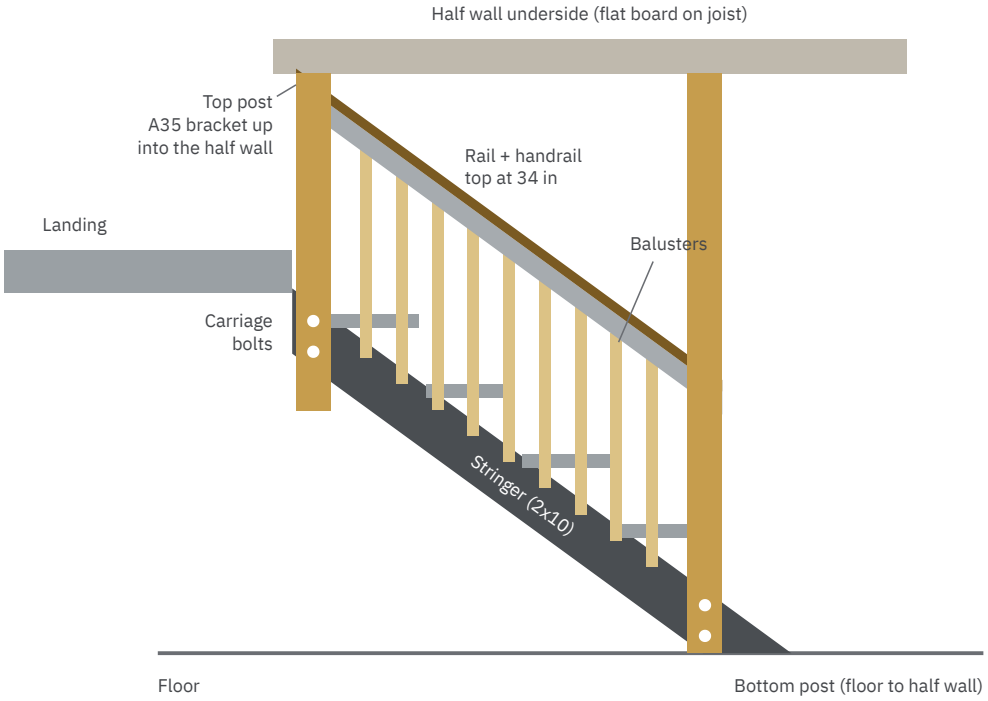
BUILD PLAN

BASEMENT STAIR GUARD

Shopping list, cut list and build plan for the open side of the basement stairs: two 4x4 posts bolted to the stringer and locked to the half wall above, a 2x4 rail topped with a handrail, and 2x2 balusters. Everything mounts on the outside of the stringer, so the full 32 in stair width stays clear for moving day.



View: standing in the basement, looking at the open side of the stairs

KEY NUMBERS

ITEM	VALUE
Drop on open side	47.5 in to top gray tread (55 in to landing): a full guard with balusters is warranted
Stringer	2x10 (1.5 x 9-1/8 in): strong enough to bolt posts to
Rail height	Top of handrail 34 in above the tread nosings (code minimum for stair guards; fits the 34 in opening under the half wall at the top step)
Baluster spacing	About 9 balusters, gaps about 3-1/2 in measured level (code max 4 in)
Stair angle	Roughly 38 degrees: always mark angle cuts in place

SHOPPING LIST

1. Lumber

	QTY	ITEM	NOTES
☐	**2**	4x4 x 8 ft, pressure-treated	One per post (they're ~47 in and ~83 in, too long to share a board). Pressure-treated because the bottom post sits on concrete.
☐	**1**	2x4 x 8 ft (straight, kiln-dried)	Top rail the balusters screw to. Sight down it at the store and pick a straight one.
☐	**1**	Handrail, 8 ft (round or oval profile, pine or oak)	Screws down onto the 2x4 so there's something to grip.
☐	**11**	2x2 x 36 in square-end balusters (Home Depot SKU 179656240)	About 9 needed (you have 11, so 2 spares). Reject split or bowed ones; let damp ones dry before priming.

2. Post fasteners: carriage bolts

	QTY	ITEM	NOTES
☐	**4**	1/2 x 6 in carriage bolts, hot-dip galvanized	Got them. 2 per post. Galvanized because they touch pressure-treated wood.
☐	**4**	1/2 in flat washers + 4 hex nuts (galvanized)	Washer and nut go on the inside face of the stringer.
☐	**1**	1/2 in auger bit	Got it. Its cutting length must be at least 5 in (3-1/2 in post + 1-1/2 in stringer).
☐	**1**	3/4 in socket + ratchet, or a 3/4 in wrench	For the nuts. Skip if you already own one.

