

The thickness planer is an essential tool for milling wood. It will quickly and accurately give you a second flat face, parallel to the jointed face.

Flat, Straight and Square

Simple milling sequence yields true stock

by Peter Korn

If wood were a stable, homogenous, man-made material like metal or plastic, how much simpler the woodworker's task would be! Instead, we pay a price for our love of natural beauty. We work with a biological medium that reacts continuously to the environment, changing dimension and shape as it breathes moisture in and out.

If you've ever attempted to dovetail cupped boards or to build a frame-and-panel door from bowed lumber, you know how frustrating it is to work with poorly prepared stock. Fine craftsmanship occurs one step at a time, and the first step is preparing (milling) stock foursquare—straight, true and accurately dimensioned.

Boards are almost never flat enough to use directly from the lumberyard. Even S2S (surfaced two sides) lumber is milled only with thickness planers, which create boards of uniform thickness but do little to iron out cup, bow or twist. In any case, wood's propensity for continuous movement dictates milling only when you're ready to use it. Stored wood will often warp between milling and joinery.

I begin every project with a cutting list specifying the exact measurements of all the parts, including allowances for tenon length. If there are curved parts, I usually mill foursquare blanks and then bandsaw the curves later. Before cutting, I lay out the location of each part on the rough lumber with chalk or a crayon, trying to minimize waste and make the most attractive use of grain. Laying out the parts right on the milled stock also prevents embarrassing mistakes.

When the cutting list calls for several parts of the same dimension, you must weigh time against conservation of material. It takes less time to mill long pieces to thickness and then cut shorter parts from those long boards than it does to crosscut smaller pieces and then mill them. Longer boards tend to be more twisted and/or bowed along the length of their faces. If you mill a long board whole, however, you'll lose more material in making it flat than if you'd cut it into shorter rough blanks. The right approach is always a judgment call, depending on how straight your rough lumber is and how much thickness you have to spare between rough lumber and the dimension of your finished stock.

When I cut rough lumber into blanks for milling, I leave the blanks at least $\frac{1}{4}$ in. wider and 1 in. longer than the final pieces I'll need. I crosscut to rough length with a radial-arm saw, circular saw or handsaw depending on what's handy and where I am. For the initial rip to rough width, I prefer the bandsaw (see the top photo) because it's quieter, less dust-producing and safer than the tablesaw. Where the cups, bows and twists endemic to rough lumber increase the likelihood of tablesaw kickback, a bandsaw purrs right on through. I bandsaw by eye to the lines I have marked.

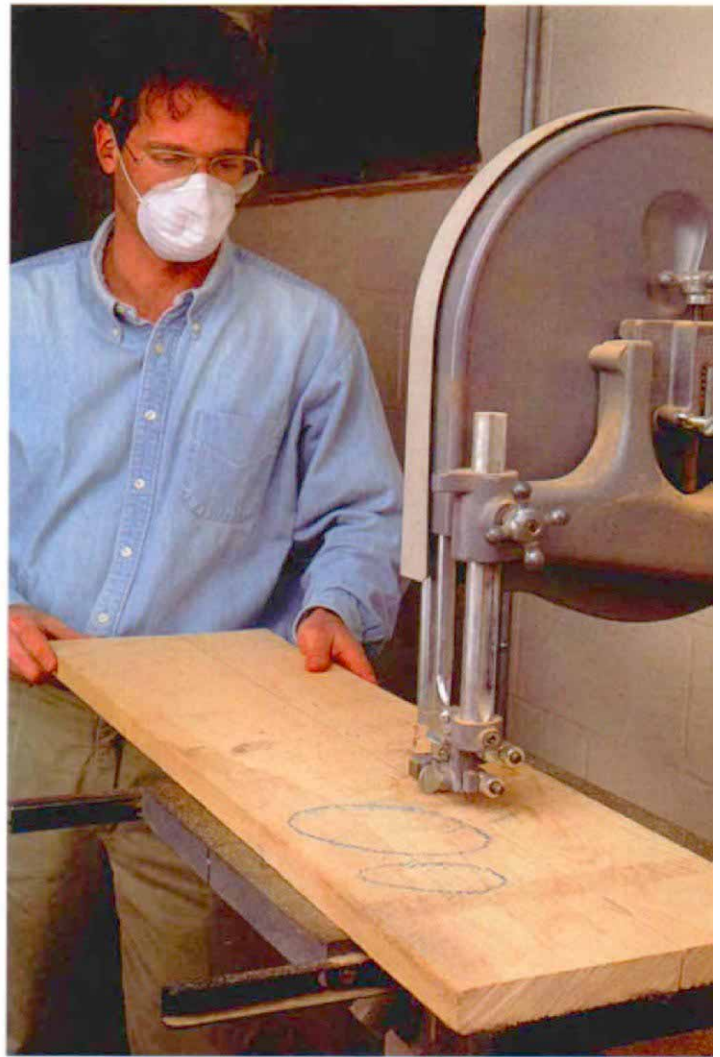
If you prefer to rip rough lumber to width on the tablesaw, make sure the edge against the rip fence is straight. If it's not, run it over the jointer first.

