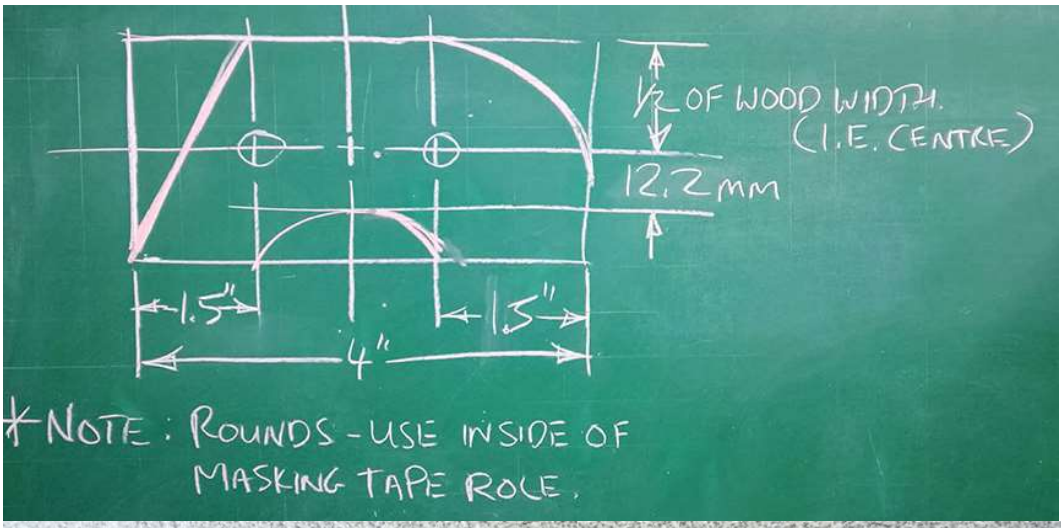
Shop Tools/Machines

Shop Hand tools, Wood Machine Safety, and Practice Wood Project

How do I use safely?



Western Technical-Commercial School

School:

Exploring Technologies, TIJ101

Course:

Grade 9 juniors

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Shop Tools/Machine Safety for Practice Wood Piece

Project:

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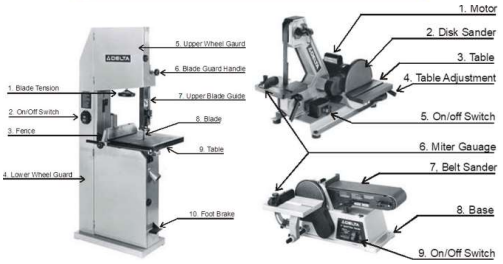
Key Holder Needed

Wood Practice – Hand tools and Machine Safety

Situation:

Class of students in Exploring Tech looking forward to making some cool projects in the shop. The shop has some hand tools, woodworking machines, work benches set-up for completing projects. Students have little if any experience using woodworking hand tools and machines.



Problem/Challenge:

The challenge is to familiarize students with the shop, hand tools, machine safety, practicing layout, cutting, filing, sanding, and finishing a small piece of wood.

Students will look at:

1. Shop layout, its resources, and importance of safety
2. Clean-up process, routines, and assign responsibilities
3. Hand tools – layout tools, tape measure, rasps, files, and sandpaper
4. Safe operation/parts of the Miter saw, Drill press, Band saw, Combo & Spindle Sander
5. Practice wood piece for layout, machine cutting, and hand tool use
6. Final finish on for overnight dry/cure, related terms, and create a report

Resources, Time and Materials

- Small piece of wood at least 5-8” long by 3-5” wide to practice on
- Shop hand tools: layout, rasp/files & various sand paper grades of coarseness
- Shop equipment: miter & drill press, band saw, combo & spindle sanders
- Paint bush, CMYK colours for paint, mixing cups, stain, & Varathane
- Apron, safety glasses, dust mask, paint paper, and hearing protection

Timeline/Due Dates:

Layout _____, Machine Safety, _____, Practice Cuts_____,

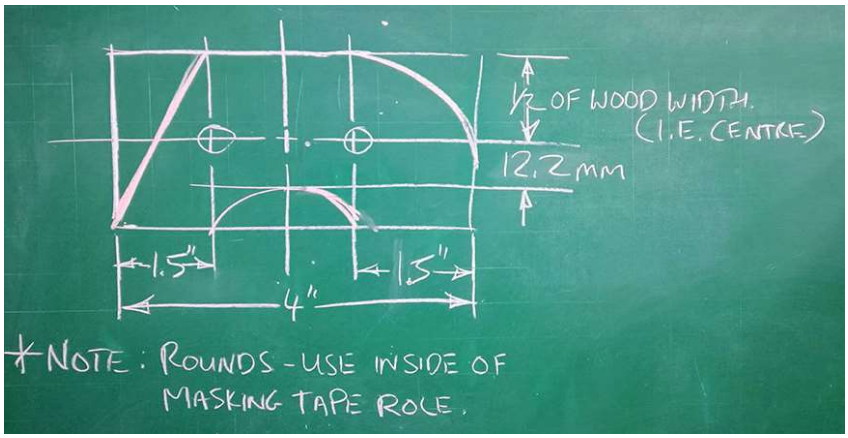
Practice Refine _____, Finish_____, and Report_____

Practice Project Overview

The intention with this practice wood project is to familiarize yourself with the basic wood machines, wood refinement tools such as the rasp, file, sandpapering, and basic finishing/sealing with a colour coat on the bottom and sides only. The shape we are using will allow you the opportunity to use/demonstrate all basic wood machines and hand tools we will be doing safety on, to prepare you for the next project. Note you will be leaving the top with layout lines and your name on top for evaluation purposes.

