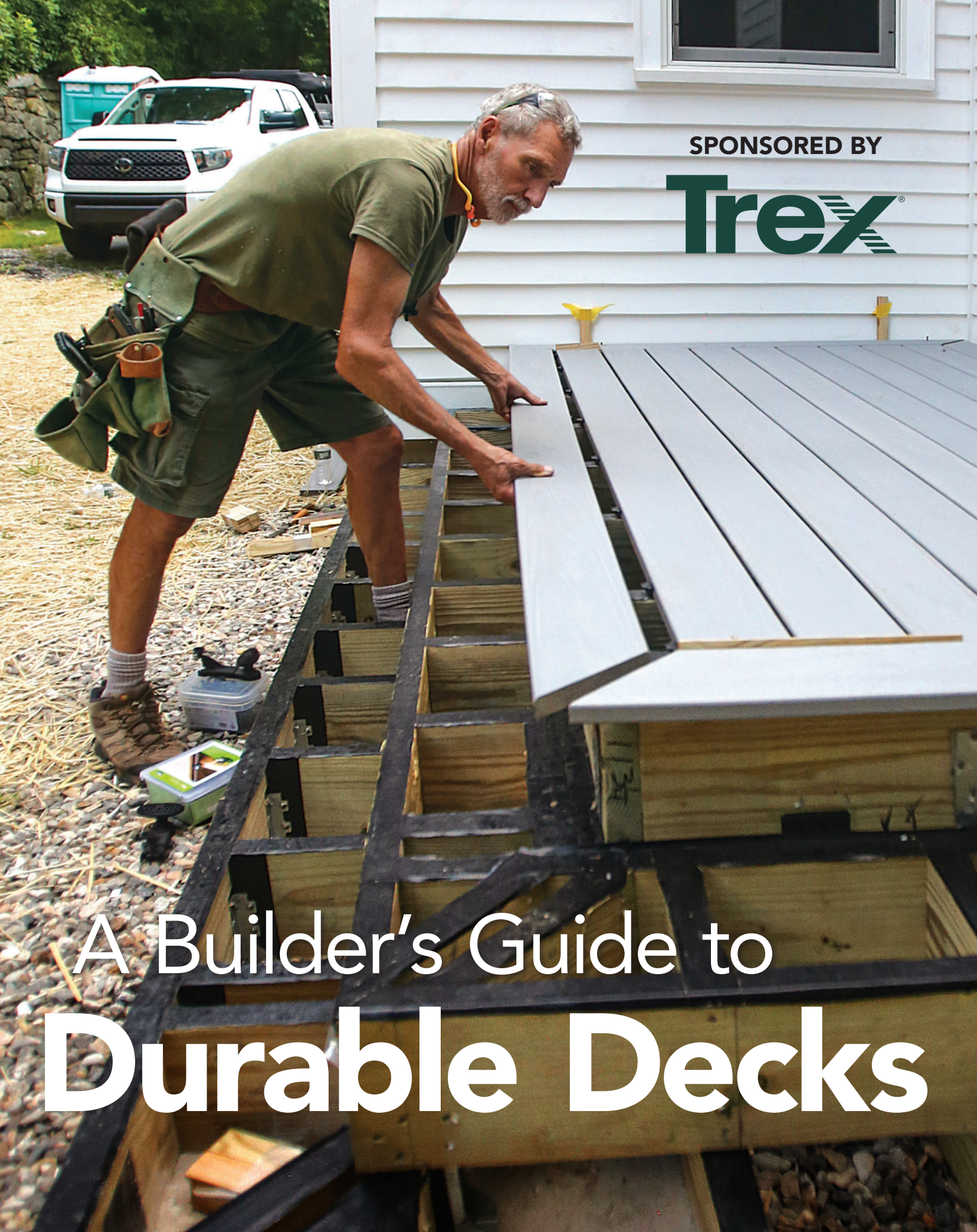

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A Builder's Guide to Durable Decks

CONTENTS

Smart Deck-Framing Strategies

Field-tested tricks, tools, and materials for overcoming six common deck-building challenges

BY MIKE GUERTIN

I love building decks. If I had to pick one part of the house that I enjoy building the most, it's the deck. There's no rush to dry it in so that other subs can work, it's a straightforward outdoor project, and we're heroes when the job is finished. Lately, my decks have been getting better as I find better ways to use new products and techniques that extend the life of the deck and its host structure.

Design a layout that's strong and relatively simple

There are numerous ways to design and frame a deck structure, which typically consists of the footings, the posts, the beams, the ledger, and the joists. I like to use framing layouts that suit the deck design and simplify the framing as much as possible. This project consisted of a 900-sq.-ft. wraparound deck that began 8 ft. above the walkout portion of a finished basement and patio, and ended at grade level at the back door.

Instead of building a deck frame cantilevered over a carrying beam, I incorporated the load-bearing characteristics into a rim beam made of a doubled 2x12 to maximize the headroom and to reduce the need for a forest of support posts. The wider rim also would later help to conceal a deck drainage system that I would install before the decking went down. □

Mike Guertin is editorial advisor. Photos by Charles Bickford, except where noted.

Photos top right, center, facing page: Mike Guertin. Photo left facing page: Krysta S. Doerfler.

Beefy brackets separate the ledger from the wall

Maine Deck Bracket

CHALLENGE The first challenge in any deck project is mounting and flashing the ledger to the building. Ledgers conventionally bolted to the wall framing usually demand a flashed break in the siding, a time-consuming method that's often not weathertight or rot-resistant.

STRATEGY On this deck, I used heavy-duty aluminum brackets from Maine Deck Bracket; I find them ideal for shingle siding. The beam-shaped sections are bolted directly to the house's rim joist. In turn, the deck ledger is bolted to the bracket's outer flange. To make the bracket's point of attachment as solid and as waterproof as possible, I first strip back five courses of shingles to create a space about a foot wide. I then lift up a flap of water-resistive barrier (WRB) and cut a rectangle in the sheathing. I line the back of the sheathing cutout with a self-sealing flashing tape like Vycor Deck Protector. After the flange is mounted, I surround and lap onto the sides of the web with flashing tape for an effective seal. The tape directs water to the top lap of the shingle course beneath. Once the head flap of WRB is back in place, the seal is water-resistant. An additional bead of caulk can be applied between the siding and the bracket's web.

My associate, Mac, and I spaced the deck brackets on approximate 40-in. centers so that we could use a single 2x8 to span between them. To keep the bolt holes away from the ledger butt joints, we positioned joints between brackets and used Fastenmaster Ledgerlok screws to connect a 3-ft.-long splice board on the back side of the primary ledger.

Create a space for the bracket flange. *After stripping back the shingles and a flap of WRB, I mark and cut out a section of sheathing directly over the rim joist.*

Brackets demand through-bolts, not lags. *After drilling the pilot holes, I flash the cutout and bolt the bracket, which requires access to the other side of the rim joist.*

Redundant overlaps are the best waterproofing. *Considering the consequences, it's best to flash and to counterflash behind, around, and over the brackets.*

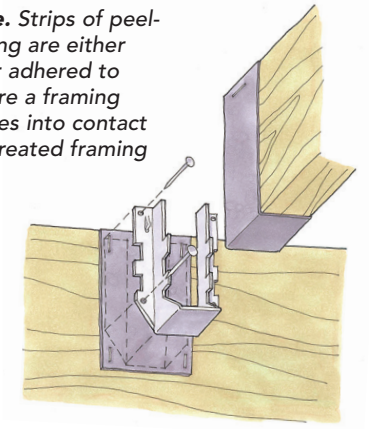
Labeling simplifies reassembly. *I number each shingle with its course and position as I remove it, which makes reinstallation easier.*

Use a spare bracket for bolt layout. *Once the brackets are in place, we can transfer their locations to the ledger, drill pilot holes, and bolt the 2x into place. Any gaps around the exposed bracket web can be caulked (inset photo).*

Flashing isolates galvanized joist hangers from possible corrosion

CHALLENGE Manufacturers of pressure-treating chemicals have modified ACQ treatments or come up with new formulas that are less corrosive, and hardware manufacturers have improved their protective coatings. However, the potential for accelerated corrosion still exists.

STRATEGY Choosing stainless-steel hardware or applying isolation membranes where hardware contacts wood can help a deck to last longer. Peel-and-stick flashing, staple-on plastic ribbon like York Wrap, or even strips of #30 builder's felt can be used as isolation membranes. We isolated each ledger bracket by wrapping its outer flange. We also positioned 4-in.-wide strips on the rim joist and ledger at each hanger location, then wrapped the joist ends.



Just to be sure. *Strips of peel-and-stick flashing are either stapled (left) or adhered to the places where a framing connector comes into contact with pressure-treated framing lumber.*

Establish a straight rim beam on temporary supports

CHALLENGE The rim beam—a load-bearing rim joist—must be set in position, level and parallel to the house, before the posts can be installed. There always seems to be room for a debate regarding the benefit of a deck's slope away from the house. Spaces between deck boards should permit water to drain so that there's little chance for it to flow toward the building. But on decks with tight deck boards, a slope away from the building is a wise move. This deck frame will eventually have a drainage system installed beneath that slopes toward the outside, and the deck boards won't be tight. In this case, I opted to set the deck itself dead level.

STRATEGY Before the deck went up, Mac and I laid out the joist positions on the inside face of a 2x12 rim beam and applied strips of isolation membrane (photo above). We used A-frame scaffolds to support the beam during assembly.

After aligning the ends of the rim, we used a stringline and gauge blocks to straighten the beam. Then we ran 1x3 furring strips between the ledger and the rim beam at each post position to keep it straight and parallel. A laser set on the ledger established a level reference for us as we raised or lowered the beam. To speed the leveling process, I placed a target block on the beam at each post location, marked to the height of the laser line above the ledger. Adjustable jacks dial in the finish height and support the beam until permanent posts are installed. In the past, we've used an adjustable A-frame support made of 2x4s. Nailed together at the apex, the 2xs are spread on a wider 2x. By knocking the legs in or out, we raise or lower the beam; stop blocks fix the legs' final position (photo bottom right, facing page).

Establish a parallel rim first. *With the rim beam temporarily supported, we use long lengths of strapping to set a constant distance from the house to the outside edge.*

Joist-hanger setup saves time

CHALLENGE We had about 120 joist hangers on this project, so installing them as accurately as possible was crucial. Joist hangers can be attached to joist ends first, to the ledger and the rim joist first, or after the joists are tacked in position. I prefer to fasten the hangers to the ledger and the rim joist so that the joists can be dropped in quickly. There's less struggling to hold joists flush before nailing, an important consideration when working off scaffolding.

STRATEGY Commercial versions are available, but I find that a simple T-jig takes 10 minutes to make and works best. Because we wrapped the joist ends with membrane, we needed a slightly wider-than-standard space between the sides of the hangers, so we ripped the leg of the T from ¾-in. stock 1$^{11}/_{16}$ in. wide. The 2x4 top registers against the top of the ledger. The leg's bottom has eased corners to match the hanger profile; the hanger is seated tight and flat to the bottom of the leg.

We used a metal-connector pneumatic nailer from Bostitch to drive the more than 750 1½-in. or 2½-in. nails and 500 3-in. nails needed to mount the hangers. These nailers pinpoint the holes stamped in the hardware and sink the nails precisely. They saved us more than eight hours of tedious hammer work and paid for themselves twice on this job alone. To keep the joist tops flush, we checked the width of all the joists and pulled any that were ⅛ in. more or less than the average. (If we'd just pulled stock off the pile, narrower joists would be lower and wider ones higher because the hangers are all at the same level.)

When there are a lot of out-of-tolerance joists, we group them in like-size order and set their associated hanger heights so that the tops are flush. We lucked out on this job. The unit of 2x8s delivered had only two out-of-tolerance joists.

Keep the drudgery to a minimum. *A jig to locate hangers and a dedicated nailer save a day's worth of labor.*

Go by the string. *To establish a straight rim, we put guide blocks on each end, run a string between, and adjust the distance by renailing the strapping.*

Laser perfect. *To gauge the height of the rim relative to the house, I set a laser level on the ledger and read the results on a marked target block.*

TEMPORARY BUT ADJUSTABLE POSTS

I use some tall, adjustable post shores to set the height of the rim beam on decks. In the past, we've also used a simple 2x A-frame (above) whose legs can be adjusted to raise or lower the beam.

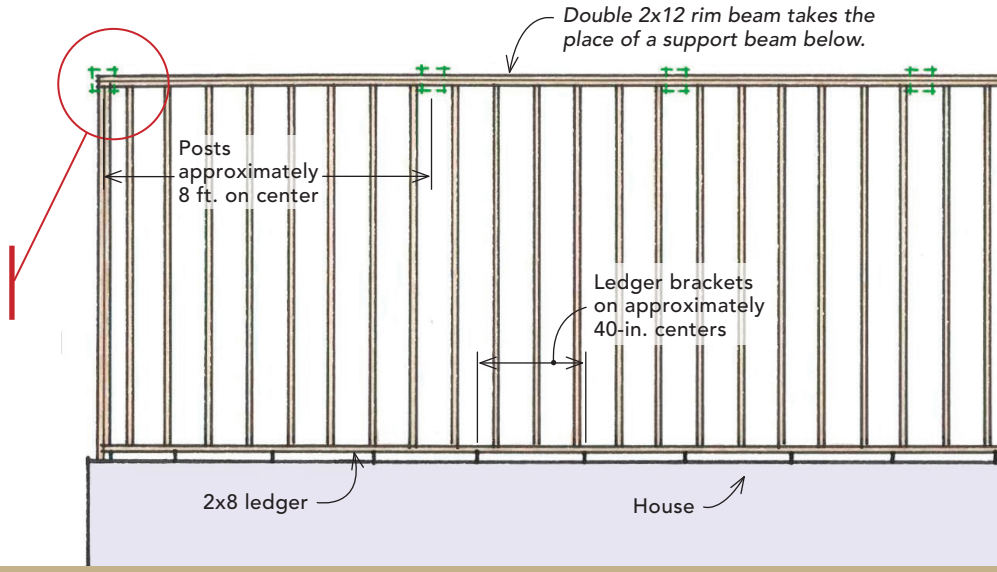
Photo bottom right: Tom O'Brien

Locate post bases. *Plumbing down from the rim, I mark and drill holes for the post-base anchor bolts, then install the bases. With the post ends wrapped in isolation membrane, I set the posts in place.*

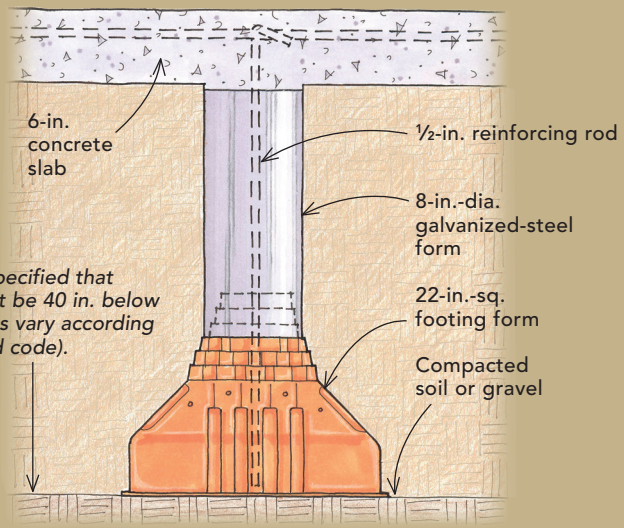
Install the posts in the right place

CHALLENGE You can't install the posts until the height and position of the rim beam are established.

STRATEGY With the rim beam straightened and braced, we squared up the frame and installed the end rim boards. We used adjustable wall braces to lock the frame in position, then plumbed down from the beam to the slab at each post position (about 8 ft. on center, spaced equally along the perimeter). After marking for the post bases, we drilled into the slab and used 5-in. by ½-in. wedge-type anchors to bolt down the bases. Post ends were wrapped with isolation membrane, then attached to the beam with galvanized connectors.



