Wood Movement & Gaps

Wood swells in humid summers and shrinks in dry winters. Here's how much, and how to build so nothing cracks, gaps, or buckles.

ROGUEENGINEER
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01 The short version

1 It moves across the width.

Boards grow and shrink across their width with the seasons, about 1/8 in. per foot. Their length barely changes.

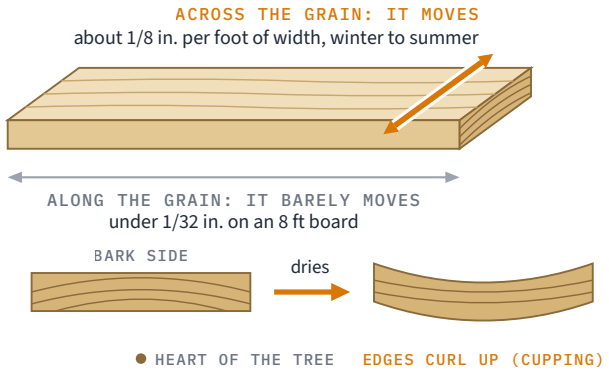
2 Wet wood shrinks after you build.

Big-box pine and fresh PT come home wet. Let furniture lumber dry indoors 2 to 4 weeks first.

3 Never trap it.

Screw a top tight only in the middle and slot the rest. Gap outdoor boards: tight for wet PT, 1/8 in. for dry.

02 Wood moves across the grain, not along it

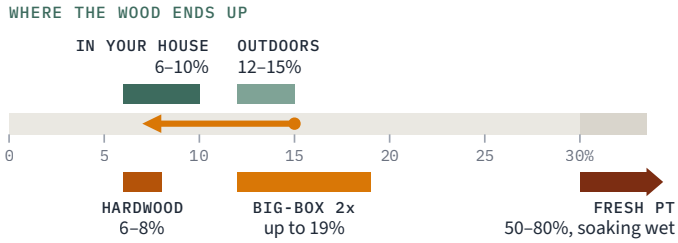


Boards also cup. As a flatsawn board dries, the side away from the tree's heart shrinks more, so the edges curl up.

- Wood soaks up moisture from the air like a sponge. It swells in humid summers and shrinks when the heat is on in winter.
- Paint and finish slow it down, but nothing stops it. **Build so it can move.**

03 Pine vs. oak? It's how wet the board is

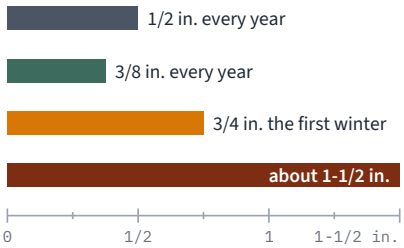
Board for board, **oak moves more than pine.** But big-box pine comes home wetter, so it does most of its shrinking **after you build.** Let it dry first and pine moves less than oak.



WHAT IT READS AT THE STORE

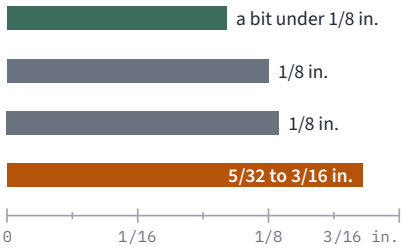
Big-box pine bought at 15% dries to about 7% in a heated house. That drop shrinks it **about 1/4 in. per foot of width**, after it's built. (Outdoors in the dry West, wood ends up at 6 to 10%.)

04 How much a 36 in. wide tabletop moves



Dry wood moves back and forth every year. Wet pine does one big shrink first, then settles into about 3/8 in. a year. Fresh PT loses **about 1/4 in. on every 2x6**, which is why gaps matter.

05 How much each wood moves



Per foot of width, from a dry winter (6%) to a humid summer (10%). Flatsawn boards, the kind most stores sell; quartersawn moves about half to two-thirds as much. Source: USDA Wood Handbook (2021), Tables 4-3 and 13-5.

06 Let it dry before you build

1 Bring it inside

to the room the piece will live in. The garage is not the house.

2 Stack it with spacers

Scrap strips between the layers let air reach both faces.

3 Wait 2 to 4 weeks

Thick 2x lumber needs the longer end.

4 Check it: 6 to 9%

with a pin moisture meter (about $25), mid-board, not at the ends.

