

College of Forestry 600: Workshops and Shop Tools

Safety Policy & Procedure Manual

Section 600: Workshops and Shop Tools

Effective: 01 January 2007

Revised: January 2020

Purpose

The purpose of this section is to provide students, staff, and faculty the information needed for safe work in a workshop environment, using both stationary machines and handheld power tools. This is not meant to be a comprehensive treatment of the proper techniques to use any machine or tool; rather, it is meant to bring attention to the fundamentals of safety for a workshop environment. Refer to individual operation manuals or other approved instruction for details on how to safely and effectively use a specific machine or tool.

Regulatory Authority

Workshops within the College of Forestry fall under operational guidance of the OSU Environmental Health and Safety (EH&S) department, as well as the Occupational Health and Safety (OSHA) guidelines at both a federal and state level (Oregon OSHA.) The information contained in this document is intended to supplement those guidelines, and in no cases should it be interpreted as superseding existing regulations or guidelines. If you are aware of any instance or situation where COF guidance or practice, pertaining to workshop or other operations, is in contradiction to the above regulatory guidance, you should bring that to the attention of your instructor or supervisor immediately.

General

Personal Protective Equipment (PPE)

1. **Eye Protection:** Eye protection must be worn when using power tools or machines. Even activities that seem low-risk, such as using a random orbit sander, can fling particles into your eye and cause irritation or damage. In addition to tool and machine use, mixing and applying finishes also pose a threat to your eyes. In short, while in a workshop environment, wear eye protection when performing any task. Situations that don't require eye protection would be limited to taking notes in a lecture when no machines are in use, or drawing plans at a workbench. Ensure that the eye protection you choose fits your face, and is suited to the operation you are performing. In many cases, a full face shield is advised or required. If you are in doubt at all as to what kind of eye protection you should wear, or whether your eye protection fits properly, bring it to the attention of your supervisor or instructor. Normal eyeglasses are NOT sufficient for use as eye protection; only if they are specially designed and approved (Z.87+ or equivalent certification) can they serve as eye protection.
2. **Hearing Protection:** Hearing loss is a very real danger when using shop machines or power tools. Hearing loss is cumulative and typically irreversible, which makes it that much more important to adhere to good practices even for short periods of use. Some machines or shop areas will be clearly marked with a "Hearing Protection Required" sign; in these cases it is not optional but mandatory to use hearing protection. In many cases, however, it is either up to your supervisor, instructor, or your own judgment, whether you should use hearing protection. When in doubt, opt to use it. As with eye protection, ensure that the method that you choose (e.g., in-ear or over-the-ear) is suitable for the environment and activity you will be doing. Both methods can be combined for extremely loud environments. In all cases in which you are working with hearing protection, be especially aware of your environment so that you can see what others are doing, and whether someone or something (a siren, for instance) is trying to get your attention.
3. **Footwear:** In most shop situations, enclosed-toe shoes are sufficient protection. Sandals and flip-flops are NOT suitable for shop work, nor are any shoes that do not provide for you to work with a solid, stable stance, such as high heels or some types of cowboy boots. In environments or activities in which heavy objects will be manipulated, steel-toe or safety boots/shoes may be required. In these cases you will be clearly notified and provided the opportunity to obtain that footwear before doing such work.
4. **Outer garments (jackets, aprons, gloves, etc.):** Many shop users find an apron to be an efficient way to keep needed tools and supplies at hand, as well as provide a light protective layer for clothing. When choosing and using a shop apron, ensure that any pockets will securely hold their intended contents against unintentionally falling out in use. Additionally, ensure that any fastening straps are at the side or back of the apron, so there are no loose ends to become entangled in machinery – this can easily and quickly lead to serious injury. In most cases, jackets or gloves are not recommended in a shop environment. Either can lead to entanglement, or to a false sense of protection against dangerous parts. A common exception to the above is when handling rough materials, when machines are not in use. In that case, injury by pinching or splinters is more likely, and can be prevented with gloves and long sleeves / jacket.