Footing forms stay sturdy until you're ready to pour



According to my engineer, 12-in.-dia. footings would have sufficed for this soil type and deck load, but I chose plastic footing forms from Square Foot to give the deck broader support. These forms provide more than four times the footing area of 12-in.-dia. footings. Also, because I knew it would be several weeks between the time I set the forms and the time we poured, I used 8-in.-dia. galvanized-steel ducts salvaged from a

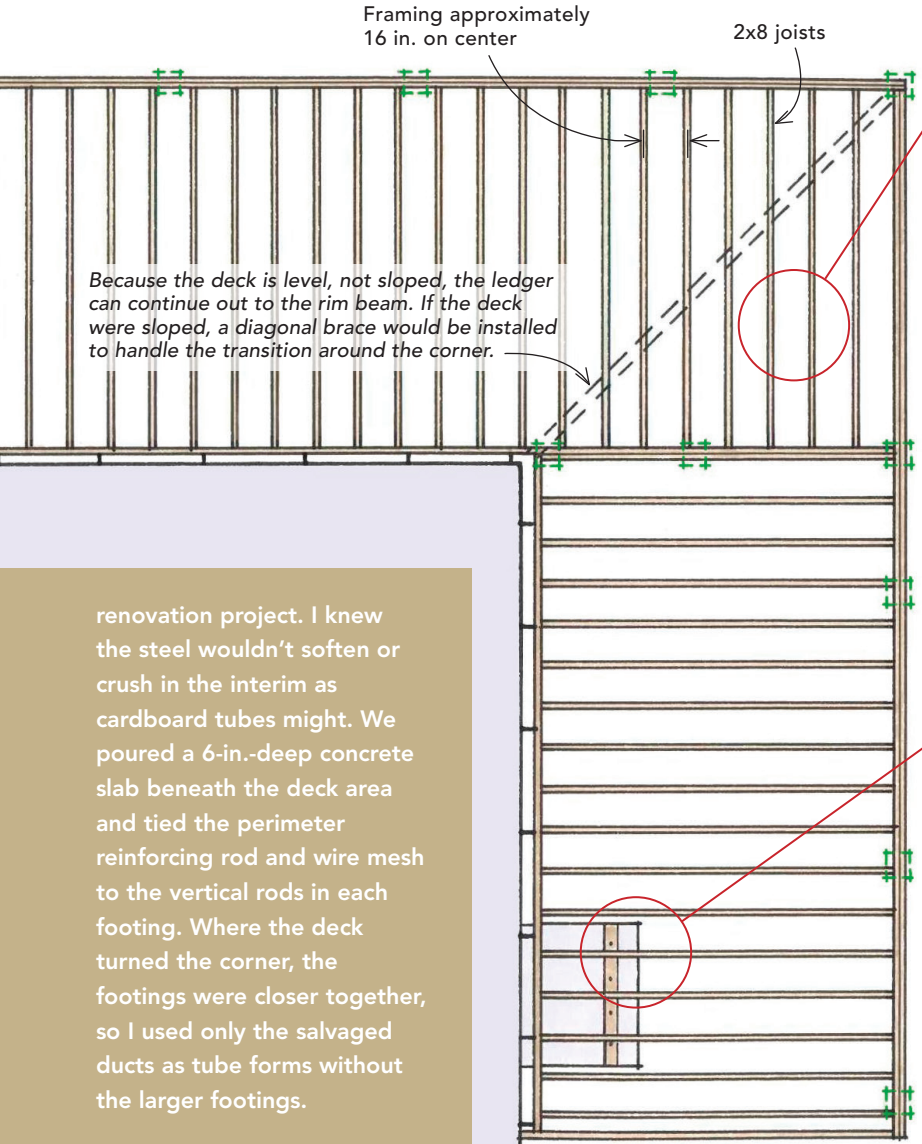
Drawings: Martha Garstang Hill

Work a section at a time. *After setting up staging, we laid out and dropped the joists into the hangers, nailing them off as we went.*

Work safer in the air

CHALLENGE Deck framing is easier when the deck is close to the ground. When the deck is 8 ft. high and you have nearly 60 joists to install, it's a big job to get this framing done efficiently without compromising safety.

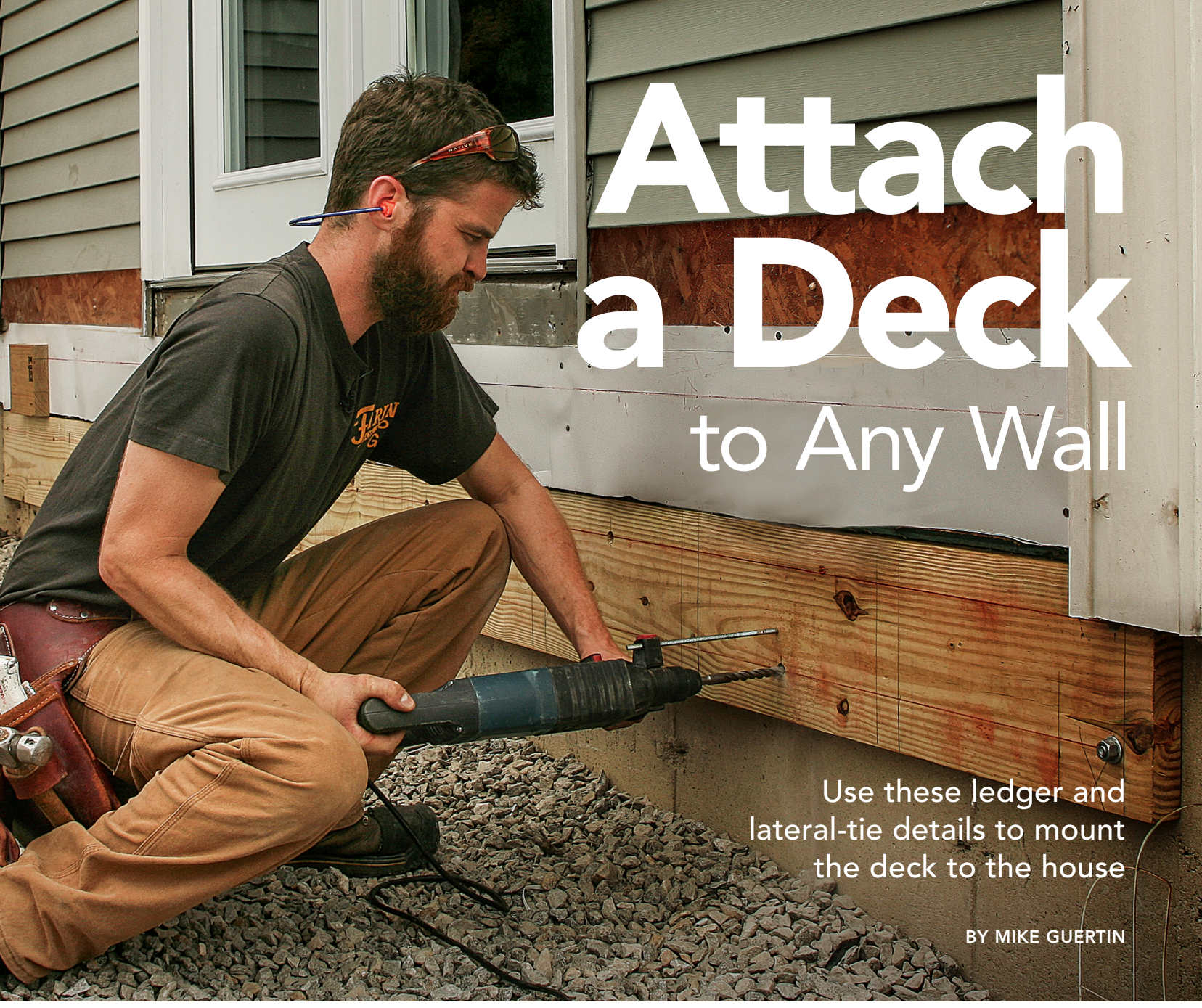
STRATEGY We trimmed the joists ⅛ in. to ¼ in. shorter than the span, which helped us to drop them in place without ripping the isolation membrane. There is a limit, however; joist ends can have no more than a ⅛-in. gap, according to the joist-hanger manufacturer. We set up planks between A-frame scaffolds to walk on and stacked enough joists to fill a plank-size section. With one crew member at each end, we dropped in the joists and drove in the diagonal nails through the hangers before moving the scaffold down for the next section. With the joists nailed off, we cleaned up and got ready to run decking.



renovation project. I knew the steel wouldn't soften or crush in the interim as cardboard tubes might. We poured a 6-in.-deep concrete slab beneath the deck area and tied the perimeter reinforcing rod and wire mesh to the vertical rods in each footing. Where the deck turned the corner, the footings were closer together, so I used only the salvaged ducts as tube forms without the larger footings.

INTEGRATE THE OLD WITH THE NEW

Around the corner, where the deck was close to grade level, the old but sound concrete back steps interfered with several joists. We scribe-fit the joist ends to rest on the landing and added full-width support with a 2x4 sleeper. Fastened to the lower step with wedge-type anchors, the sleeper also acts as a base for toenailing joists.



Attach a Deck to Any Wall

Use these ledger and lateral-tie details to mount the deck to the house

BY MIKE GUERTIN

Even a 12-ft. by 14-ft. deck's ledger has to support a minimum of two tons—a lot to ask of a single board screwed to the side of a house.

In addition to gravity loads, we also have to make sure the deck can resist lateral load, which is the horizontal force that pulls a deck away from the house. For many years, the International Residential Code (IRC) only gave us a performance criteria to meet: "Where supported by an exterior wall, decks shall be positively anchored to the primary structure and designed for both vertical and lateral loads." Unless you hired an engineer to design the ledger and lateral-load attachments or you knew how to apply engineering principles, you couldn't competently design and mount a code-complaint deck to a house.

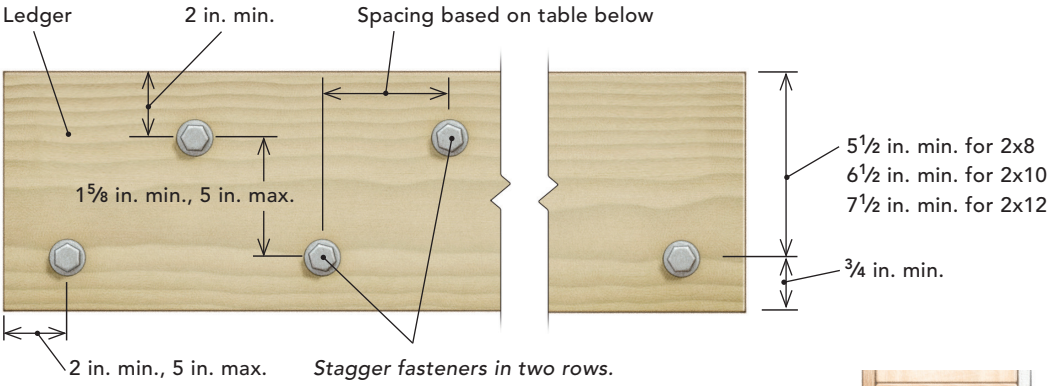
Most of us now rely on prescriptive tables and illustrations to achieve a structurally sound, code-compliant ledger attachment. There are three main resources: prescriptive measures outlined in the IRC, instructions provided by fastener or engineered-lumber manufacturers with an International Code Council Evaluation Service Report (ICC-ESR), or an "approved" technical guide provided by an industry association.

There are variations in deck sizes and loading, house framing, and deck-builder preferences. We can't address every scenario in a short article, but here are the most common ledger and lateral-tie requirements for building decks on most homes. Some code jurisdictions have developed their own prescriptive deck-ledger-attachment requirements and may prohibit some of the solutions presented here. Check with your local building-code official to ensure you're following the locally enforced code provisions. Also, remember that properly flashing a ledger is key to a safe, long-lasting deck. For clarity, the drawings in this article don't show WRB or flashing details. See my Ultimate Deck Build at FineHomebuilding.com/decks for some of these. □

Mike Guertin is editorial advisor.

Photo: Charles Bickford. Drawings: Christopher Mills.

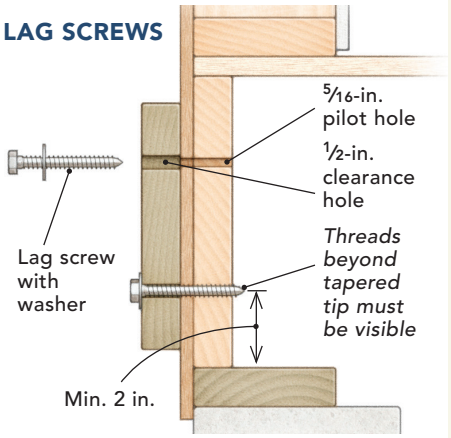
LEDGER BASICS

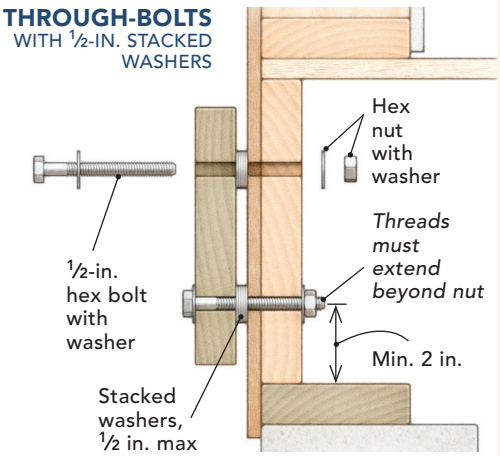


THE SPECIFIED LOCATION OF THE LAG SCREWS or through-bolts ensures there's enough ledger wood above the top row of fasteners and enough rim-joist wood below the bottom row of fasteners to reduce splitting. In addition, there are minimum and maximum distances the two rows of fasteners can be spaced apart. Proper pilot and clearance holes are also required, and the fasteners must be hot-dipped galvanized or stainless steel. Recessed heads are not allowed, nor are carriage bolts.

The fastening schedule provided in the 2018 IRC and earlier versions cannot be used for decks with live or ground snow loads in excess of 40 psf, or dead loads in excess of 10 psf. The 2021 and 2024 editions of the IRC have fastening schedules for snow loads as high as 70 psf. The connections must allow for inspection to ensure edge spacing and proper penetration (threads beyond nut for bolts and beyond tapered tip for lags).

Deck builders in snowy regions often build decks 5 in. to 7 in. lower than the interior floor level to keep snow from building up against doors that access the deck. This can't be accomplished when following the IRC table, because of the required edge distances.





WHAT ABOUT STRUCTURAL SCREWS?

FastenMaster's Ledgerlok, Simpson Strong-Tie's SDWH and SDWS, SPAX's Power Lags, MiTek's WS series, and GRK's RSS structural screws have ledger-fastening schedules. Unlike bolts or lags, most ledger-ready structural screws include fastener spacing for engineered rim joists. Some are suitable for live loads greater than 40 psf, which is great for areas with heavy snow.

And for those deck builders who like to set the deck one step down from the house-floor level, the lower row of screws can be driven into the center of the mudsill or wall plate (predrilling may be required). Some manufacturers permit the ledger to be mounted into studs rather than into a rim joist, which is great for midwall stair landings. These less-common applications aren't widely publicized in the product literature, so it's best to contact technical support.

CONNECTION DETAILS	RIM JOIST OR BAND JOIST	JOIST SPAN						
		6 ft. and less	6 ft. 1 in. to 8 ft.	8 ft. 1 in to 10 ft.	10 ft. 1 in. to 12 ft.	12 ft. 1 in. to 14 ft.	14 ft. 1 in. to 16 ft.	16 ft. 1 in. to 18 ft.
½-in.-dia. lag screw with 15/32-in. maximum sheathing	1-in. LVL	24 in.	18 in.	14 in.	12 in.	10 in.	9 in.	8 in.
	1⅛-in. LVL	28 in.	21 in.	16 in.	14 in.	12 in.	10 in.	9 in.
	1½-in. lumber	30 in.	23 in.	18 in.	15 in.	13 in.	11 in.	10 in.
½-in.-dia. through bolt with 15/32-in. maximum sheathing	1-in. LVL	24 in.	18 in.	14 in.	12 in.	10 in.	9 in.	8 in.
	1⅛-in. LVL	28 in.	21 in.	16 in.	14 in.	12 in.	10 in.	9 in.
	1½-in. lumber	36 in.	36 in.	34 in.	29 in.	24 in.	21 in.	19 in.
½-in.-dia. through bolt with 15/32-in. maximum sheathing and ½-in. stacked washers	1½-in. lumber	36 in.	36 in.	29 in.	24 in.	21 in.	18 in.	16 in.

This chart is based on DCA 6. The fastener spacings for laminated veneer lumber (LVL) are less than solid lumber because they also include other "structural composite lumber."

