T W O R O C K
SCHOOL OF WOODWORKING

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Bandsaw Set Up and Tuning

Evening Lecture with Mark Tindley - 19th October 2022

Basic set up

This is the sequence we recommend for setting up a poorly performing or used bandsaw:

(the remainder of this handout goes through these items in more detail)

1. Lower the top wheel to take the tension off and then remove the blade.
2. Take the table off.
3. Check the condition of the tires (renew/replace as necessary).
4. Spin the top wheel by hand and make sure it is free running (if not you probably need to replace the bearing).
5. Turn on the saw (with no blade installed) and make sure the bottom wheel runs freely and quietly. While it is running carefully hold a piece of wood near the perimeter to observe that it is running true and not wobbly or twisted.
6. Align the wheels to each other with a straight edge (may need to shim out the top or bottom wheel with washers or a shim kit).
7. Check that the upper and lower blade guides are in good condition (renew/replace as necessary).
8. Check that the thrust bearings are in good condition (renew/replace as necessary).
9. Check that the tension adjustment knob runs freely (may need to lubricate or use a tap and die set to renew threads).
10. Re-install the table.

11. Make sure the table alignment pin isn't missing (and replace it if it is).

12. Wax the table and fence (we use standard furniture paste wax).

13. Make sure the table insert / throat plate is flush with the table (there may be adjustment screws for this or you may need to get creative).

14. Install a new blade and set the tension correctly.

15. Adjust the tracking (top wheel alignment) so the blade runs true.

16. Set the 90 degree stop for the table (so the table sits exactly perpendicular to sides of the blade).

17. Check that the table sits exactly perpendicular to the back of the blade (if not this is harder to correct - you will probably need to shim between the table and the trunnions).

18. (With a blade installed) check the guide post that holds the upper guides - it should remain parallel to the blade at the top and bottom of travel (there is frequently no easy fix if it does not and you will need to be creative or accept that you'll always have to adjust the guides according to the height of the upper guide assembly).

We also recommend that you consider the following tweaks and upgrades

- Install a brush to clean the lower wheel as it spins

- Use the best dust collection that you can

- Replace old or worn belts between the motor and lower wheel.

- If the table insert / throat plate is worn replace it with a new one (a big gap between the blade and the plate can cause pieces to get stuck during a cut - this can cause a blade to break).

- Upgrade to a higher tension spring (especially for smaller, less expensive saws)

Tire set up, maintenance and re-surfacing

Bandsaw tires are normally made of rubber or urethane.

Cracked, flaking, damaged or worn out tires should be replaced.

Sometimes tires need to be glued onto the wheel. If you can, get self-crowning snap-on tires (like giant rubber bands). These are much easier to install and normally need no adhesive.

Bandsaw wheels and/or tires are normally **crowned** (they are curved not flat). Sometimes only the top wheel is crowned. Crowning helps blades stay tracked on the wheel.

You may need to use an abrasive or other method to add a gentle crown to a new tire.

Keep your tires clean. Sawdust gets trapped between the blade and the wheels and gets compressed onto the tires. An excessive build up will cause poor performance. We recommend gluing some 80 or 100 grit sandpaper to a stick and using that to re-surface dirty tires. Always remove the blade before you clean the tires. The bottom tire is easy - with no blade installed just turn on the machine and clean up the tires. The top tire needs more work - we recommend getting someone to spin the top wheel for you with a small abrasive disk or sanding drum in a cordless drill while you do the re-surfacing with the abrasive-on-a-stick.

Removing and installing the blade and setting the blade guides and thrust bearings

There are two sets of guides on a bandsaw - 1 above the table and 1 below it. You normally set both the same way. The advice in this section applies to most saws and blades though, of course, some variation may be needed on occasion.

Remember that you need to re-do this every time you put a new blade on.

There are many different types of guides (roller bearing, ceramic, cool block, hard wood, metal, etc). These guidelines apply to all of them.

The **blade guides** prevent side to side movement of the blade during cutting.

The **thrust bearings** prevent the blade from being pushed back too far during cutting.

