

Rock-Solid Guard-Post Connections

Tested and approved
installation details to
help you build safer
deck railings

BY MIKE GUERTIN

As deck builders know, building codes went from saying nothing about decks twenty years ago to providing prescriptive solutions for almost every part of them in the 2021 International Residential Code (IRC). Builders who follow the IRC's guidance are likely building safer decks than they did before. Still, the code falls short on prescriptive details for one important component: guards.

Whether a guard system is site-built or manufactured, it relies on the underlying deck framing and, usually, 4x4 wood posts. The 2021 IRC requires that guards be designed to resist a concentrated 200 lb. load applied at any point along the top in both downward and outward directions (if a guard also serves as a handrail, say for deck stairs, it has to resist 200 lb. in

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BRACKETED CONNECTIONS

Proprietary hardware made by Simpson Strong-Tie, MiTek, and Screw Products, Inc. are used to reinforce the guard post to the deck framing along the rim joist and end joists. The manufacturers have installation guides that are important to follow to ensure sound post reinforcement. The connection designs shown here are applicable for 36-in. guards on residential decks. Check the hardware manufacturer's literature for use with taller guards.

Simpson Strong-Tie DTT2Z Includes structural screws for installation. Installers must provide own 1/2-in. hex-head bolt or threaded rod.



MiTek DTB-TZ Includes structural screws for installation. Installers must provide own 1/2-in. hex-head bolt or threaded rod.



Simpson Strong-Tie HD3BHDG Installers must provide own 5/8-in. machine bolts and 5/8-in. hex-head bolt or threaded rod.

Screw Products, Inc. Decklok Lateral Anchor Installers must provide own 1/2-in. hex-head bolts.

SCREW AND BLOCK CONNECTIONS

FastenMaster and Simpson Strong-Tie have installation guides for framing arrangements to reinforce guard posts located inside of deck frames using their proprietary screws and blocking. The model and length of the screws, positions through the framing and blocking, and size and location of the blocking is unique to each company and is not interchangeable with other brands of screws. Each company has three basic configurations that work for posts along a rim board, along end joists, and for outside corners. You may already be blocking around your guard posts for reinforcement and to support decking, so following one of these manufacturers' designs probably won't be much of a change.



FastenMaster Thrulok

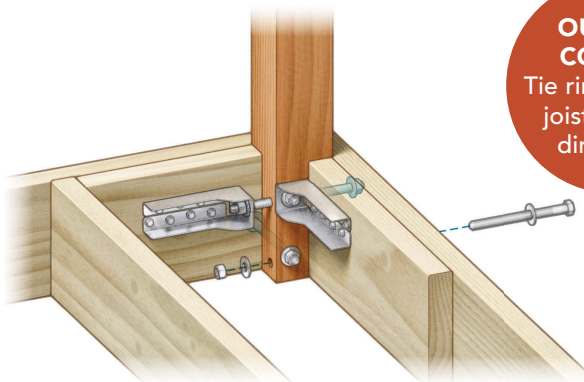
Simpson Strong-Tie Strong-Drive SDWS Timber Screw

POSTS **INSIDE** OF DECK FRAMING

Mounting posts inside of framing gives you the most options in terms of fastening. Bolts and tension ties were my go-tos for a long time, but Simpson Strong-Tie now makes screws—the Strong-Drive SDWS Timber Screw (see p. 67)—that’s approved for guard-post connections inside of framing. According to Simpson, its installation details meet the 600-lb. ultimate load requirements that are now the standard for manufactured guards with wood components. FastenMaster’s ThruLok screw-bolts are another option, though check their installation guides for details; they differ from what’s illustrated here.