Initial Layout for Practice Piece

1. Layout a landscape blank page with body for sketching (pencil) out sample practice piece layout and dimensions full scale with the rounds using inside of a standard masking tape roll
2. Transfer over to your scrap piece of wood once you have found one true 90-degree edge to work with (i.e. two edges of wood 90-degrees apart), so you can layout your cut lines on your wood piece, using a square and a pencil following your sketch



3. Put your name (last initial, first name) on top of your piece using 2 cm pencil guide lines near the centre parallel to the length of your sample piece in black permanent black marker
4. You can keep your project in the upper public open shelf above electrical panel area for your convenience and other class storage areas are out of bounds and can only be accessed by the ladder. There is no throwing projects up in this area. Only after ladder safety demo showing 3-point contact is done, will students be allowed on ladder.

Wood Working Stage

1. Safety is priority: safety glasses to be worn at all times in the shop, all students must complete their safety contracts on shop machines first before practical demonstration test for future use and students have access to dust masks, aprons, and ear protection if needed

2. First wood machine to use is the Miter saw, to cut your length needed for your practice piece, and with all cuts leave a minimum of 2-3 mm extra wood or gap for later using a rasp/file then sanding down to line, with layout pencil layout lines still be viewable as machine cuts leave rough cut that needs to be refined slowly by hand
3. Second wood machine to use is the Drill Press, as you will have more material to hold on to, to drill your two holes
4. Using the large bandsaw is used next to cut out around your shape, the angle, outside round, and inside round leaving about 3 mm
5. Use the combo disk and spindle sander to take it down to about 1 mm to your layout lines
6. Once all the wood is rough cut out and machine sanded, use hand rasp (rough) and/or file (fine) to shape edges to 1 mm of your layout lines by hand. You will need to use a table vice (use a couple of scrap pieces of wood on the vice teeth, so your project doesn't get damaged. You will most likely need your partner to assist when clamping down with vice.

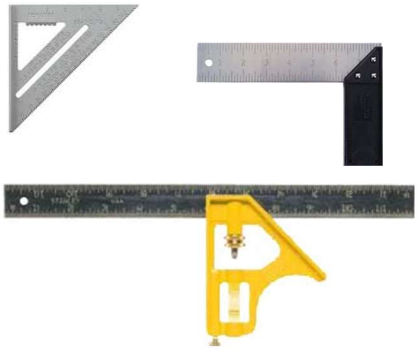
7. Last step is to use a course grade sand paper first such as 60 grit wrapped around a scrap piece of wood to refine edges further, then move up to a 80 grit for fine smooth edges and top surface result

Painting/finishing Stage

1. Once everything is smooth and accurate you are ready to apply a finish for looks, sealing, and protection
2. Determine your colour using your logo main colour, to mix a similar colour in a mixing cup with less than quarter of the container, i.e. will not need a lot paint
3. When painting make sure to not put too much paint on in one coat, as it will take longer to cure/dry and leave a poor finish and you are done
4. As this is a practice piece, one coat of paint is all that is needed but if this were a key component one or two more coats of paint would be brushed on after it has dried overnight and sanded down with fine sand paper 100-120 grit to create a smoother deeper solid colour with a finer finish

Hand Tools in the Shop

There are a number of tools that you may need when working on basic wood projects. The following is just a few that you need to be familiar with to get the basics started.

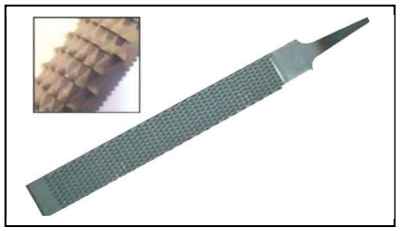


Layout Tools:

This is the first step to laying out what you will be cutting out. Use only a **pencil** to mark wood appropriately, as it will not mark permanently.
The **framing squares, carpenter,** and **combination** are used to line up and layout your designs and design features, such as your shape design and key holder hook alignment.

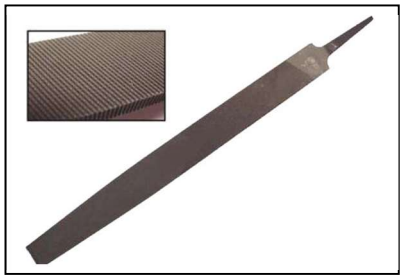
Sanding Tools:

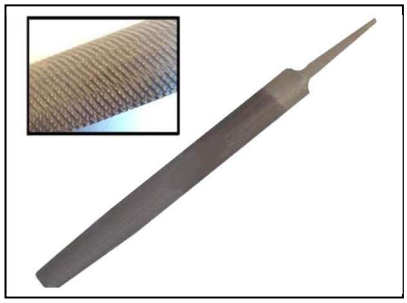
Rasp: are used to take a lot of wood material off quickly, leaving a very rough surface which comes usually in the flat/half round shape.



