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STRAIGHT, FLAT & SQUARE



STRAIGHT, FLAT & SQUARE

Straight, flat, and square boards are easier to work with, can be glued together with fewer problems, and make for doors and drawer fronts that stay flat. Here's how we get our lumber from rough to ready.



▲ Starting with rough stock gives you more control over the final workpieces.

Choose Your Boards Carefully

Successful stock preparation actually starts when you begin picking out the lumber for a project. After all, the boards you choose to bring home will determine how easy it will be for you to end up with flat and straight workpieces. Here are a few things to keep in mind.

THICKER IS BETTER. Most boards are either rough sawn or surfaced two sides (S2S) or four sides (S4S). (These terms are defined briefly in the box on page 2.) Rough sawn is exactly what it sounds like — rough

stock that hasn't been "cleaned up." S2S and S4S refer to boards that have been planed so their faces are parallel (but not necessarily flat).

Whenever possible, I try to buy rough lumber. It means more work jointing and planing. But 4/4 (read "four quarter") rough stock is close to 1" thick. On the other hand, 4/4 boards that have been surfaced (S2S or S4S) are only about $1\frac{3}{16}$ " thick. So if there is any cupping or bowing in these boards (either now or as they acclimate to your shop), you've only got $\frac{1}{16}$ " to work with before they're down to $\frac{3}{4}$ " thick. Buying rough stock means I have more

control over the final product.

BE PICKY. This is also a good time to be really picky about the boards you choose. Almost every board will bow or cup a little, but badly warped pieces should be passed over. And if I can see that it's twisted, I'll put it right back into the stack.

BUY PLENTY. Finally, I try to buy at least 20% more wood than a project calls for. This can feel like money down the drain, but I remind myself that there will be knots and other defects to cut out, mistakes I'll make, and test pieces to cut. Plus, if I buy extra wood, I won't be tempted to use pieces that are warped.

Give the Wood Time to Move

It's tempting to start working as soon as the boards are hauled into the shop. But this is a good time to do a little procrastinating. That's because the humidity in your shop is probably drier than the store, lumberyard, or mill where you bought the wood. And as the lumber acclimates to its new home, you may see some changes. For instance, the ends of a board can check, or a board that was flat in the store may cup or bow.

The thing is, you won't know for a week or two, and if you jump right in, there may be some unwanted surprises in your finished workpieces. Giving the wood time to move will let you plan around these changes when laying out the pieces.

LONG TERM STORAGE. Besides giving the wood time, you also want to make sure it acclimates evenly. So I "sticker" the boards when I first bring them into the shop. This just means

stacking them with strips of wood in between to allow air to circulate on all sides, see left photo below.

STORING PROJECT PIECES. But that's not the end of the wood movement. Every time a face is planed or an

edge is ripped, the wood may move a little. So again, to allow air to circulate, I've gotten into the habit of setting pieces on edge when I'm not working with them, see right photo below.



▲ **Let it sit.** To let the wood adjust to the moisture level in your shop, stack boards with small strips in between them.

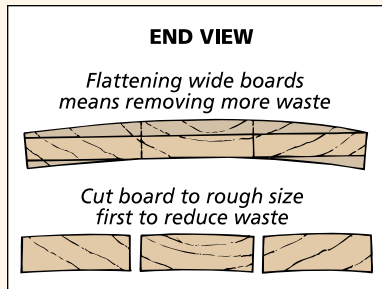


▲ **Setting pieces aside.** I set project pieces edge down on small strips at the end of the day to let air circulate around them.

Cut to Rough Size First

After the lumber has acclimated to your shop, what's the next step? Do you joint and plane the long, rough boards flat or cut them to rough size? It might seem to take less time and effort to work with a few long boards. But it's actually more efficient to cut them to rough size first.

MORE EFFICIENT. With a larger board,



you have to remove more wood to get it flat. Take a cupped board for example. To joint and plane across its entire width means removing a lot of material at the center, as shown in the drawing. But if the board is ripped into narrow pieces first, there will be much less waste.

ROUGH CUT PIECES. So after the wood has acclimated, the next thing I do is lay out the workpieces of the project and cut them to rough size, as shown in the photo. And I don't just lay out the initial pieces. This is the best time to select boards for highly visible areas, like drawer fronts, door frames, and top panels.

ALLOW FOR SNIPE. When roughing out the pieces, it's a good idea to leave them a little long. The problem is

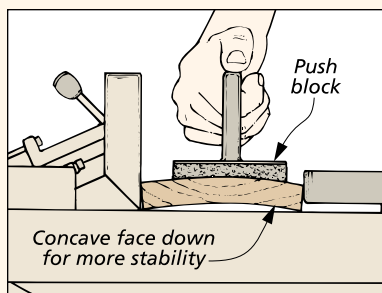


▲ **Roughing it.** Cutting pieces to rough size first means there's less material to remove to get them flat and straight.

Get One Face Perfectly Flat

After the pieces have been roughed out, the next thing I do is get one face of each board flat. My tool of choice for this is the jointer, though you could also use a hand plane. (A thickness planer normally won't flatten the face of a board unless the opposite face has already been made flat.)

Though some people just think of a jointer as an edge-cutting tool, it's



also great for flattening a board's face. And the procedure is the same.

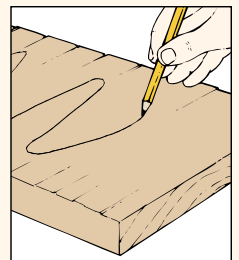
JOINTER BASICS. The piece should be fed into the cutterhead so the edge grain from left to right "runs downhill." This way, the jointer knives won't catch the wood and cause tearout. And if the board is cupped or bowed, I place the "hollow" face down on the bed (see drawing) so there are two points that keep the board from rocking.