General Shop Safety

1. A thorough preparation and an attitude towards safety will mitigate a great deal of the risk that is inherent in working with machinery and power tools. COF policy is that no students or staff will use workshops without having attended a hands-on safety training for each shop. This hands-on training may only be scheduled following the completion of online training, including the quiz that accompanies that training. **Neither the online training, quiz, nor initial hands-on training are intended, nor capable, of making anyone an “expert” user of any shop equipment.** They are intended to provide a consistent framework to convey the fundamentals of shop safety, and safe machine use.
2. Workshops should be kept clean and uncluttered – especially the common work areas that require adequate clearance between machines and other users for safe use. Some workshops have areas that are clearly marked for specific uses, groups, or other special requirements such as PPE or special training. Ensure you adhere to those instructions, in order to avoid injury to yourself, and/or disruption to other shop users.
3. Unless specifically authorized by your instructor or supervisor, the use of headphones while working in a shop is prohibited. You must coordinate any use of headphones, or playing music over speakers, with your supervisor or instructor, and in no case are headphones allowed when using cutting tools or machines. In all cases, you must be working in a location and orientation that allows you to see if someone enters the shop, or is trying to get your attention.
4. Machines should have factory-supplied or -installed safety guards in place, unless a specific task cannot be performed with the guard in place. In those situations, you must check with your supervisor or instructor to confirm that any alternative provides the necessary safety for use of that machine or tool. Blades should be sharp and clean, and properly aligned – both before you begin work, and after you have completed work. Work surfaces should be clean and smooth to allow for machining of materials without having to exert undue pressure on the workpiece. Poorly maintained blades or machines are not only inefficient, but also pose a safety hazard as the level of effort expended by the user increases. If it seems like any operation is being hindered by dull blades or a poor machine surface, stop work and bring it to the attention of your instructor or supervisor, who will either perform the work necessary, arrange for it to be done by others as appropriate, or instruct you in the task(s) needed to get the process running smoothly again. **In no circumstance is it appropriate to just finish your task in those situations, and leave the deficiency for someone else to discover and remedy.** There are no “maintenance-free” machines or processes; upkeep of workshop spaces, machines, and tools is a shared responsibility, and routine maintenance and/or cleaning is always more cost-effective and time-efficient than putting off such work until the problems are obviously detrimental.
5. COF workshops exist to support educational and research outcomes. They are not an appropriate venue for social time, meals, or personal projects. Classes and work sessions

can be enjoyable, and you are encouraged to enjoy them in a way that keeps shop safety and effectiveness at the forefront. You owe it to yourself and other workshop users to maintain a professional and attentive attitude, and enable others to do the same, while in the shop – whether learning or actively working.

First Aid

1. First Aid Kits
 - a. First Aid kits are to be installed and clearly labeled in all workshops. All users should familiarize themselves with the location and contents of the First Aid kit before it is needed.

Fire Safety

1. Prevention
 - a. Preventing fires is always critically important, but gains even more importance in a shop environment where there are frequently flammable solvents, finishes, and – in the case of woodworking shops – combustible dust and solid materials on hand.
 - b. Workshops must adhere to safe practices with respect to

Woodworking Shop Machines

1. Table Saws
 - a. Overview: The table saw is often regarded as the centerpiece of a woodworking shop, and for good reason. It is used to rip wide boards or manufactured panels to narrower widths, as well as cross-cut with a high degree of accuracy and repeatability. Rip cuts are **always** made with one straight edge of the workpiece kept firmly against the rip fence. Cross-cuts are **never** made with the workpiece held against the fence. In either case, any workpiece that is cut on the table saw should be flat, smooth, and dry, so that neither the table nor the blade is damaged, and the workpiece doesn't rock or shift on its way through the cutting operation. The blade can be tilted up to a 45 degree angle, making angled joinery possible. In addition, slots in the table top allow the use of miter gauges and a myriad other fixtures and jigs that permit compound angle cutting and many other specialty machining processes. In addition to cutting, table saws are often fitted with special blades, or sets of blades, to produce grooves or dados – known as non-through cutting operations.
 - b. Specific Safety Considerations: There are two primary dangers associated with table saws. The most obvious is making contact with the blade – either while in operation, or slowing down or even simply protruding from the table surface. The carbide teeth on modern saw blades are extremely sharp and it is not uncommon for users to get cut simply handling them without due care. The second danger is known as “kickback” and is caused when a workpiece, having passed the front of the blade where the teeth are pushing

down into the table, moves away from the fence and into the teeth at the rear of the blade, which can lift the workpiece and propel it back at the user with devastating force. Modern table saws have been equipped with a blade guard mounted to a “splitter” that is the same width as the blade, and mounted close behind it, to keep the cut piece and waste piece edges both away from their respective side of the blade. More recently, the splitter has been superseded by a curved “riving knife” that raises, lowers, and tilts along with the blade, and is mounted within 1 cm or less of the blade itself, making kickback nearly impossible. Most saws incorporate two riving knives – one that also has mounting attachments for the factory blade guard that prevents accidental contact with the blade, and another low-profile knife that is the same or slightly lower height than the blade, so that it can be used in a non-through cutting operation. The use of a dado cutting blade set or specialty wide blades, such as those used for box joints, preclude the use of either a splitter or riving knife, and are thus more dangerous cutting operations, and are not typically done by students.

- c. Safe Use: As stated earlier, workpieces being cut on the table saw must be kept firmly against the rip fence for ripping operations – cuts that are made *along* the long dimension of the workpiece. This means that the piece must be both pushed forward, and towards the fence (which is almost always to the left of the blade) throughout the cut. In cases where the ripped width is wide enough – about 6”-8” or more – the workpiece can be pushed through by hand, while keeping a safe distance from the blade. Narrower rip cuts require the use of a push stick that enables the user to maintain forward pressure of the workpiece, while keeping the hand at a safe distance from the blade. Sideways pressure against the fence must always be at or before the leading edge of the blade – NEVER past it. Applying pressure towards the fence after the blade can force the waste edge of the workpiece that has already been cut into the side and/or back teeth of the blade, increasing the chance for kickback, or at the very least a poorly cut edge. Also as stated above, cross-cuts must never be made against the fence, rather, the workpiece should be carried through the cutting operation by the use of a miter gauge for narrower workpieces, or a dedicated cross-cut sled for wider boards or panels. In these cases, the fence should be well away from the work, allowing the piece that is cut to move freely away from the blade without getting caught between the fence and the blade. If this happens, that small piece is very likely to experience kickback, ruining the piece and posing an injury threat to the user. A rule of thumb for making any cuts that involve a straight edge held against the fence, is that the edge placed against the fence is at least 12”/30cm long, AND longer than the distance between the fence and the blade.