Files: take off small amounts of wood in a consistent format according to their shape. Common shapes include:

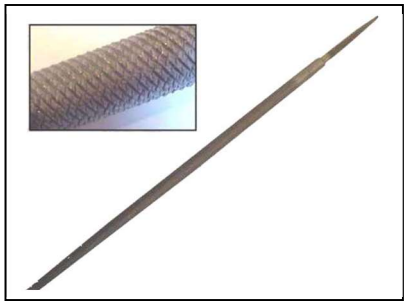
- Round
- Half round
- Flat



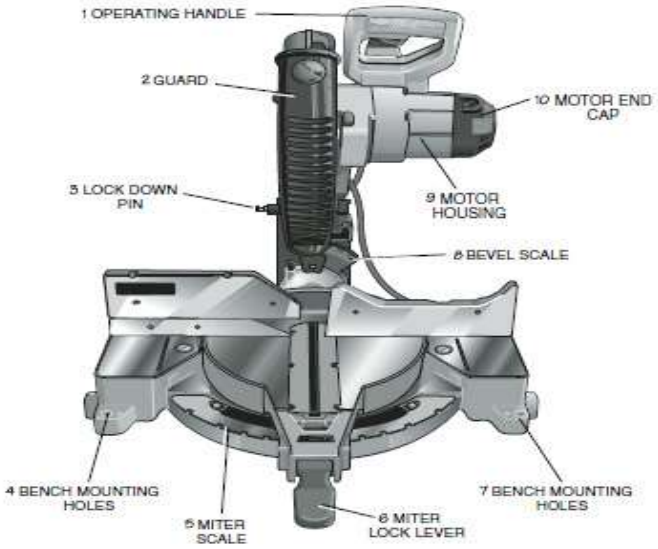


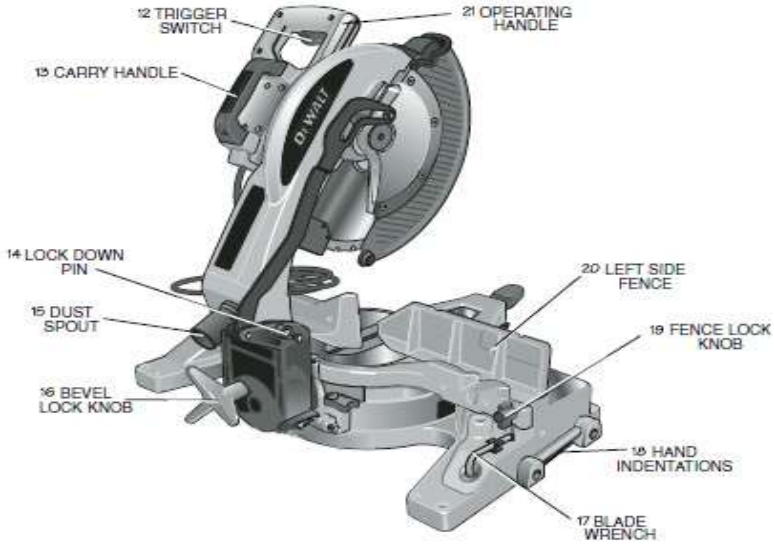
Sand paper is used to finish-off and customize specific areas of wood object. A sanding block is commonly used to keep sanding straight and consistent, as your fingers/hands would sand uneven.
When filing your work, it is important to keep the following in mind:

- Clamp your work when hand shaping it, preferably to a table vice
- Using a table vice, you may need to put some scrap wood or cardboard to protect your soft wood surface from being damaged from the clamp/vice teeth grips
- Proper filing requires you to stand (not sit) while filing, and use two hands moving both your arms and shoulders in a smooth horizontal movement



Mitre Saw General Safety and Operation





Safety First

Description:

The Mitre saw, sometimes referred to as a ~~chop saw~~ is used to make three cuts: **cross cut, bevel cuts and compound cuts**. Some of these saws also come with an adjustable arm allowing for wider cuts. This tool is very common and a valuable asset to carpenters for its quick accurate cross-cutting action.

Operation:

Place your wood up to the fence, bring the saw down to the line you need to cut, adjust the wood to line up to the cut line, then holding the wood with your left hand, use your right hand release the safety, press the power trigger, and pull down on the handle to cut into the wood.

