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Easy-to-Use Project Patterns

Best-Ever Decks & Backyard Projects

Build Your Dream Deck

150 Step-by-Step Photos Show You How!

6 Backyard Enhancements

- Arbor with Swing
- Arched Trellis
- Garden Gate
- Brick Walkway
- Flower Boxes
- Hose Holder

We can help you build a new deck

When the time comes to dig in to outdoor projects, we're here to help. For example, after introducing you to ideas for designing your dream deck you'll find more than 150 how-to photos and descriptions to walk you through building it—every step from staking out the site to applying exterior finish. It's like having a professional carpenter at your side.

But we don't stop there. This issue also contains some great projects—like a trellis, gate, and arbor—that will really distinguish your yard from the neighbor's.

What I like about building outdoor projects is that they don't require a huge investment in tools. With a shovel and some hand tools from your shop, you can complete the lion's share of outdoor projects found on these pages. A circular saw and drill-driver will really come in handy.

Even better, some of the outdoor materials available today go a long way toward reducing annual maintenance chores. For example, new-generation pressure-treated lumber (see the article beginning on *page 20*) holds up better against Mother Nature, which means less time spent renewing the finish and repairing parts. Composite decking materials are easier than ever to install because they arrive from the mill straight and free of flaws.

If the beauty of natural wood is dear to your heart, don't despair! We'll help you select the best hardwoods and softwoods as well as finishes to maintain that natural look.

Good luck! The time is now to make your yard the envy of the neighborhood.

Dave

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Best-Ever Decks & Backyard Projects™

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IN MEMORIAM — **E.T. MEREDITH III (1933–2003)**

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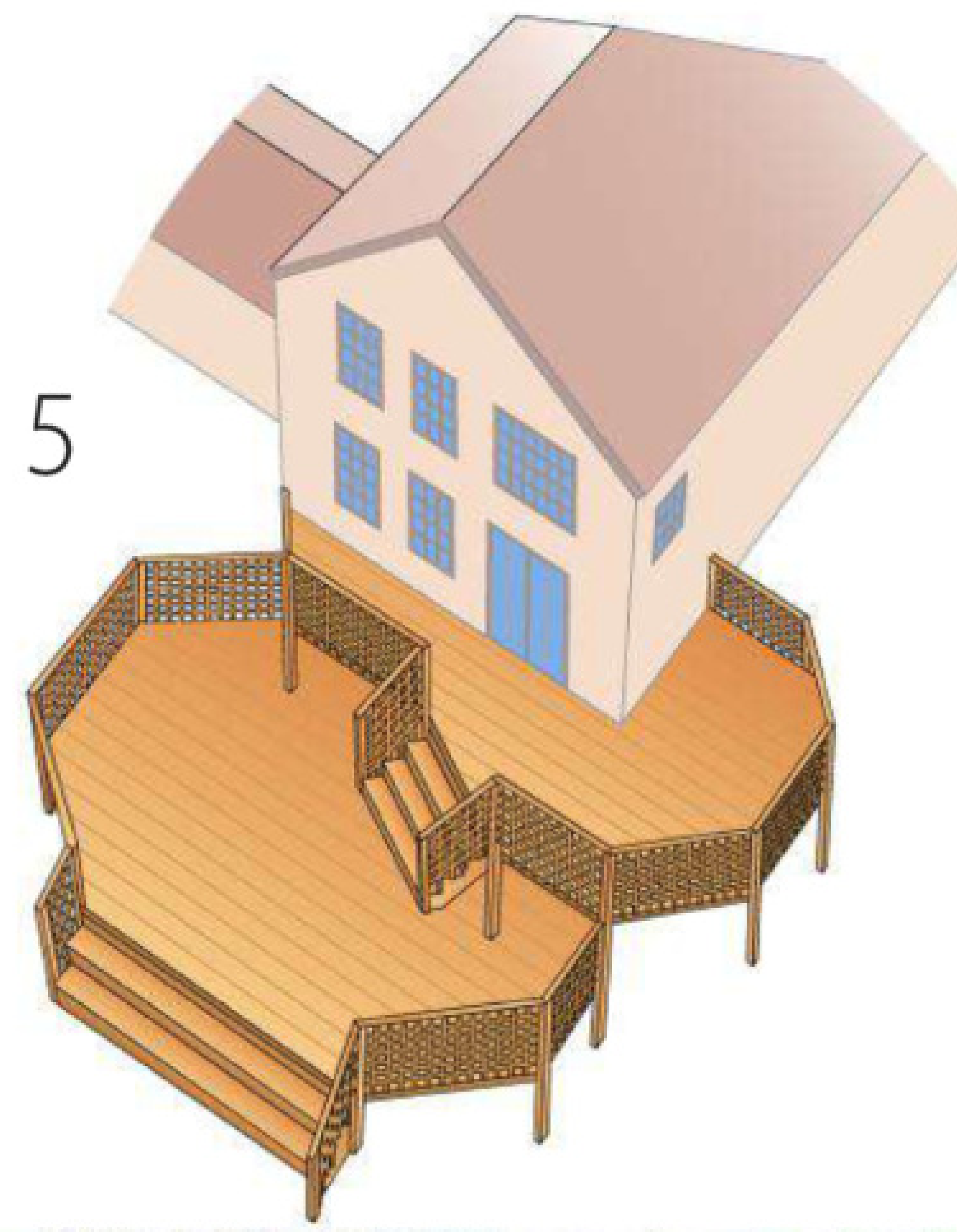
Best-Ever Decks & Backyard Projects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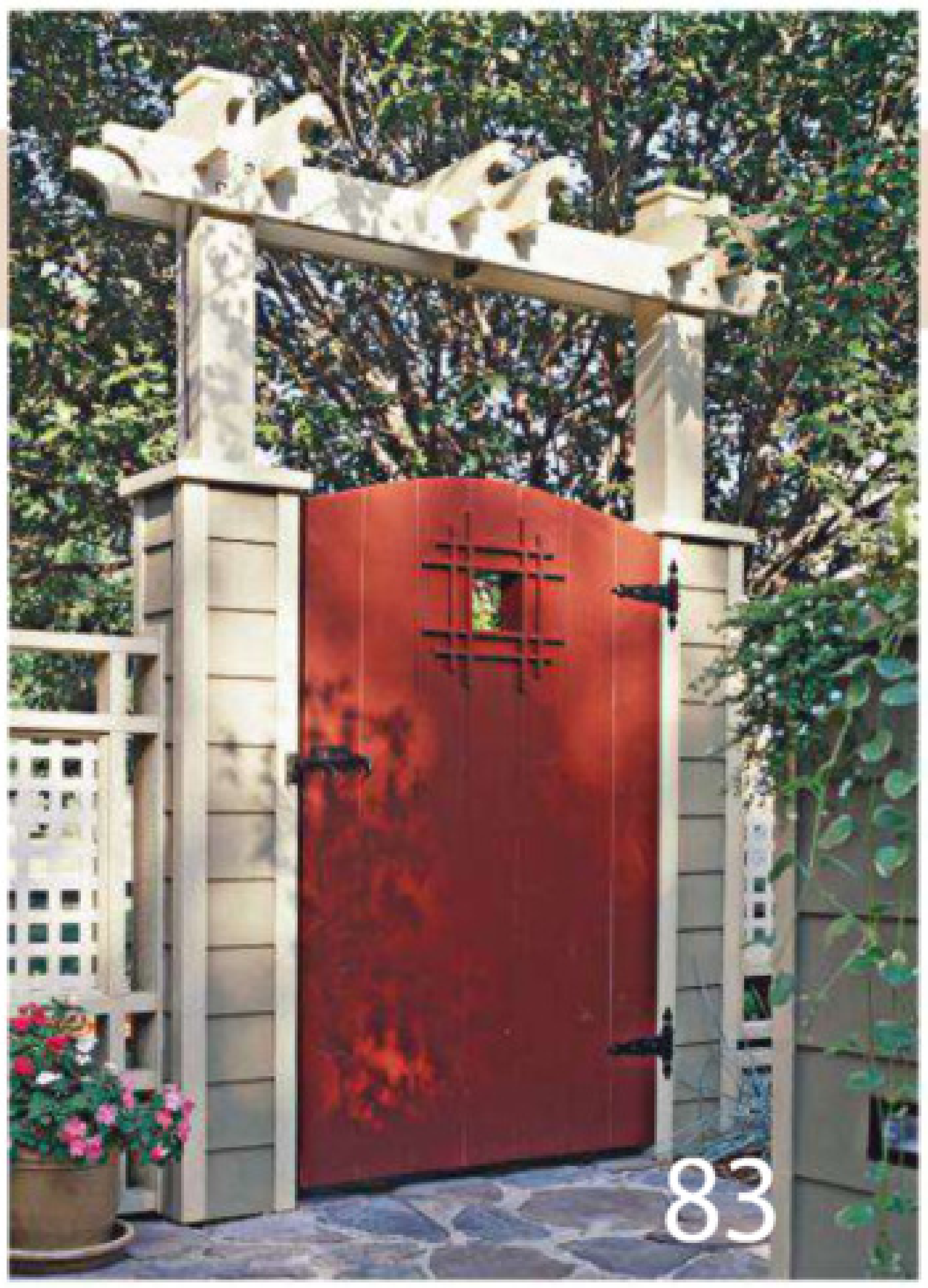

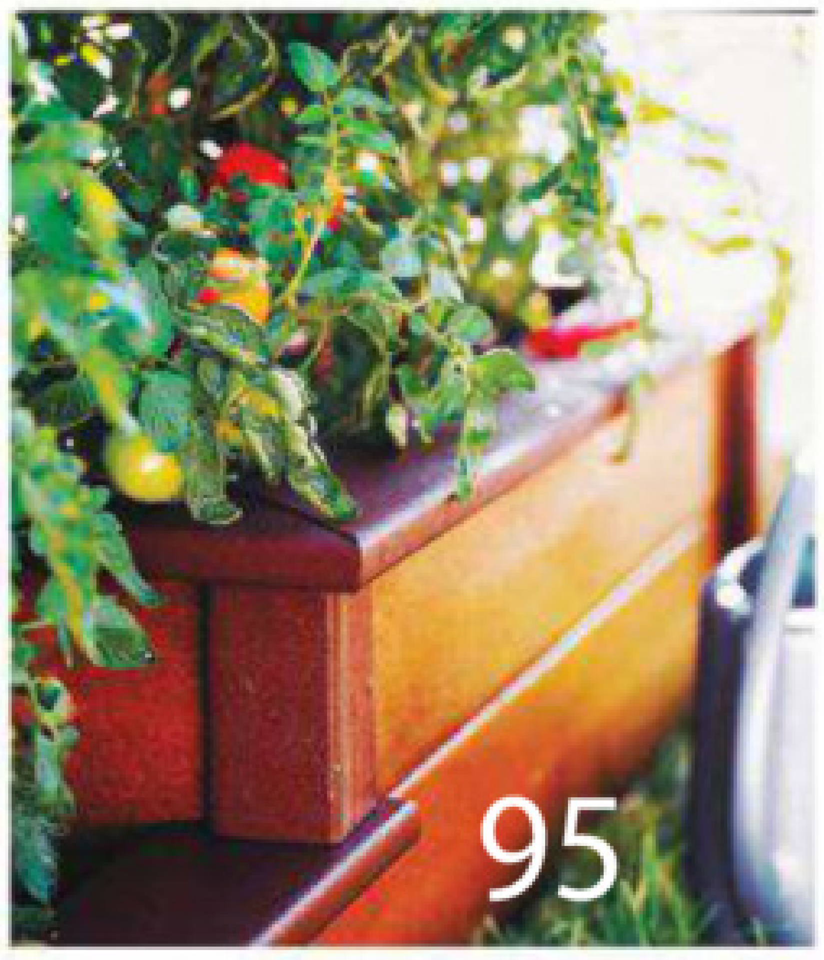

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plan your deck project

A deck should be an expression of the way you live, whether it's for winding up or winding down. It can be a quiet place for morning coffee or reading the last chapters of a book, an outdoor family room for catching up on conversation, a dining spot for two (or twenty), or the hot spot for weekend neighborhood nightlife.

A properly planned deck must be tough enough to stand up to the rigors of children's play and assaults by the outdoor elements, yet versatile enough for gatherings of almost any size. You can have all that enjoyable outdoor space, and create it yourself! Planning and designing a deck starts with the same question as planning spaces inside your home: How will you use your outdoor room? If your needs are simple and the backyard small, you can get by with a modest deck— one that's 10×12' may do. Lavish entertainment demands more elbow room, and perhaps an outdoor kitchen. Stairs leading to other levels will help handle a crowd. "Form follows function" may seem a slightly worn-out phrase, but it's still useful in deck design. Think about function first. The fun will follow.

the terminology of decks

A deck is essentially an outdoor floor supported by a frame, posts, and footings secured in the ground; assembled in stages; and built from the ground up. The following terms define all of the important components of a typical deck. Specific types of decks may differ; such variations will be discussed later in this publication.

Balusters: Small vertical members, usually spaced evenly between posts.

Beams or girders: Hefty framing members (usually 4×, 6×, or doubled or tripled 2× stock) attached horizontally to the posts to support the joists.

Bridging: Short pieces of lumber between joists that strengthen the framing. They are designed to prevent the joists from twisting.

Decking: 2× or 5/4 stock attached to the joists to form the deck floor.

Footings: Concrete columns below grade that support the posts and, thus, the deck. On sites where the soil freezes and thaws, concrete is poured in an above-grade form and a cylindrical hole. Ask your building department for footing depths in your area.

Joists: Horizontal framing members (usually 2× stock) fastened on top of the beam or flush with the ledger to support the decking. A header is fastened to the ends of the deck's interior joists. Rim joists or end joists are the outermost joists perpendicular to the ledger.

Joist hangers: Metal fasteners that allow you to fasten the joists in place without notching the ends of the board. A joist hanger secures a joist to a ledger or rim joist.

Ledger: A board (usually 2× stock) attached to the house to support one side of the deck.

Piers: (not illustrated) Precast concrete pyramids made to set on in-ground footings. Where frost heave is not a factor, piers set directly on the ground to support posts.

Post anchors: Metal framing connectors that attach posts to piers or footings. They raise the base of the posts slightly above the top of the footing, protecting them from water damage.

Posts: Timbers (usually 4× or 6×) set vertically to support the deck framing. Posts are used on all but the shortest decks. The posts can be cut off below the deck surface, or they may rise above the surface to provide support for the railing. Posts may rest on top of concrete footings or they can be set plumb in the hole before the concrete is poured.

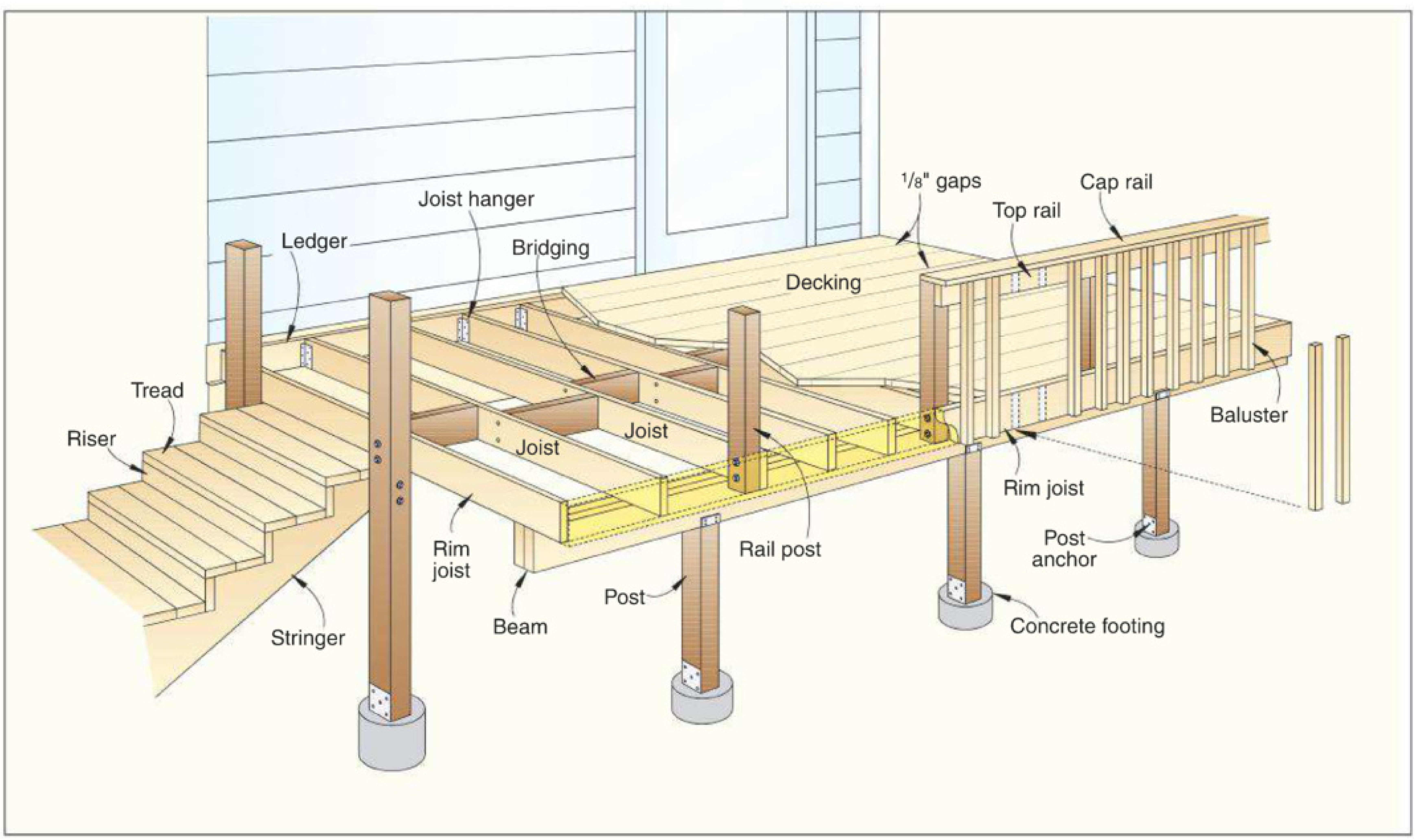
Rails: Horizontal components of railings that provide a safety barrier and handhold for stairs or along the sides of the deck.

Railing: The assembly made of rails, rail posts, cap rails, and balusters or spindles. The balusters, the smallest vertical components, are positioned to fill the space between the top and bottom rails and between rail posts. Maximum baluster spacing for child safety is 4".

Risers: Boards covering the vertical spaces between stairway treads. Although shown *below*, risers are often omitted on deck steps and other exterior steps.

Stringers: Long, diagonal framing parts (usually 2×12s) that support stair treads. The stair treads are attached to the stringers.

Treads: The horizontal, stepping surfaces of a stairway.



deck configurations

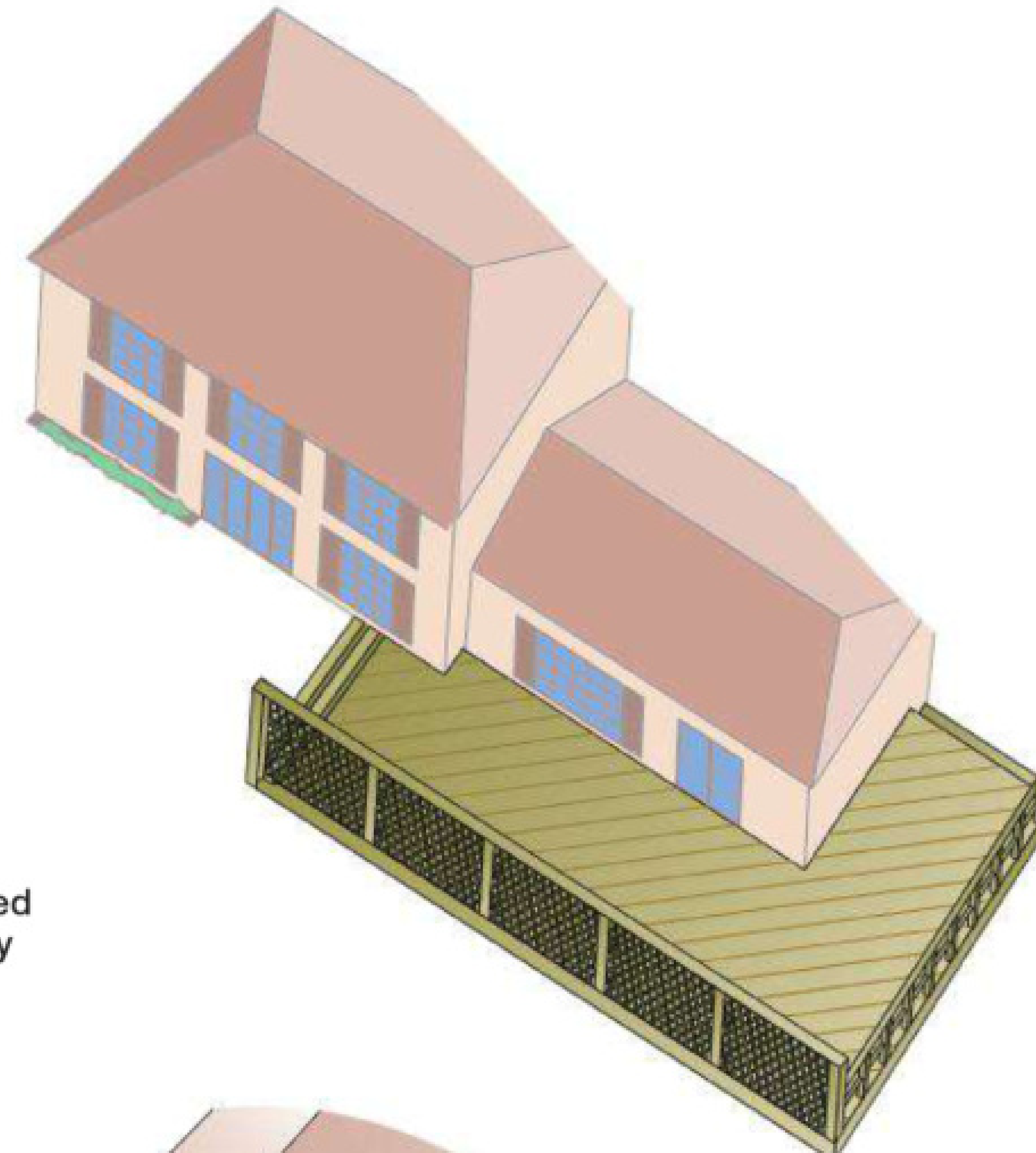
Decks can be almost any shape imaginable, but the shape of your deck should not be an arbitrary choice. Design the shape of your deck to conform to the terrain of your landscape, the architecture of your home, structural standards, and how you plan to use the deck.

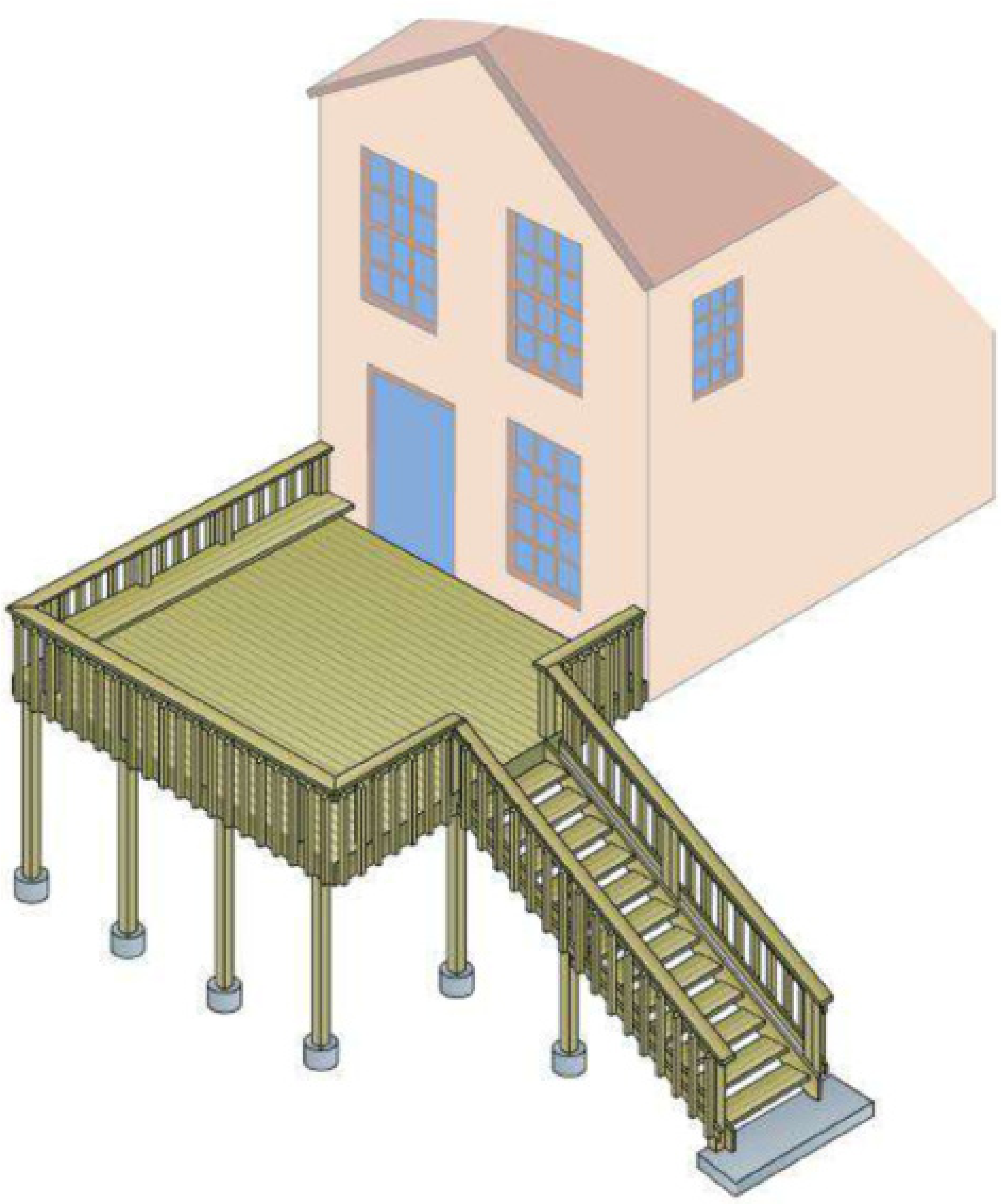
The least complicated installation will feature a ground-level deck—ideal for a flat yard and single-story home. Because this design hugs the ground, codes may not require a railing. Combine overlapping sections to make a deck cascade down a gentle slope.

Beyond the simple ground-level platform, decks fall into the three categories illustrated on this page.

wraparound deck

This design faces two or more sides of the house. It's ideal when you want areas for quiet activities (a getaway outside the bedroom, for example) and large parties (adjacent to the kitchen) all in one deck. Wraparound decks also offer a solution for backyards that get different amounts of sunlight at different times of the day. Wraparound decks offer flexibility for families who want their outdoor space for a variety of needs. You can build a wraparound deck as a single ground-level platform, as a multilevel structure, or as a raised deck that provides second-story access.





elevated deck

An elevated deck can provide access to upper-level rooms or create a level recreational or entertainment space on sloping terrain. The least complicated version of this structure is a single platform supported by posts with lengths that follow the contours of the ground to keep the platform level. You can build one also to take advantage of a spectacular view you might not otherwise see.

multilevel deck

This design, which can have sections with different sizes and shapes, provides a practical solution to sloping terrain. You don't have to build a multilevel deck on a slope. You can build one section of this structure on flat ground and use it to provide a convenient transition to a deck on an upper level of your home. Consider this design when you need additional deck areas for different outdoor activities.

choosing a site

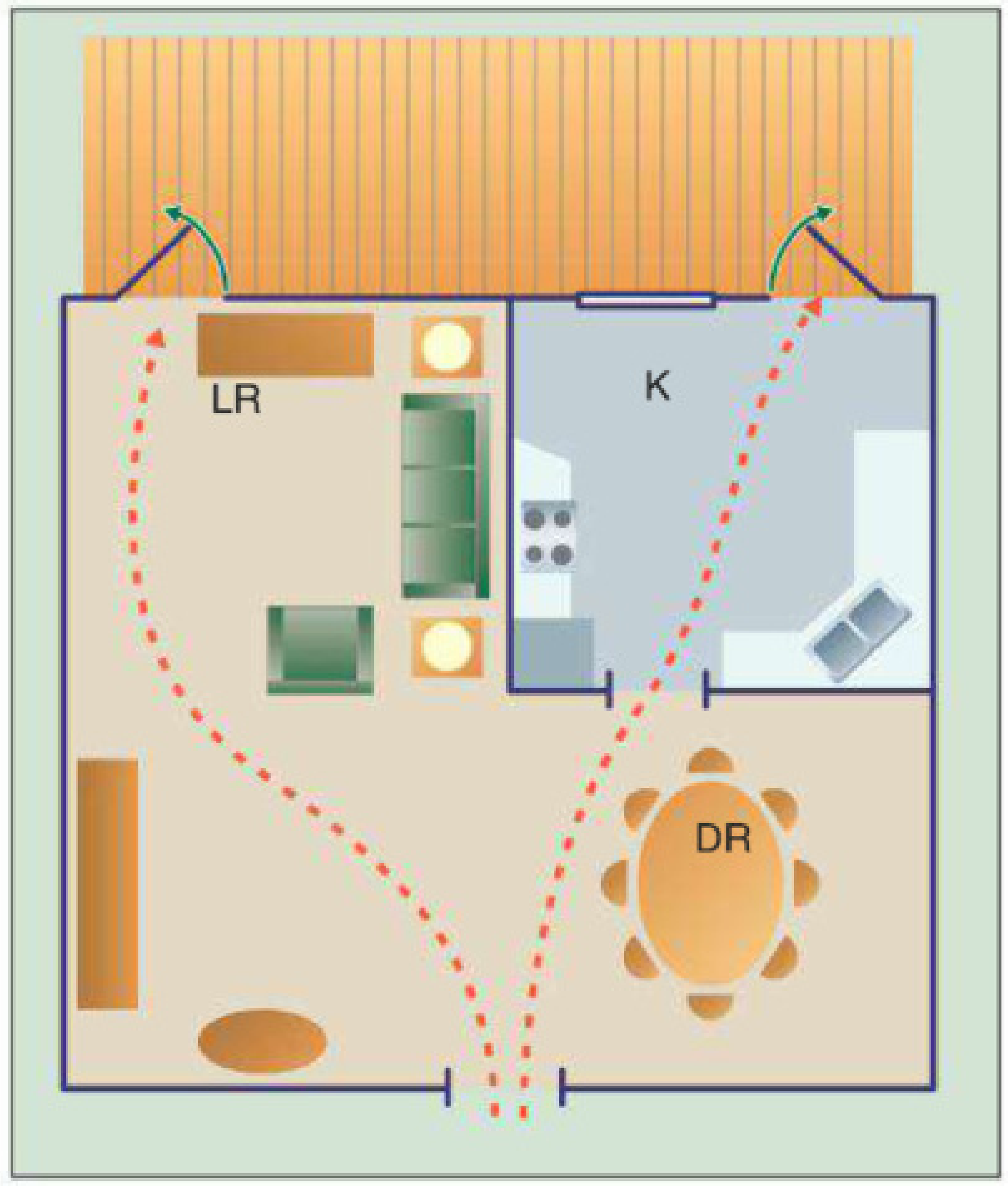
Before starting, you might assume that siting the deck is easy; that impression might change after some on-site research. Your first site choice may meet some requirements but not others.

A deck should not exist in isolation. It should relate to the architectural style of your home as well as to other aspects of your site that aren't necessarily visible. The ideal location for your deck will provide easy access from indoors and out, make the best use of natural views, and give you enough privacy that you don't feel you're on display. The proper site should also take advantage of sun and shade patterns, prevailing breezes, and other natural conditions to provide maximum comfort and usability.

Take a look at these conditions before you commit to your initial plans. Inventory your site and list its assets and liabilities. Then use your notes to draw a site analysis. You may have to evaluate a number of options, but if you make those decisions now, you'll probably avoid building a deck that you won't use much.

landscaping your deck

Even a perfectly planned deck can look like an intrusion onto your landscape. Make your deck seem like a natural extension of the yard with a thoughtful landscaping plan. A perennial border garden, for example, will ease the transition from the deck to the yard. Shrubs can camouflage the deck framing and that gaping empty space beneath it. Baskets, pots, and planters will unify the entire scene with color and texture.



make access easy

If you can't get to and from your deck without bumping into obstructions, you probably won't use it. To make access easy, start with a wide doorway—French, atrium, or sliding glass doors permit easy in-and-out traffic and offer views that invite you outside. Add a door, if necessary, or widen an existing one. Then analyze the natural pathways inside your house and place furniture to provide uninterrupted access from interior rooms to the deck.

A well-designed deck should be visible from inside the house, easy to get to, and similar in its purpose to the uses of the adjacent interior room. Interior designers call these factors access and compatibility; they can determine whether you use your deck or it sits idle.

visual and physical access

You have to see your deck for it to invite you outside. But if your proposed site doesn't beckon you outside, don't move the deck just yet. Include new widows or doors in your remodeling plans. You don't need to see the whole deck from inside the house. Just a glimpse is often more effective than a view of the complete deck.

Make the view attractive with accents you can see from the inside—geometric decking patterns, a decorative railing insert, or container gardens are attractive visual enticements. And if you can see these attractions from more than one room, so much the better. If you can't, just design your deck space so the largest view is from the room that adjoins it.

Looking out at your deck isn't the only thing that matters, of course. You have to be able to get to it easily. To make sure the pathway to the deck is open and free of obstructions, make a sketch of the routes people use when walking through your home, as shown *above*. If the location you choose creates traffic jams, make plan alterations. For example, although a deck next to your kitchen might seem ideal for outdoor dining, it may make the traffic in your cooking space unbearable. By moving a door to a side wall, you can redirect the traffic away from the work areas.

compatibility

The success of your deck may depend on what goes on in its nearest indoor room because you will tend to use your deck more if its use is similar to that of the interior room next to it. For example, a small deck for coffee, the morning paper, and conversation would feel just right outside your bedroom. But that would be the wrong place for a large party deck.

For outdoor dining, put the deck close to the kitchen. Plan party areas close to the family room or other public rooms of the house. For private space, limit access—and shield your space behind hedges or fencing.

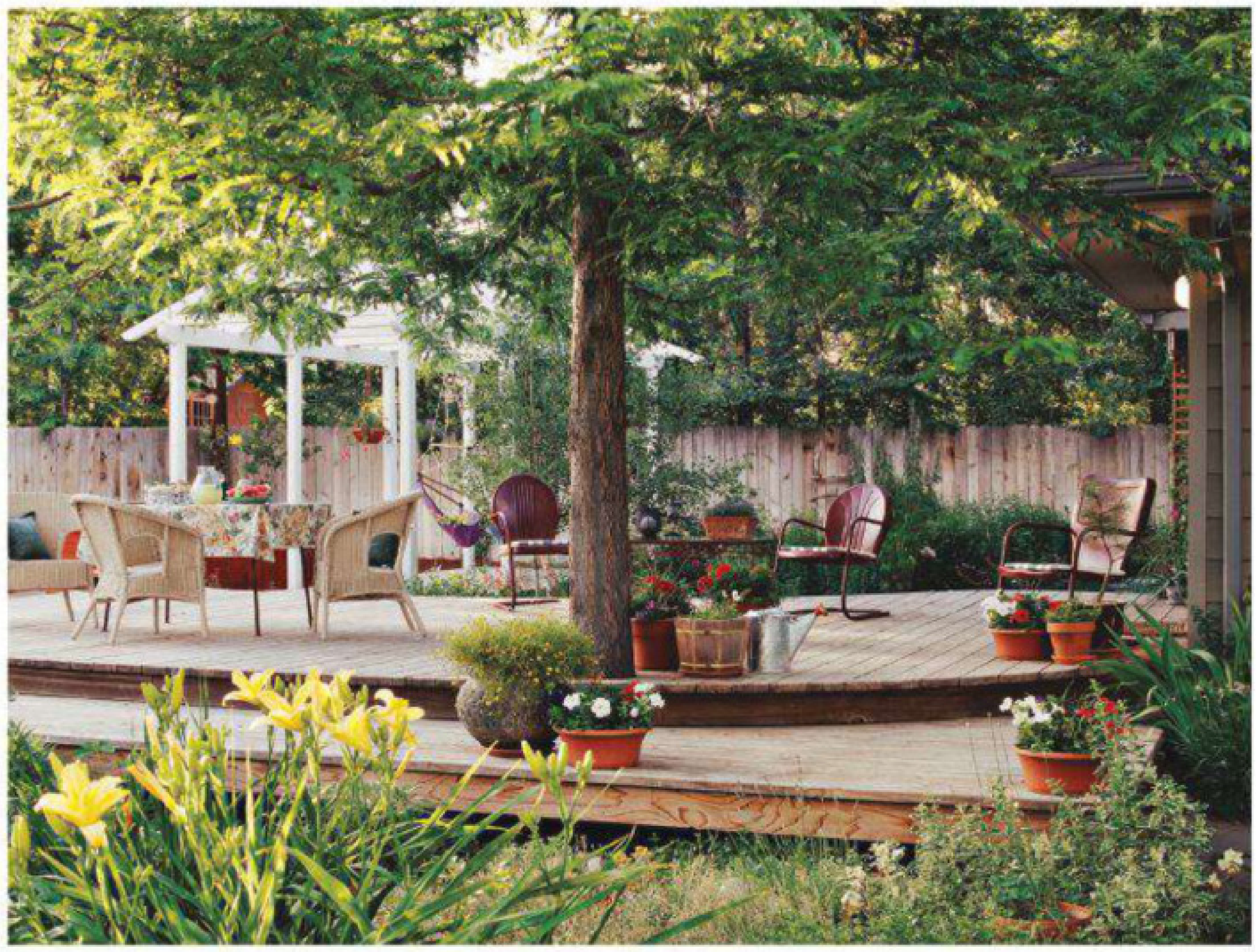
continued on page 10

View numerous deck plans at:
woodmagazine.com/deckplans

determining the size of your deck

Like many other questions about building a deck, the answer to how large it should be will pretty much fall into place once you've decided how you're going to use the deck. The chart *below* shows rough estimates of the space required for different activities. Use these estimates as a guide to sizing your deck.

If your deck will have several uses (a play area for the kids, space for dining, an area for sunning) you may be tempted to make it as big as possible. But multiple functions don't always call for more deck. Sometimes a small design element, such as a level change, can better isolate functional zones. However, if you plan to have a one-level deck, use the high end of your size estimate. Adding more space now is less expensive than adding it later, and the last thing you want is a cramped deck. If your budget is tight, plan a deck that you can build in stages, adding elements as you can afford them, but keeping the overall design intact.



a breezy boardwalk

If you're designing a single level deck large enough for both small and large gatherings—but you want to dress up the platform inexpensively—add a perimeter boardwalk. This narrow extension gives you a little more room at a fraction of the cost of an additional platform. And it gives guests a way to move to the far end of the deck without passing through the main activity sections. Define spaces casually with moveable furnishings. The hammock chairs hung from the pergola on this deck are a clever addition to informal seating.

how big?

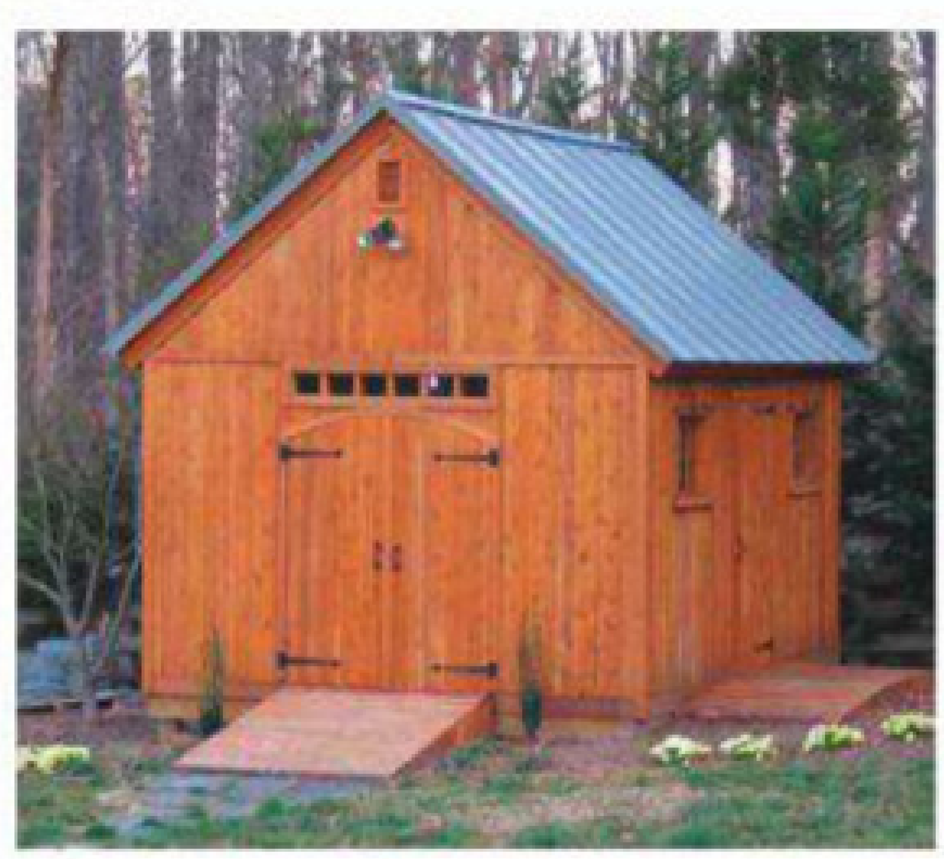
Activity	Space required
Dining for four; for six to eight	About 10×10'; 12×12'
Conversation area for six	About 10×10'
Single reclining chair	About 4×7'
Two recliners	About 7×7'
Basic cooking area with grill	A space about 6' square, more for counter, island, or large serving table
Rectangular table	An area 5' to 6' wider and longer than the table itself
A round table for six	Circular area, 6' in diameter
Pathways, real and imaginary	3½' to 4' wide at all points

cut down on mowing

A wraparound redwood deck with a wrought-iron railing transforms a narrow, unused side yard from lawn space into an open-air veranda. It's small but still has plenty of room for casual conversation. Such a deck can expand your living area with style and will reduce your lawn-mowing time.

The difference between a dream and a goal?

A good plan.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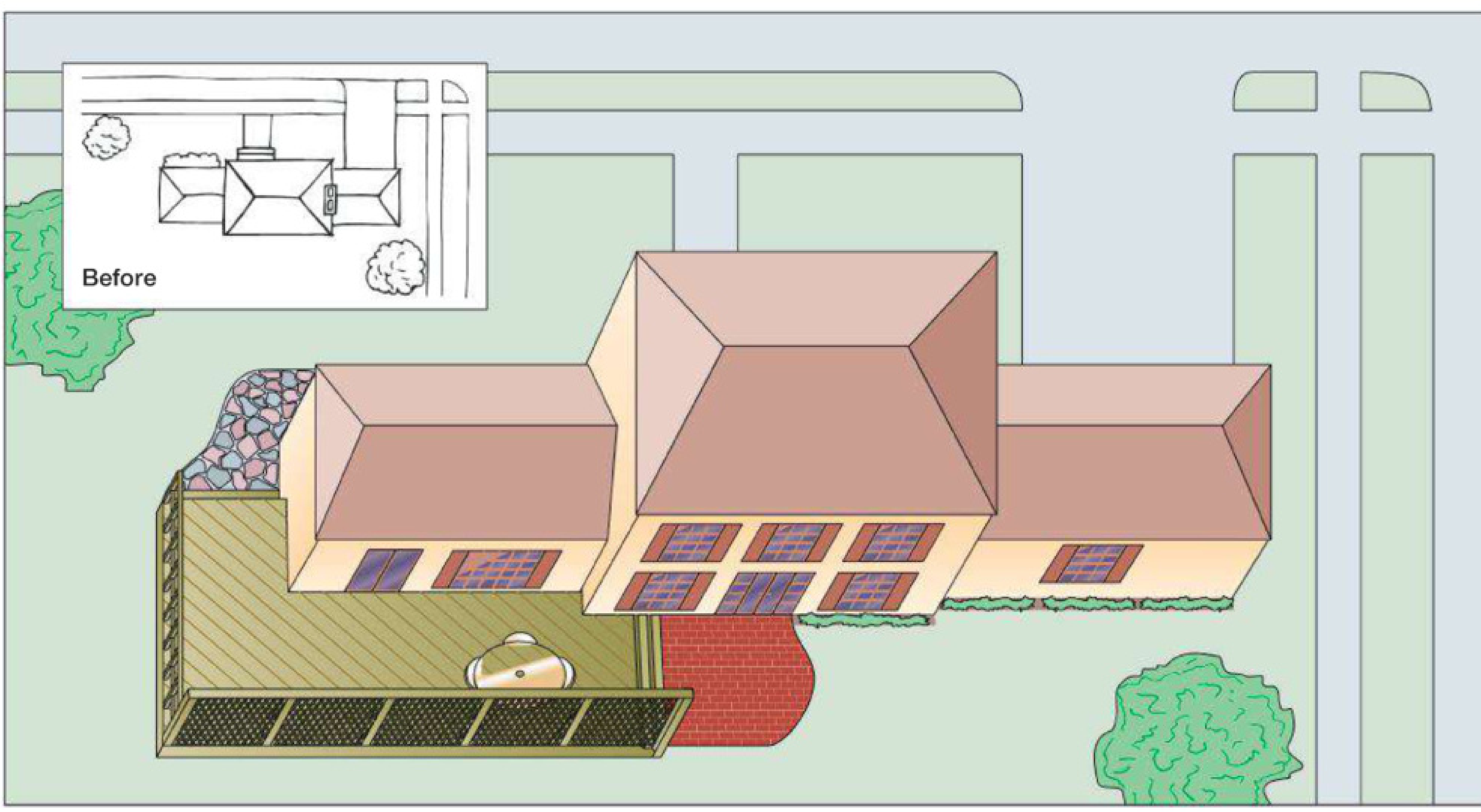
design decks
for any situation

Many lots do not have the proportions that lend themselves to deck construction. Narrow properties, shallow yards, steep slopes, or undesirable views may make building a deck seem all but impossible. Don't despair, because if you look for them, design opportunities are almost always concealed inside a problem.

Often, a deck can cover unusable outdoor space, such as a steep slope or small side yard, adding a comfortable and functional feature to your house.