- d. Maintenance: Periodic maintenance is essential to continued safe operation of a table saw. Ensure that the table and fence surfaces are smooth, and do not hinder the movement of the workpiece through the cut. Wax these surfaces regularly, in accordance with the volume of use. Ensure that the blade is sharp and clean; dull and/or resin-coated teeth will cause both poor cut quality, and pose a safety hazard in that the effort needed to push the workpiece through the saw is greatly increased. Since the dulling or contamination of a saw blade happens gradually, ensure that you are familiar with how a clean, sharp blade feels in use, and be mindful of how the saw operation feels compared to that reference. Always unplug the saw when removing or installing a blade.

College of Forestry 610: Power Tools

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Background Information

Workers performing in shop conditions using power tools are regulated under Oregon Administrative Rules Oregon Occupational Safety and Health Division, Division 2. Most all activities in workshops using power machinery will be covered under sub-section O, Machinery and Machine Guarding.

Safety rules for each piece of equipment being used must be reviewed with the employee by the immediate supervisor or someone designated by the immediate supervisor to provide such training.

Every area that uses hand or power tools shall have a safety plan that includes a section on power and hand tools safety and an acknowledgement that each person using such tools has been adequately trained prior to use.

Procedure

1. Personal Protective Equipment (PPE)
 - a. Eye Protection: Eye protection must be worn when using power tools or machines. Even activities that seem low-risk, such as using a random orbit sander, can fling particles into your eye and cause irritation or damage. In addition to tool and machine use, mixing and applying finishes also pose a threat to your eyes. In short, while in a workshop environment, wear eye protection when performing any task. Situations that don't require eye protection would be limited to taking notes in a lecture when no machines are in use, or drawing plans at a workbench. Ensure that the eye protection you choose fits your face, and is suited to the operation you are performing. In many cases, a full face shield is advised or required. If you are in doubt at all as to what kind of eye protection you should wear, or whether your eye protection fits properly, bring it to the attention of your supervisor or instructor. Normal eyeglasses are NOT sufficient for use as eye protection; only if they are specially designed and approved (Z.87+ or equivalent certification) can they serve as eye protection.
 - b. Hearing Protection: Hearing loss is a very real danger when using shop machines or power tools. Hearing loss is cumulative and typically irreversible, which makes it that much more important to adhere to good practices even for short periods of use. Some machines or shop areas will be clearly marked with a "Hearing Protection Required" sign; in these cases it is not optional but mandatory to use hearing protection. In many cases, however, it is either up to your supervisor, instructor, or your own judgment, whether you should use hearing protection. When in doubt, opt to use it. As with eye protection, ensure that the method that you choose (e.g., in-ear or over-the-ear) is suitable for the environment and activity you will be doing. Both methods can be combined for extremely loud environments. In all cases in which you are working with hearing protection, be especially aware of your environment so that you can see what others are doing, and whether someone or something (a siren, for instance) is trying to get your attention.
 - c. Footwear: In most shop situations, enclosed-toe shoes are sufficient protection. Sandals and flip-flops are NOT suitable for shop work, nor are any shoes that do not provide for you to work with a solid, stable stance, such as high heels or some types of cowboy boots. In environments or activities in which heavy objects will be manipulated, reinforced-toe or safety boots/shoes may be required. In these cases you will be clearly notified and provided the opportunity to obtain that footwear before doing such work.
 - d. Outer garments (jackets, aprons, gloves, etc.): Many shop users find an apron to be an efficient way to keep needed tools and supplies at hand, as well as provide a light protective layer for clothing. When choosing and using a shop apron, ensure that any pockets will securely hold their intended contents against unintentionally falling out in use. Additionally, ensure that any fastening straps are at the side or back of the apron, so there are no loose ends to become entangled in machinery – this can easily and quickly lead to serious injury. In most cases, jackets or gloves are not recommended in a shop environment. Either can lead to entanglement, or to a false sense of protection against dangerous parts. A common exception to the above is when handling rough materials, when machines are not in use. In that case, injury by pinching or splinters is more likely, and can be prevented with gloves and long sleeves / jacket.