3. Other hardware

	QTY	ITEM	NOTES
☐	**4**	5/16 x 4 in structural screws (Spax PowerLag, GRK RSS or FastenMaster)	Rail into the posts, 2 per end. Box must say rated for pressure-treated lumber. A small pack is fine.
☐	**2**	Simpson Strong-Tie A35 angles	One per post. Ties the top of each post up into the half wall's underside board.
☐	**1 box**	Simpson Strong-Drive SD connector screws, SD9112 (#9 x 1-1/2 in)	Every round hole in the A35s (about 24 for two brackets). Don't use deck screws in the brackets.
☐	**1 box**	#9 x 3 in exterior deck screws (Deckmate, 70+ count)	Covers the balusters (about 36) and the handrail (about 6).
☐	**1**	1/8 in drill bit + countersink bit	1/8 in to pre-drill balusters and handrail; countersink so handrail screw heads sit below the surface.
☐	**1**	1/4 in hex nut-driver bit	For the SD connector screws, if your bit set doesn't have one.
☐	**1**	Exterior wood filler, primer + paint, 120-grit sandpaper	Filler goes over the handrail screw heads. Paint to match the gray stairs.

TOOLS

STATUS	TOOLS
HAVE	Cordless drill, Hercules 20V impact driver, Hercules 20V 7-1/4 in circular saw (5Ah battery), 1/2 in auger bit
GET OR BORROW	Speed square, 2 ft level or torpedo level, tape measure, two bar clamps, hammer, safety glasses, hearing protection, impact-rated driver bits

CUT LIST

All lengths are approximate. Hold each piece in place and mark it rather than trusting these numbers: old stairs are rarely exact.

PIECE	QTY	FROM	LENGTH	NOTES	ACCURACY
Top post	1	4x4	**~46-48 in**	Square cut. Runs from ~2 in below the stringer's bottom edge up to the half wall underside. Cut 1/4 in long and trim to a snug fit.	CRITICAL
Bottom post	1	4x4	**~83 in**	Square cut. Full height from the floor to the half wall underside, like the old post. Cut 1/4 in long and trim to a snug fit.	CRITICAL
Rail	1	2x4	**~72 in rough**	Clamp it up long and mark the ends in place (see Mounting the rail).	MARK IN PLACE
Handrail	1	Handrail	**~72 in rough**	Same length and end cuts as the rail.	MARK IN PLACE
Balusters	~9	2x2 x 36	**~33-34 in**	Overlap the stringer ~3 in at the bottom and the 2x4's full height at the top. Angled ends optional.	BATCH CUT