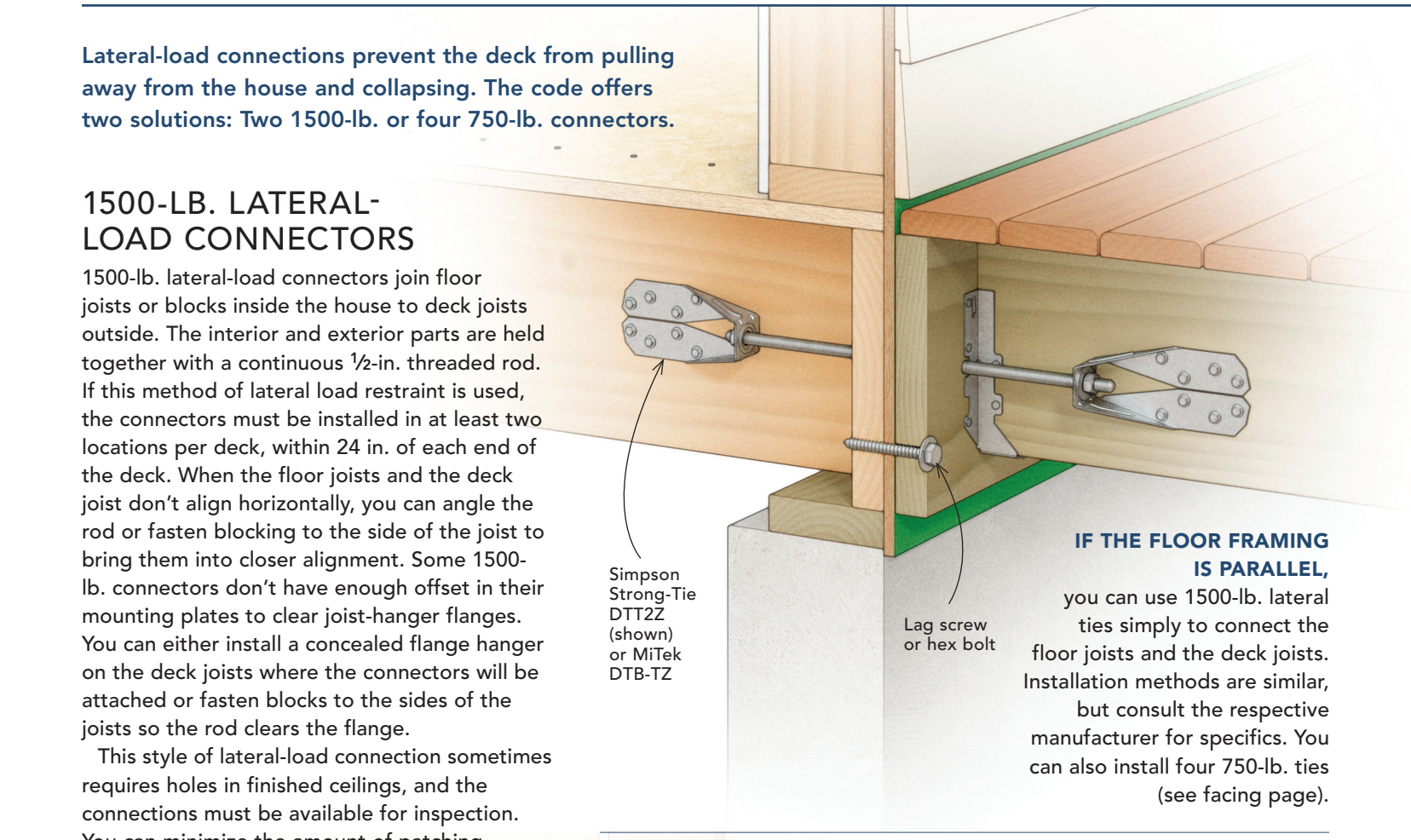
ATTACHING LEDGERS TO SOLID LUMBER

Lateral-load connections prevent the deck from pulling away from the house and collapsing. The code offers two solutions: Two 1500-lb. or four 750-lb. connectors.

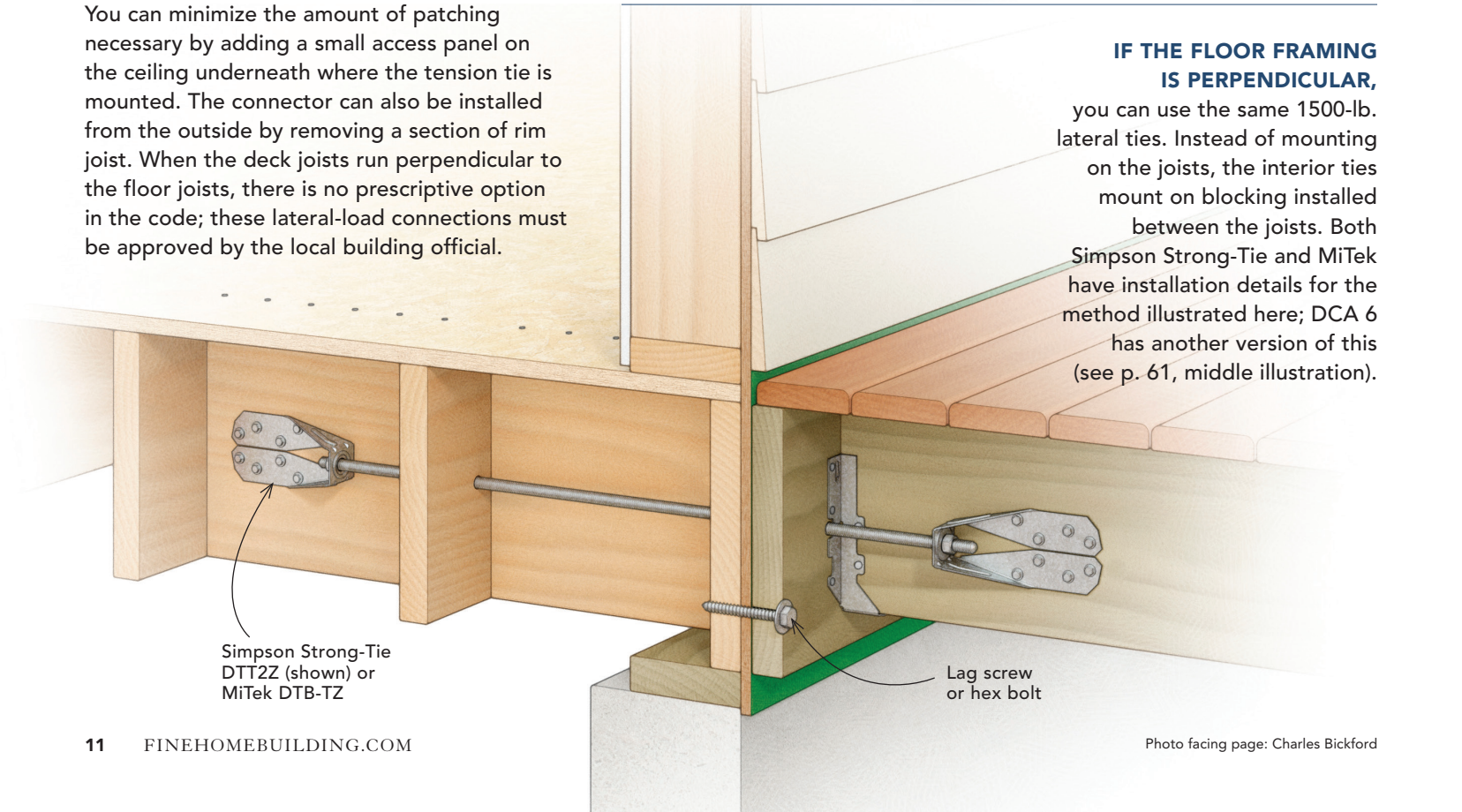
1500-LB. LATERAL-LOAD CONNECTORS

1500-lb. lateral-load connectors join floor joists or blocks inside the house to deck joists outside. The interior and exterior parts are held together with a continuous ½-in. threaded rod. If this method of lateral load restraint is used, the connectors must be installed in at least two locations per deck, within 24 in. of each end of the deck. When the floor joists and the deck joist don't align horizontally, you can angle the rod or fasten blocking to the side of the joist to bring them into closer alignment. Some 1500-lb. connectors don't have enough offset in their mounting plates to clear joist-hanger flanges. You can either install a concealed flange hanger on the deck joists where the connectors will be attached or fasten blocks to the sides of the joists so the rod clears the flange.

This style of lateral-load connection sometimes requires holes in finished ceilings, and the connections must be available for inspection. You can minimize the amount of patching necessary by adding a small access panel on the ceiling underneath where the tension tie is mounted. The connector can also be installed from the outside by removing a section of rim joist. When the deck joists run perpendicular to the floor joists, there is no prescriptive option in the code; these lateral-load connections must be approved by the local building official.

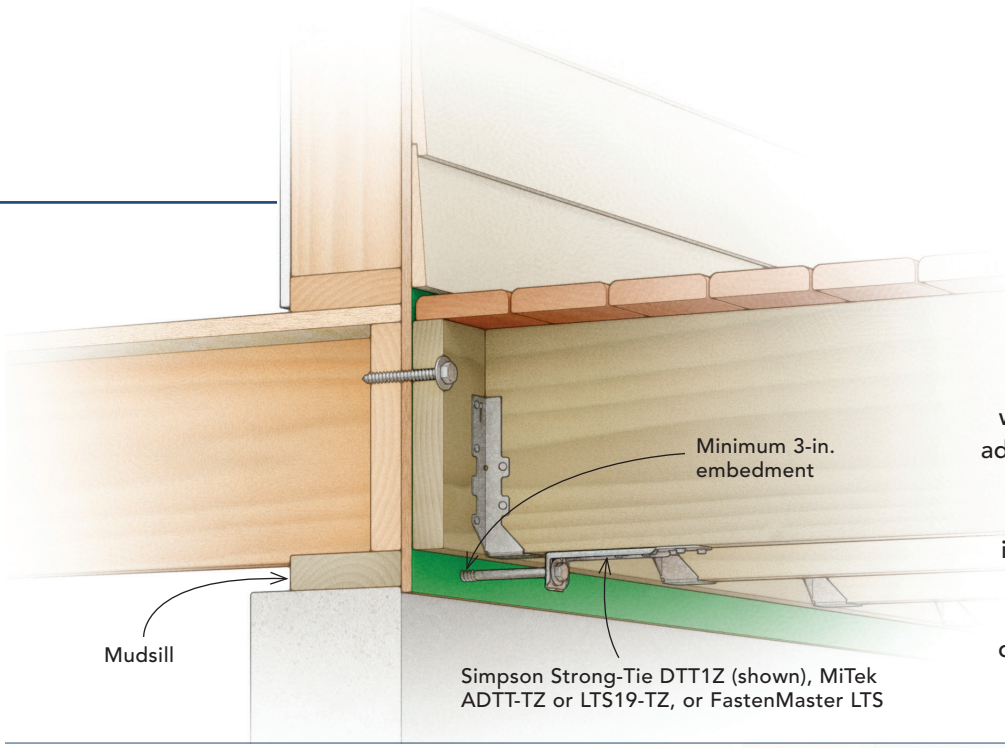


IF THE FLOOR FRAMING IS PARALLEL, you can use 1500-lb. lateral ties simply to connect the floor joists and the deck joists. Installation methods are similar, but consult the respective manufacturer for specifics. You can also install four 750-lb. ties (see facing page).



IF THE FLOOR FRAMING IS PERPENDICULAR, you can use the same 1500-lb. lateral ties. Instead of mounting on the joists, the interior ties mount on blocking installed between the joists. Both Simpson Strong-Tie and MiTek have installation details for the method illustrated here; DCA 6 has another version of this (see p. 61, middle illustration).

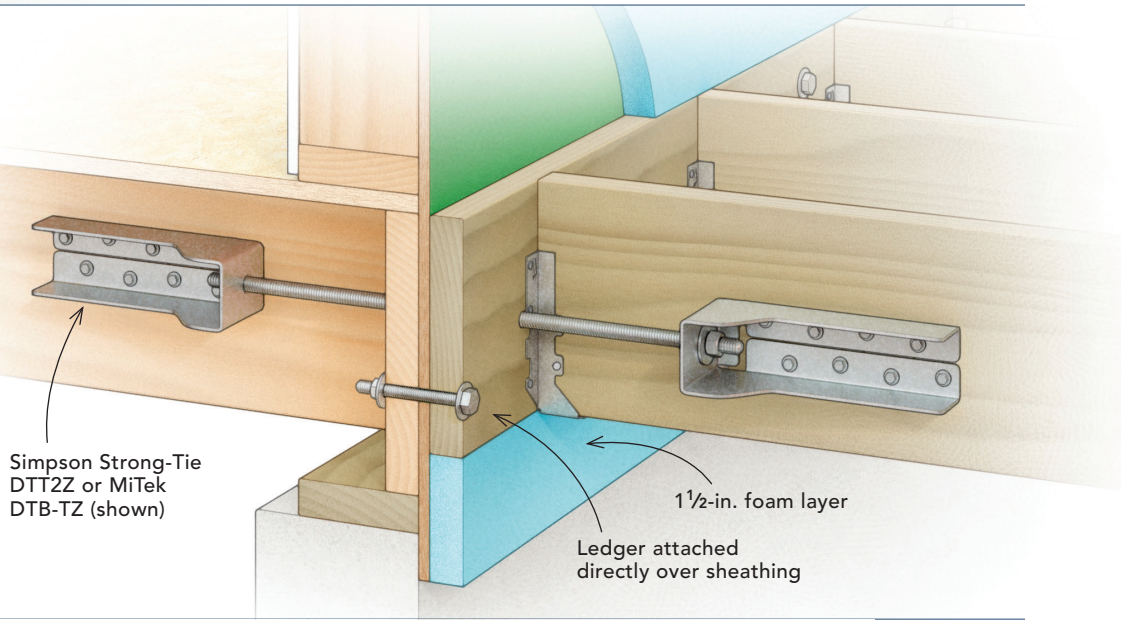
Photo facing page: Charles Bickford



750-LB. LATERAL-LOAD CONNECTORS

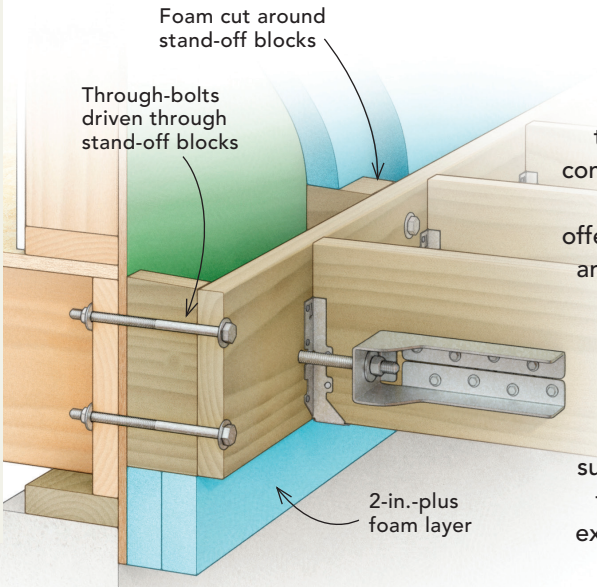
Because they install entirely from the exterior, 750-lb. lateral-load connections are faster and easier to install. The connection is made between a deck joist and the mudsill, wall top plate, or wall stud. One connector is required within 2 ft. of both ledger ends, with two additional connectors equidistant between the end connectors. Several mounting locations and blocking arrangements are illustrated in manufacturer literature, and installation methods must comply with their instructions. Unfortunately, 750-lb. connectors can't be used when the home and deck joists are perpendicular.

WITH EXTERIOR RIGID FOAM, you can make a code-compliant assembly by simply omitting the foam layer behind the ledger. This allows you to use the prescriptive ledger-fastener and spacing requirements described in the IRC and DCA 6. The 1500-lb. lateral-tie methods are the same as assemblies without foam. You can also use four 750-lb. lateral ties, assuming the house and deck joists are parallel and the screws are embedded 3 in. into the framing.



