



FABRICATION SHOP

Bernard and Anne Spitzer School of Architecture
City College of New York | City University of New York

POLICIES AND TERMS OF USE

FABRICATION SHOP



POLICIES AND TERMS OF USE

Updated on August 15th 2017

CONTENTS

PREFACE	4
INTRODUCTION TO THE FABRICATION SHOP.....	5
USING THE FABRICATION SHOP	7
1. BEFORE GOING TO THE SHOP	7
1.1. ORIENTATIONS.....	7
2. ONCE IN THE FABRICATION SHOP	8
3. USING THE FACILITIES - OPERATING THE MACHINERY	9
3.1. GENERAL.....	9
3.2. WHAT IS A KICKBACK?.....	11
3.3. WORK BENCHES.....	11
3.4. BAND SAW	12
3.5. MITER SAW	13
3.6. TABLE SAW	14
3.7. SANDERS.....	14
3.8. DRILL PRESS	15
3.9. SCROLL SAW.....	16
3.10. PLANER.....	17
3.11. TABLE MOUNTED ROUTER	18
3.12. PANEL SAW	18

3.13.	BENCH GRINDER	19
3.14.	HORIZONTAL METAL BANDSAW	20
3.15.	PORTABLE AIR COMPRESSOR:	20
3.16.	HANDHELD POWER TOOLS	21
3.17.	PNEUMATIC NAIL AND STAPLE GUN	21
3.18.	CIRCULAR SAW	22
3.19.	HANDHELD ROUTER	24
3.20.	HEAT GUN	24
4.	AFTER FINISHING YOUR WORK	25
4.1.	CLEANING YOUR WORK AREA	25
<u>TOOL CHECK OUT</u>		26
<u>MATERIAL SAFETY DATA SHEETS AND MACHINE USER MANUALS</u>		26

PREFACE

The Fabrication Shop at the Spitzer School of Architecture is one of the integral facilities for our architectural education. We depend on every member of student body and faculty to provide a safe, efficient and vibrant environment. We make every effort to constantly update and improve our facilities but what always remains vital is how we use them. This document is to be a comprehensive guideline for using the Fabrication Shop. We hope that all users will feel the urge to protect their collective facilities and use this guideline to enjoy a safer and more productive Fabrication Shop.

INTRODUCTION TO THE FABRICATION SHOP

The Fabrication Shop at the Spitzer School of Architecture (SSA) is committed to maintaining a safe working space for its students and faculty. What follows are the Fabrication Shop policies and safety rules. Every user of the shop is expected to have thoroughly familiarized themselves with this document as well as materials on the website and follow them along with the staff directions and shop signage.

It is the user's responsibility to attend a shop orientation session (see section II and III), and to read the guidelines and fully understand and follow them. The Fabrication Shop staff is available to answer questions at all times.

It is essential for the users to understand that they are using the shop tools and equipment at their own risk. The Fabrication Shop is not an educational facility for woodworking and fabrication. The SSA is not liable for injuries or loss resulting from the failure to follow the guidelines. In addition to the brief safety tips in this documents, each tool has an extensive set of instructions that can be found in their manual available at the shop. Those who do not follow these guidelines and those posted on the SSA/CCNY website will be denied the privileges of fabrication services.

- I. The fabrication facilities are available for use by SSA faculty members, active adjunct faculty and currently enrolled students. Users must present a valid and current SSA/CCNY ID and must sign the Sign-In Sheet at the front desk before entering the shop. No exceptions may be made. First time users are added to the fabrication shop database using the SSA ID.
- II. Users of the fabrication facilities are required to satisfactorily complete a general safety orientation as well as training for each machine they use (See section 1.1) (for students enrolled before Fall 2016 and transfer students see section III.) The safety orientations are offered at the beginning of each academic year and machine training is scheduled per request. The staff is available to help with the safe and correct use of machinery at all times and we encourage asking questions. After attending the orientation, it is the user's responsibility to ensure the safe use of the shop. The safety rules and policies are implemented strictly and apply to students, faculty and staff; violators may not continue to use the shop.
- III. For the students who have started their SSA studies prior to Fall 2016 and transfer students, reading and following this document and signing the waiver will suffice for the permission to use the shop. However, if you are interested in taking an orientation or machine training they can contact the director of fabrication services for participating in periodically scheduled orientations. Also, the staff is available to answer any questions in regards to safety guidelines and procedures.
- IV. The shop hours will be posted at the beginning of each semester. The hours are limited by the availability of staff and are subject to changes. Any changes in the hours as well as occasional closing for maintenance or urgent matters are announced as soon as possible. Notices are posted at the shop's front door and on the SSA Website. The Fabrication Shop is closed during the holidays, lecture evenings and also the time periods between the fall, spring and summer semesters.

- V. The Fabrication Shop is only accessible during public hours to the students and faculty.
- VI. A person may not operate shop equipment without another qualified person in attendance. Even a minor injury can become very serious if help is not immediately available.
- VII. The fabrication services are only available for school related work.
- VIII. Students are provided with a semester long credit for the free use of some Digital Fabrication Services. Fees may apply for laser cutting, 3D printing, and CNC routers. The rates are variable based on the user (i.e. student or faculty member) and the type of project (course projects, SSA/personally funded research or projects with external grants.)
- IX. The fabrication facilities may not be used for commercial and production purposes.
- X. If the scope of a project is larger than the average, a minimum of two weeks of approval and planning time should be allowed in advance. The shop staff may prioritize other jobs if a project disturbs the normal workflow for the rest of the students and faculty.
- XI. The CNC machine and 3D printers may only be operated by the staff and are accessed only through submission of digital files and materials.
- XII. Digital Files should be prepared in accordance with their respective guidelines and templates on the SSA website. The Fabrication Shop staff is available at the front desk to review the procedures with the first time users.
- XIII. A number of tools may be checked out for use outside the shop. The checkout process is mandatory and is administered by the staff. A valid SSA-CCNY ID is required at the time of check out.
- XIV. The computer systems of the Fabrication Shop are for staff use only. Please have your files prepared, properly formatted, and named before you arrive at the shop.
- XV. Due to space limitations the Fabrication Shop cannot accommodate material storage so any materials or tools left behind will be removed and placed outside the shop. Items left outside the shop may be removed or discarded after 48 hours.
- XVI. The scrap materials outside the shop are available for use. The materials kept inside the shop are the property of the Fabrication Shop.
- XVII. The shop cannot provide any consumables such as paint, glue or large quantities of fasteners.
- XVIII. Due to ventilation and OSHA restrictions any chemicals (flammable or otherwise) that generate gases and/or fumes are prohibited in the shop. Painting and varnishing is not allowed in the shop. Also, casting concrete, plaster, etc. are prohibited.
- XIX. Metal work such as welding, grinding or any other activities that create sparks and/or excessive heat are not allowed, as they constitute a fire hazard in a woodshop area.
- XX. The shop users are responsible for cleaning up immediately after they have used the machinery and workstations. Any debris or dust must be removed from the work area and the machine itself.
- XXI. Any actions or practices considered hazardous by the shop staff are strictly prohibited.
- XXII. It is required for the users to follow the instructions by the staff. The violators will be asked to leave and may be banned from using the fabrication facilities and services.
- XXIII. Policies for the Fabrication Shop are under constant review and evaluation. This and other documents pertaining to the Fabrication Shop will be revised and expanded periodically. It is important that every user refer to the SSA website to familiarize themselves with the latest revisions and updates.