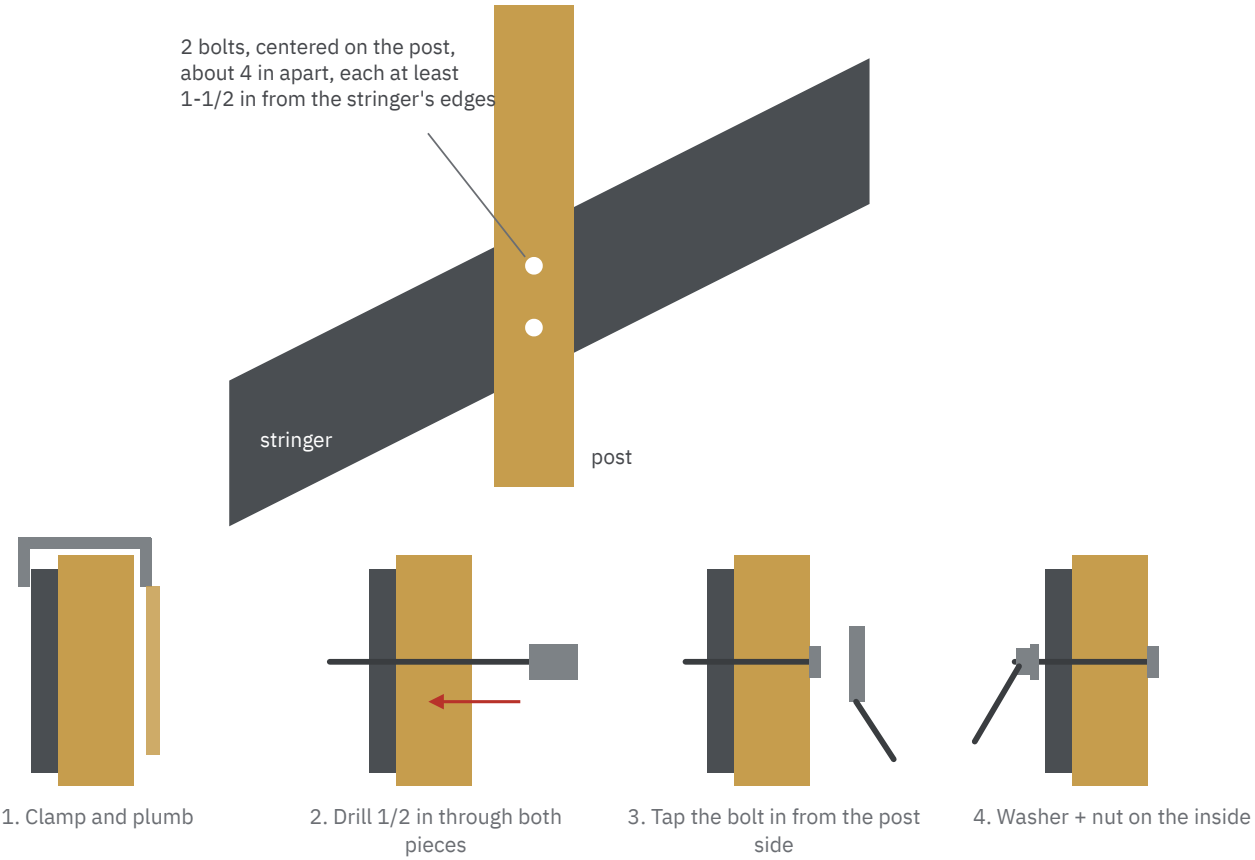
Cutting tip: measure both posts in place before cutting. Your circular saw handles every cut, including the posts in two passes (see Using your tools).

ORDER OF WORK

1. **Mark your heights.** Mark 34 in above the nosing of the top and bottom gray treads. That's where the top of the handrail lands.
2. **Top post.** Fit it snug under the half wall, then bolt it to the stringer (Bolting the posts).
3. **Bottom post.** Same, positioned where the stringer is full depth (around the first tread).
4. **Brackets.** Add an A35 at the top of each post (Anchoring the post tops).
5. **Rail and handrail.** Clamp, mark, cut and screw the 2x4, then add the handrail (Mounting the rail).
6. **Balusters.** On the outside (basement-side) face of the stringer and the 2x4 (Installing the balusters).
7. **Test and finish.** Lean hard on it at several points; nothing should flex or creak. Then fill, sand, prime and paint.

BOLTING THE POSTS

Two carriage bolts per post, through the post and the stringer. Plan the spots before you drill.



1. **Check the inside first.** Look at the stringer's inside face where each bolt will come out. Pick spots clear of the treads' grooves, with room to get a wrench on the nut.
2. **Clamp and plumb.** Clamp the post to the outside face of the stringer. Check plumb on two faces with the level and re-clamp until it's right.
3. **Mark the holes.** On the post face, centered side to side, about 4 in apart, each at least 1-1/2 in from the stringer's top and bottom edges.
4. **Drill straight through.** From the post side, drill the 1/2 in hole through the post and stringer in one go. Keep the drill level and square to the post (see drill tips under Using your tools).
5. **Tap the bolt in.** Push it through from the post side and hammer the domed head flush so the square neck bites and the bolt can't spin.
6. **Washer and nut.** On the inside, add the washer then the nut. Tighten until the washer just starts pressing into the wood. Do the second bolt the same way.
7. **Re-snug later.** Pressure-treated wood shrinks as it dries. Tighten each nut again after a few weeks.