The sequence we recommend is as follows:

1. Back off all 4 guides and both thrust bearings so they are well clear of the blade.

2. Lower the top wheel so there is room to get the blade on.

3. Remove the pin that aligns the table.

4. Remove or temporarily adjust any door or guard that gets in the way.

5. Put the new blade on the saw with no guides or thrust bearing near the blade, set the appropriate tension (raise the upper wheel) and get it tracking properly.

6. Bring the upper and lower guide assemblies forward till the guides are about 1/32" behind the back of the gullets of the blade (the gullet is the curved area behind the teeth). Lock the guide assemblies into place.

7. Set the 4 guides so that they are about a piece of papers thickness (approx 0.004 of an

inch) away from the blade (you can use a piece of paper to do this). Lock them into place.

8. Spin the top wheel by hand and observe what happens. If the guides are too close they will grab the blade and make it hard to turn it.

9. Bring the 2 thrust bearings forward so that they are about a piece of papers thickness (approx 0.004 of an inch) away from the back of the blade (you can use a piece of paper to do this). Lock them into place.

10. Spin the top wheel by hand again and observe what happens. The thrust bearings should not be spinning at this point. They are only designed to spin while you are cutting. Back off the thrust bearings as necessary.

Once you are happy that the blade is running nicely you can reinstall all the guards, close the doors and turn on the saw to check all is well.

Blade tracking - where should the blade sit on the wheel?

The tracking of the blade is adjusted by changing the angle of the top wheel using the built in adjustment. The lower wheel always remains in a fixed position.

If the top wheel is tilted too far forwards or backwards the blade could come entirely off the top wheel. Alternatively, the crown in the wheel will be fighting against this tendency and the blade will keep moving from the center of the wheel towards one of the outside edges and back again. Neither of these is a good thing.

You need to set the tracking so that the blade sits still on the top wheel without moving forwards or backwards. It is normally easiest and safest to do this by unplugging the saw, turning the top wheel by hand with the door open and adjusting the tracking as you manually spin it.

You should aim to keep the back of the gullet as close as possible to the middle of the wheel and make micro adjustments till the blade stays still. Blades 3/4" and wider often need to sit further forward than this (either because the thrust bearing can't go back far enough or because the blade is too unsupported at the back of the wheel).

Commissioning a new blade

Your bandsaw needs to be set up again every time a different blade is installed. We recommend commissioning a new blade as follows:

- Clean the blade with a cloth to remove oil and dirt left over from the manufacturing process.

- Use a **blade tuning stone** or file to even out the weld (if necessary).

- Use a **blade tuning stone** to lightly round the back of the blade. This is done carefully while the saw is running. A light rounding to the back of the blade increases the life of the thrust bearings, reduces breakages due to blade fatigue and allows tighter radius cutting. Make sure to vacuum or blow out the inside of the saw first because sparks from the rounding can ignite sawdust.

- Set the rip fence to match the drift of the blade (see below)

Setting up the rip fence and dealing with blade drift

This is a controversial topic - some people will tell you that blade drift is a myth. But we do find that different blades cut at slightly different approach angles. In other words, the rip fence must be set to run parallel to the actual blade you have installed.

There are inexpensive clip on tools that can help with setting up for blade drift - you just clip them on and they 'point' in the direction the rip fence needs to be set. Such a tool may work for you but we don't use them. Instead, we do this....

- Mark a line parallel to the edge of a square and flat board

- Cut about 10" into this board by eye making sure to stick to the line and then carefully stop feeding the board and turn the saw off. Do not let the board move or rotate.

- Clamp the board to the table in the exact position it was at the end of the cut.

- Bring the rip fence along side this board and use the (hopefully) built in adjustment to angle the fence appropriately. The rip fence should be in alignment with the board you have clamped.

Blade length

This information is always in the manual for the saw and frequently on a plate attached to the machine. Once you have the number write it in inside the top door of the machine with a Sharpie.