USING THE FABRICATION SHOP

1. Before Going to the Shop

The activities of the Fabrication Shop are different from those of design studios. It is important to prepare for using the Fabrication Shop. It is your responsibility to prepare and failure to do so can result in serious safety consequences and severe injury.

1.1. Orientations

All new students are provided with a one hour introductory orientation to be able to use the woodshop. The faculty and school administrations arrange for the orientations but it is the student's responsibility to make sure they have attended the sessions. If users have missed the orientation, they should contact the Director of Fabrication Shop to arrange for a make up session.

The orientation only includes an introduction to the shop and some basic safety rules and does NOT suffice as a complete woodshop training. It takes a long, consistent and gradual process of practicing and studying to master the correct and safe use of the tools in a fabrication shop. It is essential to take these skills seriously and try to learn them step by step. Thus, the students are required to talk to the staff when they are uncertain about the use of machinery. Particularly, it is the student's responsibility to ask for an introductory training if it is their first time using a tool. It is also required that the students read this documents as a whole and also refresh their knowledge of specific tools when they anticipate using them by reading it's respective chapter. In addition to the brief safety tips in this documents, each tool has an extensive set of instructions that can be found in their user manual available at the Fabrication Shop. Ask the staff to provide you with the digital copies. The user manuals can also be accessed here: <http://bit.ly/2x9xphB>

It is also highly recommended for the faculty to attend the Fabrication Shop Orientations and trainings. Otherwise the faculty are required to sign the waiver form to use the fabrication shop. Please contact the Director of Fabrication Shop for further information.

1.2. Before coming to the shop, make sure you **feel OK**. If you think you are not awake or attentive enough do not use the Fabrication Shop. Operating the machinery under the influence of alcohol and drugs is prohibited.

1.3. Clothing:

- 1.3.1. Wear comfortable **clothing without any loose pieces** such as hoodies, straps, etc.
- 1.3.2. Roll up your **sleeves** above your elbows when working. Take your jacket off.

- 1.3.3. Remove any **jewelry** (including long necklaces and large ear rings), **watches** and other items on your arms and hands.
 - 1.3.4. Do not wear **gloves**; particularly when working the machinery.
 - 1.3.5. Do not wear **headphones** in the shop.
 - 1.3.6. If you are wearing long and/or loose **pants** fold them up.
 - 1.3.7. Wear sturdy, comfortable **shoes** that fully cover your feet and toes.
 - 1.3.8. Tie up loose **hair** securely.
- 1.4. Leave your valuables behind.
 - 1.5. Plan for your work. Purchase the material you need and think ahead about the ways in which you are going to use the shop.
 - 1.6. **Bring your valid SSA/CCNY ID.**

2. Once in the Fabrication Shop

- 2.1. It is mandatory to give your valid **SSA/CCNY ID** (with a current sticker) to the front desk staff. They will scan your card and any tools you need in the digital **Sign-In Sheet** before entering the shop.
- 2.2. If you are using the Laser cutting, 3D printing or CNC services wait at the front desk and ask for help.
- 2.3. You will be given **safety goggles** after giving your SSA/CCNY ID to the staff when entering. Wear the goggles if you are using any machinery or standing close to someone else working.
- 2.4. Use **earplugs** if needed. They are available at the front desk. You can also borrow ear muffs.
- 2.5. Wear a **mask** if there is too much dust in your area.
- 2.6. There are **hand tools** available for borrowing to use in the shop. Ask the front desk to give you the tools you need. **THE TOOL CABINETS ARE FOR STAFF USE ONLY** and the users may not take any tools by themselves under any circumstances.
- 2.7. The shop layout has been carefully adjusted for a safe arrangement. **Moving the machines or workbenches** by the users is prohibited.
- 2.8. Users are required to **clean the machines and the area** around them after use. Leave the **vacuums** (with the cable and trunk wrapped around them), **air compressor and brooms** in the specified corners. Ask the staff if you have doubts about the placement of these items.
- 2.9. Locate the **exits and fire extinguishers** in the shop. A first aid cabinet is at the entrance.
- 2.10. You are required to follow the **staff instructions**. Those who fail to do so will be asked to leave the shop immediately.
- 2.11. Pay attention to the posted **signs and notices**. There are brief safety instruction next to the machines only as a reminder but they do not include all guidelines for using the machine.
- 2.12. It is important that you read the **tool user manuals**. Digital and paper copies can be provided upon request at the Fabrication Shop.
- 2.13. Ask questions; discuss your project with the staff to plan for your time in the shop.
- 2.14. Users must be trained by the staff if it is their **first time using a machine** in the Fabrication Shop –regardless of your experience with similar machines in the past. Ask for help at the front desk and Never use a tool that you have not been trained to use. We do not keep track of machine training and it is the user’s responsibility to inform us if they need training.
- 2.15. **Be Alert!** Not only with what you are doing but also about others.

- 2.16. The shop space is a work area. You may be asked to leave if you are not working.
- 2.17. Be cautious when **moving large pieces** of material.
- 2.18. Do not leave anything (Materials, tools, etc.) on the floor. They are a **tripping hazard**.
- 2.19. Be careful when moving in the shop. Watch for sharp objects, materials, etc. on the ground.
Running and/or moving carelessly in the shop is dangerous to you and others.
- 2.20. Be courteous of others. Playing music and/or loud noises are not allowed in the shop.
- 2.21. The use of laptops is not recommended in the Fabrication Shop. We suggest bringing paper copies of your blueprints. Laptops can be distracting. They are also susceptible to damages in dusty environments.
- 2.22. **Stay focused** while using the machinery and tools. **Do not talk to others and watch your hands**. Always be aware of where your hands are in relation to moving parts, especially blades. Never turn your attention away from what you are doing until you have completed the action.
- 2.23. Keep a **safe distance** from other people working and do not distract or talk to them.
- 2.24. **Eating and drinking** in the shop are not allowed.
- 2.25. **Never work alone in the shop**. Using the shop during afterhours is strictly prohibited.

3. Using the Facilities - Operating the Machinery

3.1. General

The following general rules and safety precautions apply to all tools at the Fabrication Shop.

- 3.1.1. Ask the staff if the **machine** you want to use is working properly.
- 3.1.2. **Prepare your material**. Check it for any knots, cracks or any other defects. Wet lumber, green lumber or pressure treated lumber require special attention during cutting operation to prevent kickback. Ask for help.
- 3.1.3. Do **NOT** use the shop tools on any **wood with metal pieces** in it (nails, staples, rods, etc.) It is dangerous and causes damage to the tools. Inspect your material very carefully beforehand, particularly for nails and staples from pneumatic guns.
- 3.1.4. **Warning:** Some dust created by power sanding, sawing, grinding, drilling, and other construction activities contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm. Some examples of these chemicals are: • lead from lead-based paints, • crystalline silica from bricks and cement and other masonry products, and • arsenic and chromium from chemically-treated lumber. Your risk from these exposures varies, depending on how often you do this type of work. To reduce your exposure to these chemicals: work in a well ventilated area, and work with approved safety equipment, such as those dust masks that are specially designed to filter out microscopic particles.
- 3.1.5. Some of the tools, such as the sanders are connected to the **dust collection system**. Ask the staff to turn the dust collector on before using them.

