

YOUR FREE READER'S COMPANION

The Pergola Build Pack

A companion to The Backyard Pergola Building Bible · by Sam Whitaker

Thanks for picking up the book. This is the companion you fold into your back pocket on build day and the one you carry to the lumberyard before it: the post-and-footing chooser that matches your ground and your frost line to the right base, the span-and-beam table so you size the spine off a chart instead of your gut, a fastener cheat sheet so you hang the frame with hardware that won't quit, a material takeoff for a starter 10x12 so you buy your lumber once instead of making the second trip, and a build-day checklist that keeps the whole thing plumb, braced, and standing. Print it, fold it, keep it in the truck.

Pergolas almost never fail at the top. They failed at the bottom and at the corners - a post set out of plumb, a footing that stopped short of the frost line, or a frame with no knee braces that racked itself loose in the first real wind. Get the posts plumb and brace it for the wind, and the rest is just carpentry.
— Sam

1. The Post & Footing Chooser

A backyard pergola stands on one of two post systems, and the footing under it is sized by your ground and your frost line. Match those two decisions and you've made the calls that decide whether the structure stands straight for thirty years or leans on you by the second winter. Every footing here sits on a gravel drainage bed, and every post lifts up off the concrete on a standoff base - that detail matters more than which size you land on.

Pick your post system first

Post method	Best for	Pick it when	Think twice when
Standoff base on a footing (post on a Simpson ABU66Z atop poured concrete)	nearly every real pergola	You want thirty years, you're spending good cedar, you might replace a post someday	Almost never - this is the default
Buried post in concrete (PT post set in the wet pour)	small garden arbor, dry soil, short lifespan accepted	Quick, cheap, PT rated for ground contact, nobody will cry over it in 15 years	A full cedar pergola - the post rots from inside the concrete sleeve where you can't see it

Size the post to the height

Post height	Minimum post size
Up to 8 ft (2.44 m)	4x4 (89 x 89 mm)
8 to 10 ft (2.44 to 3.05 m)	6x6 (140 x 140 mm)
Over 10 ft (3.05 m)	6x6 + knee bracing both directions

I build nearly everything on 6x6 now regardless of height. The extra cost is small, the structure feels solid, and a 6x6 gives you real meat to notch a beam into.

Size and depth the footing

Soil / load condition	Footing diameter	Footing depth	60-lb bags
Firm soil, post up to 8 ft	10 in (254 mm)	below frost, min 24 in (610 mm)	2-3
Firm soil, post 8 to 10 ft	12 in (305 mm)	below frost, min 30 in (762 mm)	4
Soft / clay soil, any height	16 in (406 mm)	below frost, min 36 in (914 mm)	7-8
Cold-climate (deep frost)	12 to 16 in	42 to 48 in (1.07-1.22 m)	5-8

Read your ground first

- Reach below the frost line, always. A footing that stops short heaves, lifts a post, and racks the whole frame within a winter or two. Dig 6 inches (150 mm) past your local frost number for margin - your

building department has that number if you don't.

- Give it a gravel bed. 4 inches (100 mm) of 3/4-inch (19 mm) clean crushed gravel in the bottom of each hole drains groundwater away so it can't pool and heave.
- Keep the hole straight or flared wider at the bottom, never bell-mouthed at the top - a cone of concrete near the surface is exactly what frost grabs and lifts.
- Crown the pour 1 to 2 inches above grade and trowel it to slope away, so water sheds off the base instead of sitting on the post end.
- Call 811 before you dig, every time. It's free and it's the law.

The honest trade-off: the footing is the cheapest part of the whole pergola to do right and the most expensive part to fix wrong. I jackhammered out two of mine at twenty-three for skipping the plumb check. Spend the hardware money and the curing week up front - you will never want to do this part twice.

