



# **SAFETY MANUAL**

HUDSON RIVER MARITIME MUSEUM  
WOODEN BOAT SCHOOL

## Table of Contents

<b>What is safety?</b> .....	<b>4</b>
<b>SHOP RULES AND POLICIES</b> .....	<b>5</b>
<b>GENERAL:</b> .....	<b>5</b>
<b>MACHINERY - STATIONARY POWER:</b> .....	<b>5</b>
<b>RIGGING and HOISTING EQUIPMENT:</b> .....	<b>6</b>
<b>WORKING ABOVE GROUND:</b> .....	<b>6</b>
<b>CLEAN-UP and ORGANIZATION:</b> .....	<b>6</b>
<b>GENERAL SAFETY</b> .....	<b>8</b>
<b>POLLUTANTS</b> .....	<b>9</b>
Dust Exposure .....	9
Occupational Noise Exposure .....	9
Chemical Exposure.....	9
<b>ELECTRICAL SAFETY</b> .....	<b>11</b>
<b>GUARDING OF EQUIPMENT</b> .....	<b>12</b>
<b>LIFTING AND HANDLING</b> .....	<b>13</b>
<b>EMERGENCY GUIDELINES</b> .....	<b>14</b>
<b>WORKSHOP EQUIPMENT</b> .....	<b>15</b>
<b>STATIONARY POWER TOOLS</b> .....	<b>15</b>
TABLE SAW.....	15
BAND SAW.....	17
COMPOUND MITER SAW OR “CHOP” SAW .....	18
JOINER.....	19
SURFACE PLANER.....	20
SANDERS/GRINDER/BUFFER .....	21
WOOD LATHE .....	23
DRILL PRESS .....	24
ELECTRIC ARC WELDER.....	25
<b>HAND-HELD POWER TOOLS</b> .....	<b>26</b>
JIG SAW.....	27
Circular saw.....	28
Drills-corded and cordless .....	29
Power plane.....	29
Router.....	29
Grinder .....	30
Belt Sander .....	30
Disc Sander .....	31
Pad Sander.....	32
Multi-tool.....	32
Sawzall .....	33
Chain Mortiser.....	33
<b>HAND TOOLS</b> .....	<b>34</b>
Chisels .....	35
Hand Planes.....	37

<b>RIGGING TOOLS</b> .....	<b>38</b>
Chain hoist.....	39
Lever hoist.....	39
Comealong.....	39
Jacks.....	40
Slings.....	40
Rope.....	41
Shackles.....	41

# What is safety?

“the minimization or elimination of injury resulting from non-deliberate acts such as accidents”

The purpose of this safety program is to ensure that all staff, students, and volunteers that use the Hudson River Maritime Museum/Riverport Wooden Boat shop have access to information, training and equipment needed to provide protection against foreseeable hazards in the workplace. The implementation of this program will develop proper technique, safe procedures, and a calm approach to the usage of tools and materials that will help keep all individuals in our community safe.

SAFETY IS NOT A SINGLE ACT, OR A SINGLE RULE, A SET OF RULES OR EVEN A SAFETY MANUAL. SAFETY IS A WAY OF THINKING AND BEHAVING, EVERY DAY, AND IN EVERY SITUATION.

**PRACTICED AS INDIVIDUALS, SAFETY IS A HABIT.  
PRACTICED AS A GROUP, SAFETY IS A CULTURE.**

Everyone plays a part in setting the culture of safety

- ✦ Think ahead – have a plan
- ✦ Don't rush – slow down
- ✦ Focus – pay attention to the task at hand
- ✦ Ask questions - get help if you need it
- ✦ Be aware – what and who is around you
- ✦ Be kind – help and teach

# SHOP RULES AND POLICIES

The Hudson River Maritime Museum / Riverport Wooden Boat School (Workshop) has adopted the following rules and regulations regarding the use of the Workshop. These rules have been implemented for the safety and well-being of all Workshop users. **Violations of these policies will result in the permanent loss of Workshop use privileges.**

## GENERAL:

1. The use of the Workshop is available only to staff, volunteers and students currently employed by or enrolled in programs at the HRMM/RWBS.
2. No one is to work in the Workshop alone.
3. All Workshop users must conduct themselves in a safe manner at all times.
4. Any user finding a dangerous condition in the shop must notify the Safety Officer immediately.
5. **All injuries must be reported to the Safety Officer at once no matter how minor the injury may be.**
6. Protective eyewear must be worn at all times.
7. Use ear plugs or muffs whenever using machinery or when noisy conditions exist in the shop.
8. N-95 or better dust masks should be worn whenever conditions dictate.
9. Proper respirators must be worn when using volatile chemicals. Check MSDS for correct filters. Filters are good for roughly 8 hours total of exposure to the atmosphere. If you can smell anything you probably need to change the filter or use a different kind of filter.
10. Open toed shoes or sandals are not permitted in the shop.
11. No loose-fitting clothing or loose hair to be worn while operating machines.
12. Remove all long necklaces, loose bracelets and wristwatches before operating machines.
13. No running, no horseplay, no yelling in the Workshop.
14. Do not talk to anyone who is operating machinery.
15. Do not talk to anyone while you are operating machinery.
16. Turn your cell phones off or take them outside
17. Smoking and eating are not permitted in the Workshop.

## MACHINERY - STATIONARY POWER:

1. No one should use equipment until he or she has received proper instruction and feels comfortable with its operation. Do not use a machine for the first time without approval from your instructor or the Shop Director.
2. Be sure to use each tool only for the purpose for which it was meant.
3. Before turning any machine on please note the location of all power supply switches.
4. Before turning any machine on, check vicinity for people or other obstructions.
5. Clear any unnecessary objects from machinery tables before use.

6. All safety guards must be kept in proper position while machines are being operated.
7. The Shop Director is the only person authorized to remove guards, and only for special applications.
8. Do not leave equipment while it is running.
9. Do not try to stop the machine with your hands or body.
10. Make sure machines are in "off" position and all motion has stopped before leaving machine.
11. Unplug machinery before servicing or changing blades.
12. Never lean on a piece of machinery.
13. Care must be taken to see that all lumber is free from nails, sand, paint, or loose knots before being machined.
14. Make sure floor area in front of machines is clear and not slippery.

### **RIGGING and HOISTING EQUIPMENT:**

1. All rigging and hoisting equipment must be inspected before use.
2. Never work under a lifted load.
3. Use only rated equipment for overhead lifting.
4. When jacking large loads use follow blocks to keep potential drops to a minimum.
5. Take care to set up jacks, blocks and cribbing evenly and in a stable fashion.
6. Never put hands between blocks and load.
7. Use hydraulic jacks for lifting only, not for long term holding of loads.