Six steps to foursquare stock

These are the steps I use to prepare stock from rough lumber:

- Step 1: Flatten the first face of the board.
- Step 2: Make the second face of the board parallel to the first face at the desired thickness.
- Step 3: Square an edge. (Steps 2 and 3 are often reversed.)
- Step 4: Rip the second edge square and to the desired width.
- Step 5: Cut one end square.
- Step 6: Cut the other end square and to length. (Usually, I leave stock an inch or so long until the joinery is cut.)

Before power tools existed, the entire milling process was done exclusively with hand tools, but milling is one job that machines



Ripping rough stock on the bandsaw is far safer than on the tablesaw because there's no danger of kickback if a warped or twisted board shifts as it's going through the blade. The author rips to about $\frac{1}{4}$ in. more than finish width to allow for jointing an edge and then ripping parallel to that trued edge.



The first step in stock preparation is to create one flat face, which becomes the reference face. So long as your jointer's capacity is greater than the width of the board you need to flatten, it's a quick operation. Whenever you joint, maintain pressure on the outfeed table just past the cutterhead. Always use a push stick.

Flattening the face of a board with a handplane

Like most other woodworking skills, handplaning wide boards is daunting only until you give it a serious try. All you need are one or two well-tuned planes, some elbow grease and a couple of days of practice.

The two planes I use are a scrub plane and a bench plane. The bench plane alone would be sufficient, but the scrub plane saves time and effort by removing wood quickly from seriously cupped boards. Scrub planes are made for rough work, and there is no trick to tuning them beyond sharpening the curved blade.

A bench plane is a more precise instrument, which requires greater attention to get optimum performance. The sole should be flat and polished, the blade sharp enough to shave with and the frog adjusted by trial and error for the best result. (For more information on choosing and tuning bench planes, see *FWW*#99, pp. 67-71.) Bench planes come in a wide range of sizes. For flattening boards, I prefer a 14-in. jack plane, but I know other woodworkers who like

to work with a longer, heavier plane, such as a 22-in. jointer plane.

To set up for planing, I clamp the work on a flat benchtop, making sure that nothing extends above the board's surface. A bench with dogs and a tail vise is best, but you can also wedge a board between stops that are either clamped or screwed to the bench. I usually place the convex side up, so the board sits securely on the bench. Also, I find it easier to take down a center hump than to attack raised edges.

Using winding sticks and a long straight edge, I locate and mark the board's high spots and determine the degree of twist. Winding sticks are simply sticks of uniform width placed across each end of the work, parallel to each other. Sighting along their tops reveals the exact degree of twist in a board, as shown in the bottom left photo below. Once I've marked all high spots with a pencil, it's time to plane.