2. Span & Beam Quick-Reference

This is the chart I wish I'd had the first summer, when I eyeballed a single 2x8 across twelve feet and watched it grow a belly by August. Size every member off the table, not your gut. Numbers are for No. 2 western red cedar or pressure-treated Southern pine carrying a slatted, open top - conservative on purpose. Heavy snow, high wind, or a solid roof? Throw the table out and call your building department.

Beam span — clear distance between posts

Beam size	Single beam max span	Doubled (2-ply) max span
2x6 (38 x 140 mm)	5 ft 6 in (1.68 m)	7 ft 6 in (2.29 m)
2x8 (38 x 184 mm)	7 ft 0 in (2.13 m)	9 ft 6 in (2.90 m)
2x10 (38 x 235 mm)	8 ft 6 in (2.59 m)	11 ft 6 in (3.51 m)
2x12 (38 x 286 mm)	10 ft 0 in (3.05 m)	13 ft 6 in (4.11 m)
6x6 (140 x 140 mm)	8 ft 0 in (2.44 m)	n/a (already solid)

Don't run a single beam past 8 feet. A single 1-1/2-inch ply has almost no resistance to roll, and on a pergola where the load isn't perfectly centered it'll lean and look drunk inside a year. Double it. And once you're past about 12 feet, stop chasing a bigger beam and drop in a center post - it cuts the span in half, lets you step down a beam size, and reads as intentional rather than cluttered.

Rafter span — clear distance between beams

Rafter size	16 in (406 mm) o.c.	24 in (610 mm) o.c.
2x4 (38 x 89 mm)	6 ft 0 in (1.83 m)	5 ft 0 in (1.52 m)
2x6 (38 x 140 mm)	9 ft 0 in (2.74 m)	7 ft 6 in (2.29 m)
2x8 (38 x 184 mm)	12 ft 0 in (3.66 m)	10 ft 0 in (3.05 m)
2x10 (38 x 235 mm)	15 ft 0 in (4.57 m)	12 ft 6 in (3.81 m)

Most backyard pergolas land in the 10-to-12-foot rafter span, and a 2x6 cedar rafter is the sweet spot - stiff enough, light enough to lift solo, proportional to look at.

Rafter spacing — dial in your shade

Spacing (o.c.)	Open gap (2x6 rafters)	Feel of the shade
24 in (610 mm)	~18-1/2 in (470 mm)	mostly open, light dapple, good for plants
20 in (508 mm)	~14-1/2 in (368 mm)	balanced, shadow lines move through the day
16 in (406 mm)	~10-1/2 in (267 mm)	noticeable shade, classic pergola look
12 in (305 mm)	~6-1/2 in (165 mm)	heavy shade, almost a slat ceiling

- Overhang the tails. 12 in (305 mm) each end on a short pergola, 16 to 18 in (406-457 mm) on a standard 10-14 ft, 18 to 24 in (457-610 mm) on a big one. Flush-cut tails look chopped and cheap.
- Deeper rafters block low sun. A 2x8 on edge (7-1/4 in / 184 mm) throws a longer shadow at a raking morning or evening angle than a 2x6 (5-1/2 in / 140 mm) - the trick for west-facing patios where you don't want a closed slat ceiling.

3. Hardware & Fastener Cheat Sheet

A pergola is held together with bolts, lags, and structural screws - never nails. Nails work in shear when sheathing surrounds them, but a pergola is an open frame that racks and flexes in the wind, and nails pull out under that cyclic load. Bolts clamp; nails just hang on. And every piece of metal here lives outdoors, so it's all hot-dip galvanized or stainless - cheap electro-plated zinc weeps rust streaks down fresh cedar within a year and corrodes through against treated lumber within a few.