Off-the-shelf alternatives

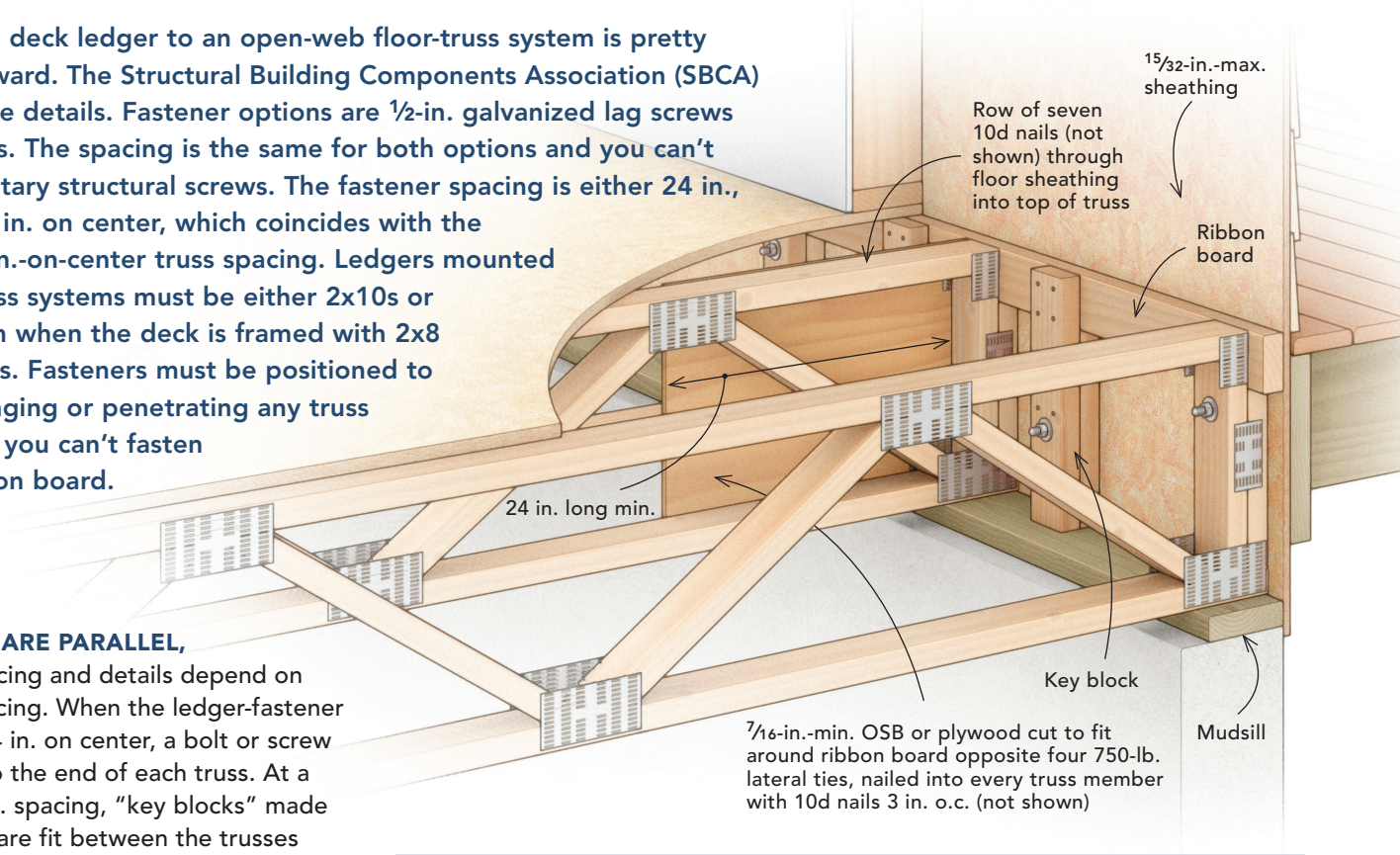
Proprietary ledger-fastening methods including the Maine Deck bracket (shown), the Metwood MTW Deck Bracket, and the BR Brick Bracket can often solve specific ledger-installation difficulties resulting from thick claddings. Check the manufacturers' websites for more information.



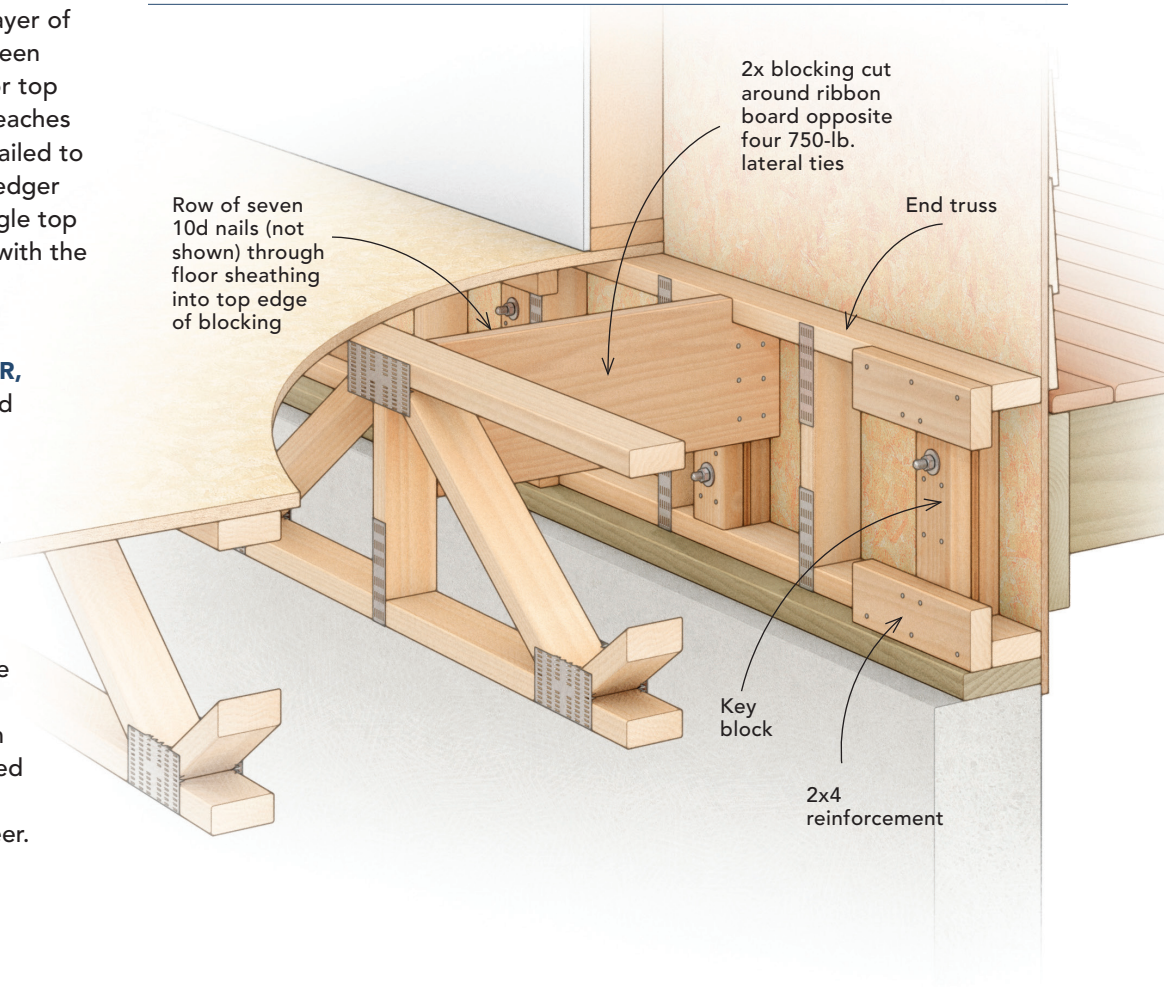
WITH THICK EXTERIOR RIGID FOAM, BRICK, STONE, ADHERED STONE, OR STUCCO, the ledger-mounting details get more complicated. The Cold Climate Research Center's REMOTE construction guide offers one option, using stand-off blocks and through-bolts to mount ledgers up to several inches off the wall. There is no prescriptive guide for spacing the bolts and blocks, so you'll need to have a structural engineer adapt the system to suit each situation. You can also build a freestanding deck, which is often less expensive than an engineered solution.

ATTACHING LEDGERS TO WEB TRUSSES

Mounting a deck ledger to an open-web floor-truss system is pretty straightforward. The Structural Building Components Association (SBCA) provides the details. Fastener options are ½-in. galvanized lag screws or hex bolts. The spacing is the same for both options and you can't use proprietary structural screws. The fastener spacing is either 24 in., 12 in., or 8 in. on center, which coincides with the typical 24-in.-on-center truss spacing. Ledgers mounted to floor-truss systems must be either 2x10s or 2x12s, even when the deck is framed with 2x8 or 2x6 joists. Fasteners must be positioned to avoid damaging or penetrating any truss plates, and you can't fasten to the ribbon board.



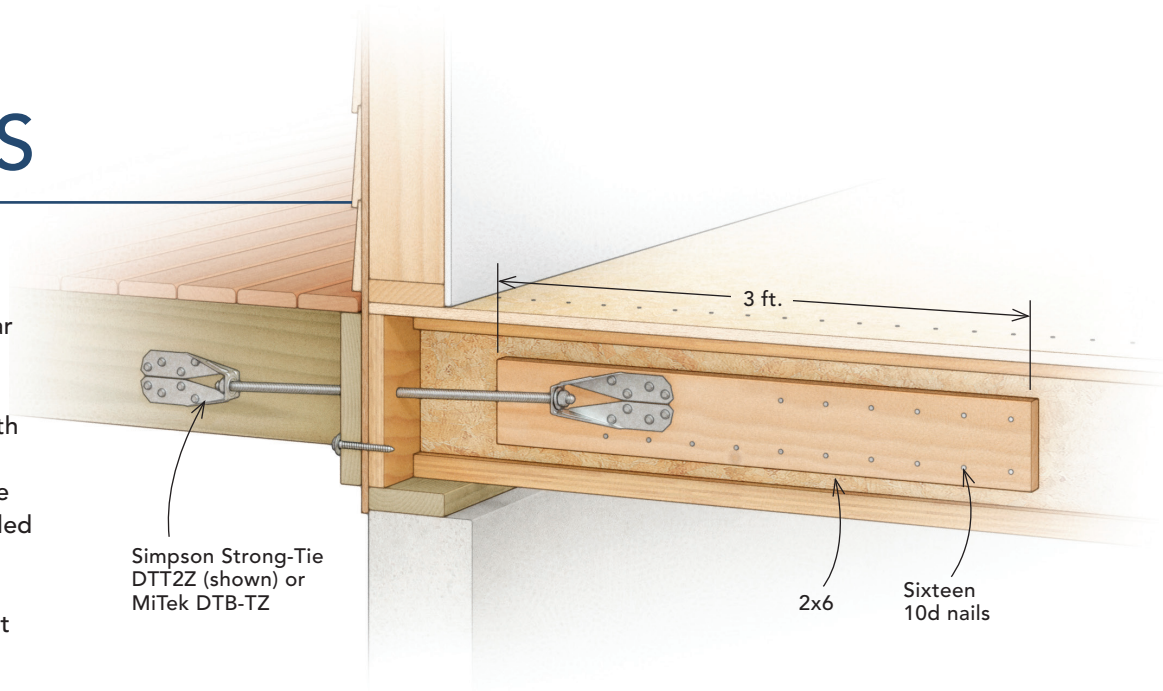
IF TRUSSES ARE PARALLEL, fastener spacing and details depend on the joist spacing. When the ledger-fastener spacing is 24 in. on center, a bolt or screw is driven into the end of each truss. At a 12-in. or 8-in. spacing, "key blocks" made of two 2x4s are fit between the trusses for additional fastening. The first layer of the key blocks is cut so it fits between the ribbon board and the mudsill or top plate. A second layer of 2x4 that reaches to the top of the ribbon board is nailed to the back for extra support. If the ledger is bearing on a stud wall with a single top plate, the key blocks must line up with the studs below.



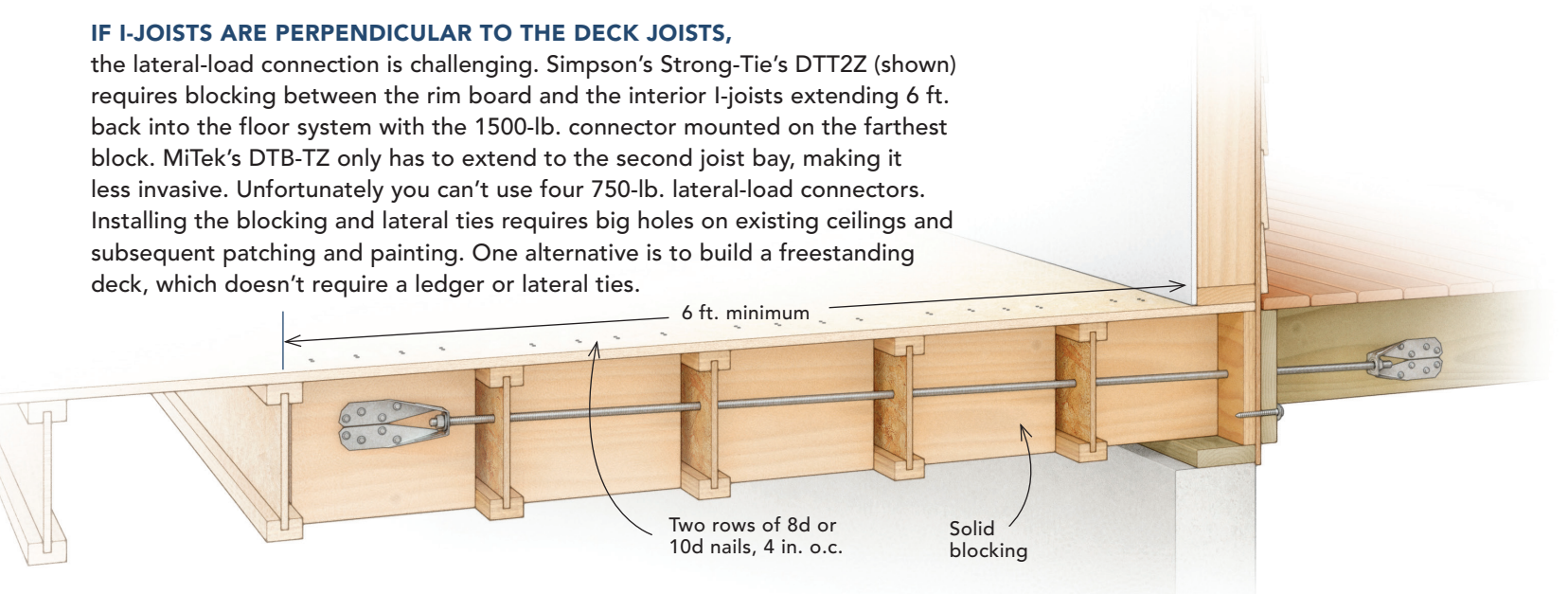
IF TRUSSES ARE PERPENDICULAR, there is often an end truss specified to provide vertical members spaced 8 in.,12 in., or 16 in. on center, instead of the diagonal webs common to standard trusses. In these cases, the deck ledger is attached to the vertical members directly as shown here. If the end trusses have diagonal members like the rest of the floor, blocking can be fit between the top and bottom chords, but how this is accomplished must be specified by the truss manufacturer or a structural engineer.

AND I-JOISTS

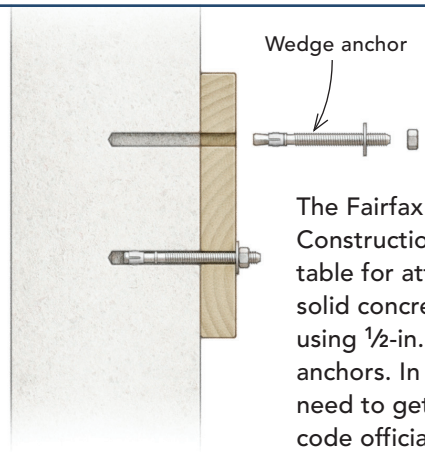
IF I-JOISTS ARE PARALLEL TO THE DECK JOISTS, the lateral-load connection is similar to the one used for solid lumber, but it includes a 3-ft. piece of 2x6 attached to the side of the joist with sixteen 10d nails and nineteen 8d nails through the sheathing into the joist. The threaded rod can be angled horizontally or vertically up to 1 in. in 12 in. for easier installation. This detail comes from DCA 6 and I-joist manufacturers.