ANCHORING THE POST TOPS

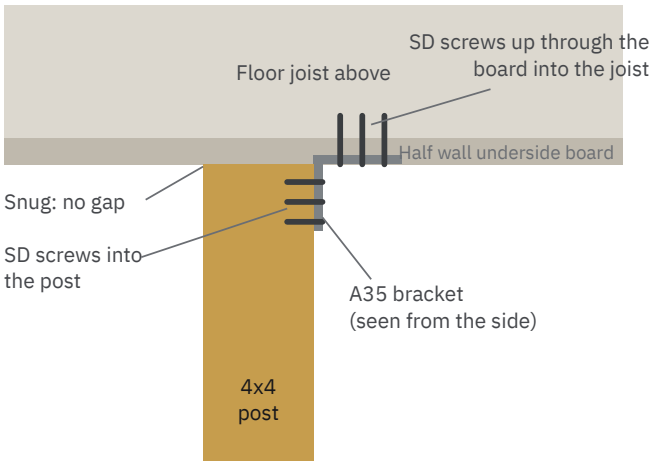
The bolts stop the bottom of each post from moving. The A35 bracket stops the top from swinging sideways, which is what keeps the post stiff when someone grabs the rail hard.



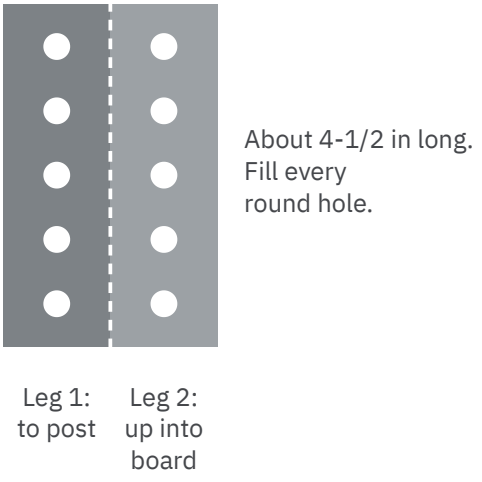
1. Measure at the exact spot

2. Fit snug, check plumb, fasten to the stringer

3. Bracket into the corner



Side view at the top of a post

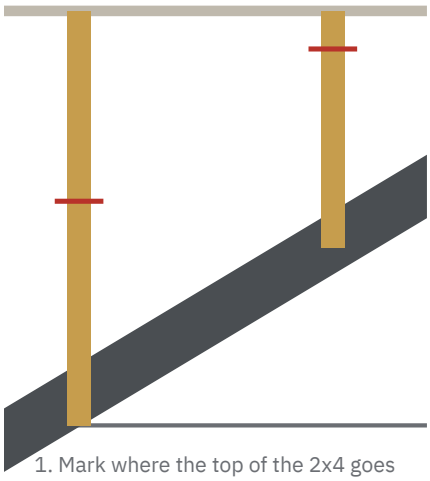


The bracket, laid flat

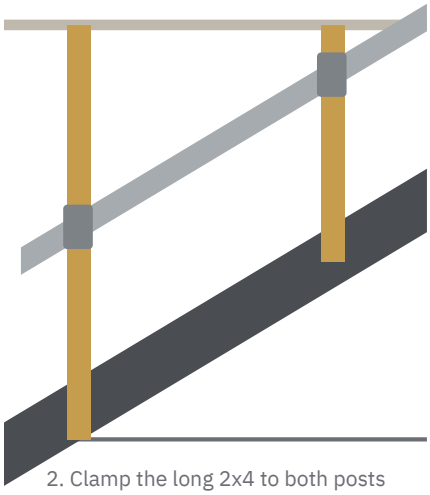
1. **Check the spot.** The underside board where the post stands should be solid and flat, with at least 2 in of board beside the face that gets the bracket. Make sure no wire is stapled to the underside there.
2. **Pick the bracket face.** A side face with board beside it and nothing in the way, usually the face pointing along the stairs. Not the face the rail screws to.
3. **Measure at that exact spot,** front and back. If they differ, use the longer number. Cut 1/4 in long, then shave thin slices until the post taps in with light hammer blows on a scrap block. Snug, not forced: forcing pushes the half wall up.
4. **Bolt the post to the stringer first,** then press the A35 tight into the corner: one leg on the post, one on the board. One SD screw in each leg to hold it, then fill every round hole.
5. **Go easy with the impact driver.** Low setting; stop the moment each head sits flush on the metal. Then push the post top sideways hard. Nothing should move. A second A35 on the opposite face is a cheap upgrade.