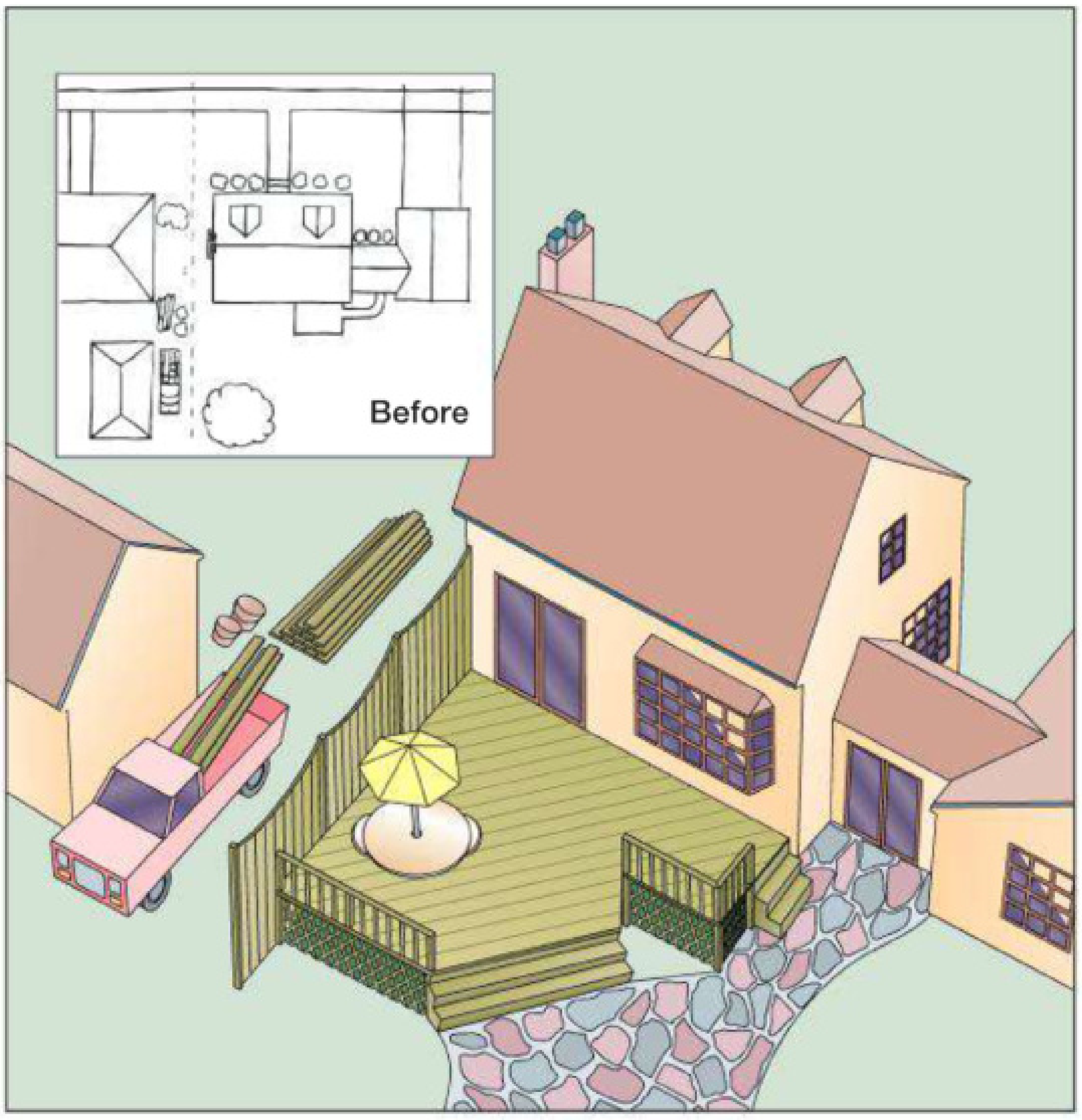
Solutions to serious site problems may require a professional designer or licensed contractor. But even if you have to call in the pros, it's good to have a preliminary idea of what you want to do with your deck space. That way, the designer can base a proposal on the limitations of the site and also the needs of your family.



build long and narrow on a shallow lot

A lot that doesn't lend itself to an expansive deck shouldn't stop you from building one. A long, narrow deck, say 8×30', might just fit the bill. This example wraps around the corner of the house and includes a new stone walk that connects it to the front of the house and a brick patio joining it to the back of the house.

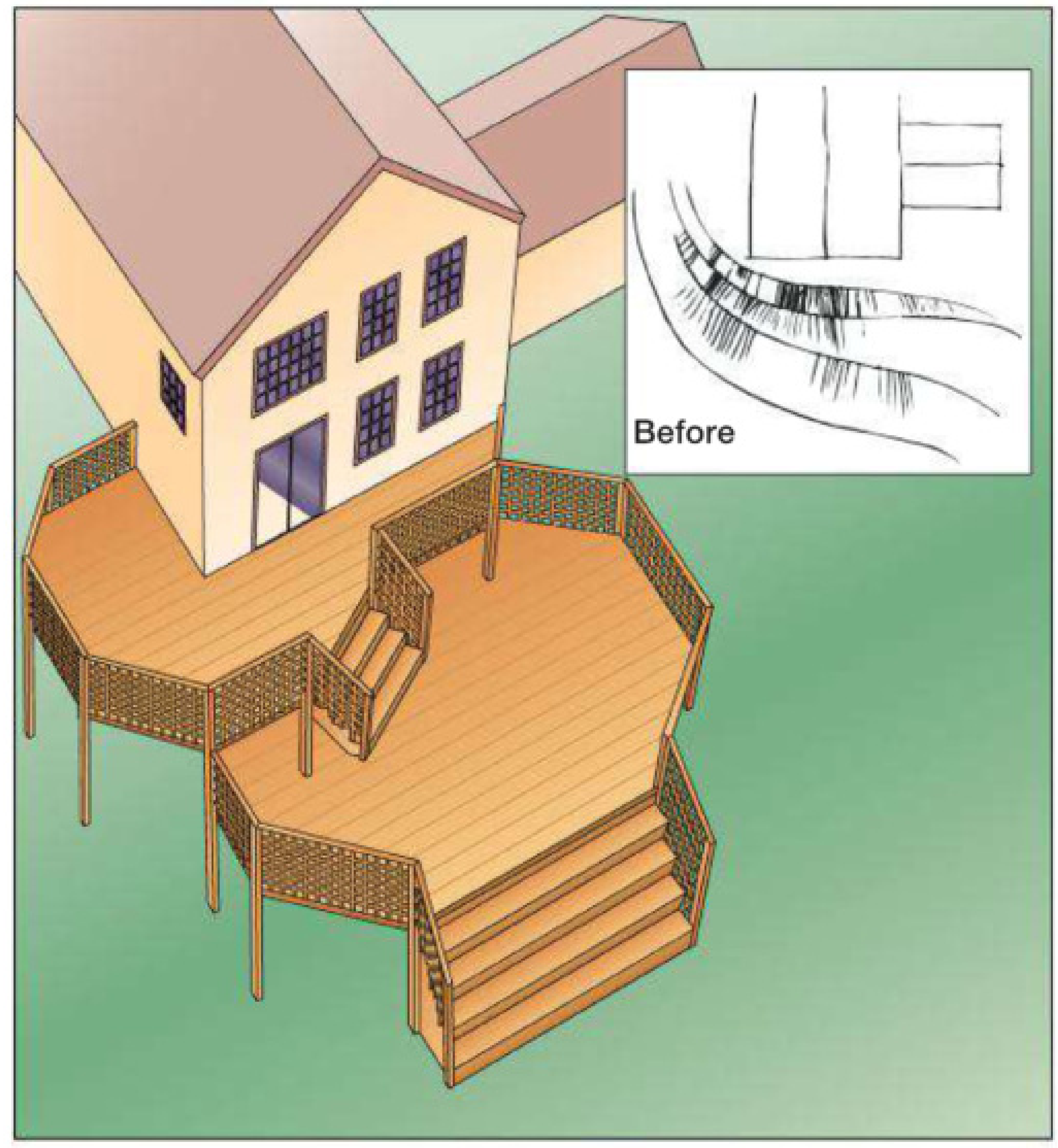
The design centers on a sliding door for access to the family room and includes lattice panels to screen the deck from the street. A patio extends the usable space while adding an extra level.



block an unsightly view

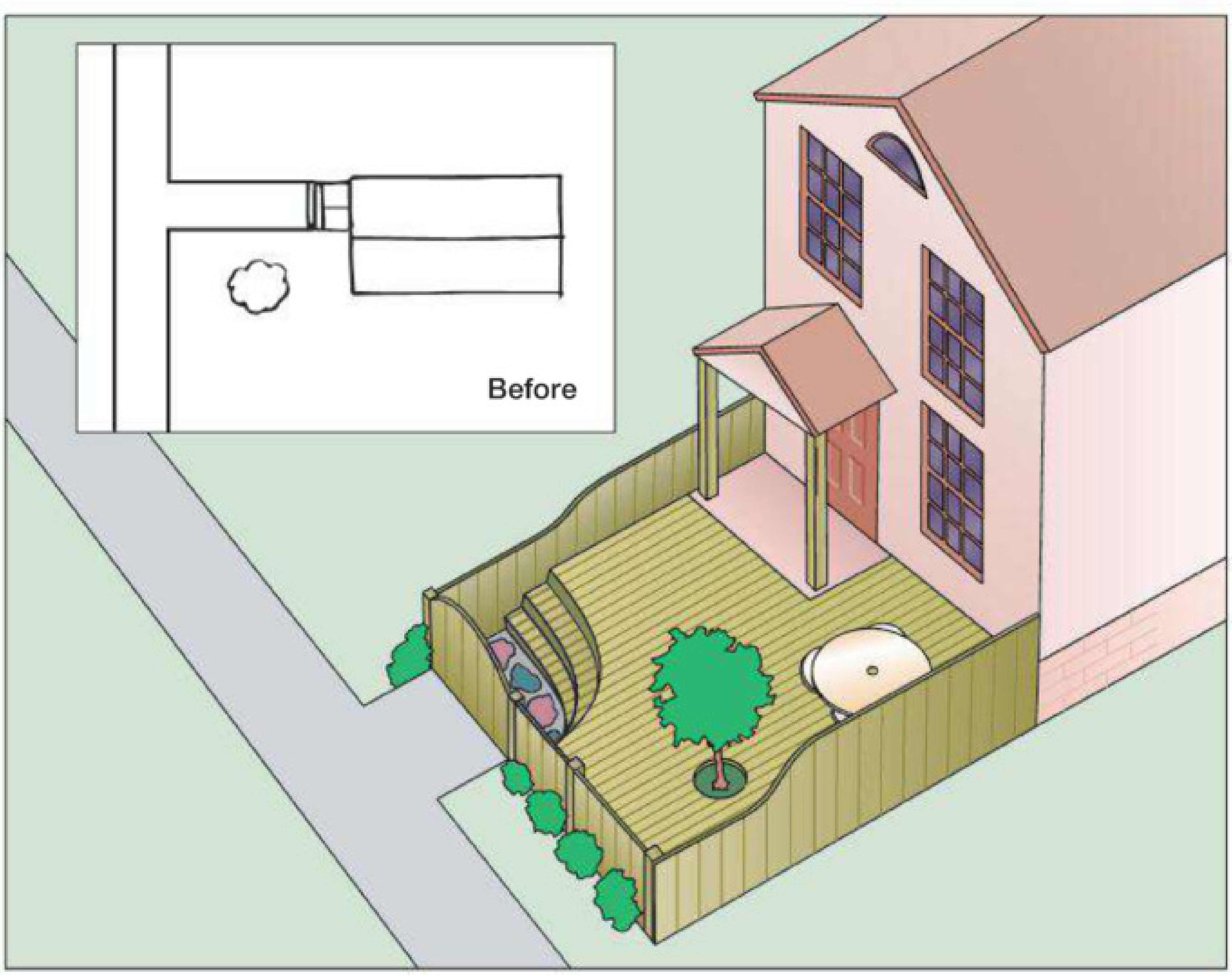
The edges of a neighboring yard often become a storage area for the unused items people just can't part with. This unsightly stuff may be invisible from your neighbor's point of view, but right up against what you want to use for outdoor living space. Because the neighbor is not likely to move his storage area, you'll have to make the adjustment by building screening.

This deck not only includes an attached privacy fence, its orientation and seating direct the views and traffic flow away from the lot next door.



take advantage of a steep slope

Steep slopes can be both an advantage and disadvantage. Because the ground drops quickly away from the house, a deck on a steep slope can offer spectacular, sweeping views. But this kind of deck can be more difficult to build. Whether the ground slopes down or up from the deck site, a multilevel deck that follows the contour of the landscape is often the best solution.



use all of a narrow lot

Decks for narrow lots with close neighbors often are only as wide as the house. Here, a deck completely fills a narrow city lot, putting a limited front yard to good use. High fences wrapping the structure keep the deck area private and buffer unwanted street noise.

caution

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Elevated decks on steep slopes may require well-engineered foundations and framing. You may need to assess soil integrity, drainage, and earthquake vulnerability. Before building on a steep slope, check with your building officials; you might need to consult an architect or engineer.

Deck projects are as unique as the people who build them. Even so, different projects have common features, such as size, level of complexity, and amenities that make them useful for approximating costs. In this chapter you'll find illustrations of six deck projects—small, medium, and large deck sizes, each with two levels of features: basic and upgraded.

building a small deck

A small deck, such as this one, provides an ideal locale for quiet at-home escapes—a spot to relax with a good book or to enjoy the beauty of a backyard garden. If a place for restful solitude is the goal for your deck, a small deck may provide all the space you need. Of course, small decks are ideal if you have limited outdoor space and want to maximize outdoor use. Modest-size decks are also appropriate with a bungalow that would be overwhelmed by an expansive deck.

This 10×12' platform deck is positioned only 12" above the ground, offering an easy transition from house to yard and requiring no railings. Steps ease the transition from house to deck and deck to yard.

basic

- Decking: pressure-treated lumber

Materials: $722
Contractor's bid, including labor and materials: $3,066

upgrade

- Decking: ipe, double-diagonal pattern
- Built-in benches
- Trellis behind bench on far side of deck, or arbor in same position

Materials: $2,711
Contractor's bid, including labor and materials: $7,894

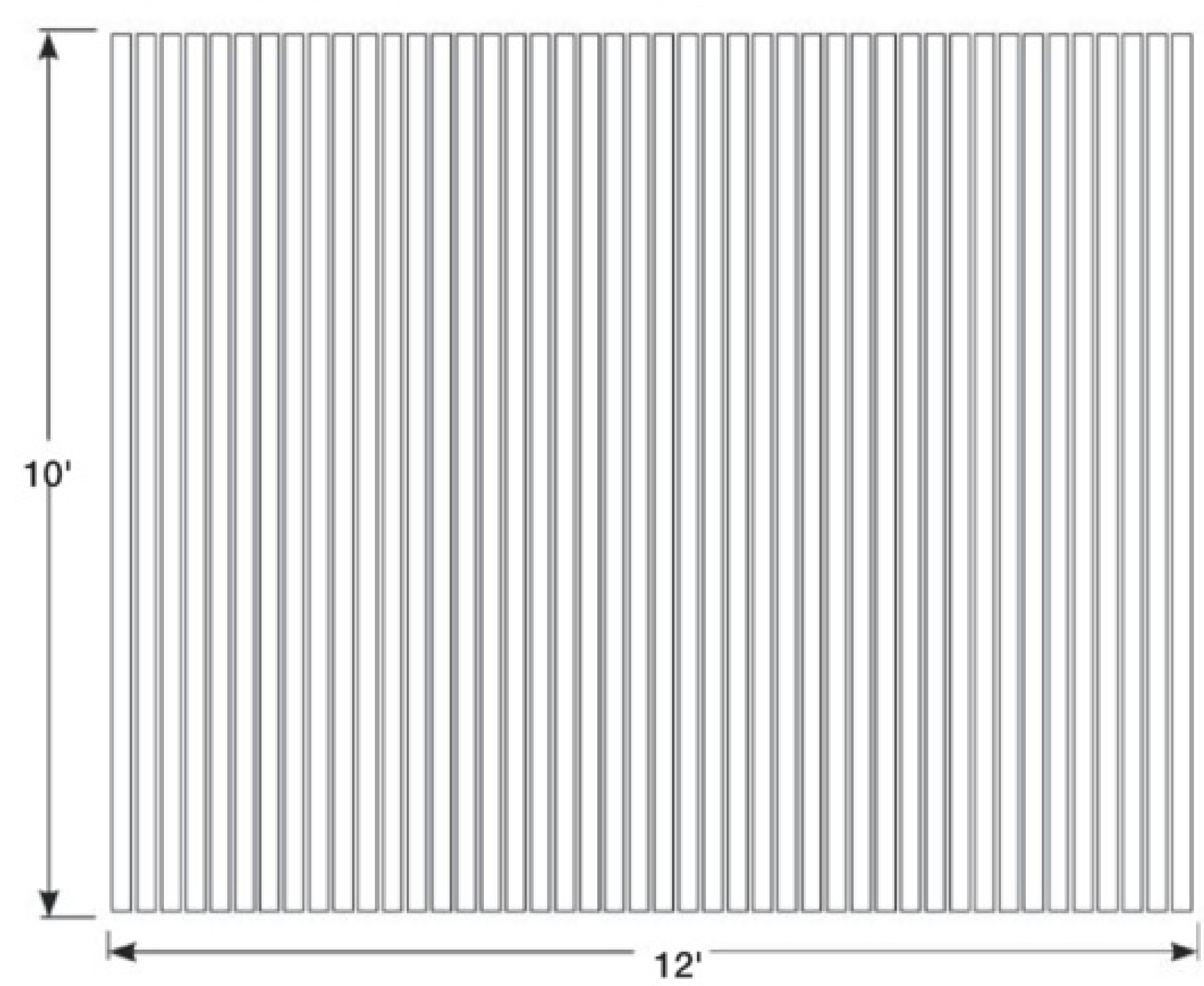
what will it cost?

The vignettes provided in this chapter include a few details of construction and approximate costs for materials—as well as estimates of the cost of having a professional contractor complete the job. These figures, provided by Archadeck, America's largest deck builder, reflect North American averages. You should expect to pay more for materials and labor in more distant locations, such as Hawaii, and lower costs in a less remote locale, where costs of transporting materials are lower. Use these project estimates to ballpark the cost of your own deck. Once planning is underway, get firm estimates from professionals so your project plans and your budget closely agree.

considerations

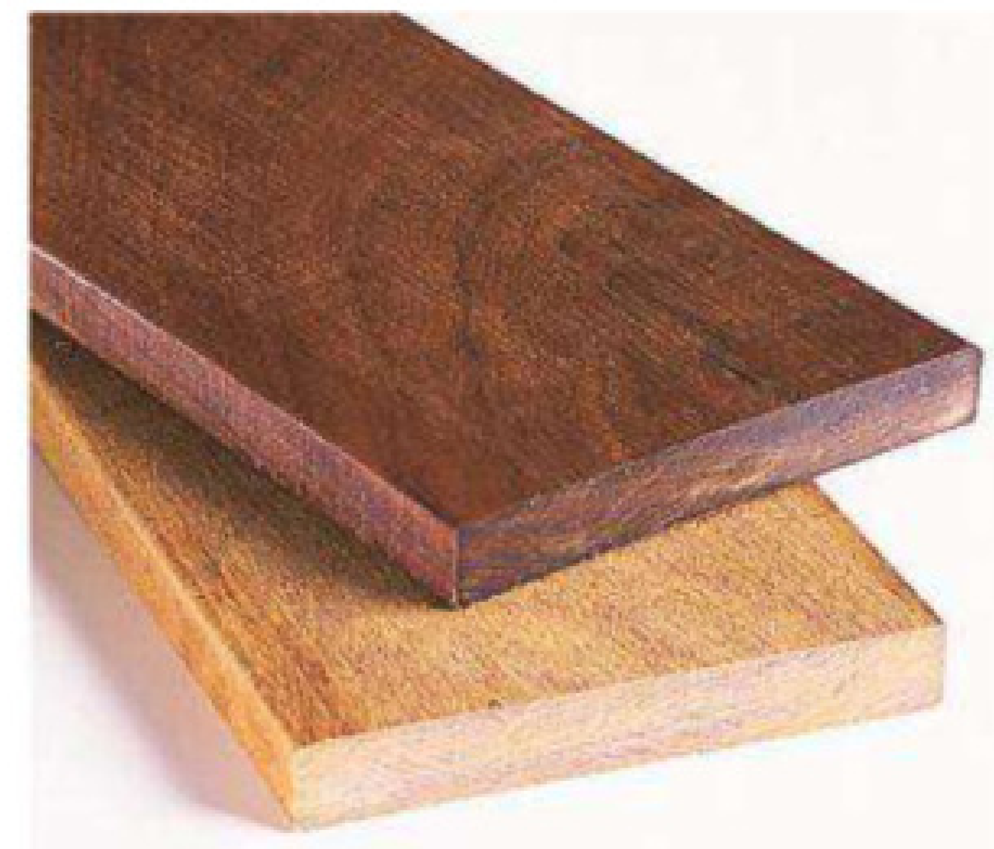
If you only have the space or budget for a small deck, plan carefully to make the most of the square footage. Use flour to outline the proposed deck area in your yard. Prior to finalizing dimensions, measure the furnishings you plan to use, or if you have the furniture already, place it within the area. Determine whether you have enough space to comfortably move around. If not, adjust the dimensions slightly. You may not even need to increase square footage to make the area function better. Maybe a 12×12' square works better for your situation than an 8×18' rectangle, even though both provide 144 square feet of deck.

basic small-size deck

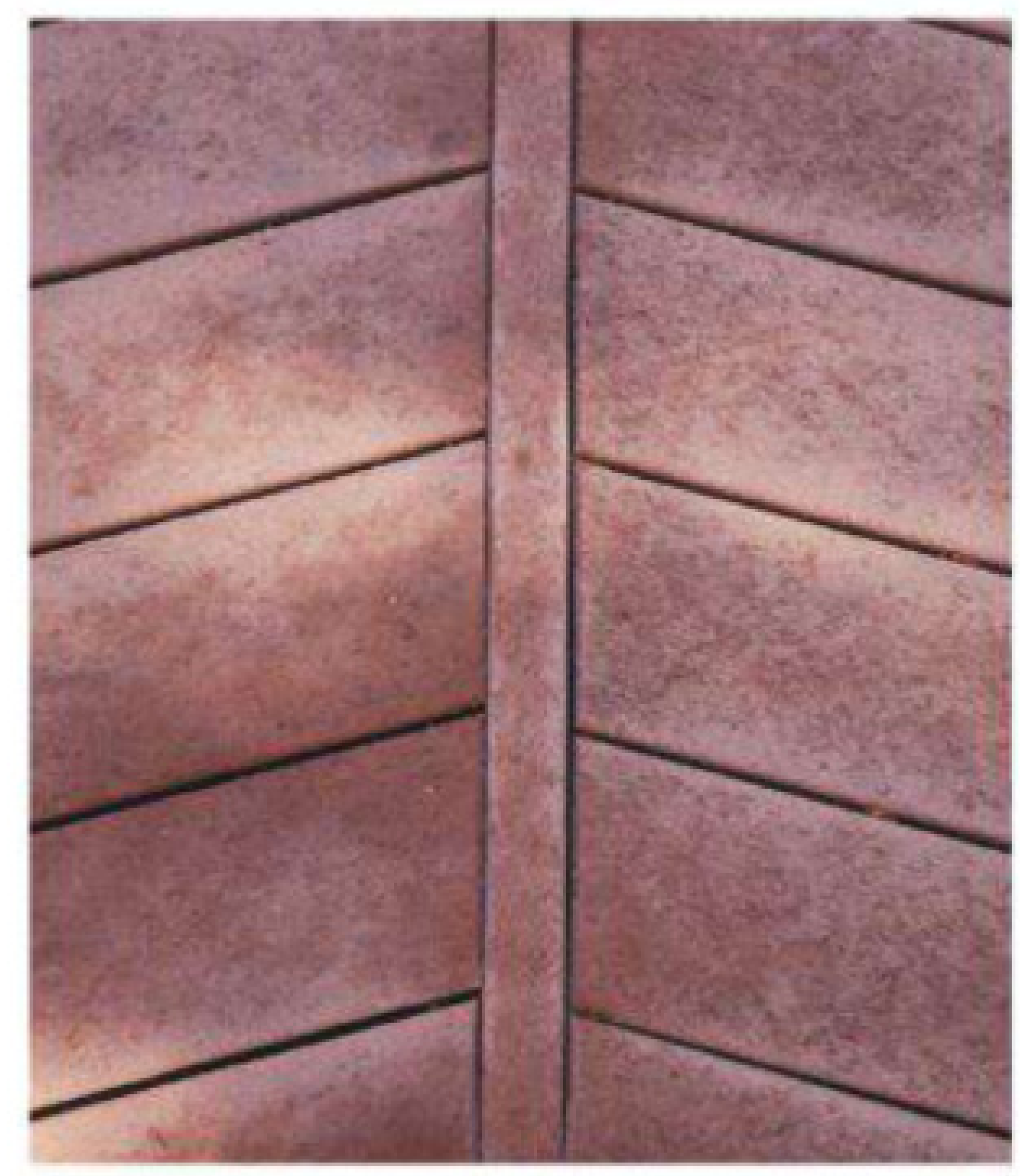


upgrade options

Trellis: Supports flowering vines and provides privacy

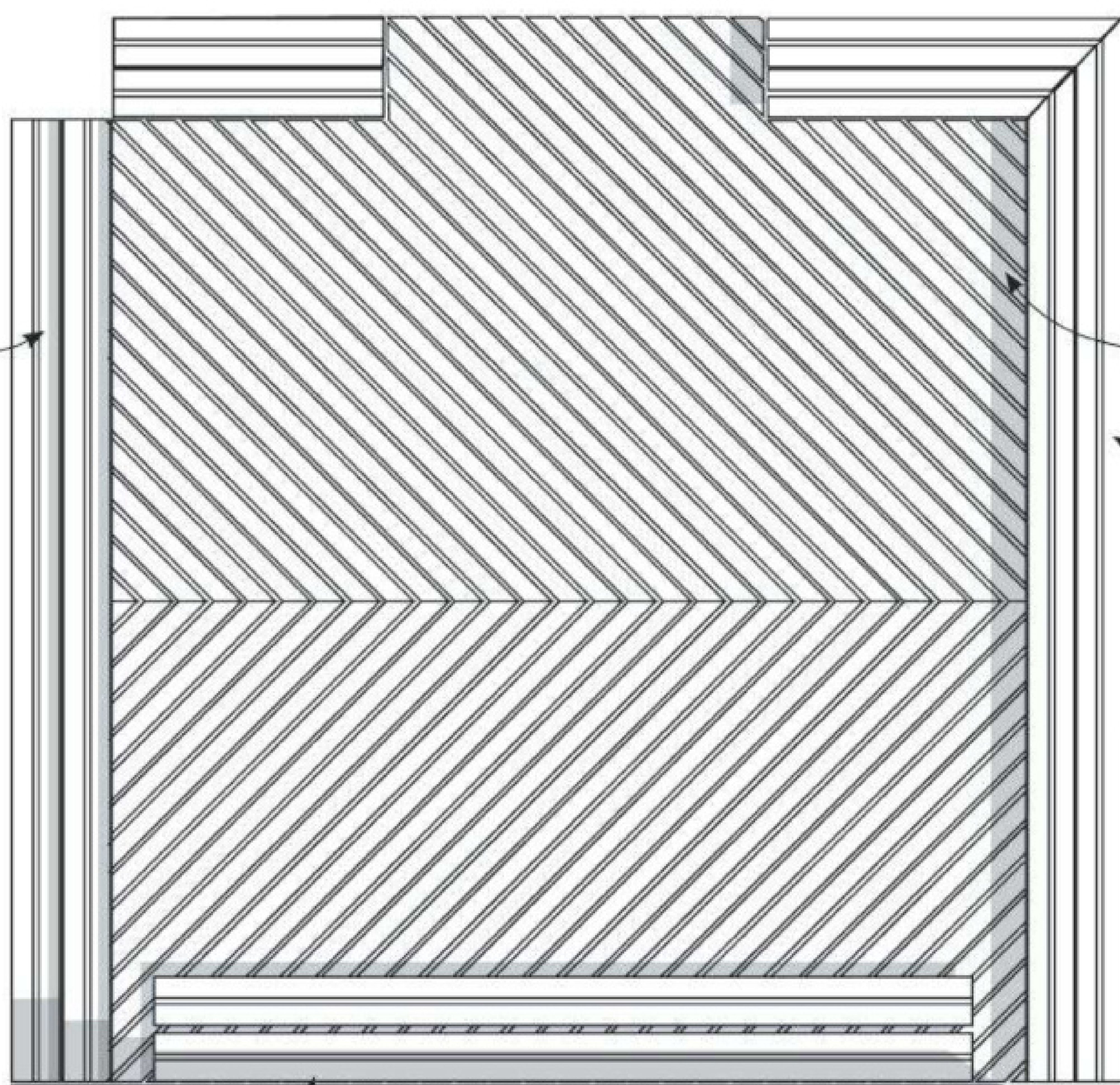


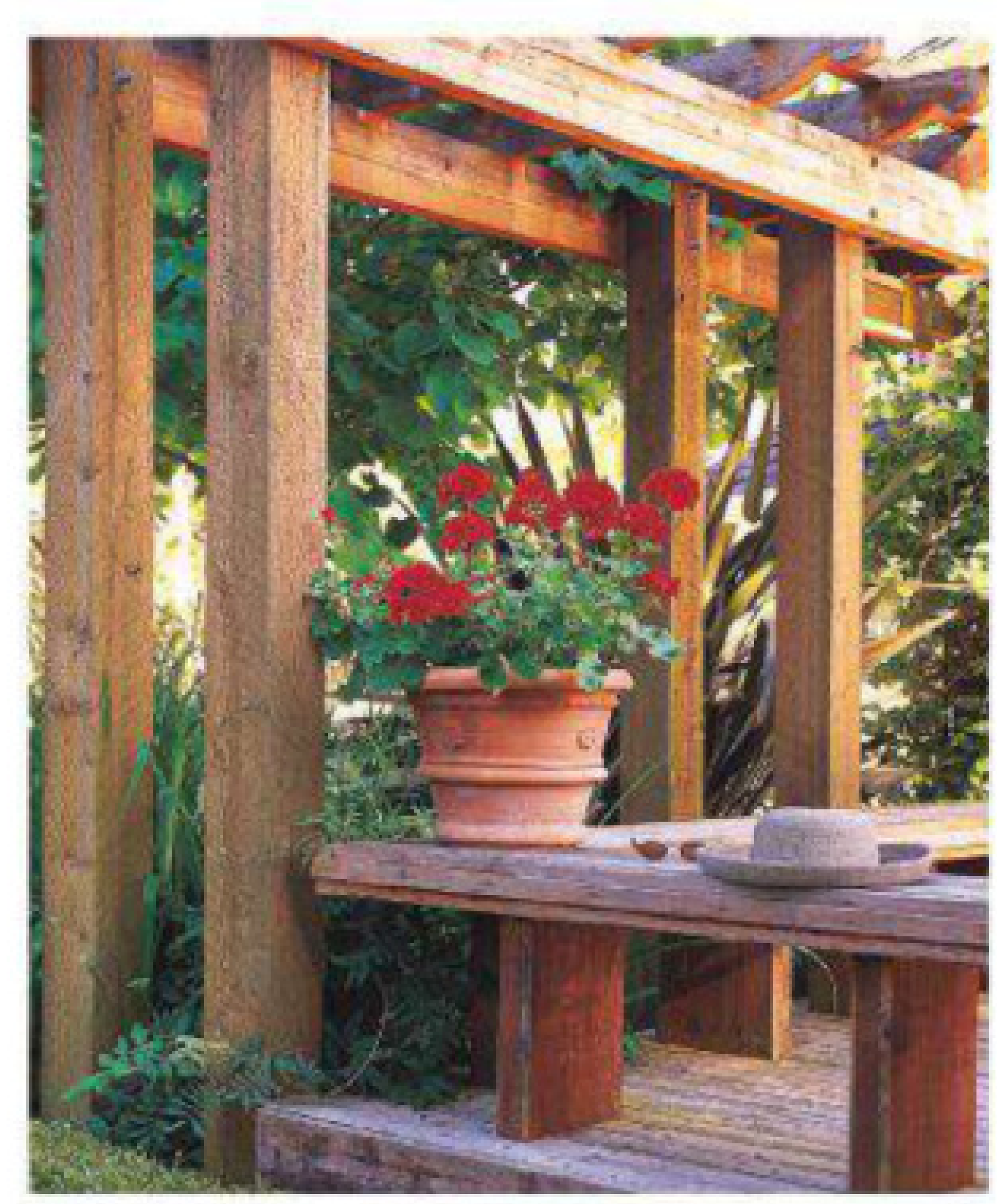
Ipe, *top*, and composite decking, *bottom*



Decking: Double-diagonal pattern

upgraded small-size deck





Built-in benches

building a medium deck

A medium-size deck, such as this one, creates an outdoor room. At approximately 20×15', the deck provides space for alfresco dining just outside the kitchen, with additional space for a small gathering or family activities. A deck of this size integrates better with most story-and-a-half and two-story homes than a typical tiny builder's deck, and it offers ample room for activities.

The raised deck offers the opportunity for enclosed under-deck storage. For locations with a view, alternative railing styles, such as stainless-steel cabling or safety glass, preserve the view in all directions.

basic medium-size deck

basic

- Decking: pressure-treated lumber; boards parallel to house
- No skirting; river rock or gravel underneath deck
- Standard, most basic railing style around deck
- No overhead structures

Materials: $2,361
Contractor's bid, including labor and materials: $7,516

upgrade

- Decking: cedar; diagonal pattern
- Overhead structure similar to illustration, or flat-top pergola over portion of deck, with overhead in illustration
- Skirting around deck, with one part that opens on hinge for storage
- Metal wire railing, perhaps stainless-steel cabling
- Built-in storage bench next to house, under window on left; doubles as seating bench

Materials = $8,729
Contractor's bid, including labor and materials = $23,647

considerations

With a deck this size it's key to consider how you will use the deck prior to finalizing amenities and upgrades. Add too much and the deck may feel cramped; leave it as a plain, open space and you may miss opportunities for outdoor fun. In addition to the options shown here, consider the following:

- Cooking area with grill and adjacent counter space for food prep
- Lattice screening on one side of deck to screen unwanted views
- Built-in benches along perimeter for ample seating
- Flower boxes integrated with deck railing, depending on railing style

upgrade options

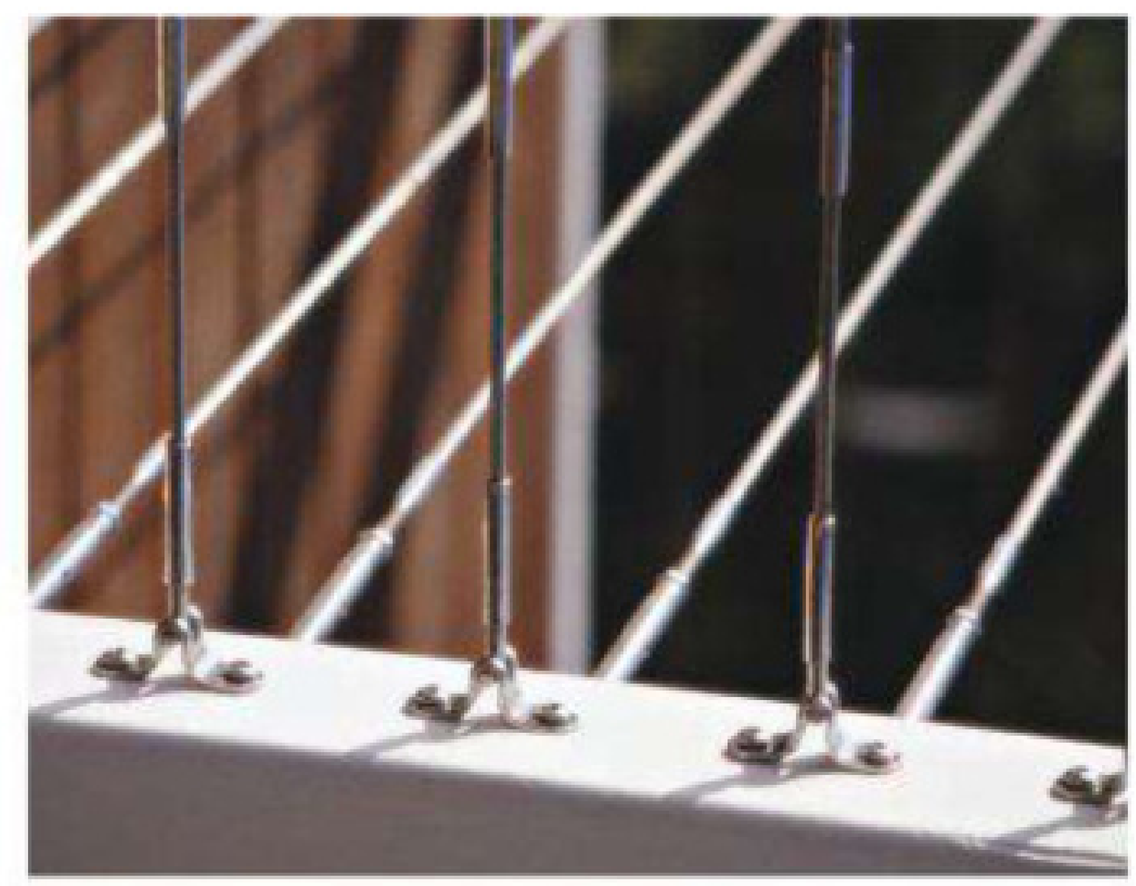
Storage bench: Doubles as additional seating

Lattice skirting: Attractive under-deck coverage; hinges allow access to handy storage area

upgrade options

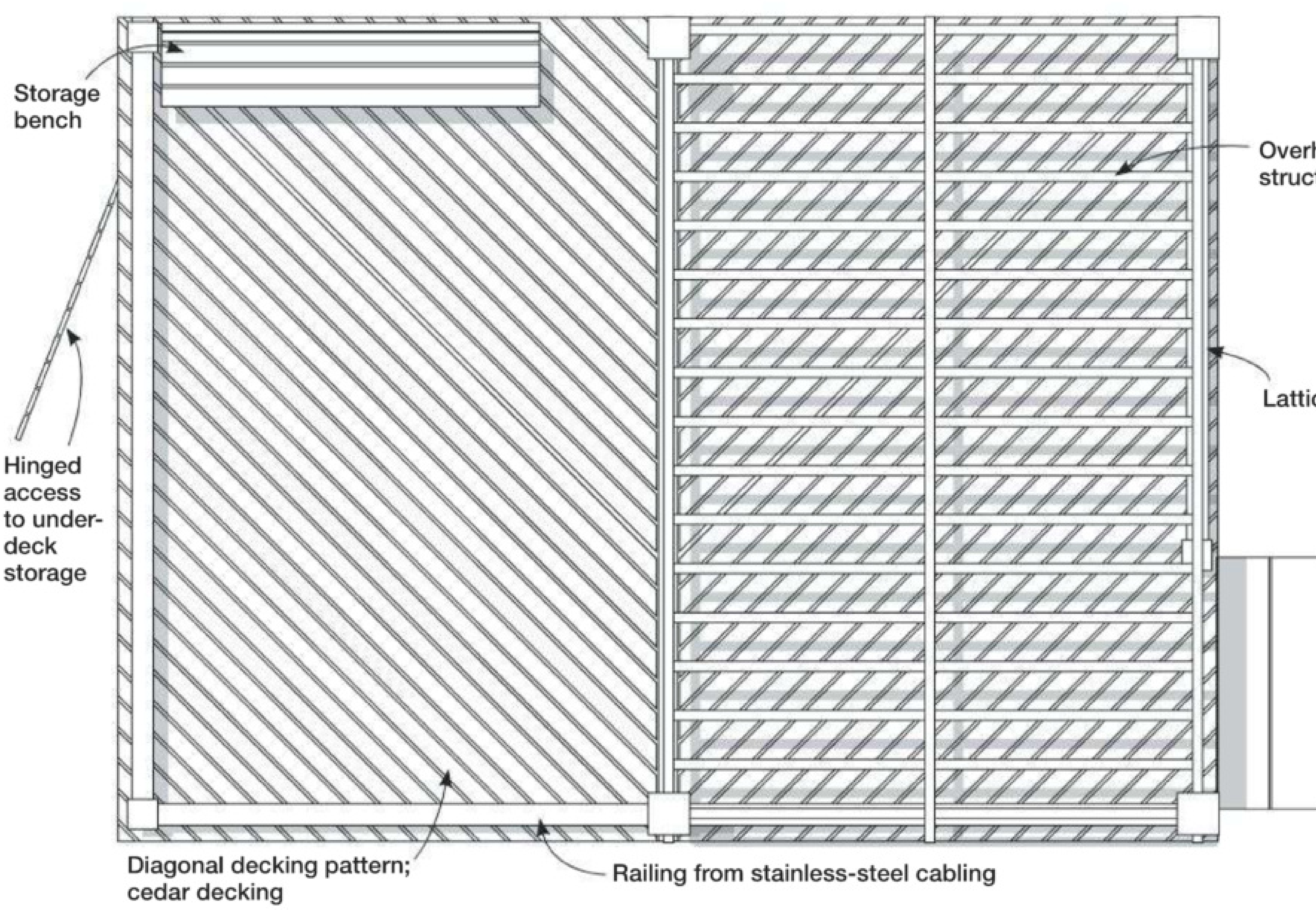
Overhead structure: Provides shade for portion of deck

Cedar



Railing: Stainless-steel cabling

upgraded medium-size deck



building a large deck

A large deck should be designed as a multifunctional area, with space for a variety of outdoor activities. At approximately 650 square feet, this large, multilevel deck project adds an abundance of outdoor living area and smoothly integrates with a number of entry points to the back of a house.

A key benefit of this deck is access. Doors open to the deck from the kitchen at one end of the house and from a master bedroom on the other. The well-planned deck also transitions well to the yard. Platforms gradually step down from the highest level of the deck nearest the house to the lowest platform that opens to the yard.

Another successful design element is the use of individual spaces—some designated by a shift in level, others by decking patterns—to give each area of the deck personality and to indicate rooms. The octagon, for example, is a natural location for outdoor meals—particularly when sheltered by a screened gazebo, as in the upgrade. The space adjacent to the master bedroom is a natural spot for intimate conversations and relaxing at day's end. Open areas nearer the kitchen and family room offer plenty of space for large gatherings.

basic

• Decking: pressure-treated lumber, boards parallel to house
• Basic railing
Materials: $4,320
Contractor's bid, including labor and materials: $15,650

upgrade

• Decking: composite, with patterns changing on each area of the deck to visually distinguish various areas
• Gazebo on octagon portion of deck
• Built-in spa
• Privacy screen to shelter spa
• Outdoor kitchen with large built-in grill, prep sink, and counter space with storage under counter
• Built-in seating along perimeter of deck, with planters along top of back portion of seats
• Wide stairs with easy access to lawn
• Skirting around perimeter
Materials: $21,855
Contractor's bid, including labor and materials: $46,679

designer tip

Find out whether your permit price will be a flat fee or a percentage of the total project cost before adding it to your budget.

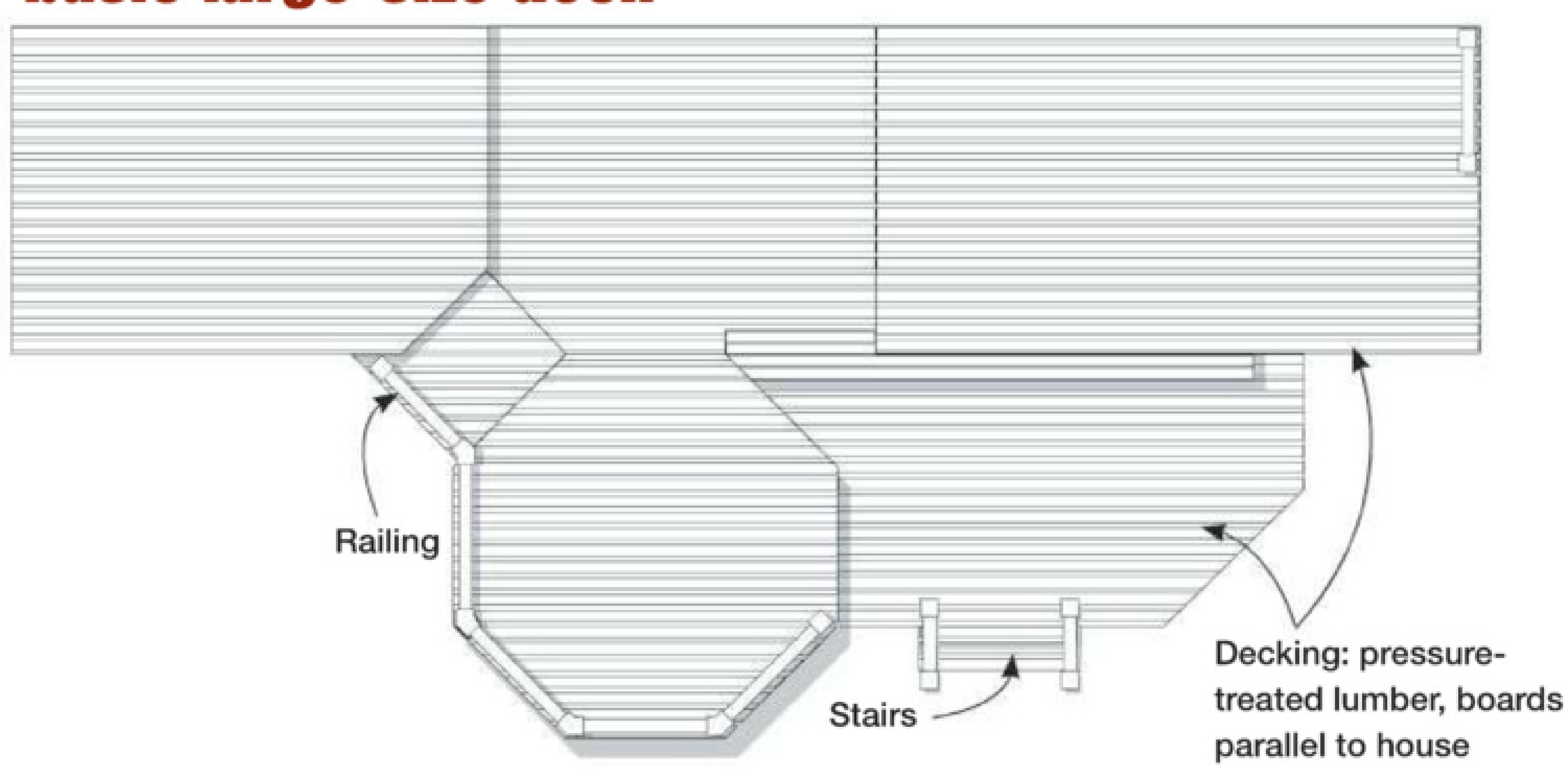
Find more deck plans at:
woodmagazine.com/deckplans

considerations

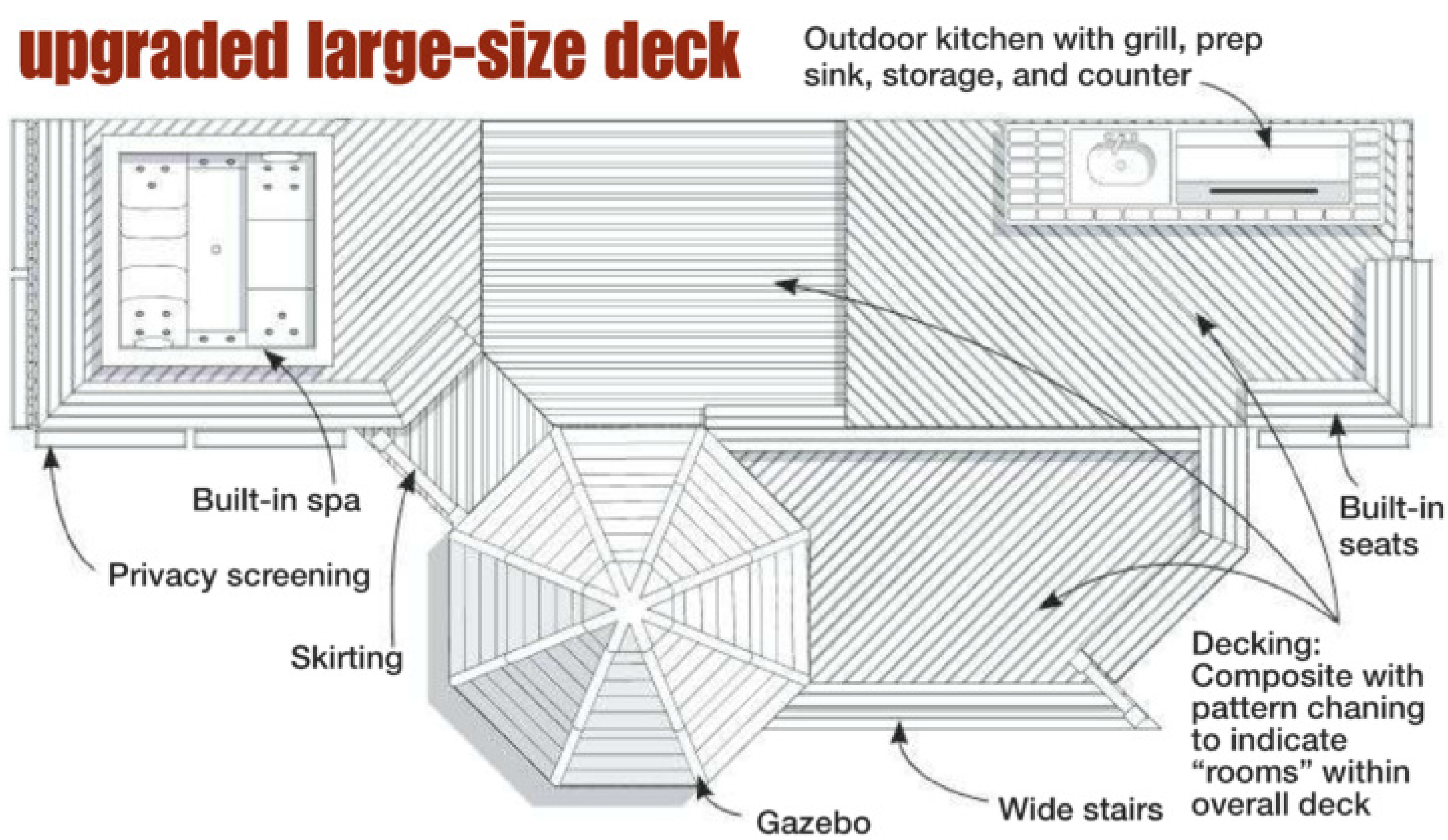
Because of their size, large decks offer the chance to include the most amenities and options. Don't simply add as much deck space or as many amenities as you can afford, however. A huge deck may overwhelm your house, and you may not need every possible amenity. Though this deck is loaded with special features, each contributes to a carefully planned outdoor living space.