- 3.1.6. **Use the correct power tool for your application.** The correct power tool will do the job better and safer at the rate for which it was designed. Ask for help if unsure.
- 3.1.7. **DO NOT USE THE MACHINE IF YOU SEE ANY DEFECTS.** Before working with a tool, inspect it carefully and make sure it is in the proper working order. Ask the staff for help.
- 3.1.8. Depending upon use, **the switch** on the power tools may not last the life of the machine. Should the switch fail in the “OFF” position, the tool may not start. If it should fail while the saw is running, the saw may not shut off. If either occurs, unplug from power immediately and do not use until repaired.
- 3.1.9. Make sure the **safety guards** are in place and properly adjusted. **Never** remove the safety guards without permission; they may only be removed by the staff.
- 3.1.10. **Keep tools and handles dry, clean and free from oil and grease.** Slippery hands cannot safely control the power tool.
- 3.1.11. **Avoid water and any sources of moisture when using electric power tools. Electric shocks may occur.**
- 3.1.12. **Your material can be as dangerous as the blade** if it is not safely held down. Clamp your material when using hand tools or you need more support.
- 3.1.13. Be careful to position the material in a way that will not damage the table underneath. (see “Work Benches”)
- 3.1.14. **Before turning the tool on** be sure that your stock is not touching the blade or bit. This can strain the motor or cause the blade or bit to bind in the stock.
- 3.1.15. **Avoid accidental starting.** Be sure switch is off before plugging in. Do not use a tool if the power switch does not turn the tool on and off. Do not carry a plugged-in tool with your finger on the switch.
- 3.1.16. Never make any **adjustments** unless the power is off, the tools is unplugged and the moving parts has come to a complete stop.
- 3.1.17. **Blades** on the band saws, miter saws, panel saw, table saw, planer, and abrasive surfaces on the sanders may only be changed by the staff. The users are allowed to change the drill bits and adjust the blade on the scroll saw. Make sure the machine is unplugged before doing so.
- 3.1.18. **Stand in a comfortable, balanced position** when working with power tools. Both feet should be firmly on the ground. **Don't over-reach.**
- 3.1.19. Keep your **hands at least 3” from the blades** and moving parts. Do not push the material with your hand/finger in front of the blade. Your hand may slip towards the blade.
- 3.1.20. Wait until the blade is at **full speed before engaging** the material.
- 3.1.21. Be alert for **strange odors, sounds, or unusual behavior in the machine.** Pay attention to smells that may indicate overheating of the machine or stock. If the machine sounds unusual or behaves unusually, turn it off immediately and notify the staff.
- 3.1.22. **Do not become over-confident.** As you learn to operate a machine you will gain confidence; do **not** allow your confidence to lead to carelessness. Always remain alert to the machine's potential danger.
- 3.1.23. **Be cautious, not timid.** Having some fear is healthy and keeps you alert. Being timid can result in apprehension and poor control of machines or stock.
- 3.1.24. **Never leave a machine with the power on.** Further, the machine should be completely stopped before you leave it.

- 3.1.25. Always **wait until the blade has stopped** moving before clearing scrap and/or leaving the machine. Many accidents by getting too close the blade right after turning the machine off.

3.2. What is a Kickback?

It is important to be cautious about the material you are cutting, drilling, etc. as much the moving machine parts such as a blade. If a material binds to the blade or bit it can create a sudden recoil of the material or a part or the whole tool. **Kickbacks can cause severe injury and amputation.** Kickbacks and losing control of the material can occur in all power tools. The most important tools to watch for kickbacks are table saws, circular saws, miter saws, panel saw (all of which use a circular blade with high rotation speed (RPM)) and Routers. Also drills can spin the materials with the rotating bit very fast and hit the operator if the material is not clamped and secured properly. Kickbacks can happen in a fraction of a second and are often too quick for the operator to perceive and react to them. The mechanism of kickbacks are different in each tools but the general reason is the material being forced into the blade and thus being thrown off of the tool, braking the blade/bit or in case of handheld tools such as circular saws or handheld routers throwing the tool towards the operator. In most cases the material may “pinch” the blade or get stock between the blade and supports (fence, table, etc.) Kickback are caused by dull, misplaced, warped or misaligned blades, and other broken parts (that is another reason to avoid defective tools) but the main reason is often the wrong use of the tools. You can see some of the common kickbacks in these links (caution: videos may include graphic content): <http://bit.ly/2uUy1WS> / <http://bit.ly/2v5Dkln> / <http://bit.ly/2x8GwOy> Following the instruction on the tools can prevent injury. Under each tool’s section you can find the safety measures to avoid losing control of the material and the tool. Make sure to read thoroughly, take all steps seriously and follow them.

3.3. Work Benches

There are tables in the shop with wood and metal tops. In both cases, users should be careful to **avoid damaging the surfaces.**

- 3.3.1. Only the staff is allowed to **move tables** for specific occasions. Ask for help.
- 3.3.2. Use a **scrap board under your material when drilling or cutting** on the tables. Drilling directly on the tabletop is not allowed.
- 3.3.3. **When using jigsaws do not** get closer than 2” to the sides of the table.
- 3.3.4. **Painting, varnishing,** and any use of similar chemicals is not allowed in the woodshop.
- 3.3.5. **Gluing** is only allowed on the metal top tables. When using glue ask for **paper covers** for the table. Be very careful not to spill glue on the tools and ground. The glued pieces may not remain on the workbenches and/or in the shop unless you are working on the table. The glued pieces may not stay in the shop overnight.

- 3.3.6. Climbing over the tables for cutting is prohibited.
- 3.3.7. **Clean** the table and the area around it of dust and scrap.

3.4. Band Saw

The band saw is a versatile tool. Using the correct blades, curve cuts can be done on a band saw by feeding the stock through the blade freehanded, i.e. without the use of a guide. With the proper set up you can also rip, crosscut, miter, and resaw, i.e. cut a board to the thickness of your desire. You can also cut lap joints and slip joints on the band saw. (Example User Manual: <http://bit.ly/2vbudR1>)