Things to Remember:

+ **Never cross arms** to hold the wood and the saw handle when cutting material
+ Always double check settings and angles and make sure the safety guard is in working condition

Extra Notes:

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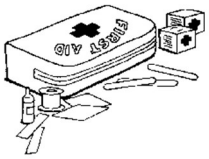
Safety Contract for the Mitre Saw



Rules to remember

1. **Wear safety glasses!**
2. Connect and turn on the dust collection system for reduced sawdust spread
3. Keep hands away from blade and blade cutting pathway
4. **Clamp** small pieces of wood that close to the blade, to keep hands away from blade
5. **Do not** have another person support the far end of your wood, as wood could bind against blade
6. Make sure wood is **tightly held against the fence** when cutting
7. **Remove scrap pieces** of wood and keep saw area clean
8. Release trigger once wood has been cut
9. Before replacing blade, **be sure that power is disconnected**

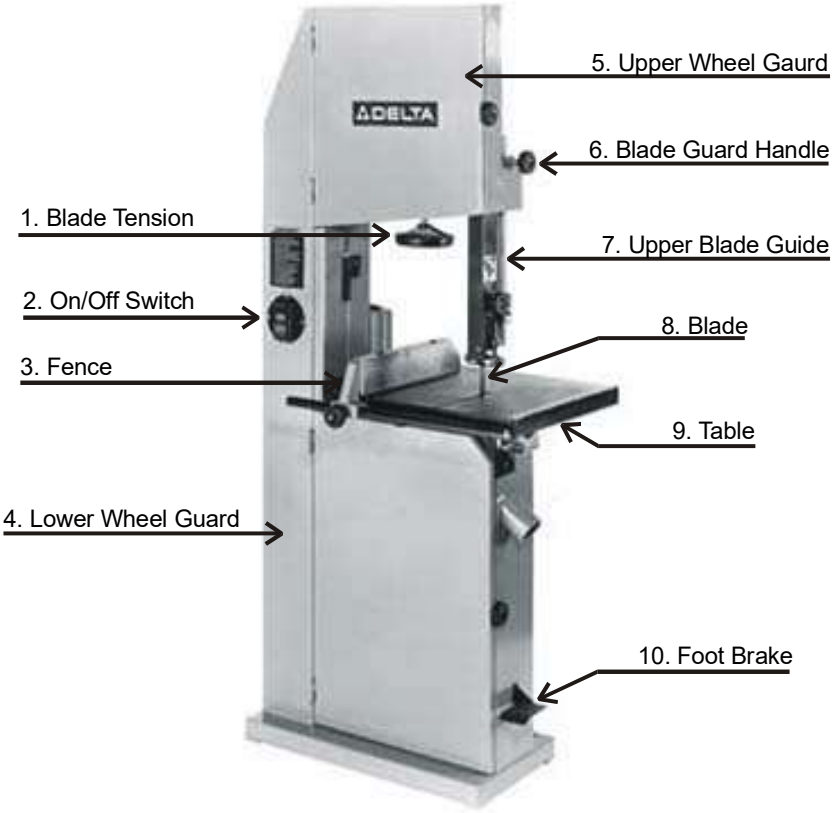
+ Look at yourself; if you have all your body parts and you're not bleeding, then you can appreciate the benefits of safety in the shop.

I was **present** for the instruction on the safe use of the **Mitre saw** and I understand its use and will operate this machine in a safe method as described. I feel comfortable in the operation of the Mitre saw and if in any doubt will ask for help from an Instructor.

Fill in below, the lesson date (year/month/day), check off that you have seen the instructor's parts, safety, and operation demonstration, your name, check off your completions, signature and then have your instructor sign-off for your contract to be allowed to use the machine.

Students to fill in all column boxes below once completed, then sign.						Teacher
Lesson Date	Demo ✓	Last Initial, First Name	HO Done ✓	Demonstrated ✓	Signature	Safe to Use

Band Saw General Safety and Operation



Safety First

Description:

The band saw is a powerful motor-driven cutting tool. The saw's **blade is a continuous, flexible band of steel with rip-cut teeth filed on one edge**. It has a tilting table for cutting on an angle. The size of a band saw is determined by the diameter of the wheels that drive and guide the blade. The distance between the table and the blade guard limits the depth of cut.

Operation:

The band saw blade travels in a clockwise direction forcing the stock that is being cut down against the table. Although the band saw is an excellent machine for cutting curves, it can also rip, crosscut, and re-saw stock. Because of its powerful motor and deep depth of cut the band saw can cut large pieces of wood and also odd pieces of wood. The blade must be under tension to maintain a straight cut.

Things to Remember:

+ Wait for the band saw to come up to **full speed before starting to cut**
+ Do not cut **curves that are too tight** for the width of the band saw blade, use relief cuts first
+ Do not force a cut, always use a **smooth, slow feed** into the blade

Extra Notes:

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Safety Contract for the Band Saw

Rules to remember

1. Wear **safety glasses!**
2. Be sure that all **guards/covers** are in place and dust collector system is connected and on
3. The **blade guard clearance** must not be more than 25 mm. above work
4. Keep **hands to the sides of the blade**, never in front of the blade
5. Keep work flat on the table for **work piece stability** and support while cutting
6. Use a **push stick** to move scrap pieces of wood away from the blade
7. Do not cut **too small radius cuts**, if necessary, make relief cuts first, ninety degrees to your cut
8. **One person at a time** operating the machine
9. If the **blade breaks**, shut off the power and stand clear until the wheels have stopped turning
10. When backing out of a cut, **do so with extreme caution** so as not to catch the blade and pull it off the wheels, otherwise you must **stop the machine first**
11. **When finished**, turn machine off and use the brake to stop the blade

+ Look at yourself; if you have **all** your body parts and you're not bleeding, then you can appreciate the benefits of safety in the shop.