Here are other amenities to consider for a large deck:
• Pergola or arbor for filtered shade
• Hinged access to under-deck storage
• Custom railings
• Hinged storage benches that double as extra seating

basic large-size deck



upgraded large-size deck



final deck checklist

Spare yourself some hassle and headache, as well as last-minute budget busters, by checking this list of deck-project essentials. Though it won't cover everything needed for special upgrades, such as a fireplace or full outdoor kitchen, checking your plans against these points should keep your project on the right track.

planning

- Does the deck comply with area building codes?
- Is there plenty of space for planned outdoor activities?
- Is there enough space for amenities and furnishings, such as tables and chairs, and for the people who will use them?
- Will traffic flow easily between the house and the deck?
- Is it easy to access the yard from the deck?
- Are individual spaces for specific uses designated on a large deck?
- Will the deck visually integrate with the house?
- Will at least a portion of the deck be shaded, if desired, during peak use times?
- If privacy is a concern, are privacy screens planned?
- Does the deck contain storage elements, such as built-ins or access doors?
- Do you have detailed plans of the final deck design?
- If you plan to work with contractors, builders, and other professionals, have you reviewed and signed contracts specifying all work, materials, and responsibilities?
- Have your checked with all utility companies regarding buried services?

components

- Does your project list include all project components that follow?
- Have you budgeted for all the project items listed at *right*?

materials

Lumber:
- Substructure (ledgers, joists, posts, beams)
- Railings (rail posts, balusters, top rails)
- Stairway parts (stringers, risers, treads)
- Decking

Fasteners:
- Post anchors
- Joist hangers
- Bolts
- Screws
- Nails

Finishes:
- Stain
- Sealer
- Paint

Other materials:
- Alternate materials planned for decking and railings
- Skirting
- Fill for under deck, such as weed-blocking landscape fabric and river rock

labor

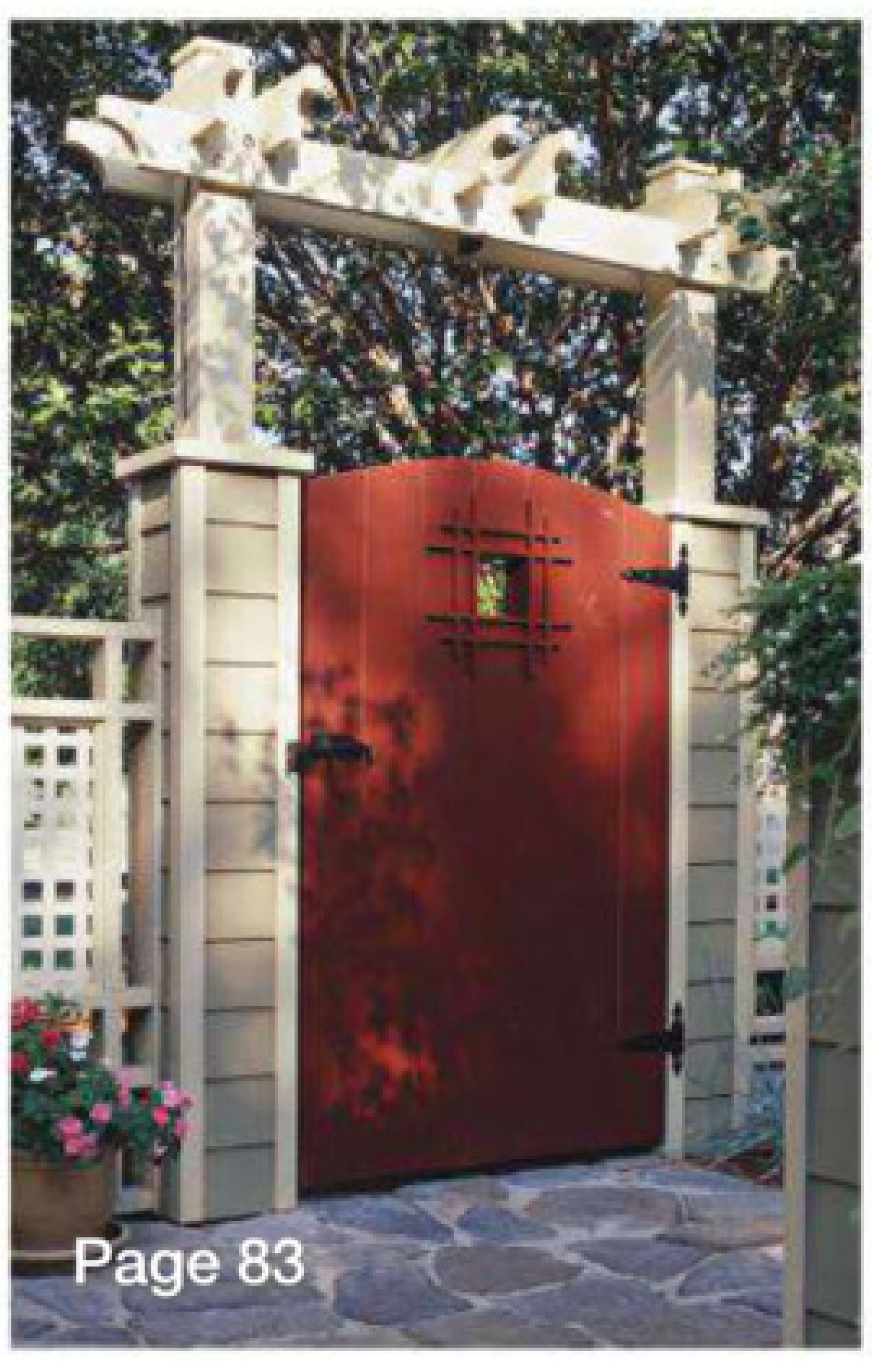
- Site clearing and prep
- Digging footings
- Pouring footings
- Constructing substructure
- Installing decking
- Building stairs (if needed)
- Installing railings (if needed)
- Finishing deck

special features

- Do the final deck plans account for any special features, such as an outdoor kitchen, spa, or gazebo?
- Will structural elements adequately support heavy features, such as a spa?
- If plans include adding a special feature later, will proper prep work—such as roughing in utilities—be done during initial construction prep work?

build outdoor projects that last

You'll put a lot of effort into your outdoor wood projects, but the elements can wear away your best attempts to protect them. Here are some important steps you can take to keep projects in this issue looking great.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avoid rotting woes with woods that don't quickly decompose

Although no wood is completely immune to rotting and insect damage, some species resist such decay much better than others. Through a combination of dense cell structure and/or naturally occuring preservatives in the wood, insects and fungi find such woods unappetizing. See the chart *below right* for more specific information about some of your lumber choices for outdoor structures as well as furniture.

You're probably familiar with some of the commonly used species, such as western red cedar and redwood. But in recent years some lesser-known imported species have claimed a share of the exterior-wood market. Of the imported woods listed in the chart, ipe, in particular, is an excellent decking material because of its incredibly dense structure. Yet, unlike many other dense woods, ipe is quite stable.

Lapacho-group ipe is expensive, but it has few defects, ¾"-thick deck boards are so rigid they can be supported 24" on center, and suppliers claim it will outlast cedar and redwood 5 to 1.

for greater rot resistance, try pressure-treated wood

Any wood placed in contact with the ground or another source of continual moisture will rot. At these times, you need to use a pressure-treated (PT) softwood (typically southern pine in the eastern U.S. and hemlock or fir in western states).

To make this material, producers force a water-based preservative deep into the wood under high pressure. The most commonly available preservative treatments (described as new generation PT) are alkaline copper quat (ACQ), copper azole (CA-B). Another preservative, copper xyligen (CX-A), is currently marketed for above-ground applications such as decking. Chromated copper arsenate (CCA) is no longer available in treated lumber, but can still be used for preservative in plywood, poles, and heavy timbers. Because the risk of decay and termite attack is greater for wood placed in soil, lumber treated for use in ground contact has a higher preservative retention. Even higher retentions may be used for critical structural members such as pole-barn poles, wood foundations, and guard rails.

Before you buy PT lumber, make sure the wood has a retention rating that matches or exceeds your use.

PT lumber has become quite popular because of its high degree of decay resistance, strength, and economical price. But it does have some drawbacks you should know about.

Because the currently available treatments give the wood a brownish or greenish color, PT lumber is not as well suited for applications where a natural appearance is desired. PT southern pine decking is also more likely to check and warp than more dimensionally stable species such as cedar or redwood, although most problems with warp can be avoided by firmly screwing the decking into place before it dries. Because of these disadvantages, we use PT lumber in places where long term durability is the primary concern. Examples: the support structure of decks, fence posts, and other applications where wood is in contact with the ground.

Most producers ship PT wood immediately after treatment, so the wood is often water-soaked when you buy it. That means it will shrink, sometimes substantially, after you bring it home. When building a deck, it is usually best to cut and install the wood while it is wet because of the difficulty of cutting and screwing into dried PT wood. If you do this, just butt the deck boards edge to edge—they will shrink to form gaps, usually in a week or two of dry weather.

The amount of shrinkage can be unpredictable, though, so allow PT wood to dry for several weeks if you don't want to guess. But be prepared to predrill for screws and nails. Also, PT stock must be dry before it will accept a finish.

Most importantly, always remember to wear gloves (waterproof ones are best) when handling PT stock. When sawing it, wear a dust mask and eye protection. Wash your hands after handling treated wood, and never burn it—the ashes contain poisons.

more stock-selection tips for outdoor applications

• **Although vertical-grained stock can be hard to find**, it will hold up to the effects of weathering better than flat-grained (flatsawn) lumber. That's because it's less likely to warp, and it expands and contracts less with changing moisture content.

Also, boards or plywood with wide, flat-grain bands are more susceptible to finish failure. Paint or other film-forming finishes often stick to the earlywood bands but peel from the latewood bands over time.

Earlywood and latewood bands actually can separate, which is known as shelling. This defect is more likely to occur on the pith side of a board, rather than the bark side of flatsawn lumber.

woods that hold up to the elements

Exceptionally Decay-Resistant Domestic Woods	black locust, red mulberry, Pacific yew, Osage orange
Decay-Resistant Domestic Woods	Arizona cypress, bald cypress (old growth), black cherry, black walnut, catalpa, cedars*, chestnut, junipers, mesquite, redwood, sassafras, white oak
Exceptionally Decay-Resistant Imported Woods	greenheart, Honduras mahogany, ipe**, jarrah, lignum vitae, Spanish cedar, teak

*Old-growth wood is more decay-resistant than wood from younger trees.
**There are many species of ipe. Make sure you buy ipe of the lapacho group of species.

• **Even if you like to use every square inch of your lumber**, resist the temptation to use sapwood in exterior applications. Regardless of species, sapwood has virtually no resistance to rot or insects. Much of the western red cedar commonly found in lumber outlets has some sapwood—typically exposed on the edges and one face.

Note: *This rule about sapwood is reversed for PT lumber. Because the preservatives are accepted only by sapwood, the heartwood areas of PT lumber are not decay resistant. Fortunately, most of a southern pine tree is sapwood. Nevertheless, treaters use the whole log, so when shopping for PT lumber, keep an eye out for the heartwood—it's typically tan or pink instead of green.*

• **If your project calls for using sheet goods**, be sure to buy an exterior-grade product. Plywood intended for outdoor use is bonded with waterproof glue, so its layers won't delaminate in the presence of moisture. You still will need to apply paint or another finish to protect the sheet from rotting and sun damage. And you can extend its life greatly by sealing its edges with a flexible finish, such as latex paint over a water-repellent preservative.

• **Low-density woods (softwoods, such as cedar and redwood)** have less tendency to warp, check, and change dimensions than high-density domestic woods, such as white oak and southern pine. So low-density woods work better with film-forming finishes, such as paint, because the film is less likely to crack or peel from wood movement. (As noted earlier, some incredibly dense tropical species are quite stable and do not follow this general rule.)

• **Avoid using juvenile wood, the 10-or-so innermost rings**. This type of wood is highly susceptible to warping and various forms of degradation, such as checking and splitting. These defects not only look bad, they provide easy entry into the wood for water, insects, and fungi.

materials that weather all seasons

1. Ipe (a tropical hardwood)
2. 2x pressure-treated pine
3. 5/4 pressure-treated pine
4. 2x western red cedar
5. 5/4 western red cedar
6. 2x redwood
7. 2x Trex (weathers to grey)
8. TimberTech
9. 5/4 Trex (brown)
10. 5/4 Trex (weathers to gray)

see image below for corresponding material

drive screws that don't corrode

Lots of screws are labeled appropriate for exterior applications, but only a few hold up to the elements.

Among your most-common options are stainless steel (which comes in different grades), silicon bronze, and steel with one of several available coatings. Here, we look at each. Although aluminum and brass resist corrosion, we don't include them because they're too soft for most applications. Also, aluminum will corrode quickly in contact with the chemicals in treated lumber.

• **Silicon bronze**. This material is the standard in marine fasteners because it resists corrosion and doesn't promote rot in the wood around the fastener. It costs about twice as much as 304-grade stainless steel, so reserve screws made of this material for boat-building.

• **Stainless steel.** Screws made of this material may cost twice as much as coated steel fasteners. But stainless steel is well worth it if you don't want to see any rust or stain marks on your project. Whenever you put time or expensive lumber into a clear-finished project, it doesn't make sense to use anything but stainless steel.

Most widely available stainless steel fasteners are either 304 or 305 grade. Both are appropriate for general use, although 305-grade fasteners have slightly greater corrosion resistance. For maximum corrosion resistance in extreme environments, say one where salt spray is common, spend the extra money for 316-grade stainless.

get the best grip

The Golden Rule for outdoor fasteners

Use screws, not nails, to join your outdoor projects. The additional gripping strength provided by their threads better resists the inevitable and considerable wood movement caused by outdoor exposure.

options in screw materials and coatings

1. Steel with electro-plated clear zinc coating

2. Steel with yellow-zinc coating

3. Steel with mechanically galvanized coating

4. Steel coated with zinc, chromate coversion coating, and polymer

5. Steel coated with polymer and resin

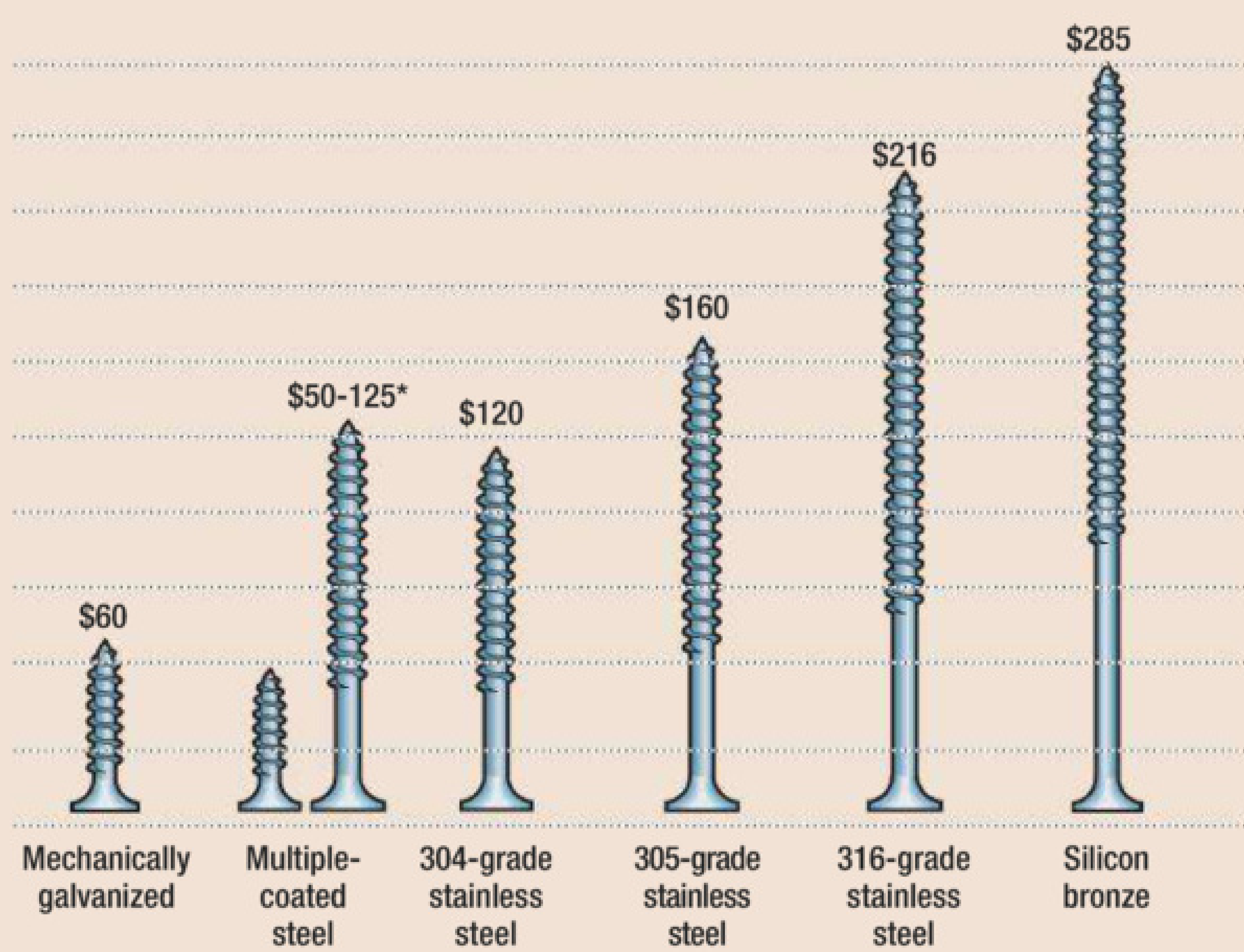
6. Steel coated with two layers of zinc and two clear coats

7. Stainless steel

8. Silicon bronze

cost comparison of exterior screws

Approximate cost for 1,000 #10 x 3" screws



*Price of multiple-coated steel screws varies tremendously depending on quality and distribution.

• **Coated steel fasteners**. Because of the many available coatings and different processes for applying them, this category can confuse many DIYers. Most local hardware outlets still sell the galvanized fastener as their basic exterior-grade fastener. Generally speaking, the thicker the galvanized coating (consisting mostly of zinc) the more durable it will be. You'll find the thickest zinc coatings on hot-dipped nails, but you may have a hard time finding hot-dipped galvanized screws. That's because the thick, globby coating tends to clog the threads and driving recess of the screw, making it hard to drive.

Commonly available galvanized screws are either mechanically galvanized or electro-galvanized. At the lumberyard, you can quickly tell these two types apart because mechanically galvanized screws have a dull gray surface and electro-galvanized screws have a shiny silver-color surface. We do not recommend electro-galvanized screws (also called clear-zinc coated) for exterior applications. They will corrode quickly in contact with the elements.

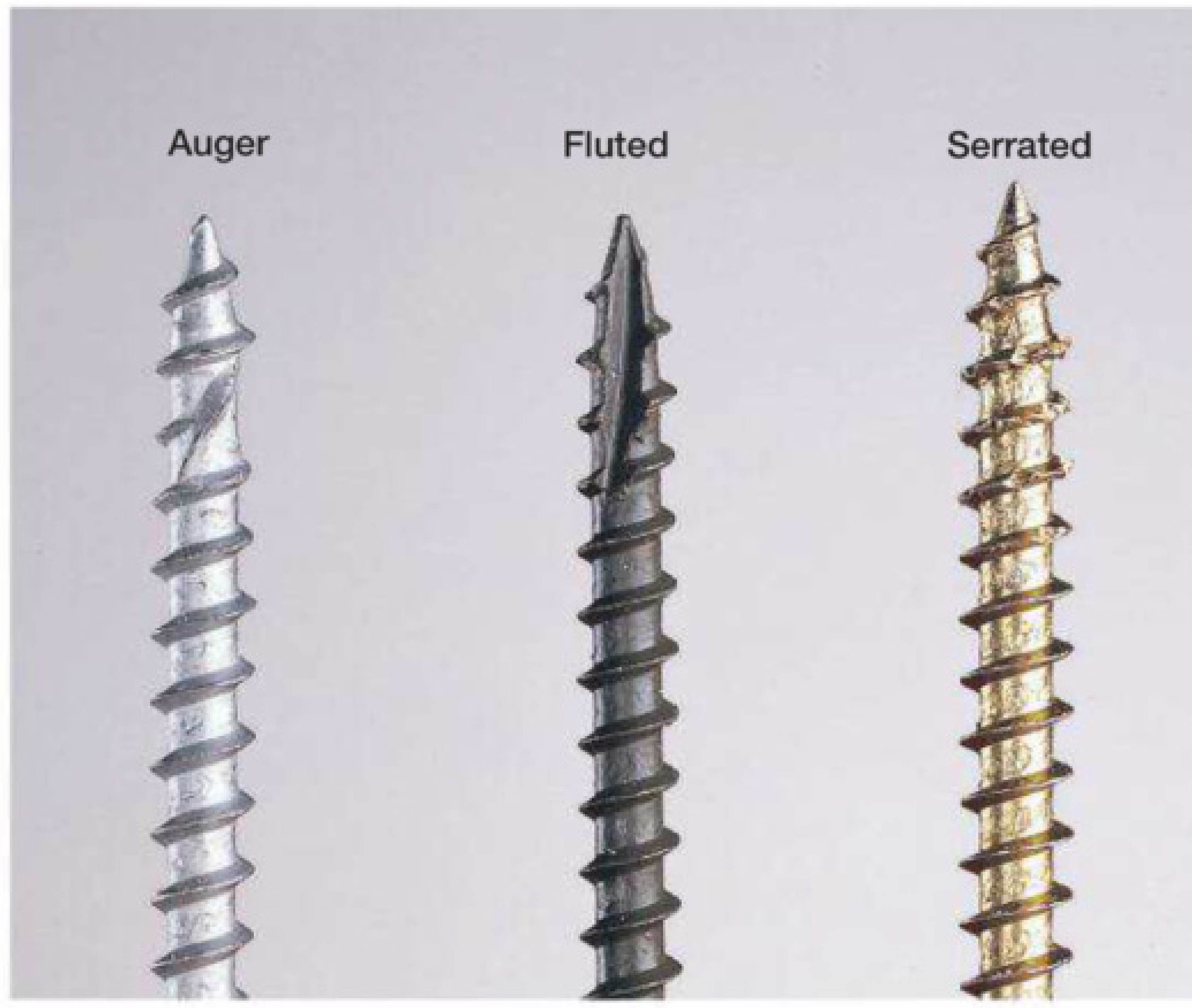
Mechanically galvanized screws are generally suitable for decks and other outdoor projects made of pressure-treated lumber. Nevertheless, you should not use them with PT lumber in contact with the soil, in high-moisture areas, or in areas with salt content in the air. Also, keep in mind that mechanically applied zinc contains some iron that is susceptible to attack from the tannic acids that occur in redwood and cedar. The acids combine with the iron to form a dark stain around the fastener head.

As you can see in the photos, *above left*, manufacturers have improved the basic electro-galvanized fastener by adding a polymer coating (often pigmented) on top of the galvanized coating.

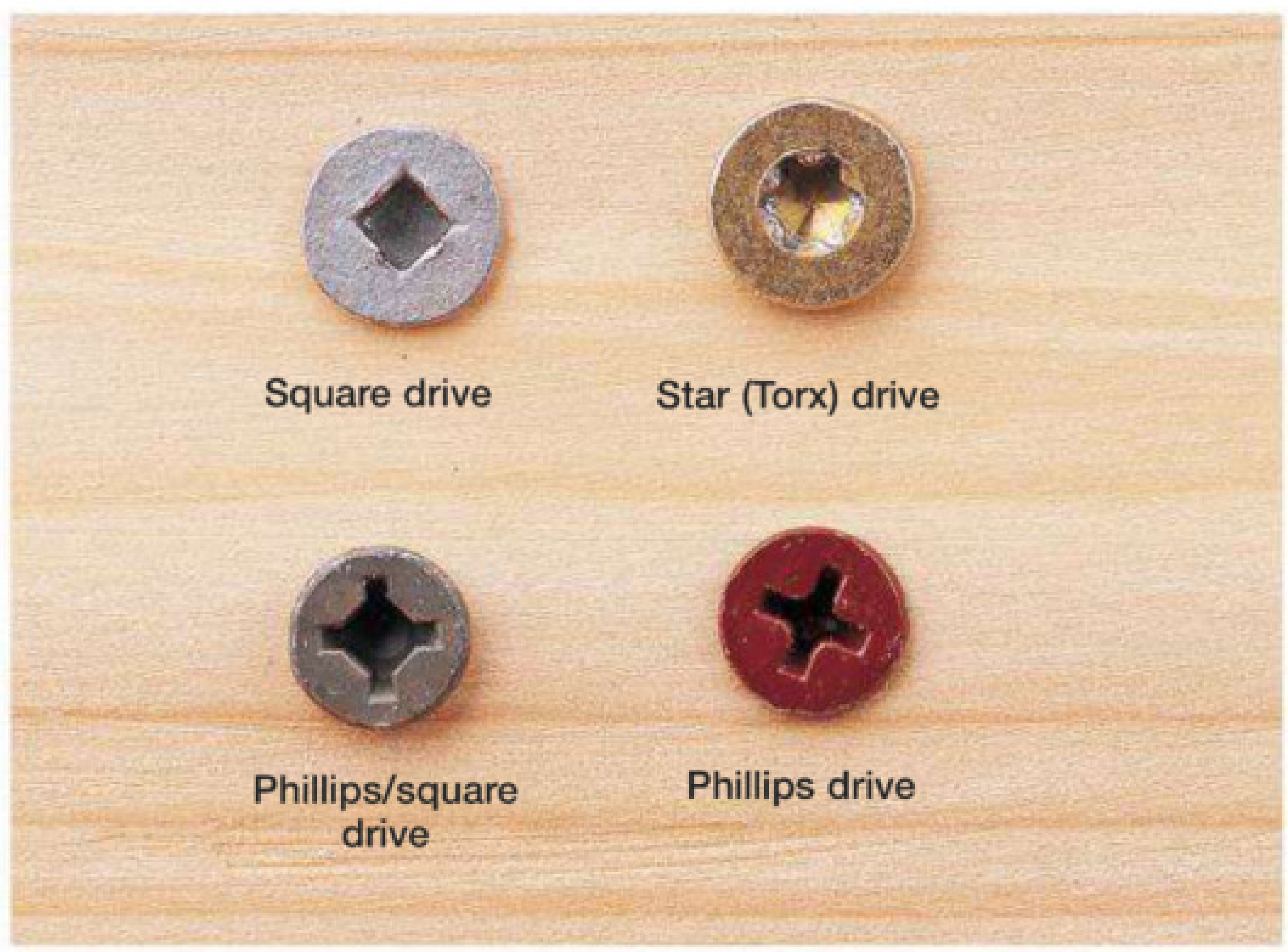
• **Fasteners for pressure-treated wood**. If you purchase pressure-treated woods, be sure to ask your retailer about recommended screws and fasneners. For example, your dealer may stock proprietary anti-corrrosion technologies matched for alkaline copper quat (ACQ) or copper azole (CA-B).

These multiple-coated screws have several advantages. First, some of the coated screws come in colors that help the fastener blend with natural and pressure-treated wood tones. Also, the additional coatings increase

Composite decking requires a different thread pattern, as shown *above*. Traditional-threaded deck screws don't hold well and the boards "mushroom" (form a convex surface).



The design of these three tips helps prevent splits on board ends that aren't predrilled.



Screws with star- and square-drive recesses resist stripping better than Phillips-drive recesses, and they outperform screws with combination Phillips/square-drive recesses.

driving lessons

When driving screws in hard materials, such as PT lumber or hardwoods, opt for a screw in the largest gauge available. For example, many outlets carry 3" deck screws in #8 gauge, but you'll experience fewer snapped screws if you spend a few extra bucks for #10 screws.

If you plan to drive deck screws near the ends of boards without predrilling, look for a fastener with an auger, serrated, or fluted point, such as the ones shown *top right*. In our tests, these screws were less likely to split the wood. Serrated and fluted screws proved noticeably easier to drive when using long screws in hard materials.

Square-drive and star-drive (also called Torx) recesses grip driver bits better than Phillips head or combination Phillips/ square recesses do. (See photo *above right*.) In our tests we found it difficult to strip out a square- or star-drive recess or do serious damage to their coatings. Phillips recesses strip out occasionally, and combination recesses, although handy, strip out excessively.

corrosion resistance. For example, the outer coatings resist tannic acids, making them suitable for use with cedar and redwood decking. These coatings also help prevent iron stain (if the coating remains intact). This type of stain should not be confused with extractive bleed. The latter can occur with any fastener.

Nevertheless, any coating has the potential to wear through and expose the underlying steel to corrosion. This wear typically happens when you drive the fastener. Some low-cost coated screws lose part of the coating covering their threads after one drive through dimensional pressure-treated lumber.

All of the fasteners we tried showed some wear in the coating covering the driving recess. If you are less than careful and leave the head of the screw slightly above the surface, foot traffic will abrade the coating, too.

Our advice: Buy a few sample screws and test-drive them in the material you intend to use. Also, ask the manufacturer about how well the screw holds up in a salt-spray test; disregard any fastener not test-rated for a minimum of 1,000 hours.

- **Yellow-zinc coated steel**. Some fasteners with this electro-plated coating are labeled as being corrosion resistant, but they are not appropriate for exterior applications.

For a free downloadable screw chart, go to:
woodmagazine.com/screwchart

framing hardware and fasteners

Don't scrimp on anchoring hardware and fasteners, which are vulnerable to moisture.

Building codes now require framing hardware for many connections. These connectors strengthen the joints. Attach joists to beams with joist hangers. At the corners, use angle brackets.

Where a beam sits on a post, a post-to-beam bracket provides a secure connection. On beams, many local codes require seismic ties with joists, which add lateral strength.

A post anchor secures a post to a concrete pier and supports it above grade so the bottom won't sit in a puddle. Purchase adjustable post anchors so you can line up the post centers.

heavy-duty screws and bolts

To fasten large framing members together, such as railing posts to joists, use lag screws, machine bolts, or carriage bolts. Bolts are stronger and can be tightened in the future if the lumber shrinks. Always use washers under the head of a lag screw or machine bolt and the nut on a carriage or machine bolt so the fastener head does not sink into the wood.

To attach wood to brick, block, or concrete, use lag screws and lag shields (also called masonry anchors). To tack a ledger temporarily, use masonry screws; they're not as strong but are much easier to drive and don't require an anchor.

hidden clips and rails

You can install decking these days without any visible fasteners. Deck clips, recessed fasteners, and metal rails all attach the decking to the joists, either between or under the decking.

liquid fasteners

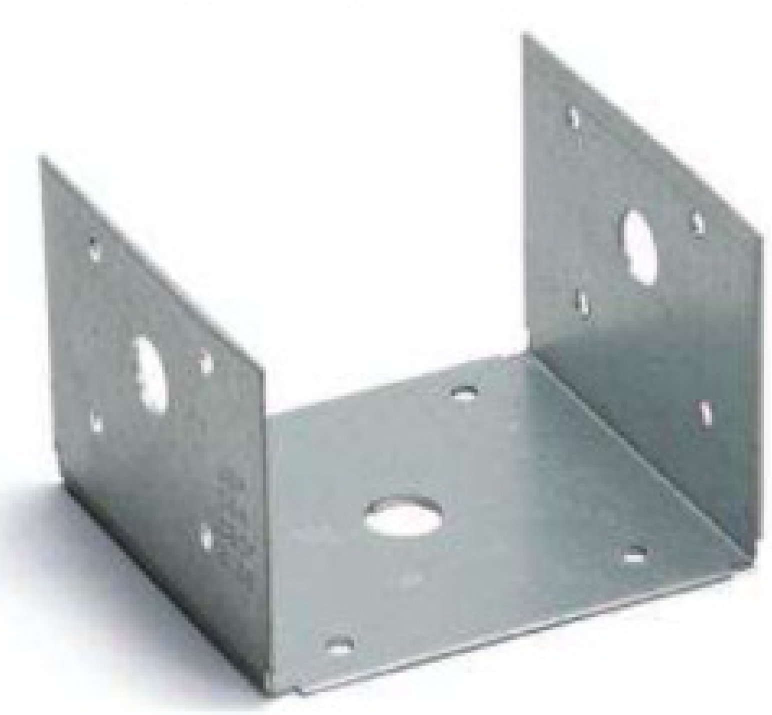
Many carpentry jobs call for adhesives, either as the primary or secondary fastener. Purchase several tubes of construction adhesive to help keep miters from separating. Two-part epoxy in syringes is self-mixing. You'll need it to anchor threaded studs in post footings.

Joist hanger

Angled joist hanger

Nonadjustable post anchor

Adjustable post anchor



Post-to-beam bracket

Framing angle

Hurricane or seismic tie

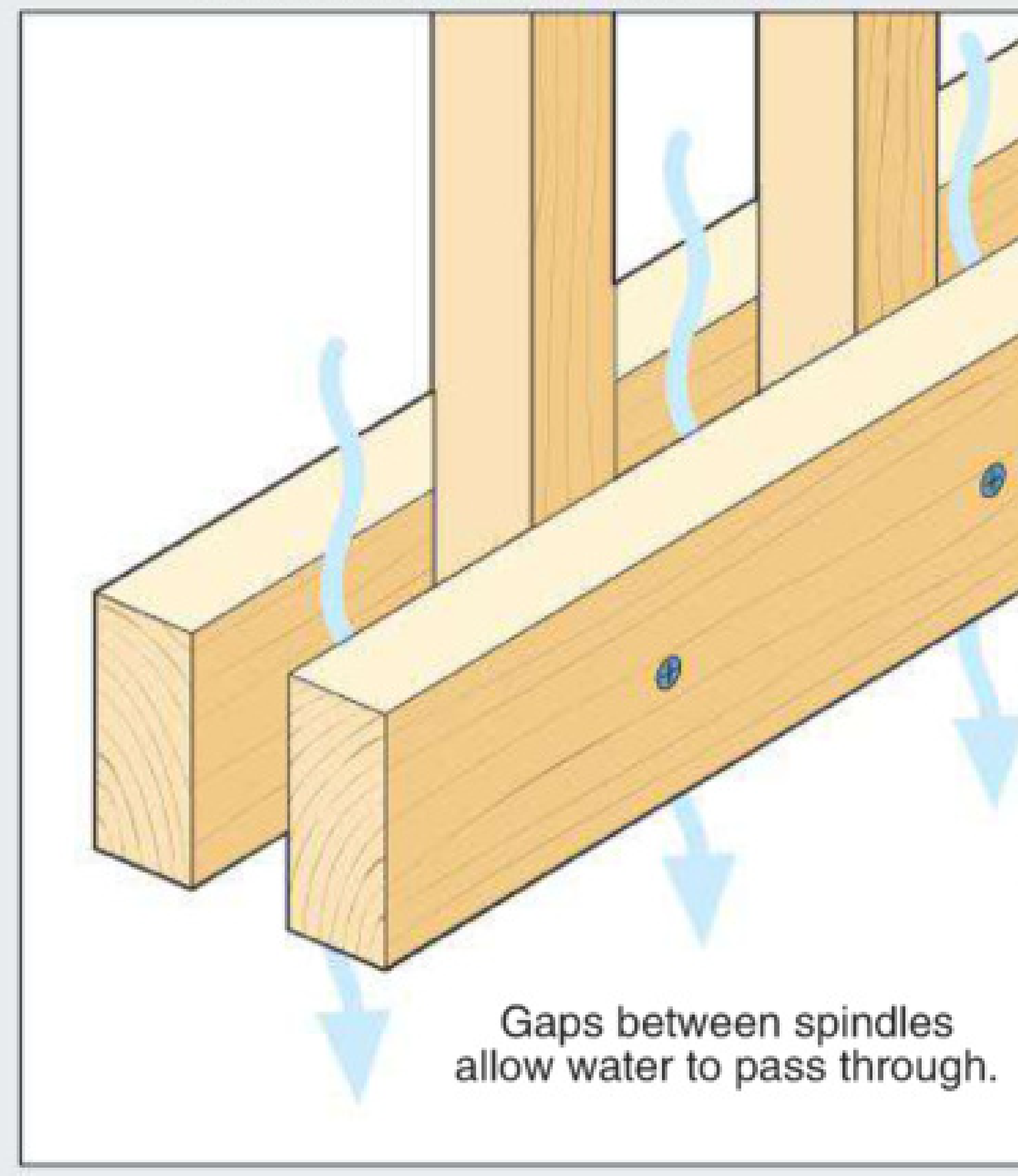
six construction tips that defeat the drips

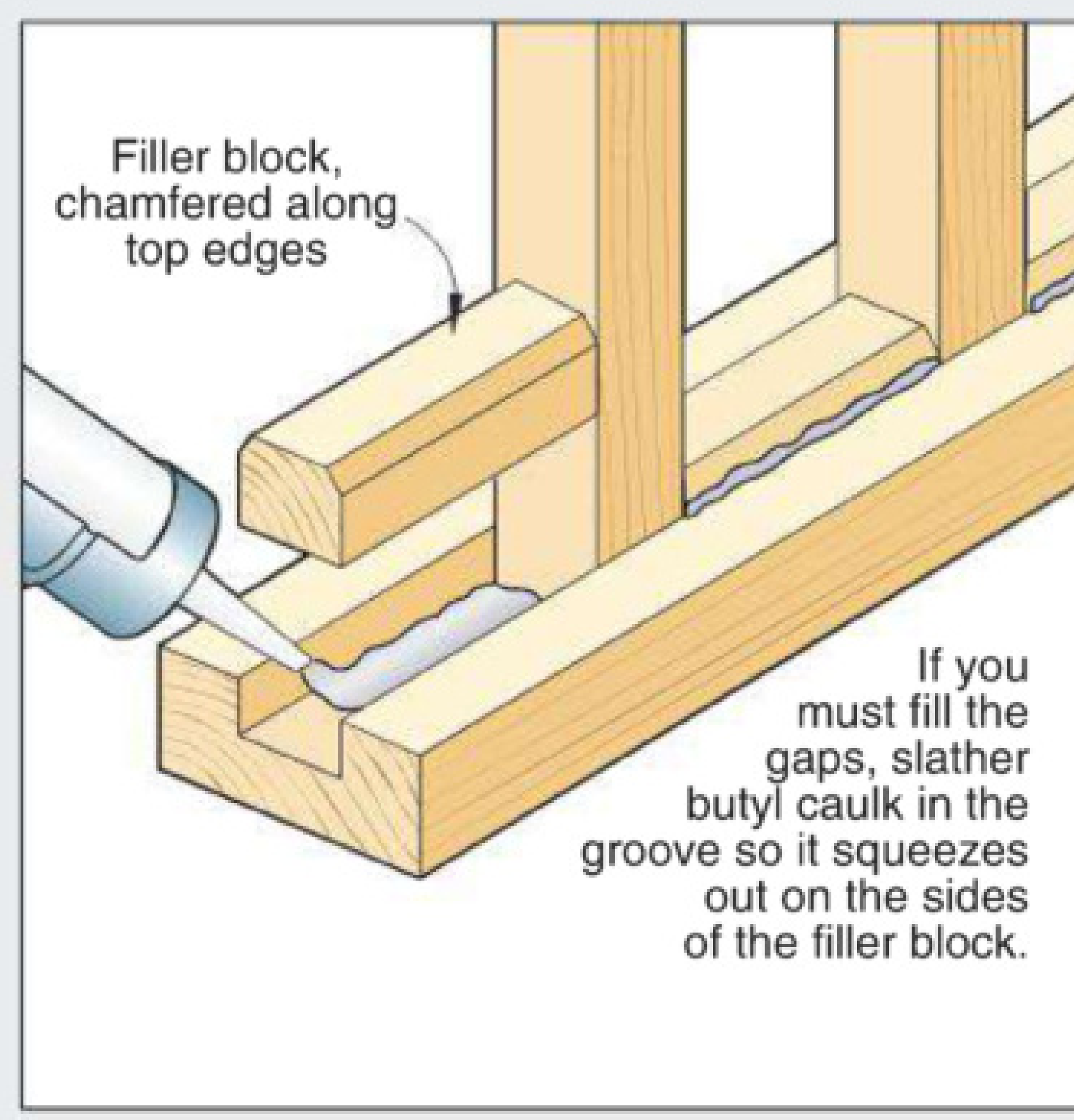
Most exterior glues can't overcome poor workmanship, so build your exterior projects with the same care you would use on your finest interior pieces: Make tight-fitting joints; work the glue while it's still wet; and clamp. Beyond that, building for the great outdoors calls for a little extra thought at the design and assembly stages. Here are six things you can do to keep your project from falling prey to the rain:

1 fasten with care. The key to using fasteners in your outdoor project is to avoid any stress that damages the wood or leaves a dimple that holds water. That means predrilling screw holes and driving fasteners just below the surface. Avoid counterboring for bolt heads and nuts unless there's a danger of injury from the jutting fastener. (Counterboring opens up more end grain to moisture.)

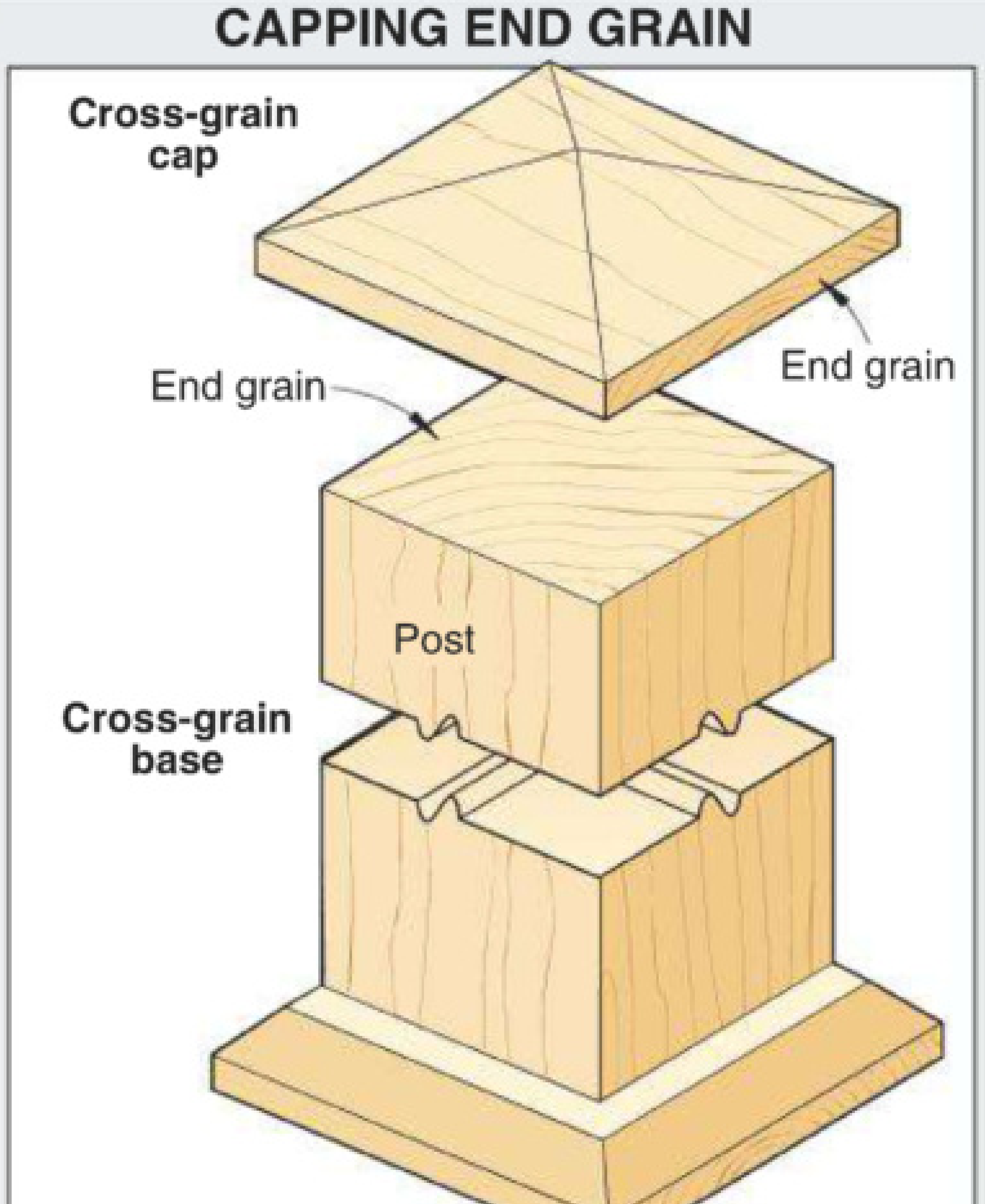
2 build to shed water. Birdbaths and planters should catch rainwater; your patio table should not. Instead of edge-joining lumber for a large, flat tabletop, leave 1/8" gaps between each piece. The gaps allow rain to drain, and let the wood move. Likewise, leave the spaces between slats open so water falls through, or caulk to prevent trapped water. (See drawing at *right*).