- 3.4.1. When making **curved cuts**, make sure the blade on the band saw you are using can make the cut. The smaller the blade width, the tighter the curve you can achieve. Ask if you are unsure.
- 3.4.2. **NEVER turn the stock to achieve a corner or a very tight curve.** The blade is tensioned and twisting it will make it break and possibly lash out of the machine.
- 3.4.3. Never make **adjustments** to the tool unless the power is off and the blade is completely still.
- 3.4.4. Adjust the **blade guard to about a ¼” over** the surface of the material you are cutting. This way the minimum amount of blade is exposed if your hand slips and the blade guides are close to the cutting action ensuring a straight cut.
- 3.4.5. **Stand positioned in front of the machine** (i.e. on the side of the machine that the teeth of the blade face). Do not stand to the right of the blade or permit others to stand to the right of the blade. If the band saw blade breaks it could potentially lash into the area to the right of the saw. Stand squarely balanced on **two** feet at comfortable arms reach from the table surface.
- 3.4.6. Make sure the band saw **table surface** is clear of any obstructions (no push sticks, tape measures, or other items) before turning power on.
- 3.4.7. Make sure that your **material is clear of the blade** before turning the power on so that the blade is at full speed before starting your cut.
- 3.4.8. When cutting freehand, keep your hands to **either side of the blade** as you feed the material through the blade. Never feed stock with your hands, fingers, or thumbs directly in front of the blade! Your hand may slip forward into the blade.
- 3.4.9. Keep your fingers **3” away from the blade**. Remember, the closer your fingers come to the blade the higher the risk of injury. Use any means necessary to increase the distance between your hands and the blade: use **push sticks or blocks**, use a wood clamp to hold the piece you are cutting, tack your piece to a larger board, and/or plan your cuts wisely to leave the most material in tact as long as possible.
- 3.4.10. Tuck in your thumbs.
- 3.4.11. Make sure that your thumbs, as well as fingers, are not in the line of the cut.
- 3.4.12. You may safely **back out** of a straight cut while the machine is running. To back out of a short, gently curved cut, turn the power off, and wait for the blade to come to a complete stop before backing out.
- 3.4.13. Never **back out** of a long, complicated or tightly curved cut—you must cut your way out!
- 3.4.14. Use **relief cuts** on sharp curves to remove material and free the blade from tension.

- 3.4.15. Make sure the stock you are cutting lays **flat on the table** as you cut.
- 3.4.16. **Never cut mid air.** Lay your material on the bed.
- 3.4.17. Never cut anything that rocks or rolls on the table surface.
- 3.4.18. **Round stock** can be cut using a "V" block.
- 3.4.19. **Slow down at the end** of your cut to avoid lurching forward when the blade breaks free of the stock you are cutting.
- 3.4.20. **If the blade breaks, or you notice anything out of the ordinary,** immediately turn the power off, step back from the tool until all movement stops, then notify Fabrication Shop staff.
- 3.4.21. Make sure the power is off and the blade has completely stopped moving before clearing small material away from the blade (i.e. material that will bring your hand within 3" of the blade).
- 3.4.22. **After finishing** your cut, turn the power off, wait until blade has come to a complete stop, and lower the blade guard to its lowest position.
- 3.4.23. Never stick an object into the blade in order to stop it quicker.
- 3.4.24. **Clean** the tool and the area around the tool of dust and scrap.

3.5. Miter Saw

(Example User Manual: <http://bit.ly/2wvlBYQ>)

- 3.5.1. **The miter saw is for crosscutting only.** It allows for fast, straight, and accurate crosscuts, including miters. It may also be referred to as a chop saw.
- 3.5.2. Make sure the board you are cutting lies **flat on the table** and flush against the fence.
- 3.5.3. If your board is warped in any way ask the shop staff if and how it can be safely cut.
- 3.5.4. **If you are right handed,** stand just to the left of the blade, holding the board with your left hand and operating the saw with your right. Left-handers should reverse this procedure.
- 3.5.5. **Never cut cross-handed!** If you are standing to the left of the blade, you hold the board in place on the left. If you are standing to the right of the blade, hold the board in place on the right.
- 3.5.6. Hold the board firmly in place. If you doubt your strength, **use a clamp** to hold the board in place.
- 3.5.7. Make sure your hand is not in the **circular plate area** of the table when making a cut. If you cannot make a cut without your hand being in the circular plate area, your board is too short. **Use another tool!**
- 3.5.8. Do not place your finger on the power trigger **when adjusting your material placement.**
- 3.5.9. Make sure your stock is **not** in contact with the blade when you **power on** the saw.
- 3.5.10. **Don't force the cut!** Lower the blade into and through the wood at a slow and steady pace. Remember a slower cut is a cleaner cut.
- 3.5.11. When making a cut, lower the blade until it will lower no more, and then raise the blade completely out of the stock before releasing the power trigger.
- 3.5.12. **Don't cut stacked boards.** If you need multiple pieces of the same length, ask how to set up a stop.

- 3.5.13. **When using a stop**, make sure that you have control over the length of board that is between the stop and the blade. You can also use a block between your board and the stop that is removed before cutting so that your board is not pinched between the stop and the blade when making your cut. The material may fly loose if that happens and can be dangerous.
- 3.5.14. Always **wait until the blade has stopped moving** before clearing scrap.
- 3.5.15. When adjusting the miter table, be sure to **tighten the lock knob**.
- 3.5.16. **Keep blade guards intact**.
- 3.5.17. **Clean** the tool and the area around the tool of dust and scrap.

3.6. Table Saw

The table saw is a very useful machine for creating accurate cuts and it is also the most dangerous machine in the Fabrication Shop. **DO NOT USE THE TABLE SAW IF YOU ARE NOT CERTIFIED FOR THE TABLE SAW. The use of the table saw is for certified users only.** To be certified for the table saw contact the Director of Fabrications to set up an appointment. (User Manual : <http://bit.ly/2wkF7ru>)

- 3.6.1. **The area in front of the table saw is only for the person cutting the material.** The material may get a **kick back** and it will be dangerous to be in front of the blade.
- 3.6.2. Do not use or put any material on the **table saw extension table**.
- 3.6.3. If you are helping others by **holding a large material** be careful to let them “drive” the material. Do not put any force on the material and only hold the weight.
- 3.6.4. If someone else cuts your material for you, **you are still responsible for cleaning** the machine and the area around it. The table saw creates a larger amount of dust and a wider area around it –particularly in front of the machine and under the table- should be cleaned.

3.7. Sanders

(Example User Manual: <http://bit.ly/2vLABVh> , <http://bit.ly/2vc0RSP>)

- 3.7.1. **Roll up your sleeves, remove any loose piece of clothing, tie up long hair, and take off any jewelry, watches, and anything that could get cut pulled into the machine. Don't use gloves.** The abrasive surface can catch any loose pieces immediately because of high friction.
- 3.7.2. **Eye protection** is required as with any other power tool. Sanders can throw chips and/or bit of abrasives at high speed.
- 3.7.3. Use sanders for finishing your pieces. Do not use sanders instead of a saw for cutting off large chunks.
- 3.7.4. Sanders are connected to **the dust collection system**. Ask the staff to turn the dust collector on before using them.
- 3.7.5. Wear a dust mask if you are sanding for a long time.
- 3.7.6. Pay careful attention to where your hands are, keeping clear of the abrasive surface.
- 3.7.7. **Grip your work securely** in order to maintain control and avoid having the work thrown from your hands.