### **WORKING ABOVE GROUND:**

1. Always use proper safety belt and fall arrest when working above 5 feet in the boat yard and 6 feet when working on buildings.
2. Check fall arrest anchors before use.
3. Ladders must always be used according to manufacturer's recommendations which are printed on the side of the ladder.
4. Always use hard pads under scaffolding and ladder feet when used on soft surfaces.
5. Any hand tools being used overhead must have safety lanyards.
6. Never leave loose tools or materials on top of ladder.

### **CLEAN-UP and ORGANIZATION:**

1. Everyone is responsible to clean up after themselves – brush off machines, sweep floor, clean up any mess.
2. Return all tools and equipment to their proper storage location after each use.
3. The floor and aisles must be clear of all liquids, sawdust, and wood scraps to avoid tripping or other accidents.

4. Dispose of solvents, finishes, chemicals and other hazardous materials in the proper containers. Ask the Shop Director.

# GENERAL SAFETY

**Common sense and a reasonable amount of care go a long way towards preventing accidents and injury.**

- Always wear the correct safety gear applicable to your task and the tasks happening around you (protective eye wear, ear protection, dust mask, gloves, etc.)
- Always warn others of dust or noise about to be raised
- As a courtesy, check to make sure there are no passersby before turning on the Dust Collector
- If you've not been shown by shop staff how to use a particular tool don't try to use it on your own.
- If you're not sure how to do something, don't do it until you consult with the Shop Director or shop staff.
- If you're worried about something you're about to do, see above.
- If you think you've been told to do something that seems dangerous to you it's likely that there has been a misunderstanding and you should express your concerns and ask for clarification.
- If a work piece is too heavy for you to handle it easily ask for help.
- I know that this is a cliché, but when it comes to safety, the only stupid question is the one you don't ask.



# POLLUTANTS

**Perhaps the most hidden risk to our overall health is the prolonged exposure to dust, noise, and chemicals**

## Dust Exposure

Wood dust becomes a potential health problem when wood particles from processes such as sanding and cutting become airborne. Breathing these particles may cause allergic respiratory symptoms, mucosal and non-allergic respiratory symptoms, and cancer. The extent of these hazards and the associated wood types have not been clearly established.

~OSHA

- Always wear a dust mask and eye protection when sanding or cutting materials, whether they are wood or metal
- Air Filter needs to be turned on whenever dust is raised in the shop

## Occupational Noise Exposure

Exposure to high levels of noise can cause permanent hearing loss. Neither surgery nor a hearing aid can help correct this type of hearing loss. Short term exposure to loud noise can also cause a temporary change in hearing (your ears may feel stuffed up) or ringing in your ears (tinnitus). These short-term problems may go away within a few minutes or hours after the noise. However, repeated exposures to loud noise can lead to permanent tinnitus and/or hearing loss. ~OSHA

- Always wear hearing protection when working with power tools (both stationary and hand held); or whenever sharp or loud noises arise.
  - This hold true even if someone else is using power tools
- Always warn co-workers when you are about to begin to make noise

## Chemical Exposure

Chemical hazards and toxic substances pose a wide range of health hazards (such as irritation, sensitization, and carcinogenicity) and physical hazards (such as flammability, corrosion, and explosibility). ~OSHA

- Please review the specific MSDS for a product before using it, and use all applicable safety equipment (gloves, respirator, etc.)
- Mixing & Cleaning of paints and solvents should always be done in the paint room

- We have developed a preference to use disposable brushes except in cases of finish paint and varnish coats.

## **ELECTRICAL SAFETY**

Electricity is a necessary part of any workshop. It is taken for granted as an energy source, but there are hazards that accompany electricity. Failure to ensure that safe design considerations, work practices, procedures, servicing, and maintenance operations are established often results in bodily harm, property damage, or both. Some simple precautions can reduce or eliminate the possibility of electrical hazards.

In particular, water increases the possibility of shock hazards in the shop. When working with electrical equipment, you should make every effort to prevent water from coming into contact with the electrical outlet or wiring. The electrical equipment and machinery should be properly grounded at all times. The most often used type of grounding is the third prong added to the equipment plug. This third prong acts to send the electricity directly to ground that gives it no chance to pass through a human body. If it's broken do not use the tool or cord until the plug is replaced. Unfortunately, when the electrical cord or wire is cut, the grounding mechanism no longer works. The grounding conductor on all tools and equipment that are not double insulated should be regularly checked for frays, cracks, and breaks. Improper or inadequate maintenance of tools, machinery and equipment can result in electrical hazards in the shop ranging from mild shocks to major electrical fires.

Each piece of heavy equipment should have at least two means of shutting off the power. There is the stop switch on the machine itself within reach of the operator and the cord which should be accessible for unplugging. There is also the main shut-off switch that is located on the wall in or near the electric panel away from the equipment. If an operator is in trouble or the stop switch is not working, the main shut-off or plug at the receptacle should be used to shut off the power. Everyone should know where that main shut-off is located in the workshop.

### **Basic Electrical Rules:**

1. Do not use electrical equipment if power cords are frayed, plugs are missing prongs or control switches are not in good working order.
2. Keep all equipment and hands dry while using electricity.
3. When using electrical equipment outside always insure that the circuit includes GFCI protection.
4. Never run over electric cords with vehicles.
5. Use proper size electric cords for the tool or tools.
6. Do not try to repair equipment yourself. Contact the Shop Director for assistance.
7. Do not use electrical equipment around flammable liquids or gases.
8. No one except trained personnel may operate special electrical equipment.
9. Never try to bypass any safety device on electrical equipment.

## **GUARDING OF EQUIPMENT**

All mechanical equipment should be adequately furnished with guards that prevent access to electrical connections and moving parts. Careful design of guards is vital. An ineffective guard can be worse than none at all because it can give a false sense of security. Emergency shut-off devices may be needed in addition to electrical and mechanical guarding.

It is necessary to guard all machinery and equipment to eliminate hazards created by points of operation, in-going nip points, rotating parts, and flying chips and sparks. These hazards have been responsible for countless injuries and fatalities. The law clearly states that all points of operation and power transmission shall be guarded. There are many forms of guarding. Guarding means that workers are effectively prevented from coming into contact with the moving parts of machinery or equipment that could cause physical harm to the operator.

All belts, shafts, gears, and other moving parts must be fully enclosed or guarded, in a manner to present no hazard to the operator. These moving parts can easily catch a hand in their rotation, causing a serious injury. Because most woodworking operations involve cutting, it is necessary, although often difficult, to provide guards at the point of operation. On most machines, the point-of-operation guard must be movable to accommodate the work piece, balanced so as not to impede the operations, and yet strong enough to provide protection to the operator. Whenever possible, blades and cutting edges need to be completely covered at the point of operation. It is too easy for a blade to cut an operator's hand.

### **Basic Rules for Guarding Equipment:**

1. Be sure that machines have effective and properly working guards.
2. Never remove a guard. It is there for your protection.
3. Bring the guard as close as possible to the blade. There should not be an opening between the work piece and the blade big enough to allow a hand to get in.
4. Contact the Shop Director if the guard is not in place or not working properly.