ALLOW FOR DRAINAGE AND AIR CIRCULATION

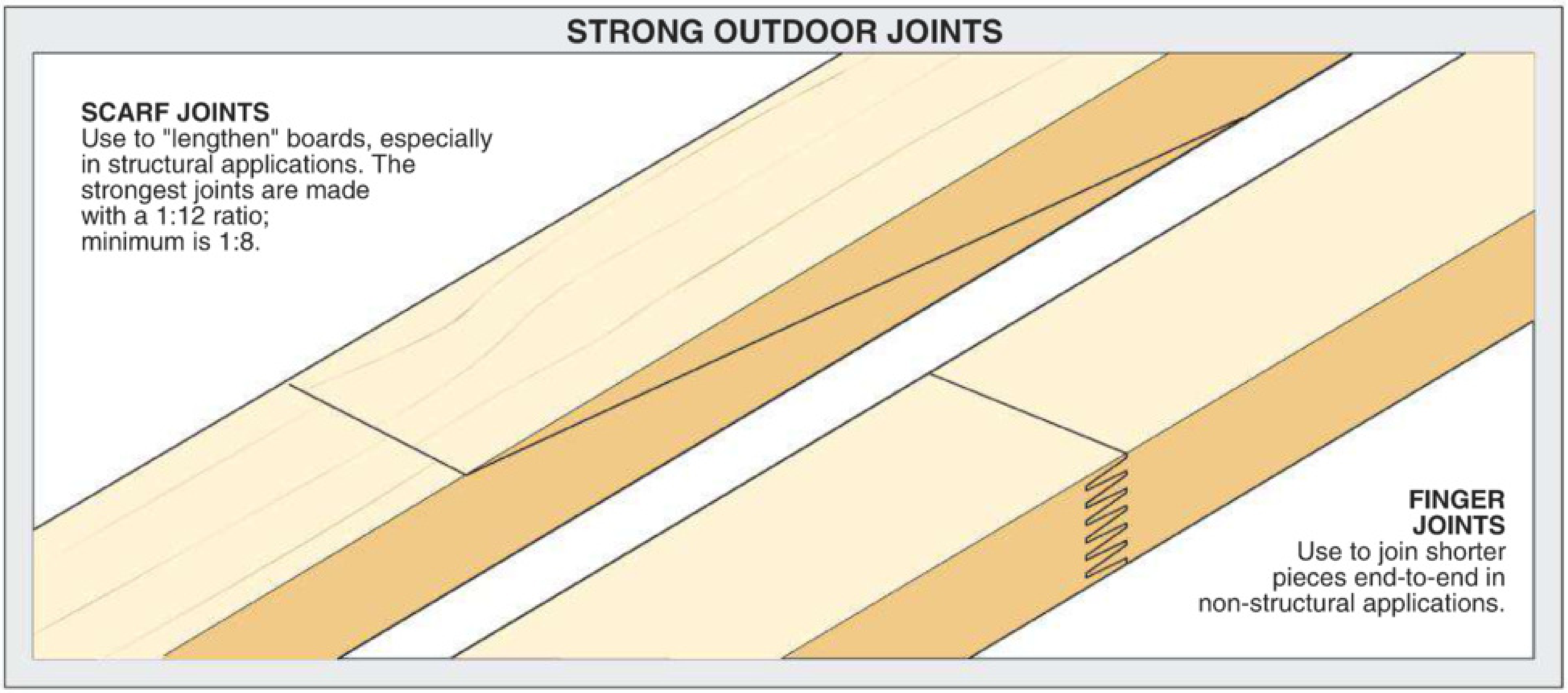


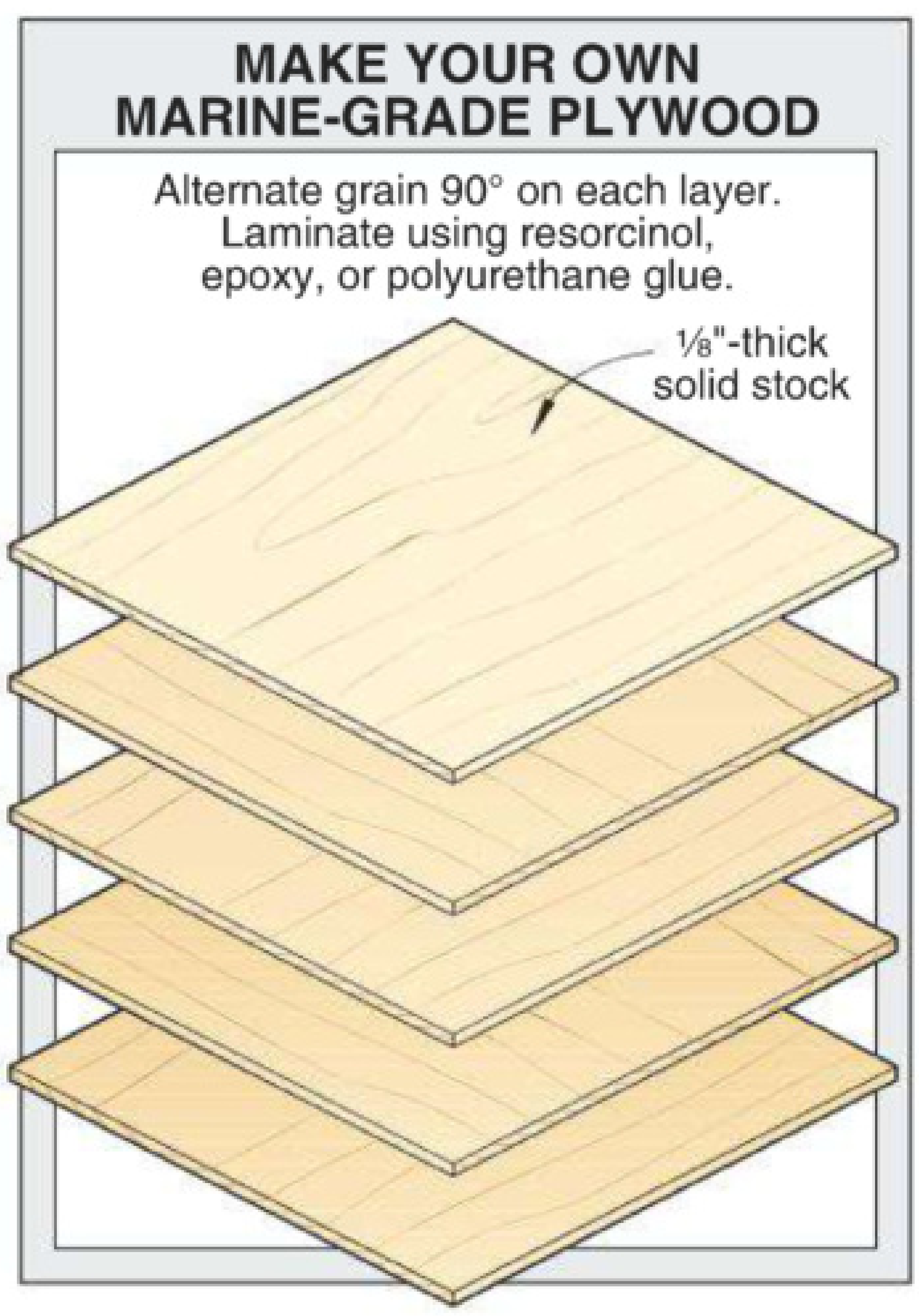


CAPPING END GRAIN



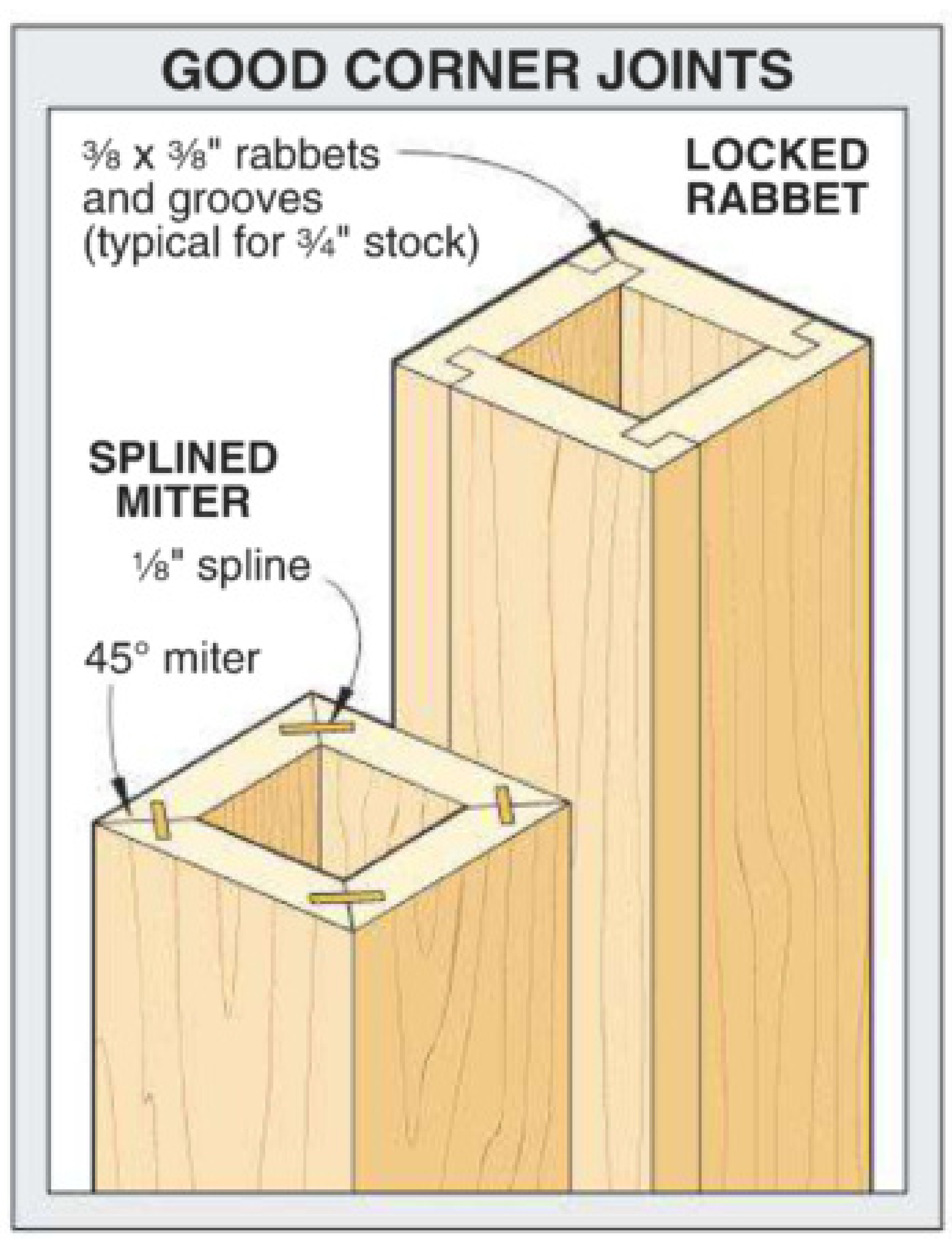
3 minimize end-grain exposure. Moisture moves through end grain like soda through a straw, so plug up end grain by sealing it with finish or caulk, or capturing it in a joint. For end grain that points to the stormy sky or touches the ground, consider covering it with a cross-grain cap, as shown at *left*. Also, keep the edges of laminations from facing up, and fill the edges of plywood with epoxy or primer and paint.

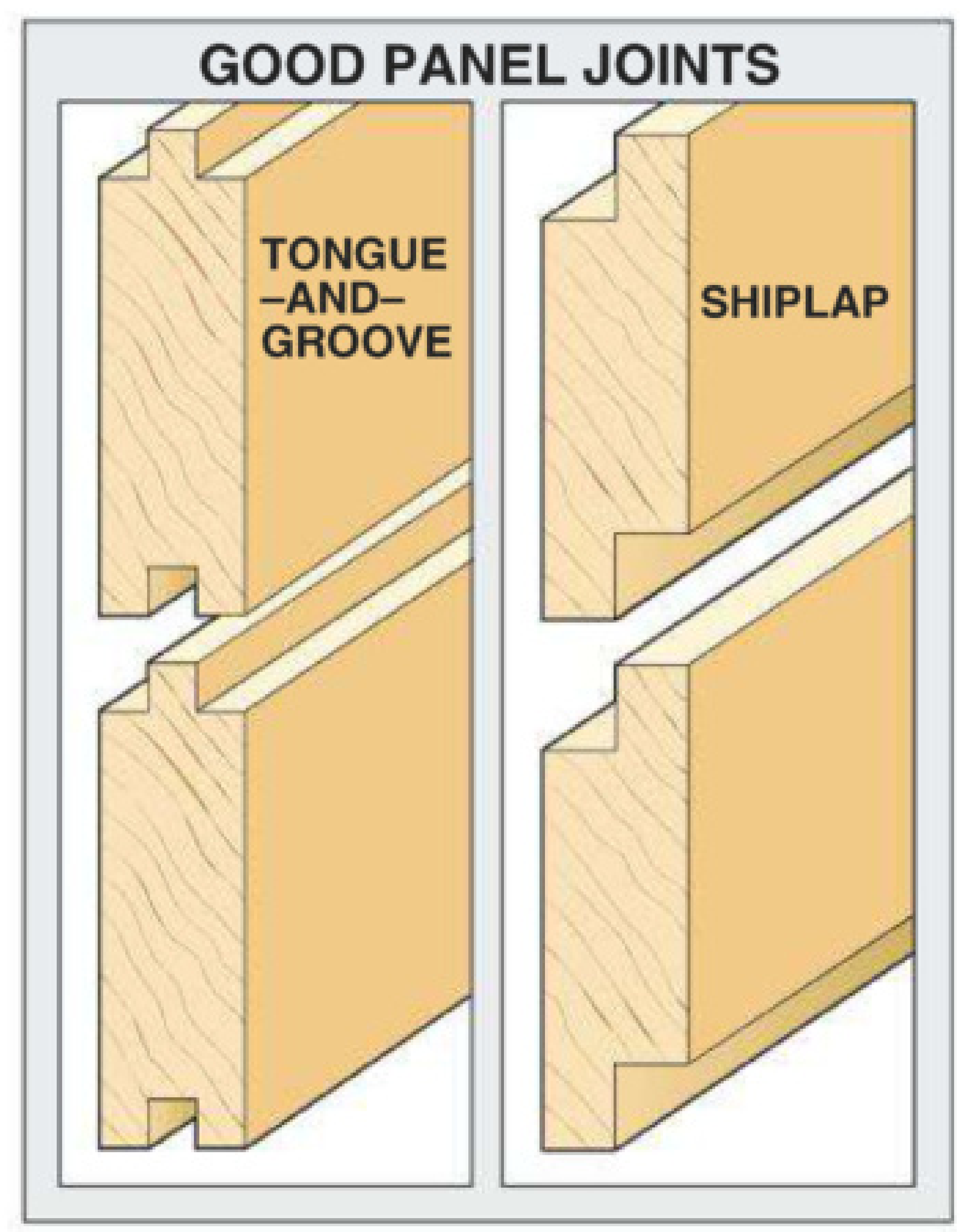




4 make your own plywood. For fragile fretwork or parts, such as wheels, that must endure stress from multiple directions, you can fabricate your own marine-grade plywood, as shown *above*. Resaw and plane an odd number of thin pieces of your project stock (the more the better). Then laminate them back together using polyurethane, epoxy, or resorcinol adhesive, and rotating the grain 90° each layer. The parts will be stronger and more stable than solid stock, and will match the wood in your project.

5 Use mechanically sound joinery. Locked rabbets and splined miters, as shown *below*, are more durable than butt joints and non-reinforced miters and bevels because they rely less on adhesive alone to make the connection. Scarf and finger joints, like those shown *above*, provide lots of gluing surface for long workpieces or when gluing up an arch.





6 allow for shrinking and swelling. Weather-exposed wood changes size more often than a lottery jackpot. Use tongue-and-groove or shiplap joints (shown *above*) for broad vertical surfaces to keep the inevitable wet/dry cycles from tearing apart your project.

remove an old deck

There are a number of reasons you might need to tear down an old deck and build a new one. Perhaps the style or size of the old structure was simply not appropriate to your lifestyle or landscape design. Perhaps you are planning a major addition to your house—an extra bedroom, new family room, or bigger kitchen—and the old deck is in the way. Perhaps the construction of the old deck was too shoddy, or previous owners did not maintain it and it's now almost falling down on its own.

Removing an old deck is not a difficult chore. Decks are easier to tear down than to build. Before you get out the reciprocating saw and order the "dumpster" delivered to your site, make sure that removing the deck is your only option.

If it's more outdoor space you want, you can build onto a sound existing deck in a number of ways. If you need more shade, you can add an arbor, an awning, or a pergola. If you simply don't like the way the old deck looks, maybe a new railing or even new decking will save you the trouble of tearing it all down and rebuilding.

All of these options, of course, assume a deck whose structural integrity is sound. If the deck is simply too poorly built or too deteriorated to justify keeping it, then tear it down.

Like construction, demolition follows a logical, safe sequence. Take the deck down in steps, as illustrated on these pages. They follow a logical progression. Work carefully so you don't get hurt.

If you're going to replace an old structure with a new one, think about how much of the existing material you want to salvage and recycle. You may be able to reuse structural lumber, as well as other parts of the deck. But recycling is not without its consequences. You can pry up nailed lumber with a pry bar, but you're likely to split the wood beyond usefulness. Screwed-down boards can't be pried without ruining them, and removing the thousand or so screws in a deck will take a long time. Nailed framing connectors can be pried up, but the connectors will probably bend. Removing screws from framing connectors will leave the connectors intact, but may not be cost-efficient.

After considering all of that, you'll probably think it makes more sense to dismantle the deck with a reciprocating saw, as shown here. Joists and decking that have been cut can still be used in the new deck if they're in good condition and long enough. You can recycle boards for blocking, bracing, and building planters and seating.

Order a waste container and set it as close as possible to the site without ruining the lawn. Cut the pieces into lengths you—and a helper—can carry comfortably. Find out what your dumping fees will be—some municipalities charge more for pressure-treated lumber because they can't dispose of it by burning it.

If your old deck has a water feature or lighting of any kind, find the water supply and power lines. Turn the power and water off before you start. Wear gloves, safety glasses, and a dust mask. Old wood can release mold spores that can get into your lungs.

you'll need

TIME: Six to eight hours to tear down a 12x16' deck

SKILLS: Rough cutting, lifting, prying

TOOLS: Reciprocating saw, pry bar, hammer, circular saw

1 cut the railings

Cut railings into sections. Using a reciprocating saw, cut the bottom rails at the posts. Have someone hold the railing while you cut. Cut balusters across the decking if they are attached to the joists.

2 cut the decking

Snap chalk lines to indicate both sides of each joist, and with your circular saw set to the depth of the decking, cut the decking into sections. Remove stair treads by unscrewing or prying up the fasteners.

3 remove stair stringers
Holding your reciprocating saw so it will clear the joists, cut the tops of the stringers from the joists. Then, pry the stringer off the landing pad.

4 cut the joists
Cut the joists with a reciprocating saw, sawing where the blade won't hit the joist hangers. Don't force the cut; let the weight of the saw set the pace.

5 cut the posts
Using a blade long enough to cut in one pass, cut the posts under the beam. Have someone help support the beam so it won't fall away when you complete the cut. Cut the posts off at the bottom. Remove the anchor and saw off the bolt with a hack saw.

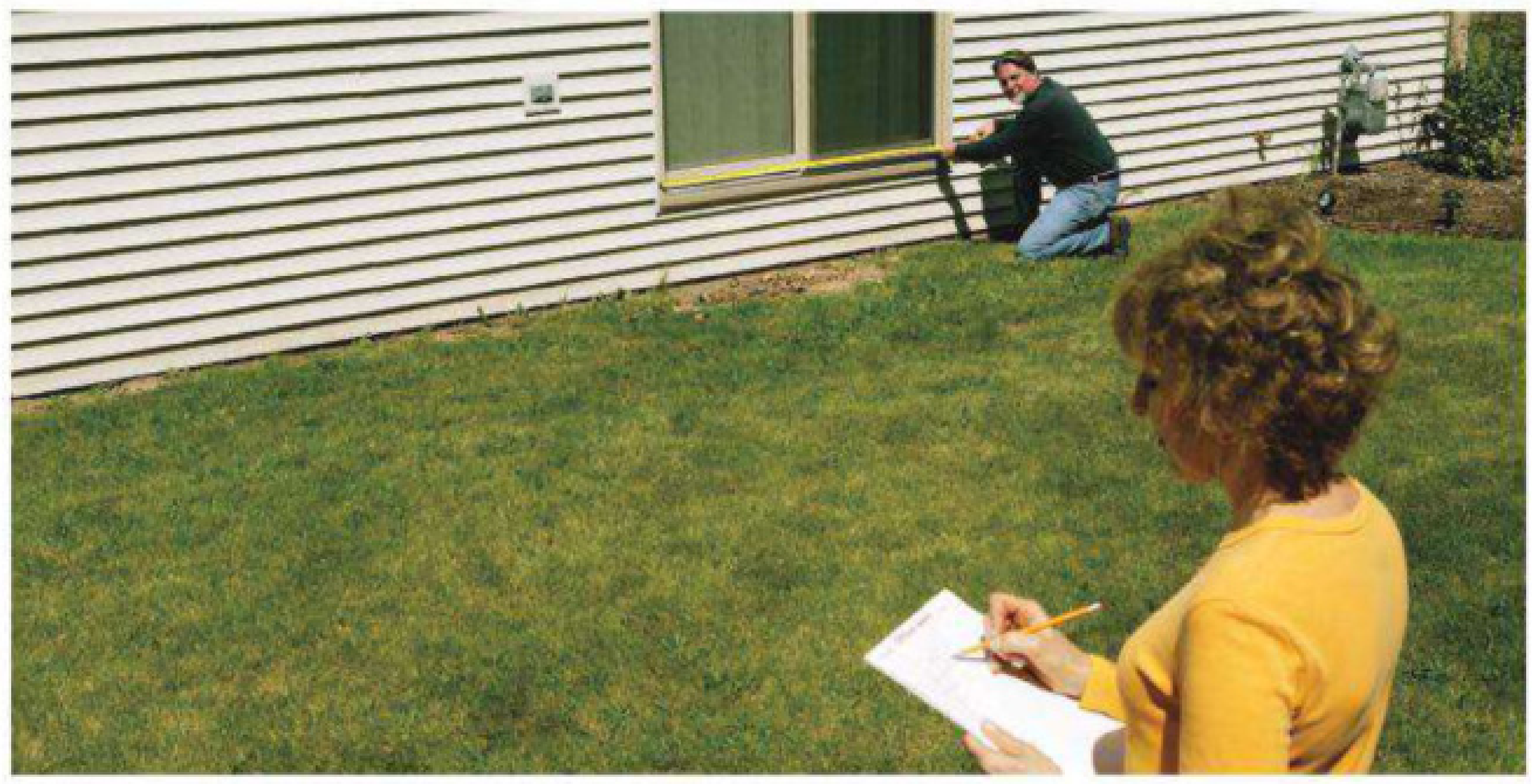
6 remove the ledger
Unscrew the fasteners that hold the ledger in place and pry the ledger off with a pry bar if necessary (it may come away of its own weight). Have someone help you hold it as it comes off so it won't fall and hurt you. Remove the flashing and caulk the fastener holes.

draw a plan

and choose a decking pattern

All you need to make accurate deck plans are a pencil, ruler, and graph paper. A dimensioned plan that's drawn to scale will help when you order materials and calculate costs, as well as keep your construction on schedule. You'll probably also need a plan to submit to the city's building department for approval.

Draw your deck to scale on graph paper (typically ¼" to the foot). You'll need at least a site plan, a plan view, and one or two elevations. You also may want to draw detailed plans for complex parts of the deck. Drawing plans can be tedious, but it's worth the effort to make the project go smoothly.



1 take measurements

Deck plans begin with measurements of your property. Take a 100' tape (and a pad and pencil) out to your yard and measure the distance from the house to the property lines, as well as the dimensions of the house, the location of windows and doors, electrical outlets, dryer vents, and water valves.

2 draw a site plan

A site plan is a drawing that shows your property boundaries, the house, and other major features. It also shows the distances between elements in your landscape that might affect the deck construction. A simple deck plan only needs to be a sketch that includes these measurements. More complicated deck plans will require a scaled drawing.

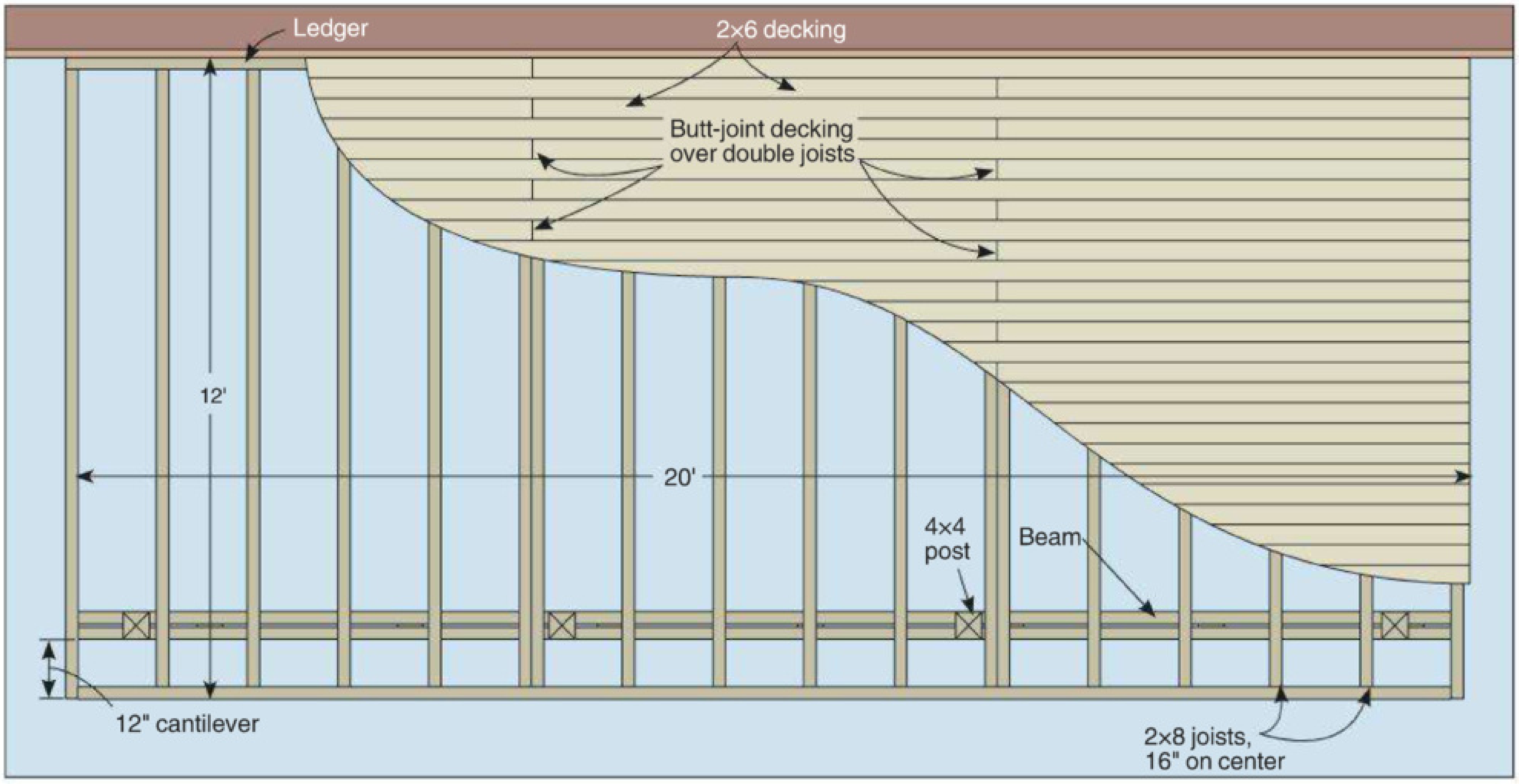
drafting toolbox

You can draw a deck plan quickly with these tools.

- A pad of graph paper (use a ¼" grid) and tracing paper
- Drafting tape (to hold the paper down)
- Two or three #3 pencils (the harder lead makes more precise lines than #2s)
- A good eraser
- A 12" ruler, circle templates, and perhaps an architect's scale

3 make detailed plans

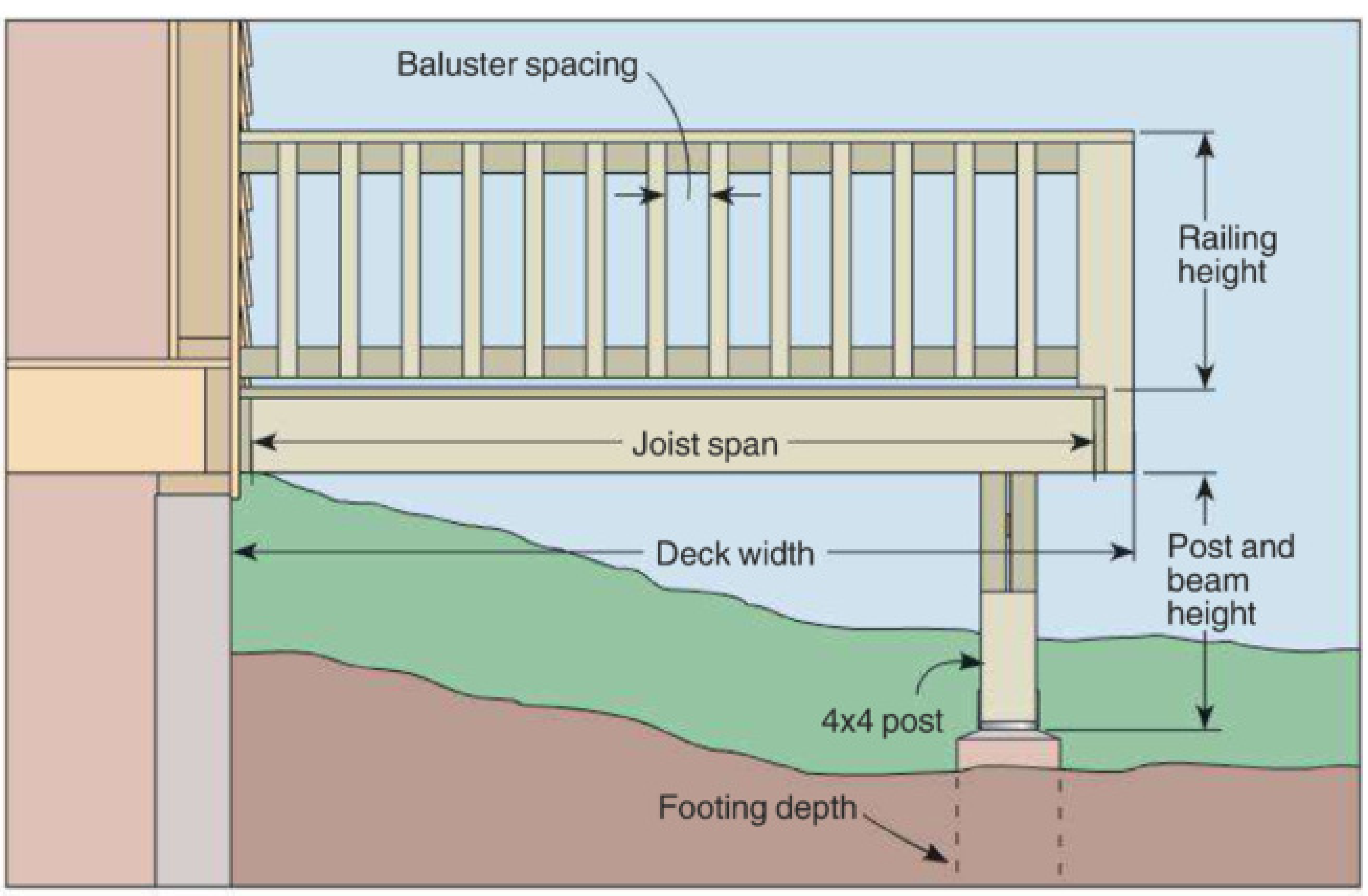
With detailed plans that show every framing member, you can count the pieces of lumber you need. You also can show obstacles such as dryer vents; plans will help you work around them. Detailed plans can also save you money. For example, because lumber is sold in even lengths, you can keep costs down by making deck dimensions correspond to those lengths. If your detailed plan specifies a 12½' ledger and you can reduce the size to 12', you'll avoid cutting a 14' board and wasting a lot of lumber.



complete a plan (overhead) view

A plan view shows the deck as viewed from above. It illustrates the exact location of piers, beams, and joists. It also may include a partial view of the decking, railing, and any other structures attached to the deck. The drawing *above* combines a view of the framing with the decking installed above the beams and posts. For more complex decks, these two views can be drawn separately. Draw the foundation and framing plan first, then use tracing paper to produce the finished view.

Include all dimensions—overall length and width, joist and beam spacing, and material sizes.



elements of an elevation (side or front) view

A front or side elevation illustrates the vertical arrangement of deck elements—footings, posts, railings, and any built-in planters, benches, or overhead structures. Each elevation should show the depth of the footings and spans, plus post and railing dimensions. Railing dimensions should indicate the height of the railing as well as baluster spacing.

computer-assisted planning

Design your deck with computer-assisted drafting (CAD) software. Most CAD versions will produce a plan view, an elevation, and a perspective. Many also will produce a list of lumber and other materials.

If you're not confident of your computer skills, ask your home center staff for help. Many retail outlets offer computer planning programs and have staff members who know how to use them. Bring in a rough drawing with dimensions (height, width, and length) and have the computer draw your plans.

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decking patterns

Decking usually is installed in long strips that run parallel to the face of the house and perpendicular to joists. You can add visual interest by installing decking diagonally, or by making patterns that display creative flair. Patterned decking is one way to break up the expanse of a large deck.

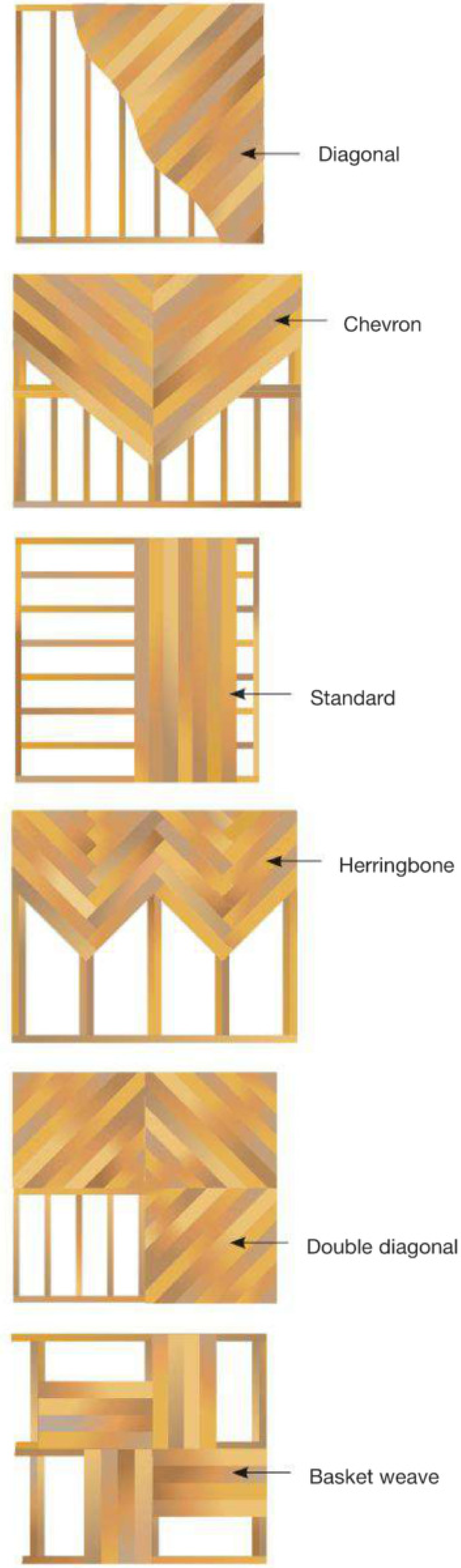
Patterns should be planned to avoid partial grids or incomplete patterns at the deck's perimeter. Some patterns require additional joists or structural framing to provide enough nailing surfaces for the ends of the decking boards. You can create interesting patterns only by drawing plans that show the proper framing. For illustrations of some popular patterns, see *next page*.

- Standard patterns have the decking running perpendicular to the joists and parallel to the longest face of the house. This is the least expensive and least complicated way to install decking.
- Diagonal decking usually is installed at a 45° angle to the joists. Generally, altering the joist pattern or adding joists is not necessary. But angled cuts at the ends of the decking waste wood and require 5 to 10 percent more deck boards than a standard pattern.
- Parquet or grid patterns are modular squares featuring decking boards that change direction. A common practice is to have the boards of each square run perpendicular to the adjacent squares. A variation is a geometric pattern of modular grids featuring diagonal decking.

***Below*:** For greater visual impact, install your decking in an interesting pattern. A basket-weave pattern dresses up this platform deck.

***Right*:** Narrow 2×4 decking intersects with a cross of 2×8s, which breaks up the surface into quadrants. The white paint of the railing and furniture enhances the dark-green stain applied to the floor.

***Below right*:** The bold pattern of double diagonals (also called nested squares) adds drama to decking. Trimmed edges give the adjoining steps a finished look.



Decking patterns can be important design elements. Each pattern must have a particular joist layout so that the ends of the decking boards are adequately supported.

sound ways to install a ledger

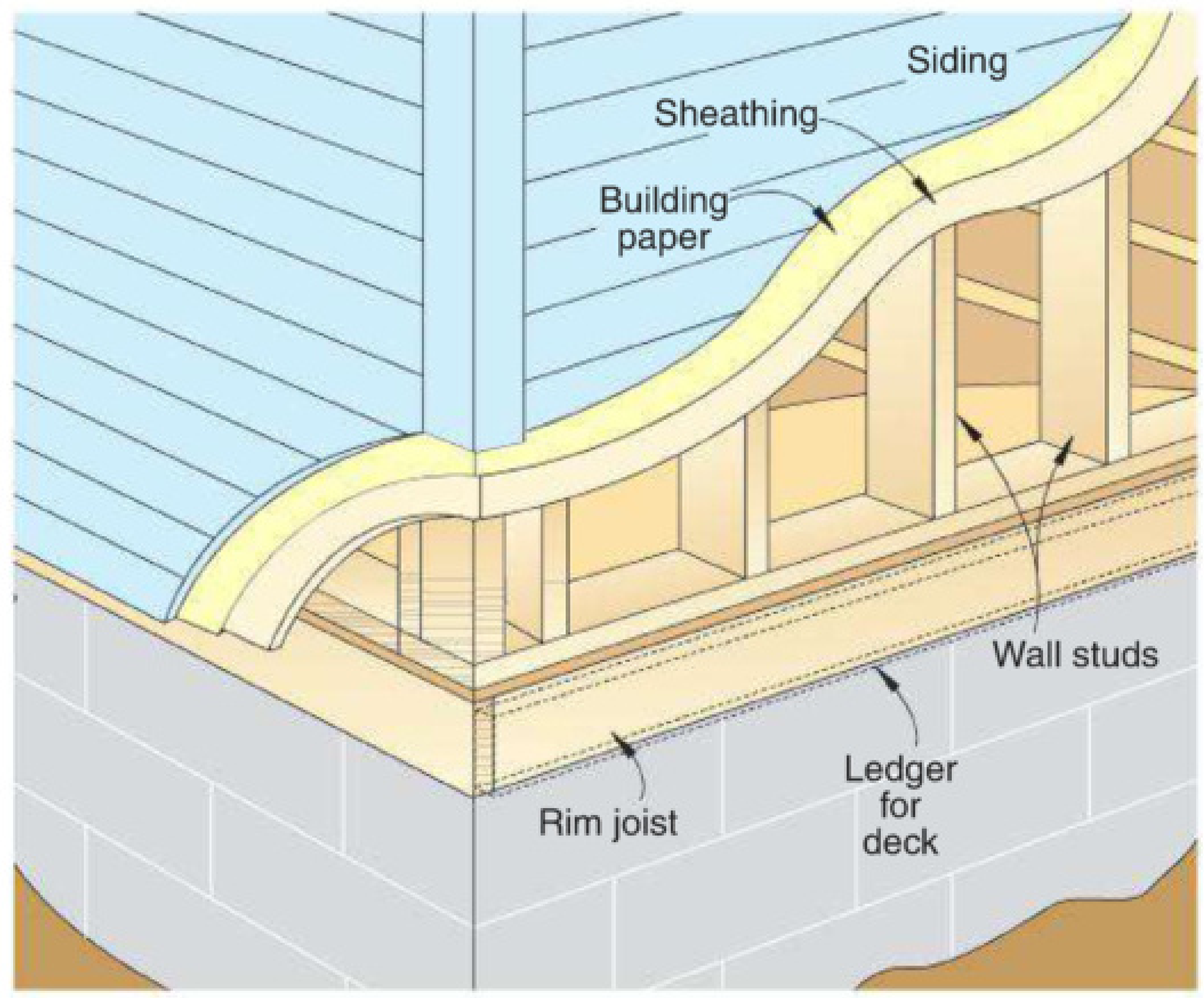
If your deck will be attached to your house, installing a ledger is the first step in construction. (Freestanding decks are supported on all sides by posts and footings.) We'll show you three methods.

A ledger is a header that's attached to the house. A ledger transfers the weight of the deck to the framing and foundation of the house. That's why the fasteners on a frame house (usually lag screws, but sometimes bolts) must penetrate the sheathing, and anchor firmly into the rim joist (sometimes called band joist) or studs. On brick, block, or concrete construction, use masonry anchors or studs in holes drilled into the masonry.

Installing a ledger usually requires removing the siding so the ledger can rest against a flat surface. Cut metal siding with a circular saw and metal-cutting blade. Cut vinyl and wood siding with a circular saw and a carbide-tipped blade.

Be careful when cutting your ledger. Use the same size stock as the joists. Cut the ledger 3" shorter than the width of the framing to allow a 1½" space at each end of the ledger for attaching the rim joist.

When attaching a ledger, consider where moisture will run. You don't want it getting behind the siding.



locate the ledger on your house

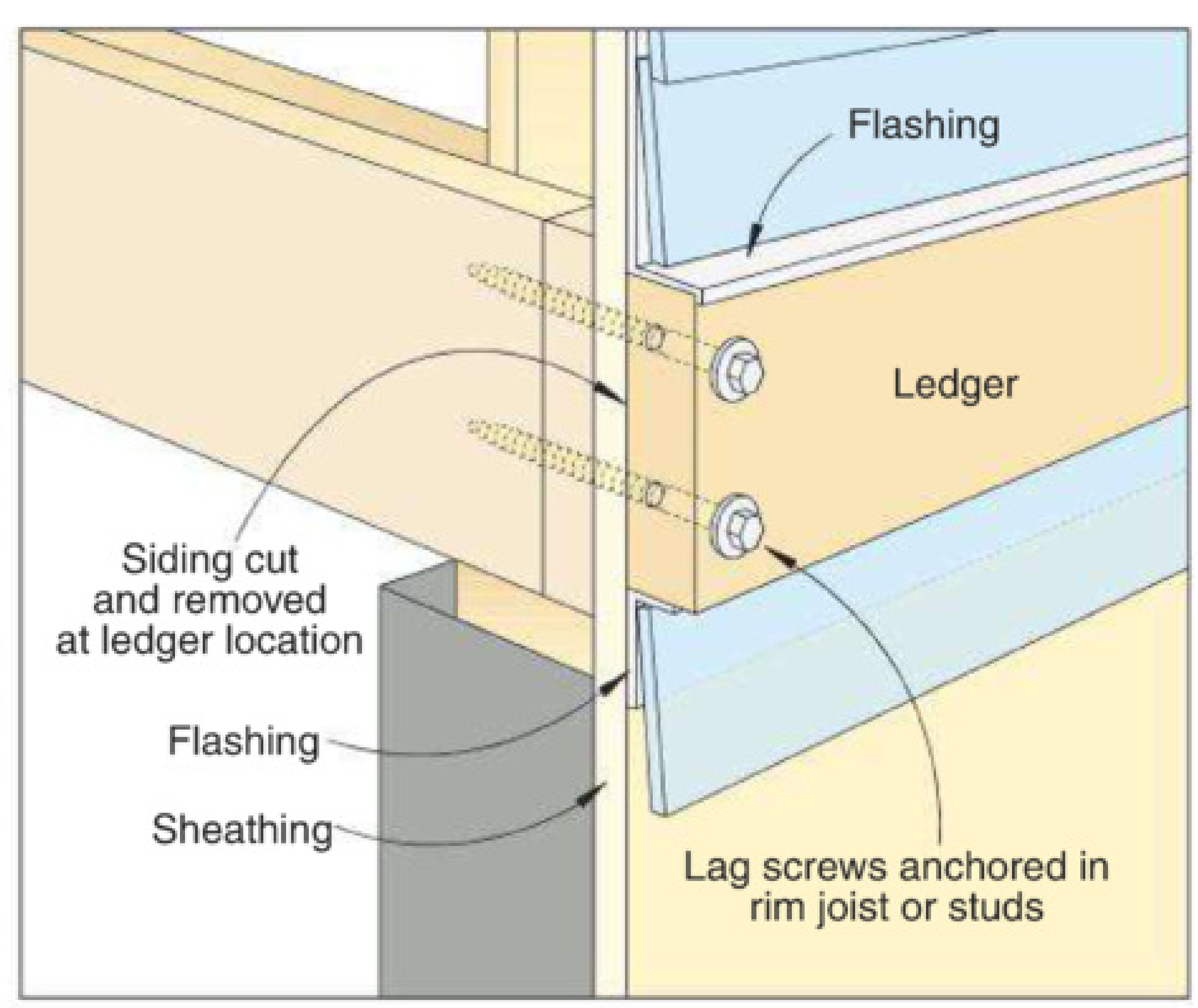
The framing and foundation of your house provide several secure points for anchoring the ledger. The actual placement of the ledger will depend on your deck design and the location of the door that provides access to it. Most decks are first-floor structures and anchor into the rim joist. Other deck designs will require that you drive the fasteners into the studs or into the masonry foundation.

you'll need

TIME: Four to five hours for a 16' ledger (helper also required)
SKILLS: Cutting, drilling, driving fasteners
TOOLS: Hammer, chalk line, tape measure, level, drill, layout square, circular saw, chisel, caulk and gun, socket wrench, snips

install on siding

Wherever you put your deck ledger—if your house is sided with lapped wood, metal, or vinyl siding—a section of the siding has to come off. Installing the ledger on top of the siding will crush the siding, leaving the ledger in incomplete contact with the surface behind it. That could cause the ledger to fail. Ledgers also need flashing (preformed or flat metal stock that you bend to shape), which slides under the siding and extends over the ledger to keep water from collecting behind it.



Install a ledger on siding

1 mark the top edge of the ledger
Decking should sit from 1 to 3" below the bottom of the threshold. Add this space to the thickness of the decking and make a mark for the top of the ledger. For 2× decking installed 3" below the door, your mark should fall 4½" below the bottom of the threshold.

2 mark the ledger length
Make marks on the side of your house that indicate the ends of the ledger. To allow space for the end joist, make a mark 1½" beyond each end of the ledger. With a level, draw vertical lines indicating the length of siding you'll remove. Use a water level to transfer the top edge of the ledger (the Step 1 mark) onto the house.

3 check for level
With a chalkline, snap a line indicating the top edge of the ledger. From this line, measure down the width of the ledger, and snap another line to indicate its bottom edge. With a short ledger, you could combine a level with a straightedge to make these marks. Double-check your lines for accuracy before you go to the next step.