Joint	Fastener	Size
Post to footing	Galvanized standoff post base (Simpson ABU66Z) + anchor bolt	5/8 in (16 mm) anchor
Beam to post (through-bolt)	Carriage bolt + washer + nut, two staggered per post	1/2 in x 8 in (13 x 203 mm)
Doubled beam, ply to ply	Carriage bolts, staggered, plus construction adhesive	3/8 in x 4 in (10 x 102 mm), every 16 in (406 mm)
Beam on top of post	Simpson post cap (BC / AC series)	sized to post + beam
Knee brace to post/beam	Structural lag or through-bolt, two per end offset	3/8 in x 5 in (10 x 127 mm)
Rafter to beam	Hurricane tie (Simpson H1 / H2.5A) + structural screw	tie + 1-1/2 in (38 mm) screws, or 4 in (102 mm) structural
Top slats to rafters	Exterior structural screw	2-1/2 to 3 in (64 to 76 mm)
Ledger to house (attached)	Lag or structural screw into framing, staggered	1/2 in x 4 in (13 x 102 mm), every 16 in (406 mm)

Pre-drill so you don't split a cedar post

Fastener	Pilot / clearance bit
3/8 in (10 mm) lag screw	1/4 in (6 mm) pilot in main member
1/2 in (13 mm) carriage bolt	1/2 in (13 mm) clearance hole
5/8 in (16 mm) anchor bolt	5/8 in (16 mm) clearance hole

Four hardware rules that save the build

1. Two staggered bolts at every beam-to-post joint, never one. A single centered bolt lets the beam pivot and roll. Two - one high, one low, at least 2 in (51 mm) from any edge and 4 in (100 mm) apart - resist both the downward load and the roll.
2. The standoff base is the best \$30 you'll spend. It lifts the post bottom an inch off the concrete so it breathes and drains, and it anchors against the uplift that flips pergolas. A pergola without one is a clock counting down.
3. Run a little wax or soap on lag threads and pre-drill, and they drive like butter. Skip the pilot and you'll

snap the lag or split the post.

4. Buy treated only where it's wet. Posts at ground contact and a house ledger want PT or cedar heartwood; beams and rafters sitting up in the open air can be cedar or dry stock. Don't pay treated prices for the whole frame.

4. Material Takeoff — One Starter Pergola

Use this to turn a plan into a lumberyard list. These numbers are the freestanding 10x12 (3.0 x 3.7 m) cedar pergola on standoff footings - the one to build first. Posts sit on a 120 x 144 in (3,048 x 3,658 mm) center-to-center layout, doubled 2x10 beams along each post row, 2x6 rafters across the top. Adjust for your footprint, and buy a spare board or two of rafter stock, because everyone miscuts a tail and a spare is cheaper than a second trip.

Item	Qty	Size	Use
Cedar 6x6	4	12 ft	Posts (cut to height after plumb)
Cedar 2x10	4	14 ft	Doubled beams, 2 per row, with overhang
Cedar 2x6	9	14 ft	Rafters at ~16 in o.c. + overhang
Cedar 4x4	2	8 ft	Knee braces (4-8 cut on the diagonal)
Cedar 2x2	—	as needed	Optional top slats for deeper shade
Simpson ABU66Z post base	4	6x6 standoff	Post to footing
Hurricane ties (H1 / H2.5A)	12	—	Rafter to beam
Carriage bolts, HDG	1 box	1/2 in x 8 in	Beam to post, 2 per post
Structural lag screws, HDG	1 box	3/8 in x 5 in	Knee braces, 2 per end
Structural screws (SDWS/RSS)	1 box	3 in	Rafters, slats, general
Anchor bolts, HDG	4	5/8 in	Cast in footings
4,000 psi concrete	~18-20	60-lb bags	Four footings, 12 in dia x 30 in deep
Crushed gravel 3/4 in	~1-2	bags	Footing drainage beds
Semi-transparent UV stain	1-2	gal	Finish (cedar default)

Budget, 2026 dollars: roughly \$900-\$1,400 for this pergola in cedar, depending on lumber grade and where you are. Footings and posts alone - the part you never want to do twice - run about \$480 of that (cedar 6x6 ~\$52 each, four ABU66Z bases ~\$28 each, concrete ~\$120, gravel and misc ~\$40). PT drops the lumber cost; a 12x16 with a center post runs more.

