

## Processing Wood – Breathing the Air in a Woodshop (3 of 4)

### Avoid Creating a Potential Hazard -- Sawdust

Info in red font is for the benefit of the teacher (notes and ideas for differentiated learning etc). Delete text in red font from the copies that are distributed to students.

In a document / template that is intended to be "filled in" by students for assessment / evaluation purposes, the Version History table can be retained for students to use. Making an improved version is great learning.

#### Version History:

V #	Date	Author	Short Listing / Description of Changes
1	July 16/12	D.B. McCowan	Initial Version -- uploaded to OCTE Safety Portal
2			

## Parts

- 1 Expectations; Introduction; Review; Sample Situation; Hardwood vs Softwood
- 2 Thinking -- Finding Information: Properties of Wood Species
- 3 **Observation and Research - Processing Wood Using Tools; Sanding and Limitations**
- 4 Integrate New Knowledge With Old; Assignment for Marks

### 1 Observation / Research - Processing Wood Using Tools: Teacher Demonstrations

Now that you have your piece of wood and some knowledge of that particular species – including the risks of its sawdust -- you are a little closer to starting your woodworking project. Now, how do you process that rough piece of wood into the product that you want? And what are the hazards along the way?

The teacher will give several demonstrations. He or she will:

1. Chisel (pare and split) and shape using a chisel or gouge
2. Cut straight across the grain using a hand cross-cut saw
3. Cut straight along the grain using a hand rip saw
4. Cut a curved pattern using a keyhole saw, compass saw or coping saw
5. Bore a hole using a brace and bit (auger) and a drill press or hand-drill
6. Plane an edge along the grain and across the end-grain using a hand plane
7. Convert the edge of a small board into a round using a wood-rasp and then a finer file
8. Sand the face of a small board by hand
9. Sand the face or edge of a board using a power sander

In all of the demonstrations, the location of the cut, hole etc. will be pre-planned and measured in order to reinforce precision, accuracy and quality workmanship. Watch the layout process carefully. And be sure to pick up on techniques that yield quality results – and perhaps a few that don't!\*\*

If the teacher is not giving you a constant play-by-play in words during the demonstration, it is because the teacher wants you to watch closely and think very carefully about what he or she is doing – every step of the process. For example, take careful note of where the teacher's hands are placed while doing the work in each demonstration. In what direction is the work being done and why? And beware – the teacher may even deliberately begin to show you something that is wrong!\*\* He or she will be waiting patiently for you to say something! Speak up and show your critical thinking skills! Did the teacher turn on the ventilation / dust extraction system ahead of time?

Listen and watch for the following general principles of tool usage. Regardless of the tool being used, careful measurement ahead of time, clear markup, having good control over your tool, and using proven techniques are paramount to your success. Ahead of time all tools must be verified to be properly sharpened. Wearing full eye protection is an absolute must (including side-shields). Clean up thoroughly after your task (bench, floor and tools) and dispose of waste material according to the shop policy.

While nature is wonderful and nature produces a near-perfect building material – wood – knots are a discontinuity which upset the consistency and near perfection of a piece of wood. Beware of knots in any woodworking that you do. Your safety while cutting and carving and the safety of others after you build a timber structure will depend on your detailed attention to knots.

You will be assessed on how much you learned during these demonstrations. So, pay close attention to what the teacher is saying and doing -- and take notes.

<b>Differentiated Learning Ideas</b>	
<b>Abbrev</b>	<b>Description / Notes</b>
<b>DL-L</b>	<p><b>For students with lower abilities.</b></p> <p>-Give these students all of the cell-data that you want them to have in terms of sawdust creation.                      -Have them add another column so that they can sort the rows according to which tools create the most significant wood residue hazard.</p>
<b>DL-M</b>	<p><b>For students with moderate / mid-range abilities. This should generally be the default, always involving some level of critical thinking.</b></p> <p>-Delete the cell-data for the tools / processes that you want the students to concentrate on and have the students fill in all of the missing data during the demonstrations. They should also sort the rows according to which tools create the most significant wood residue hazard.</p>
<b>DL-H</b>	<p><b>For students with higher abilities or, ideally, "for any students who want to do more".</b></p> <p>-For selected rows, do not delete the cell data in columns 1, 2 and 3. For these rows delete the cell data in columns 4 and 5. Allow these students 15 minutes before the demonstrations begin to fill in data for column 4 and 5 just by imagining – thinking critically about – the associated risks. Then, during the demonstrations, they can improve their risk data entry for these selected rows.</p> <p>-For the remainder of the rows, delete all of the cell data. These students should be able to fill in most cells in the table just by watching the demonstrations and by using their critical thinking skills.</p>