## **LIFTING AND HANDLING**

Following proper lifting and handling techniques in the workshop can ensure productivity and health. The most common effect of neglect with regard to lifting and handling practices is back problems. Using proper lifting and handling techniques and common sense is the best form of prevention against back injuries. You can do something about preventing back pain by knowing and using proper lifting techniques.

### **Basic Rules for Safe and Proper Lifting:**

1. Size up the load to make sure you can handle it safely.
2. If you think the load is too bulky or too heavy, ask someone to help you, use mechanical assistance such as hand trucks, dollies, hoists etc., or try to break it up into smaller, more manageable loads.
3. Make sure you can carry the load in the direction you intend to go before attempting to move it. Also, make sure your path is clear of obstacles and that there are no hazards (spilled liquid on the floor, for instance) in your path.
4. Stand close to the load with feet far apart.
5. Squat down, bending at the hips and knees. Do not lean over the load. This is the most important rule when lifting heavy objects.
6. As you grip the load, arch your lower back inward by pulling your shoulders back and sticking your chest out.
7. Tuck the chin, so that the neck and head continue the straight line of the back. Tucking the chin helps keep the spine straight.
8. Grip the object with the whole hand. Fingers alone have very little power. The whole hand is needed for safety.
9. Keep the arms and elbows tucked in. When the arms are far away from the body, they lose much of their power. Keeping your arms tucked in close to the body also keeps body weight centered.
10. Center your body over your feet. This provides a more powerful lift and also gives better balance.
11. Keep load close to your body. The closer it is to your body, the less pressure it exerts on your back.
12. When you set the load down, squat, bending at the hips and knees, keeping your lower back arched in.
13. Breathe normally when lifting, don't hold your breath.

## **EMERGENCY GUIDELINES**

The most important work done in an emergency is the work done ahead of time. This includes procedures to follow, equipment condition, and knowledge of first aid.

The following procedures are to be followed immediately whenever **alarms are sounded** or the Fire Department, Security, or the Safety Office notifies you that an emergency exists.

- Remain calm - do not panic.
- Walk directly to the exit designated for the area you are in at the time the "signal" is given.
- Close all doors while exiting if no other occupants are present.
- Do not collect personal belongings before exiting. You will be advised when it is safe to return to the building to collect purses, packages, etc.
- Walk - do not run! Do not use elevators.
- Proceed down the stairwell as quickly as possible, but in an orderly manner. Do not rush or shove past others on the stairwell.
- Do not talk during the exiting period in order to allow instructions to be given.
- Do not smoke - all cigarettes, cigars, and pipes should be extinguished immediately.
- Upon reaching the street level, clear the exit way immediately. Move to your designated assembly area.

## **EMERGENCY CONTACTS:**

**All injuries, no matter how slight, must be reported to the Shop Director, Safety Officer, or other supervisory personnel.**

**Do not make determinations on your own, as to whether or not you need to go to the emergency room or Emergency One. The Shop Director, Safety Officer, or other supervisory personnel should make this decision.**

## **EMERGENCY 911**

**Do not call 911 frivolously, but do not hesitate, even for a moment, if you feel that an injury to yourself or someone else might be severe or life threatening.**

# WORKSHOP EQUIPMENT

## STATIONARY POWER TOOLS

### TABLE SAW



**Design Function** The table saw gets its name from the circular saw blade that is positioned in the middle of a table. It is intended to be used for:

- Straight cuts
- Ripping or cross-cutting stock

The work piece is brought into contact with the rotating blade. A properly equipped table saw has a push stick, a cross cut guide and a fence. The fence assists in guiding the material through the blade. The push stick is a piece of wood that is used in place of the operator's hands. It allows an operator to push the work piece into the blade without getting their hands too close to the blade. It should be used when ripping a piece of wood 6" wide or less. The push stick should be placed on the material between the blade and the fence, closer to the blade than the fence. When using the cross cut-guide the waste piece should not come into contact with the fence or other parts of the saw or jig. The blade underneath the table should be enclosed so the operator cannot accidentally contact the blade.

**Safety Precautions** The most frequent types of accidents that occur from the use of the table saw are cuts or abrasions and kickbacks. Power saw operators are injured when their hands slip off the stock while pushing it through the saw or when holding their hands too close to the blade during the cutting operation. These types of injury can generally be avoided by using a push stick. Never have your hand in line with the blade when pushing work through the saw. A kickback occurs during a cutting operation when all or a part of the work piece is violently thrown back towards the operator. Kickbacks can be avoided by ensuring that the material being cut remains firmly against the fence and flat on the table while being pushed through the blade. Keeping the saw blade sharp, and keeping the saw blade guard, splitter, and anti-kickback device in place all help to prevent kickback. Eye protection must always be worn when working with the table saw.

### Rules of use:

**All users must first attend a table saw orientation before being cleared to use table saw.**

1. The blade should be just high enough to cut the piece -- no more than 1/2 inch above the stock, except when cutting thin stock like 1/4" plywood. In which case the blade should extend approximately 1 inch above the stock.

2. Ask the Shop Director if any special cuts need to be performed.
3. The work piece should be placed firmly against the fence.
4. Your hand should never be in line with the blade or near the blade while the saw is running.
5. The operator must never allow his hands to come closer than 4 inches to the saw blade.
6. Always check the set-up carefully on the table saw before turning on the power. Wait until the blade stops completely before adjusting fence and measuring the distance from the blade.
7. When ripping stock, the fence should never be closer than 1/2 inch to the blade.
8. Always use a push stick to guide a piece through the saw when the fence is closer than 6 inches to the blade.
9. Nothing should be on the saw table while the saw is in operation.
10. The saw should always be turned off and the blade lowered below the table when you are done.
11. Never adjust the saw while it is running.
12. AVOID KICKBACKS - Never leave stock between the blade and the fence. Be sure to push material all the way past the blade after it is cut.
13. Never pull the piece being cut backwards in the middle of a cut.
14. Never use the rip fence for a length stop when cross cutting.
15. Never cut freehand on the table saw-always use the rip fence or a cross cut guide.
16. Unplug the saw when changing blades.
17. Wait for saw blade to come to a complete stop before walking away.
18. Wear eye protection.
19. Keep loose clothing and hair away from blade.
20. Clean the machine surface and the floor when finished.
21. Never reach beyond blade when blade is still in or near the work.
22. If it is not going to be possible to fit the push stick between the blade guard and the fence inform the Shop Director who will make a decision about removing the guard.
23. Always determine that a cut can be finished before starting the saw.