Three takeoff rules that save real money

1. Order beam and rafter stock long, then trim. Posts get cut to a level line after they're standing and braced - far more accurate than measuring each in the hole. Rafters get traced off one good tail pattern so every overhang matches.
2. Double, don't oversize. A doubled 2x10 is stronger, straighter, and easier to lift in two passes than a single solid timber of the same depth. For any span over 8 ft, default to a doubled 2x10 or 2x12.
3. Round concrete up, not down. Running a bag short mid-pour means a hardware-store run with wet concrete waiting. A spare bag or two is cheap insurance.

5. Printable Build-Day Checklist

Work this in order. The mantra runs through all of it: set the posts plumb, brace it for the wind. Skip a box and you'll find out which one at the worst time.

Before you order a board

- ☐ Call the building department and ask three things: do I need a permit for a pergola this size; what are my setbacks from each property line and easement; what's my frost-line depth and any height limit?
- ☐ Write down the answers with the date and who you talked to. That note is your record that you asked.
- ☐ Measure setbacks from the real property line, not the fence. Find your survey pins or pay for a survey.
- ☐ Read your HOA covenants on outbuildings - size, placement, height. Get any required approval in writing first.
- ☐ Call 811 and get underground utilities marked before you dig.

Footings and posts

- ☐ Stake and string the layout; confirm both diagonals match within 1/4 in (6 mm) before digging.
- ☐ Dig each footing below frost, 6 in (150 mm) deeper for margin; sides straight or flared at the bottom.
- ☐ Tamp a 4 in gravel bed in each hole; re-string and re-check centers - dirt shifts stakes.
- ☐ Pour to a stiff oatmeal consistency, crown 1-2 in above grade, set the anchor bolt or base square to the layout while wet.
- ☐ Let it cure 5 to 7 days before you load it. Don't rush the cure.
- ☐ Stand each post and plumb BOTH adjacent faces with a post level - one face plumb, the next leaning, is the classic mistake.
- ☐ Temporary-brace each post to ground stakes at ~45 degrees with screws, re-check plumb, then bolt to the base.
- ☐ Re-check diagonals across the post tops before going up.

Beams, rafters, bracing

- ☐ Size the beam off the span table; double anything over 8 ft, add a center post past 12 ft.
- ☐ Screw temporary cleats to the inside post faces so the beam rests while you fasten - never hold 100 lb overhead. Wait for wind under 15 mph to lift a long beam.
- ☐ Two staggered carriage bolts per post - tight, not gorilla-tight.
- ☐ Cut one rafter tail, test-fit, trace every other from it. Keep overhangs equal end to end.
- ☐ Tie every rafter to both beams with hurricane ties or structural screws - both ends, every rafter, so wind can't lift them and they can't twist.
- ☐ Install knee braces in BOTH directions - along the beams and across them. Aim for 45 degrees, legs

at least 18 in (24 in is better), 4x4 minimum stock, two offset fasteners per end. Don't be the guy at the kitchen window watching it sway.

Finish

- [] Leave temporary braces on until beams and some rafters are in - the permanent frame is what holds the posts plumb against wind.
- [] Sand the tails and any rough spots, then seal or stain - semi-transparent UV stain holds cedar's warm tone and recoats without scraping.
- [] Re-tighten every bolt after the first season as the wood gives up moisture and settles.

That's the pack. The one habit worth more than any tool in the truck: get the posts plumb on footings that reach below frost, then brace the corners in both directions before you ever call it done. Build the freestanding 10x12 first to learn the moves, then the attached patio cover or the garden arbor when you're ready - all three are drawn up complete with cut lists in the back of the book. When you've stood up your first pergola on your own footings, I'd love to hear about it, and in a couple of emails I'll tell you how a quick word from you helps this book reach the next person standing in their backyard with a pile of cedar and an idea.

Set the posts plumb, brace it for the wind,

Sam Whitaker