Some manufacturers specify a range of blade lengths for a particular bandsaw. In general, the shorter lengths are a safer number to order at. Wide blades ordered in the upper-range of a stated length may not get to a high enough tension before the upper wheel tops out.

Blade width

The most common widths for standard wood cutting bandsaws are 1/8", 1/4", 3/8", 1/2", 5/8", 3/4", 1" and 1-1/4".

The **narrower** the blade width the **tighter** a curve you can cut.

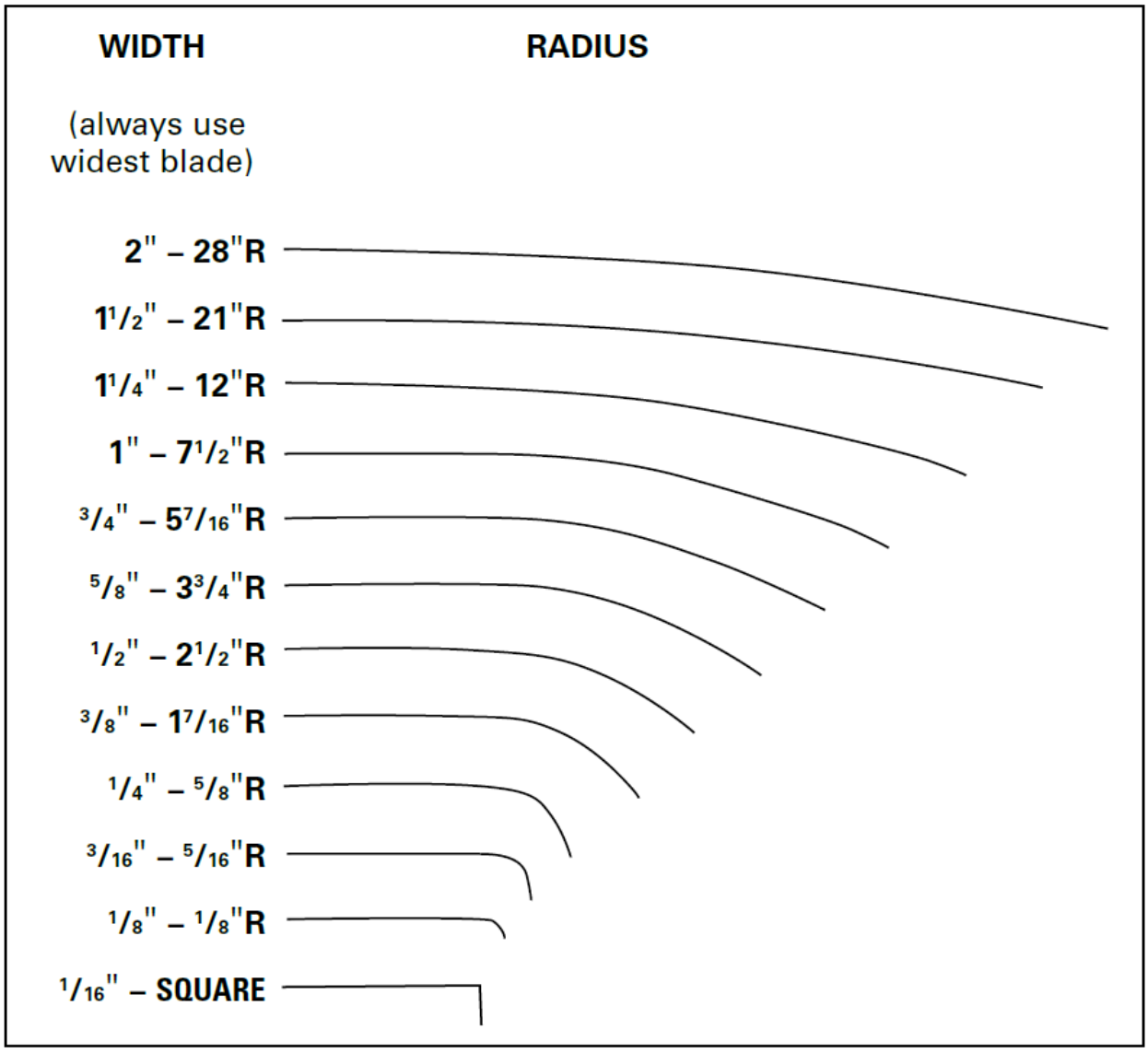
The **wider** the blade width the **more accurately it should cut straight**.