I set my scrub plane's blade so that it protrudes about $\frac{3}{16}$ in. beyond the sole. I plane diagonally across the grain in parallel strokes, removing wood quickly and

minimizing the chance of severe tearout, which would most likely occur if I went with the grain. Then I go back and plane on the opposing diagonal until I've covered the board (see the top left photo below). If I didn't have a scrub plane, I would begin flattening the board by using the jack plane in the exact same manner, but the process would just take longer.

When the work is more or less flat across, I switch to my bench plane, planing with the grain along the length of the board (see the photo at right below). I check for cup, bow or twist every once in a while and again mark any high spots with a pencil. It's important to avoid planing low spots because they'd just become that much lower. If my plane starts to make dust instead of shavings, I sharpen the blade. I find that rubbing paraffin on the sole of a metal plane cuts down on friction tremendously.

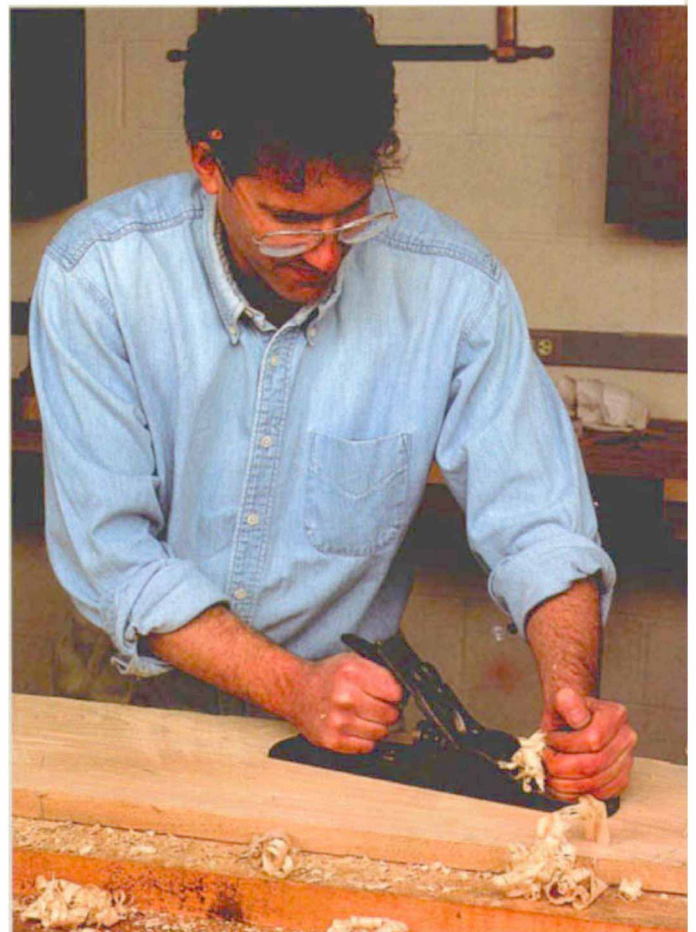
My straightedge and winding sticks tell me when a board is flat, but it's evident, too, when I'm able to take long, lovely shavings over the full length of the board. —*P.K.*



A scrub plane makes quick work of high spots on the rough board. Korn planes across the grain diagonally to prevent tearout and then planes on the opposing diagonal, removing the ridges created with the first passes. A bench plane is the next step.



Sighting along winding sticks tells the author that the board doesn't twist. He also uses a long straightedge to check flatness along and across the board's length.