I was **present** for the instruction on the safe use of the **Band Saw** and I understand its meaning and will operate this machine in a safe method as described. I feel comfortable in the operation of the Band Saw and if in any doubt will ask for help from an Instructor.

Fill in below, the lesson date (year/month/day), check off that you have seen the instructor's parts, safety, and operation demonstration, your name, check off your completions, signature and then have your instructor sign-off for your contract to be allowed to use the machine.

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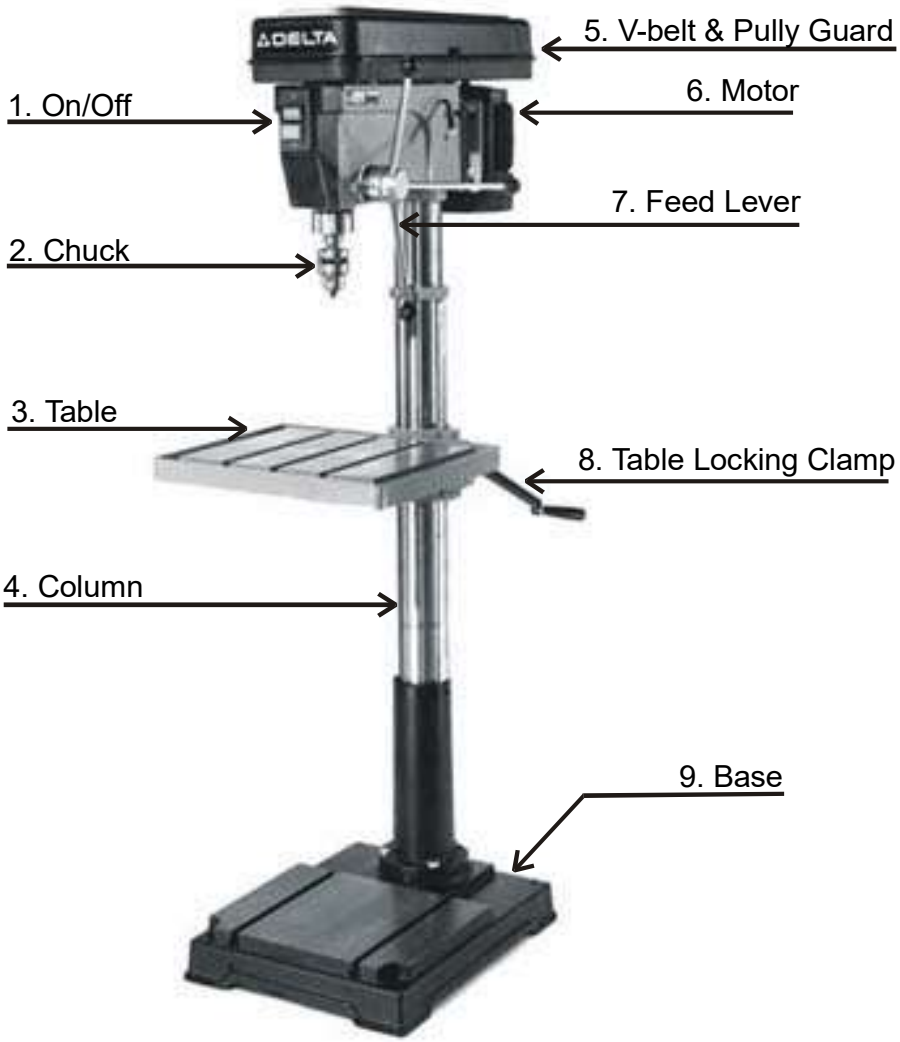
Drill Press General Safety and Operation



Safety First

Description:

The drill press is an accurate, **vertical boring or drilling machine**. It is also capable of many other operations such as mortising, routing, sanding and shaping using a variety of attachments.

Operations:

Stock is held by hand, jig or Clamp on the Drill press table and the chuck is brought down to the work using the feed wheel. The speed can be adjusted for different materials, faster for soft, slower for hard.

Things to Remember:

+ **Do not force** the bit into the work
+ Use a **slow, steady, even feed rate** into the work
+ The **depth guide** is used to make multiple, same depth holes

Extra Notes:

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Safety Contract for the Drill Press

Rules to remember

1. Wear **safety glasses!**
2. Long hair **must be enclosed** in a hair net or be tied up and no loose clothing/jewelry
3. When boring small pieces **hold them securely** with a clamp
4. **Be sure** to use a bottoming piece (scrap) under the work for clean back cut/not drill into the table
5. Operate the drill at the **correct speed** for material drilling
6. Make sure the **drill bit is tight** in the chuck (leave gap space at top of chuck prior to tightening)
7. **Never** leave the chuck key in the chuck
8. Be sure you have the **right type of drill bit** for the job
9. One person operating the machine at a time
10. Turn off drill press when finished and clean off table for next user

+ Look at yourself, if you have all your body parts and you're not bleeding, then you can appreciate the benefits of safety in the shop.