## BAND SAW



**Design Function** A band saw has a long, thin blade that travels in a constant path around wheels, and pulleys. The only portion of the blade exposed is the area from the table to the top of the work piece. The wheels, pulleys, belts, and all non-working parts of the blade are encased within the machine. The upper guide of a band saw should be set at a height just above the work piece. The intended use is for:

- Cutting freehand curves or circles
- Ripping stock into thin strips
- Cross cutting or ripping stock

**Safety Precautions** The most frequent type of accidents associated with the band saw are cuts or abrasions. Carelessness and recklessness are the major reasons behind band saw accidents. The operator should never hold his hand directly in front of the band saw blade when cutting small work pieces because he may accidentally push his hand into the blade. If the guards are in place and the upper guide is in the proper position, the operator's hands should remain clear of all moving parts of the saw. Band saw blades should periodically be examined for cracks and broken teeth. The operator should contact the Shop Director if there are any questions concerning the blade. If the band saw blade breaks or comes off, you should step away immediately, shut off power, and call the Shop Director.

### Rules of use:

1. Keep your hands out of the path of the blade. Never allow your fingers to come closer than 2 inches to the blade. Don't push the work with your hands in line with the blade.
2. GO SLOW! Do not force material through the blade.
3. Make short cuts before long ones to avoid unnecessary backing out.
4. The guide should be no more than a 1/4 inch above the stock.
5. When it is necessary to back out stock from a long cut you should stop the machine, wait for the blade to come to a complete stop and then back out the work piece using a wedge to keep the kerf open.
6. Remove jammed pieces of stock only when machine is stopped.
7. Use care when removing off cuts from the table-make sure the saw has come to a full stop.
8. Wear eye protection.
9. Keep loose clothing and hair away from blade.
10. Clean the machine and the floor when finished.
11. Unplug the saw before changing the blade.

12. Make sure that small cut-offs fall to the right of the blade lest they fall between the blade and the wheel and damage the blade.

## COMPOUND MITER SAW OR “CHOP” SAW



**Design Function** The compound miter saw (chop saw) is a circular saw in which the blade is pulled down into the work piece. This saw has a guard surrounding the entire blade. The saw should be returned to its neutral position after cut is made. This type of saw has a fence that restricts the movement of the work piece. The intended use is for:

- Cross-cutting
- Making simple or compound miter cuts (angles)
- Making dado cuts

**Safety Precautions** The most common accidents that occur with a chop arm saw are cuts or abrasions and kickbacks. If all the guards are in place and the work piece is held securely against the fence, no accidents should occur. No operator should ever have cause to bring his hand in close to the blade of this saw. Kickback is a dangerous reaction of the saw to notches or unevenness in the work piece, or to improperly supported work pieces.

### Rules of use:

1. Wear eye protection.
2. Do not place hands closer than 2 inches from the blade.
3. Do not attempt to cut short stock on the chop saw.
4. Do not attempt to cut round stock on the chop saw
5. Make sure the area between the fences is kept free of cut-offs. These can kick back if caught by the blade.
6. Cut in a slow steady motion. Do not “chop” at the material. It is not an axe.
7. Check the recommended direction of cut.
8. Bring saw to a complete stop before walking away.
9. Unplug the saw when setting angles that require holding a square or bevel gauge close to the blade.
10. Clean the machine and the floor when finished.

## JOINER



**Design Function** The jointer is a heavy machine with a rotating cutterhead. The work piece is pushed over the cutterhead. There is a fence to guide the work piece. The intended use is for:

- Shaving edges smooth
- Squaring and straightening edges
- Face jointing to true the flat surface of a board

**Safety Precautions** The most common accidents that occur with a jointer are cuts or abrasions and kickbacks. If all the guards are in place and the work piece is restrained by the fence, no accidents should occur. No operator should ever have cause to bring his hand in close to the blade of this machine.

### Rules of use:

1. Guards / fences should be in place and used at all times
2. If stock is below top of fence, use push stick / push paddle
3. Feed stock through so knives cut with the grain
4. Do not run used or painted stock through jointer
5. Do not attempt to cut short stock on the jointer
6. Depth of cut can be set for different operations. Never take too heavy a cut.
7. Never position hands so they can contact the cutterhead if the work piece kicks back.
8. Bring jointer to a complete stop before walking away.
9. Always maintain sharp cutters, do not use if dull.
10. Wear eye protection
11. Clean the machine and the floor when finished.

## SURFACE PLANER



**Design Function:** The cutter head on this equipment rotates at high speed while the work piece is moved beneath it. Straight or segmented knives are mounted in the cutter head.

- The intended use is for:
- Planing stock to uniform thickness
- Smoothing and truing surfaces

**Safety Precautions:** Never bring hands (or anything else other than the work piece) into the area within the table when the machine is plugged in.

### Rules of use:

1. The planer may only be operated with assistance of the woodshop staff.
2. Inspect the wood carefully before starting to work. Remove all foreign objects from the wood before passing material through the blades. Make sure there are no loose knots in the wood.
3. Always make cuts with the grain.
4. The guards should always be kept in place.
5. Always re-check the depth of cut before turning on the power.
6. Wear eye protection.
7. Keep loose clothing and hair away from feed rollers.
8. Refer to operator's manual for minimum length of work piece. Never plane anything shorter than recommended minimum length.
9. Unplug machine before changing or servicing knives.
10. Unless the planer has segmented feed rollers (ours does NOT) DO NOT put more than 1 work piece in the machine at the same time.
11. Clean the machine and the floor when finished.
12. Do not try to remove more than 1/16" of stock in hardwood or 1/8" in softwood.
13. Before setting depth of the initial cut check that the stock is of a consistent thickness or determine the maximum thickness and set machine accordingly.
14. Hold the back end of the stock up slightly when beginning the cut and the front end up as the cut finishes. This will minimize "snipe".

## SANDERS/GRINDER/BUFFER



**Design Function:** Sanders, grinders, and buffers shape the work piece by bringing it into contact with a rotating abrasive wheel, belt, or disk. Polishing, honing and wire brushing also are classed as grinding operations. Sanders use drums, disks, or belts that are composed of abrasive materials. Most sanders and grinders are equipped with a work rest. A properly adjusted rest will have the smallest practical clearance between the abrasive and the work piece. The rest acts as a guide and support for the work

piece. Sander/grinders/buffers should have a guard affixed over all moving parts to prevent hands from coming into contact with the moving parts of the machine. Shields are attached to the sander/grinder as added protection against sparking and dust. When using the buffer, a heavy coat of compound should be applied to the buffing wheel. The work should be kept in motion across the face of the wheel, buffing flat surfaces from side to side. Using firm pressure to press the material against the wheel will get the best results. Intended use is for:

- Sanders: Smoothing or shaping small pieces of wood
- Grinders: Removing metal, sharpening tools
- Buffers: Smoothing and polishing surfaces

**Safety Precautions:** The two most common injuries associated with any sander/grinder/buffer are eye irritation or injury and finger abrasions. Eye irritation is the direct result of dust that is produced by the machine. Eye protection must be worn whenever working in the shop. There should also be a dust collection bag on a sander to prevent excessive dust from getting into the air. The shield on the sander/grinder help contain the dust, but it cannot be your only protection. These are high speed machines and the slightest contact will cause a painful injury. An operator should not allow his/her fingers to get close to the cutting surface.