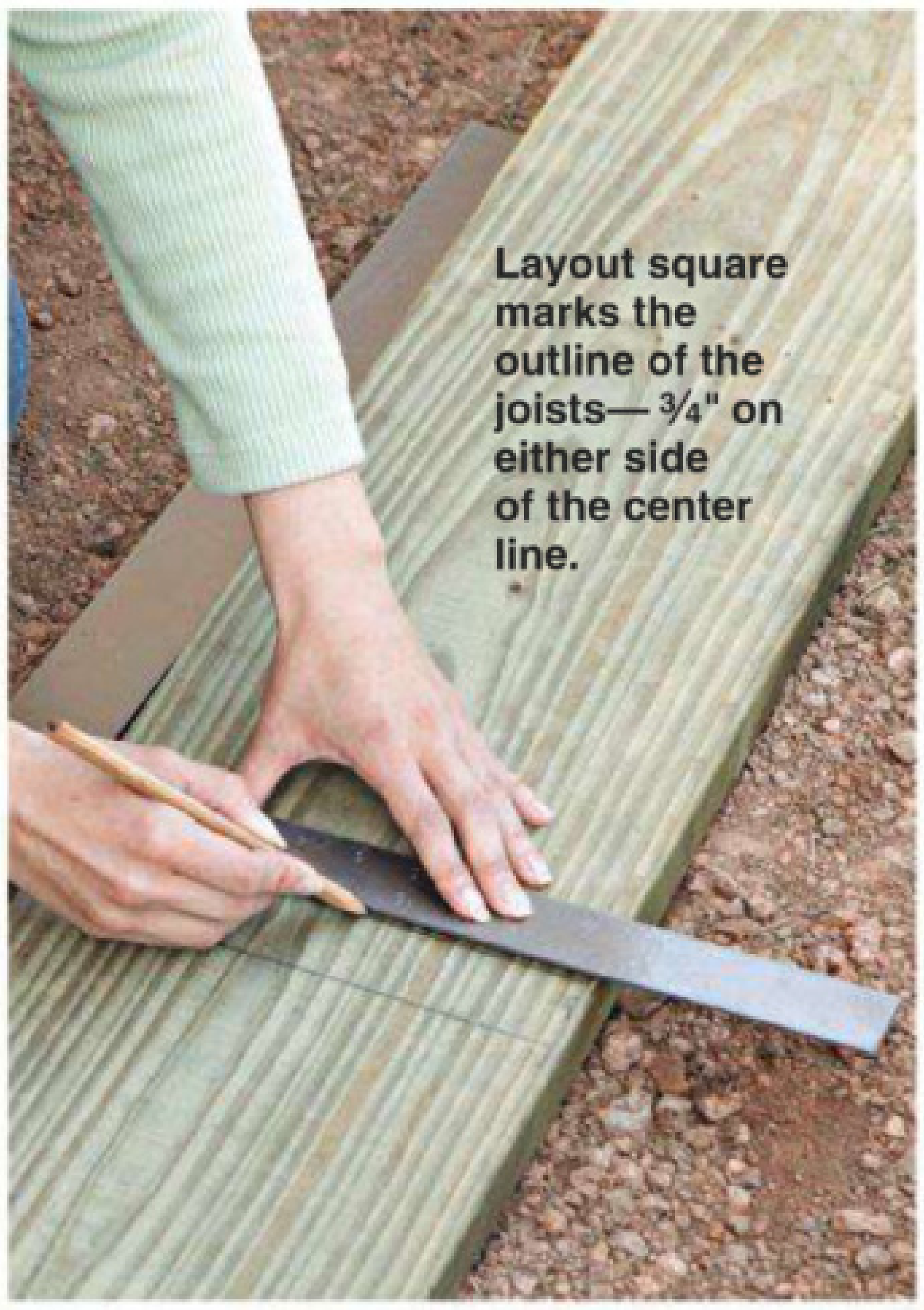
lag bolts or screws?

You can bolt the ledger to the rim joist of your house, but you need to drill through the wall and into the basement or crawl space beneath to thread on a nut. Lag screws are easier to install and make a strong connection. Use carriage bolts for bolted joints when the head will be visible, hexhead machine bolts when looks don't matter.

caution

LEDGERS AND LADDERS

Installing a ledger for a first-floor deck won't pose a serious safety problem. But for a second-story deck, you will have to work on a ladder. Ledgers can be heavy and throw you off balance. Use braces (*page 35*) or get some help. Drive stakes against the bottom of the ladder legs to keep the ladder from slipping on a slope.



4 mark Joist locations

Mark the joist spacing (usually 12" or 16" on center) on the ledger, allowing for the rim joists to be attached to the ends of the ledger. For 16" centers, make the mark for the edge of the first interior joist 15¼" on center from the end of the ledger. Then transfer the marks to the ledger face.

5 cut siding and flash

Set your circular saw depth to the thickness of the siding and cut along the ledger outline. Cut flashing to the length of the cutout and slide it at least 1" under the siding above the cutout. Pressure will hold it in place. Overlap flashing joints by 3" and notch it for the doorway.

6 level the ledger

Hoist the ledger into place, and center it into the cutout, leaving 1½" on either side for the rim joists. Tack one end of the ledger to the sheathing with one 10d nail or deck screw. Level the ledger and tack the other end. Don't fasten it just yet.

finishing the cuts

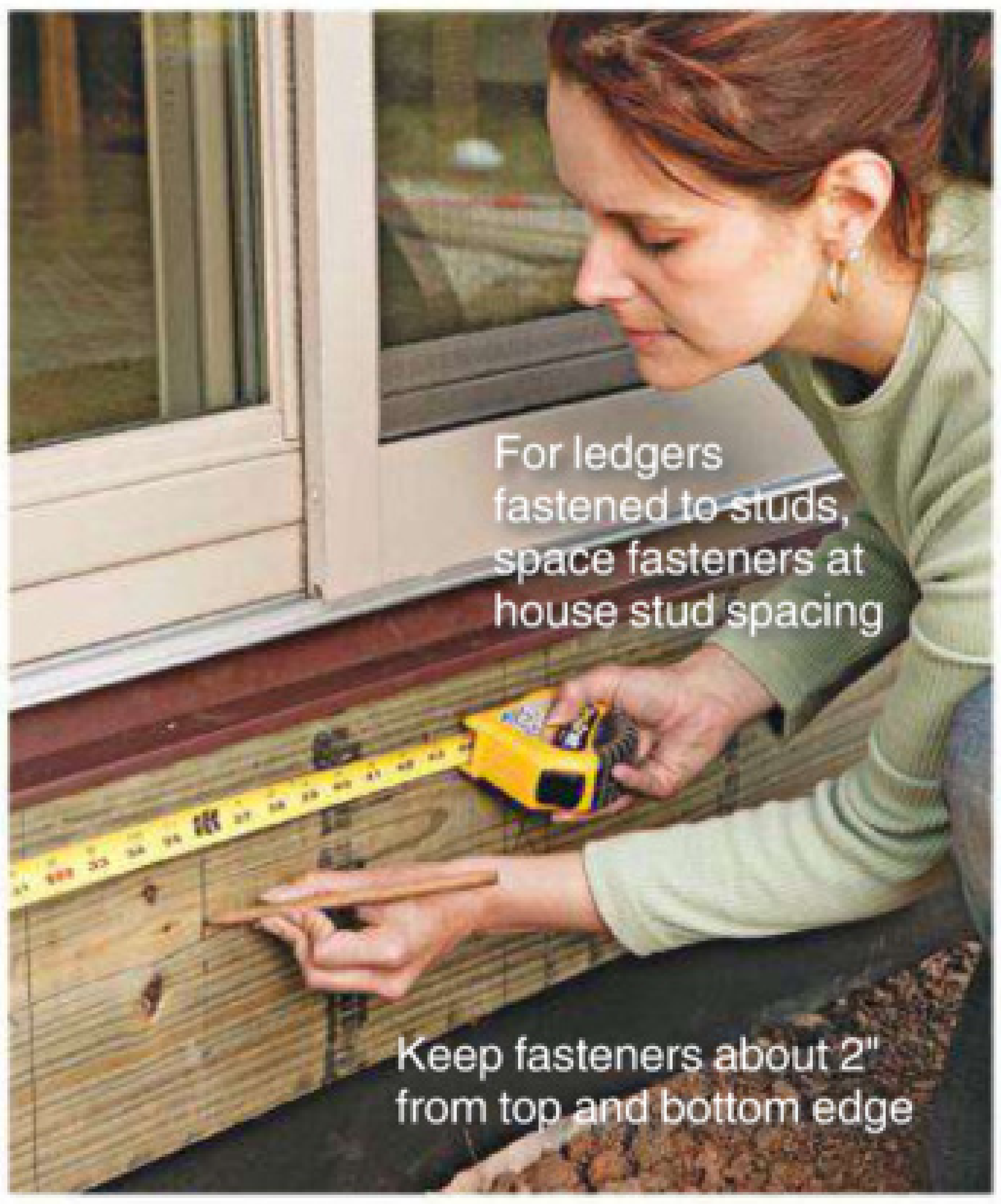
A circular saw can't cut into the corners on the siding. Chisel out the corners on wood siding with a sharp wood chisel. Cut metal and vinyl siding corners with metal snips.

use braces when working alone

If you're working by yourself, putting the ledger into its exact position and getting it to stay there can be almost impossible unless you use braces.

Cut 2x4 braces a little longer than the height of the ledger, and notch one end, if you want. Prop the braces at an angle below both ends of the ledger cutout. Then lift the ledger and set it onto the supportive braces—one at a time, if necessary.

Keeping the face of the ledger flat against the sheathing, slide the ledger so it's centered in the opening, leaving 1½" on each side for the joists. Adjust the brace on one end with one hand (don't let go of the ledger), until the top of the ledger rests on the top of the cutout. Tack this end to the sheathing with a 10d nail or deck screw. Pivot the ledger on this fastener, level the board by adjusting the brace at the other end of the ledger, and tack that end of the ledger.

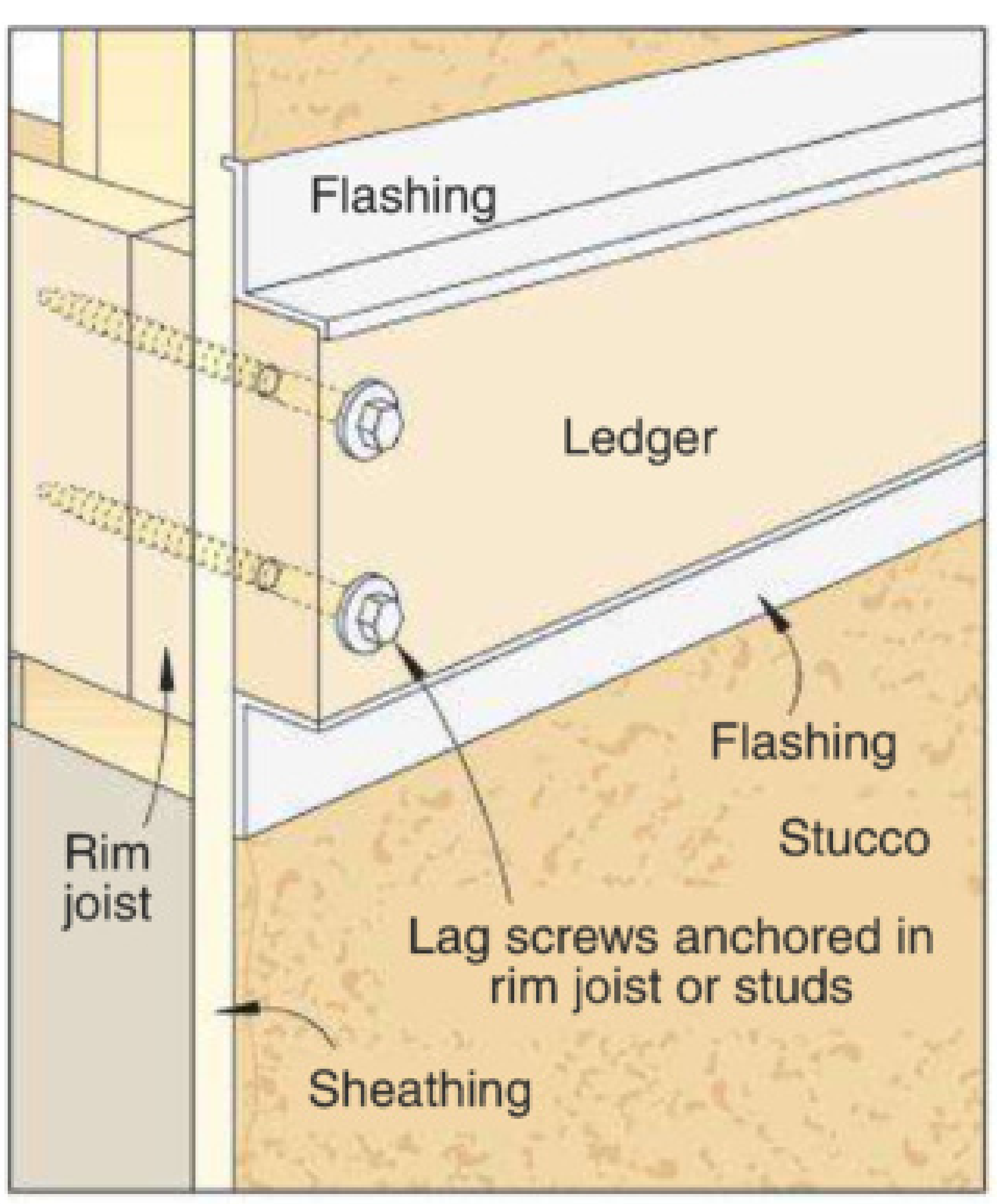


7 mark for fasteners
Beginning about 2" from one end, mark fastener locations at 18" to 24" intervals. Mark both the top and bottom edges of the ledger, using a layout square. Don't worry if a fastener is at a deck joist location.

8 drill pilot holes
Counterbore lag-screw locations that fall on deck joist markings, then drill pilot holes for the lag screws through the ledger and about ¾" into the rim joist or studs. Drive washered lag screws with a socket wrench.

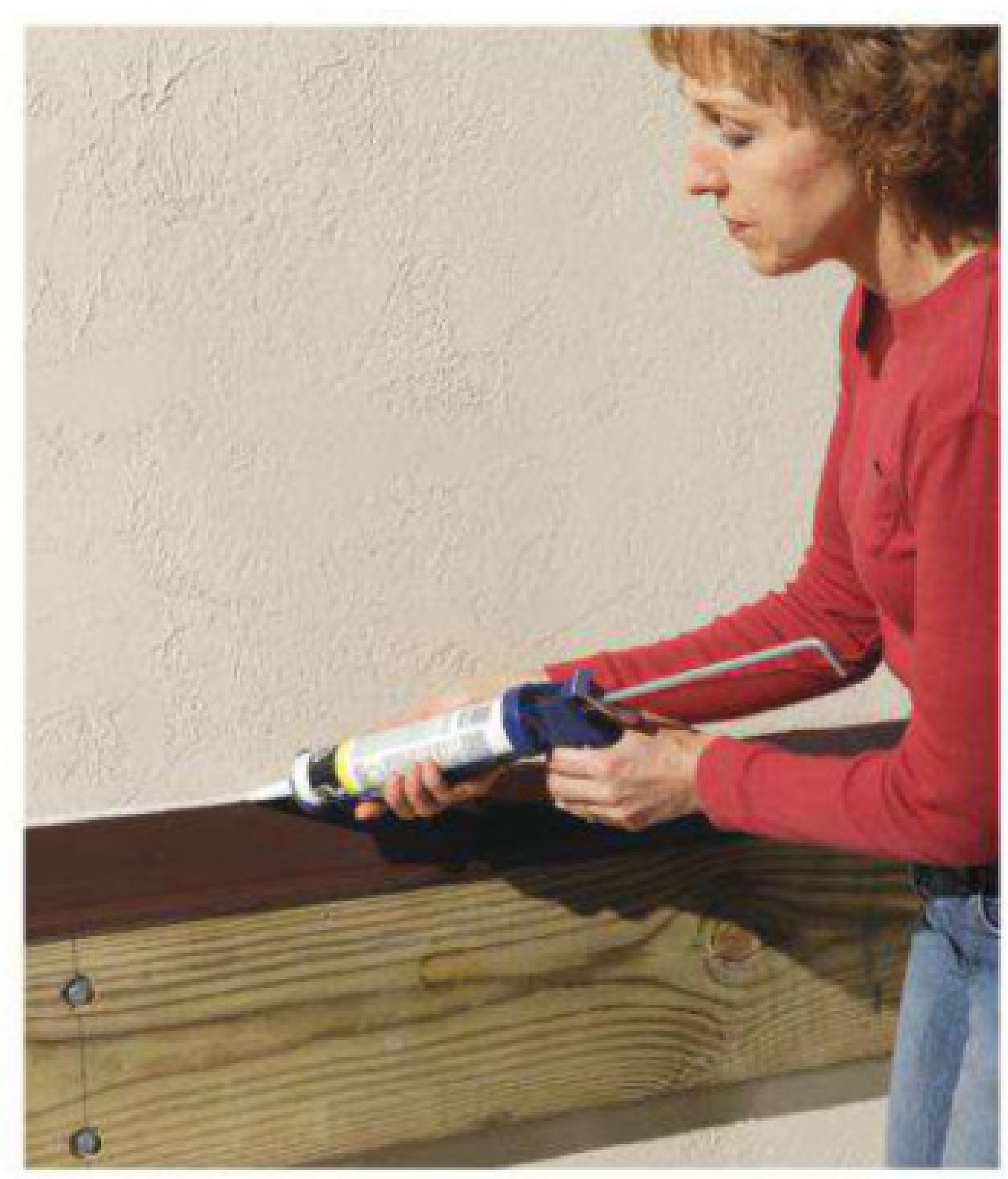
9 seal the edges
The next day, tighten the screws again, stopping when they won't turn without force. Caulk the counterbores, the top of the flashing, and the ledger bottom with exterior silicone caulk.

install on stucco



Stucco acts essentially as a layer of siding (one that consists of concrete), so fastening a ledger to stucco involves the same techniques as for wood or vinyl siding. Stucco behind the ledger should be removed to the sheathing, but you cut just a groove in the stucco, as shown *above*.

1 cut a groove
Hang the ledger on the stucco. Mark the wall about 3" above the ledger and tack a guide onto the ledger so the saw blade will cut on the mark. Using a circular saw with a masonry blade, cut a ¼"-deep kerf from one end of the ledger to the other.



2 seal the flashing
Blow the dust out of the kerf with a compressed air can, then push the lip of the flashing into the kerf until it's seated firmly. Seal the top of the flashing with high-quality silicone caulk.

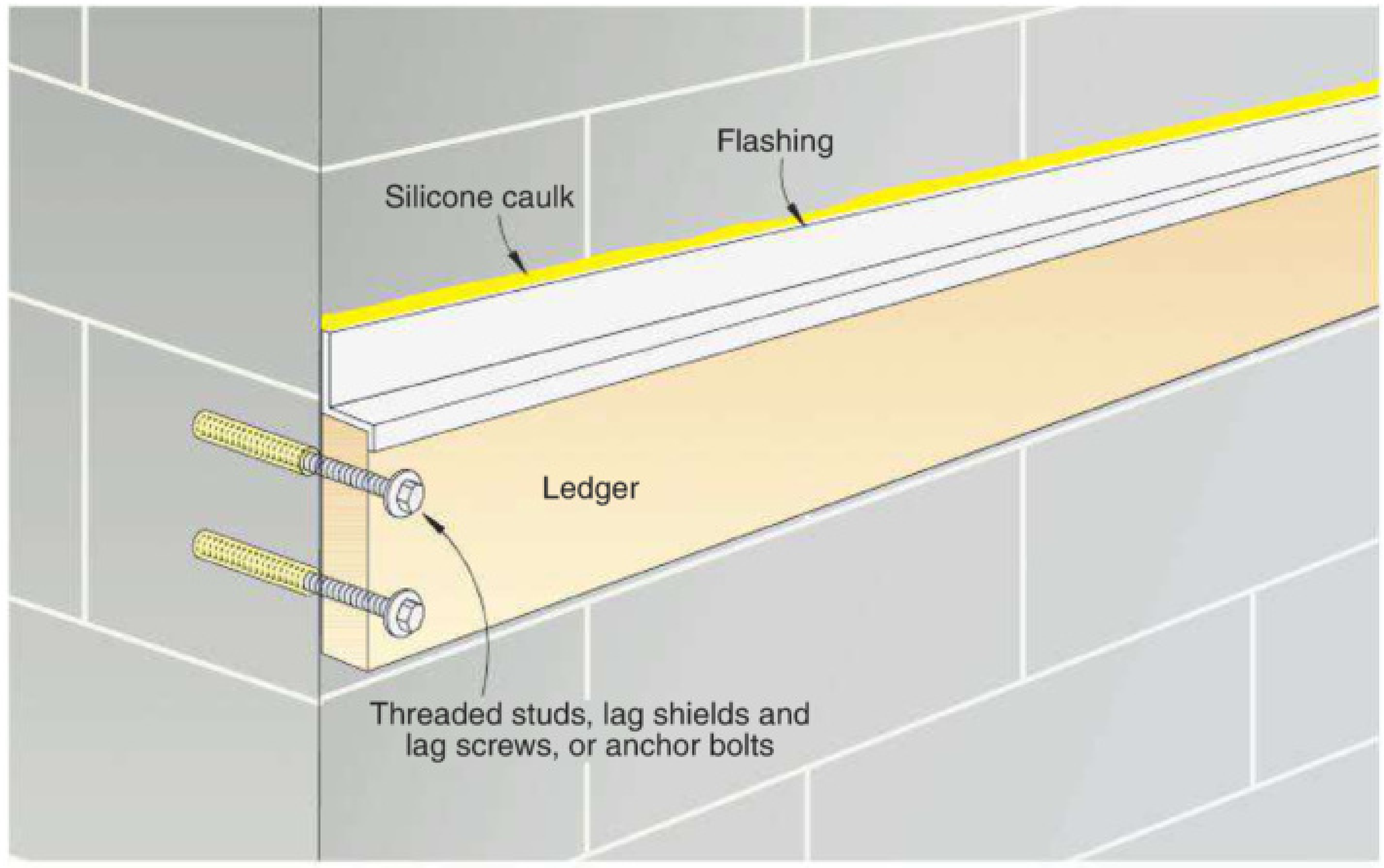
install on masonry

A ledger on a brick, block, or poured concrete wall has to be anchored to the masonry material because there's no framing to support a ledger. It must be securely fastened so it can withstand the downward pressure of the deck.

The beam and perimeter posts bear about half of the load of the deck away from the house. The ledger must support the rest of the weight. Because zoning regulations vary, get your plans approved and your progress inspected by a building inspector.

Through-bolting provides the most secure fastening. The block is sandwiched between the ledger outside and dimensional lumber inside. Threaded bolts pass through the entire block, and are locked down with nuts.

In some applications, you can secure the ledger to the masonry with epoxied threaded studs (as shown *next page*), with lag shields and lag screws, or with masonry bolts in poured concrete. If you epoxy threaded studs into the masonry, use epoxy made for that purpose. Lag shields are made for use with lag screws. Don't use any other masonry anchor. Although most of the stress put on ledger anchors will be down (not out), inadequate anchors could allow the ledger the pull away from the wall.

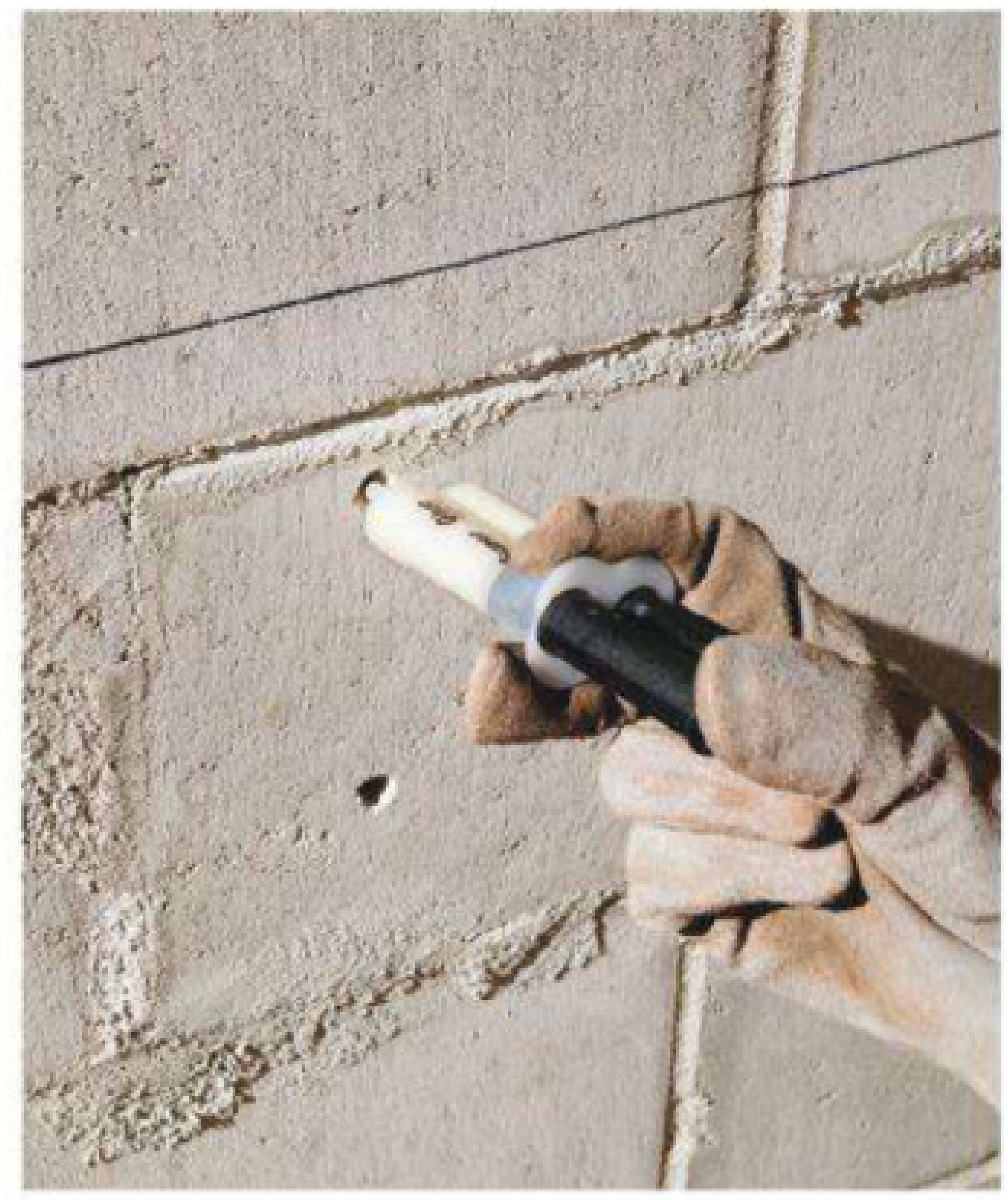


ledger on masonry

There are two kinds of threaded studs for masonry: continuous-threaded lengths (up to 4') called all-thread and short pre-cut lengths. The building inspector will want to approve the fasteners before instalation. Cutting all-thread to length often results in damaged or distorted threads and uneven lengths. Precut studs are easier to use. Use studs with a diameter of at least 3⁄8"; 1⁄2" studs are better. When fastening a ledger to concrete block, be sure the fasteners enter the webs (the solid part) of the block, not the cores (the voids).

1 outline the ledger
Mark the wall so the top edge of the ledger will be at the correct point below the threshold. For short ledgers, extend the mark with a level. Use a water level over long spans (see *page 50* for details). Mark the length of the ledger, and snap a chalk line between the marks.

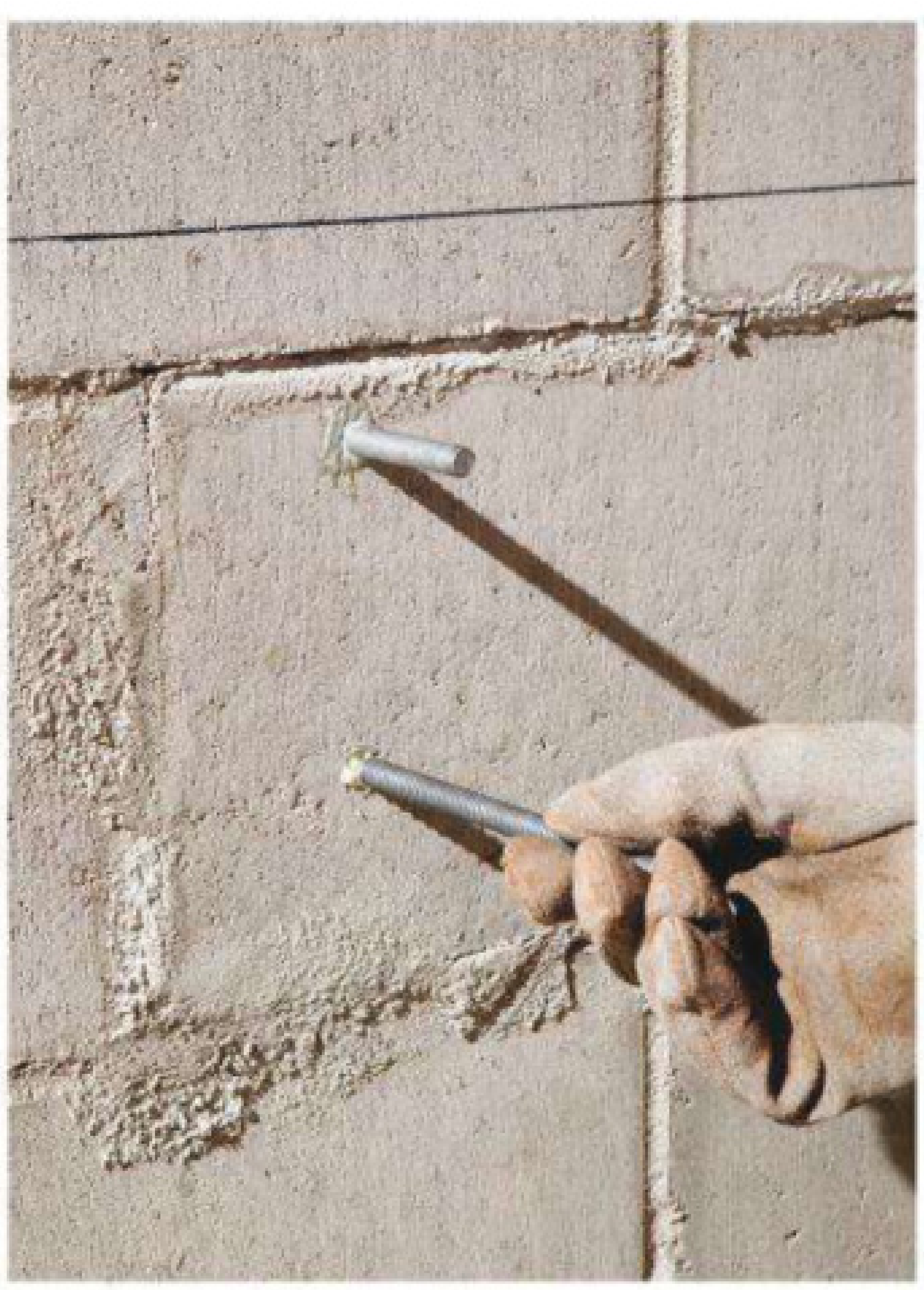
2 tack the ledger into place
Mark the ledger for both joist and fastener locations. Then tack the ledger to the masonry with concrete screws, making sure the ledger is level with your chalk line. Brace the ledger against the wall, if necessary.

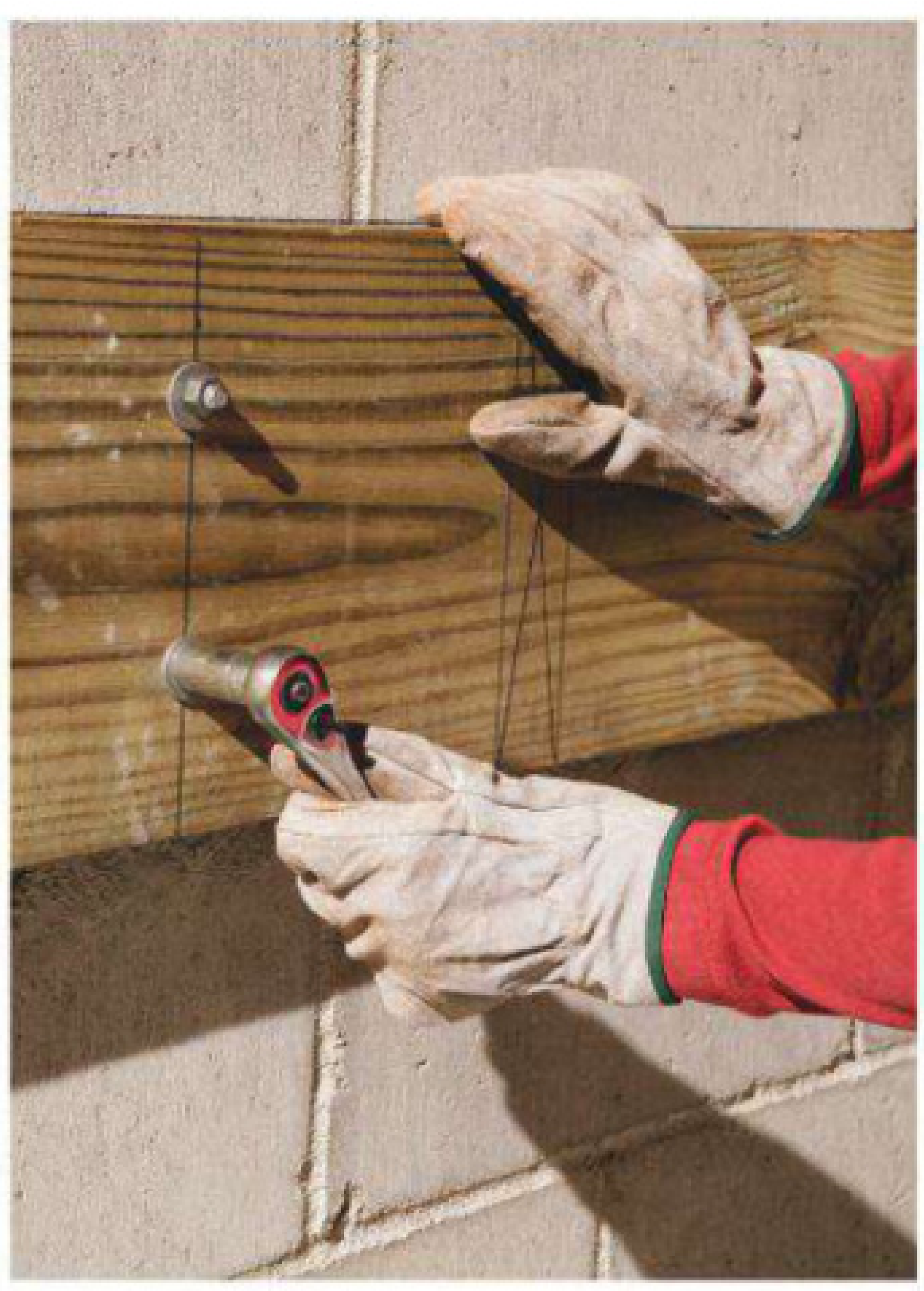


3 drill marker holes
With masking tape, mark a twist drill just short of 1½", and drill marker holes at your fastener locations. Don't push past the mark on the drill bit or you'll ruin the tip of the twist drill.

4 drill anchor holes
Insert a masonry bit of the same size into a hammer drill or rotary hammer, and drill the fastener holes 3" into the masonry. The hammer drill will push through the undrilled wood at the bottom of the marker hole.

5 epoxy the holes
Remove the ledger. Blow or vacuum dust from the hole. Prepare the epoxy syringe, making sure both its parts will mix evenly. Insert the syringe into the hole, and push out the epoxy into the masonry.





6 insert studs
Insert a threaded stud into each hole right after you've epoxied it. If you wait until all the holes are epoxied, the glue may set up, so you might not be able to get the studs into the first holes. With a layout square, square the studs (horizontal and vertical planes) to the wall.

7 install washers and nuts
Let the two-part epoxy cure overnight and replace the ledger over the studs. Slide washers over the studs, and tighten the nuts with a socket wrench. Don't overtighten—stop when the washer begins to dent the wood. Keep your level handy to check the accuracy of your work.

using lag screws

To use lag screws, you'll need lag shields. Tack or brace the ledger in place, and drill marker holes, then remove the ledger. Mark the wall with a small masonry bit, then use a larger masonry bit to drill holes for the lag shields. Next, tap the lag shields flush with the wall, then hang the ledger board with the lag screws.

lay out the deck

prepare the site

Most deck sites require some preparation so the ground under the deck will drain properly and won't become filled with weeds. You can prepare the site after laying out the batter boards, but removing the sod first will make the layout easier.

Then, eliminate any drainage problems, especially around the foundation. Beginning at the foundation and out to about 4 feet, slope the soil away from the house. If a downspout empties onto the deck site, reroute it. Divert water that will flow off the deck with a drainage ditch around the perimeter.

1 stake the corners

With a 3-pound drilling hammer, drive a temporary stake (or attach a batter board) near the house about where the corner of the deck will be (or just outside the corner). Using your scaled plan, measure and stake the other three corners. You don't need to be exact; you'll fine-tune the outline later.

2 run lines

Run mason's lines between the stakes a couple of inches above the ground. Measure the diagonals and adjust the stakes until the diagonals are equal. Tighten the lines and spray-paint or chalk the outline on the grass.

3 remove the sod and soil

Remove the lines and slice the sod into strips with a spade. Dislodge the roots with a spade and roll up the sod. Leave the stakes in place. Excavate the site to a 2" depth.

you'll need

TIME: About one hour to run lines; more to remove sod and lay fabric
SKILLS: Measuring, digging
TOOLS: Spade, rake, hammer, 3-pound drilling hammer, mason's line

Lay gravel before or after digging postholes.

4 lay fabric and gravel

Lay landscape fabric (it blocks grass and weeds) into the excavation from edge to edge, overlapping the seams by 6" to 12". Pour in crushed stone and rake it level with a garden rake.

get it square

Laying out a deck site—marking the perimeter of the deck with mason's lines and locating the footings—isn't hard work, but it does require some precision. It doesn't have to be perfect because you still can make minor adjustments when you set the posts. But the success of your project depends on aligning the centers of the footings. Although laying out the site won't wear you out, you can do it much more quickly and accurately with someone to help pull lines tight, hold the loose end of the measuring tape, adjust lines, and double check the layout for errors.

you'll need

TIME: About six hours for a 12×16' deck

SKILLS: Measuring, leveling, making simple calculations

TOOLS: Tape measure, cordless drill, 3-pound drilling hammer, plumb bob, mason's line, line level, wooden stakes

You'll need a pair of batter boards (*page 41*) at each corner. If you can't drive them close to the house, substitute a stake or 1× board tacked to the siding. Mason's lines tied to batter boards allow you to square the corners and make straight lines for centering the line footings for all the posts.

The illustration *below* shows a typical site layout and its relationship to the finished deck. All mason's lines run through the centers of the footings. The next two pages illustrate preparation and layout steps for a freestanding deck.

If you've already fastened a ledger to the house for an attached deck, start with the steps in the box on the bottom of *page 42*, then follow the remaining steps to complete your layout.

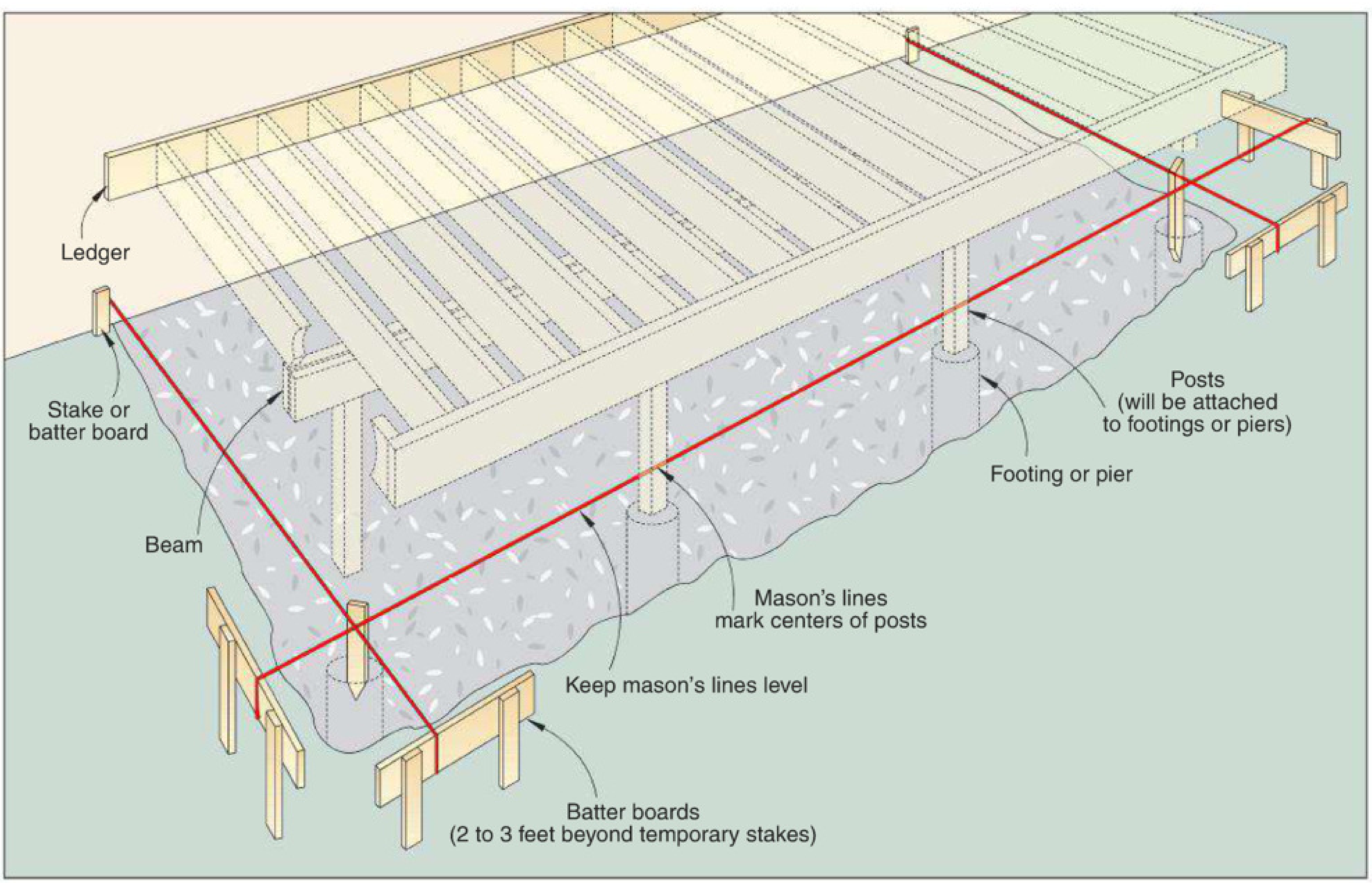
caution

EDGES OR CENTERS?

You can lay out your deck site with the mason's lines set to mark either the edges of the posts or their centers. If the lines mark the post edges, you'll have to move them at some time by half the thickness of the post. This method is effective if you don't get the two mixed up. If one line marks the centers and another the edges of the posts, your whole layout will be off.

After laying out the deck, set up a work site close by, but out of the way.

Caution: Before you dig postholes, have your utilities provider survey the area to mark underground lines.

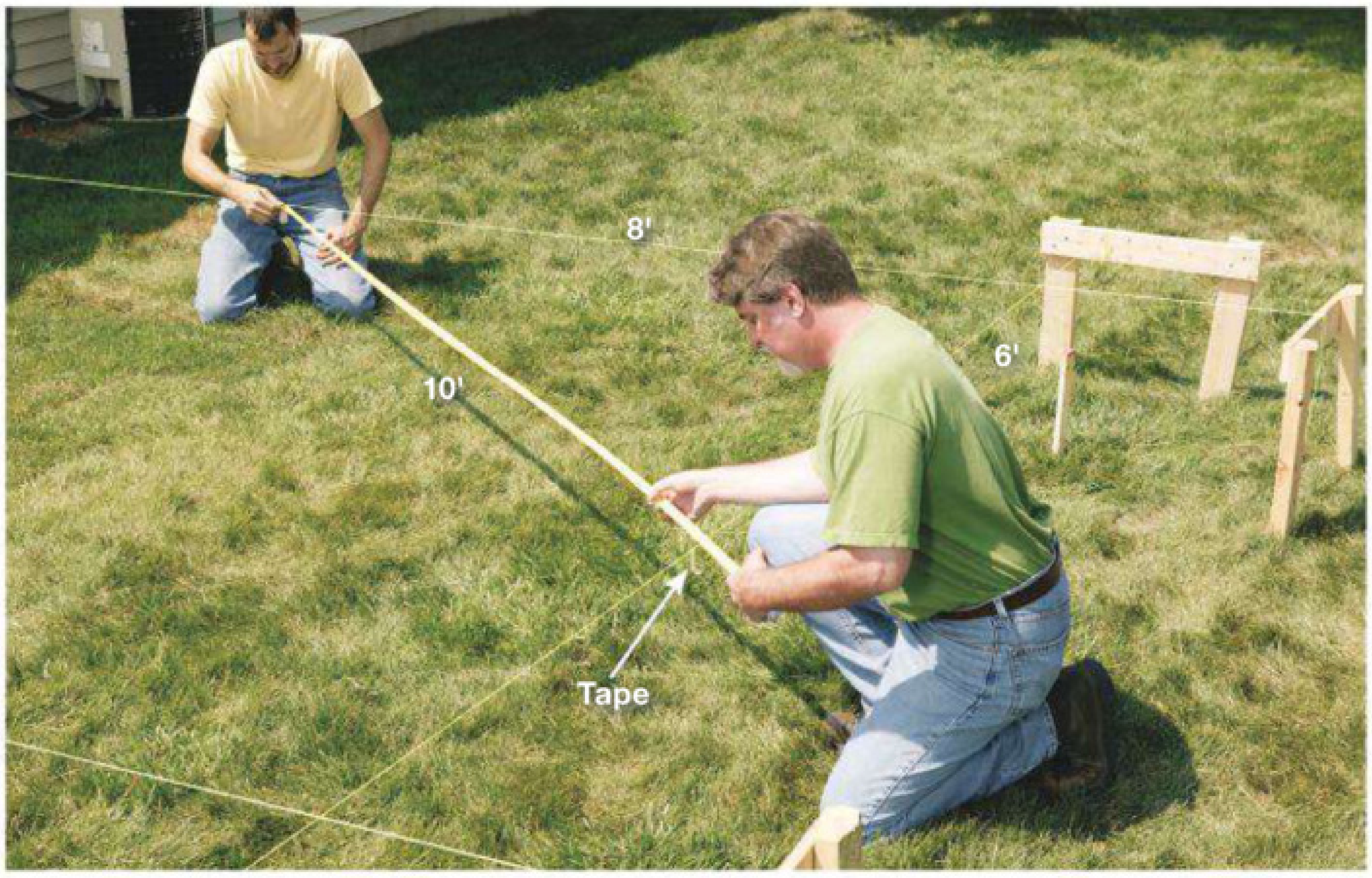


1 build batter boards

Make batter boards from 2' to 3' pointed 2×4 legs and an 18" to 36" 1×4 crosspiece. You might need batter boards with longer legs on a sloped site. Many lumberyards and home centers sell pointed stakes, or you can cut points on the stakes yourself. Cut the crosspiece to length and attach it to the stakes with 1½" screws. Place the batter boards at right angles to each other and 2' to 3' beyond your temporary corner stakes. If you use a stake at the house, center it in line with the center of your corner post. Drive the stakes deep enough to support tightly stretched lines. The cross-pieces should be up about 18" to 24" above grade.

2 string mason's lines

Stringing and adjusting mason's lines is easier with two people. Mark the siding for the edge of the decking, then for the center of the corner post. Usually, the post is placed inside the decking line a distance equal to the amount of overhang plus the thickness of the end joist plus one-half the thickness of the post. Tie a line to the crosspiece (or stake) at this point and to the crosspiece of the corner batter board. Keep it roughly square to the house. Do the same on the opposite side of the deck. Next, tie a mason's line parallel to the house and lined up with the center of the footings. Pull the lines tight, and level them by driving in the batter boards. Make sure the lines touch where they intersect.