I was **present** for the instruction on the safe use of the **Drill Press** and I understand its meaning and will operate this machine in a safe method as described. I feel comfortable in the operation of the Drill Press and if in any doubt will ask for help from an instructor.

Fill in below, the lesson date (year/month/day), check off that you have seen the instructor's parts, safety, and operation demonstration, your name, check off your completions, signature and then have your instructor sign-off for your contract to be allowed to use the machine.

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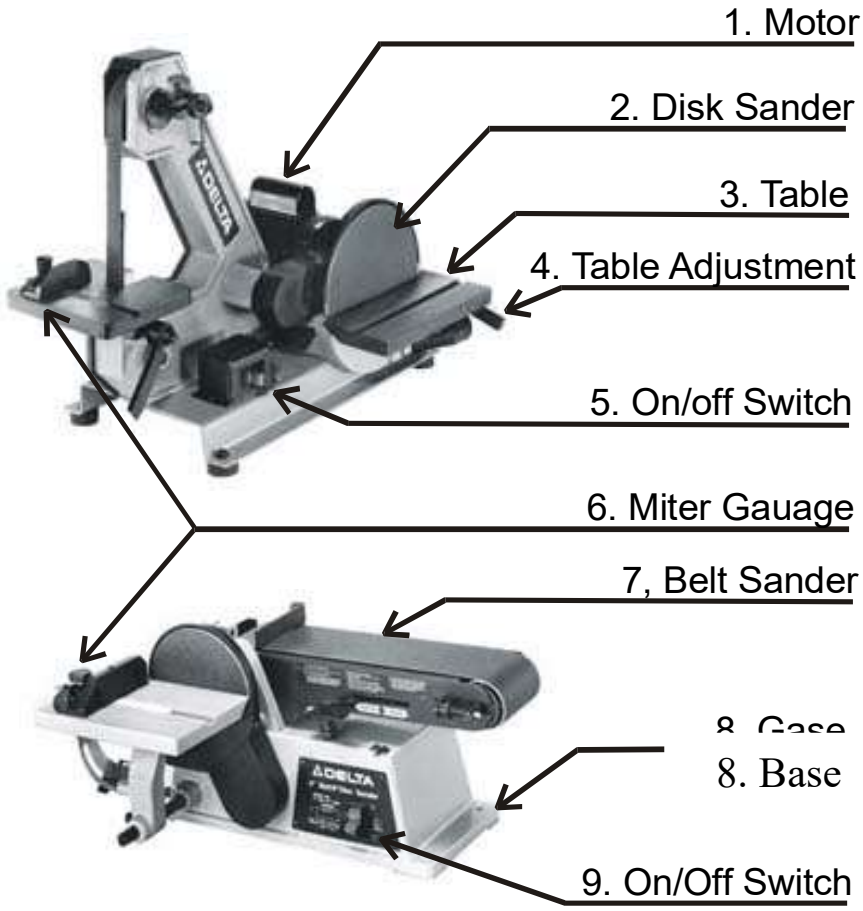
Combination Disk/Belt Sander General Safety and Operation



Safety First

Description:

The combination disk sander is extremely useful for **sanding end grain and outside curves** of wooden projects. When it is properly setup, it can be very accurate.

Operation:

The table can be adjusted for angles or to have a larger gap between the table and disk to compensate for different shaped projects. When starting let the belt/disk come up to full speed before using. On disk part, ensure you are using the down turn towards the table to remove material.

Things to Remember:

+ After the machine has been turned off remember the disk takes time to stop turning
+ Always work on the downward turning side of the disk so that the stock is pushed down onto the table

Extra Notes:

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Safety Contract for the Combination Disk/Belt Sander

Rules to remember

1. Wear **safety glasses!**
2. Connect and turn on the dust collection system for reduced sawdust spread
3. Do not **touch the disk/belt abrasive** when it is turning
4. Do not sand pieces of wood that are **too small to hold** safely
5. Do not try to sand off **large amounts of stock**, remove excess with a cutting tool first
6. Do not apply **too much pressure** on stock when sanding or else it will burn
7. If sandpaper is **dull, ripped, or wrinkled, do not use** until abrasive sandpaper is replaced
8. Turn **machine off** when finished, needs some time to actually stop and **clean area**
9. Before replacing paper, **be sure that power is disconnected**

+ Look at yourself; if you have all your body parts and you're not bleeding, then you can appreciate the benefits of safety in the shop.

I was **present** for the instruction on the safe use of the **Disk Sander** and I understand its meaning and will operate this machine in a safe method as described. I feel comfortable in the operation of the Disk Sander and if in any doubt will ask for help from an Instructor.

Fill in below, the lesson date (year/month/day), check off that you have seen the instructor's parts, safety, and operation demonstration, your name, check off your completions, signature and then have your instructor sign-off for your contract to be allowed to use the machine.