If money is tight and you can only have one blade it should be 1/4" wide. This blade can cut reasonably tight curves and also cut reliably straight lines in stock up to about 2" thick.

If you are only cutting straight lines (like for re-sawing or joinery) then the widest blade your saw can fit should work best. But be careful - smaller 14" bandsaws can often take blades up to 3/4" wide but have trouble getting adequate tension at that blade width. You may find that a 1/2" or even 3/8" blade works better simply because you can get a higher tension.

This table (provided by Lennox) tells you the minimum radius you can cut with the common blade widths.

MINIMUM RADIUS FOR WIDTH OF BLADE



Blade thickness

Blade thicknesses are stated in thousands of an inch and generally vary from 0.020" (narrow kerf) to 0.035". There is no particular advantage to a narrow kerf blade unless you are cutting veneers from premium stock and need to increase the yield.

Carbon tipped blades are normally thicker than carbon steel or bi-metal blades (see table below for the differences)

What blade type do I need?

There are are baffling array of bandsaw blade types and a discussion of them all is well beyond the scope of this handout (we also don't know what half of them are!). Many of them are relevant only to the cutting of metals - not wood.

The main considerations are:

Blade type	Description	Notes
Carbon Steel (Hard back)	A one piece blade made of carbon steel with a hardened tooth edge and hardened back	These are the the cheapest blades. They also dull the fastest and are prone to overheating. They work well for soft woods and thinner materials. If you want blades narrower than 1/4" they may only be available in carbon steel.
Carbon Steel (Flex back)	A one-piece blade made of carbon steel with a hardened tooth edge and soft back	
Bi-Metal	High Speed Steel edge welded to a spring steel backing (for a combination of cutting performance and fatigue life)	These cost more than Carbon Steel blades but are almost always better value because they last about 10 times as long. If you're cutting very hard or tropical woods this is the minimum standard of blade you will need.
Carbide tooth / carbide tipped	A steel blade with carbide teeth brazed on. The teeth are normally a tungsten and cobalt alloy.	These are by far the best blades you can buy and excel for re-sawing - but at a cost. They last about 40 times longer than carbon steel. They are only available in 3/8" and wider.

How many teeth per inch (TPI) do I want?

For many bandsaw users this is the most confusing question of all.

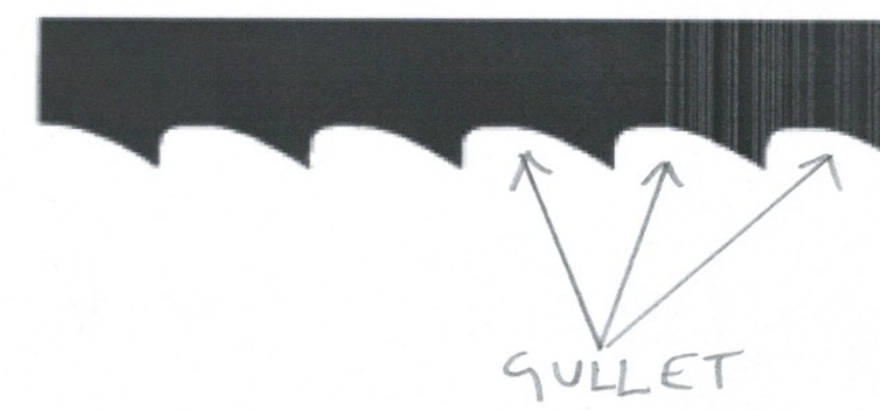
Most woodworkers know that **finer saw blades with more teeth** produce cleaner surfaces that need less sanding....and that **coarser saw blades with less teeth** produce rougher surfaces that need more sanding.....