2. General Shop Safety

- a. A thorough preparation and an attitude towards safety will mitigate a great deal of the risk that is inherent in working with machinery and power tools. COF policy is that no students or staff will use workshops without having attended a hands-on safety training for each shop. This hands-on training may only be scheduled following the completion of online training, including the quiz that accompanies that training. **Neither the online training, quiz, nor initial hands-on training are intended, nor capable, of making anyone an “expert” user of any shop equipment.** They are intended to provide a consistent framework to convey the fundamentals of shop safety, and safe machine use.
- b. Workshops should be kept clean and uncluttered – especially the common work areas that require adequate clearance between machines and other users for safe use. Some workshops have areas that are clearly marked for specific uses, groups, or other special requirements such as PPE or special training. Ensure you adhere to those instructions, in order to avoid injury to yourself, and/or disruption to other shop users.
- c. Unless specifically authorized by your instructor or supervisor, the use of headphones while working in a shop is prohibited. You must coordinate any use of headphones, or playing music over speakers, with your supervisor or instructor, and in no case are headphones allowed when using cutting tools or machines. In all cases, you must be working in a location and orientation that allows you to see if someone enters the shop, or is trying to get your attention.
- d. Machines should have factory-supplied or -installed safety guards in place, unless a specific task cannot be performed with the guard in place. In those situations, you must check with your supervisor or instructor to confirm that any alternative provides the necessary safety for use of that machine or tool. Blades should be sharp and clean, and properly aligned – both before you begin work, and after you have completed work. Work surfaces should be clean and smooth to allow for machining of materials without having to exert undue pressure on the workpiece. Poorly maintained blades or machines are not only inefficient, but also pose a safety hazard as the level of effort expended by the user increases. If it seems like any operation is being hindered by dull blades or a poor machine surface, stop work and bring it to the attention of your instructor or supervisor, who will either perform the work necessary, arrange for it to be done by others as appropriate, or instruct you in the task(s) needed to get the process running smoothly again. **In no circumstance is it appropriate to just finish your task in those situations, and leave the deficiency for someone else to discover and remedy.** There are no “maintenance-free” machines or processes; upkeep of workshop spaces, machines, and tools is a shared responsibility, and routine maintenance and/or cleaning is always more cost-effective and time-efficient than putting off such work until the problems are obviously detrimental.
- e. COF workshops exist to support educational and research outcomes. They are not an appropriate venue for social time, meals, or personal projects. Classes and work sessions can be enjoyable, and you are encouraged to enjoy them in a way that keeps shop safety and effectiveness at the forefront. You owe it to yourself and other workshop users to maintain a professional and attentive attitude, and enable others to do the same, while in the shop – whether learning or actively working.

3. First Aid

- a. First Aid Kits

- i. First Aid kits are to be installed and clearly labeled in all workshops. All users should familiarize themselves with the location and contents of the First Aid kit before it is needed. Inform your instructor or supervisor of any items removed from the first aid kit so they can be replaced as necessary.
 - b. Eye Wash Stations
 - i. Eye wash stations are required where employees handle substances that could injure their eyes, or are corrosive. Shop workers should familiarize themselves with the location and operation of the nearest eye wash station, both for their own potential use and to be able to assist someone else in the case of exposure to a hazardous material, since the first 10 seconds after such exposure offer the best treatment window.
- 4. Fire Safety
 - a. Prevention
 - i. Preventing fires is always critically important, but gains even more importance in a shop environment where there are frequently flammable solvents, finishes, and – in the case of woodworking shops – combustible dust and solid materials on hand.
 - ii. Workshops must adhere to safe practices with respect to shop cleanliness and the proper disposal of finishes and materials used in their application.
 - iii. Clean your sawdust and wood chips to a level specified by your instructor or supervisor. Ensure finishes and solvents are stored properly after use, and that rags used in the application of finishes – especially oil-based finishes that cure through oxidization – are properly disposed of.
- 5. Woodworking Shop Machines
 - a. Table Saws
 - i. Overview: The table saw is often regarded as the centerpiece of a woodworking shop, and for good reason. It is used to rip wide boards or manufactured panels to narrower widths, as well as cross-cut with a high degree of accuracy and repeatability. Rip cuts are **always** made with one straight edge of the workpiece kept firmly against the rip fence. Cross-cuts are **never** made with the workpiece held against the fence. **Free-hand cuts must never be attempted on the table saw.** Any workpiece that is cut on the table saw should be flat, smooth, and dry, so that neither the table nor the blade is damaged, and the workpiece doesn't rock or shift on its way through the cutting operation. The blade can be tilted up to a 45 degree angle, making angled joinery possible. In addition, slots in the table top allow the use of miter gauges and a myriad other fixtures and jigs that permit compound angle cutting and many other specialty machining processes. In addition to cutting, table saws are often fitted with special blades, or sets of blades, to produce grooves or dados – known as non-through cutting operations.
 - ii. Specific Safety Considerations: There are two primary dangers associated with table saws. The most obvious is making contact with the blade – either while in operation, or slowing down or even simply protruding from the table surface. The carbide teeth on modern saw blades are extremely sharp and it is not uncommon for users to get cut simply handling them without due care. Some modern table saws – most notably the SawStop brand –