MOUNTING THE RAIL

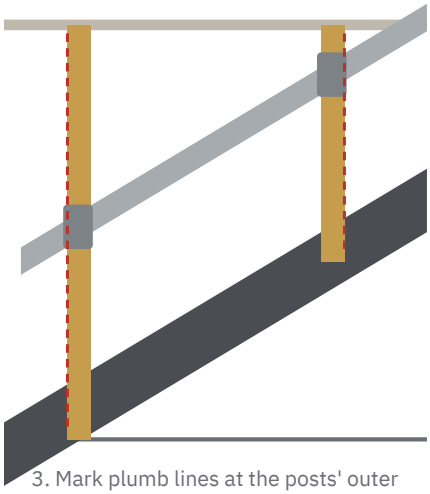
Leave the 2x4 long, clamp it up, and mark the ends in place. That way the angle takes care of itself and you never have to calculate it.



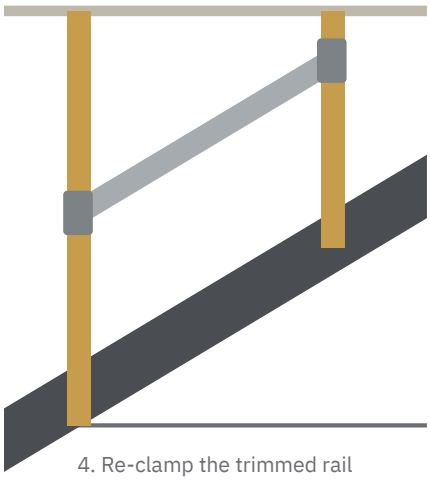
1. Mark where the top of the 2x4 goes



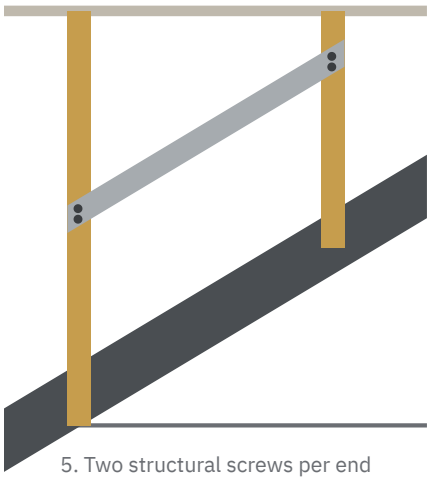
2. Clamp the long 2x4 to both posts



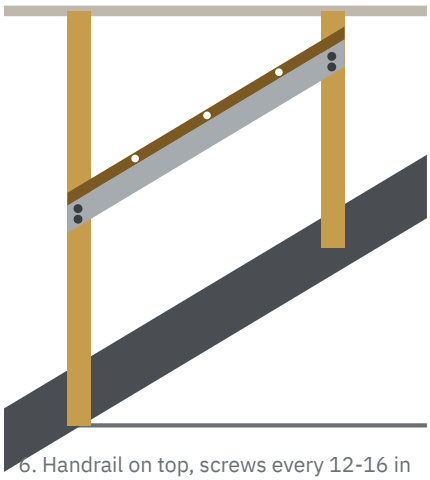
3. Mark plumb lines at the posts' outer edges



4. Re-clamp the trimmed rail



5. Two structural screws per end

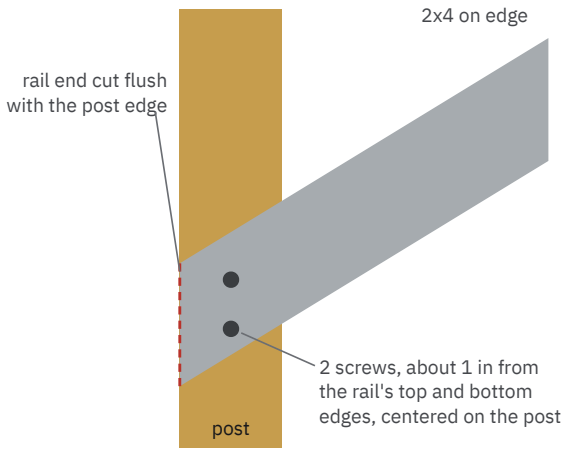


6. Handrail on top, screws every 12-16 in

View from the stairs looking at the open side. Simplified, not to scale; balusters go in after the handrail.