LIGHT PASSES. Jointing the face of a wide board requires a firm grip and a good push block. But you don't need to "hog out" a lot of material in one pass. My jointer is usually set to remove $\frac{1}{32}$ " or less. And to help me check my progress (especially with S2S and S4S boards, since the faces



▲ **Joint one face.** Flattening one face first is the key to ending up with pieces that are flat, straight, and square.

are already smooth), I scribble lines across the face, as you can see in the margin drawing. When the lines are completely gone, the face is flat.



▲ To tell when the face is flat, scribble a line across the board and continue jointing until all the marks disappear.

LUMBER LINGO

BOW: A board that is warped along the length of its faces. (It will rock from end to end on one face.)

CHECK: A split that occurs on the end of a board as it dries out.

CROOK: A board that is warped along the length of its edges. (It will rock from end to end on one edge.)

CUP: A board that is warped across the width of its faces. (It will rock from side-to-side on one face.)

"FOUR QUARTER" STOCK (4/4): Designation for hardwood that is rough cut 1" thick. If the board has been surfaced, the actual thickness will be closer to $\frac{13}{16}$ ". (5/4, 6/4, and 8/4 are also common.)

ROUGH SAWN: Boards that have been dried and cut to rough size, but their faces haven't been surfaced.

SNIPE: A deeper slice that's planed off the ends of a board with a thickness planer.

SURFACED FOUR SIDES (S4S): Hardwood lumber

that has been surfaced (planed) so both faces and both edges are smooth.

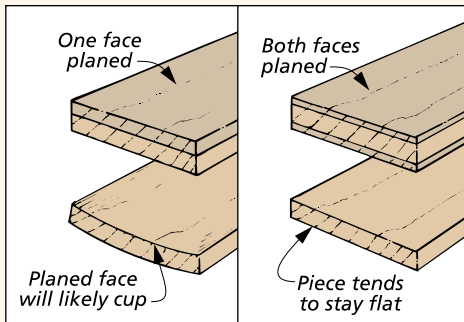
SURFACED TWO SIDES (S2S): Hardwood lumber that has been surfaced (planed) on both faces, but the edges have been left rough. (Faces are parallel but not necessarily flat.)

TWIST: A warped board that is distorted on both its faces and edges. One corner is lifted, and the ends aren't parallel.

WARP: Any deviation from true or square in a piece of wood.

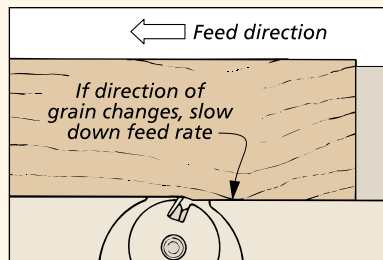
Thickness Stock with Planer

After one face has been jointed (or hand planed) flat, the board is ready to be run through a thickness planer. The planer does two things. It makes the second face flat and parallel to the first. *And* it reduces the thickness of the stock. Note: It bears repeating that if you don't start with one flat face, a thickness planer will only make the faces of the board parallel — but they



Joint an Edge

Now that both faces are flat and parallel, all that's left is to make sure the edges of the workpiece are straight and square to the faces. The first edge is straightened on the jointer. Just make sure the



Cut to Final Size

To get the second edge straight and parallel to the first, I simply walk the board over to the table saw and rip it to final width, making sure that the jointed edge is against the rip fence, like you see in the photo.

CLEAN EDGES. However, sometimes a saw blade will leave saw marks or burn the edge of the workpiece. You could remove these by sanding or scraping, but a quicker way is to use the jointer *after* the piece has been ripped on the table saw. (Cutting it on the table saw first ensures that the edges will be parallel.)

won't necessarily end up flat.

PLANER BASICS. Feeding a board through a planer is even easier than pushing it over a jointer. After all, the feed rollers do most of the work. I still like to take light passes ($\frac{1}{32}$ " or so) and take care to feed the piece so the cutterhead is cutting with the grain. (Remember, a planer shaves off the *top* face of the piece.)

PLANE BOTH FACES. If there's more thickness planing to do after both faces are flat and parallel, I usually flip the piece between passes. Planing the same amount from each face like this "cancels out" (or at least minimizes) any cupping or bowing that happens after the fresh wood is exposed to the air, see drawing.

BOARDS OF A FEATHER. When planing, it's important that the pieces end up

fence is 90° to the table and joint the concave edge until you can "hear" the jointer cutting along the entire length of the piece.

Again, you want to cut with the grain, but with many boards (especially longer ones), the grain direction may change, as it does in the drawing at left.

This shouldn't be too big a problem. As you're jointing, slow down when you get to the point where the grain direction changes. This way, the knives will be taking smaller "bites," and you'll be less likely to end up with any chipout.

In this case, I rip the board so it's $\frac{1}{32}$ " wider than the final width. Then make a light pass on the jointer.

START OVER. In a perfect world, this would be the end of the process, and you could start on the joinery. But occasionally I'll discover that a piece I had milled straight and flat the day before has warped enough overnight to prevent me from using it. It wasn't that I'd done anything wrong; it's just that wood moves. If this happens, don't be afraid to start over with a new piece. In the end, it'll save you time (and frustration).



▲ **Thicknessing the stock.** A planer not only reduces the thickness of the board, it creates a face that's flat and parallel to the jointed face.

the same thickness. So I run all the boards through the planer at each setting before changing it. Thinner pieces can be added into the works as you adjust the depth of cut.



▲ **Joint an edge.** Now that both faces are flat and parallel, you can begin to work on the edges. So it's back to the jointer to clean up one edge.



▲ **Final edge.** To get the second edge to be straight and parallel with the first, it can be ripped on the table saw (and cleaned up on the jointer, if necessary).