- 3.7.8. Press stock to sanding surface using **moderate pressure**. Do not apply excessive pressure as this can put undue strain on the machine.
- 3.7.9. **Disc Sander**: Always sand with the **downward motion** of the disc. In this manner the momentum of the disc helps stabilize the work piece on the table. Sanding with the upward motion can, on the other hand, send your piece flying upward.
- 3.7.10. **Disc Sander**: Make sure that the gap between the table and the sanding disc does not exceed one eighth of an inch. If you notice a larger gap, notify the shop staff. If the gap is too large, the motion of the disc can pull your work piece into the gap, potentially bringing your hands in contact with the abrasive disc.
- 3.7.11. **Belt Sander**: If you notice that the **sanding belt is frayed or cracked**, do not use the machine. Notify the shop staff to have the belt changed. Belts in poor condition can break and be thrown from the sander.
- 3.7.12. **Belt Sander**: Stand so that the rotation of the belt is traveling away from you. This way, if your work piece is thrown from your hands, it will be carried away from you.
- 3.7.13. **Belt Sander**: If the belt is not tracking properly, i.e. is not remaining centered on the cylinders, stop the machine and notify the shop staff.
- 3.7.14. **Spindle Sander**: Sanding against the rotation of the spindle gives you the greatest control. The resistance allows for better control of the work piece.
- 3.7.15. **Spindle Sander**: Mind the gap between the spindle and the table. Be sure that you have enough of the work piece in contact with the table to prevent it from being pulled into the gap by the oscillating motion of the spindle.
- 3.7.16. **Clean** the tool and the area around the tool of dust and scrap.

3.8. Drill Press

A drill press is used to bore accurate holes through stock. You can set up the drill press to bore completely through your material or only partially through. (Example User Manual : <http://bit.ly/2xqacHe>)

- 3.8.1. **Removing any loose clothing and tying long hair is particularly important to avoid getting cut around the drill bit.**
- 3.8.2. Be sure to have a **firm hold on the material** you are drilling. The material may get caught in around the bit and spin or swing towards you. If you are having difficulty holding the material securely in place, clamp it to the table. It is a safer and more accurate method.
- 3.8.3. The machine's rpm (**spindle speed**) is usually adjusted to a medium. If you are drilling in metal ask for the staff help to adjust the speed.
- 3.8.4. If your piece is small or will not easily lie flat on the table, secure it in a vice or hold it in place with the aid of a **clamp. Fingers should be 3" from the bit.**
- 3.8.5. Use a "V" Block when drilling cylindrical stock.
- 3.8.6. When drilling **long stock**, position the excess of the board to the left. This way, if the board spins, it will hit the post, not you!
- 3.8.7. When drilling **extra long stock**, make sure the length of the board is supported.

- 3.8.8. **If the bit catches in your wood and starts to revolve, stand away and turn the power off if it is safe.** Don't try to grab it with the power on.
- 3.8.9. Keep your hands away from the revolving chuck and bit.
- 3.8.10. Make sure that your bit is **securely fastened in the chuck.**
- 3.8.11. Make sure that you remove the **chuck key** once you have fastened the drill bit in place. Put the key back in place.
- 3.8.12. Be sure to place a **scrap board under your work piece** to avoid drilling into the table. This will also help getting a better drilling quality.
- 3.8.13. When **cutting deep holes**, particularly in hard woods, raise the bit out of the hole from time to time to clear the cuttings and permit the bit to cut efficiently.
- 3.8.14. The drill bit and shavings can be very hot immediately after drilling. **Use caution when clearing shavings and removing the bit.**
- 3.8.15. If your wood is burning, slow down your feed rate. Also, slowing down your feed rate at the end of a through-cut prevents tear out.
- 3.8.16. **When you are finished**, remove the bit and return it to the front desk.
- 3.8.17. **Clean** the tool and the area around the tool of dust and scrap.

3.9. Scroll Saw

A scroll saw allows for the cutting of intricate shapes, including inside cuts. (Example User Manual: <http://bit.ly/2g2IHBI>)

- 3.9.1. Always **unplug tool and back off the tension** when changing or threading blade for an inside cut.
- 3.9.2. **Make sure the blade is adequately** secure in both upper and lower blade clamps.
- 3.9.3. **The blade must be tensioned.** A loose blade will bend and results in an inaccurate line. Release the tension before changing the blade. Clamp the lower end of the blade first. Make sure the blade is straight before clamping the top. Turn the tension knob (with a 1 to 5 scale) to your left until the blade is fully tensioned.
- 3.9.4. **Keep your fingers to either side of the blade** to keep it from slipping forward into the blade. Your hand should never be positioned directly in front of the blade.
- 3.9.5. Unlike band saws, the scroll saw goes down **and** up. The scroll saws don't have a hold down mechanism and you should be **holding the material down firmly**. Hold stock applying pressure down to hold it on the table while feeding it into the blade at a moderate speed. Do not force the material through the blade faster than it wants to go!
- 3.9.6. Make sure the stock you are cutting lays **flat on the table.**
- 3.9.7. **When backing out** of curved cuts, power off, and then back out.
- 3.9.8. Make **relief cuts** on sharp curves to remove material and free the blade from tension.
- 3.9.9. When clearing small pieces from near the blade, make sure the power is off and the blade has stopped moving.
- 3.9.10. Always **back off the tension when finished** using the tool.
- 3.9.11. **Clean** the tool and the area around the tool of dust and scrap.

3.10. Planer

The planer is used to create a perfectly flat face on a board that is exactly parallel to the opposite flat face, which is usually created on a jointer. The planer may not be used with warped materials or ones with no flat surface. (User Manual : <http://bit.ly/2xq72mJ>)

- 3.10.1. Ask the staff to turn on the **dust collection system** before using the planer.
- 3.10.2. Make sure the **table** is free of debris before powering on the planer.
- 3.10.3. **Check the board for loose knots, nails, staples, dirt**, sand or other foreign objects that could come free during the planing process, harming you or the machine.
- 3.10.4. **Do not plane material less than 12" long.**
- 3.10.5. **Make sure the side of the stock lying on the table is flat.** This can be achieved on the jointer. Do not plane twisted materials
- 3.10.6. **Do not plane painted or varnished boards.**
- 3.10.7. **Never set the machine to take off more than 1/16" per pass.** Be sure that the measurement that you use to set the table is taken from the thickest part of your board.
- 3.10.8. **Do not stand directly behind the board** you are feeding into the planer. The board can be thrown from the planer.
- 3.10.9. **Never look into or reach into the planer** when it is powered on.
- 3.10.10. Never reach into to planer without disconnecting the power first.
- 3.10.11. **Feed only one board through at a time.**
- 3.10.12. **Once the machine's rollers grab the board, STOP feeding it by hand** and let the rollers take over. The material may be pushed down and your fingers could be stuck in between.
- 3.10.13. As soon as there is no longer any need to support the weight of the board, take your hands away from the board completely. If the board needs help going through the planer use a **push stick**.
- 3.10.14. If your board is **thicker at one end**, run the thicker end through first.
- 3.10.15. **Short boards may tilt up then down quickly.** Be careful that your **fingers** are not on the underside of the board so that they do not get pinched between the board and the table.
- 3.10.16. Ask for instruction before planing material thinner than 3/8".
- 3.10.17. **If stock gets stuck in the planer, power off and** wait for the knives to quit turning completely. Then, and only then, lower the table and remove the board. Don't reach into the planer: use another board to push the board out of the planer. If it is necessary to reach into the planer to remove the board, disconnect the power first.
- 3.10.18. **Orient grain** on board so that it runs uphill from left to right when looking at the side of the board. This will prevent tear-out and facilitate a smooth cut.
- 3.10.19. **Never plane across the grain.**
- 3.10.20. Wait until half of the length of your board is through the planer before moving to other side to retrieve it.
- 3.10.21. Get someone to help you catch the board when planing long boards.
- 3.10.22. When removing lumber from out feed table, **stand to the side of the board** so that you do not get pinned between the board and any immovable object.
- 3.10.23. **Return table to its highest position** when finished using the planer.
- 3.10.24. **Clean** the tool and the area around the tool of dust and scrap.