### Rules of use:

1. Do not use sanders on metal without prior approval. (metal sparks and flakes could start a fire in sawdust)
2. Inspect abrasive belts and wheels before using them. Contact the Shop Director if you find a belt with a tear, fray, or any excessive wear, or a disc with chips or cracks. Be sure wheels are tightly mounted on shaft.
3. When sanding on the sanding disk, be sure the sandpaper is securely fastened.
4. The tool rest should remain 1/8" away from the face of the wheel.
5. Stop the machine when adjusting tool rest, shields, wheels or belts.
6. Remove or fasten all loose articles of clothing.
7. Remove all jewelry such as watches, rings, and necklaces.
8. Wear eye protection, do NOT wear gloves.

9. Always buff on the bottom portion of the wheel.
10. The type of job you are doing determines the amount of pressure to be applied in pressing the material against the grinding wheel. Always use a very light touch when grinding edge tools and quench the edge frequently.
11. Small or irregular shaped work pieces should not be held in your hand while sanding or grinding. They should be held by a jig, locking pliers or other holding device.
12. When using the buffer, you should point the sharp edges of your work downward.
13. When using a disc sander, make sure to hold your work against the downward motion side.
14. When sanding short pieces of stock on the belt sander, you should use the backstop.
15. Remove jammed pieces of stock only when machine is stopped.
16. Bring sanding pad to a complete stop before walking away.
17. Clean the machine and the floor when finished.

### **Using grinders to sharpen edge tools**

The angle to which a tool is ground is critical. Most people prefer 25 degrees for the primary bevel. When grinding edge tools it is important not to overheat the steel, with this in mind very little pressure should be used, the blade should be kept moving at all times and frequently quenched in water.

## WOOD LATHE



**Design Function:** A lathe works to shape a piece of wood by rotating the stock against a stationary cutting tool. The work piece must be securely clamped between the lathe centers. The tool must be firmly supported on a tool rest, so it will not be thrown towards the operator. The tool rest should be adjusted so that it is 1/8 inch from the largest work piece diameter. If a stationary tailstock center is used it should be oiled or waxed. Intended use is for:

- Turning / shaping symmetrical pieces
- Buffing / sanding symmetrical pieces

**Safety Precautions:** A face shield should be worn when operating a lathe. Safety glasses or goggles can be worn in addition to the face shield. The shield protects the face from injury if a tool or workpiece flies off the machine. The operator should carefully inspect all parts for any defects so they can be corrected before operation. Work pieces containing checks, splits, cracks, or knots should not be used. The operator must give constant attention to the work piece being turned in order to discard any material likely to break. He or she must carefully place the work piece in the machine and feed the cutting tool slowly into the work piece.

### Rules of use:

1. Users must receive instruction from shop director prior to use.
2. Power should be off when adjusting tools.
3. Fasten each end securely to the lathe and check for tightness periodically during operation.
4. Sharpen all chisels prior to starting
5. There are two primary ways to remove material on a lathe. Your instructor will discuss these with you.
6. Start with large chisel, hold firmly and shape slowly, removing only a little bit of material at a time. Continue to shape with finer chisels, and later sandpaper.
7. Never feel the edge of the work piece while the lathe is running.
8. Never leave chuck wrench in chuck.
9. Stop lathe before cleaning or taking measurement.
10. Never try to stop a spinning chuck with your hands.
11. When spindle is turning, do not start roughing cuts from either end.
12. Be sure there is proper clearance for rotating work pieces.
13. Always use the lowest speed possible for roughing out the work piece.
14. Wood ONLY.
15. Remove or fasten all loose articles of clothing.
16. Remove all jewelry such as watches, rings, and necklaces.
17. Wear eye protection, do NOT wear gloves.
18. Clean the machine and the floor when finished.



## DRILL PRESS



**Design Function:** Drill presses are equipped with rotating chucks that hold drills or other cutting tools (boring bars for instance). Guards are used to prevent operators from reaching into the areas where there

are moving belts, gears, and pulleys. Clamps and vises are used to hold small work pieces in place. Intended use is for:

- Cutting holes in wood, metal, or plastic
- Drilling to a depth or through stock
- Counter-sinking, reaming, tapping, facing, spot facing and routing.

**Safety Precautions:** Most accidents occur on the drill press have to do with improperly secured stock, improper personal protection, or faulty equipment. Operators should remain alert and aware whenever using heavy equipment. Eye protection is necessary when working on drill presses. Dust and chips can easily damage your eyes if you are not properly protected. Drill press bits should be checked frequently for cracks because if the bit breaks it can fly out and hit the operator. **Your hand should never leave a chuck key while it is in the chuck!**

### Rules of use:

1. Never hold the work piece with your hands. Always clamp it to the table.
2. The speed of the drill press should be adjusted to suit the material being drilled and the size and type of the drill itself. If you do not know what speed should be used consult the Shop Director.
3. The bit should be advanced at an appropriate speed. Forcing the bit may result in bit failure with the accompanying risk of injury.
4. If the work piece should slip from the clamp, **never attempt to stop it with your hands**, stop the machine and re-secure the work piece taking into account why it slipped in the first place.
5. If the drill stops in the work, shut off the motor and free the drill by hand.
6. When drilling deep holes, use interrupted feed to break up chip; back drill bit out of the hole to clear sawdust or chips.
7. Ease up on feed pressure when breaking through work piece.
8. Do not handle chips with your bare hands.
9. Never leave the chuck key in the chuck when not tightening or loosening the chuck. **Your hand should never leave a chuck key while it is in the chuck!**
10. Remove or fasten all loose articles of clothing.
11. Remove all jewelry such as watches, rings, and necklaces.
12. Wear eye protection, do NOT wear gloves.