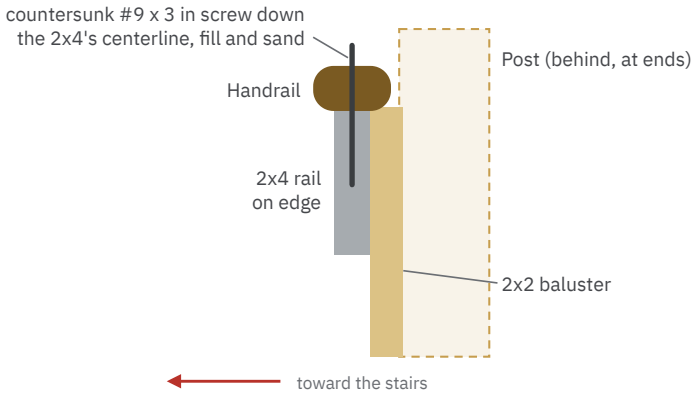
1. **Mark the rail height.** Measure your handrail's thickness. On each post's stair-side face, mark 34 in above the nearest tread nosing, minus that thickness. That's where the top edge of the 2x4 goes.
2. **Clamp it up long.** With a helper holding the other end, set the 2x4 on edge against the stair-side faces of both posts, top edge on the marks, in line with the stringer below. Clamp it to each post.
3. **Mark the ends.** Run a pencil straight up and down along each post's outer edge onto the 2x4. Check the lines with the level; they should be plumb.
4. **Cut.** Unclamp, set the 2x4 on sawhorses, clamp it down and cut on the lines with the circular saw, guided by the speed square.
5. **Re-clamp and check.** Put it back on the marks. The ends should land flush with the posts' outer edges.
6. **Screw it on.** Drive 2 structural screws per end with the impact driver, positioned as in the close-up on the next page. Remove the clamps and push on the rail; it should feel solid.

RAIL CLOSE-UP



ADDING THE HANDRAIL

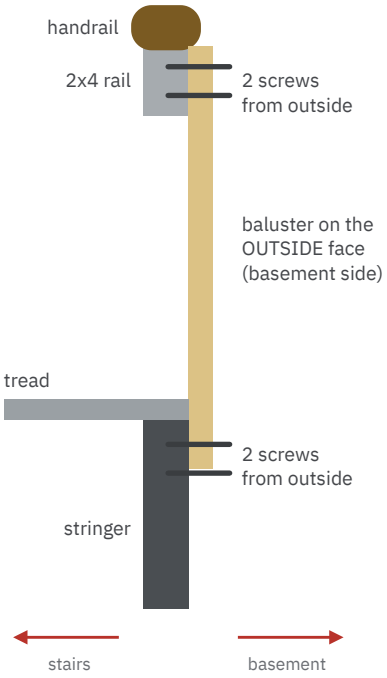
The 2x4 stands on edge in line with the stringer; the balusters sit flat against both the stringer and the rail, and the handrail screws down onto the top of the 2x4.



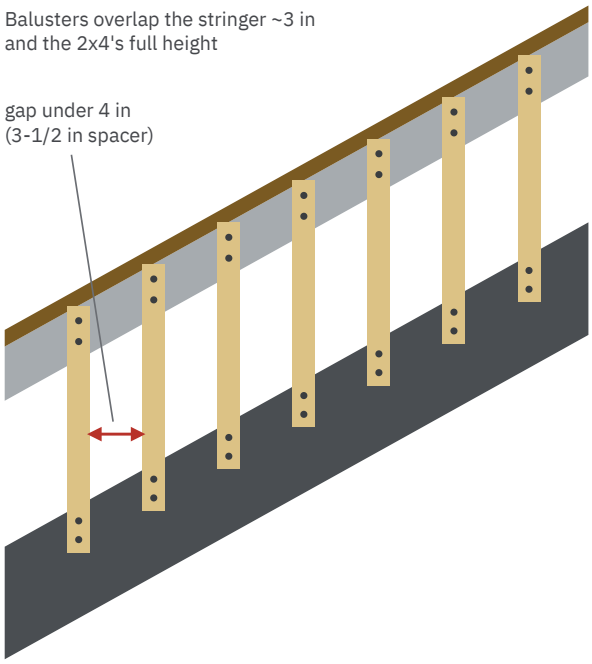
1. **Fit it.** Clamp the handrail on top of the 2x4 and mark and cut the ends the same way as the rail.
2. **Mark a centerline** along the top of the handrail, right over the middle of the 2x4 (it's only 1-1/2 in wide).
3. **Pre-drill and countersink** every 12-16 in: 1/8 in pilot, then the countersink so each head sits just below the surface.
4. **Screw it down** with #9 x 3 in screws, impact driver on low. If your handrail is thicker than 2 in, use 3-1/2 in screws instead.
5. **Fill and sand.** Exterior wood filler over each head, let it dry, sand smooth. Run your palm down the rail: nothing should snag.