incorporate a flesh-sensing technology that nearly instantaneously stops and lowers the blade in the case of skin contact, greatly diminishing the first danger. However, this technology can also result in blade stoppage in the case of cutting wet lumber or other conductive materials, and can be disabled in order to make those cuts. In a shared shop using a table saw equipped with this technology, it is imperative that it is enabled and verified before general saw use, and that users continue to exercise proper operational procedures and technique, and not get drawn into a false sense of safety because of that technology. The second danger is known as “kickback” and is caused when a workpiece, having passed the front of the blade where the teeth are pushing down into the table, moves away from the fence and into the teeth at the rear of the blade, which can lift the workpiece and propel it back at the user with devastating force. Modern table saws have been equipped with a blade guard mounted to a “splitter” that is the same width as the blade, and mounted close behind it, to keep the cut piece and waste piece edges both away from their respective side of the blade. More recently, the splitter has been superseded by a curved “riving knife” that raises, lowers, and tilts along with the blade, and is mounted within 1 cm or less of the blade itself, making kickback nearly impossible. Most saws incorporate two riving knives – one that also has mounting attachments for the factory blade guard that prevents accidental contact with the blade, and another low-profile knife that is the same or slightly lower height than the blade, so that it can be used in a non-through cutting operation. The use of a dado cutting blade set or specialty wide blades such as those used for box joints preclude the use of either a splitter or riving knife, and are thus more dangerous cutting operations, and are not typically done by students.

- iii. Safe Use: As stated earlier, workpieces being cut on the table saw must be kept firmly against the rip fence for ripping operations – cuts that are made *along* the long dimension of the workpiece. This means that the piece must be both pushed forward, and towards the fence (which is almost always to the left of the blade) throughout the cut. In cases where the ripped width is wide enough – about 6”-8” or more – the workpiece can be pushed through by hand, while keeping a safe distance from the blade. Narrower rip cuts require the use of a push stick that enables the user to maintain forward pressure of the workpiece, while keeping the hand at a safe distance from the blade. Sideways pressure against the fence must always be at or before the leading edge of the blade – NEVER past it. Applying pressure towards the fence after the blade can force the waste edge of the workpiece that has already been cut into the side and/or back teeth of the blade, increasing the chance for kickback, or at the very least a poorly cut edge. Also as stated above, cross-cuts must never be made against the fence, rather, the workpiece should be carried through the cutting operation by the use of a miter gauge for narrower workpieces, or a dedicated cross-cut sled for wider boards or panels. In these cases, the fence should be well away from the work, allowing the piece that is cut to move freely away from the blade without getting caught between the fence and the blade. If this happens, that small piece is very likely to experience kickback, ruining the piece and posing an injury threat to the user and others nearby. A rule of thumb for

making any cuts that involve a straight edge held against the fence, is that the edge placed against the fence is at least 12"/30cm long, AND longer than the distance between the fence and the blade.

- iv. Maintenance: Periodic maintenance is essential to continued safe operation of a table saw. Ensure that the table and fence surfaces are smooth, and do not hinder the movement of the workpiece through the cut. Wax these surfaces regularly, in accordance with the volume of use. Ensure that the blade is sharp and clean; dull and/or resin-coated teeth will cause both poor cut quality, and pose a safety hazard in that the effort needed to push the workpiece through the saw is greatly increased. Since the dulling or contamination of a saw blade happens gradually, ensure that you are familiar with how a clean, sharp blade feels in use, and be mindful of how the saw operation feels compared to that reference. Always unplug the saw when removing or installing a blade.

b. Band Saws

- i. Overview: Bandsaws, with their two parallel wheels turning a thin blade that forces the workpiece onto the saw table, offer a much safer cutting environment than a table saw. In addition, the bandsaw provides the ability to make curved cuts and also permits working free-hand without risk of kickback. Various blade sizes, tooth configurations, and blade materials allow for the cutting of a wide range of materials. When properly set up, a band saw can do tasks from rough cutting large timbers, to repeatedly slicing veneers only a few millimeters thick.
- ii. Specific Safety Considerations: As with the table saw, the primary danger in using a band saw is in making contact with the running blade. In contrast to some table saws, there is no technology currently on the market that can intervene to stop a band saw blade in order to avoid serious injury. So it is **always** on the user to practice safe procedures in order to avoid injury due to blade contact. The second danger in using band saws is having the teeth suddenly grab an unsupported workpiece and slamming it to the table, damaging both the blade (and potentially the guide systems) and also the user's hands as they are caught between the workpiece and the table. Occasionally, bandsaw blades may break from metal fatigue after heavy use, and in some instances the loose blade can cause injury if it exits the saw guides before coming to a stop. In most instances of blade breakage, the blade simply stops in the workpiece without further event.
- iii. Safe Use: First and foremost, ALWAYS be mindful of the blade, and the movement of the workpiece through the cut. Never push the workpiece with your hand in a position where you are moving it directly at the moving blade, unless you are still at least about 50cm / 20" away from the blade. Especially in the case of long rip cuts or resawing, it is possible for the board to have sufficient tension inside (that the cut is now releasing) that the final several inches of the board will suddenly split apart to the end of the board. In these cases, you will go from applying pressure against the resistance of the cut, to having no resistance at all. It is easy to see how this can result in a sudden hand movement directly in the direction of the cut. Pushing the workpiece from a position to the side of the cut line, and/or using a push stick or block, will keep your hand out of the path of the blade in these circumstances. As mentioned above, it is also critical to

have the workpiece supported by solid contact with the table throughout the cut. In the cases where the band saw will be used to cut a workpiece that has no flat reference surfaces yet (milling boards from a small log, for instance) it is imperative that a jig be used that will ride securely on the table, and also securely hold the irregular workpiece so it cannot shift throughout the cutting process. Visualizing how the entire cut will be performed (including what will happen to the two pieces after the cut) will reduce the opportunities for stress or surprises. Similarly when making a complicated curved cut, know the smallest radius that the installed blade is capable of cutting, and don't exceed it. Where there are locations where the blade could bind in a tight curve, make relief cuts first in order to eliminate that possibility. It is NEVER advisable to pull a workpiece back out of a partial cut; the blade could be pulled out of the guides, off the wheels entirely, or stressed in other ways. It is therefore critically important to plan cuts that avoid this possibility entirely.