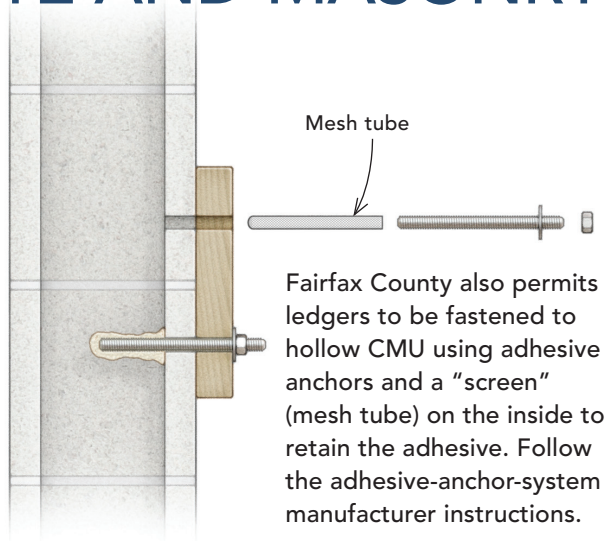
IF I-JOISTS ARE PERPENDICULAR TO THE DECK JOISTS, the lateral-load connection is challenging. Simpson's Strong-Tie's DTT2Z (shown) requires blocking between the rim board and the interior I-joists extending 6 ft. back into the floor system with the 1500-lb. connector mounted on the farthest block. MiTek's DTB-TZ only has to extend to the second joist bay, making it less invasive. Unfortunately you can't use four 750-lb. lateral-load connectors. Installing the blocking and lateral ties requires big holes on existing ceilings and subsequent patching and painting. One alternative is to build a freestanding deck, which doesn't require a ledger or lateral ties.



CONCRETE AND MASONRY

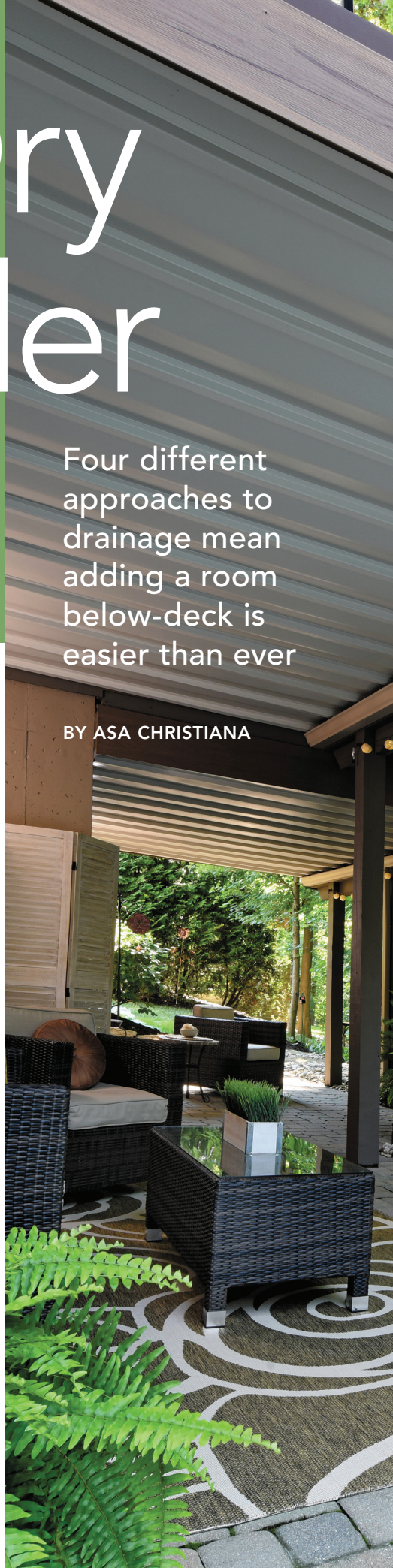


The Fairfax County, Va., Deck Construction Guide lists a prescriptive table for attaching deck ledgers to solid concrete or fully-grouted CMU using ½-in. adhesive anchors or wedge anchors. In order to use this detail you need to get approval from the local code official. Follow minimum depths and edge distances prescribed by the anchor manufacturer. In addition to wedge anchors and adhesive anchors, Simpson Strong-Tie's stainless-steel Titen HD can be used to mount a ledger to solid concrete or grouted CMU. Note: the standard galvanized Titen HD cannot be used.



Fairfax County also permits ledgers to be fastened to hollow CMU using adhesive anchors and a "screen" (mesh tube) on the inside to retain the adhesive. Follow the adhesive-anchor-system manufacturer instructions.

Create a Dry Space Under Your Deck



Four different approaches to drainage mean adding a room below-deck is easier than ever

BY ASA CHRISTIANA

For regions of the country with multiple-story homes or hilly terrain, the dead zone under a tall deck can add valuable living space at far less cost than a traditional addition. The trick to transforming that dark, wet space into an area that's dry and useful is a deck drainage system.

"Think about real-estate value," says Pete Ciaraldi, who remodels exteriors in Salem, N.H. "You're adding another room. It could be an outdoor patio with a fire pit or a finished formal room that's completely closed in, with an outdoor kitchen on the deck above."

Deck drainage can do more than just shield the space below it from the elements; some systems also make it easy to add lights, speakers, heaters, and fans to the ceiling under a deck, adding comfort and value to the space they protect.

While drainage systems are most often added to decks 7 ft. or more above grade, Ciaraldi has added them to decks as low as low as 5 ft. high, creating valuable outdoor storage space—letting a client drive a lawn tractor underneath, for example.

For these reasons and more, deck drainage systems are increasingly popular, driving an expanding—and confusing—marketplace. Systems vary widely, as do the conditions they contend with.

Protecting today's vulnerable deck framing

The stakes are high for making a wise choice. Trapped water and debris can cause damaging leaks that are hard to track down and cause the deck framing to rot and fail.

"We've taken failing systems down and found hundreds of pounds of soggy, smelly crud," Ciaraldi says. "Think about what gets caught in a 5-in.-wide gutter. This is like having a big gutter in each bay [between the joists]."

A well-chosen drainage system, on the other hand, installed correctly, will be reliable and easy to maintain, keeping the framing healthy and the space below it dry and comfortable for decades to come.

Contractors across the country agree that pressure-treated deck-framing lumber isn't what it once was, thanks to faster-growing forests, lower grading standards, and less effective preservatives. At the same time, today's decking is more durable than ever, lasting decades with minimal maintenance.

"It's like putting a filet mignon on a paper plate," says Leslie Adkins, former VP of marketing for Trex. Experienced contractors agree. This reality makes standing water and rotting leaf

Photo: Daniel Feldkamp, Visual Edge Imaging Studios, courtesy of TimberTech

mold even more threatening to deck framing, and therefore more important to avoid in the drainage system you choose.

Two main approaches to deck drainage

With one outlying exception, there are two main groupings of deck drainage systems: those installed above the framing and those that attach below it. The undermount type is usually an array of ceiling panels, which act as the drain system and create a ceiling finish at the same time. The big advantages of this type of system are its overall cost and its ability to be added to any type of deck, be it new construction or retrofit.

Systems that install above the framing break down into two categories: waterproof decking that stops water at the surface, and membrane material that's draped over the joists, creating sloped troughs that direct water outward.

Both types of products protect the framing from moisture, and allow any type of ceiling finish to be installed below, with dry, open space for wiring, junction boxes, and electrical fixtures like lights, fans, and speakers. But there are critical differences between the two.

Choose an over-the-joist membrane system if possible

I spoke with high-end deck builders across the United States, each with decades of experience, and all agreed that the best approach to deck drainage is some sort of membrane installed over the joists. Their big advantage is the amount of slope that can be created in each trough—up to ¾ in. per ft., depending on the depth of the joists and span of the deck. The drain slope is created by pulling the material nearly flat at one end—typically the ledger board—and draping it almost to the bottom of the framing at the other—usually at the rim joist.

Slope is critical for clearing debris, which is why Ciaraldi and others trust these systems enough to install them over fully finished indoor rooms created below.

On the negative side, over-the-joist systems are generally pricier overall. There's the cost of the system, and then the additional cost of installing some sort of ceiling finish below them. That's why a number of high-end deck builders prefer to create their own over-the-framing membrane systems on-site, using common building materials, which lets them offer a state-of-the art system for less (see "Site-built systems," p. 20).

Also, these systems are seldom added to existing decks, since that requires removing the decking and either replacing it with new material or numbering each board, flashing the posts and other penetrations, and reattaching the deck boards in their original order.

Of the manufactured draped-membrane systems, Trex RainEscape was the runaway favorite of the deck builders I spoke with.

The RainEscape system includes plastic trough material, downspout gutters that collect water and debris at the end of each trough (directing it into a standard gutter installed below), and adhesive butyl tape that seals the overlapping

THE FAVORED APPROACH

OVER-THE-JOIST MEMBRANES

PROS
- Pitch up to ¾ in. per ft. while maintaining a level deck
- Any finish can be used below
- Large slope reduces clogging
- Protects framing from rot

CONS
- Expensive
- Difficult to retrofit to existing decks

Business up top. *Trex RainEscape consists of a series of overlapping membrane troughs that feed into plastic downspouts, and includes various proprietary flashing and sealing materials. The system is a favorite among deck builders, who like the slick-surfaced membrane's ability to shed debris without clogging.*

Party underneath. *Ceilings under membrane systems that provide waterproofing from above can allow just about any ceiling finish and amenity to be added underneath. Here, Trex RainEscape provides waterproofing and drainage above a cozy enclosed porch.*

seam over each joist and also seals around screw penetrations when decking is installed.

The slick plastic trough material is one advantage of the system; contractors believe that it clears debris better than a rubber membrane. Another plus is the cutlines on the trough material, premarked for various joist spans and spacing.

While contractors like Ciaraldi and others extol the self-purging abilities of RainEscape and site-built systems like it, all recommend that installers build in a way to clear debris from the draped troughs, which are trapped beneath the decking and above the finished ceiling.

The easiest approach is to face-screw a few rows of deck boards—one set near the house and another above the gutters, and maybe one at the midpoint too—for inserting a garden hose and clearing debris at least once a year. Others build access hatches into the ceiling at the end of each joist bay, allowing the homeowner to clear debris by pushing up on the underside of the flexible troughs and reaching into the gutter boxes.

Brendan Casey, who's built decks for four decades in western Maryland, has another tip. To eliminate what he considers to be a weak link in the system—the flashing and caulking around railing posts that penetrate the decking—he uses only surface-mounted posts that he bolts down on top of the RainEscape tape and trough material, placing an extra layer of adhesive butyl rubber below, with everything compressed and sealed by the post flange.

Trex RainEscape has an excellent set of instructions and instructional videos, and the product's North American sales director, Dave Kile, highly recommends that installers read and watch them, as the system has been refined over the years and each step is critical. One important step, Kile says, is to unroll the long strips and fold them down the middle to keep them straight and make them easier to handle. This lets them finish shrinking or expanding as they acclimate to the environment, especially in hot sun.

Kile also recommends Trex's free design services. "Send us your plans and we'll do a materials estimate and send you diagrams," he says. "For example, we'll show you how to frame around a railing so it works better with our system."

Waterproof decking is another over-joist option

Waterproof decking can also stop water and debris before it gets to the framing, and create a dry space below. Unlike draped membranes, waterproof deck boards create a finished look on their lower side, albeit at the tops of the joist bays.

Two downsides are slope, which is only as steep as the pitch of the deck framing, and the potential to trap water and debris in channels that can't be accessed. Both factors make it important to sweep debris off the deck regularly.

While some contractors aren't sold quite yet on waterproof decking, Jason Russell (aka Dr. Decks), a longtime

Photos: this page top, Patrick McCombe; bottom; courtesy of Professional Building Services; facing page top, courtesy of Green Bay Decking; bottom, courtesy of Dexerdry

deck builder in Tacoma, Wash., uses three of these products regularly with good results.

His first choice is Dexerdry, a rubber flange installed between deck boards, filling the slots intended for hidden fasteners. This requires that the decking be face-screwed instead (Russell uses Cortex screws with grain- and color-matched plugs). To seal around screw penetrations, he tops each joist with G-Tape, a popular adhesive flashing that tears by hand. Russell uses Dexerdry flanges with Azek PVC decking, but they make versions for other popular deck boards too.

For other decking materials and looks, Russell chooses interlocking deck boards with integrated drainage channels. When composite decking is called for, his choice is DuxxBak, which offers a range of wood looks in a durable material that includes no wood flour. And when clients want aluminum decking, he goes with LockDry, made by Nexan Building Products.

Systems that install from below

Whether you are building a deck from scratch or waterproofing an existing deck, you can save money and time with a system that installs below the joists. These two-in-one ceiling systems provide a drainage system and a finished look at the same time.

Their main downside is drainage slope, which is limited by the nature of a ceiling-panel system. While that slope can be increased by adding nailers or tapered 2x4s to the bottom of the joists, it will never be as much as a draped membrane can produce, and the increased angle will show up in the finished ceiling. Worse, the low slope angle renders these systems less capable than draped membrane when it comes to clearing debris, potentially trapping wet muck against wood framing for years at a time.

Therefore, contractors should think twice about installing these systems in areas with heavy rains and overhanging trees. If one of these systems is the right option, for cost or other reasons, installers must make it clear to clients that clogs will need to be cleared, and explain the dangers of not doing so.

Another reality of under-joist systems is how they need to stop and restart around support beams, with a gutter on each side.

TimberTech's DrySpace drainage system is an option for existing decks or for customers unwilling to pay extra for an over-the-framing system. It includes rails that cap the bottom of the joists and serve as mounting points for the shallow troughs that collect and drain water, channeling it away from the house and completing a finished ceiling.

Instead of the caulk that some systems use to seal the joints between their brackets and the wood joists, DrySpace uses a self-adhesive butyl rubber flashing tape.

Because of the design of the cap rails and how they attach, the system can only be sloped 1¾ in. from end to end, but experienced contractors like *FHB* editorial advisor Mike Guertin recommend attaching wedge-shaped 2x4s to the bottom of each joist, adding 3½ in. to the slope and helping the system clear debris.

Casey uses ZipUp Underdeck for his waterproofing retrofits. It's an under-joist system that creates a smooth, finished ceiling at the same time. As with all of the best ceiling-panel systems, the individual panels pop out easily for maintenance. To create additional drain slope (beyond the pitch of the deck itself), ZipUp provides plastic "pitch rails." Casey points out that these rails drop the end of the system below the bottom of the rim joists, requiring a wider fascia board to hide them.

While ZipUp does not provide or recommend wiring or lighting systems for the wet environment atop the ceiling panels, Casey's electrician surface-mounts lights and

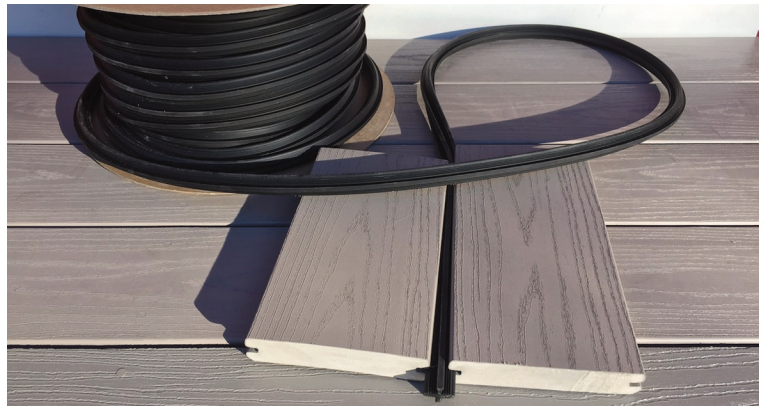
CAPABLE, BUT INCOMPLETE

WATERPROOF DECKING

PROS
- Protects framing from rot
- Can cost far less than other systems
- Somewhat finished look below

CONS
- Framing must be pitched to shed water
- May have to reorient framing to properly direct water away from structure
- Additional products required to waterproof wall transitions

From the top. *DuxxBak is an interlocking composite decking system that sheds water both along the top of the decking and in channels inside it. Unlike membrane systems, which create pitched troughs inside the framing cavities, the deck framing itself has to be pitched in order to facilitate drainage when waterproof decking is used.*



Watertight flange. *Dexerdry produces waterproofing thermoplastic flanges to fit into the hidden-fastener slots of various manufacturers' deck boards. More of an accessory than a system, Dexerdry also relies on a properly pitched deck for drainage.*

TWO-IN-ONE SYSTEMS

CEILING-MOUNTED

PROS

- Easiest to retrofit to existing decks
- Less expensive than membrane systems
- Provides ceiling finish and drainage
- Some easy to remove for cleaning debris

CONS

- Slope can be limited, so greater chance of clogs
- Increasing slope is evident in finished ceiling
- Doesn't protect framing

Dry below. *Installing a deck drainage system can protect what's below from the weather and create additional outdoor spaces that stay dry when the deck itself is battered by rain. These systems provide both drainage and a finished ceiling.*

Easy access and customizable. *Haven Underdeck comes in dozens of colors in flat or beadboard finishes, and has numerous add-on features, including LED lights, speakers, ceiling fans, and swing hooks. The all-aluminum panels are easily removed to clean out debris.*

junction boxes on the dry side, and shields wiring in the wet space above with small putty dams.