Taking a bench plane and planing with the grain, Korn takes out the scrub plane's marks and smooths the face of the board flat, readying it for the thickness planer and further milling.

do much more efficiently than hand tools with no sacrifice in quality. Generally, I joint the face of a board and square a perpendicular edge (steps 1 and 3) on the jointer, plane the board to thickness (step 2) with a planer, and rip the board to width and crosscut it to length on the tablesaw (steps 4, 5,6). If I have to flatten the face of a board wider than the 8-in. capacity of my jointer, I'll use handplanes for that step (see the sidebar on the facing page), but I still use machines for the rest of the sequence. If I didn't want to have to flatten a wide board with handplanes, I could rip the board in half, mill each half foursquare and then glue the pieces back together. Handplaning avoids the extra glueline, and it's also one of the great pleasures of working with wood. There's nothing quite like unveiling a board's beauty with a well-tuned handplane, shaving by sinuous shaving.

Flattening the first face

The setting of a jointer is critical to its performance. (For more on using and adjusting the jointer, see "Jointer Savvy" on p. 48 in this issue.) The outfeed table should be set at the highest point of the knives' rotation. A slightly high outfeed table will cause a board to become convex along its length. A low outfeed table causes snipe—the rear end of a board drops as it leaves the support of the infeed table, making the last few inches thinner.

The height of the jointer's infeed table determines the amount of wood removed with each pass. Take thin passes to reduce the possibility of tearout as well as wear on the machine. I never take off more than $\frac{1}{16}$ in. per pass.

Whenever you joint or plane wood, you should check grain direction and ensure that you cut with the grain to avoid tearout. Where the grain is contrary, feed wood slowly and steadily and be sure the knives are sharp. *Always* use a push stick when using the jointer to flatten a face, so your fingers don't pass right over the cutterhead (see the bottom photo on p. 75). If a board is cupped and/or bowed—as most are—joint the concave side so that the board doesn't rock.

Making the second face parallel to the first

A thickness planer's infeed roller, outfeed roller, pressure bar and knives should be set according to the machine's manual. Also, the knives must be sharp and the table parallel to the cutterhead. I vary the setting of the table rollers in the planer's bed to suit the occasion. If I have hundreds of board feet to plane, I'll raise the table rollers a bit above the bed to help the lumber along. This causes a bit of snipe at the boards' ends as they are lifted by the table rollers, but I live with it because of the time and effort saved. When I want finer, more accurately machined stock, I lower the table rollers beneath the surface of the bed, which I keep waxed to help the boards slide along.

Snipe can occur even with the table rollers lowered. On a planer with an adjustable table and a fixed head, the table may be rocking, in which case the gibs that hold the table in place need to be tightened. On a planer with a fixed table and an adjustable head, the head assembly may need to be tightened in place. Check the manual for your particular machine if you have a problem.

To prevent tearout, thickness plane with the grain as much as possible. If a board has very squirrely grain that has a tendency to tear out, feed the board through as slowly as your planer allows, and take thin passes. Never plane more than $\frac{1}{16}$ in. at a time, in any case, to avoid stress on the machine.

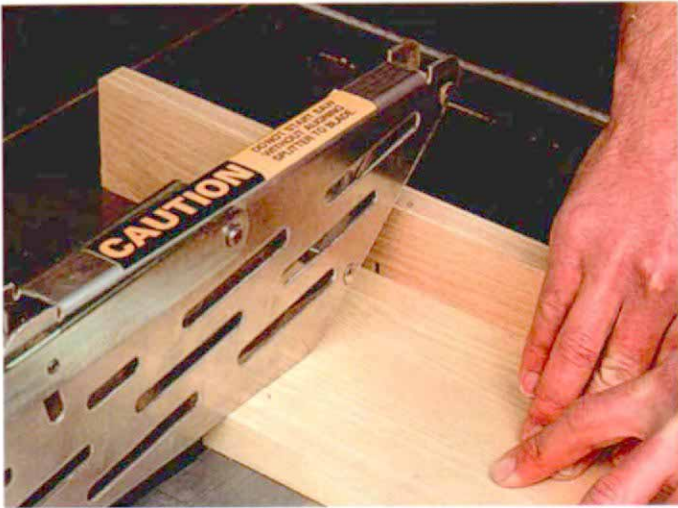
Removing wood from the surface of a board will often upset its internal stress equilibrium and cause the board to warp. To maximize stability and flatness, I often stop planing when a board is between $\frac{1}{16}$ in. and $\frac{1}{8}$ in. from final thickness and let it readjust itself



When jointing an edge, choose whichever edge looks as though it will be less prone to tearout. Make sure the fence is square to the jointer beds and that the face against the fence is snug up against it. As when face jointing, transfer downward pressure from the infeed to the outfeed table as the board passes the cutterhead.