INSTALLING THE BALUSTERS

The balusters go on the **outside face**, the basement side, of both the stringer and the 2x4. The 2x4 sits directly above the stringer in the same line, so each baluster lies flat against both and spans between them. All their screws go in from the basement side.



End view, looking down the stairs



From the basement side, balusters in front

1. **Count them.** With the posts and rail up, hold the level horizontally between the posts and measure the gap between their inside faces. Subtract 3-1/2, divide by 5 and round up. A span of about 47 in gives 9. The 4 in limit is measured level, not along the slope.
2. **Make a spacer.** Gap width = (span minus 1-1/2 in for each baluster) divided by (number of balusters + 1). For 47 in and 9 balusters: (47 - 13.5) / 10 = about 3-3/8 in. Cut a scrap to that width.
3. **Cut the balusters** to about 33-34 in: long enough to cover the 2x4's full height at the top and overlap the stringer about 3 in at the bottom. Hold one in place to confirm before cutting the rest.
4. **Start at one post.** Hold the spacer level against the post, set the first baluster against it on the outside faces, check plumb on two sides, and clamp it.
5. **Pre-drill** two 1/8 in holes at each end, about 1 in apart and at least 3/4 in from the cut ends, so the 2x2 doesn't split.
6. **Screw it on:** 2 #9 x 3 in screws into the 2x4 and 2 into the stringer, impact driver on low. Angle each screw slightly downward, because 1-1/2 in of baluster plus 1-1/2 in of wood is exactly 3 in and a straight screw can poke out the stair side.
7. **Work across** with the spacer held level between balusters, checking every second or third one for plumb. The last gap at the far post should match the spacer; if it's off by more than about 1/4 in, nudge the last few to even it out.

USING YOUR TOOLS

Drill with the 1/2 in auger bit

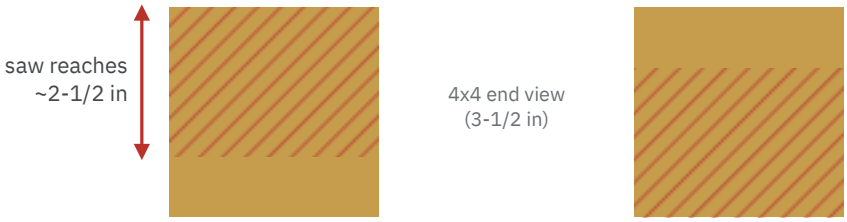
Use the cordless drill, not the impact driver, for the bolt holes: it gives you more control. Set it to the low speed (gear 1) and the drill setting on the clutch. Most auger bits have a screw tip that pulls itself into the wood, so let it feed; don't push hard. Hold the drill firmly with both hands, because if the bit catches it can twist the drill. Back it out every inch or so to clear chips. Start with a fully charged battery.

Hercules 20V impact driver

Use it for the structural rail screws (full power, slowing as the head nears the wood), and on a low setting for the SD bracket screws and the deck screws. For the carriage bolt nuts, you can spin them down with a 3/4 in impact socket on a hex adapter, but do the final snug by hand with a wrench so you don't crush the wood.

Hercules 20V 7-1/4 in circular saw

A 7-1/4 in saw cuts about 2-1/2 in deep, and a 4x4 is 3-1/2 in thick, so posts take two passes.



Cut 1 from the top, then flip the post and cut again

Cutting a post: mark the cut line on all four sides with the speed square so the lines meet. Set the blade to full depth. Cut one face, roll the post over 180 degrees, line the blade up with the mark and cut again. Tidy any sliver with a handsaw. Support both sides so the blade doesn't pinch.

Rail and handrail ends: clamp the board down, hold the speed square firmly against the edge as a fence and run the saw base along it, following your plumb line.

Balusters: set the blade about 1/4 in deeper than the wood and clamp a few together to cut them at once.

> **Saw safety:** clamp the work, never hold it by hand or across your leg. Keep both hands on the saw and let the blade stop before lifting it. Don't cut short offcuts you can't clamp. Pull the battery before changing the blade. Wear safety glasses and hearing protection.

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HAVE A PROBLEM WORTH SOLVING?

Understand the problem properly, then build something that genuinely solves it.

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