When John Lea, of Decksouth in Marietta, Ga., can't mount his own DIY membrane system above the framing, he installs Haven Underdeck below. It's an all-aluminum system with removable panels that create a smooth ceiling.

Lea cites Haven's accessory lighting and electrical systems as pluses, as well as the hockey-puck-type vents available upon request. "If you're going to encapsulate a deck frame, you need to add ventilation and be able to remove a panel to inspect the system, without taking down the whole thing," he says.

DryJoistEZ is in its own category

One option that doesn't fit into either of the two broad categories described above is DryJoistEZ from Wahoo Decks. This is a unique hybrid, with its own set of strengths and weaknesses. What you get are a series of structural, interlocking aluminum joists with integral drainage channels. These replace standard deck joists and handle spans up to 8 ft., greatly simplifying the wood framing below—the panels sit right on the deck beams. They also protect that framing from moisture and rot, and create a finished beadboard look above the deck beams. Better yet, you can attach any type of decking to the aluminum joists, using face screws or hidden fasteners.

The big downside is slope, which is limited to the pitch of the overall deck. To create the drainage angle other systems can produce, you'll need a more noticeably pitched deck. That said, the drainage channels in DryJoistEZ are very deep, and should easily be able to handle considerable obstructions without leaking.

After a few years, however, once leaf mold and other debris piles up, you'll need a way to push it through the system, so installers should definitely face-screw a few areas of the decking for the occasional clearout.

Bottom line

Choosing a deck drainage system—or choosing not to add one—depends on a number of factors. The first main one is where you live. Ciaraldi's New England locale, for example, serves up a perfect storm of challenges, including heavy rainfall and overhanging trees that dump piles of dead leaves and pine needles onto the deck.

Because of that, he sticks with drainage systems that install over the joists, isolating the wood framing from water, leaves, asphalt-shingle granules, food grease, and everything else that drops between deck boards. For regions with lighter rain or fewer trees, however, a broader array of products are workable.

Roof load—the amount of the roof that drains onto a deck—is another variable, potentially doubling or tripling the amount of water and debris that ends up in the system. That's because heavy rain tends to bypass

Photos: this page top, courtesy of TimberTech; bottom, courtesy of Haven Underdeck; facing page top, courtesy of Wahoo Decks; bottom, courtesy of Mike Guertin

gutter guards, while gutters without them tend to clog and overflow.

If the deck is new construction, any deck drainage system on the market will work. If the system is a retrofit, however, an under-joist system is usually the best option. That said, in a tough drainage environment, it might be worth the extra time and labor to install an over-joist membrane system on an existing deck, as Ciaraldi sometimes does.

Another key factor is the desired look of the ceiling below the deck, and what you want to have in it. Most of the systems that install under the joists are finished ceiling panels, saving money on additional finish work but making it more difficult to add wiring and fixtures. Over-the-joist systems sit high up in the bays, letting you add whatever ceiling finish and electrical systems you want, knowing they will stay dry.

Closely related to the ceiling is the purpose of the space below. If it's an outdoor living space, a leaky ceiling panel might be OK once in a while, since most systems allow individual panels to be taken down to clear debris and blockages. To create a finished indoor room, however, best practices must be followed. □

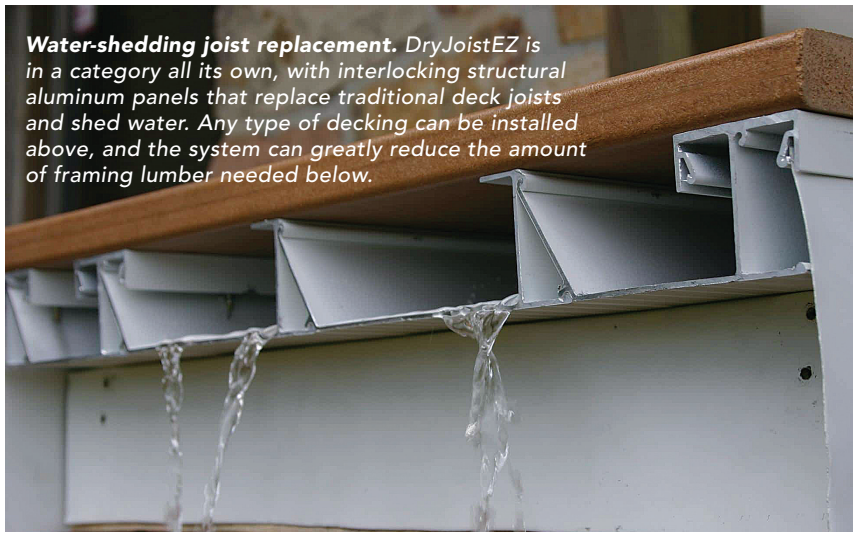
Asa Christiana is a contributing editor at *Fine Homebuilding* and *Fine Woodworking*.

A CATEGORY OF ITS OWN

STRUCTURAL DRAINAGE

PROS
- Eliminates a large amount of traditional framing
- Protects the limited framing below
- Provides ceiling finish and drainage
- Works with any decking material

CONS
- Relies on framing for slope
- Difficult to retrofit



Water-shedding joist replacement. *DryJoistEZ is in a category all its own, with interlocking structural aluminum panels that replace traditional deck joists and shed water. Any type of decking can be installed above, and the system can greatly reduce the amount of framing lumber needed below.*

BEST PRACTICES FOR LESS

Site-built systems

The raw materials for an over-the-framing deck drainage system are widely available, at a fraction of the cost of the commercial products, which is why a number of skilled deck builders prefer a DIY approach.

Fine Homebuilding **editorial advisor Mike Guertin outlined his site-built system in *FHB* #220, and it's included in a video at FineHomebuilding.com. Guertin and others base their systems on EPDM rubber, a roofing material used on flat and low-slope roofs and also as pond liner. It's available from roofing-supply houses in 45-mil and 60-mil thicknesses, in 10-ft.- or 20-ft.-wide rolls 50 ft. to 100 ft. long. Guertin used the thicker material at first, but uses 45-mil EPDM now, which is easier to handle but just as durable in this context, he believes.**

For curvy decks with irregular framing and decking, deck builder Jason Russell creates a site-built system much like Guertin's, with EPDM cut in long, fan-shaped strips that are draped between joists to create sloped troughs, which lead in turn to a standard rain gutter installed near the rim joist. To seal the overlaps on top of each joist, Russell applies self-adhesive G-Tape flashing, warning that it's important to use a product that seals around screws and is compatible with EPDM.

Builder John Lea uses two types of site-built systems: the draped approach when rainfall and debris will be severe, and a flat system when it won't. The flat system is created by attaching a layer of plywood to the framing, followed by a wide, unbroken sheet of EPDM, and then sleepers that the deck boards are screwed to.

While RainEscape rep Dave Kile acknowledges that his product is more costly than the basic materials for a site-built approach, he points to RainEscape's 20-year warranty and ease of installation. "A two-person crew with no experience can install 70 sq. ft. per hour, and get twice as fast over time," he says. —*A.C.*

Go it alone. *It's possible to save a lot of money installing a site-built membrane. This approach can also be easily tailored for unique or unusual situations.*

Deck Details for Durability

Freestanding with boxed stairs, this small deck is full of ideas for a long-lasting entry that will look great for years to come

BY MIKE GUERTIN

The part I like best about building a deck is that it's like building a house but on a smaller scale—it involves design, foundation, framing, finishes, landscaping, and more. So I get to use all my skills, even on a small deck like this one. And I get the satisfaction of a completed project in a few days.

This deck is an entry landing nested into a corner intersection of two backyard-facing walls. Including the stairs, the deck's footprint is 11 ft. by 7 ft. Though the footprint is small in comparison to that of most decks I build, this deck involved the same design process and durable building details found on a larger deck.

A good deck design is informed by the house, site conditions, elevation above grade, finish decking and trim choices, landscaping plan, and owners' preferences. The landscaping plan on this project was important to the deck design. The backyard plan called for a paver patio about 30 in. below the inside floor level. Since the deck would be a focal point and serve as the connection between the patio and the house, the design and finish details had to complement both.

The stairs from the deck to the patio take on significant importance visually and functionally, so it seemed natural to use wraparound stairs, or "stadium stairs." These stairs eliminate the need for a guardrail that would be a visual barrier between the patio and the house.

No ledger, and shallow footings

There's another twist on this deck project—I built it freestanding, which means that it is not attached to the house with a ledger, as most decks are. On houses with conditions that make attaching a ledger challenging and may require special engineering, a freestanding deck makes a lot of sense. These may include balloon-framed homes, homes built with ICFs or open-web floor trusses, or homes with cantilevered floors or other floors framed without structural rim boards. Freestanding decks also make sense on homes with exterior insulation, where installing a ledger deep in the wall assembly is tough and reduces the thermal efficiency of the wall. They also work well for decks at mid-wall level, where there is no rim joist for fastening a ledger.

In order to install a ledger to an existing house, you have to remove the siding and trim so that you can fasten and flash the ledger properly. And attaching a ledger triggers a visual inspection of the inside of the rim joist by the code official. The inspector must verify the condition and suitability of the rim joist, check that the ledger fasteners penetrate the rim, and see that lateral load hardware is installed properly. The inspection isn't a problem when the inside is accessible, as in an unfinished basement or crawlspace. When there is a finished ceiling, however, it may be necessary to cut holes for the inspection, which means patching the holes and repainting the ceiling.

A freestanding deck does require extra footings and an additional beam, but it avoids the hassles of adding a ledger and the risks of water leaking into the framing if the flashing is damaged or fails.

The footing requirements for a freestanding deck in the International Residential Code (IRC) have some similarities and differences to the requirements for a ledger-attached deck. The footings on both types of decks must be sized

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DESIGN TIP

SIZING THE DECK TO THE DECKING

When possible, I like to size a deck to use full-width deck boards at the house and the edge of the deck. To make sure that measurement was precise on this deck, I racked up decking samples spaced with the fasteners I would be using to determine the deck's depth. To get to the final dimensions for the framing, I also factored in the nosing overhang at the edge of the deck, as well as air spaces between the house and the deck frame and between the framing and the fascia. I also used this exercise to plan the stair framing by measuring two spaced deck boards, which I used for treads, plus an additional air space between tread and riser board. The air spaces are crucial for water to be able to drain and can be adjusted a little narrower or wider so that the decking overhang is equal around the deck and the stairs.

PRECISE LAYOUT WITH STORY POLES

For accurate post-base placement, I like to drill holes for anchors after the concrete footing has cured. A story pole is a handy layout tool for avoiding mistakes. Here, we used story poles to find the precise post-base locations and to locate the front edge of the wraparound stairs on both sides of the deck. Because the deck will be met with a paver patio, the stair footings could not extend beyond the stair framing and needed some trimming.

SIMPLE STORY POLES I use story poles to verify measurements taken from the plans and then hang a plumb bob from the story pole to mark for post-base anchors and the stair framing. Once I locate the stairs on each footing, we snap chalklines to mark their location across the length of all the footings.

BLOW IT OUT After drilling holes for the post-base anchors with a rotary hammer, I clear the dust from the hole with a blow gun attached to my compressor hose. Dust left in the hole can lead to the anchor slipping against the side of the hole and prevent it from seating deep enough in the hole.

A LITTLE TOO LONG After cutting a kerf with an angle grinder, I trim the stair footings back with a chisel in a rotary hammer so they will not extend beyond the stairs and interfere with the future patio-paver installation.

to support the live or snow load (whichever is greater) and the dead load of the materials used to construct the deck, and the footings have to be installed properly to transfer those loads to the earth below. The difference between the two types of decks is how deep the footings have to go.

When a deck is attached to a house, the deck footings must be protected from frost heaving in cold climates. This means the bottom of the footings must be below the local frost depth. Freestanding decks aren't supported by the house, so footings only have to be 12 in. below undisturbed or properly compacted soil, even if a deck is adjacent to the house like this one. The earth at the bottom of an excavated hole must be flat, and loose soil from digging activities must be removed or compacted.

The size of a specific footing is based on the soil-bearing capacity and the surface area of the deck (the tributary area) that bears on the footing. Code tables can be used to accurately size a footing. This deck has four footings supporting the deck beams and four footings supporting the stairs.

A little planning

I like to nail down all the details and dimensions on the plan so that we can move efficiently when we start building. It's worth stressing a little over the details. Precise planning generates the materials list we'll need for the lumber order and the cut lists we'll need to break down the materials. Part of my planning process is to design the deck-frame size with the deck boards in mind. I like to plan the finish dimensions of a deck so that I am able to use full-width boards along the house and at the outside edge, and I base measurements on stock lengths of the decking and trim boards for symmetry and to minimize waste.

The decking and trim (as well as the fasteners and the flashing tape) used here are all from Trex. (Trex sponsored a video of this project, which you can watch at FineHomebuilding.com.) To plan the deck-frame size, I borrowed sample pieces of the grooved decking from the distributor and ganged them together with the hidden fasteners to measure the precise overall dimension of the full boards for the roughly 5-ft. depth of the deck floor. (Eleven deck boards with 10 spaces between them totaled 62½ in.) With that information, I worked backward to determine the depth of the

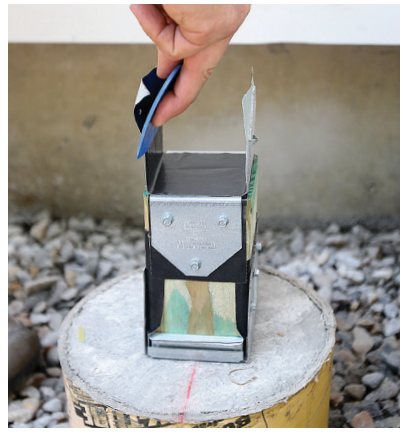
SMALL POSTS, BIG PROTECTION

This low deck needed very short posts. I found their height with another story pole and made sure they would last as long as possible by treating the cut ends with copper naphthenate. To minimize galvanic corrosion, I isolated the hardware from the copper in the treated wood by applying flashing tape over the ends and on the sides wherever hardware contacted the posts.

THE RIGHT HEIGHT After rough cutting all of the posts a bit longer than we need, we use a vertical story pole and a laser to mark the top of each post, which is also the elevation of the bottom of the beam. The laser receiver on the story pole registers the height, and we transfer the mark to the post with a framing square.

COAT THE CUTS It's not only best practice; the IRC requires cuts in pressure-treated lumber to be treated with copper naphthenate. I coat the cut ends of these posts until they won't accept any more of the preservative.

ISOLATION STATION To protect post bases and post caps from galvanic corrosion, I wrap the post with flashing tape on the ends and on the sides where the hardware ears land.



CAP IT OFF In preparation for the beams, I screw the post caps onto the posts and wrap the inside of each cap with more flashing tape. I use this technique everywhere hardware meets the pressure-treated lumber.

BOMB-PROOF BEAMS

These two-ply 2x8 beams may be about as simple as they get, but that doesn't mean there aren't important details to keep in mind. They're going to support the deck floor, so we want them to be solid and to last. I followed code requirements and what I think are best practices for the beam assembly and installation.

FOLLOW THE PATTERN The nailing pattern for a beam like this is described in the IRC, section R507.5, which calls for a minimum of 10d nails every 16 in. on-center along both edges of the beam.

CROWNS UP We had the rare occurrence of a dead-flat beam on this project, but it's always best practice to check and to turn the crowns up on the beams (and the joists).

SPECIFICALLY SPACED As my helper pushes the beam toward the house, I hold a 1-in. block between the beam end and the building to ensure a generous air space.

TAPE THE TOPS Even pressure-treated wood is vulnerable to decay, so we apply flashing tape to the top of the beams to keep water from getting between the beam plies and into splits where nails and screws are driven.

deck frame by subtracting the ¾-in. decking overhangs (the maximum Trex allows), the 1 1/16-in. fascia-board thickness, and a 3/16-in. air space.