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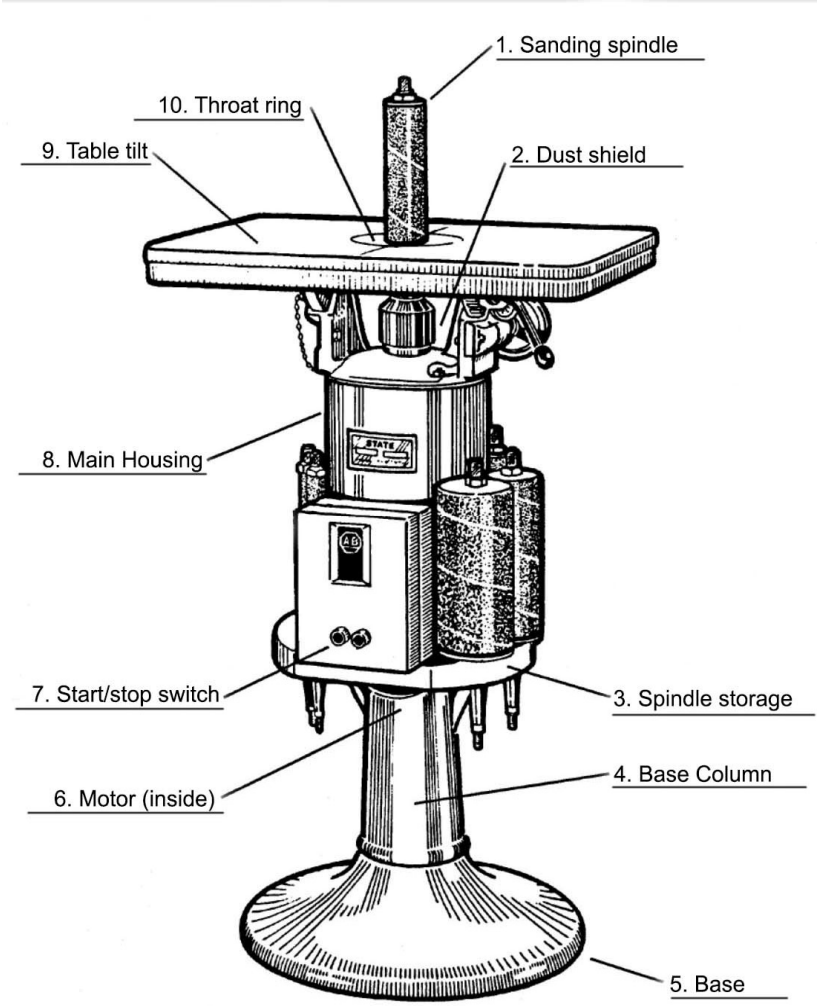
Oscillating Spindle Sander General Safety and Operation



Safety First

Description:

The oscillating spindle sander is extremely useful for **sanding inside curves** of wooden projects. The sanding spindle moves up and down (oscillates) to spread wear and use more of the sander roll.

Operation:

The table can be adjusted for angles but commonly used flat. Ensure clean area, project area marked and hold work securely on table and slide work piece slowly to remove inside curve area.

Things to Remember:

+ After the machine has been turned off remember the disk takes time to stop turning
+ Hold work piece securely on table and feed into oscillating spindle sander slowly

Extra Notes:

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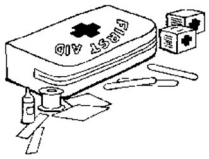
Safety Contract for the Oscillating Spindle Sander



Rules to remember

1. Wear **safety glasses!**
2. Connect and turn on the dust collection system for reduced sawdust spread
3. Do not **touch the spindle sander abrasive** when it is turning
4. Do not sand pieces of wood that are **too small to hold** safely
5. Do not try to sand off **large amounts of stock**, remove excess with a cutting tool first
6. Do not apply **too much pressure** on stock when sanding or else it will burn
7. If sandpaper is **dull, ripped, or wrinkled, do not use** until abrasive sandpaper is replaced
8. Turn machine **off** when finished, needs some time to actually stop and **clean area**
9. Before replacing spindle sandpaper, **be sure that power is disconnected**

+ Look at yourself; if you have all your body parts and you're not bleeding, then you can appreciate the benefits of safety in the shop.

I was **present** for the instruction on the safe use of the **Oscillating Spindle Sander** and I understand its meaning and will operate this machine in a safe method as described. I feel comfortable in the operation of the Oscillating Spindle Sander and if in any doubt will ask for help from an Instructor.

Fill in below, the lesson date (year/month/day), check off that you have seen the instructor's parts, safety, and operation demonstration, your name, check off your completions, signature and then have your instructor sign-off for your contract to be allowed to use the machine.

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Lesson Date	Demo ✓	Last Initial, First Name	HO Done ✓	Demonstrated ✓	Signature	Safe to Use

Finishing Your Wood Project

When you have completed your wood project to your satisfaction… hint you should check with teacher to make sure you are ready to paint. This part will allow you to practice the paint mixing process, brush painting prep, brush painting method, and proper clean-up

It is important to finish wood projects to:

1. Protect and harden your surface
2. Make it look attractive
3. Seal, and preserve the wood

Surface Prep, Finish Types, and Paint Process

Surface of wood should be dust free with at least 80 grit smoothness. You can use a lightly dampened cloth or wipe to remove the dust. You will want to plan before you paint such as some spacers under your work or temporary stand.