TENSION TIES

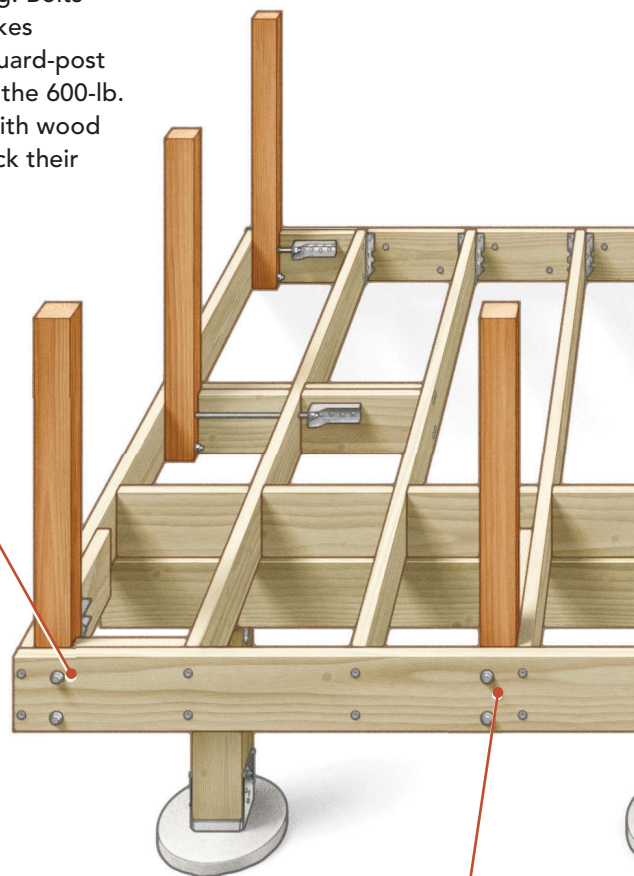
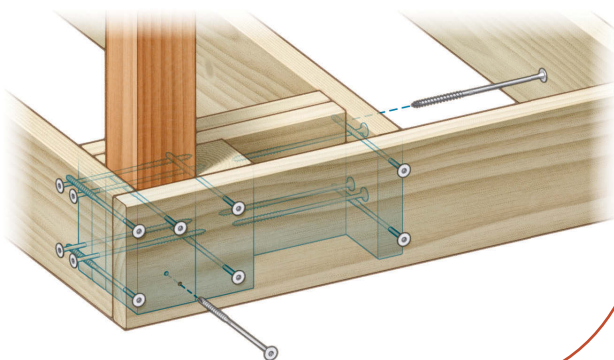
2x blocking along the rim and end joist reinforces the post and moves the connectors and bolts back from the joist ends so they don’t split.



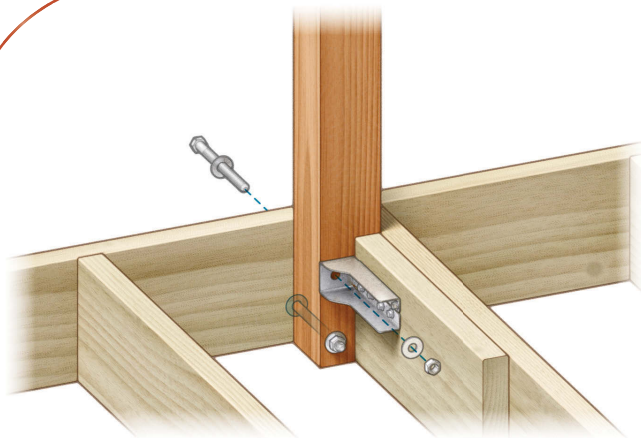
OUTSIDE CORNER
Tie rim and end joists in two directions

SCREWS

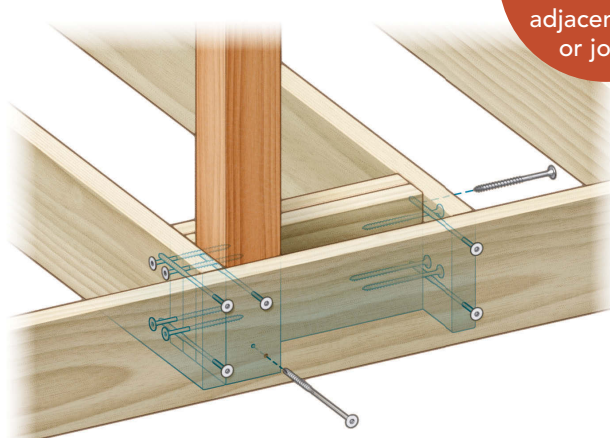
Double 2x blocking and a 4x block bolster the connection between the rim and end joists.