- iv. Maintenance: As simple as a band saw is in operation, there are MANY aspects of setting up the saw so that the operation is simple and effective. The blade must be installed at the proper location on the wheels, and at the proper tension for each specific blade. The upper and lower guide assemblies, including both the side guides (rollers or guide blocks) as well as the thrust bearings, must be adjusted **for each blade. Before each use.** The blade can accumulate buildup on the sides and in the gullets, which can then transfer to the tires and lead to poor tracking. Many problems in the use of a band saw can be traced to a poorly cleaned/adjusted machine. If you are not familiar with how to check and/or correct the setup of a band saw, ask your supervisor or instructor before using the saw. As with other saws, you should be familiar with how a dull blade feels and performs, so you can identify when a blade needs to be replaced. Dull blades require more effort, and often will no longer cut straight without constant adjustment during the cut. It can be both dangerous and result in poor cuts, to continue to use a blade that needs replacing.

c. Miter Saw

- i. Overview: The miter saw is designed to make repetitive cuts at angles both left and right of 90 degrees, and in most modern saws at bevels in one or both directions (a "compound" miter saw). They are typically installed with longer auxiliary fences to one or both sides of the saw, with moveable stops to allow for easily repeatable cuts.
- ii. Specific Safety Considerations: Again, as with the table saw, the primary dangers in the use of this tool are making contact with the blade, and having the blade pinched by the workpiece during the cut, throwing the saw body back at the user in a sudden and often violent action. This can be very much reduced or eliminated through proper preparation for the cut, and/or following proper cutting procedures.
- iii. Safe Use: In order to prevent injury due to blade contact, users must always remain mindful of the cutting area, and keep their free hand (the one not operating the saw switch) at least 8" away from it. The free hand should be used to firmly hold down the work piece throughout the cut. This is especially true in cutting at angles other than 90 degrees, in that the cutting area is effectively widened and thus the safe holding distance is increased.

Making a “dry run” through the intended cut – and even practicing on a scrap board or piece of plywood – can reveal where there are areas to better prepare for the cut. All work should be done with the workpiece held firmly and cleanly against the fence. If the workpiece to be cut is away from the fence at the cut line when the cut is begun, the blade can be pinched as the workpiece moves towards the fence as the cut is completed. This phenomenon (often encountered when cutting rough lumber that does not yet have perfectly straight or flat edges & faces) can be reliably predicted and planned for by evaluating the workpiece before cutting, and planning around the specifics of each workpiece and cut. If in doubt about how to set up for any cut on the miter saw, especially with rough or curved/twisted lumber, as your supervisor or instructor for assistance.

- iv. **Maintenance:** Ensure the blade runs true, and that the teeth are sharp and clean. Ensure you are using the proper blade for the application at hand; a general-purpose blade will cut more aggressively than a fine finish blade, making quicker work of rough lumber cutting at the expense of the smoothness of the cut edge.

d. **Jointer**

- i. **Overview:** The jointer’s primary purpose is in creating a flat reference face on rough lumber, as well as to straighten one edge of boards that already have one (or both) flat face(s) that can be placed against the fence.
- ii. **Specific Safety Considerations:** The primary danger in using the jointer is in making contact with the moving cutterhead. In some cases, the cutterhead can engage too aggressively with the workpiece and throw it back towards the user; this is more common when taking a deep cut on a severely concave face.
- iii. **Safe Use:** In order to produce a reference flat face, the workpiece must not be pushed down against the cutterhead while it passes across the machine. Downward and forward pressure are necessary but in varying amounts and locations throughout the operation. In cases of large/long boards, a second set of hands (or an auxiliary work stand) may be necessary to safely conduct the workpiece through the cut. And in most cases, multiple passes are necessary to produce a truly flat face. Several light passes are preferable to only one or two heavier cuts, especially on boards that approach the full width of the cutterhead, or especially hard woods.
- iv. **Maintenance:** Ensure the cutterhead knives/cutters are clean and sharp, and free of nicks. If you notice any damage to the cutting edges during this inspection, bring it to the attention of your supervisor/instructor. Ensure the tables and fence are clean and smooth and allow for free movement of the workpiece. If the workpiece is difficult to move across the tables or fence, this is usually an indication that it is time to clean and wax these surfaces. Ensure this is done in accordance with the instructions on the wax or other material used for this purpose, and only do this work with the power disconnected from the jointer.