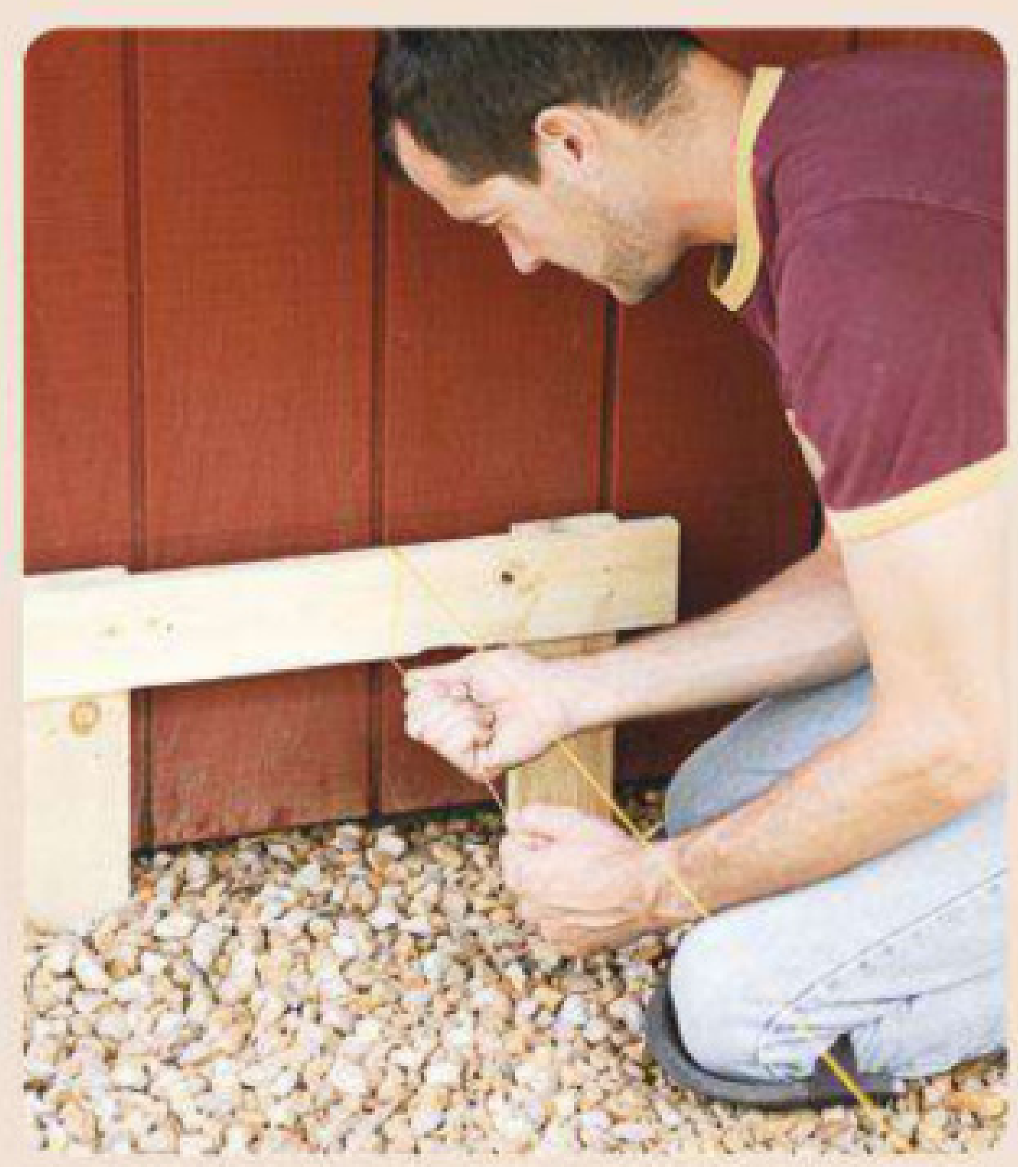
3 square the layout
To square the layout, use any even multiple of a 3-4-5 triangle. The larger the numbers, the greater the accuracy. In this case, measure 6' along one line and mark the spot with a piece of tape. Measure 8' along the perpendicular line or on the siding and mark it also. Measure the distance between the two marks. If it is exactly 10', the lines are square. If not, adjust one line. Square each corner with the same method.

4 mark the crosspiece
Once you've squared the layout, mark the position of the line on each crosspiece. If the lines get bumped or when you need to take them down and restring them, you can reset them to the marks to maintain the layout.

5 mark footings
To mark the center of a corner footing, hold a plumb line barely touching the intersection of the lines. Drive a stake or landscape spike into the ground to mark the spot below the plumb bob. If your design includes line posts between the corners, measure along the line and use a plumb bob to mark the center of the footings. Mark an X across each stake or spike with chalk or spray paint.

laying out with a ledger

1 plumb the corner
Drive a nail into the ledger at the centerline of the post location. (Step 2 on the *previous page*). Drop a plumb line from the nail to the batter board.



2 tie line to batter board
Let the plumb bob come to rest. Mark the batter board directly below the tip of the plumb bob. Tie a mason's line at this mark and continue your layout, following the procedure that begins in Step 2 on the *previous page*.

good foundations

digging footings

Before you dig footings, ask your local building department for specific requirements for type, depth, and strength of posts and footings. Footings need to be stable in soft soil, withstand frost, and provide a base that keeps posts or beams above moisture. See *page 45* for more information on footing options. Also, have your utilities survey the area to locate underground lines.

In cold climates, footings should extend below the frost line (the depth to which frost penetrates the soil). This prevents the deck structure from rising and falling during freeze-thaw cycles.

Frost depth is not the only thing that affects the depth of the footing. Soil composition, the size of the post, and the height of the deck also affect footing depth.

Don't dig postholes with a shovel; borrow, rent, or buy a clamshell digger. A clamshell digger is an efficient tool for digging a few holes by hand, better than the old-style hand auger. If your design requires a large number of footings, rent a power auger or hire a professional. If you rent a power auger, be sure to get instructions on its use. If you will pile removed soil onto a grassy area, lay a sheet of plywood or plastic first.

you'll need

TIME: One to four hours, depending on the digging tool, the type of soil, and the number and depth of the holes
SKILLS: Using a manual posthole digger requires no special skills, but get instructions before using a power auger
TOOLS: Garden spade, clamshell posthole digger, digging bar, plywood or plastic sheet, level, handsaw, small sledge

1 start the footing
Unstring the mason's lines and spread your feet on both sides of the X that marks the center of the footing. With the digger handles parallel to each other, drive the blades into the soil. Let the weight of the digger do as much of the work as possible.

2 remove the soil
Pull the handles apart to hold the soil between the blades, and lift the digger straight up. Move the digger away from the hole, and release the soil by pushing together the two handles. At the proper depth, flare the bottom of the hole by angling the blades.

caution

WATCH YOUR BACK
Digging postholes is hard work. If you need to dig holes that are 3 to 4' deep, do not be surprised if each one takes a couple of hours. You may spend a good bit of this time prying out rocks and cutting through roots. Don't try to grind rocks out with a clamshell digger. Pry them from the sides of the hole with a digging bar.

This work can be tough on the arms and shoulders, and even tougher on the back. Even if you are in relatively good physical shape, it makes sense to take your time and take frequent breaks.

3 pour a gravel base
Clean out loose soil from the bottom of the hole and pour in 2" to 6" of crushed gravel (or the depth required by code). Tamp the gravel with a 2×4 or tamping bar. The gravel lets water drain out the bottom of the footing and helps reduce frost heave.

4 cut the tube form

Mark the tube form so it will reach the level where the hole flares and will extend 2" above grade. Cut the form with a handsaw, keeping the saw perpendicular to the form to make a straight cut. If the cut isn't square, put that end in the bottom of the hole. A straight cut, however, makes the form easier to level.

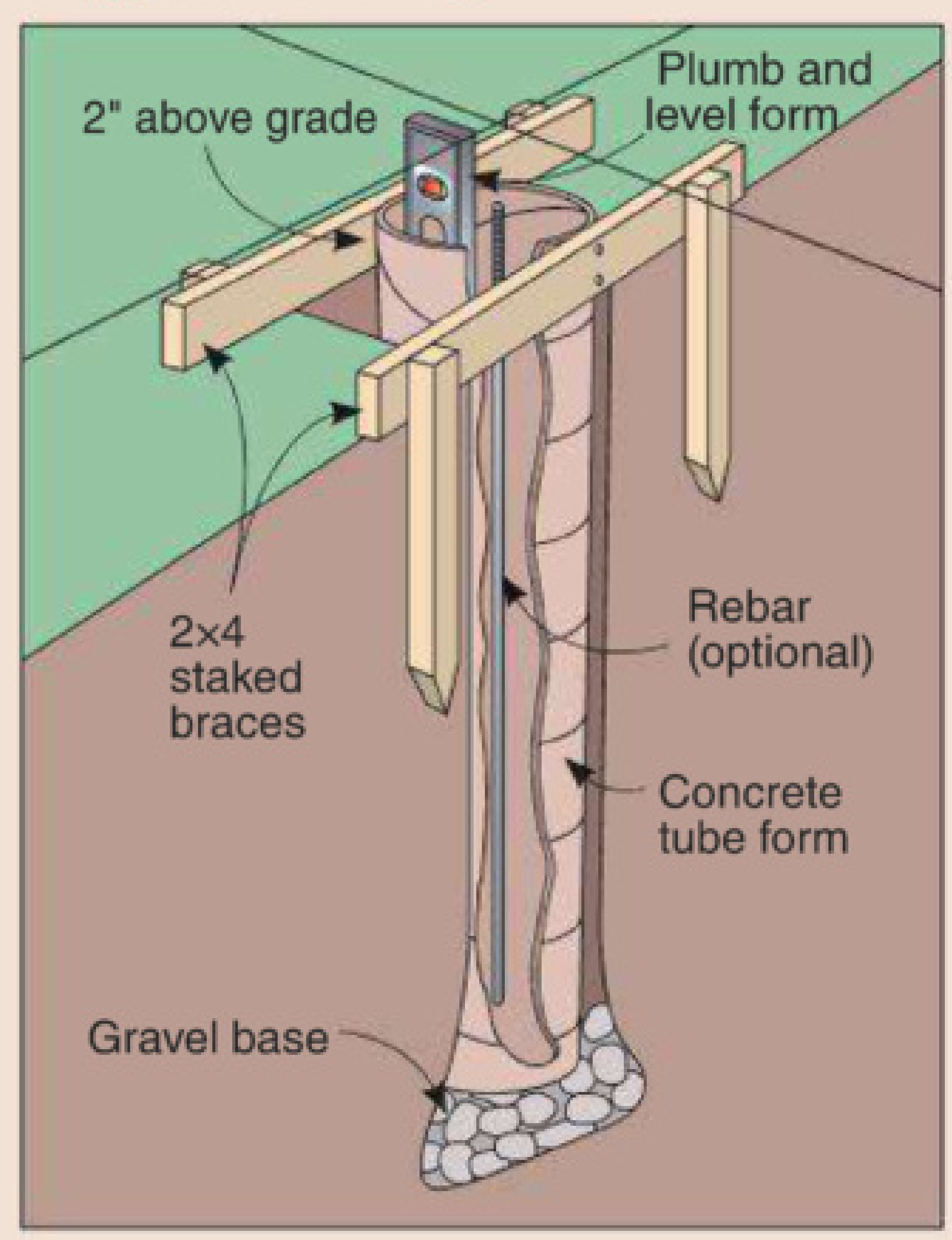
5 brace the form

Lower the form into the hole and fasten it to 2× braces with short screws. Then drive stakes at both ends of the braces. Fasten one end of each brace to a stake, and set a 2' level atop the form. Raise or lower the brace to level the tube, then screw the braces to the stakes. Set the form as plumb as possible. (It doesn't have to be perfect.)

6 backfill the form

Backfill the outside edge of the form with a round-nose shovel, tamping the soil lightly with a 2×2 after every 4" of soil. With the form held in place as shown *above*, backfill while making sure the form stays in position. If the hole is more than 3" wider than the tube, tamping may fill the flared recess at the bottom of the hole.

a typical footing



A typical footing installation consists of a concrete tube form set into the hole and plumbed with braced stakes. Be sure to center the form before you stake the braces. If codes require rebar, don't put it in the center of the hole—that's where your J-bolt will go.

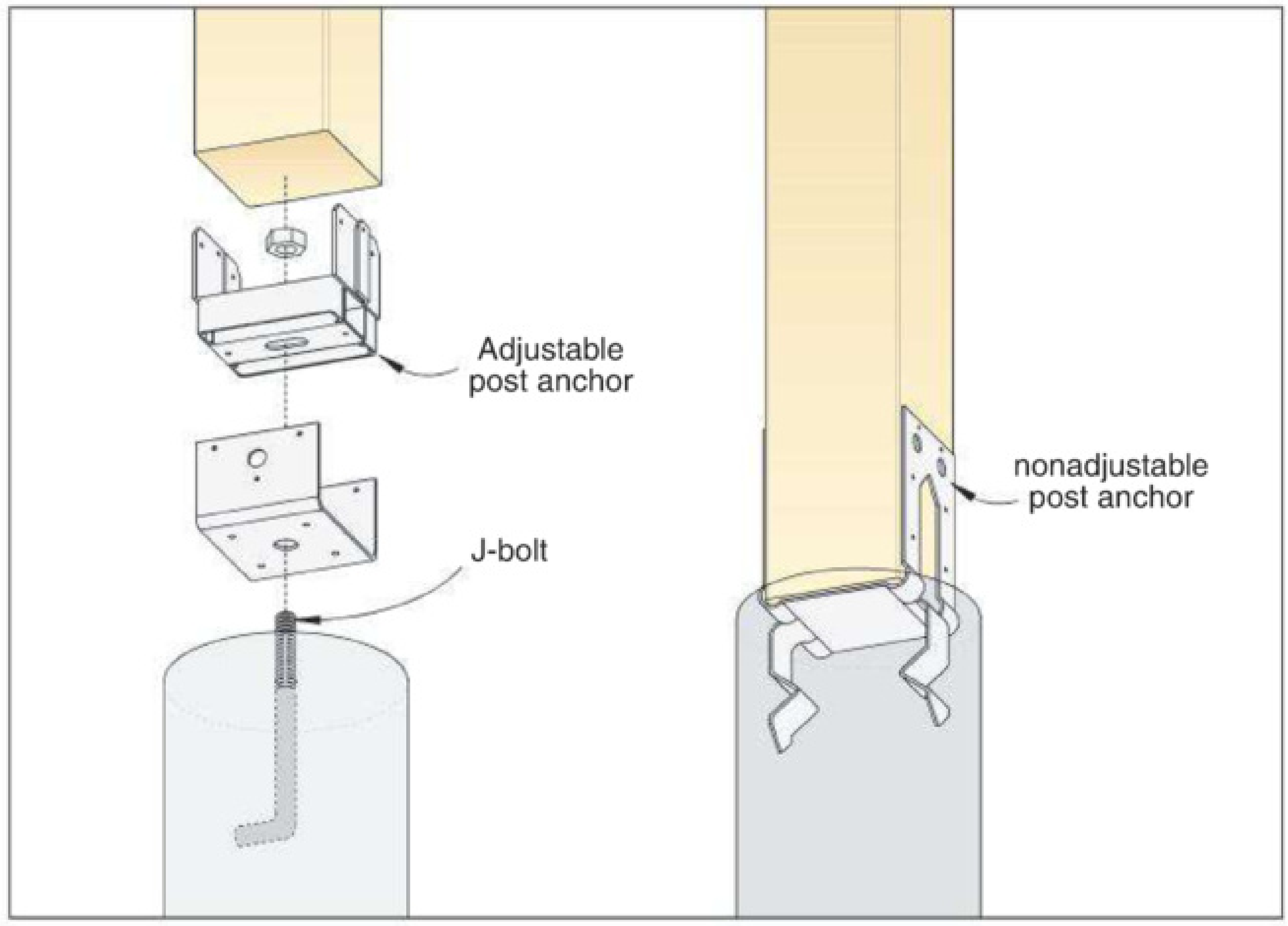
pouring footings

If your deck will have corner footings only, preparing premixed bags of concrete in a wheelbarrow is quick and cost-effective. If you're pouring more than six footings, rent a power mixer, or order truck-delivered ready-mix from a local concrete supplier.

Either move the mixer to each hole or move the concrete in a wheelbarrow. Lay a 2×12 ramp to make the job easier and minimize damage to your lawn. Measure the dry ingredients first (in shovelfuls), mix them in the power mixer or wheelbarrow, then add the water.

you'll need

TIME: About an hour per footing
SKILLS: Basic masonry skills; follow instructions on the bag to mix concrete
TOOLS: Power mixer or wheelbarrow, mason's hoe, shovel, hose, framing square, trowel



post-anchor options

Post anchors are made in a number of styles, either adjustable or nonadjustable. Nonadjustable anchors are slightly less expensive but require precise setting. Adjustable anchors will give you a margin of error, allowing a correction of up to ½", which makes them worth their slightly higher cost. It's a lot easier to adjust an anchor to center the posts than it is to set the anchor precisely. The installation of footings shown on these pages involves inserting a J-bolt, which is anchored into the concrete and accepts an adjustable anchor.

mixing in a wheelbarrow

Pour in a bag of dry concrete mix, or measure dry ingredients in shovelfuls. Mix the ingredients with a hoe, then mound them and make a depression. Pour clean water into the depression, and pull the dry mix into the water, working the mix back and forth and scraping up dry material from the bottom. Add water as necessary.

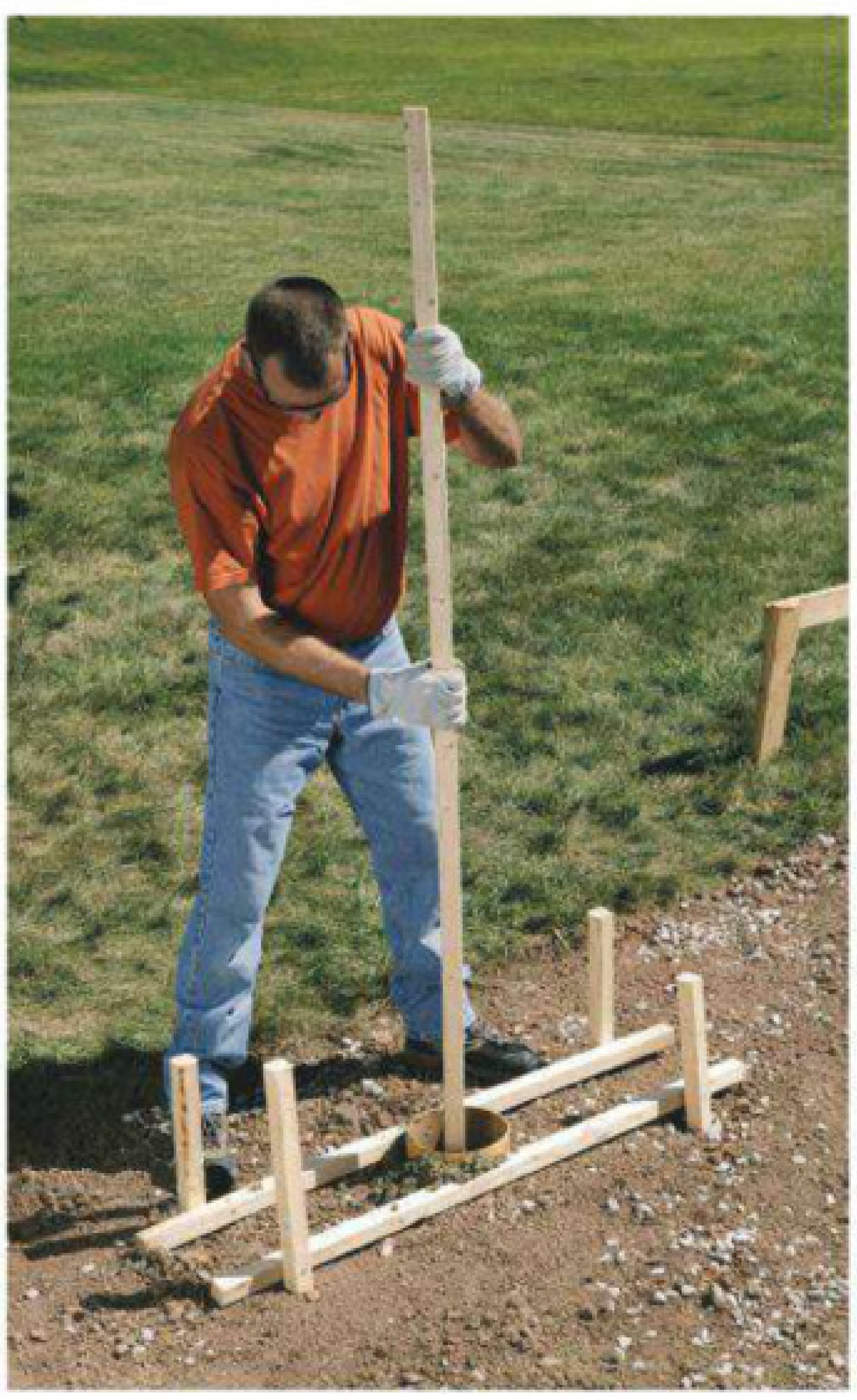
getting the right mix

Whether you're mixing in a wheelbarrow or in a power mixer, make sure all of the ingredients are mixed together thoroughly. To test the consistency of the mix (its slump), scoop up some with a shovel or trowel. When the concrete clings to a shovel or a trowel turned on edge, it's ready.

pouring footings

1 mix dry ingredients
Bring the wheelbarrow to the hole. Empty premix bags into the mixer, or measure cement, sand, and aggregate in shovelfuls. With the shovel, mix the materials. Then add half the water and mix again. Continue mixing, adding water a little at a time.

2 making the pour
If working from a wheelbarrow, shovel in the concrete. Stop pouring when the hole is half full, tamp the concrete (see Step 3), then finish filling the hole. If you're using a mixer, tip the mixer so the concrete pours straight into the hole. Have a helper guide the flow with a round-nose shovel.



3 consolidate the mix
When the footing is half full (and again when full), consolidate the mix by working a 2×4 up and down in it to remove any air trapped by the pour. Removing air pockets will allow the concrete to cure properly.

4 level the footing
Overfill the form by about 2", then screed off (scrape off and level) the excess with a short length of scrap 2×4. Seesaw the screed back and forth to level the mix. Pulling the screed straight back will drag concrete out of the form.

soak your piers

If you're building a freestanding deck on flat, stable ground where frost heave is not a problem, building codes may allow you to use precast concrete piers instead of footings and posts. If the ground does rise and fall by a small amount, the deck will move as a unit. Because it's not fastened to the house, such movement won't cause the deck to break up.

Some codes require that the piers be bedded into a footing, varying in depth from 1' to below the frost line. If your plan calls for bedding precast piers in a footing, be sure to soak the piers into a tub of water for several minutes, then center them into the footing before the concrete sets up. A dry pier will quickly absorb the water from wet concrete, causing it to flake and spall. Such a weakened bond between the pier and concrete could cause the deck structure to fail.

5 set the J-bolt
Restring the mason's lines to center the J-bolt in the form. When the concrete begins to set (it will resist finger pressure), push a J-bolt into the center of the form, leaving about 1" exposed. Center the bolt with a plumb bob or tape measure.

6 square the threads
The exposed threads of the J-bolt must be vertical, otherwise the post anchor will not sit squarely on the footing. Square the threads to the footing with a speed (layout) square. Repack loose concrete with a pointed trowel, adding a little more, if necessary.

installing a wet-insert anchor

1 insert the base
Most wet-insert anchors have prongs or a post and must be installed before the concrete sets up. Push the base of the anchor into the center of the footing, rocking it back and forth as you go. Stop when the bottom of the anchor plate touches the footing.

2 align the anchors
Line up a long, straight 2×4 atop the footings, placing the 2×4 so the edges of all the anchors will be lined up on the same plane. Have someone hold the 2×4 in place while you adjust the position of the anchors.

preparing a stair landing

If you want to build stairs that rest on a concrete pad, you can save time and effort by building forms for the pad and pouring them at the same time as your footings. But you must determine exactly where the pad will be placed, which is difficult to gauge when the deck hasn't been built yet. To accurately position the pad, your plans have to be accurate, and you have to know where you want the stairs located. See *page 63* for information about positioning and building a form for a concrete stair landing.

drilling an anchor bolt into cured concrete

1 drill and epoxy the hole
Threaded studs that attach post anchors may be installed after the footings have cured. Hammer-drill a hole ⅛" to 3⁄16" larger than the stud diameter and deep enough to leave 1" exposed. Wrap the top 1" of the stud with masking tape. Then blow the dust out of the hole with compressed air. Inject anchor-setting epoxy into the hole, and insert the stud immediately.

2 square the stud
Square the end of the stud to the footing, and let the epoxy cure as long as specified by the manufacturer. When the epoxy has cured, measure the height of the threads. If the threads extend more than 1" above the concrete, thread on the nut until its top face is 1" above the concrete. Cut the stud with a hacksaw, and remove the nut.

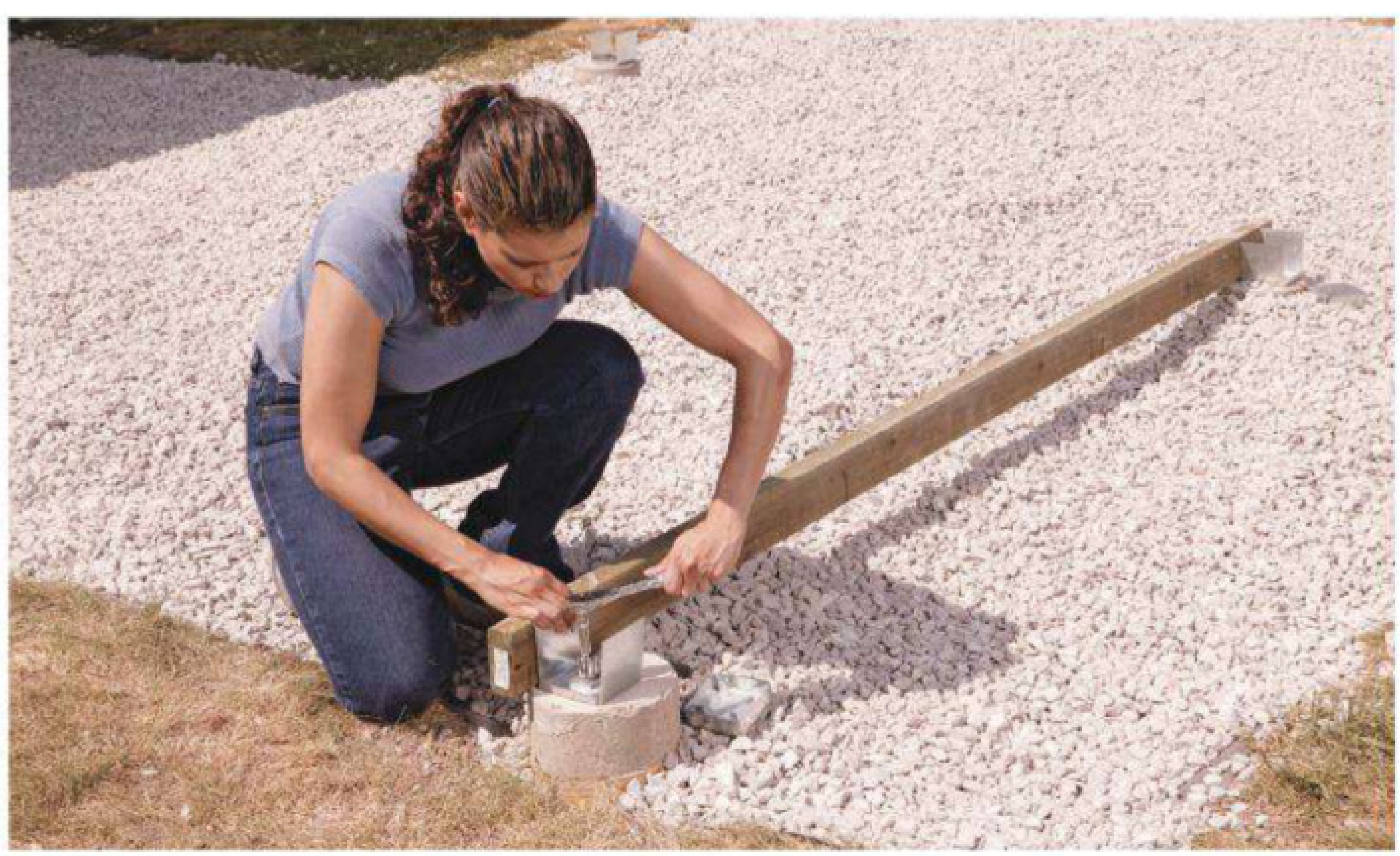
installing posts

When you install the posts, you'll employ the same techniques you used laying out the site of your deck—measuring, squaring, and aligning. Only this time, everything needs to line up precisely. That's where adjustable post anchors have an advantage: They will let you correct most alignment problems.

You will work more quickly if you do everything in stages—set all the anchors loosely and line them up, square all the posts, set and brace them in the anchors, then plumb and align all of them.

you'll need

TIME: About 45 minutes to anchor and brace each post
SKILLS: Measuring, plumbing, driving fasteners
TOOLS: Hammer, open-end and socket wrenches, drill, tape measure



1 set the anchors
Tighten all the anchors into place just enough so you can move each anchor slightly. On the footings parallel to the house, set a long, straight 2×4 across the front edges of the anchors. Line up the anchors so all of them are an equal distance from the house. Then tighten each anchor with a socket wrench. Repeat the process on the side posts, setting up the edge of the anchors closest to the house with a plumb bob.

prep the posts and run them wild

Plumb posts start out square. The day before you set the posts, check each of them and square the ends with a layout square and circular or reciprocating saw. Dip the cut ends into preservative, and let the preservative soak in overnight.

You can cut the posts to the specified length before you install them, but slight variations in the footings or deck framing might cause some posts to be too short or too long. Instead, let the lengths of the posts run wild—with each one slightly longer than you need. That way, you can use a water level to mark them at the same height after installation.

2 tack the post base
Set each post into its anchor, and drive one nail through the anchor hole and about halfway into the post. Have a helper hold the post as plumb as possible. This will keep the bottom of the post in place but will allow you to move it when you plumb it with braces. Tack or screw a 1×4 brace to the post and stake it. Tack and brace the remaining posts. The posts don't have to be perfectly plumb; you can adjust them later.

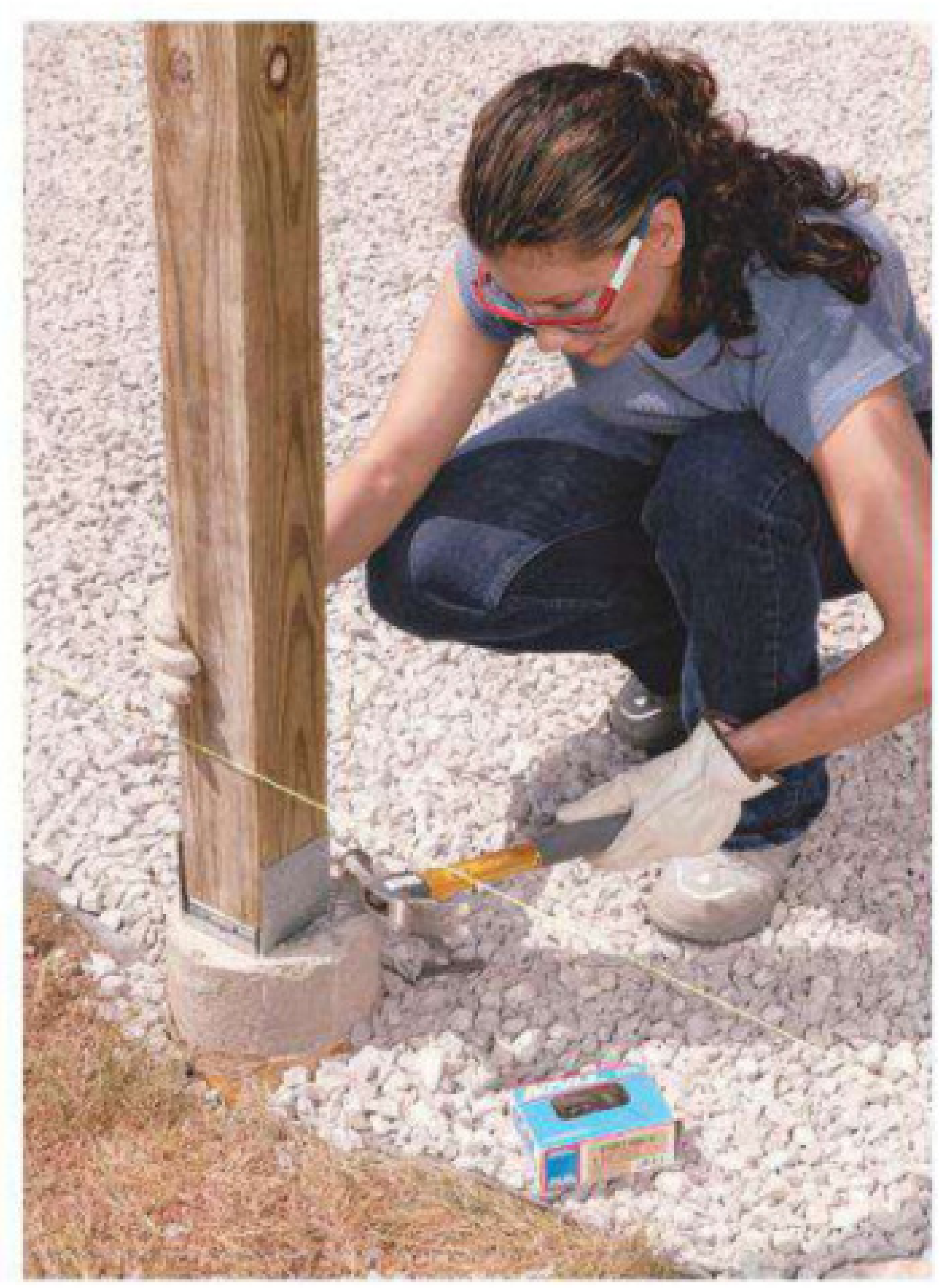
redressing anchor threads

Setting footings and posts can damage the threads of a J-bolt or stud. Protect the threads with tightly wound tape or by turning a nut onto the threads so that it's even with the top of the bolt.

If the threads of an anchor bolt do become damaged, you can clean them up with a hardened steel die, available at your hardware store.

Make sure you get an anchor bolt with the same thread design. Turn the die on the threads to recut them and clean out any damage. Absent a die, you often can clean up a damaged bolt with a nut. It will suffer some damage in the process, so don't reuse the nut.

3 stake the posts
Move the mason's lines on the crosspiece outside the center line by half the width of the post. Restring the lines, and clamp a second 1×4 staked brace to the post. Plumb each post with a post level, keeping its outside face against the mason's line.



4 fasten the posts
Drive the remaining fasteners into the anchors. Some post anchors accept nails or screws only. Others also accept a lag screw. Predrill for the lag screw before driving it.

marking and cutting posts

Marking and cutting posts require patience and precision. Properly cut posts make the rest of the job go easier and will ensure a sturdy, level deck, so don't rush this step. Ask a friend or two to help so you won't have to keep moving back and forth from one post to another to adjust them.

If time has passed since you set the posts, check them for plumb and readjust them if necessary.

top-coat your posts

If you are building your deck with pressure-treated lumber, treat the tops of the posts after you cut them. Although treated wood absorbs preservatives during manufacture, cutting off the end exposes a surface that is less-thoroughly treated. To avoid ongoing maintenance problems, brush preservative onto the cut ends of the posts. Horizontal surfaces (such as post ends) are most exposed to the weather, but joists and beams need treatment, too.

1 establish the level

Rest one end of a long, straight 2×4 on top of the ledger. Hold the other end against the nearest post. Place a level on top of the 2×4 and level it. Mark the post where the bottom of the 2×4 intersects it. This line is the reference for the next steps.

you'll need

TIME: About 30 minutes per post
SKILLS: Measuring, plumbing, cutting, driving fasteners
TOOLS: Framing square, layout square, hammer, post level, wrench, tape measure, carpenter's level, water level, reciprocating saw

2 mark the cut line

Hold a piece of joist scrap on the reference line and mark the post for the bottoms of the joists (top of the beam). Then hold a piece of beam scrap on this second line, and mark the bottom of the beam (top of the post). You'll cut the posts along this line.

3 extend the cut line

Hold a layout square on an adjacent post face, level with the cut line. Mark this face and the remaining faces. Cut the post on the line with a reciprocating saw. Set one end of a water level against the cut and the other on the next post. Mark all posts with the water level, and cut them.

more footings & flashings

Deck footings support the entire load of the structure. Footings usually consist of round holes in the ground that extend below the frost line and are filled with concrete. Different building codes, climates, and soil conditions may call for different footings. Precast piers set into concrete or tamped earth are one example, as shown *below right*. The types and dimensions of your deck footings ultimately will depend on the height of the deck, the types of materials you use, how deep the ground freezes, and the load-bearing capacity of the soil.

Most building codes require that a deck support a dead load (weight of materials) of 10 pounds per square foot and a live load (weight of people and furnishings) of 40 pounds per square foot, or a total of 50 pounds per square foot. All the framing works together—the ledger carries a portion of the weight, which it transfers to the foundation of the house; beams carry the intermediate loads, and footings support the loads that are transferred to the perimeter.

preventing frost heave

In cold climates, soil freezes and thaws, causing the soil to expand and contract—a movement that can break up the deck, if footings are not set properly. Different regions have different depths at which the ground freezes during the winter. That's called the "frost line," and footings have to be dug below it. Local codes will specify the frost line and how far below it you must set your footings.

In warm climates, you may only need a shallow footing—a concrete pad about 6"–12" deep and 1'–2' square. Even in some winter climates, codes will allow you to set posts into a tamped-earth footing.

soils and slopes

Loose soils have less load-bearing capacity and may require more or larger footings than heavy clay or compacted soils. Posts set into sloping terrain will need at least 7' of soil extending horizontally beyond the bottom of the footing.

Considering all of these variations, don't be surprised if you find that your codes specify different spacings or construction methods than are noted in standard span tables.

estimating concrete

Concrete is calculated by its volume in cubic yards. To estimate how much you'll need, convert all dimensions to feet, and use this formula: 3.14 × the square of the radius of the hole × the depth, divided by 27. Thus, a hole 1' in diameter (0.5' radius) and 3.5' deep would need (3.14×.25×3.5)÷27 or .10 cubic yard of concrete. That doesn't seem like much, but for 12 footings it would be more than a cubic yard. Two 60-pound bags of premix should fill the form in a hole 3' deep. Order ready-mix truck delivery whenever you need a cubic yard of concrete or more.

4 options for deck footings

use precast piers

Precast concrete piers are available at your home center and may be used with or without footings, depending on local codes.

They may be used without hardware, as shown *above left*, to simplify construction of ground-level decks. When using a precast pier to support a post, install a post anchor in the center, or purchase piers that have the hardware already mounted.

use fiber tube forms

Fiber tube forms make it easy to cast footings, and may be required by code in areas with loose or sandy soils. Sold in 12' lengths and various diameters, the tubes should be cut as squarely as possible with a handsaw as shown *above.*

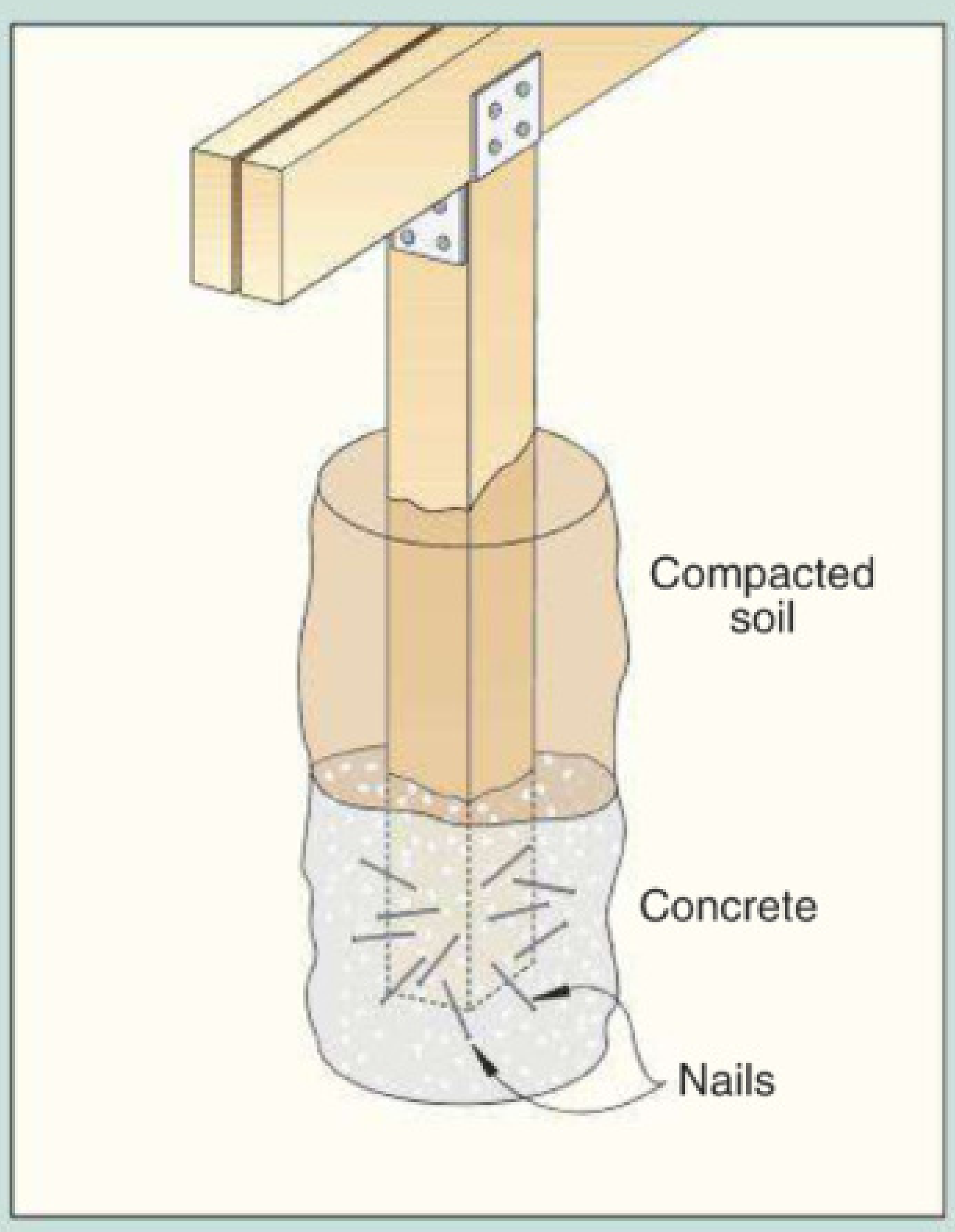
mix your own concrete

You can mix your own concrete for footings. If you have more than six or eight footings to pour, mixing your own can be more cost-effective than buying premixed bags.

Shovel the dry ingredients into a wheelbarrow or power mixer—1 part portland cement, 2¼ parts sand, 2½ to 3 parts gravel. Mix the dry ingredients together first, then add water a little at a time and mix it again. Keep adding water until the concrete clings to a shovel turned on edge.

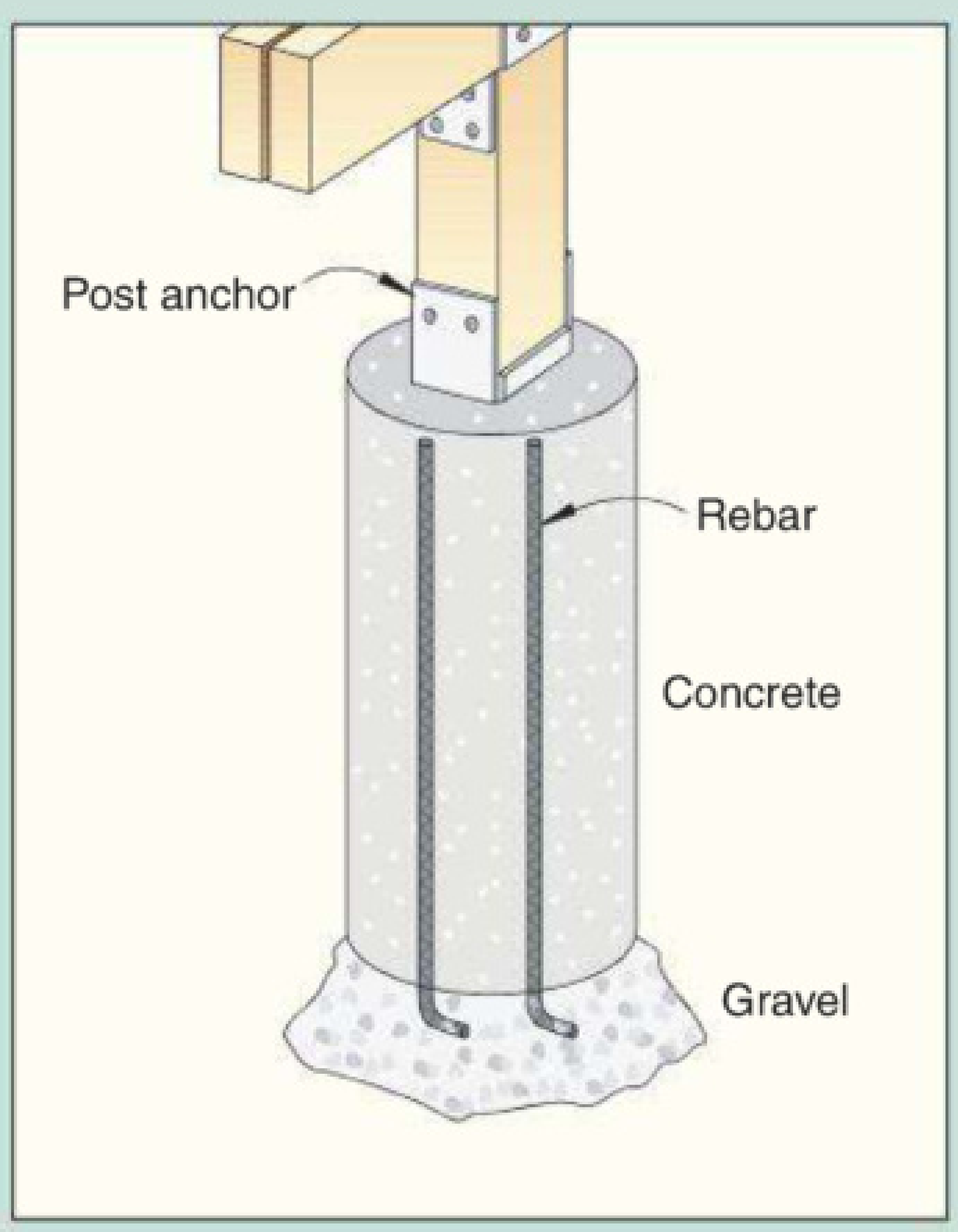
flashing

Flashing comes preformed in Z-shape sections, in rolls, or as a self-stick synthetic membrane. Flashing keeps water from collecting behind the ledger and rotting both it and the house framing. Purchase whatever style is required by your application.