The air space between the finish fascia and the framing is functional (it lets water drain and dry) and practical (it affords a little wiggle room in case the final decking installation runs shy or strong of the test measurement). The 3/16-in. air space can be adjusted down to ⅛ in. or up to ⅜ in. so the decking overhangs match around the perimeter of the deck. This wiggle room also lets me shim the fascia straight in case the rim or end joists aren't.

Also, long before heading to the job site, I use checklists to ensure I don't forget any necessary tools and materials and to verify that the job site is ready for us to get started. For example, I should know if the top of the ground will be covered with weed blocking and whether it has been properly graded.

When a deck is close to the ground, we won't have access to the earth beneath once the framing is done. So before framing we need to grade the slope away from the house to promote water drainage and then cover the surface to reduce the chance of weeds growing up between deck boards. The IRC requires that the grade slope a minimum of 6 in. in the first 10 ft. from the house.

Even though it will be dark beneath a grade-level deck, there will still be enough light through the gaps in the decking that weeds may emerge. Weed-blocking geotextile fabric can help alleviate the problem. A crushed-rock ballast placed on top of the weed blocking protects the fabric and keeps it in position.

Dropped beams, cantilevered joists

Decks can be framed with flush (rim) beams or with dropped beams where the joists cantilever over the beams. Since a freestanding deck will have a beam along the house side, a flush-beam frame would put the footings tight against the house foundation. I prefer to have the footings a foot or so away from the house, so a dropped-beam design made more sense for this deck.

The two beams are positioned about 10 in. from the inside and outside edges of the deck. They are sized at close to the maximum span listed in the code table for double 2x8s. The distance between the two beams is spanned by 2x6 joists with cantilevers at both ends.

FREESTANDING FLOOR FRAME

For this small deck, 2x6 joists were able to span the space between the beams and cantilever enough to give us the overall dimension we wanted. For the outside rim board and the end joist at the stairs I used 2x8s, because the riser height is greater than 5½ in. and I wanted solid backing behind the riser boards. We took extra steps to give the frame strength and durability and added blocking where required by code and necessary for the design.

FRAME AWAY Since the inside rim board will be 1 in. from the house, we have to hold the frame away from the house to fasten the joists. To make the work easier, we place a couple 2x4s between the beams and the floor framing until we are ready to push it into place.

HOLDING POWER As the wood shrinks and people walk on the deck, the rim board can separate a little bit from the joists. In addition to fastening the rim boards to the joists with nails, we drive 5-in. structural screws to hold the frame tightly together over time.

RISER SUPPORT For the outer rim board and joist on one side of the deck, where the stairs will be, I use 2x8s instead of 2x6s to back up the full height of the risers. The 2x8 end joist is notched to fit around the beam.

TIE IT DOWN The IRC would allow us to simply toenail the joist to the beam for attachment and uplift protection, but a lot of building officials want to see mechanical ties here. We install hurricane clips to allay any concern.

FREESTANDING TIP

ADDING DIAGONAL BRACES

If this deck had been mounted with a ledger board and lateral-load connectors, we wouldn't have to worry about it shifting away from the house. But because the deck is not connected to the house, we needed to brace it to keep it from moving. We installed simple diagonal braces, nailed to the bottom of the posts and to the side of the joists. It's not important that post and joist align perfectly for this brace to be effective. If the deck posts had been taller, we would have added diagonal braces between the beams and the posts to prevent side-to-side movement.

LOTS OF BLOCKING For this deck we need blocking in two locations. First, we need blocking over the beam to help prevent the joists from rolling or twisting when they're loaded (an IRC requirement). We also need to install blocking for the border boards that run around the perimeter of the deck. For this, an extra joist catches the ends of the main decking boards, and perpendicular blocks offer fastening and support for the border boards.

COVER THE GAPS Taping the joists isn't rocket science, but a common mistake is to cut the joist tape at the ends of the joists. This leaves the gap between the joists and the rim open. To protect this joint and help keep water out, we run the tape over the gap and over the rim joist.

STAIR BOXES INSTEAD OF STRINGERS

When you're building wraparound stairs, traditional stringers are a bit fussy. Not only do the stringers have to be perfect, but they need a continuous level footing all the way around the deck. On top of that, the Trex decking used for treads here requires 12-in.-on-center stringer spacing, which means cutting a lot of stringers, even for a small deck like this. And you would have to frame the tricky diagonal stringer at the corner. The simpler alternative is to build box-frame deck stairs.

START WITH A SCRIBE Because I know how high the top of the stair box needs to be in relation to the top of the deck, I simply use a level and measure down to determine how much of a notch we need to make in the header boards. Once I know how much material I need to remove, I can scribe the cut line with a scrap of wood of the right thickness.

BUILD THE BOXES The stair boxes are like a small deck with rim boards and joists. I assemble the boxes with through-nails, and my helper adds joist hangers because much of the bottom box will be spanning and not supported by the footings.

The joists are spaced 16 in. on-center—the maximum allowed for Trex decking run perpendicular to the joists. (When Trex decking is run diagonally, the max joist spacing is 12 in. on-center.) Always check your decking specs for proper joist spacing. I planned the outside rim joist and end joist on the sides that meet the stairs as 2x8s to give full-height backing to the stair risers for support and fastening.

With a freestanding deck, the inside rim joist is so close to the house that there would be no room to drive fasteners through the rim and into the joist ends if the frame were built in place. On a small deck, you can frame it on sawhorses and carry it into place. With a deck that is so large you can't carry the whole floor frame to the beams, you can build the frame about a foot away from the wall and push it into place after you're finished. We chose that method here, setting a couple 2xs on the beams to hold the rim board as we worked. The frame was light enough for us to lift later to remove these supports. Some decks are simply too big for either of these methods, in which case the joists can be installed leaving a 2-in. space to the siding. Then the rim joist can be slipped into the space and toenailed or toe-screwed to the joists.

Picture-framing border board

We picture-framed the deck with a border board using solid-edge deck boards for a finished look. Most of the decking is grooved for hidden fasteners; the border hides the exposed core material of the decking at the end of the field boards and the hidden fastener groove of the next-to-last board along

ANCHORED FOR STABILITY I anchor the bottom box to the footings with hold-down hardware and expansion anchors, and I connect the stairs to the deck frame with metal strapping. Along with some toenails, this strapping will also connect the two stair boxes.

ADD A STEP The second set of boxes sits on and aligns with the boxes below, so no joist hangers are needed.

DOUBLE THE BLOCKING The mitered deck boards that form the stair treads need diagonal blocking at the corner. Two blocks spaced a bit apart and 1 in. back from the miter will support the boards and allow the water and debris to flow through.

the front. On this small landing deck, we're using a single border board; if the deck were larger, though, we might have chosen a double border board that would match the double-deck-board treads on the stairs.

Because border boards run parallel to the joists at the ends of the deck, they need extra framing to support their inside edge. There are a few ways to provide this, but some methods, such as adding an extra joist beneath the space between the border board and the decking ends, or running a flat 2x alongside the end joists, block the gaps between the deck boards. Blocking end gaps and spaces between border boards can result in debris collecting and create a maintenance headache. I prefer to install extra joists positioned about ½ in. to the inside of the ends of field boards and then install perpendicular blocking at 12 in. to 16 in. on-center between the outside joist and the extra joists. Framing this way provides support for the ends of the field deck boards and border boards while leaving the gap between the decking and border board open so that water flows through and debris can't be trapped.

Stacked stair boxes

The two options for framing wraparound stairs that most deck builders consider are cut stringers and stacked boxes. Each system has its positives and negatives. Cut stringers need to rest on a solid surface—usually a continuous concrete footing placed precisely level and flat around the perimeter of the deck. The stringers must be cut exactly the same and must be installed in line so that the tread boards are flat and the riser boards straight.

Stacked boxes are simpler and less prone to unevenness. They can rest on small foot-

DURABLE DECKING IS IN THE DETAILS

One reason people choose synthetic decking is for its low maintenance and durability. But nearly all building materials will start to degrade when they can't dry, and the way that decking is installed has an impact on the framing below. Mostly, a durable decking installation means creating spaces for water to drain, and there are a few ways we accomplished that here.

USE SPACERS I install all the boards that run along the house with spacers, creating an air gap between the decking and the siding or trim. I use another spacer to ensure a space between the ends of the boards in the field and the border boards.

GAP THE FIELD On this deck, the Trex hidden fasteners create equal gaps between the deck boards for a drainage space. Spacing deck boards apart allows water to drain and edges to dry. Know the properties of your decking material, and choose a spacing and fastening system that will result in roughly ¼-in. spaces between boards over time.

ENDS AND MITERS I make sure the spacers are in place when marking border boards for their miters. I cut the miters for ⅛-in. gaps as required by Trex. This gives the boards room to expand and contract and adds a drainage space.

RAINSCREEN RISERS The last water-shedding detail on this project is a gap between the riser boards and the framing. I simply use small blocks of wood to create enough of an air space that water won't get trapped here.

INSIDE TREADS The inside tread boards are installed with hidden starter clips spaced off the fascia. Regular hidden fasteners gap the inside and outside tread boards.

SLOT THE SOLID-EDGE BORDER BOARD The deck boards on the front of the deck and along the front edge of the stairs are solid-edge boards. To use the hidden fasteners at the back of the boards, we cut a slot at each joist location using a router and the Trex grooving bit. The bit matches the decking groove profile, so the fasteners fit and the gap between the boards matches those between the field boards. The front edge of the boards is screwed and plugged, like the fascia boards.

PLUG WHEN YOU CAN The fascia boards, front stair treads, and deck-border boards all need to be screwed and plugged. In some cases, as with the bottom screws on the fascia boards, it is important to plug the screw holes before they are partially covered by the stair tread. Otherwise, this can be your last step.

ings spaced several feet apart, are quick to assemble, and are easy to set straight and flat for finishes. The main downside to stacked box stairs is that they consume more lumber than stringers do.

For me, the decision between the two options is based on the number of stair steps. Stairs like these, with three or fewer risers, are efficient to build with one box step or two stacked boxes. Stacking three or more boxes eats up a lot of lumber. When I encounter wraparound steps with more than three risers, I use a hybrid frame of a box for the first step set across spaced footings, with stringers resting on the rear of the box.

Building boxed stairs is a pretty basic framing project, but keep in mind that you may need specific blocking to support the treads. The Trex decking used here calls for tread supports spaced 12 in. on-center or closer. (Check your decking material for proper spacing when using it for treads too.) Because header boards on the first box span between footings, the tread blocks between them need joist hangers for enduring support. We positioned the tread blocks on the second stair box directly above those on the first box, so we didn't need hangers on those.

Built to last

This deck is close to the ground, and with its wraparound stairs, accessing the underside is nearly impossible. For that reason, it's even more important to take steps during the building process to ensure durability.

We field-treated all cuts in the pressure-treated framing lumber with copper naphthenate—which is both a good practice and a code requirement. We also applied flashing tape as an isolation membrane where metal hardware comes in contact with pressure-treated lumber. The tape separates the copper in the treated lumber and the zinc and steel of the hardware, preventing galvanic corrosion. We also taped the top of the beams and joists to prevent water from seeping into cracks in the lumber and the plies of the beam. And I spaced the decking, trim, treads, and risers to allow water to drain.

Whether the deck is big or small, finished with synthetic decking or hardwood, these are details that will make any deck last and look good for years to come. □

Mike Guertin is *Fine Homebuilding*'s editorial advisor. Photos by Brian Pontolilo.

know the code
MASTER THE RULES OF HOME BUILDING

BY GLENN MATHEWSON

Requirements for deck guards and handrails

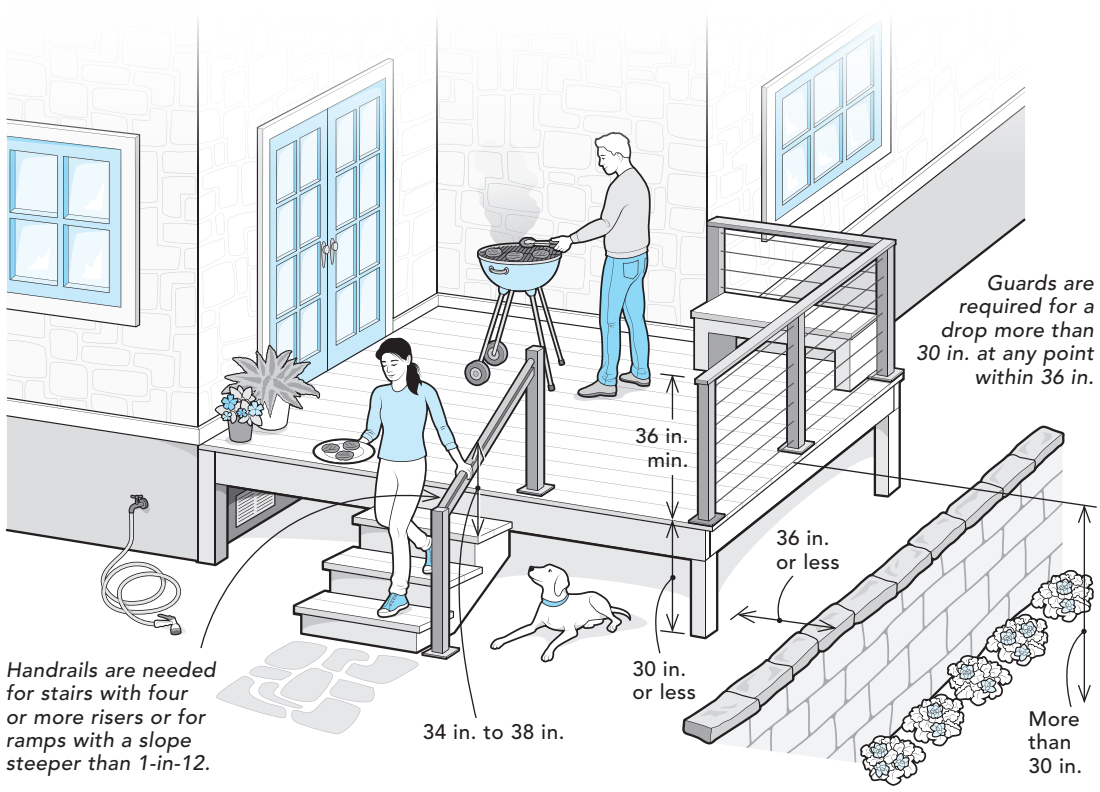
Guards and handrails are like peanut butter and jelly: They can be in the same sandwich, but they're distinct ingredients. While guards and handrails often coexist in the same assembly, they serve different jobs. But due to the casual use of the terms "handrail" and "guardrail," the distinction can get blurred in code applications.

At least some of that confusion can be attributed to phrasing in older versions of the code. For example, up through the 2012 IRC, the code used the term "guardrail" without defining it, and referred to the use of a "guardrail or handrail" on the side of a stairway, as if the two served the same purpose and were interchangeable (even then, they were not). The 2015 IRC purged all use of the term "guardrail" and replaced it with "guard"—a term that was already in use and defined—to allay confusion.

There's nothing in the definition of "guard" that says it has to be the typical railing that comes to the minds of many. Though the codes we're talking about apply to more than just decks, the reason for the change in terminology was so that features on decks such as benches, planters, and built-in kitchens were not precluded from serving as guards. "Handrail" is also defined in the IRC, but it, on the other hand, does require a rail. Here are the definitions in the building code:

Guard: *A building component or a system of building components located near the open sides of elevated walking surfaces that minimizes the possibility of a fall from the walking surface to the lower level.*

Handrail: *A horizontal or sloping rail intended for grasping by the hand for guidance or support.*



As the definition implies, guards have only one purpose: They stand as a barrier at the edge of raised walking surfaces to reduce the possibility of an accidental fall. While serving in this protective role, they also invite users to purposefully lean against them or on them. Because of this, features that fit the definition of a guard must be designed to resist minimum required live loads, whether the guard is required or not. However, the architectural limitations of guards, such as minimum height and the size of openings between guard components, only apply to required guards.

A guard is required at any portion of an open-sided walking surface, including stairs, ramps, landings, and decks,

Drawing: Kate Francis

that are more than 30 in. above the surface below. And not just immediately below—if the floor or grade below drops more than 30 in. within any point 36 in. out from the edge of the elevated surface, a guard is required. This clarification came into the code to address decks that may be less than 30 in. above grade at their edge, but are located on a downslope or near a retaining wall with a greater drop. Once a guard is required, the minimum height can be no less than 36 in. (with one caveat to come). This is a reduced height from the 42 in. required in commercial buildings, and is a safety trade-off to allow greater visibility for individuals seated on decks. Safety provisions are often reduced for private residences due to occupant familiarity and to protect design freedom in our homes. These dimensions have been unchanged in the code since the 1970s.