...but when it comes to bandsaw blade selection there is a lot more to it than that.

We find that most new bandsaw users think they need a fine blade with lots of teeth per inch and that those coarser blades must be just for cutting up rough timber. This is false. The reason why is **chip clearance**.

When a bandsaw blade is cutting wood it is making chips or sawdust - and that waste material needs to be removed from the cut at least as fast as the cut is being made. If the waste is removed slower than the cut is being made then the dust builds up on the blade, gets trapped between the blade and the cut and leads to poor cutting performance - or worse (think blade breaks, wandering blades and all manner of horrors).

So what moves the waste material from the cut? **The gullet.**



The gullet is there to collect the chips and sawdust and pull it out of the cut. The bigger the gullet the easier it can move the waste out of the cut. So how do you get a bigger gullet? The answer is.....**you need fewer teeth!**

This is why you normally need a coarse blade to cut thick stock. By coarse we mean no more than 4 TPI (teeth per inch). Less is even better.

A standard re-saw blade has between 1 TPI and 4 TPI.

Our bandsaws that are set up for re-sawing use the Lennox Woodmaster CT (carbide tipped)

blade that has 1.3TPI.

Most woodworkers have more use for coarser blades with fewer teeth than finer blades with more teeth.

You do want finer blades with more teeth for cutting thin materials (like 1/4" thick MDF for templates) because they leave a finer surface. There is not the urgency to remove lots of waste from the cut. You'll find that anything between 4TPI and 14TPI will work well in that application.

On a wood cutting bandsaw you can also cut sort man-made materials like acrylic, aluminum, copper and brass. To do this you'll want a finer blade with more teeth - something like 14-18TPI to do it safely and cleanly. It will also dull the blade a lot faster than wood so you'll want a dedicated blade for that purpose.

What Tooth Form do I need?

The 4 main tooth forms you will find are shown below:

Name	Description	What it looks like
Variable	Rather than having a set number of TPI (teeth per inch) a variable blade has a certain number of teeth in one section followed by a different number of teeth in the next. For example a variable tooth 3/4TPI blade (which is very common) has 3 TPI followed by 4TPI followed by 3TPI followed by 4TPI, etc This tooth pattern can cut down on noise and vibration.	
Standard	Nothing special going on here....just a good general purpose blade.	
Skip	A blade with a specifically wide gullet. Ideal for re-sawing (see section above). Named because the wide spacing between teeth makes it look like a tooth was skipped each time.	
Hook	Very similar to a skip blade (see above) but with a slightly different geometry that produces discontinuous chips.	

You may also notice that the **set** of the blade is part of a blade specification. The set refers to the angle and method by which the teeth are bent away from the blade to create the **kerf** (the width of the actual cut).

There are many different types of set - raker, vari-raker, alternate, wavy, and more. Interesting as this may be you will almost certainly not find it helpful to pick one or the other when choosing a blade for wood cutting - we leave that one to the experts.

Setting blade tension

All band saw blades need to be set to a certain tension. The higher you move the upper wheel the greater the tension will be.

Never adjust the tension while the saw is running.

Most bandsaws have some sort of built in device for setting the correct tension - almost always based on blade width. To begin with you should use this guide and see if it works for you.

Tension that is too low is a big culprit in poor performance. **Flutter** describes what happens when a blade is installed with the tension too low. The blade will move rapidly from side-to-side between the upper and lower guide assemblies.

If the built in tension gauge on your saw doesn't appear to be reliable - or you can't trust it - there are 2 main options:

The expensive option

Buy a tension meter. These clip onto the blade before you start applying tension and then show you how many PSI (pounds per square inch) you are applying. You'll probably want a readout in the 15,000 to 20,000 PSI range but you should refer to the blade manufacturers specifications.

The cheap option

Just crank up the tension! It is theoretically possible to over-tension your blades. Doing so can cause premature fatigue or blade breakage. It could also damage your saw if you try and apply more tension than it was designed for. But in our experience the majority of consumer-grade bandsaws have woefully inadequate tension to begin with. That is why we recommend upgrading the springs whenever you can.