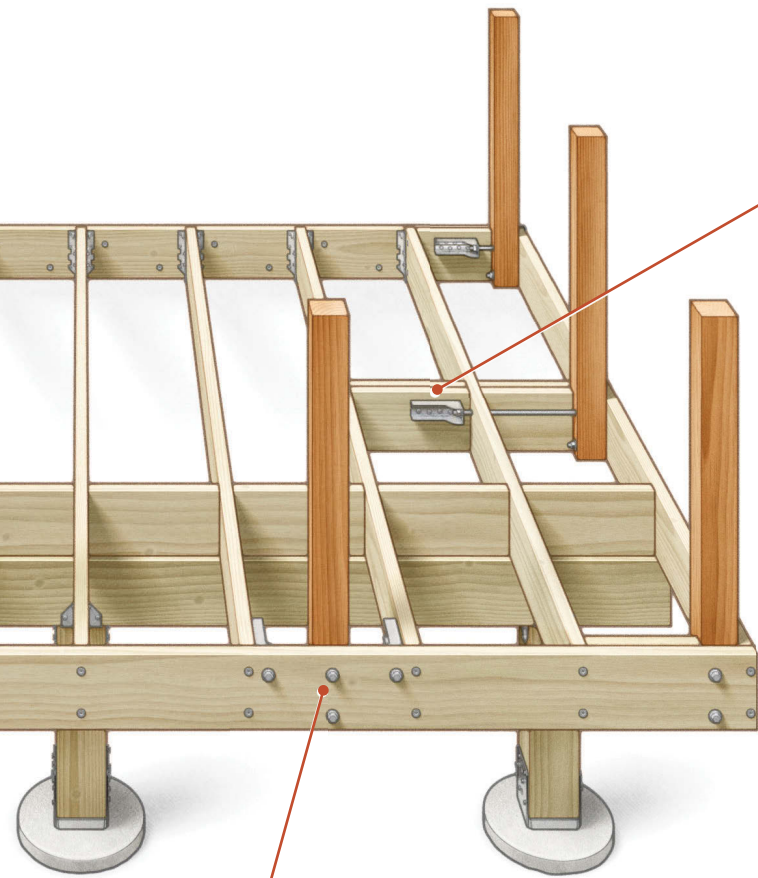
RIM, BESIDE JOISTS Tie the rim to the adjacent joist or joists



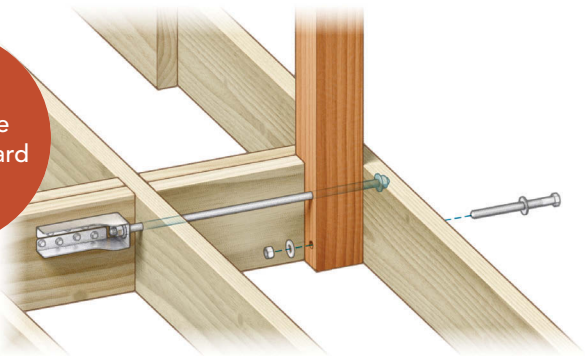
TENSION TIES Block behind the post to the adjacent joist, and secure the upper bolt to the blocking with a tension tie.



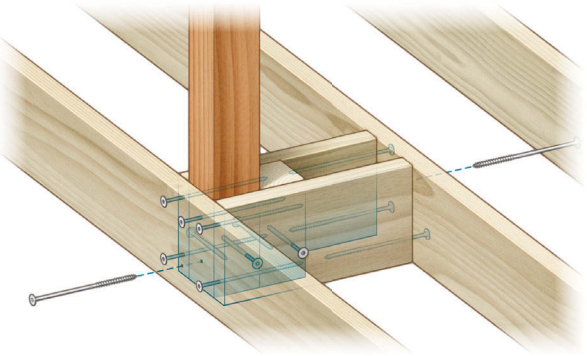
SCREWS Double 2x blocking ties the joist to its neighbor, sandwiches the post to the rim, and provides face-grain screwing for optimal hold.