When ripping on the tablesaw, safety should be foremost in your mind. Use a guard, splitter and push stick, and make sure you stay out from behind the board you're ripping: Kickback happens faster than you can react to it.



Crosscutting one end square and the other end both square and to length can be done on the tablesaw with either a sliding table or a miter gauge with a wooden extension fence (below). The author lines up his cutoff mark with the inside edge of the sawkerf in the miter fence, ensuring an accurate cut.



overnight. The next day, I reflatten one face with the jointer or handplane and take the board to final thickness with my planer.

Squaring the first edge

Unless there are other considerations, the first edge I square is the one that can best be cut with the grain (see the top photo on p. 77). Here is where the advantage of flattening both faces before truing an edge becomes apparent because I can now choose either face to run against the jointer fence. I always check the fence for square before jointing any wood, but I usually also make a test pass and check the board with a try square.

Ripping to width

A rip blade in the tablesaw works well for ripping stock to width, but I prefer a combination blade when preparing stock so I won't have to change blades to crosscut the ends. Set the blade square to the table and just a tooth's height above the wood for safety. Then set your fence for the exact width of your cut by measuring from the rip fence to any sawtooth that inclines toward the fence.

There are two schools of thought about rip fences. One holds that the fence should be exactly parallel to the sawblade. The other believes that the fence should tilt a hair away from the back of the blade as extra insurance against kickback. I used to believe it

was best to angle the fence away from the blade, but now I try to get the fence exactly parallel. Whichever you believe, just be sure the far end of your rip fence doesn't angle in toward the blade. At best, the wood will pinch and burn from friction; at worst, stock will catch and fly back at you faster than you can react.

Tablesaws are inherently dangerous, so here are some oft-repeated tips to take to heart: When ripping, keep the board firmly against the fence at all times, and push it with a smooth, steady motion (see the bottom photo on p. 77). Never let go of a board, until it is entirely past the blade. Use a push stick rather than pass your hand by the blade. Don't hold wood with a hand placed beyond the blade—your hand could be drawn back through the blade by kickback. Avoid standing directly behind the board being cut, and make sure no one else is in the path of potential kickback either.

Crosscutting the ends square and to length

After stock has been flattened on both sides, jointed on one edge, and ripped to the designated width, it's time to cut the board to length. There are a number of tools with which you can crosscut. I prefer a tablesaw equipped with a combination blade. Crosscutting on the tablesaw is done with the aid of a sliding table or a miter gauge with an add-on wooden extension fence (see the top photo at left). Never crosscut with the end of a board against the rip fence.

After the first end is cut square, you can either measure out the desired length on the stock and pencil a cutoff mark, or you can attach a stop to the fence of your sliding table or miter guide at the desired distance from the sawblade. The quickest way to cut to a pencil line is to align it with the edge of the kerf the blade has left in the fence—as long as you always use the same blade (see the photo at left).

From the moment wood is milled, movement should be minimized by careful handling. To promote even exposure to air, I either leave boards on edge or stack them horizontally with spacers between them. I also keep wood away from direct sunlight and any other heat source that could affect one side of a board more than the other. I also try to cut all joinery right away while the wood is as square and straight as it will ever be. □

Peter Korn works wood and teaches woodworking at his school, the Center for Furniture Craftsmanship, in Rockland, Maine. His book, Working with Wood: The Basics of Craftsmanship, was published by The Taunton Press in May.