work in the machine shop.

2) I understand that my failure to do so can result in my loss of privileges in the machine shop areas.

3) I have purchased a pair of safety glasses and will wear them properly at all times while in the shop and agree not to enter the shop area without them: _____(INITIAL).

4) I understand what attire is required to work in the shop and will not enter the shop unless so attired.

5) I will clean and maintain all equipment, floors, and benches that I use by the end of the day: _____ (INITIAL).

6) I promise not to attempt to use any machine or tooling that I do not have written permission to use (permitted users are listed by the pertinent machine or tool): _____(INITIAL).

7) For any equipment or tooling I find needing repair or that I damage I will leave a note listing my name, research group or class, and a phone number or email address where I can be reached.

I understand that it is a privilege and learning opportunity to use the machine shop areas and agree to abide by all university regulations and stipulations placed upon me as conditions for working in these areas.

User Signature _____Date _____