END JOIST
Transfer the load to inboard joists with blocking

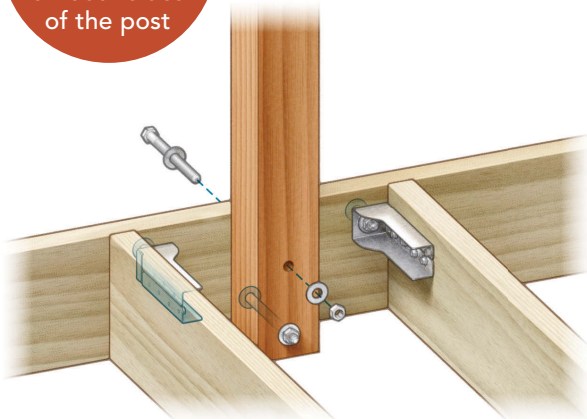


TENSION TIES Using two sets of double-2x blocking to tie back to the second inboard joist bay allows use of a single tension tie for a solid connection.

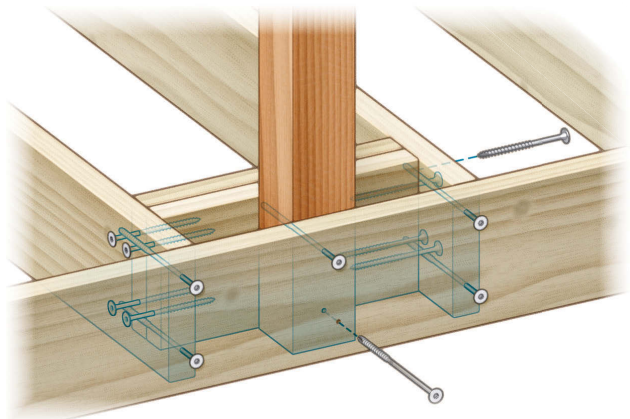


SCREWS A combination of 2x and 4x blocking ties the end joist to the first inboard joist and braces the post.

RIM, BETWEEN JOISTS Tie the rim to the joists on both sides of the post



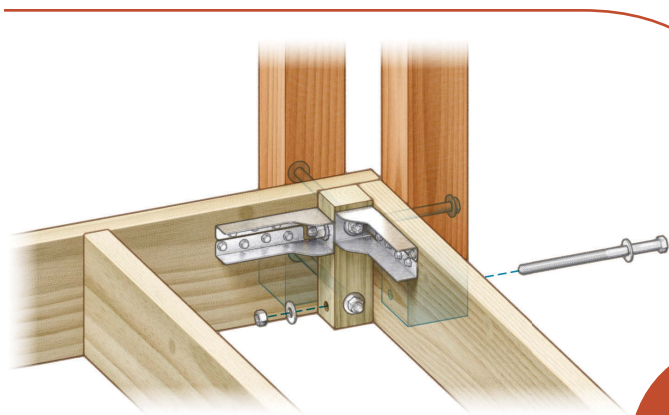
TENSION TIES Tension ties on the joists adjacent to the post prevent the rim from being levered off the joists.



SCREWS Double 2x blocking ties the joist to its neighbor, sandwiches the post to the rim, and provides face-grain screwing for optimal hold.

POSTS **OUTSIDE** OF DECK FRAMING

While it's often easier to mount posts outside of the deck framing, going this route can limit your fastener and hardware choices. Simpson Strong-Tie doesn't have details for using its Timber Screws for these connections, so tension ties are my go-to for solid outside-the-rim attachment. That's not to say it can't be done with screws, but you'd have to have an engineer design a solution.