## ELECTRIC ARC WELDER



**Design Function:** Intended use is for:

- Joining metals together
- Adding metal from an electrode to build up a joint

**Safety Precautions:** Most injuries associated with arc welders consist of burns from unprotected contact with hot metal or the arc itself, or temporary (but painful and incapacitating) damage to the eyes from looking at the arc without proper eye protection. There is however, also a significant danger of electric shock which can cause temporary or permanent injury or death. This particular hazard is generally the result of improperly maintained

equipment. **Never use a welder if the insulation on any of the wires or the electrode handle is damaged.**

### Rules of use:

1. **Users must receive instruction from shop director prior to use.**
2. Wear special protective helmet with proper number shade for welding
3. Use the proper electrode for the job
4. Wear heavy-duty protective gloves and jacket
5. Avoid contact between ground attachments and electrode
6. Use pliers to handle hot metals
7. Never change settings while arc welder is under load
8. Do not wear flammable materials such as fleece
9. Turn welder off after use
10. Always keep electrode in your line of sight
11. Do not weld while standing on wet floor
12. Warn other people in the area before striking arc

# HAND-HELD POWER TOOLS

## General rules for portable power tools:

1. Before starting the tool be sure you know where the cutting edge is and what's going to happen when you pull the trigger.
2. Do not use tools for purposes other than those for which they were designed.
3. Do not force tools! It puts you and the work at risk and shortens the life of the tool.
4. Never assume that the use of any power tool is self-evident.
5. Do not attempt to use any tool for which you have not been trained.
6. Always keep clothing and cords, as well as fingers and other body parts, away from moving parts of power tools.
7. Be very careful when setting down machines that may still be rotating.
8. Never use an extension cord that is lighter than 12 gauge and if you need to use more than one cord use a 10 gauge closest to the outlet.
9. Power Tools designed for use with 2 hands should be used with both hands

## Power tool etiquette:

1. As with hand tools, **do not use someone else's tool without asking permission.** If you need it again tomorrow, ask again tomorrow. There will be exceptions to this but if you don't know assume that this is not one of them.
2. Use extra care when using someone else's tool.
3. If you use up a blade or notice that there is a problem with the tool be sure to tell the owner.
4. **When returning tools to their boxes be sure that all accessories (wrenches, rip guides, etc.) are kept with the tools.**

## JIG SAW



**Design Function:** A jig saw is a hand-held cutting tool with a reciprocating blade. □ Safe operating procedure requires the blade to be properly attached and secure. The threshold rest (slotted foot) should be positioned directly on the work piece. The guards must cover all moving parts and induce the operator to keep his hands a safe distance from the blade.

**Safety Precautions** For any saw, cuts and abrasions should be the major concern of the operator. The operator's hand should remain as far as practical from the blade. The material should be secured to the worktable before operating the tool. Because of the size of the jig saw it may seem harmless, but it must be remembered that whenever you are working with a piece of equipment that can cut through wood and metal it can very easily cut through flesh.

### Rules of Use:

1. Turn cuts should be made slowly.
2. Do not attempt sharp or small radius turns if you are working with a wide blade.
3. Do not attempt to remove saw from the workpiece before it has stopped running.
4. Clearance cuts should be planned to eliminate the need to back out of curves.
5. There should be enough clearance around the saw to allow proper maneuvering of the work piece.
6. Never allow your fingers to come closer than 2 inches from the blade.
7. Check with the Shop Director to determine the maximum work piece thickness that can be safely cut on each jigsaw.
8. Use caution to be sure the hand not holding the saw will not contact the blade under the workpiece.

## Circular saw



**Design Function:** The circular saw is one of the most frequently used portable hand tools. It is used primarily for straight cuts either with or across the grain in wood or similar materials. A circular saw can also be used to cut very gentle curves such as are found on boat planks.

**Safety Precautions:** Always check that the blade guard returns on its own when the saw is removed from the wood. **IF THIS DOESN'T HAPPEN ON ITS OWN DON'T USE THE TOOL!** The base of the saw should **ALWAYS** rest firmly on the stock being cut.

Always clamp the stock to be cut to a horse or a bench. Do not attempt to hand-hold a piece to be cut. Do not reach under the stock when cutting. Beware of cutting the cord. If this happens, immediately unplug the cord from the outlet. If the blade begins to bind stop the saw immediately lest it kick back and ruin your work.

### Rules of Use:

1. As with all tools, the circular saw should not be forced. If there is excessive resistance either the blade is dull or you're pushing too hard. Do not work with a dull blade.
2. Use wedges if the cut tends to pinch.
3. Before beginning the cut make sure that the cord is not going to snag and prevent you from finishing the cut.
4. When cross cutting a piece away from the ends always support both pieces.
5. Before using the saw always make sure that the blade guard returns on its' own.

## Drills-corded and cordless



**Design Function:** Drills are used to make holes in wood and other materials. They come in several configurations including “D” handle, pistol grip, and right-angle. They are intended to drive any number of drill bit types, each of which have particular uses.

**Safety Precautions:** Clamp the stock to be drilled to a bench or a saw horse, especially when working with larger bits. Be aware of where the bit will come through the work piece and be sure that it won’t come into contact with anything you don’t want to drill, your knee for instance. Guard against rotational kickback, particularly when using a corded pistol grip drill with a large bit. Whenever possible use a right-angle drill when working with large bits. When you do have to use a pistol grip use a side handle.

### Rules of Use:

1. Do not over-stress the drill. If it seems as though it might not be powerful enough for the job it probably isn’t. We probably have another drill that is.
2. Back the bit out frequently to clear chips. This will help the work to go faster and in the case of the larger bits may prevent the bit from becoming stuck in the hole.

## Power plane



**Design Function:** Power planes are designed to remove material relatively quickly. They are particularly suited to working the edge of a piece.

**Safety Precautions:** Stock to be planed should be secured to a stationary object. Never attempt to plane anything you are holding in your hand. Beware of cutting the cord. If this happens immediately unplug the cord from the outlet. Wait until the cutter head has stopped revolving before setting the tool down.

### Rules of Use:

1. Aggressive use of a power plane will result in broken blades and cutter heads and reduced tool life.
2. Do not continue to use a power plane once it has become clogged with shavings. Stop and use a pencil or other slim (non-metallic) object to clear the clog.
3. With a little thought a power plane can be used to make reasonably precise taper cuts.

## Router



**Design Function:** Routers are meant to remove material quickly and in a controlled fashion. They are generally used with specialized jigs or with self-guiding cutters. With appropriate jigs they can be used to do very precise work.

**Safety Precautions:** Stock to be worked should be stationary. Again, do not attempt to hand-hold stock. Take care when setting the tool down after use that the bit is no longer rotating. Always be sure that the collet is properly tightened around the bit. When inserting the bit be sure to not push it all the way in (leave roughly 1/32" at the bottom). Pushing the bit all the way into the collet may prevent the bit from being properly secured. If you don't understand this ask someone who does to explain it. When using edge guides be sure the edge of the router base is against the guide.

### Rules of Use:

1. Attention needs to be paid to grain direction when using a router lest the cutter split out the edge of the workpiece.
2. A firm hand needs to be kept on the router so that the bit doesn't grab the wood.

## Grinder



**Design Function:** Hand held grinders are generally right-angle tools designed to drive a small (usually 4") abrasive disc or cut-off wheel or a wire wheel. They are generally used on metal and are usually operated freehand.

**Safety Precautions:** Grinders, by their very nature, produce sparks so care must be used when around combustible materials. Do not use a grinder in such a way that the wheel catches, for instance, in an inside corner. If this does happen the disc needs to be inspected for cracks or signs that it may fracture. Because of the high rotational speeds at which this tool operates a cracked or broken disc could fly apart.