**Notes to Teacher:**

The main point of the table below, in the context of this lesson on sawdust, is the far right-hand column 5. If columns 2, 3 and 4 have been addressed previously in the course, they may be omitted from the table. The teacher may choose to not demonstrate some of the tools / processes, focusing only on those tools / operations that create the most sawdust, for example. Before printing or distributing the table to students, sort on the Process column alphabetically to ensure that the wood residue risks column is fairly random. Refer also to the Differentiated Learning Ideas above.

<b>1 Process</b>	<b>2 What is Happening to the Wood</b>	<b>3 A Few Selected Best Practices</b>	<b>4 Risks – the Tool</b>	<b>5 Risks – the Wood Residue</b>
Split	Spread long fibres away from each other with large impact	Keep your eye on the work that the wedge or chisel is doing – meter the mallet swing accordingly. (Examine this wording very critically. There is an easy way to distinguish the amateur from the expert user of a chisel)	Using a mallet to strike the wedge – mind you don't crush a finger or hit your hand. Do not pound on any chisel that has a mushroomed head – ask the teacher to take the chisel out of service until the head is fixed.	Depending on the intensity of the blow, sharp chunks of wood can be thrown many feet, spinning as the fly, possibly toward the face.
Pare	Slowly remove thin shavings, one at a time	Take a shearing cut so that one end of the cutting edge leads on a modest angle.	Serious cuts, severed fingers.	The shavings of wood are large and practically harmless.
Carve / Whittle	Slowly remove only relatively small pieces of wood, one at a time	Move the blade away from your body parts.	Serious cuts, severed fingers	A small chunk of wood, at a final cut, could pop out and fly several feet, possibly toward the face.
Cross-cut	Slowly smash across the long fibres of wood	To avoid surface splintering, use a sharp knife and straightedge to cleanly cut the outermost fibre layers. Saw just very slightly on the waste side of the line. To start the saw-cut, use the thumb of your free hand to steady and guide the blade and take several slow strokes. Slow down and back off on applied force near the end of the cut.	Cuts to hands, legs and feet. Severed fingers.	The sawdust particles are relatively large and, when cutting is by hand, accumulate slowly. When power-cutting (ie not by hand), particles can enter the eye.
Rip	Slowly break long fibres away from each other	Support the cut-end with another saw-horse. To prevent	Cuts to hands, legs and feet. Severed fingers.	The sawdust particles are quite large and, when cutting is by hand, accumulate slowly. When power-