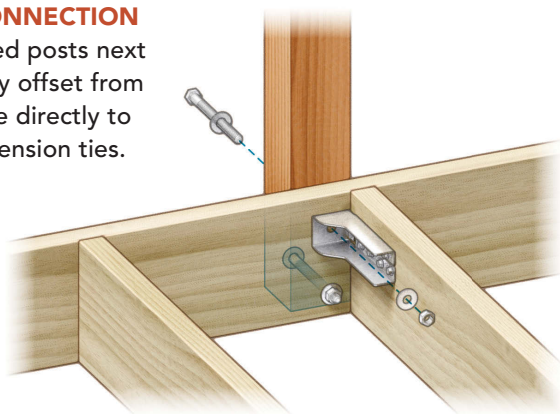


BLOCKING INTERFERENCE A square rip of 2x allows the tension ties to be installed closer together up high to resist outward thrust.

OUTSIDE CORNER
Tie rim and end joists on two axes

DIRECT CONNECTION

Rim-mounted posts next to or slightly offset from joists can tie directly to them with tension ties.



RIM, BESIDE JOISTS Tie the rim to the adjacent joist



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any direction). Manufactured guards must be tested for code approval, and that testing includes safety factors of up to three times the 200 lb. required by code. Rarely does anyone test site-built guards to make sure they're in compliance, but the new code provides some requirements and restrictions we can use to guide their construction.

The IRC now requires that guards have a continuous load path to the deck joists; they can't connect to the rim joist alone. Where guards are connected to joists at the ends of a deck, the joists must be connected to inboard

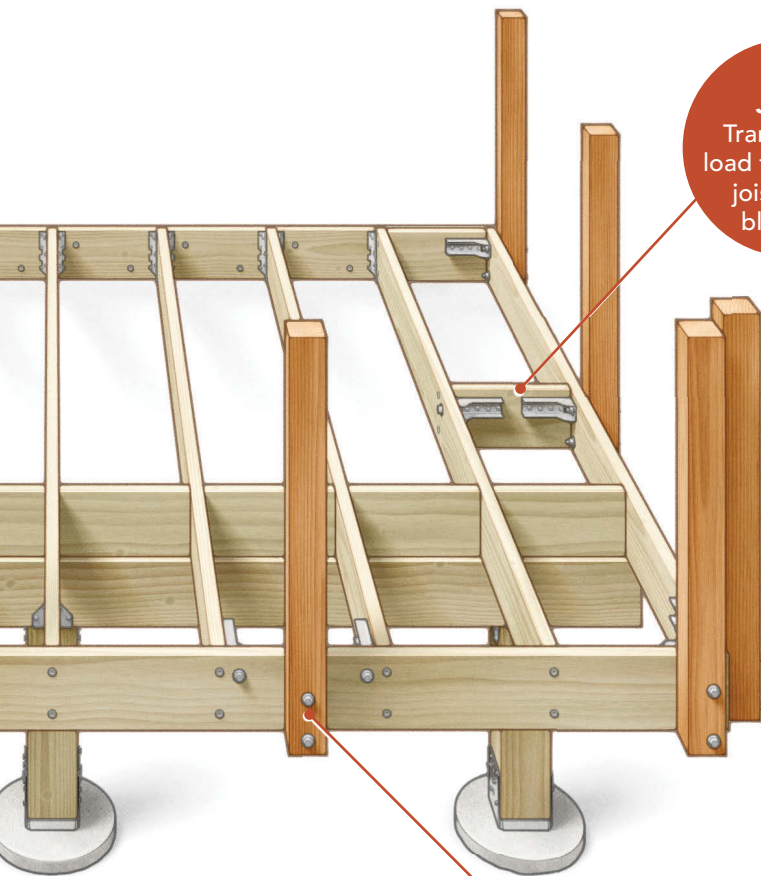
joists to help resist rotation. This is usually done with blocking, but the blocking connections can't rely solely on fasteners driven into end grain.