### Rules of Use:

1. When using a thin cut-off wheel care needs to be taken that the disc does not come into contact with wood.
2. Some abrasive discs are designed to cut with the edge and some on the flat. Determine which you are using and use it accordingly.

## Belt Sander



**Design Function:** Belt sanders are used to smooth and to a lesser degree, shape, wood. They can be used, albeit not as effectively, on metal. You will also see them clamped to a horse or a bench top and used as stationary sanders.

**Safety Precautions:** Keep it off your body and don't run over the cord. Never let go of a belt sander while it is running. (it will take off at a high rate of speed). Do not underestimate

the amount of damage a sander can do to your body. They can cause a nasty wound very quickly.

### Rules of Use:

1. When using a belt sander it should always be kept moving.
2. Do not push down on the tool. Let its own weight do the work.
3. A belt sander should always be used at a slight angle to the grain.

## Disc Sander



**Design Function:** Disc sanders are used mostly to shape wood as opposed to smoothing it. They can be invaluable fairing tools, though careless use will cause notches and hollows.

**Safety Precautions:** Keep it off your body. Because of the aggressive nature of their cut they can do a lot of damage quickly and because they generally use a fairly large disc with no protection it is easy for loose clothing or long hair to get caught up. Be careful not to set it down while it is still running, you don't need that kind of excitement.

### Rules of Use:

1. Use this tool gently. It works quickly and can easily remove more material than you intended.
2. As with most tools, and all sanders, keep it moving.
3. It will do the most work, and with the most control, if you angle the disc (very) slightly and remove wood across the grain.
4. Do not try to use the edge of the disc, and avoid touching adjacent objects with the edge.

## Pad Sander



**Design Function:** The pad sander is a finishing tool. It is designed to smooth the surface of the wood and prepare it for a finish. It should not be used to shape the wood in any way, or to remove significant amounts of material.

**Safety Precautions:** This is a pretty benign tool but keep it off your body and always wear a mask and glasses when using

one.

### Rules of Use:

1. Never press down on this tool.
2. Keep the tool moving.
3. Keep the work surface clean as allowing grit that breaks off the disc to build up will cause circular scratches.

## Multi-tool



**Design Function:** These are, as the name implies, multi-purpose tools. Their main uses are in making small cuts and for sanding into inside corners. I have found that they work very well as a sort of an electric chisel. They are primarily used on wood although we have used them to cut fasteners that couldn't be dealt with any other way.

**Safety Precautions:** This thing is a little like a gila monster; you'd have to go out of your way to get bitten by it, but I suspect a bite would be pretty painful.

### Rules of Use:

1. There are several different blade types for this tool. The more aggressive ones are great for wood but would not hold up at all with metal.
2. The best way to use this tool is to hold the body of the tool firmly and allow the blade to move against the work. Pushing too hard defeats the purpose.
3. When cutting metal especially use a very light pressure and a relatively low speed.



## Sawzall



**Design Function:** Fast, rough cuts in wood and metal. Great tool for demolition. This is generally not a precision tool though we have successfully used them to cut the notches in pole rafters.

**Safety Precautions:** A little common sense will go a long way towards keeping you safe with this tool. Make sure you know what's behind whatever you are cutting. Watch out for wires and pipes, and don't put your hand behind the work.

### Rules of Use:

1. This tool works best when you keep the foot against the work, though this is not always possible. Blades come in several lengths and it's best to use the one closest to the thickness of whatever you're cutting. Too short a blade simply won't work and too long a blade wastes a lot of blade.
2. There are a number of different blades made for sawzalls but we've found that the "Axe" works best for wood and the "Torch" is best for metal.

## Chain Mortiser



**Design Function:** A chain mortiser, as the name implies, is used to cut mortises in heavy timbers. It can be used to produce a finished mortise although if particularly high-quality work is called for some hand finishing with a chisel may be necessary.

**Safety Precautions:** This is a powerful machine with an aggressive cutting chain similar to that on a chain saw. As with most of the portable power tools the piece being worked on will have to be secured in some way, though in many cases the timbers will be heavy enough to stay put on their own. The machine must be clamped firmly to the timber being cut. Ask someone with experience on this machine to help you with this. Your stance is important when using this tool as pulling it up out of the mortise could injure your back if you're not standing properly.

### Rules of Use:

1. Accuracy with this machine requires a little extra care. The nature of the machine is such that the bar will be shifted when the chain hits the wood. This must be taken into consideration when setting the machine.

# HAND TOOLS

**Do not use tools for purposes other than those for which they were designed!**

## **Hand Tool Etiquette:**

- Most hand tools are the property of individual craftsmen rather than the shop or the company, because of this they are subject to even more stringent rules of etiquette than stationary or hand-held power tools.
- Many of the tools you see in day-to-day use here are vintage, unique, or otherwise irreplaceable. Please keep this in mind.
- Never use anyone's personal tools without their specific permission. Don't assume that because you were given permission to use someone's hammer that they will be alright with you using their plane, for instance. And don't assume that because you had permission to use it yesterday that you can use it again today without asking.
- Do not use anyone else's tools in a way that will damage the tool. Don't pick up someone's hammer (for instance) if your hands are covered with epoxy or red lead.
- When handing a tool to someone always offer the handle end.
- When setting a chisel down place the bevel down so that the edge is not touching anything.
- When setting a plane down put it on its side so that the blade is not touching anything.
- **NEVER SHARPEN ANYONE ELSE'S TOOLS. NEVER. NOT EVER.** Unless you have been told, by the owner, to do so.

## Chisels

**Design Function:** Chisels are intended to be used as cutting instruments. They are not for turning screws, or opening paint cans, or even prying up pieces of wood. They are for cutting.

Chisels come in a number of different configurations, each with a range of uses.

**Safety Precautions:** Do not attempt to use a dull chisel, you will have to use too much force which increases the risk that you will lose control of the tool. Always secure your workpiece in a vise or with a clamp or screws. Even if you can safely hold the work with one hand and work the chisel with the other, it isn't efficient. **NEVER** pull a chisel towards any part of your body and never place your hand or any other body part in the path of a chisel. If it can cut wood it can certainly cut you!



**Slicks** are large, heavy chisels, generally 2 1/2 - 3 inches wide at the cutting edge and several feet long, used primarily in boat building and timber framing. In use they are generally held at a low angle to the work and pushed by hand. A slick should never be driven with a hammer or mallet. Slicks are often used for paring surfaces where a plane would be awkward, or to smooth uneven surfaces quickly, either with or across the grain. They can also get into corners where a plane won't fit. Because of

their size and weight a slick can do a lot of damage quickly if carelessly used.



**Framing Chisels** are sturdy tools usually 1 1/2 - 2 inches wide at the edge and 12 - 18 inches long. They are a general use chisel, intended to be struck with a mallet or driven by hand. They are used with or across the grain or on end grain. This is the tool that is used to clean up the inside of a large mortise.