e. **Planer**

- i. **Overview:** The planer has only one function, and that is to produce a smooth face at a specified thickness, on the opposite side of a reference face that is placed on the infeed table of the planer. It is imperative that the

- material to be planed have a flat reference face; putting a curved or twisted board through a planer will only result in a thinner curved or twisted board.
- ii. **Specific Safety Considerations:** The planer does its work through a rotating cutterhead that is normally well-contained within the machine. It is obviously the primary danger when using the planer, although the other common injury when using a planer is getting a hand or finger(s) pinched either between the board and the table, when the infeed rollers grab the workpiece, or at the mouth of the planer if the user keeps their hand on the workpiece right up to this opening. (These are called “induction zones” and are frequent causes of painful injuries.)
 - iii. **Safe Use:** When it is properly set up, running boards through a planer is a low-drama event. Ensure the depth of cut to be taken is reasonable considering the width of the workpiece, the power of the planer, and the hardness of the board. Further detail on this can be found in the manual for the planer you will be using. Attempting to take too deep a cut in a single pass can overload the planer motor and require a reset – and will jam the workpiece in the planer. As with the jointer, if the tables become worn, they will drastically increase the friction on the workpiece, which may cause it to stall on its way through the planer and require either pulling on the outfeed end, or in cases where that is not effective, stopping the planer and lowering the table (or raising the cutterhead) in order to free the piece. In those cases, that is a sure sign that it is time for a thorough cleaning and waxing of the tables.
 - iv. **Maintenance:** You should be familiar with how the planer sounds and feels when it is operating with sharp blades and well-conditioned infeed/outfeed beds. The blades (or cutters, if using a planer that has a helix-style cutterhead) will get dull over time, and some materials or processes will dull the cutters more quickly. When this happens, the sound will be the first indication – to sometimes accompanied by lines in the workpiece where the blades or cutters have been nicked. Ensure you follow the procedures in the manual for the planer you’re using when changing cutters/blades. In the case of individual cutters, their multiple faces permit rotating to a fresh, sharp surface until all faces are dull. As mentioned, ensure you keep the infeed and outfeed tables clean and waxed for less load on the motor and a smoother operation. When doing ANY maintenance on the planer, ensure it is disconnected from power, and that there is no way another user can power it up while maintenance is being performed. Ensure chips and sawdust are cleaned out from the interior whenever other maintenance is being performed in those areas.
- f. **Power Sanding Machines (drum/belt/spindle)**
- i. **Overview:** Power sanders are substantial time-savers in the shop. They can be used to sand workpieces to a specified thickness with great precision, smooth straight or curved cuts on edges, and shape items either freehand or through the use of jigs or attachments. Various sandpaper grits can be installed, allowing for either rapid stock removal or a finely finished surface.
 - ii. **Specific Safety Considerations:** There are three main dangers in using a power sander. One is through making direct contact with the moving sandpaper surface, which will produce a painful abrasion injury very

quickly. The second is through having the sandpaper (normally a belt) grab the workpiece unexpectedly, causing it to spin or be thrown off the table in the direction of the moving belt. In this case, injuries can range from cuts from the spinning workpiece edges, crushing injuries as fingers are caught between the workpiece and another stationary object, or you and/or other users being hit by the workpiece as it is thrown off the table. The third is through induction zone injuries; for instance, getting a finger pinched at the infeed of a surfacing drum sander.

- iii. **Safe Use:** The primary principle in using sanders safely is to prepare for how the work will be performed, and observing where there is potential for one or more of the above hazards to be encountered. Using jigs and stops, workpieces can be held more securely and at a safe distance from the moving sandpaper. Keep hands well away from the infeed locations that can lead to induction zone injuries. Ensure you are only removing an appropriate amount of material, at an appropriate feed rate/pressure, for the sandpaper grit and workpiece that you are putting through the sanding procedure. Trying to remove too much, too quickly, can easily and quickly lead to heat build-up that will burn the material and clog the sandpaper; in the case of a drum sander, this can lead to a positive-feedback loop of increased heat until both the workpiece and the sandpaper is ruined – and can even lead to smoking or a fire in extreme cases. Check the sandpaper surface before each use to ensure that there are not already any “hot spots” where worn, resin-clogged sandpaper will more quickly overheat. If possible, put workpieces through the sander at various points (or various heights, in the case of spindle or edge sanders) in order to spread the wear more evenly across the entire surface.
 - iv. **Maintenance:** Sandpaper will eventually become worn, or can become clogged with resins and sawdust. Special cleaning tools can remove the clogging materials, prolonging the life of the sandpaper considerably. These tools must be used in strict accordance with the instructions, in order to provide maximum benefit as well as safe use. When cleaning no longer provides benefit, it is necessary to replace the sandpaper. Each machine – drum, spindle, belt, disk – has its own specific method and materials. Ensure you know and follow the specific processes for the machine you are using. If in doubt, ask your instructor or supervisor. Often these machines will be marked with a requirement that the sandpaper be changed only by trained shop personnel.
- g. **Router Table**
- i. **Overview:** A table-mounted router is an extremely versatile machine, allowing a wider variety of edge profiling, joinery, and specialty machining than is possible to list here. Through the use of a precise fence, as well as jigs, hold-downs, and stops, it is possible to create repeatable precision on large numbers of workpieces.
 - ii. **Specific Safety Considerations:** The router table does its work through a spinning bit, extended some measure above the surface of the table. As with many machines already discussed, this leads to two primary dangers: making contact with the spinning router bit, or being struck by a workpiece that is unexpectedly grabbed and thrown by the spinning bit. It is also

possible for the spinning bit to come loose from the collet, and be thrown from the router.