Testing done at Virginia Tech in the early 2000s showed that the common ways builders were fastening guard posts to deck frames couldn't meet the code-required load plus a two-and-a-half-times safety factor (the standard for some manufactured guard systems). It's easy to understand why these old-school connections—many relying on fasteners into end grain—failed. Guard posts

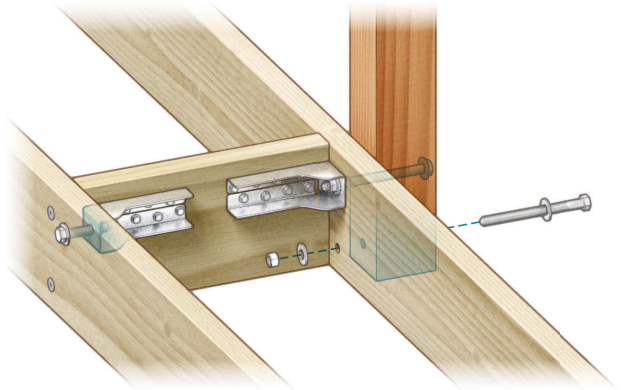
are essentially levers. A 200-lb. load applied horizontally at the top of a post translates to roughly 1400 lb. at the bottom of the shortest guard height allowed by code (36 in.). That leverage can easily pry the rim off the joists. This, not the connection between the guard post and framing, tends to be the weak point. But it's easy to reinforce.

The examiners at Virginia Tech found that when using metal hardware that transfers the load from the posts to the deck joists, the posts and deck frame can handle the load—two-and-a-half-times

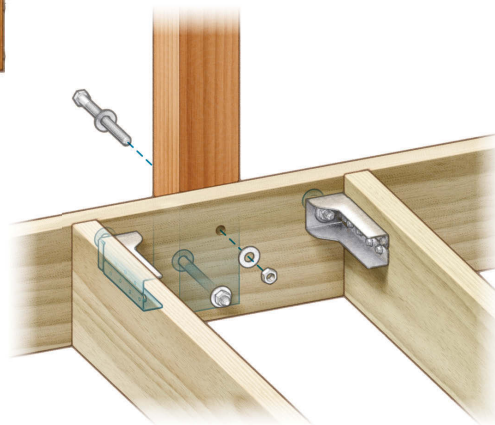
CONNECTION DETAILS What's shown here are the basics, but you can extrapolate these connections to fit almost any scenario—from 45° outside corners to double- and single-post inside corners, and just about every other situation where posts get attached to deck frames.



END JOIST
Transfer the load to inboard joists with blocking



TIE BACK Blocking and tension ties secure the post to the end joist and transfer the load to the first inboard joist and the decking.



RIM, BETWEEN JOISTS Tie the rim to the joists on both sides of the post

SIDE SECURITY
Bolts attach the post to the rim, while tension ties on either side of the post secure the rim to the joists.

safety factor included—without deflecting beyond the code limit. From the original few post-to-frame connection details developed at Virginia Tech, numerous combinations have arisen using the same principle: Reinforce the deck framing and the post at the connection.

This article illustrates 12 different post-to-frame arrangements. The details vary depending on whether the posts are installed inside or outside of the rim board and end joists. Most have been tested either by Virginia Tech or by hardware manufactur-

ers, but their designs don't address every possible scenario where you need a guard post. I have, on occasion, extrapolated a few post-to-frame attachments, and done my own unofficial testing to gauge their strength. You may also encounter unique post locations that don't have a tested reinforcement design. You should be able to extrapolate a connection design from the ones shown here, or you can ask an engineer to design one.

Reinforcing guard posts to the deck frame using metal hardware or extra screws and blocking may seem like overkill, especially if

your current post-connection practices seem rock solid. But unlike framing connections inside a house, deck-framing materials are subject to pronounced swings in moisture content that lead to swelling and shrinking, freeze/thaw cycles, and fastener corrosion that can loosen up connections. Collapses aren't common occurrences, but if a guard does give way when people are leaning against it, they're likely going to fall. □

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Drawings by Christopher Mills.