Experimenting with modestly higher tensions is unlikely to do any real harm and very likely to fix the problems you may be experiencing.

Some people like to measure blade deflection to check blade tension but this is not a method we teach. We recommend 'plucking' the back of the blade like a guitar string and listening to the note it produces. A very low pitch almost certainly means the tension is too low. A very high pitch may mean the tension is too high. Something in between is what you are after. This will seem like very vague advice for many of you...and you'd be right - the pitch is affected by blade width too!....but unless you're going to use a tension meter it's the best we can offer until you gain more experience.

Tension when the saw is not in use

When the bandsaw is not in use for an extended period it is good practice to release the tension on the blade. This reduces metal fatigue on the blade and potential flat spotting of the tires.

Many people never ever let off the tension on their bandsaws and seem to get away with it. If you have a saw with a quick tension release we certainly recommend using it (and making a sign that you place on the saw to remind you not to turn it on before you re-apply the tension).

Feed rate - slow and steady wins the race

Another big culprit in poor bandsaw performance is feeding the stock too fast. New bandsaw users almost always feed the wood too fast.

Thinner, softer pieces can be fed faster than **thicker, harder** ones.

Too fast means that the chips and sawdust can't be cleared from the cut as quickly as you are trying to go (see the section on TPI above for more about this). If you see the cut full of sawdust at the end of the cut you were going too fast.

Too fast also causes **overheating** of the blade which will drastically reduce it's life - it will both dull and break sooner. On carbon steel blades you may see the teeth change color - that's normally because you went too fast and the overheating softened the teeth.

Only experience will tell you the optimum feed speed - you need to feel the cut (how much resistance is there?) and listen to and watch the saw.

Feeding wood too slowly is rarely a problem - but you do need a **constant feed rate**. In other words, once you start cutting do not let up on the pressure - if you stop pushing the wood into the blade at any point you will notice that the cut quality suffers in that section of the work piece

Cleaning the blade

Dirty blades cut poorly. Gum and pitch are the main culprits - they stick to the blade and collect sawdust.

Resinous woods (like pine) are notorious for gumming up bandsaw blades. You can reduce the likelihood of this by **lubricating the blade** with something like the Lennox Lube Tube (it's like making the blade non-stick).

You can clean a modestly dirty blade with a stiff brush (a small brass one works best) while the blade is on the saw (unplugged, of course!). Just rotate the blade by hand until you've

done the whole thing.

A better method, and essential for really dirty blades, is to remove the blade and use a commercial blade cleaning product. We like CMT blade cleaner but any high performance detergent will work. Oven cleaner works well too. Whatever you use, spray it on, wait a few minutes, then brush hard with a stiff brush. Clean the detergent off with water, dry the blade and re-install it.

Safe working practices

The bandsaw is one of the safest power tools in the shop. But accidents still can and do occur.

Never operate the bandsaw without wearing **safety glasses**.

Always have the work piece flat on the table. If you try and cut in mid air the work piece may be grabbed from your hand and violently slammed into the table. You'll almost certainly break or twist the blade and ruin the work piece You'll also either be injured or have given yourself a hell of a scare. Renowned furniture maker, Sam Maloof used to freehand all sorts of shaping cuts in mid-air - just accept that he was a genius and do not try and emulate him.

Don't have too much blade exposed. Adjust the guide post so that the upper guides sit just above the work piece (or just above the rip fence if it's close to the blade). As well as being safer you'll also get a better cut since there is less chance of the blade wandering between the guides.

If you feel your hands getting too close to the blade - stop what you are doing. Use push sticks or other holding devices to get the job done (hand screws work well for smaller pieces).

Because the forces are downwards towards the table you can stand wherever is most convenient to complete the cut. This means you can both **push** the work piece through at the start of a cut and **pull** it through at the end.

Consider using **feather boards** to hold work against the rip fence. This takes longer to set up than just using your hands but is always safer and normally produces more accurate cuts.