3.11. Table Mounted Router

The table-mounted router can be used to cut a variety of decorative molding on board edges depending on the type of bit being used. Various types of joinery can also be cut on the table-mounted router, such as dodoes and rabbets and grooves can cut into the face a material. (Also see Handheld Router). (User Manual: <http://bit.ly/2vVOzRi>)

This machine requires training; ask the staff for permission.

- 3.11.1. **Unplug the machine when changing the bit.**
- 3.11.2. **Make sure the bit is securely fastened** in the chuck and the collet is tightened before powering on.
- 3.11.3. **Feed stock against the rotation of the bit.** Feeding with the rotations can cause the bit to grab and pull the board, which can be dangerous.
- 3.11.4. **Do not route short stock.** The board must ride securely against the fence without tipping into the bit. Route the board while long then cut it to length.
- 3.11.5. **Never trap the stock in between the fence and the bit.**
- 3.11.6. **Keep hands 3" away** from the cutting bit when machine is in motion. Use push blocks to achieve this. Use feather boards if stock is narrow.
- 3.11.7. Be sure to use a **miter gauge** for cuts made across the width of the board.
- 3.11.8. **Never reach under the table when the tool is running.**
- 3.11.9. Take light cuts of 1/8" at a time until you reach your desired depth.
- 3.11.10. **When you are finished,** remove the bit and return it to the front desk.
- 3.11.11. **Clean** the tool and the area around the tool of dust and scrap.

3.12. Panel Saw

Panel saw is a powerful tool for cutting sheet material such as MDf and Plywood boards. It is designed for holding the sheets in position to cut across the boards in a 90 degree angle.

(User Manual : <http://bit.ly/2x9HevQ>)

- 3.12.1. The main safety concern on panelsaws are **KICKBACKS**. Using small, warped, deformed, curved edge materials, misplacement of the sheet and inadequate support can cause kickbacks.
- 3.12.2. **Make sure your material is long enough on both sides to sit on the saw carriage** (red roller wheels at the bottom.) The workpiece must be supported by a minimum of two rollers. Cutting small materials is dangerous and may result in kickbacks.
- 3.12.3. **Minimum size of a material is 3x3ft. (1.5 ft on each side)**
- 3.12.4. **The maximum width (height limit) is 4ft.**
- 3.12.5. **ONLY VERTICAL CROSS CUTS** are allowed on the panel saw. Do not cut along a material.
- 3.12.6. When placing the material, **Do not drop the material**; this may knock the rollers out of alignment or damage the rollers.

- 3.12.7. Place your material by aligning the pre drawn cut line to the blade. You can also use the rulers on both side. Be careful to keep away from the switch and the blade if you are bringing down the blade to match the line.
- 3.12.8. Make sure your material is supported and held firmly on the wheels; particularly if you are cutting smaller sheets. **The material must not be able to move or rotate during the cut** or it may result in kickbacks. Ask for help if you need help holding the material.
- 3.12.9. **Before starting** the machine, raise the saw and **make sure the blade is not touching the material.**
- 3.12.10. Do not use push-sticks on this machine.
- 3.12.11. **Do not place hands on or under saw carriage or in the path of the blade.** Do not attempt to retrieve a piece of material that is cut off while the blade is rotating.
- 3.12.12. **Cross-cutting must always be done from the top down.** Saw carriage should be raised to the uppermost position on the guide tubes and locked into position with the carriage lock when- ever the tool is not in use.
- 3.12.13. **When the motor has reached full speed, slowly pull the saw motor down** through the workpiece, keeping your hand on the handle.
- 3.12.14. **When blade is binding, or when interrupting a cut for any reason, turn the switch off and hold the saw motionless in the material until the blade comes to a complete stop.** Never attempt to remove the saw from the work or pull the saw backward while the blade is in motion or KICKBACK may occur. Investigate and take corrective actions to eliminate the cause of blade binding.
- 3.12.15. **Once the cut is complete, turn the tool off and DO NOT MOVE THE SAW;** wait for the blade to come to a complete stop before raising the carriage.
- 3.12.16. Raise the saw motor and allow the saw motor to return to the top of the guide tubes. Tighten the carriage lock.
- 3.12.17. **Clean** the tool and the area around the tool of all dust and scrap.

3.13. Bench Grinder

The benchtop grinder is used for sharpening and grinding small metal parts and tools.

(Alternative User Manual only for safety guides : <http://bit.ly/2xpKRNq>)

- 3.13.1. **MAKE SURE THERE ARE NO FLAMMABLES (E.G. OIL, WD40, SPRAY CANS, ETC.) OR SAW DUST IN THE AREA. THE SPARKS MAY IGNITE FIRE.**
- 3.13.2. This Machine is **for metal only**. Do not use on wood, plastic, etc.
- 3.13.3. Inspect the machine and the wheel. **Do not use a cracked wheel.**
- 3.13.4. **Check the tool rest piece is no further that 1/16" from the stone.** Larger gaps may allow the material to be pulled down.
- 3.13.5. Use goggles and the protection guard.
- 3.13.6. When starting the tool, let it run for one minute.
- 3.13.7. **Never start the tool with a person in line with the wheel.** This includes the operator.
- 3.13.8. Do not grind on the sides of grinding wheels.
- 3.13.9. **Hold the workpiece firmly** and against the tool rest. Hold very small pieces with pliers or other suitable clamps.

- 3.13.10. **Keep fingers away** from the wheel.
- 3.13.11. Feed the work smoothly and evenly into the grinding wheel. Move the work slowly and avoid jamming the work against the wheel.
- 3.13.12. As the wheel tends to slow down you should occasionally release the pressure to let the wheel return to full speed.
- 3.13.13. **Prolonged grinding will cause most materials to become hot.** Handle them with pliers or allow intervals for cooling.
- 3.13.14. **Clean** the tool and the area around the tool of all dust and scrap after use.

3.14. Horizontal Metal Bandsaw

The horizontal bandsaw is used for cutting metal profiles such as pipe or tubes. (Alternative User Manual only for safety guides : <http://bit.ly/2inXLJd>)

- 3.14.1. This Machine **is for metal only**. Do not use on wood, plastic, etc.
- 3.14.2. **Clamp your material** using the chain or a c clamp.
- 3.14.3. **Keep fingers away from the blade.**
- 3.14.4. **This tool must be used with a lubricant.** As the blade and the metal heat up, the blade will quickly become dull if it is not cooled and lubricated. Ask the staff to get a spray lubricant and use every 10 seconds while cutting.
- 3.14.5. Never start a cut with the blade resting on the material.
- 3.14.6. Pull the trigger on the handle to start the blade and lower the blade to the material. Apply a light consistent pressure to the handle to ensure a proper feed speed. **Do not force or apply excessive pressure while cutting.** Metal should be cut at a low speed.
- 3.14.7. Be careful about touching the material as prolong cutting will make the metal hot.
- 3.14.8. Once complete let go of the trigger and wait until the blade stops moving before raising it.
- 3.14.9. **Clean** the tool and the area around the tool of all dust and scrap after use.