5 Build, then finish every side

top, bottom, and edges, so it gains and loses moisture evenly.

Outdoor PT? Buy KDAT (kiln-dried after treatment), let it dry stacked in the shade, or build it wet and set the gaps for wet wood (page 2).

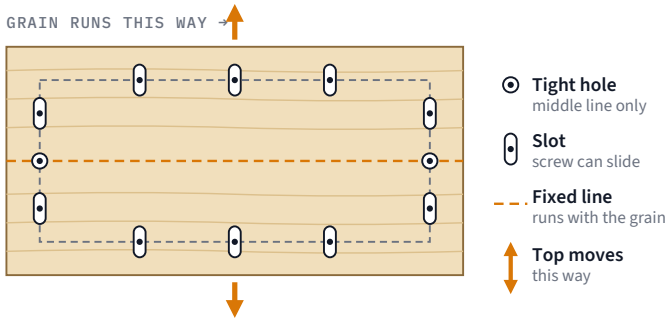
The rest of the shop-wall charts are free at rogueengineer.com/guides. Built for the same projects as the Outdoor Table + 4x4 Bench plans.

Be safe and happy building.

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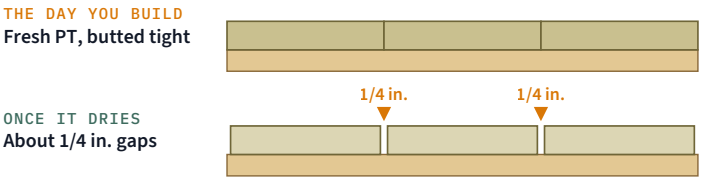
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07 Attaching a top: fix the middle, slot the rest



- Screw the top tight only along its middle line. Every other screw goes through a **slot that runs across the grain.**
- To make a slot: drill the hole, then rock the bit front to back. About 1/2 in. long covers a top up to 3 ft wide. A fender washer helps it slide.
- Or use figure-8 fasteners or Z-clips. Same idea, no slots.
- Cleats and breadboard ends across a top get the same rule. Never glue a top to its base.

09 Why fresh PT deck boards go in tight



Gap fresh PT 1/4 in. on day one and you'll have **1/2 in. gaps** once it dries. Dry boards (KDAT, cedar) go down with a 1/8 in. gap and stay about there.

11 Panels in a frame float



Door and wainscot panels sit loose in a groove. Glue only the frame joints. Small rubber spacer balls in the groove stop rattles. Plywood panels barely move, so they can be glued.

08 Gaps to leave

WHAT YOU'RE BUILDING	GAP	WHY
Deck boards, fresh PT (damp, heavy)	Butt tight, or 1/16 in.	Each board shrinks about 1/4 in. as it dries
Deck boards, dry (KDAT, cedar)	1/8 in.	Lets water and dirt drain. An 8d nail is about 1/8 in.
Composite decking	Follow the brand (Trex 3/16 in.)	Moves with heat, not moisture
Outdoor table and bench slats	1/4 in.	Drains water. Soaking-wet PT? 1/8 in.; it opens up as it dries
Panel in a door or frame	1/16 to 1/8 in. each side	Never glue the panel. Or use plywood; it barely moves
Glued-up indoor top	No gaps, glue it into one panel	The whole top moves, so attach it as shown at left
Raised bed and planter boards	Tight	Wet soil swells them. A liner helps

10 What went wrong?

WHAT YOU SEE	WHY, AND THE FIX
Top split, or cracked at a screw	It was screwed tight and couldn't shrink. Fix the middle, slot the rest.
Gaps open up in winter	Built with wet wood, then the furnace dried it. Let it dry first.
Edges curled up (cupped)	One face dried faster than the other. Finish both faces; screw near both edges.
Deck gaps of 1/2 in.	Fresh PT was gapped, then shrank. Butt wet boards tight.
Deck boards buckled	Dry boards were laid tight, then swelled. Gap dry boards 1/8 in.
Ends split	Ends dry fastest. Seal cut ends (cut-end preservative on PT); buy long, trim later.

12 Handy to have

- A pin moisture meter, about $25
- Tabletop fasteners: figure-8s or Z-clips
- Washer-head screws or fender washers for slotted holes
- 1/8 in. deck spacers (or an 8d nail)
- End-grain sealer, plus cut-end preservative for PT
- Plywood for panels, cabinet backs, and drawer bottoms

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