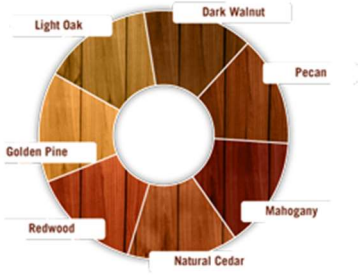
There are two major ways to go about finishing the surface of your wood:

- Stain and/or clear coat
- Primer and coloured paint

Both we use are water-base and recommend that shop aprons be worn just in case. Clean up of brushes, and paint area, and slop sink (Bradley is for washing hands only) are to be cleaned up after use. Paint brushes are to be returned to the paint bath tubs, once finished. All painting is to be done using Kraft paper and/or newspaper under your work, and paint away from machines that make a lot of dust, while students sanding should also be working well away from students painting.

Stain and Clear Coat

Stains will darken and bring out the grain in the wood in an attractive manner by **high-lighting the wood grains and density areas**. Stain is just a cosmetic look, but still will need to be painted twice with a clear coat of Varathane. After the stain, you must let dry, then put a **first coat of Varathane on, which will soak into the wood** leaving a rough some-what flat appearance once dry. **A second coat is needed**, after a fine and light sanding with +100 grit sand paper in order complete the seal properly. If you wish to put more coats on, you may do so as to make a finer and smoother finish.



Primer and Coloured Paint

The object must have a minimum of one coat of primer for the following reasons:

1. Prepare surface for colour coat to stick to
2. Seal in small holes, imperfections, and

3. Minimize surface absorption for your next coat of paint

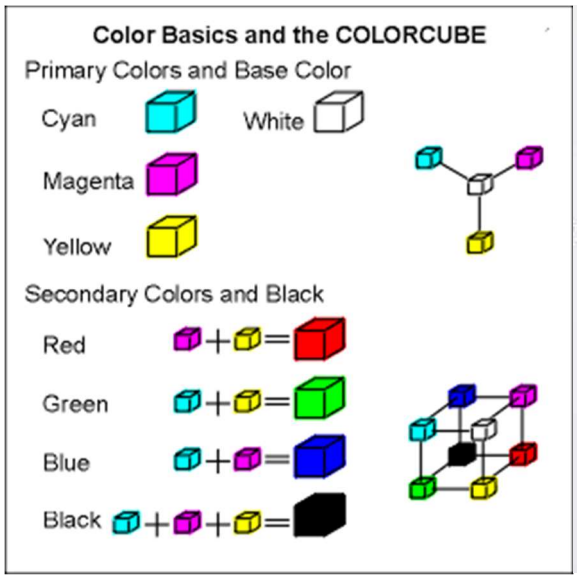
Once this is done and primer is dry, it needs to be sanded lightly. Note: if wood was poorly prepared, you will most likely have to put another coat of primer on, as you generally don't want any wood showing through the primer.

Colour Mixing

Colours will have to be mixed from primaries provided namely:

- Cyan,
- Magenta
- Yellow
- White to lighten
- Black to darken

By **using a mixing cup, you can use the cyan, magenta, and yellow to get your primary and secondary colour match**, then if you need **to darken, lighten or tint, you can use a bit of the white or black**. Mix only what you need and base that on how much you used when you primed your key holder. This colour system is known as the **CYMK system where K stands for black**. If you were to mix equal amounts of cyan, magenta and yellow together, theoretically you would get black, but actually what you get is a murky dark brown. For this reason, a separate black pigment colour is added to the system. Inkjet and laser printers generally use the same principle, with the assumption you are printing on white paper.



If you are planning on multiple colours, then you will require more time and have to plan your painting because of extended drying and sanding time required. You probably will go with your base colour first, then your secondary colours. Painter's tape can assist with controlling where the paint is going and give a nice clean and sharp professional edge.

Index of Key Terms and Phrases:

Find ten new key terms or phrases and include the page number in the table below:

	New Key Terms or Phrases	Definition/explanation	From Page #
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Wood Practice is Done!

Submission

There will be two parts to submit, the combined PDF of your filled out common wood machines safety sheets and a small report

Machine Safety Sheets

Machine safety sheets to be completed first with labeled parts, notation, and highlighting, attaching your combined PDF and submitted first prior to being able to demonstrate in shop your safe use of the machines, after the teacher has reviewed and gave a live demonstration for students to follow.

Finished Practice Wood Piece

Create a title page showing the top and bottom of your finished Practice Wood Piece, i.e. the layout side showing your 2 cm guideline name with all of your layout lines and the bottom and edges showing painted colour you mixed and painted on with one coat, turn into a PDF. Combine your title page PDF to this PDF report, showing your key terms filled in, notations, and highlighting done earlier, for a final mark.

Practice and Review Until it Becomes HABIT

Ensure you review this report and your safety sheets regularly, so you are fully aware of the safety concerns and proper safe use of working in the shop, using hand tools, using machines safely, and keep the shop clean and organized until it becomes habit.