3.15. Portable Air Compressor:

WARNING: If the air compressor does not turn off at 150 PSI, unplug immediately and inform the staff.

Compressed air shall not be used for cleaning purposes except where reduced to less than 30 psi and then only with effective chip guarding and personal protective equipment.

Compressed air can be hazardous. Compressed air is extremely forceful. Depending on its pressure, compressed air can dislodge particles. These particles are a danger since they can enter your eyes or abrade the skin. Compressed air can enter the body through ear, nose, eye or any scratch or puncture in the skin, however small, and can cause damage. Hearing damage is possible.

(User Manual: <http://bit.ly/2wBs1pr>)

3.16. Handheld Power Tools

There are a variety of power tools available at the fabrication shop including Drills, Jigsaws, Palm Sanders, Pneumatic Nail Guns and Staple Guns, Handheld Router, Dremel Rotary tool, Heat Gun and Circular saw. The following precautions apply to all tools unless specified:

- 3.16.1. Check out the tools from the front desk. Tool cabinets are for staff use only.
- 3.16.2. **Hand held power tools require training** similar to other machines. If it is your first time using the tool ask the staff to help you.
- 3.16.3. **DO NOT USE DEFECTIVE POWER TOOLS.** Inspect carefully and make sure the tools and make sure it is in operating order. Handheld tools are more susceptible to mishandling and falling. Make sure the last user has returned the tool in a proper condition.
- 3.16.4. **Clamp your material** to the workbench safely before using the tool. Do not try to keep your material with one hand.
- 3.16.5. **Do not drill or cut the workbench underneath.** Use scrap pieces underneath and keep away from the edge of the workbench.
- 3.16.6. **Be careful about the power cord** and keep it away to avoid cutting, sanding, drilling it. A damaged power cord may cause electrical shock. .
- 3.16.7. Hold power tool by insulated gripping surfaces when performing an operation where the cutting tool may contact hidden wiring or its own cord. Contact with a “live” wire will also make exposed metal parts of the power tool “live” and shock the operator.
- 3.16.8. **Hold the tool firmly with both hands** (except in case sanders and nail/staple guns) and situate yourself in a **stable position**. Do not climb over the tables and the material.
- 3.16.9. Make sure the blade/drill bit/sander, etc. is not touching the material before starting.
- 3.16.10. **Wait until the tool is at full speed** after starting.
- 3.16.11. **Do not move the tool after switching off until complete stop of all moving parts.**
- 3.16.12. **Unplug** the machine after use or when not needed to avoid accidental start.

3.17. Pneumatic Nail and Staple Gun

Nail and staple guns are used for quick attachment of materials. They use high pressure air to drive fasteners. Once connected to air compressor, a fastener will fire each time the trigger is depressed as long as the contact trip remains depressed which could result in inadvertent actuation. Hence the following safety precautions must be followed. (Example User Manual: <http://bit.ly/2w0wO1r>)

- 3.17.1. **Nail guns require special training.** Ask for help if it is the first time you are using them.
- 3.17.2. **Find the proper fastener (nail/staple).** Be aware of material thickness. A protruding nail may cause injury. Also, there are 16 and 18 gauge nail guns that require different nail width. Be careful when loading the fastener and make sure they in the right place. Badly placed nails can result in accidents or tool jams. **Do not change load/unload fasteners when connected to the air compressor.**
- 3.17.3. Allow the mobile air compressor to run until it automatically shuts off at 150 PSI.

- 3.17.4. **Adjust the regulated pressure** (left gauge) with the front knob to **100 PSI. High pressure can cause serious injury.** Use less pressure for soft and/or thin materials.
- 3.17.5. **Keep your fingers far away** from the trigger and contact trip when not using, plugging/unplugging.
- 3.17.6. Place the nail gun in a safe place when not in use.
- 3.17.7. **Keep the tool pointed away** from yourself and others.
- 3.17.8. **Locate your material safely** in a way that if the fastener goes through, it won't hit anyone. Face the gun down when nailing as much as possible (i.e. nail on top of a horizontal piece.)
- 3.17.9. **Do not drive fasteners near edge of the material.** The nail may protrude from the sides.
- 3.17.10. Do not drive fastener on top of another. Be careful to only press the trigger once (avoid double fires).
- 3.17.11. Do not drive fastener where you are not sure what is inside/behind the surface.
- 3.17.12. **Keep hands and body parts clear of immediate work area.** The nail may come out from the sides if it cannot go through. Hold workpiece with clamps when necessary to keep hands and body out of potential harm. Be sure the workpiece is properly secured before pressing the nailer against the material. The contact trip may cause the work material to shift unexpectedly.
- 3.17.13. Connect the air plug to the nail/staple gun.
- 3.17.14. **Grip tool firmly** to maintain control while allowing tool to recoil away from work surface as fastener is driven.
- 3.17.15. Press the nailer contact trip against the material until the trigger is engaged. **Do not tilt the gun;** nail/staple perpendicular to the material surface. Nailing in an angle causes the fastener to scratch the surface, bend and shoot away.
- 3.17.16. **Be careful not to leave the contact trip pressed against a surface or body when not in use.** Do not leave the tool on your lap. Always keep fingers clear of contact trip to prevent injury from inadvertent release of nails.
- 3.17.17. Once done, unplug the air compressor and only then empty the magazine.
- 3.17.18. Return unused nails to the front desk.

3.18. Circular Saw

Circular saw is a powerful tools for cutting straight lines through sheet (flat top) materials. It can be used when cutting on a table saw, panel saw or miter saw is not possible.

The two main safety concerns are the exposed blade and kickback.

(User Manual: <http://bit.ly/2wkRkg2>)

Circular saws require special training and supervision – Ask the staff for help.

- 3.18.1. **When checking out a circular saw, ask for the staff availability to supervise.** There may be a wait time.
- 3.18.2. Before plugging in, make sure the **lower blade guard** is in working condition, moves freely and covers the blade instantly. Never clamp or tie the lower guard into the open position.
- 3.18.3. Secure **power cord** away from your cutting path.