**Corner Chisels** are used almost exclusively to clean up the corners of mortises.



**Paring Chisels** are relatively light chisels, generally used for finer work. Mostly they are pushed by hand, though from time to time it may be useful to tap one with a mallet.

## Hand Planes

**Design Function:** Hand planes are used to remove relatively small amounts of wood in a controlled fashion. There are a number of different types of hand plane, each with a particular use. Using the proper plane is important.

**Safety Precautions:** I think you'd have to work pretty hard to hurt yourself very badly with a hand plane, but don't try. As with any tool, if you are careless enough you could hurt yourself. Don't be careless.



**Block planes** come in two primary types; low angle and standard. The standard block plane is a general use plane small enough to be used effectively with one hand. The low angle block plane is used primarily on end grain. Block planes are suited to relatively rough removal of stock, with the finish work left for the larger “smooth planes”.



**Bench planes** come in several sizes, the most common of which, by far, is the #4. They are used for general smoothing of stock. Larger bench planes, known as “jointer planes” are used to straighten and flatten stock. They are generally used when a straight, flat surface is required on a piece that is too large to be run across a jointer (see “power tools”).



**Rebate planes** are designed to allow cutting right up to an inside corner. They are available in several types and sizes. The most common ones, for cabinet and furniture work, are about 1 - 1 1/2 inches wide and made entirely of steel. The other type of rebate plane (pronounced “rabbit” by-the-way) is the bench rebate plane. It is larger, generally about the size of a number 4 or 5 bench plane and is frequently used in timber framing.

# RIGGING TOOLS

By its very nature, rigging is hazardous work.

## General Rules for Rigging Tools:

- Plan ahead and work deliberately. Take as much time as you need to be safe.
- **Never let any part of your body, or anyone else's for that matter, get under the piece being lifted!!!**
- Never use a tool or accessory that is not in good condition and functioning properly.
- Do not use frayed slings in critical operations.
- Make sure that all springs and ratchet cogs on come-alongs and lever hoists are working properly.
- Follow your load up with blocks and shims.

## Chain hoist

**Design Function:** A chain hoist uses gearing to multiply lifting force. They are particularly useful where the load is to be lifted a significant distance or where the lifting point must be beyond reach.

**Safety Precautions:** Know how much weight you are lifting and be sure that the hoist is rated for at least that much. If there is a safety catch make sure it is working properly. When doing critical lifting either use the safety catch or mouse the hook (if you don't know what this is, ask someone who does). See General Rules for Rigging Tools, above. Make sure the hook is large enough to handle the size of whatever you're going to put on it. If it isn't, use a shackle as a transition.

### Rules of Use:

- Position yourself relative to the hoist so that the lead is fair in order to prevent the chain from jamming.
- Take care, especially when lowering, that the control chain does not get tangled in itself.

## Lever hoist

**Design Function:** The lever hoist does much the same thing as the chain hoist but using slightly different means and controls. It works best if it can be positioned at the pick point rather than just above the load. Lever hoists, like chain hoists, generally use chain as the lifting medium.

**Safety Precautions:** Know how much weight you are lifting and be sure that the hoist is rated for at least that much. If there is a safety catch make sure it is working properly. When doing critical lifting either use the safety catch or mouse the hook (if you don't know what this is, ask someone who does). See General Rules for Rigging Tools, above. Make sure the hook is large enough to handle the size of whatever you're going to put on it. If it isn't, use a shackle as a transition. If you are having to use considerable force to lift your load you are probably using a hoist that is too small. Use extra care when lowering loads; go slowly and make sure the cog engages the ratchet with each stroke.

### Rules of Use:

- When using a lever hoist, do so slowly enough that the ratchet has a chance to engage with each stroke. Keep the hoist in line with the lifting chain.

## Comealong

**Design Function:** The come-along works very similarly to the lever hoist but the lifting medium is generally cable, rope, or flat strap. Usually the lifting medium on a come-along is longer than that on a lever hoist. Because the lifting medium is lighter than chain the come-along is better suited than the lever hoist for horizontal pulls.

**Safety Precautions:** Know how much weight you are lifting and be sure that the hoist is rated for at least that much. If there is a safety catch make sure it is working properly. When doing critical lifting either use the safety catch or mouse the hook (if you don't know what this is, ask someone who does). See General Rules for Rigging Tools, above. Make sure the hook is large enough to handle the size of whatever you're going to put on it. If it isn't, use a shackle as a transition. If you are having to use considerable force to lift your load you are probably using a come-along that is too small. Use extra care when lowering loads; go slowly and make sure the cog engages the ratchet with each stroke.

**Rules of Use:**

1. Take care that the lifting medium does not override itself on the drum.
2. Always see that the lifting medium remaining on the drum is pulled tight before you begin lifting.

## Jacks

**Design Function:** Jacks are designed to lift loads from below as opposed to hoisting them from above. The distance they can lift a load is constrained by the height of the jack. One of the advantages of a jack over a hoist of any sort is that they lift from below, eliminating the need for clearance above the load.

**Safety Precautions:** Do not try to lift more weight than your jack is rated for. Make sure the surface the jack is resting on is solid and level. Make sure that the jack and any posting that is between the jack and the load are plumb and in line. There may be exceptions to the plumb requirement but they are rare and obvious.) Be certain that the controls are in the proper position for what you are asking the jack to do (raise or lower). This is particularly important with high-lift or railroad type jacks. Whenever possible replace jacks with blocking as soon as possible.

**Rules of Use:**

1. **Pay attention.** More than with other types of lifting device there is the potential to raise not only the piece you're trying to lift but whatever it touches above as well.

## Slings

**Design Function:** Slings are used as anchor points for hoists and lifts and between lifting hooks and the load to be lifted.



**Safety Precautions:** Never use a sling that is frayed or excessively worn. Know the weight of your load and be sure the sling is rated for at least that much weight. Do not allow slings to come into contact with sharp edges or rough surfaces. If more than one sling is required do not knot or bend them together: use a shackle.

## Rope

**Design Function:** Self evident

**Safety Precautions:** Do not use rope that is undersized or frayed for critical applications.

- Keep ropes clean and free of grit.
- Use the proper type of rope for your purpose.
- Take care, when coiling ropes, that they not become kinked.

### Rules of Use:

1. Using ropes generally entails using knots. If you don't know the proper knot for a particular application or how to tie it, ask someone who does.
2. Tying a bunch of knots instead of the proper one is not the way to do it.

## Shackles

**Design Function:** Shackles are used to mate multiple pieces of chain or cable and to attach chain or cable to something else. Always use a shackle when joining two or more slings. They prevent chafe when attaching rope directly to light anchors.

**Safety Precautions:** As with nearly everything else, don't use a shackle that is too light for the job. Don't use a shackle that has become deformed or is excessively worn. Be sure the pin is tight.

### Rules of Use:

1. Ask for assistance if you are unsure. There may be applications where it is better to have either the body of the shackle or the pin on one end or the other.