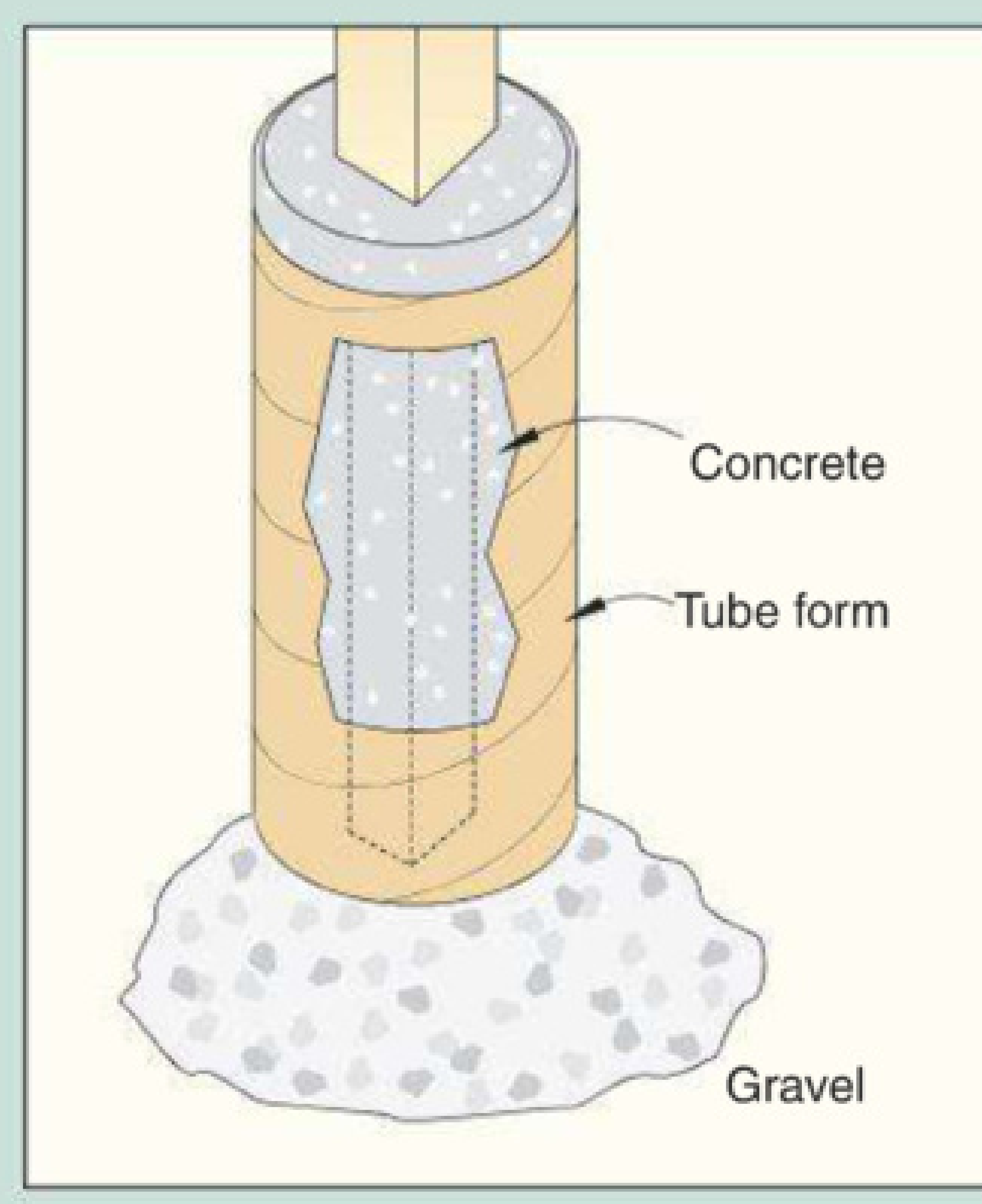
place post into concrete footing

This foundation uses only a small amount of concrete to form a footing entirely below the frost line. The post must be rated for ground contact. Drive nails into each side to hold the post in the concrete. Backfill the remainder of the hole with compacted layers of soil.



reinforce with rebar

Reinforcing steel bars, or rebar, add strength to concrete structures, and in some areas may be required. If rebar is needed, building codes will specify how many and what size. Deck footings typically need one or two lengths of rebar set into the concrete.



embed the post

In some areas (check your building code), pressure-treated posts can be embedded into concrete footings, eliminating the need for metal post bases. This technique can create a stronger foundation than other methods, but aligning the posts is more difficult, and moisture can accumulate between the post and the concrete, leading to rot.

beams and joists
main supports

install a beam

A beam runs parallel to the ledger and supports the joists. There are several ways to construct a beam (see photos, *right*).

A single 4× or 6× beam reduces construction time, but long pieces may be difficult to find, are expensive, and are heavy to handle.

You can build your own beams from doubled lengths of 2× stock. This construction is strong, less expensive, and comes together quickly.

Add ½" plywood spacers with mitered tops to a doubled beam to make its width consistent with dimensional lumber and hardware. The miters on the tops of the spacers allow water to drain.

Two lengths of 2× stock sandwiched to the sides of posts won't be as strong, but may be necessary because of other factors in your design.

Different deck designs may impel you to use a particular method, but local code requirements may determine how you build your beam.

If the beam rests on top of the posts, strengthen the joint with a metal post/beam connector.

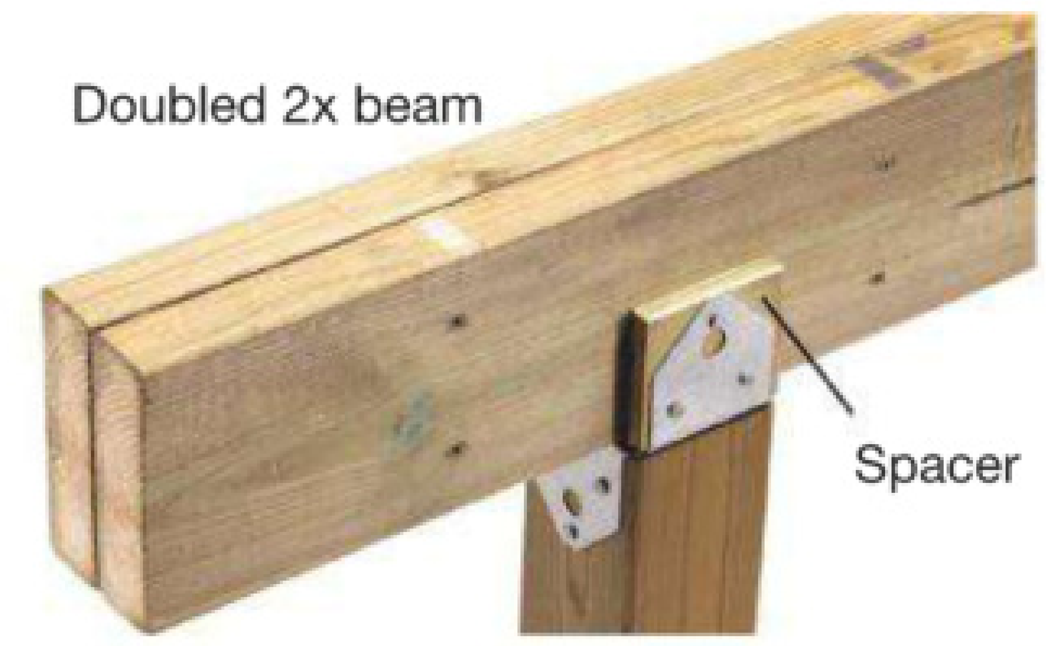
Use pressure-treated lumber unless you've chosen a naturally rot-resistant wood. Install the beam with its crown (curved) side up, as defined on *page 55*.

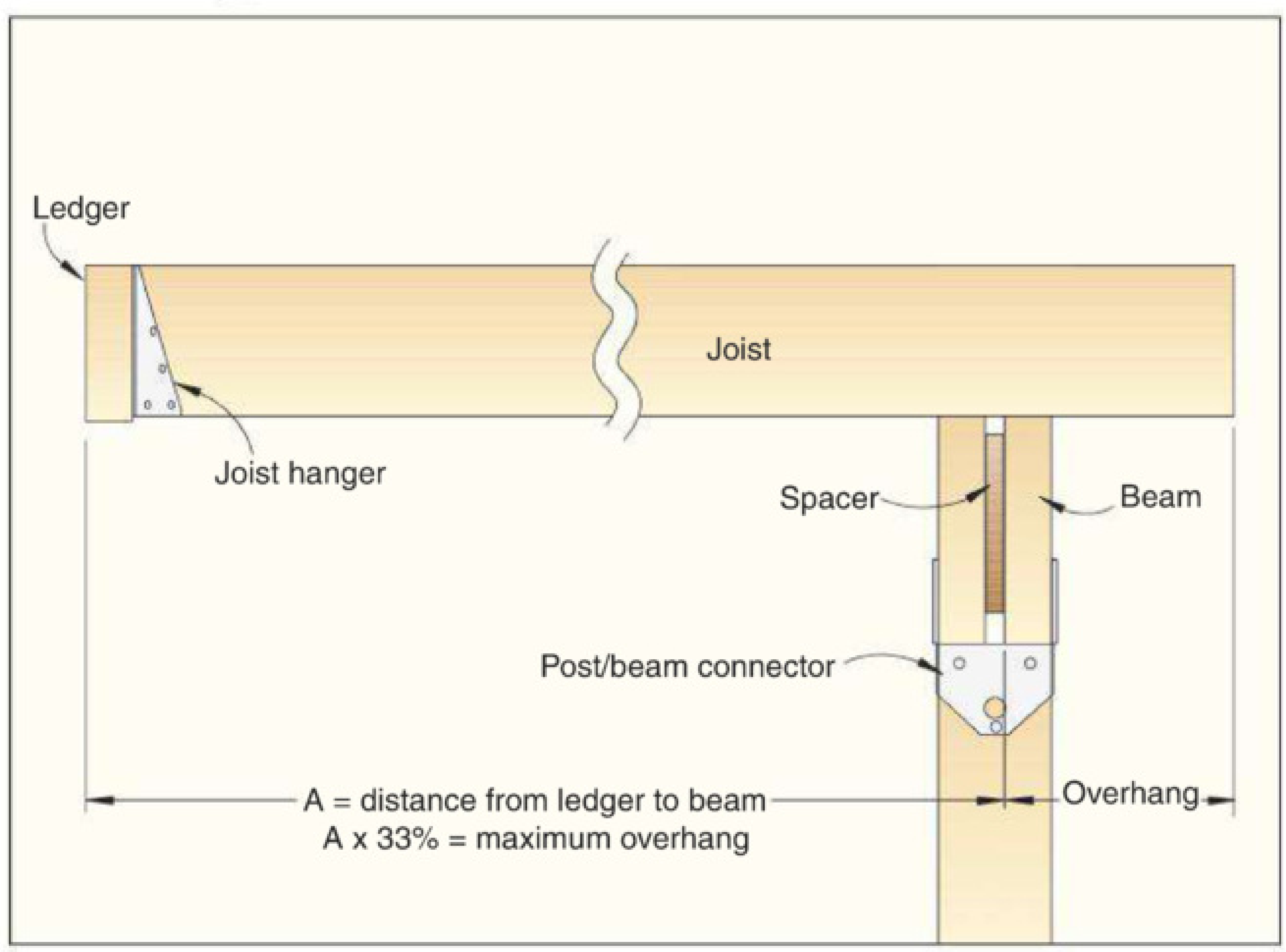
you'll need

TIME: About three hours for a doubled 16' beam, including assembly and installation

SKILLS: Measuring, cutting, fastening, drilling

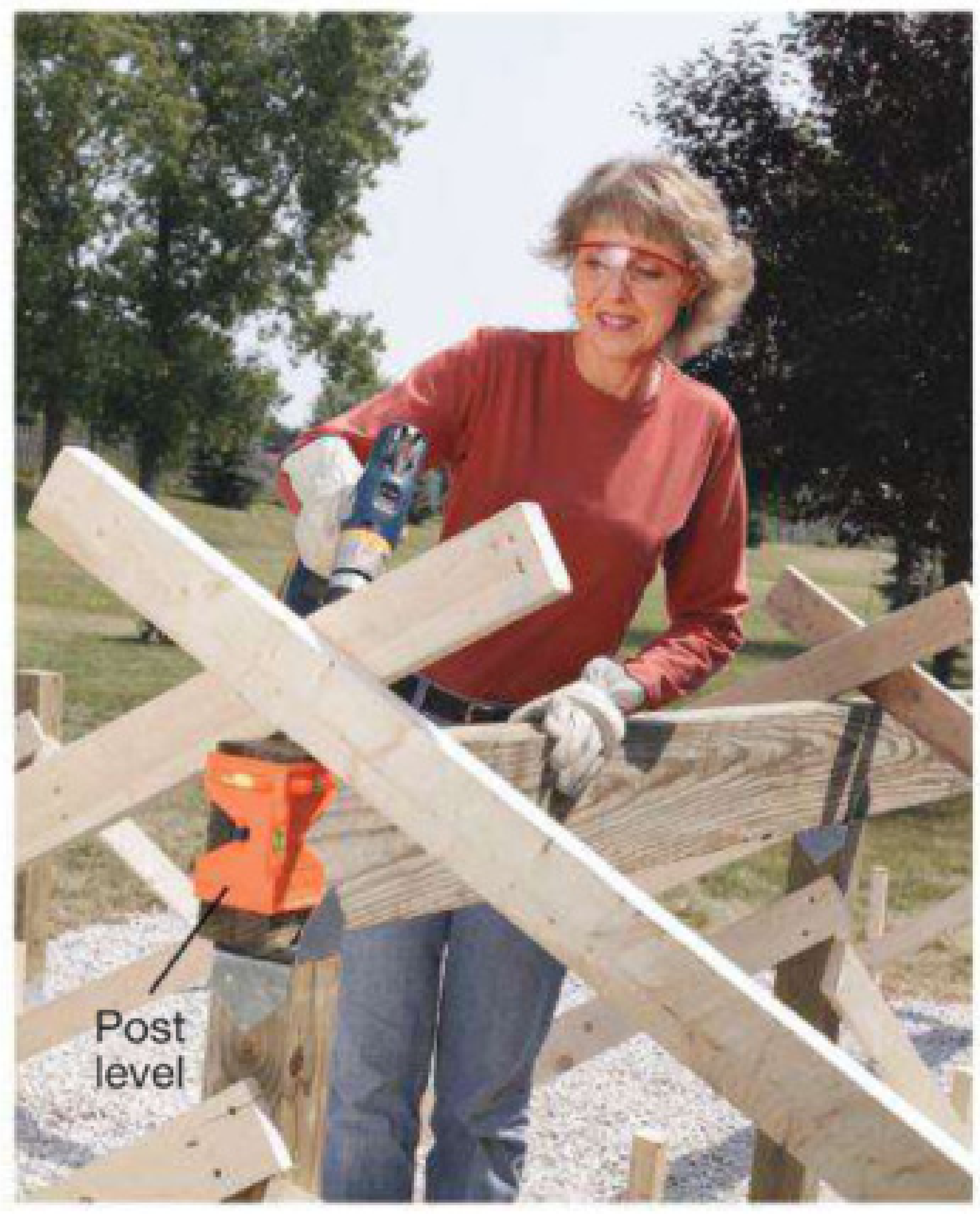
TOOLS: Tape measure, hammer, circular saw or mitersaw, drill, socket wrench, level, post level





cantilevering (overhanging) the deck

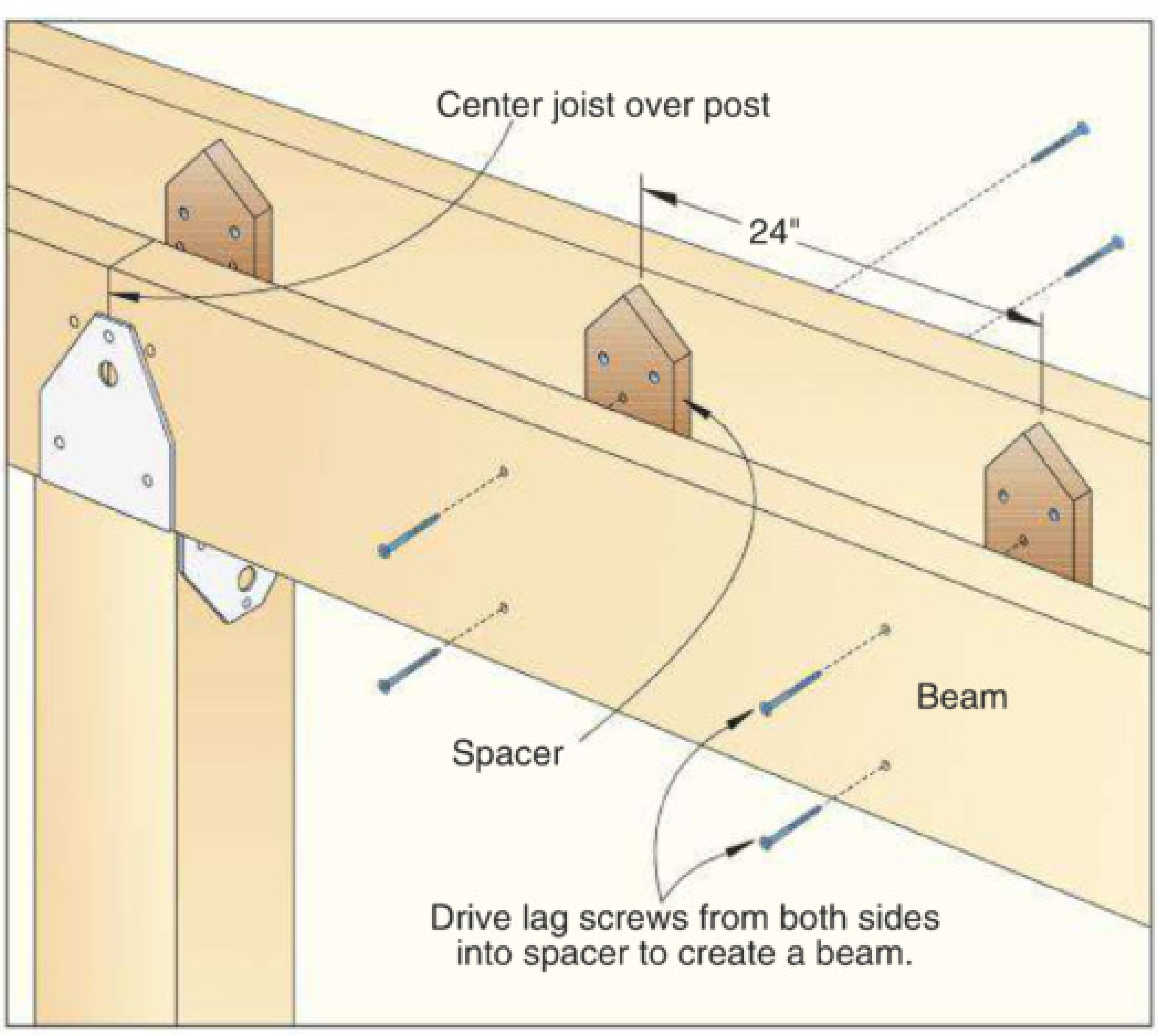
Cantilevering the front edge of a low deck beyond the beam make the beam less visible. On a ground-level deck, cantilevering makes the platform appear to float. Usually, joists can overhang the beam up to a third of the total joist length. However, your local building code may set different requirements: Be sure to check cantilever limits. A low deck may be so close to the ground that you won't have room for a large beam. In that case, use smaller beam stock and install an additional post.



1 setting the beam
Install post/beam connectors on the posts, making sure they're oriented in the same direction. Bring the beam assembly to the site, then lower it into the connectors. Center the beam on the deck site.

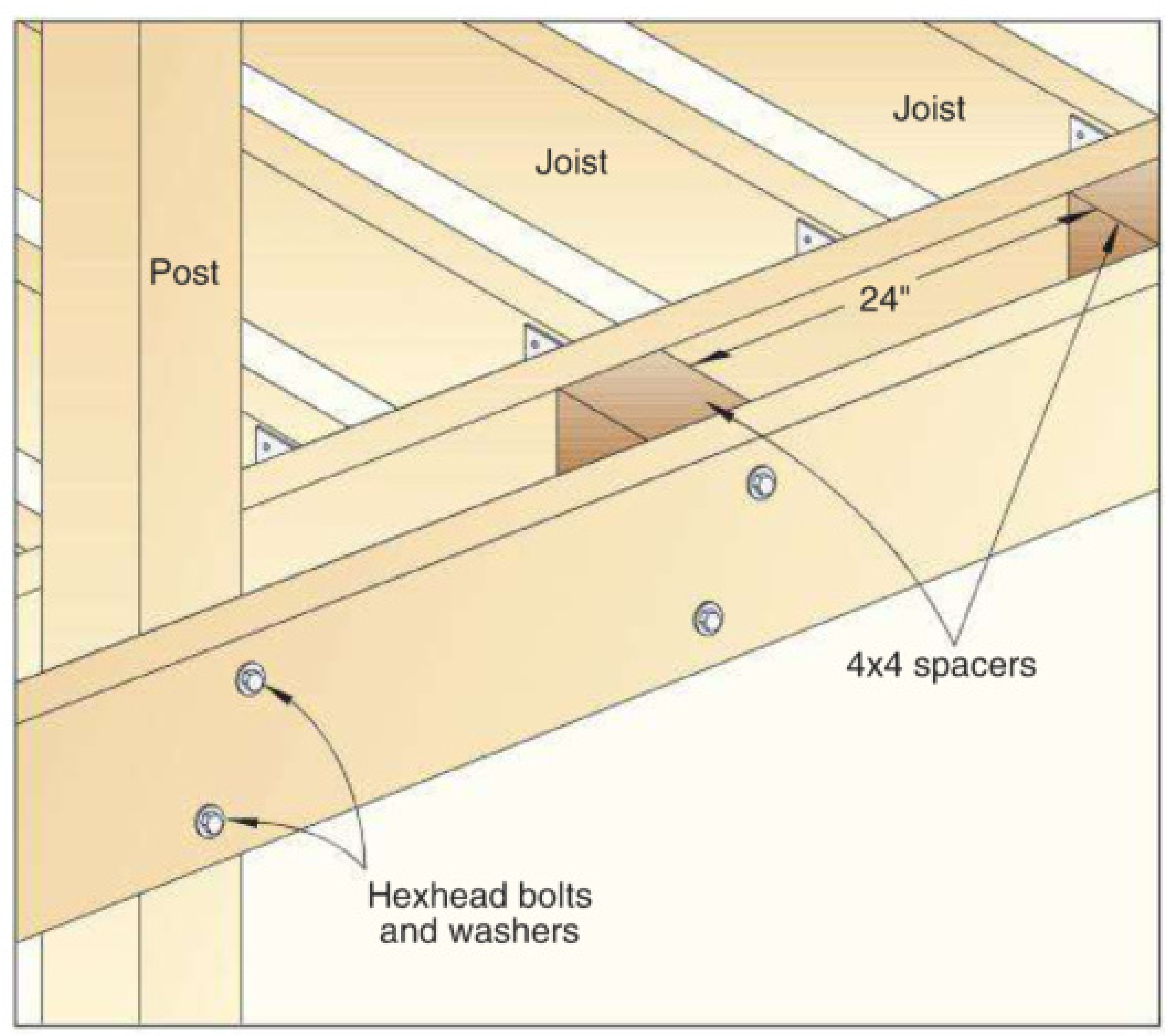
2 bracing the beam
Fasten a stake to a 2×4 brace and drive the stake into the ground. With a post level, brace the face of the beam plumb. Install another staked brace on the opposite end.

3 fastening the beam
With the beam braced, attach it to the post/beam connectors with screws or nails. Screws are less likely to push the beam out of alignment. Be sure to remove the braces before you install the joists.



building up a beam

A doubled 2× beam with ½" or ⅜" spacers will match the width of a 4×4 post. Measure the post width—pressure-treated posts are sometimes a little thinner than other dimensioned lumber. Miter the spacers (pressure-treated plywood) to aid water drainage. Set one board on a solid surface, and tack spacers every 24". Set the other board on top, and clamp everything together with edges flush. Drive lag screws through each spacer, turn over the beam, then fasten from the other side. Or through-bolt the sandwich with ¼" bolts.



installing a sandwiched beam

If your deck design requires a 2× sandwiched beam, and the face of the beam will be visible, assemble it with ½" carriage bolts. If the beam is not visible (*above* example), use hexhead bolts with washers on both ends. Support the beam every 24" with spacer blocks cut from post stock. Clamp and level both sides of the beam to the posts before drilling the bolt holes; offset the holes to reduce splitting. Tighten the nuts with a socket wrench.

hang joists

No matter how many methods of hanging joists you've heard or read about, you should use joist hangers. Most building codes require them, anyway. Unless you plan to clad the header and rim joists with a fascia, select the straightest and least blemished boards for these pieces—and square the ends before measuring.

Fasten the rim joists and header to the ledger and beam, then hang the inner joists. Building this box structure first is easier than hanging the joists first, then attaching the header. If you haven't marked joist locations on the ledger and header, do it after you square the frame.

you'll need

TIME: Two hours for a 12×16' deck, longer if on a ladder
SKILLS: Measuring, cutting, fastening, squaring
TOOLS: Hammer, tape measure, pencil, framing square, layout square, circular saw, cordless drill

crown side up

Dimensional lumber often has a slightly bowed edge, or crown. You can see this crowning by sighting down the edge of the board. When using crowned lumber for joists, keep the crown up for a more even result and better drainage.

1 install the rim joists

Measure and cut the rim joists to length—usually 1½" shorter than the total front-to-back deck dimension. Rest one end of one joist on the beam and fasten the other end flush with the ledger with two 3" deck screws. Hang the other rim joist in the same way. You can install framing angles (*page 24*) at the ledger joint now or after you square the frame.

2 tack the rim joist

Set a framing square inside the corner at the ledger and again at the intersection of the beam, and adjust the rim joists until they are square to the house and the beam. If everything is properly placed, the outer face of the rim joist should be flush with the end of the beam (unless you have a cantilevered design). For now, tack the rim joists to the top of the beam with a screw or nail driven at an angle (toenailed).

hang joists

3 install the header
If you have someone to help, one of you should hold the header while the other screws it to the ends of the rim joists. Square the frame with a framing square and check it with a 3-4-5 triangle (see *page 42*). If necessary, remove the angled fasteners at the beam, adjust the joists, and drive the fasteners in again. Set framing angles in the corners, if you haven't already. If working alone, prop the header, tack one corner, then the other.

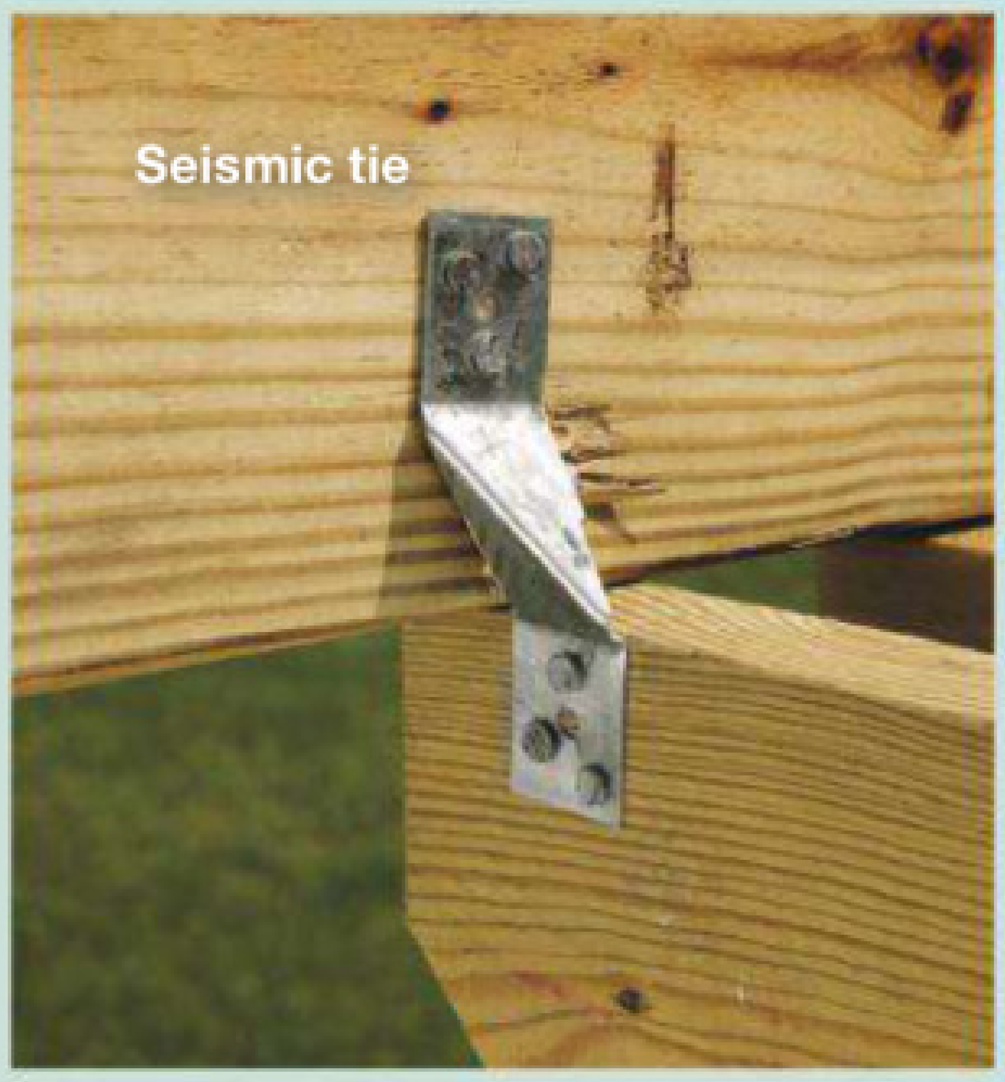
keep it square

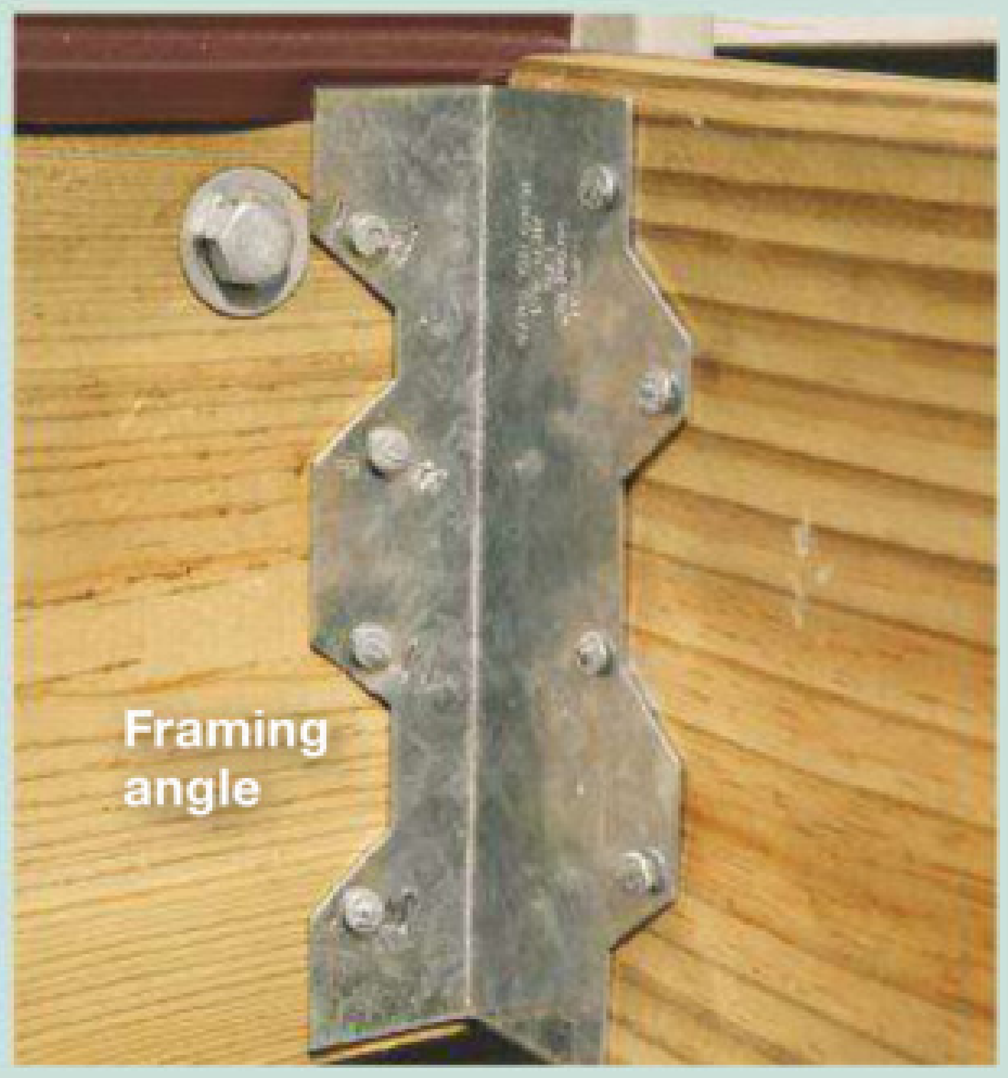
The more care you take to install the joists square with the ledger, the easier the rest of the construction will be. Don't assume you can square up things later. Use a framing square to align each joist at the ledger. If your joists are all the same thickness, use a spacer to test their spacing. To make the spacer, make square end cuts on a piece of joist stock exactly 14½" long. Have a helper use the scrap to space and align the joists at the beam.

4 install the joists
Cut joists to length and tack a 2× flange at each end, extending it 1½" past the end. The flange keeps the top of the joist flush with the top of the ledger and header. Set the joist on the marks and slide a joist hanger tight to the bottom. Fasten the hanger to both pieces of lumber.

5 finish the installation
Continue fastening hangers, nailing or screwing each joist to the hanger as you go. If the rim joist is bowed, have a helper push it toward the joist while you drive the hanger fasteners.

reinforce the frame





Framing was once held together by facenailing or toenailing the joints. Bugle-head (self-sinking), coated deck screws make joints easier to fasten, but do not greatly increase the stability of the joint. Framing connectors—such as framing angles and seismic ties—along with joist hangers greatly increase the strength of framing joints. Most codes require them, but you should use them even if your codes don't specify them.

additional information

Here are web addresses for additional information about deck-related products.

Arch Treatment Technologies (PT wood) wolmanizedwood.com

Chemical Specialties Incorporated (PT wood) treatedwood.com

International Code Council (building codes) iccsafe.org

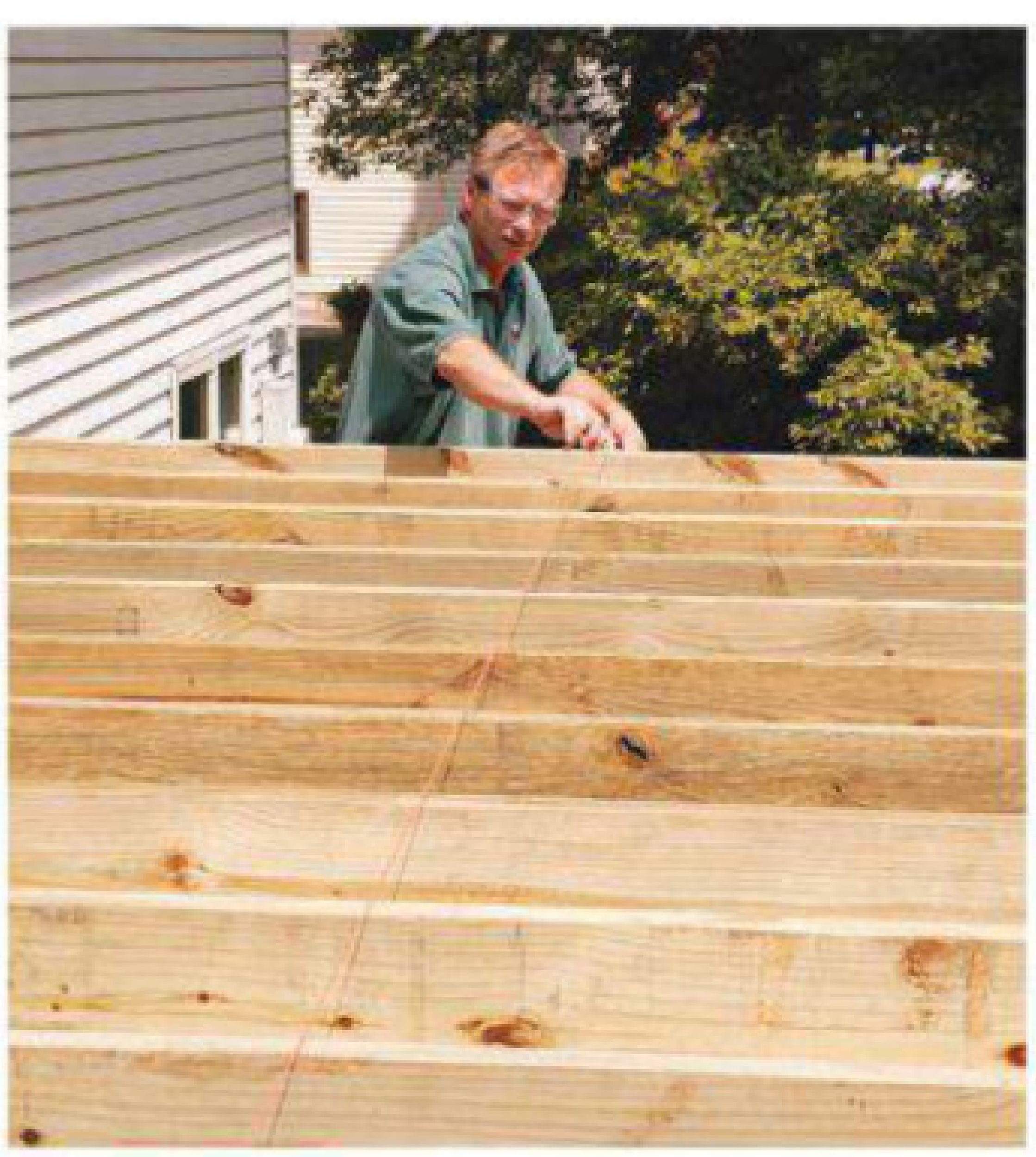
Int'l Staple, Nail & Tool Assn. (screws) isanta.org

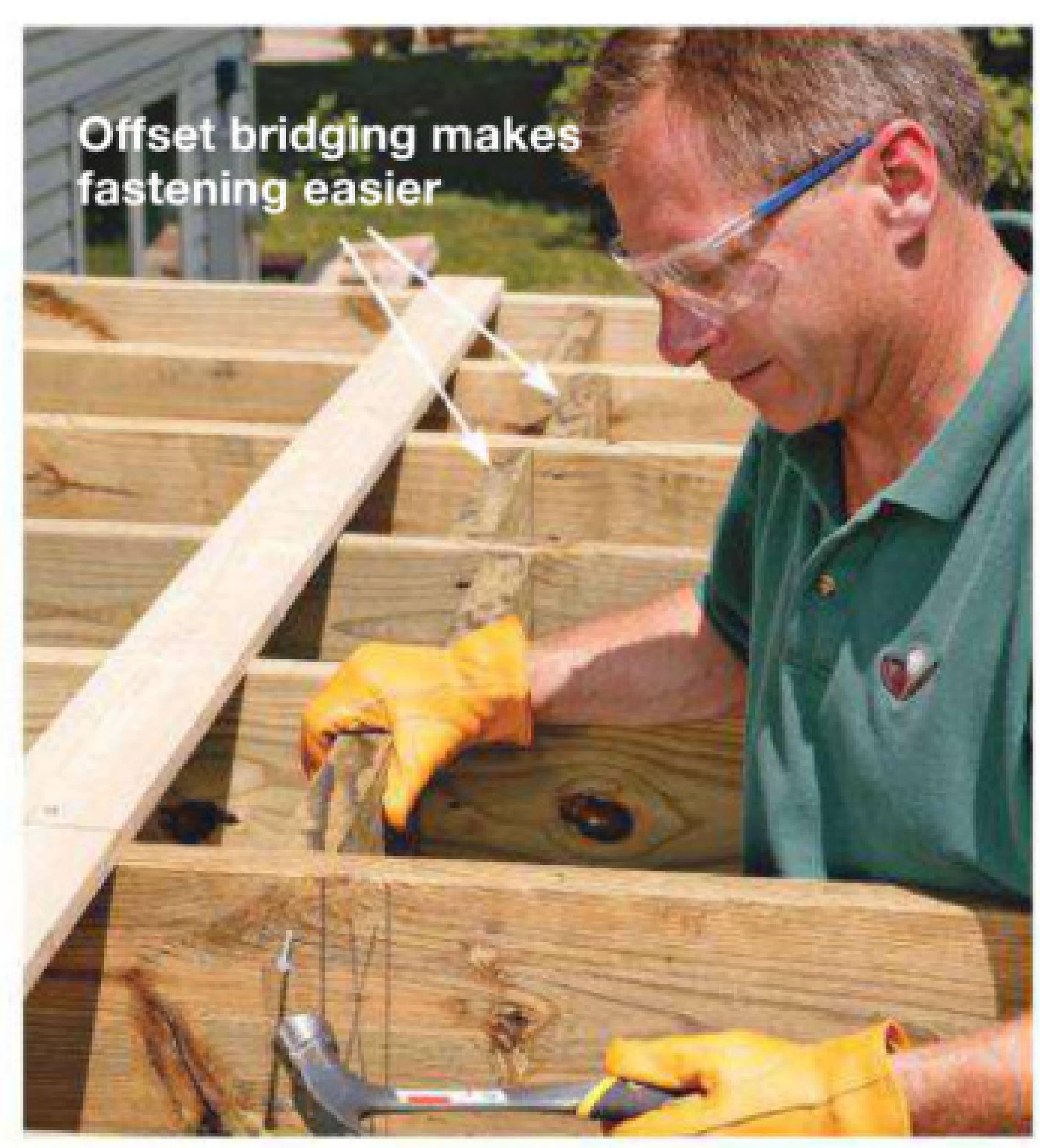
Osmose Incorporated (PT wood) osmose.com

Simpson Strong-Tie Company (fasteners) strongtie.com

United Steel Products Company (fasteners) uspconnectors.com

bridge the joists





1 mark joist centers
Bridging adds lateral stability to a deck frame and provides additional nailing surfaces for some decking patterns. Mark the midpoint of the deck (half the distance from the house to the beam) on both rim joists, and snap a chalk line between the marks across the tops of the joists.

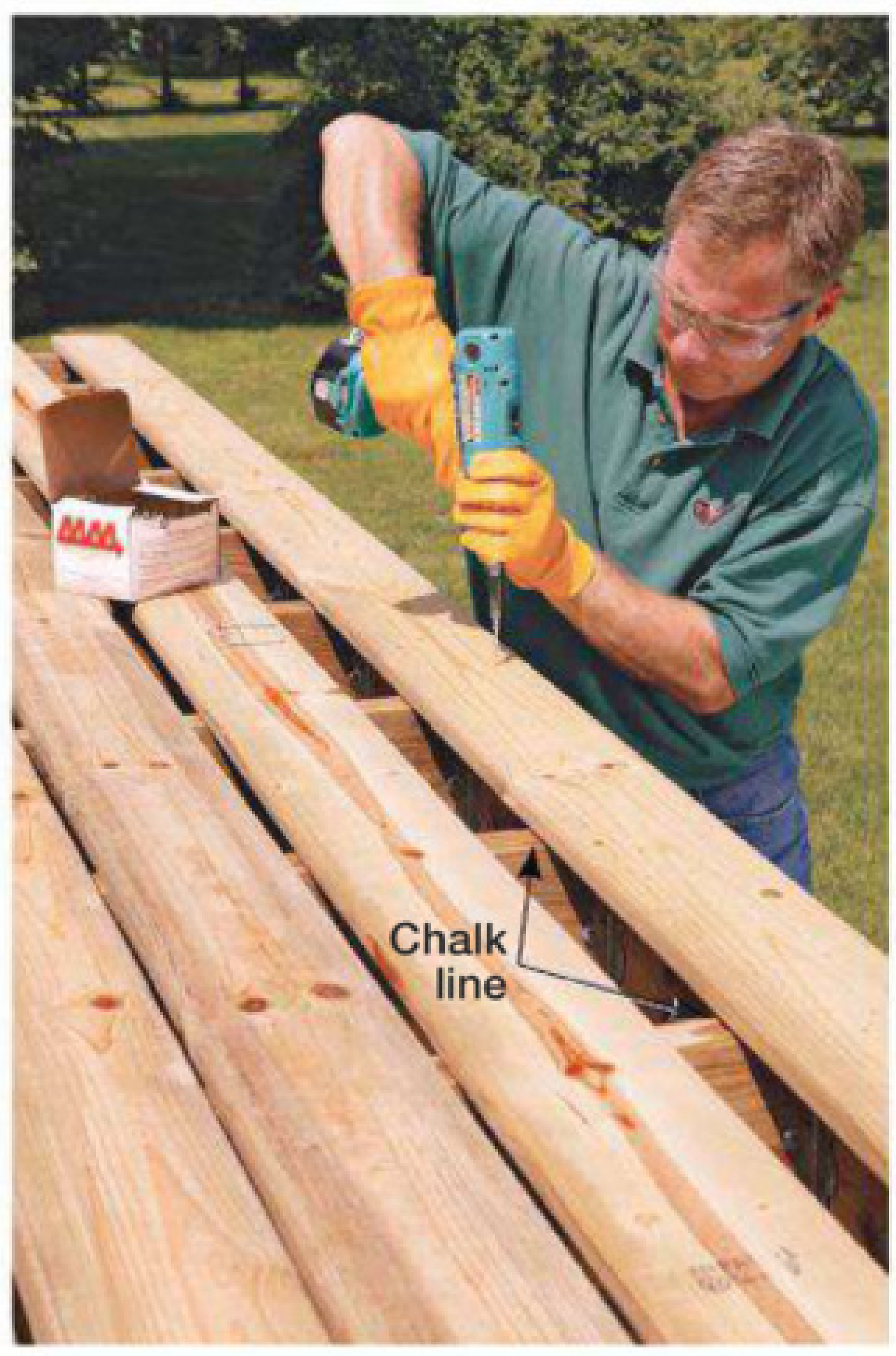
2 mark the bridging
Tack a 1×4 on top of each joist near the chalk line (hidden by the 1×4 *above*) to space the joists as your plan specifies. If necessary, pull the joists into proper spacing before tacking on the board. Mark the location of the bridging, offsetting the marks as shown.

3 fasten the bridging
Measure the space between the joists and cut 2× bridging to fit. Don't cut all the 2× the same length—the thickness of the joists and the spacing between joists may vary slightly. Install the bridging with nails or screws on alternate sides of your chalk line. Fasten the joists to the beam with seismic ties.

install decking
to show off your project

Decking is the centerpiece of your new outdoor living space, gets the most use, takes the most abuse, and represents your deck's most visible elements. So after you've invested in the best decking to match your budget, you want to call upon your top-notch woodworking skills to make the most of the materials. No shortcuts!

For help in selecting decking materials, see *page 20* and the tips at *right* for more information about lumber.



1 mark the starter board
Measure from the house to the point where the inside edge of the starter board will fall, and mark both rim joists at this distance. Snap a chalk line between the marks. Remember that the position of the first board will depend on whether you will overhang the decking or install fascia.

2 attach the starter board
Lay out the decking boards loosely on the deck. Align the starter board with the chalk line and drive two deck screws centered on each joist. If you have joints in the starter board, fasten 2× cleats to the sides of the joists for additional support at the joints.

tips to better decking

Decking is one of the most visible elements of your deck, so install it with care. Because naturally resistant woods and KDAT (kiln dried after treatment) lumber won't shrink much, they need a uniform ⅛" spacing. Make a spacing jig to speed the job (see *next page*). PT lumber will shrink after you install it. Fasten PT boards without spacing.