**OCTE Safety Portal – Technological Design Skills (TDJ20)**

**Date** \_\_\_\_\_

**Portfolio For** \_\_\_\_\_

**Page** \_\_\_\_\_

<b>1 Process</b>	<b>2 What is Happening to the Wood</b>	<b>3 A Few Selected Best Practices</b>	<b>4 Risks – the Tool</b>	<b>5 Risks – the Wood Residue</b>
		binding, use a thin piece of wood to wedge the waste part away from good part.		cutting (ie not by hand), particles can enter the eye.
Curved cut	Slowly smash across the long fibres or break the long fibres away from each other	Use the narrower part of the blade for the sections of curve with smaller radius and be more gentle with the tool.	Cuts to hands, legs and feet. Severed fingers.	The sawdust particles are finer (depending on the saw type) but, when cutting is by hand, accumulate slowly. When power-cutting (ie not by hand) particles can enter the eye.
Brace / Bit (Auger)	Slowly break off curved slices	With your fingernail, clean out the threads of the feed screw before starting the hole. Use a piece of scrap wood as a backing to prevent tearing as the bit breaks through.	Punctured skin Do not use a power drill with a large auger bit. The torque can be so high that the bearings in a cheap drill can be damaged.	Curled shavings are large and practically harmless when using the brace by hand. Nonetheless if you are drilling overhead, put a mask on.
Drill	Quickly break off mid-sized particles	If the purpose of the hole is to tighten a wood screw, be sure to make the hole somewhat smaller than the shank diameter of the screw. (Difference depends on the screw and the wood species.)	Punctured skin	The sawdust particles are fairly large and, when drilling is by hand, accumulate slowly. Particles can enter the eye.
Plane	Very slowly remove thin slivers	Take a shearing cut (at an angle to direction of travel)	Cuts to skin	The shavings of wood are large and practically harmless.
Rasp	Slowly break off large particles	Use slow determined strokes in an angular forward direction.	Abrasions to skin	The sawdust particles are large and accumulate slowly. A finer file will generate finer sawdust particles. Particles can enter the eye – don't clean off your workpiece by blowing in the direction of someone's face.
Hand-sand	More quickly break off small to extremely small particles	Sand only in the direction of the grain using a padded sanding block on flat surfaces.	Abrasions to skin	Particles can enter the eyes, ears and lungs and irritate the skin. The finer the particles, the deeper they can go into the respiratory system.
Power-sand	Very rapidly break off small to extremely small particles	Be sure to tightly attach the dust-collection bag. Finish off with a light hand-sand in the direction of the grain	Abrasions to skin Severed toes and fingers	Particles can enter the eyes, ears and lungs and irritate the skin. The finer the particles, the deeper they can go into the respiratory system.

## 2 A Near-Final Process for Aesthetics – Sanding and Limitations

Ok, so you've followed the teacher's detailed instructions and you have carefully used a sharp woodcarving knife to carve – whittle, more correctly – a simple shape. But wait, there is this fundamental concept of technology called “aesthetics”. And -- for reasons that you had explained in your Requirements document -- you want your carved object to be smooth before you apply a finish.

So some sanding is required – but don't overdo it. For a school project, going as fine as 200 grit sandpaper is probably smooth enough. After all, the finer the sandpaper grit, the finer the dust particles and the farther they can travel into your respiratory system. Wear a good respirator when sanding with grit paper this fine.

### 2.1 Recycled Materials – *There will also be another lesson on this matter...*

If you are working with recycled or salvaged wood materials -- such as flooring for your picture frame -- it becomes even more important to have improved local dust collection / ventilation and certified personal protective equipment. If the old floorboards have an old finish on them, that old finish could add to the story of your picture frame. But if you insist on removing the old finish, approach the problem in the following order:

1. consult with the teacher and be prepared to discuss the pros and cons of your proposed finishing procedure
2. scrape off the large loose pieces and dispose of properly by contacting the municipality
3. use a non-toxic chemical paint stripper outdoors (follow all instructions; use personal protective equipment)
4. use a heat gun outdoors and scrape off loosened finish material (follow all instructions; use personal protective equipment) (but not advisable for lead-based paints)
5. hand-sand outdoors (follow all instructions; use personal protective equipment) (but not advisable for lead-based paints)

It should be a requirement to wear a tight-fitting certified respirator that has a charcoal filter cartridge to remove organic vapours such as from solvents and finishes. It should also be a requirement to wear the manufacturer-recommended chemical resistant gloves. Use a paint / varnish remover outdoors.

## 3 Peer Assessment

NOTE: In the feedback, the Peer Assessor must “make the student think” – not give the student the answer! Be sure to include comments justifying the assessment value that you are giving. Peer Assessor must put his / her comments in **red** font. Hand in both your version 1 with peer comments and your improved version 2.

**Assessor's Name and Additional Notes:**

**Go to Part 4: Integrate New Knowledge With Old; Assignment for Marks  
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