Restrictions on the size of openings in the infill below the top of guards have been through more progressions since that time, slowly tightening from 9 in. to 4 in. The current rule is that openings cannot allow the passage of a 4-in. sphere, which is intended to prohibit a small child from passing through the guards. (This measurement is increased to 4⅜ in. at the sides of stairs.) The larger dimensions of the past were found to allow a child's body to slip through, but not their larger heads, resulting in tragedy. Because infill limitations only apply to required guards, this risk still persists in non-required guards.

A handrail serves a very different role: It is meant for purposeful use by an occupant while traversing an obstacle, such as a stairway or ramp. When a flight of stairs between two landings has four or more rises and when a ramp is steeper than a 1-in-12 slope, a handrail is required on at least one side. These thresholds are not related to height or the distance of a fall; they are related to how many times one must lift their legs to ascend or descend. Four 4-in. risers would only ascend a height of 16 in. and would not require a guard, but would require a handrail to be available to assist someone's movement. It's worth noting here that a handrail is just a rail. Anything below or next to it—be it a guard, wall, post, or something else—is not part of the handrail. It can be attached to almost anything so long as it meets loading requirements.

There's nothing in the definition of "guard" that says it has to be the typical railing that comes to the minds of many.

Handrail height also differs from guard height. It is measured vertically from the finish surface of a ramp or the imaginary sloped line connecting tread nosings on a stairway, and can be anywhere from a minimum of 34 in. to a maximum of 38 in. in height. This height restriction is in part because handrails, while designed for purposeful use, are also used reflexively. Even when not using a handrail, an accidental slip will result in a reflex to grab it. And here's where the caveat about guard height comes in. As previously stated, guards are required on the sides of stairs where there's a drop of more than 30. in from the edge. But while guards must typically be at least 36 in. tall, guards on stairs can be as low as 34 in., measured from the line connecting tread nosings—the same as the minimum height for handrails. This holds true whether the guard has a handrail attached to it or not. The top of a guard can also serve as a handrail, and when that's the case, the minimum and maximum heights for handrails—34 in. to 38 in.—also apply to the guard. Where the top of the guard doesn't serve as a handrail, there's no maximum limit on its height.

Graspability is where handrails get very specific in their design. Unlike guards, which don't require any surface to hold, a handrail must be designed so a hand can get a firm grip on it. The key here is grip, not pinch. A typical handrail must have a diameter no greater than 2 in. so that a small hand can wrap its fingers around it, not just pinch the sides. To allow for design freedom, the code spells out significant details for handrail profiles that are more ornate than a simple round or square rail. For these handrails, a "finger recess" is described for both sides of the profile in a range of allowable locations. Though the code spells out in detail these profiles as "Type I" and "Type II," it also makes it clear that other profiles are permitted that offer "equivalent graspability." While it's easy to get lost in the specific dimensions elaborated in the code, the intent is simple: Users should be able to grasp the rail with fingers and thumb hooked around it.

Handrails and guards, whether required or not, cannot become booby traps. Much like the '80s movie *Field of Dreams*—"If you build it, he will come"—if a guard or handrail is available, an occupant will expect it to bear their weight. With this consideration in mind, all guards and handrails, whether they must be present or not, have long been required to resist a 200-lb. concentrated load at any point along their top surface and applied in any direction. But for guards, this loading requirement was changed in the 2021 edition of the IRC.

While 200 lb. of force applied in any direction is an appropriate requirement for handrails, the question arose of whether it's appropriate to consider loads pulling inward, upward, or inline on a guard. Load resistance in these directions is dictated by the phrase "in all directions," but it's not really justified—there is no requirement for a graspable feature or any mention of protecting people from a backward fall to the surface they are standing on (were they to yank backward on the guard). For that reason, in the 2021 IRC (and the newer 2024 edition), guards must now resist 200 lb. in the outward and downward directions only.

Perhaps more importantly, a change to separate guards and handrails from one another in the minimum design load table was also approved for the 2021 IRC, which will drive home the importance of evaluating these features independently of one another.

Glenn Mathewson is a consultant and educator with buildingcodecollege.com.

A Field Guide for **Prefab Railing**

Manufactured deck railings are fast to assemble and look great

BY JOE CIARALDI

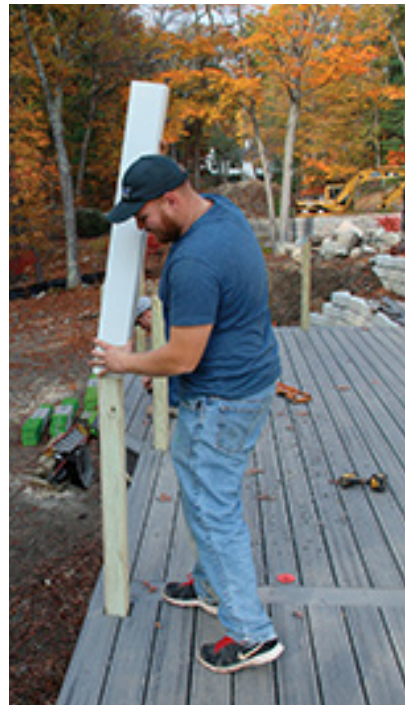
My Salem, New Hampshire-based remodeling company builds a lot of decks. Given our harsh New England weather and insistence on high-quality products, we almost always install manufactured railing parts rather than using wood. We've used several brands over the years, and all have performed well. Generally speaking, the way the various manufactured railing systems are constructed is pretty similar, but we prefer the Trex Transcend line because of the wide range of available rail and baluster styles and colors. The top and bottom rails, post sleeves, and balusters are made of a durable composite material designed to withstand rot, warping, fading, or splintering. The railing components come boxed and prefinished, and installation is straightforward. Best of all, our clients like the look of the finished railings, the maintenance-free system, and the option to integrate low-voltage lighting if desired.

A relatively simple white guardrail free of curves, angles, or sloping sections runs about $175 per section in material costs. Colors cost more, as do more complicated layouts. The railings depend on 4x4 pressure-treated posts spaced every 6 ft. to 8 ft. The rail lengths are based on the on-center spacing, so they are actually 67½ in. and 91½ in. long, which is important to keep in mind when you're ordering components and installing the posts. Because Trex designed the rails to work with multiple baluster styles, you'll find that baluster kits include style-specific matched inserts that snap into the universal top and bottom rails to space the balusters. We're careful to accurately order all the parts plus one or two extras of each because it usually takes a few days for our local lumberyard to deliver an order. □

Joe Ciaraldi is an award-winning carpenter and deck builder with Professional Building Services in Salem, N.H. Photos by Patrick McCombe.

START WITH STURDY POSTS

Before installation, I run each post through the tablesaw to remove all four corners, making space to run low-voltage lighting cable. I fasten the structural posts to the joists and rim joist using self-drilling FastenMaster Thrulok fasteners. Then I reinforce the posts with blocking fastened to nearby joists with structural screws. Once the blocking is in place, I use additional Thrulok fasteners to connect the posts to the blocking. Fibrex sleeves make the pressure-treated posts maintenance-free.



Slide on the sleeves. *The 4½-in.-square post sleeves are sold in 39-in. and 108-in. lengths. Cedar shims are used to plumb the sleeves once they're on the posts.*

String the posts. *Once the sleeves are on the posts, stretch a string across the posts to ensure they are in line. If one or more is out of line, remove the sleeve and use a flat bar to shove the post over. A plastic shim or two is sometimes needed to hold the post in place before reinstalling the sleeve.*

Follow the template. *With the four-sided base trim already slipped over the sleeve, use the included cardboard template to guide the placement of the plastic rail-support brackets. The rail-fastening kit includes zinc-coated, self-drilling screws.*

FIT THE RAILS AND BALUSTERS

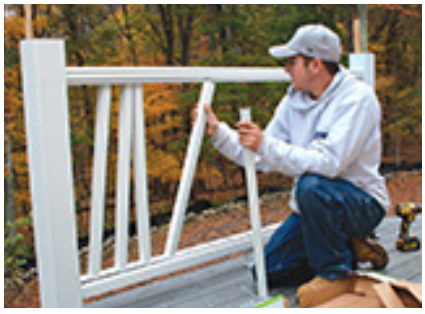
The rails, rail inserts, and balusters all work together to create a sturdy, code-compliant guardrail system. Once I've cut both rails, I fasten the bottom rail and place the top rail on support brackets, leaving it unfastened. I then install the balusters.

Cut the rails. *Cut the top and bottom rails 3/16 in. short to allow for the trim pieces at each end. It's best to cut the rail section inserts at the same time to ensure the parts are the same length. Removing equal amounts from both ends evens the baluster spacing.*

Fasten the intermediate support. *To prevent the rail from sagging, fasten the intermediate support to the underside of the bottom rail. When the rail is in its installed position, extend the support's telescopic foot to the decking. A pair of set screws with matching caps hold the support in its extended position.*

Connect the rails. *With the U-shaped trim placed halfway onto the rails, drive screws through the brackets into the bottom rail and then the top rail, securing them to the post. Once the screws are driven, push the trim fully onto the rails.*

Install the insert. *Designed to accommodate both round and square baluster styles, the rail sections include PVC inserts to space and secure the balusters. After the top rail is secured to the bracket, snap the lower insert into the lower rail and place the upper insert on top of it to prep for the baluster installation.*



Fit the balusters. *The balusters are precut to make a 36-in.- or 42-in.-high code-compliant guardrail. Slip the balusters through both rail inserts and angle them to fit into the top rail's receiving channel.*

Pull it tight. *Top and bottom rails must be cut to an exact length to ensure the posts stand perfectly straight. If necessary, draw the posts together with a ratchet strap to tighten the fit before fastening the top railing.*

Slide up the top insert. *Once all the balusters are in place, slide the upper insert (which was placed on the lower rail) upward and snap it into the top rail. It's often necessary to move it gradually, switching from one end to the other.*

Curves require a special setup

ONE OF THE ADVANTAGES OF COMPOSITE RAILING PARTS is that they can be heated to form curves. The ability to easily incorporate curves into our decks helps differentiate us from the competition, so about 10 years ago we bought a CustomCurve heating oven from Trex. This $10,000, 9-ft. long, propane-powered oven can hold two pieces of decking or railing on slide-out racks that make it easy to get the parts in and out.

Depending on the part, it can take anywhere from a few minutes (for inserts) to two hours (for deck boards) to get the material soft enough to bend. Before bending, we place 1x4 PVC stock on both sides of the piece to prevent scuffs and encourage a fair curve. We set up the clamping table for the specific curve using a paper template made by scribing the deck frame. The table—also part of Trex's CustomCurve system—has an aluminum top that accepts clamps to hold a curve while it cools. We've found the table can sometimes flex, throwing off the curve, so we added steel framing underneath to reinforce it.

WHAT ABOUT SLOPED RAILING?

Although it's installed much like straight railing, sloped railing for stairways requires a different hardware kit. The stair hardware has longer trim pieces for rail ends and an intermediate support cut to match the rail's slope.

Scribe the fit. *With the rail resting directly on the treads, scribe the rail length and the angle of the miter using the posts as a guide. Reduce this measurement by 3/16 in. to account for the U-shaped trim that will be installed on both ends.*

Mark the brackets. *Place the bottom rail on a 2x4 and temporarily attach the bracket to the post sleeve with double-sided tape. Then remove the 2x4 and move the lower rail out of the way.*

Fasten the brackets. *With the bottom rail out of the way, you can now fasten the bracket to the post. The mounting bracket is sloped to match the rail (see below).*

Pilot holes help. *Although the screws are self-drilling, pilot holes are helpful to get the screws started, especially when you're fastening the top and bottom rails to the support bracket.*

TOOLBOX

Rail brackets do double duty

High-strength plastic rail-support brackets connect the top and bottom rails to the structural post. They include corrosion-resistant self-drilling screws.

Sloping rails use the same bracket as straight rails, but you have to use two instead of one at every rail-to-post connection. The two brackets are joined by means of a sliding dovetail molded into the plastic.

Clip the long points. *The sloped balusters have mitered ends and are meant to work with any code-compliant stair's rise and run. But clipping ⅜ in. off both long points allows the baluster to sit deeper in the receiving channel for a sturdier connection.*

Trim in place. *We wait until the end of the railing install to trim the post sleeves. The easiest way to do this is with a cordless multitool equipped with a fine-toothed woodcutting blade. Any slight irregularities in the cut will be hidden by the post cap.*

Cap it off. *Post caps come in flat and pyramid styles (prices start at $12). Both styles are designed to accept low-voltage lighting. Secure each cap with a bead of silicone where it meets the top of the post.*

DETAILS ON

BUILDING A DURABLE DECK.

The name Trex likely brings to mind the industry-leading composite decking that has revolutionized outdoor living. However, Trex is much more than just decking. With a full portfolio of outdoor solutions—including railing, lighting, pergolas, fencing, furniture, outdoor kitchens, deck drainage, the tools to make it happen and more—Trex enables you to create a fully integrated, stylish and functional backyard retreat. Whether you're doing a quick deck resurfacing project or planning a complete outdoor transformation, Trex has the products and tools to bring any vision to life.

Trex® Composite Decking: Beauty, Strength and Low Maintenance

Trex offers five tiers of Performance-Engineered™ composite decking designed for any backyard and budget. Every board features Trex's proprietary, high-traffic formulation and ultra-durable integrated shell, delivering the look and feel of real wood without the hassles of ongoing upkeep. No stripping, sanding or staining is ever required; just a simple soap-and-water cleaning is all that's needed to keep a Trex deck looking like new for decades. So, owners can spend more time enjoying—rather than maintaining—their outdoor spaces.

All Trex decking is sustainably made with up to 95% recycled and reclaimed materials and engineered to withstand decades of wear and weather. Boards are fully submersible, making them ideal for marine applications, and many feature the brand's exclusive **SunComfortable™ heat-mitigating technology**, which keeps them cooler* under the sun.

Trex® Railing: Form and Function Unite

Trex also offers a railing lineup that mirrors its industry-leading decking portfolio with options for every project that pair seamlessly with Trex composite decking, allowing homeowners and builders to create safe, stylish and enduring outdoor spaces. Among the latest additions to the Trex railing roster are steel, aluminum, cable and glass systems, along with enhancements to the **Trex Select®** composite railing system, offering more sophisticated alternatives to traditional wood, vinyl and metal railings. Designed for longevity, Trex railings resist fading, warping and corrosion, making them a perfect low-maintenance choice for today's active lifestyles.

Trex® Hidden Fasteners: A Seamless Look

If you want to create a clean deck surface while ensuring a secure hold, **Trex® Hidden Fastener** clips do that and more. Designed for Trex boards, they provide precise spacing for a polished, uniform look. Engineered for durability, these fasteners also help minimize surface damage. Whether you're working with a steel or wood substructure, there are options for every project. Easy to install and built to last, Trex® Hidden Fasteners deliver both beauty and strength for a flawless finish.

Trex® Fencing: Stylish Surroundings

Offering a durable and eco-friendly alternative to traditional fencing, **Trex® Fencing** provides the perfect frame to any outdoor space. Made from the same innovative blend of recycled wood and plastic film used to make Trex decking, Trex composite fencing delivers all the beauty, durability and ease of maintenance builders and homeowners expect from Trex. Trex Fencing won't rot, split or splinter, is insect-resistant, and can be trusted to outlast the elements for decades without ever needing to be painted, stained or sealed.

Available in vertical and horizontal designs in sizes up to 12' tall, **Trex® Fencing** comes in a variety of configurations with interlocking pickets for optimal privacy and security. The system is offered in multiple color options and features the same upscale aesthetics on both sides for enhanced curb appeal.

Trex: Beyond Decking— Build a Complete Outdoor Oasis

Trex isn't just about creating beautiful, long-lasting decks. Whether you're adding railing, a comfortable furniture set, a high-end outdoor kitchen or a stylish shade structure, Trex offers a full suite of products and tools designed to enhance a home's exterior—all with Trex's signature durability, premium aesthetics and low-maintenance ease.

Ready to take your projects to the next level? Explore the full Trex product lineup at Trex.com and start designing your clients' dream outdoor oasis today!

**Trex SunComfortable™ products with heat-mitigating technology are designed to be cooler than most other composite decking products of a similar color. Although engineered to be more comfortable, they can still get hot to the touch when direct sunlight and high temperatures converge for extended periods of time. On such days, care should be taken.*

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