- iii. **Safe Use:** It is imperative that any work on the router table take into consideration the location and the direction of rotation of the router bit. In most cases, the exposed cutting portion of the bit is rotating towards the user's right, meaning that the workpiece is moved across the bit from right to left in order to push against the cutter and not with it. In infrequent cases, the proper movement will be left to right; users should always verify that the workpiece is moved against the leading edge of the rotating cutters, so it is pushed back at them and not pulled away. When at all possible, guards and hold-downs should be used, so that the opportunity to make contact with the spinning bit is minimized or eliminated. Ensure bits are securely held in the collet and that you are using the correct motor speed for the bit diameter, if using a variable-speed router. If you are unsure about the correct speed, ask your supervisor or instructor before proceeding.
 - iv. **Maintenance:** Ensure the router motor is protected from dust and other debris that could build up in the motor, impairing performance or damaging the motor. Ensure bits are clean and sharp before each use, and that any bearings on the bit spin freely. As with most other machines, ensure the table and fence surfaces are clean and smooth, so that there is minimal effort required to move the workpiece except to counter the force exerted by the spinning bit. Ensure the collet is clean before inserting the bit.
- h. **Lathes**
- i. **Overview:** Lathes are a special-purpose tool, and are not used in the normal operation of the woodworking shops outside of specific classroom / lab instruction. **ONLY** use lathes under the instruction and supervision of the instructor(s) or technician(s) assigned to teach these classes, and only after completion of their specified, lathe-specific training.

College of Forestry 620: Hand Tools

Safety Policy & Procedure Manual

Section 600: Workshops and Shop Tools

Effective: 01 January 2007

Revised: January 2020

Purpose

The purpose of this section is to provide information on proper procedures for the use of hand tools and to help protect employees and students from the health hazards presented by hand tools in the shop environment.

Background Information

Workers performing in shop conditions using hand tools are regulated under Oregon Administrative Rules Oregon Occupational Safety and Health Division, Division 2. Most all activities in workshops using hand tools will be covered under sub-section P, Hand and Portable Power Tools and Other Hand-held Equipment.

Safety rules for each piece of equipment being used must be reviewed with the employee by the immediate supervisor or someone designated by the immediate supervisor to provide such training.

Every area that uses hand or power tools shall have a safety plan that includes a section on power and hand tools safety and an acknowledgement that each person using such tools has been adequately trained prior to use.

General

1. Defective tools shall be removed from service
2. When not in use, tools shall be placed where they will not create a hazard.
3. Flexible cords with damaged insulation or defective parts shall not be used
4. Handles of all tools shall be smooth, without sharp edges or splinters, and shall be firmly attached to the tool. Wooden handles of tools shall be of firm straight grained stock.
5. The heads of all shock tools (hammers, sledges, cold chisels) shall be dressed or ground as they begin to mushroom or crack. When such tools show a tendency to chip they shall be immediately removed from service.
6. The cutting edges of tools shall be maintained in a uniformly sharp condition to eliminate the additional hazard resulting from dull edges.
7. Heavy leather holsters, guards, or equivalent protection shall be used for sharp- edged or sharp-pointed tools carried on the worker's person.
8. Workers who use sharp-edged cutting tools shall use appropriate protective equipment such as gloves, aprons, and leg guards.
9. Hand tools used in explosive or flammable atmospheres shall be of the spark arresting type.

College of Forestry 630: Chemical Handling

Safety Policy & Procedure Manual

Section 600: Workshops and Shop Tools

Effective: 01 January 2007

Revised: January 2020

Purpose

The purpose of this section is to provide information on proper procedures for the use and handling of chemicals in the workshop environment.

Background Information

Workers performing in shop conditions where hazardous chemicals are stored or in use should refer to the sections of the safety manual on chemical safety. In addition, these areas must have a safety plan in place that includes appropriate knowledge and training in the use of these chemicals. All chemicals shall have appropriate MSDS sheets readily available and posted in a conspicuous location for reference by all workers.

General

1. Do not wash hands in cleaning solvents. Absorption of these liquids through the skin can cause serious illness.
2. Do not handle chemicals of any type unless you are aware of the potential skin and inhalation hazards. Consult the appropriate MSDS.
3. Wear appropriate skin, face, eye, and hand protection when moving or handling bulk chemicals.
4. Always wear chemical resistant gloves, aprons, and complete eye protection when handling corrosive chemicals. If chemicals contact skin, wash with large amounts of water immediately.
5. Do not open chemical containers that have been stored in the sun unless proper care is taken. Many chemicals will build up pressure in the container when exposed to heat.
6. Clean up small chemical spills immediately if you can do it safely; otherwise, notify supervisor.