- 3.18.4. **Adjust the cutting depth to the thickness of the workpiece.** Less than a full tooth of the blade teeth should be visible below the workpiece. Do not use the saw with an excessive depth of cut setting. Too much blade exposure increases the likelihood of the blade twisting in the kerf and increases the surface area of the blade available for pinching that leads to kickback. Blade depth and bevel adjusting locking levers must be tight and secure before making cut. If blade adjustment shifts while cutting, it may cause binding and kickback.
- 3.18.5. **Support large panels to minimize the risk of blade pinching and kickback.** Large panels tend to sag under their own weight. Supports must be placed under the panel on both sides, near the line of cut and near the edge of the panel. Use clamps to stabilize the piece and make sure the cut line is at least **1 inch** away from the edge of the workbench (other than damages, hitting to the workbench can cause a kickback) but not further than **4 inches** (for stability and less shaking.) **Do not rest both sides on tables without clamping down; it can cause kickbacks.** Cutting while a piece is resting on the sides can cause the material to be pushed down in the middle by the saw and “pinch” the blade. Never hold the piece being cut with your hands or across your leg. It is important to support the work properly to minimize body exposure, blade binding, or loss of control.
- 3.18.6. **Hold the saw firmly** to prevent loss of control. The circular saw is a powerful tool and can easily cause fast movements. **Maintain a firm grip with both hands on the saw and position your arms to resist kickback forces. Position your body to either side of the blade, but not in line with the blade.** Kickback could cause the saw to jump backwards, but kickback forces can be controlled by the operator, if proper precautions are taken.
- 3.18.7. **Never place your hand behind the saw blade.** Kickback could cause the saw to jump backwards over your hand.
- 3.18.8. **Before starting, make sure the blade is not touching the material.**
- 3.18.9. When blade is binding, or when interrupting a cut for any reason, release the trigger and hold the saw motionless in the material until the blade comes to a complete stop. **Never attempt to remove the saw from the work or pull the saw backward while the blade is in motion or kickback may occur.** Investigate and take corrective action to eliminate the cause of blade binding.
- 3.18.10. **When restarting a saw in a workpiece, center the saw blade in the kerf** and check that saw teeth are not engaged into the material. If saw blade is binding, it may walk up or kickback from the workpiece as the saw is restarted.
- 3.18.11. **Do not reach underneath the workpiece.** The guard cannot protect you from the blade below the workpiece.
- 3.18.12. When ripping always **use a rip fence or straight edge guide.** This improves the accuracy of cut and reduces the chance of blade binding.
- 3.18.13. **Do not “plunge cut” in the middle of a sheet/material.**
- 3.18.14. **Do not run the tool while carrying it.** Lower guard may be opened by a contact with your clothing. Accidental contact with the spinning saw blade could result in serious personal injury
- 3.18.15. Once done, **move fingers away from the trigger.**
- 3.18.16. **Wait until the blade has come to complete stop** before removing from the material.

3.18.17. **Clean** the tool and the area around the tool of all dust and scrap after use.

3.19. Handheld Router

Handheld router is the specifically used for removing a partial depth from the face of the material or shaping/cleaning the edges. Channels and grooves for joins or otherwise and molding the edges (e.g. in cabinetry) are examples of the common use of routers. In comparison to the table mount router, the handheld round can provide more freedom when working on larger workpieces or for freehand routing of patterns on a surface. (User Manual: <http://bit.ly/2w0KiKw>)

- 3.19.1. **Make sure the Bit is in place and the collet is tightened.**
- 3.19.2. **Secure the workpiece.** If working around the edges make sure they are about 2" away from the workbench. Never hold the workpiece in one hand and the tool in the other hand when in use. Clamping the material and guiding the tool with both hands is safer.
- 3.19.3. **Never place hands near or below cutting surface.**
- 3.19.4. Do not place the material on hard surfaces such as concrete, etc. If the bit hits the surface it might break or you may lose control.
- 3.19.5. Never use dull or damaged bits.
- 3.19.6. Be careful to set the **power cord** aside from the cutting path.
- 3.19.7. **Hold the router with both hands.**
- 3.19.8. **The direction of feeding** the bit into the material is very important and it relates to the direction of bit rotation. When viewing the tool from the top, the bit rotates clockwise. Feed direction of cutting must be counter-clockwise. Inside and outside cuts will require different feed direction. Feeding the tool in the wrong direction, causes the cutting edge of the bit to climb out of the work and pull the tool in the direction of this feed. For more information see here, p.15 : <https://thd.co/2xpGan1>
- 3.19.9. **Never touch the bit** during or immediately after the use. It is hot and can cause burns.
- 3.19.10. **Keep the router in place until the motor has come to a complete standstill.** You may lose control of the tool.
- 3.19.11. **Lay the tool on the side when not in use.** Do not hit the bit onto a surface.
- 3.19.12. **Clean** the tool and the area around the tool of all dust and scrap after use.

3.20. Heat Gun

Heat guns can be used to locally heat an area in order to soften or melt the material, expand the material, etc. (Example User Manual: <http://bit.ly/2w0sgYN>)

- 3.20.1. **RISK OF FIRE: If the material is flammable or highly combustible or it is overheated it may cause fire.**
- 3.20.2. **Make sure the area is clean** from any oil or other flammables and clean any saw dust in the area.

- 3.20.3. **Some material may emit toxic gasses** when heated. It is the user's responsibility to know their material but the shop staff may stop the process if they find the material hazardous.
- 3.20.4. Melting material to liquid is not allowed in the woodshop.
- 3.20.5. **Do not place your hand in front of the hot air** to test the temperature.
- 3.20.6. **Do not leave a heat gun running.** Use the heat gun in short intervals to avoid frying the motor.
- 3.20.7. **After use, turn off the heat gun and place safely** in way that the hot nozzle does not touch any surface. Warn other people about a recently turned off tools.

4. After Finishing Your Work

4.1. Cleaning your Work Area

The shop users are required to clean their workspace immediately after using a tool and give a clean machine to the next person in line. Do not wait until you are leaving the shop. By leaving more dust on the ground, more dust will be circulated in the air and inhaled by the shop users and staff. There are dust collector trunks, vacuums, air compressors, brooms, brushes and paper towels available in the Fabrication Shop. Any debris or dust on the tool AND the area around it should be cleaned. We recommend that you use the air compressor with some distance and gently to clean the machine and use a vacuum or broom to clean the area around it afterwards. The shop staff may ask you to clean the machine again if it has not been cleaned adequately.

At the end of the day, everyone in the shop will be asked to help clean the shop.

- 4.2. Do not leave any **material scraps** behind. Only small pieces (less than 3") may go into the **garbage bins**. Larger pieces should be put in the sorted scrap bin outside the shop. Sharp objects (e.g. blades) should be placed in the Sharp objects disposal box at the front desk.
- 4.3. The Fabrication Shop accommodates neither **material nor project storage**. Any materials or tools left behind will be removed. The leftover materials will be placed outside and the Fabrication Shop cannot be held responsible for their loss.
- 4.4. Make sure to take everything with you. The shop is not responsible for any losses or damages.
- 4.5. Give the goggles and any other tools you have borrowed back to the front desk staff and retrieve your SSA/CCNY ID.

TOOL CHECK OUT

The Fabrication Shop has a number of tools that may be checked out by students and faculty during the shop hours. Ask the staff for the available extra tools as the tools intended for use in the shop may not be checked out.

The tools are not available to be checked out overnight with the exception of clamps. The check-out limit is 24 hours for clamps.

The person who has borrowed the tool is responsible for its safe and proper use. Users are liable for any health consequences and the damages to the tools.

To check out the tools, come to the Fabrication Shop with your valid SSA/CCNY ID and ask the staff for help. You may take the tools once you have left your ID and the tools and your card have been scanned in the data base. First time users will be added to the Fabrication Shop User Database.

Late return may result in losing your privilege to check out tools.

Material Safety Data Sheets and Machine User Manuals

All MSDS documents and machine manuals are available at the fabrication shop. Digital and/or paper copies will be provided by request at the fabrication shop.

UPDATED ON August 15TH 2017

Policies for the SSA Fabrication are under continuing review and evaluation. This and other documents pertaining to the Fabrication Shop will be revised and expanded periodically. It is important that every user refer to the SSA website to familiarize themselves with the latest revisions and updates.