If you install parallel decking, start with the first board next to the house or at the outer edge of the deck. Your decking may not come out exactly, because of board and spacing widths and the size of your deck, so you may need to rip the last few boards to fit. If you want to hide the size adjustment, install the full-sized starter board at the edge of the deck, and finish with the ripped decking next to the house, where it will be less visible. For diagonal and other decking patterns that begin in the center, you may need to reduce the width of deck boards as you approach the edge.

To make the pattern more attractive, offset the joints so they do not fall in a straight line. Center the end of the decking on a joist, and attach cleats to the joist so you can keep the fasteners away from the ends of the boards.

you'll need

TIME: Five to eight hours for a 12×16' deck, longer for complex patterns
SKILLS: Measuring, cutting, fastening
TOOLS: Tape measure, circular saw, hammer, screw gun or drill, chalk line, pry bar, layout square, random-orbit sander

pretreat the frame and decking

If your lumber and decking were not pretreated, apply water repellent. Start with the joists, posts, and framing—it's much easier to treat them while they're still exposed than to treat them from underneath the deck later.

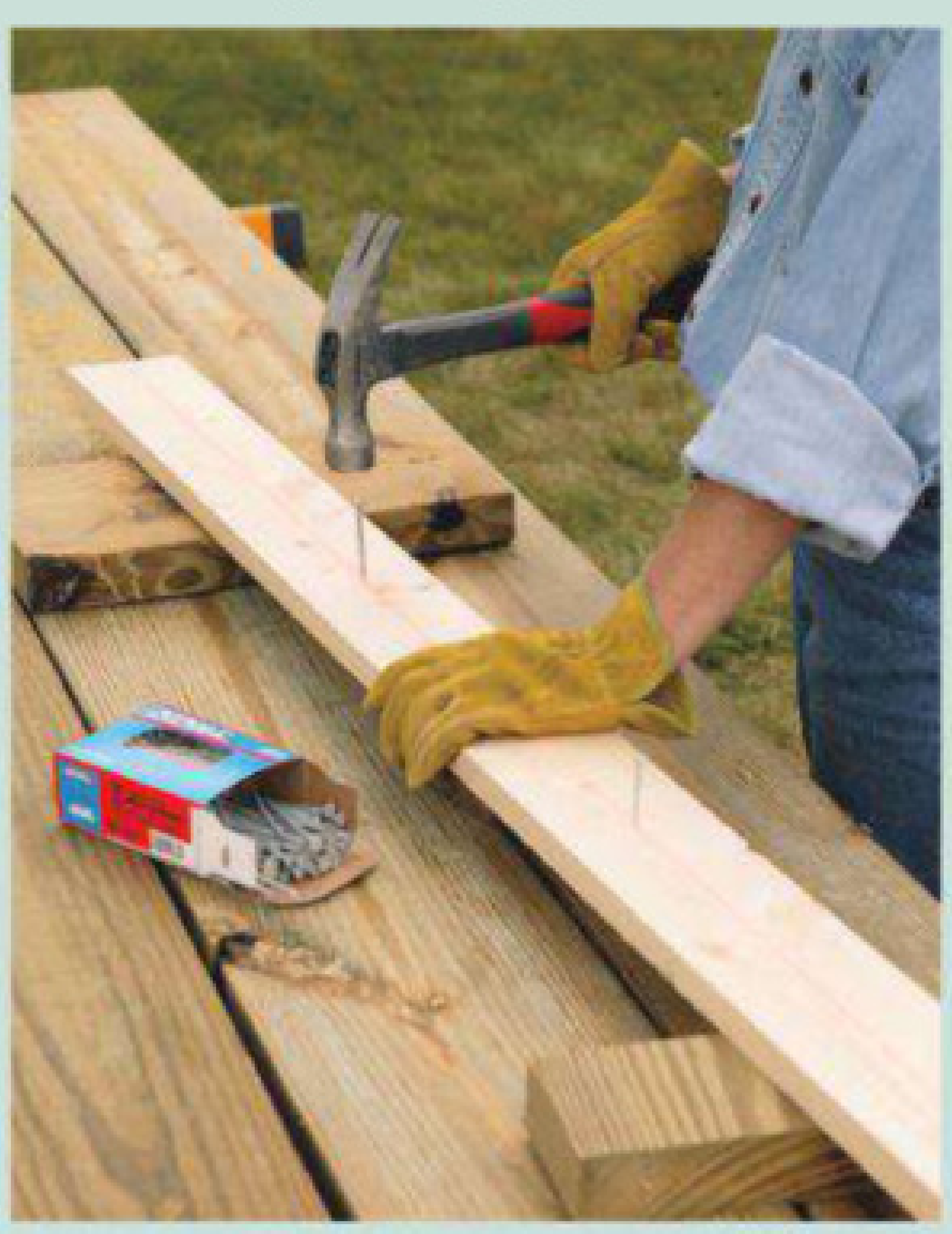
The day before you install the decking, spray both sides of the deck boards and let them dry. Now, begin assembly.

Install decking

3 space the boards
Set a spacing jig, as described *below*, against the starter board and pull the next decking board against it. Fasten the second board to the joists, moving the spacing jig along its length as you go. Make sure the decking joints are centered on the joists and strengthened with 2×4 cleats fastened to both sides of the joist under the joint. Drill pilot holes in the decking (especially near the ends) to minimize splits. Angle the screws slightly toward the joist to strengthen the connection.

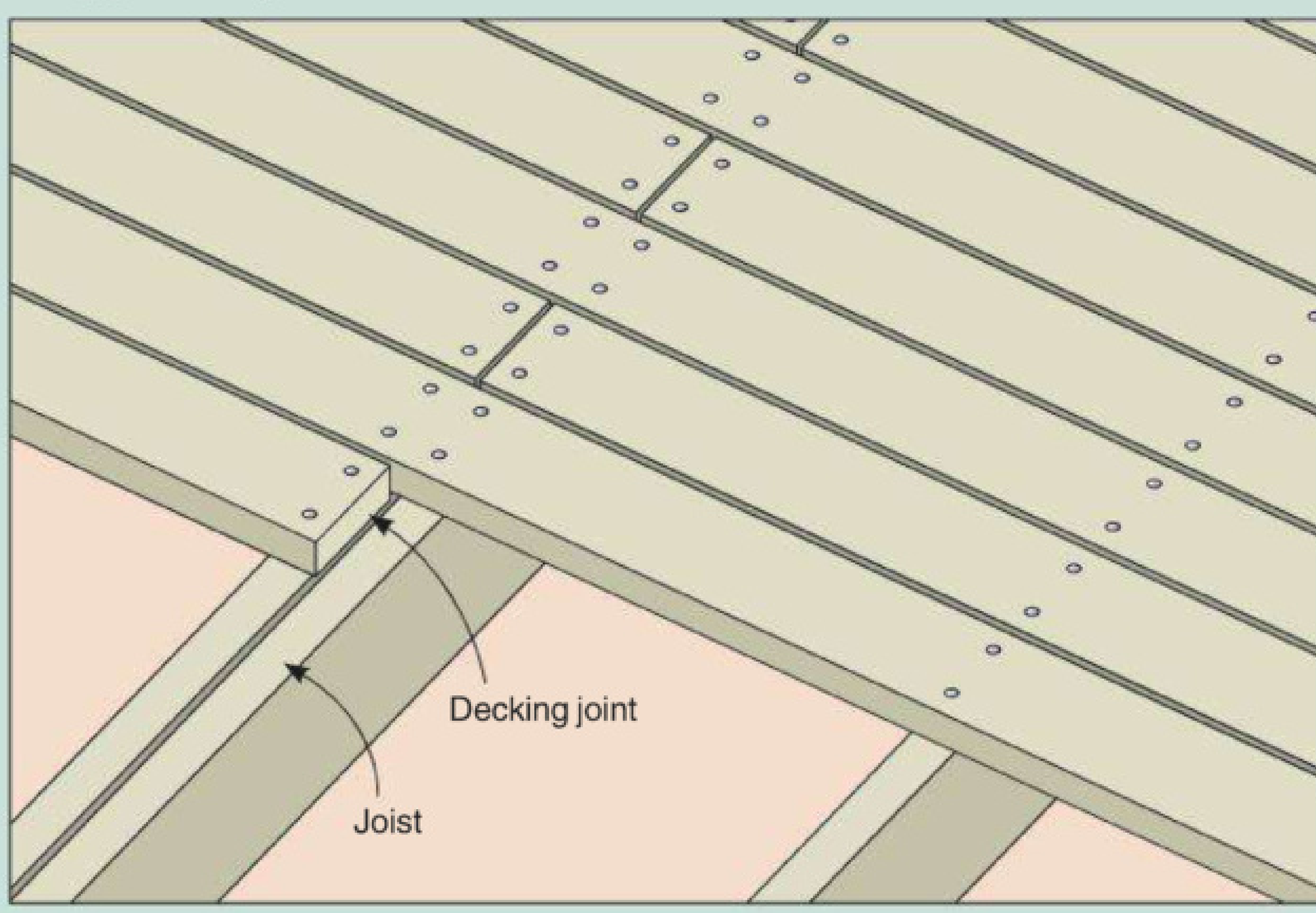
4 check the spacing
The width of a decking board may vary along its length. One odd board won't make a difference, but several could throw the boards off parallel over the span of a deck. Measure the distance from the house to the board every third row. Adjust the spacing to keep the decking parallel. Snap a chalk line for reference.

make a spacing jig



To space decking evenly, make a spacing jig from a 1×4 and 10d nails spaced the same as the joist spacing (16", for example). Center and drive the nails about 1" through the 1×4. Blunt the tips of the nails so they're less likely to mar or snag on the decking.

stagger the joints



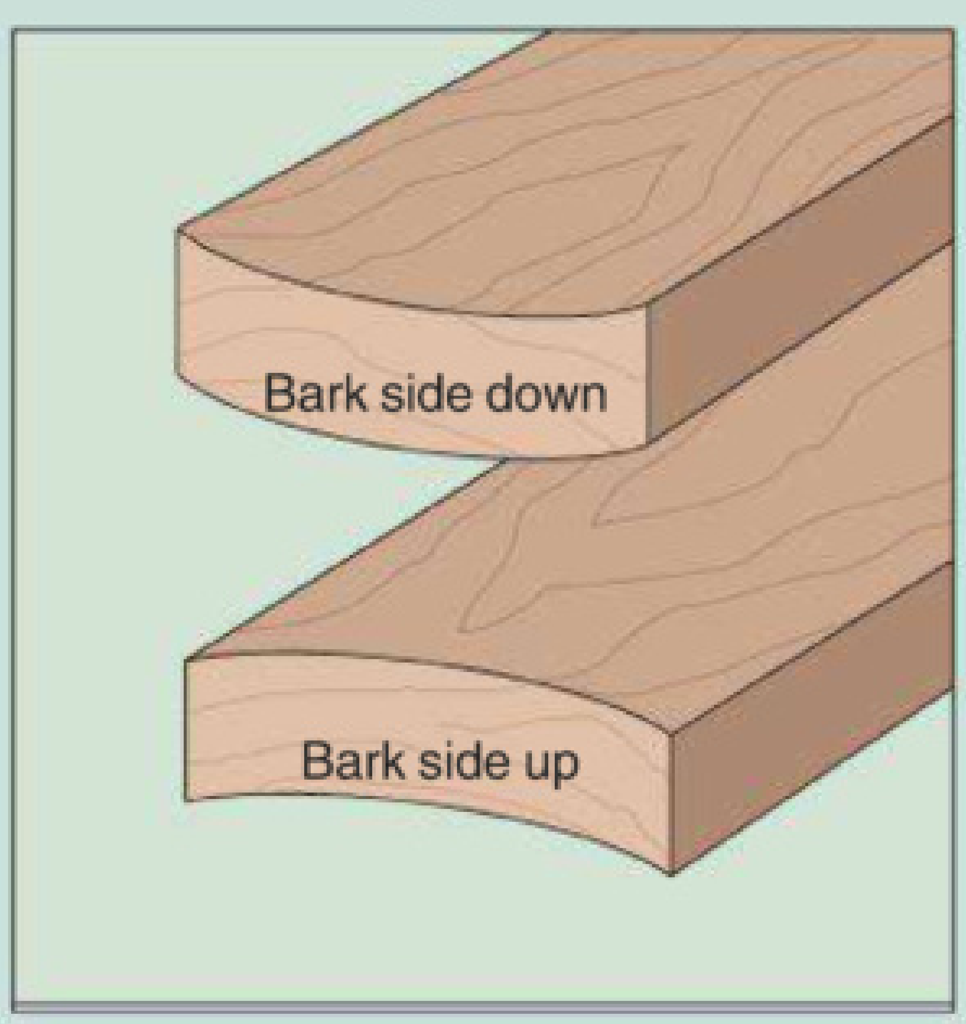
Long boards can span a small deck without joints. However, a long deck (certainly one more than 20' long) will have joints. When you fasten the decking, alternately offset the joints as shown *above*. Butt the ends of the board tightly; the boards will shrink over time.

5 straighten bowed boards

To straighten a bowed board, first start one fastener in the board at one end. Then drive the blade of a pry bar solidly into the joist and force the decking into place. Hold the board in place with one hand, and drive the fastener with the other. Then drive the second fastener.

To push a bowed edge away from an adjacent board, start the fastener and insert a pry bar between the boards. Protect the edge you're prying against with a wide putty knife, as shown *above right.* Force the board into position, and hold it. Then drive the fasteners.

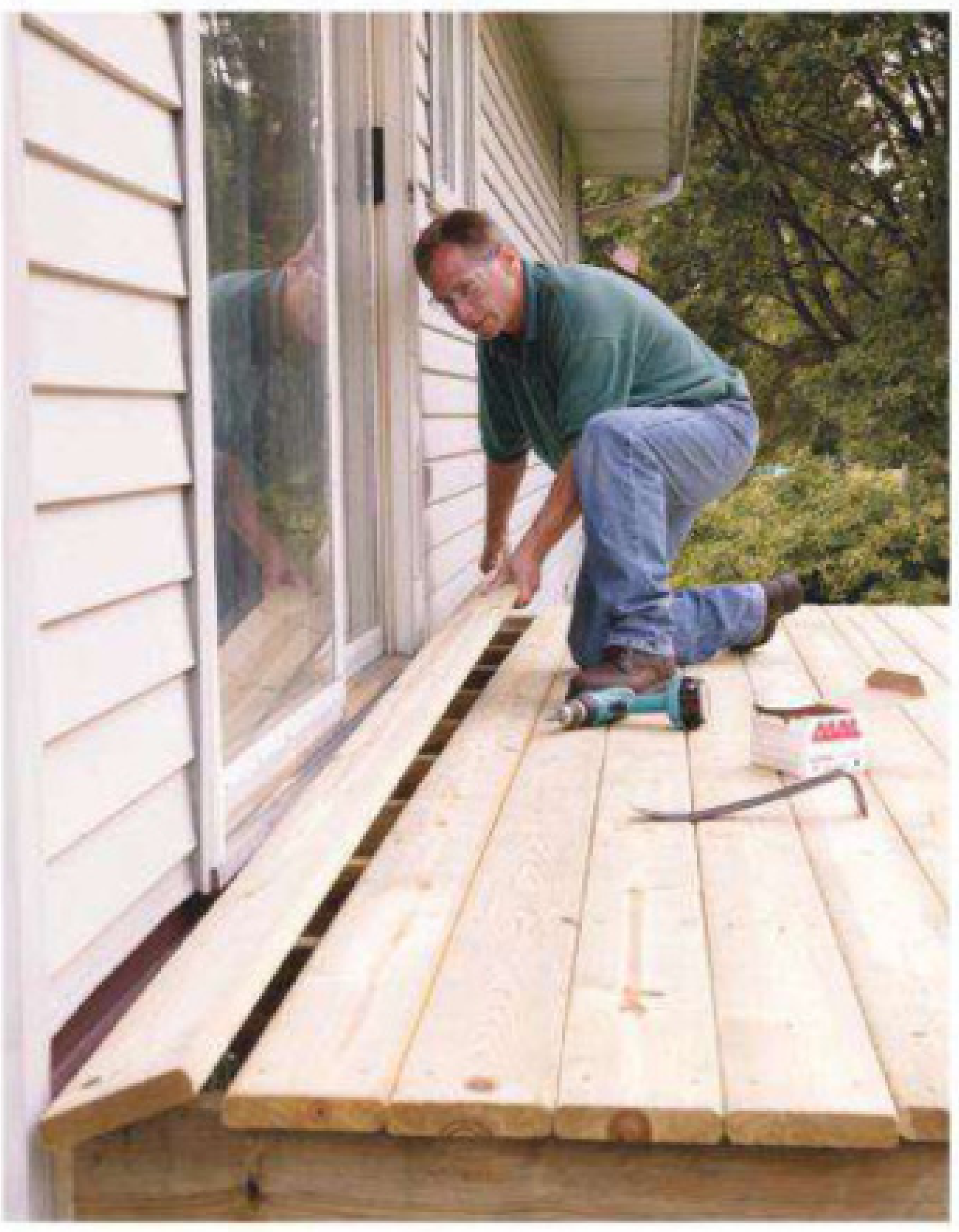
which side up?



Traditional advice is to install decking with the bark side up so water will drain more quickly. It's been debated for about 30 years. Some studies show that decking installed with the bark side down is less likely to develop splits. Other research says it doesn't make any difference. A practical compromise is to put the best side up and apply an annual coat of water repellent.

straightening the stubborn ones

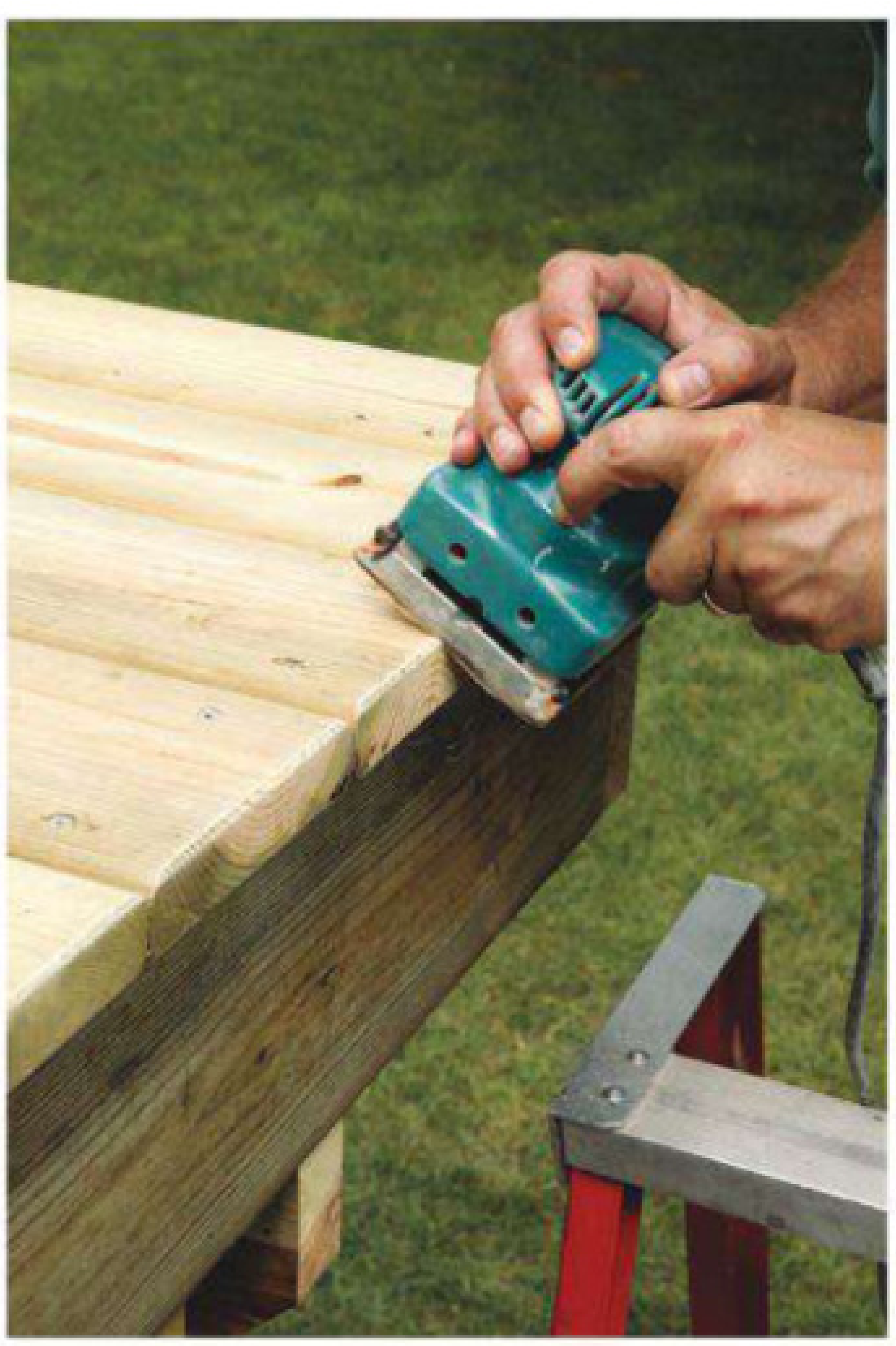
Sometimes, even a pry bar won't straighten a bowed board. The best way to prevent this, of course, is to leave these boards at the lumberyard. But if one of them has slipped by you, don't throw it away. You probably can straighten it with a long bar clamp designed to hold together wide glue-ups for tabletops and the like. Set clamp head against the 90° fulcrum end of the pry bar inserted into a space between the decking. Position the clamp screw against the bowed board. Turn the screw to force the board into place, then fasten it.



6 adjust spacing in the home stretch When you get within three-boards of the last one, lay them loosely with ⅜" spaces. If the last board fits, fasten all three. If not, lay two and trim the last one, or rip the excess width evenly from all three.

7 fasten the last board
Cut the last board to length, including any overhang. You can trim it with a handsaw after it's in place, but cutting it first is easier. Position the board with the proper overhang on both ends, then fasten it.

8 trim the overhang
Mark the overhang on the face of both the starter board and the last board. Snap a chalk line between the marks. To trim the overhang, tack a straightedge (1×6 shown *above*) to the deck to guide your saw blade.



9 bevel and seal the edges
Produce a professional-looking edge by beveling it with a palm (shown *above*) or random-orbit sander, or a sanding block and 80-grit paper. Seal the cut edge of the decking before installing the railing.

notch decking for posts

1 outline the notch
Set the decking board against the post, then mark the edges of the notch on the decking, adding ⅛". Measure and mark the depth of the notch, then lay out all sides with a layout square.

2 cut and fasten
Cut the notch with a jigsaw and test-fit the cut. Fasten 2× cleats on to the posts (both sides of the notch) to provide a solid attachment surface. Fasten the board to the joist and the cleats.

rise to the top

step-by-step stair building

Almost all building codes have strict standards for stairs. Exterior tread dimensions are often afforded a little latitude, but codes are quite strict about stringers, materials, and overall construction.

Before you start designing your stairway, review stair-building terminology—it can seem confusing at first. Total rise is the vertical distance from the bottom of a landing surface to the top of the deck (see *page 64*). Unit rise is the height of one step. Total run is the horizontal distance the stairway travels. Unit run is the horizontal depth of one tread from front to back.

After code compliance, the most important requirement for outdoor stairs is to make a gradual ascent—short risers and deep treads enhance the safety and comfort of the stairs.

A 3' width is the standard minimum, but you may find that a 4' to 6' width is more comfortable without adding much to your costs. Use three stringers on stairs 3' wide, and add a stringer for every 2' of width. (The photo *at right* was shot before installation of balusters and rails.)

you'll need

TIME: Two to three days to lay out and pour the concrete pad; five to seven hours within that time to lay out, cut, and attach stringers to the deck and treads to the stringers
SKILLS: Working with concrete, measuring, leveling, accurate cutting and fastening
TOOLS: Hammer, straightedge, tape measure, pencil, framing square, level, circular saw, jigsaw or handsaw, sander

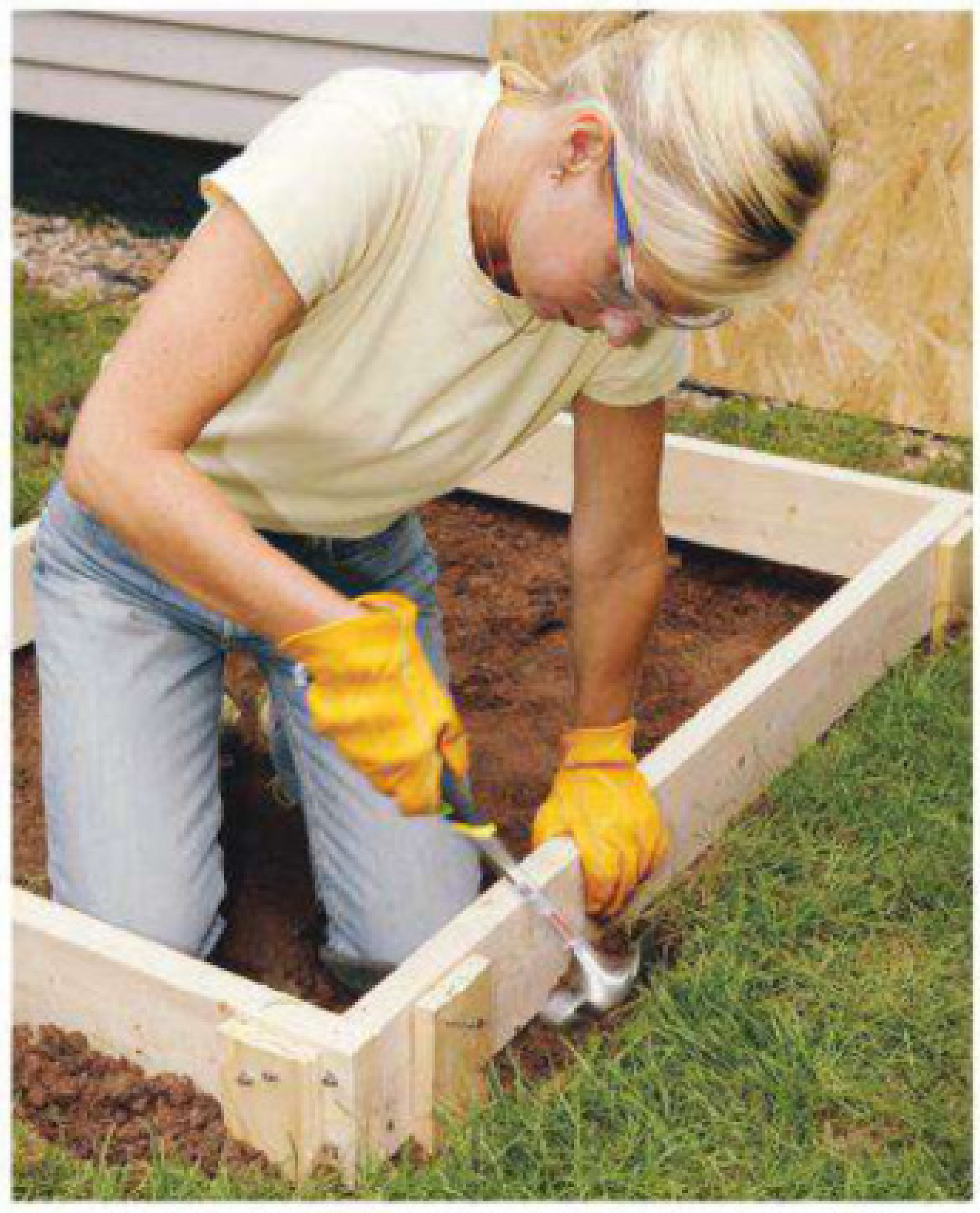
access and design

Stairs serve many purposes in deck designs. They provide access to and from the deck—both to the surrounding landscape and to other levels of the deck. They can greatly increase the seating area of your deck and can be important elements in its style. Stairs come in many forms, from simple, straight-line structures to elaborate multilevel additions with landings. You can install them with or without a landing, but a concrete pad will provide a solid base and a guaranteed long life.

measure the rise and run

Measure the rise and run both to establish the landing location and the cuts on the stringers. On a level yard, measure the rise down from the deck to the ground, and the run from that point to the pad. If the yard slopes (and most do), set a level and long board on the deck, and measure down to the soil at the location of the pad. Then calculate the individual rise and run (*page 64*), and adjust the location of the pad to make the steps more comfortable.

building a landing



1 lay out and excavate
A concrete pad 3" to 4" thick should rest on 2" of gravel and should have reinforcing wire mesh. Lay out the site with a 4×8' sheet of plywood or batter boards and lines (*page 41*). Excavate 6" deep.

2 build the forms
Use 2×6 lumber to build forms, cutting and staking each piece as you go. Drive the stakes flush or below the tops of the forms so they won't interfere with the screed when you level the concrete (Step 5). Square the corners with a framing square.

3 level the forms
As you build them, level the forms and make sure their edges are flush at the corners. Then shovel in crushed gravel and tamp it. You won't need a power tamper for this small site; make a plywood tamper with 2×4 handles. Tamp the gravel to 2" deep.

4 backfill, reinforce
Backfill the forms to stabilize them. Lay wire reinforcing mesh over the gravel. Set the wire on dobies (from your home center) to keep it at the right height, or pull it up with a rake when you pour the concrete. Oil the forms with motor oil. (See Step 7 for details.)

5 screed the surface
Mix the concrete in a wheelbarrow (*page 45*) and shovel it into the excavation. Then screed the surface (level it) by pulling a long 2×4 across it, seesawing the board. Screed again if necessary and fill in low spots.

6 slip-proof the pad
Smooth the surface with a wood or metal float, working in wide arcs and keeping the leading edge of the float raised slightly. When the concrete has started to set up (it resists pushing with your thumb), drag a broom across it to make a nonslip surface.

7 separate the forms
Concrete will stick to wood forms like glue, sometimes even if you coat the forms with motor oil. To get them to pop off more easily, slide a pointed trowel between the forms to a depth of about 2".

8 edge the pad
A round edge on the pad will help prevent chipping. Insert an edger inside the forms, and work it back and forth, with its leading edge raised slightly. When the concrete has set, remove the forms and let it cure seven days.

choose the right lumber for stringers

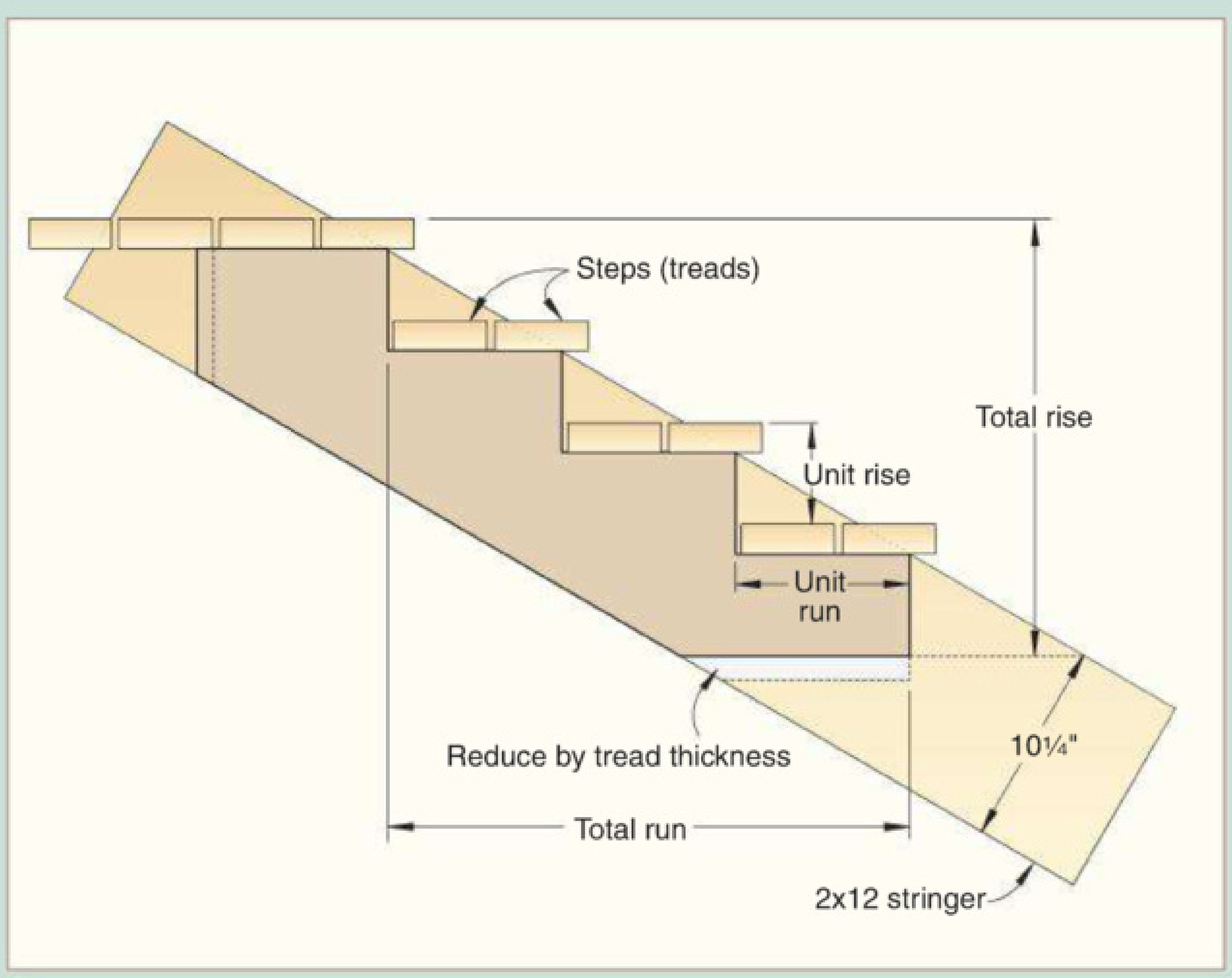
Stringers carry the weight of the stairs. Choose straight, clear 2×12s with maximum vertical straight grain. Clear lumber (without knots) is expensive, but it enhances the safety of the stairs.

step comfortably

For safe, comfortable stairs, apply this simple formula: Twice the unit rise (the height of each step to the top of the tread) plus its run (the front-to-back depth of the tread) should equal between 24" and 27".

A standard set of stairs has a unit rise of about 7" and treads of 11", for a total of 25".

rise & run: easy steps to getting it done right

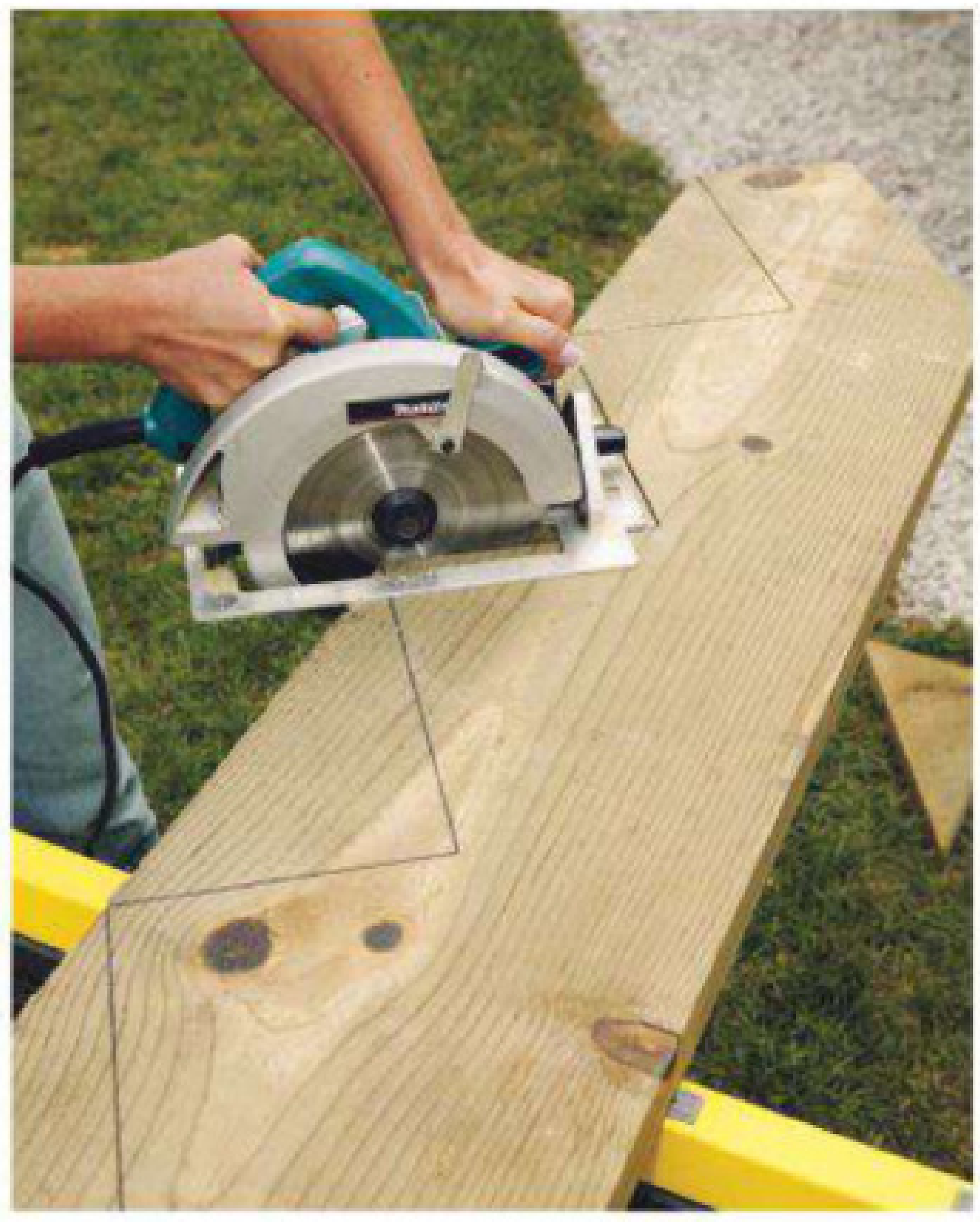


To calculate rise and run:

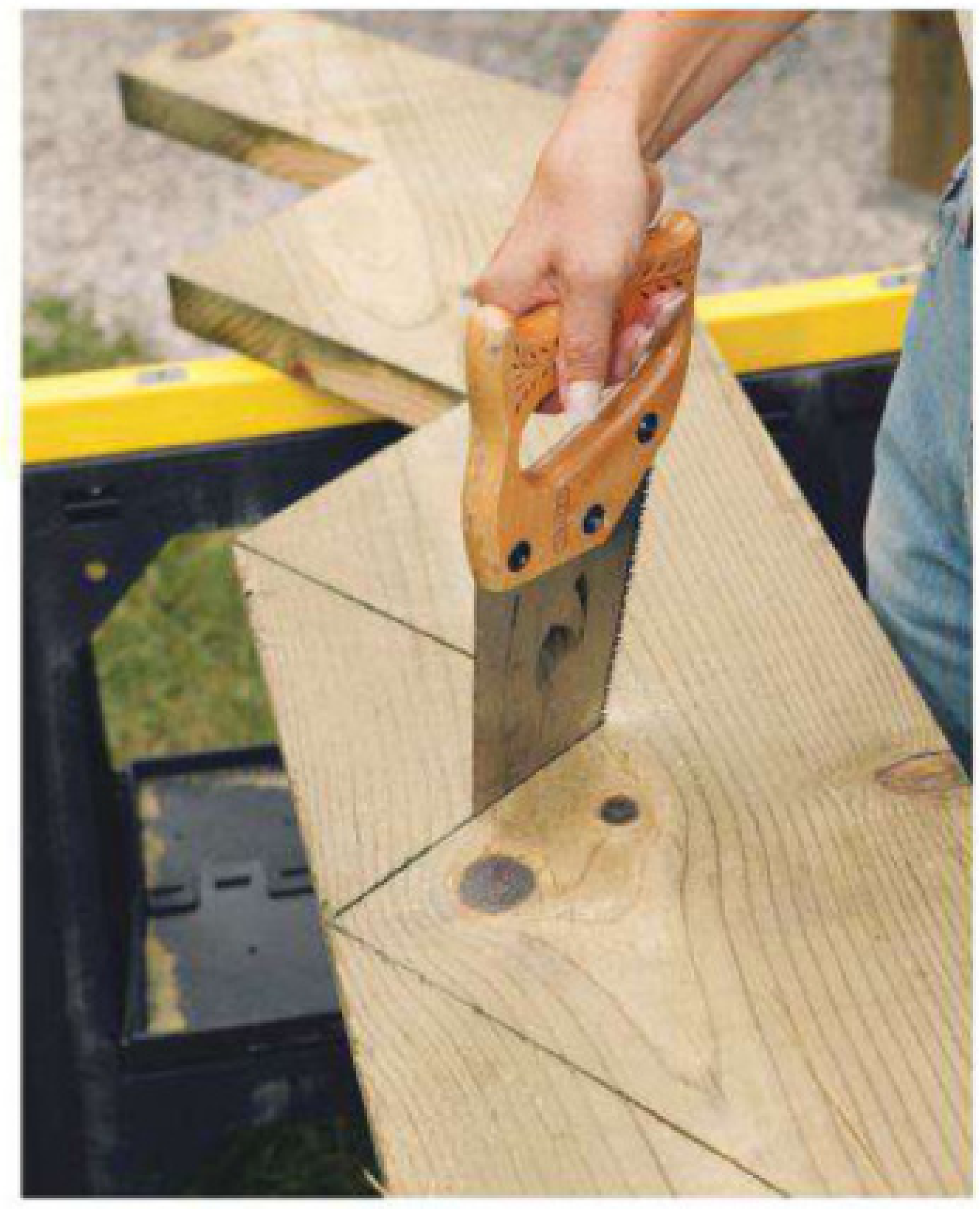
- Divide the total rise (say 58") by the unit rise you want (7" is standard). For this example, the result is 8.2.
- Round that to the nearest whole number, 8. This is the number of steps.
- Then divide the total rise (58) by the number of steps (8) to find the exact unit rise (58"÷8=7¼"). So each step is 7¼" tall.
- Now multiply the unit run (11" is standard) by the number of steps, minus one. (Remember, the last step is the deck surface.) In this case 11"×7 = 77".
- So the stairway will end 77" from the deck.

constucting the stairs

1 outline the stringer
Once you've determined the dimensions of the treads and risers, outline the stringer on a 2×12. Use a framing square with stair gauges, setting the tongue (the short side) of the square at the unit rise, and the blade at the unit run.



2 cut the outline
Cut the top and bottom of the stringer and test its fit between the deck and the landing. Then use a circular saw to cut the outline, stopping the saw blade just short of the intersection of the lines.



3 finish the cuts
Finish the cuts with a jigsaw or sharp handsaw, but don't cut deeper than the intersection of the lines. Keep the saw lined up in the circular-saw kerf.

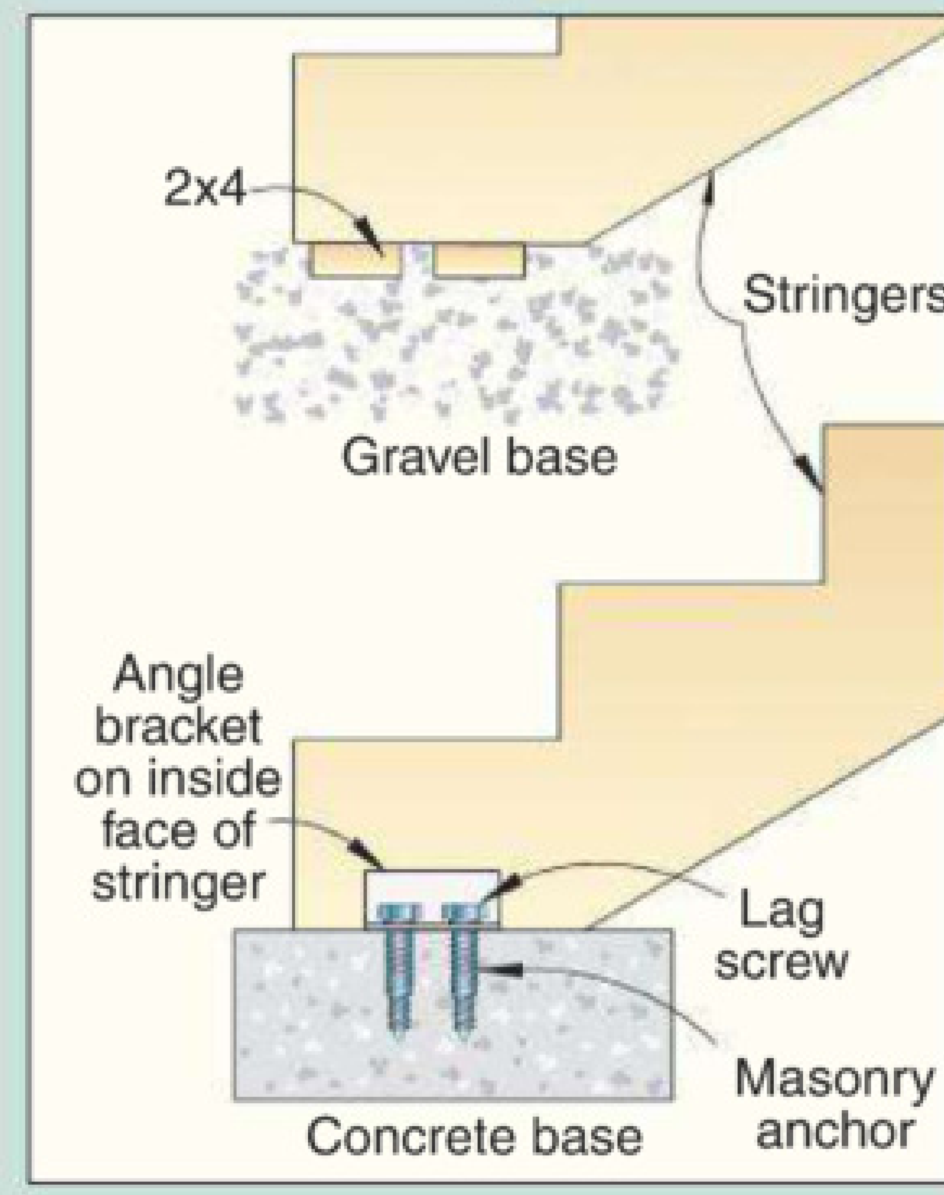
4 outline the remaining stringers
Set the cut stringer atop the second 2×12 and position it so you can make the same cuts. Clamp the boards together tightly, and use the cut stringer as a template to mark the second stringer. Hold your pencil at a slight angle to make sure it follows the outline of the cuts exactly. (Clamps removed for clarity.)

5 attach the stringers
Depending on your design, you will attach the stringers either to one of the outer joists or to a brace fastened below one of them. Mark the framing for both outside stringers, and snap a level chalk line between the marks. This line shows the tops of open stringers and the plane of metal cleats on closed stringers. (See *page 67*.) Square the stringers to the deck frame and attach them with framing angles.

6 add the toe-kick

There are several ways to anchor the bottom of the stringers ("attachment options," *right*). These stringers have been notched for a toe-kick—a 2×4 fastened to the concrete pad. Cut the toe-kick, and drill holes for lag screws, then position the toe-kick. Using the drilled holes, mark the pad with a small masonry bit. Remove the toe-kick, and drill the pad with a masonry bit to fit the lag-screw shields. Attach the toe-kick to the landing with lag screws, and attach the stringers to the toe-kick.

attachment options



Attach stringers to footing. On a gravel pad, attach two 2×4s to the bottoms of the stringers and drive landscape spikes through them into the gravel. On a concrete pad, space the outside stringers, equally space intermediate stringers, and attach with masonry anchors.

7 fasten the treads

If your outside stringers are open, cut the treads with a 1½" overhang on both ends. If the stringers are closed (*page 67*), cut the treads to fit between them. Attach the treads with deck screws—three per joint for a 2×12 or 2×10 tread, two for narrower boards. Fasten the treads to the outside stringers with nails or screws.

8 add a professional edge

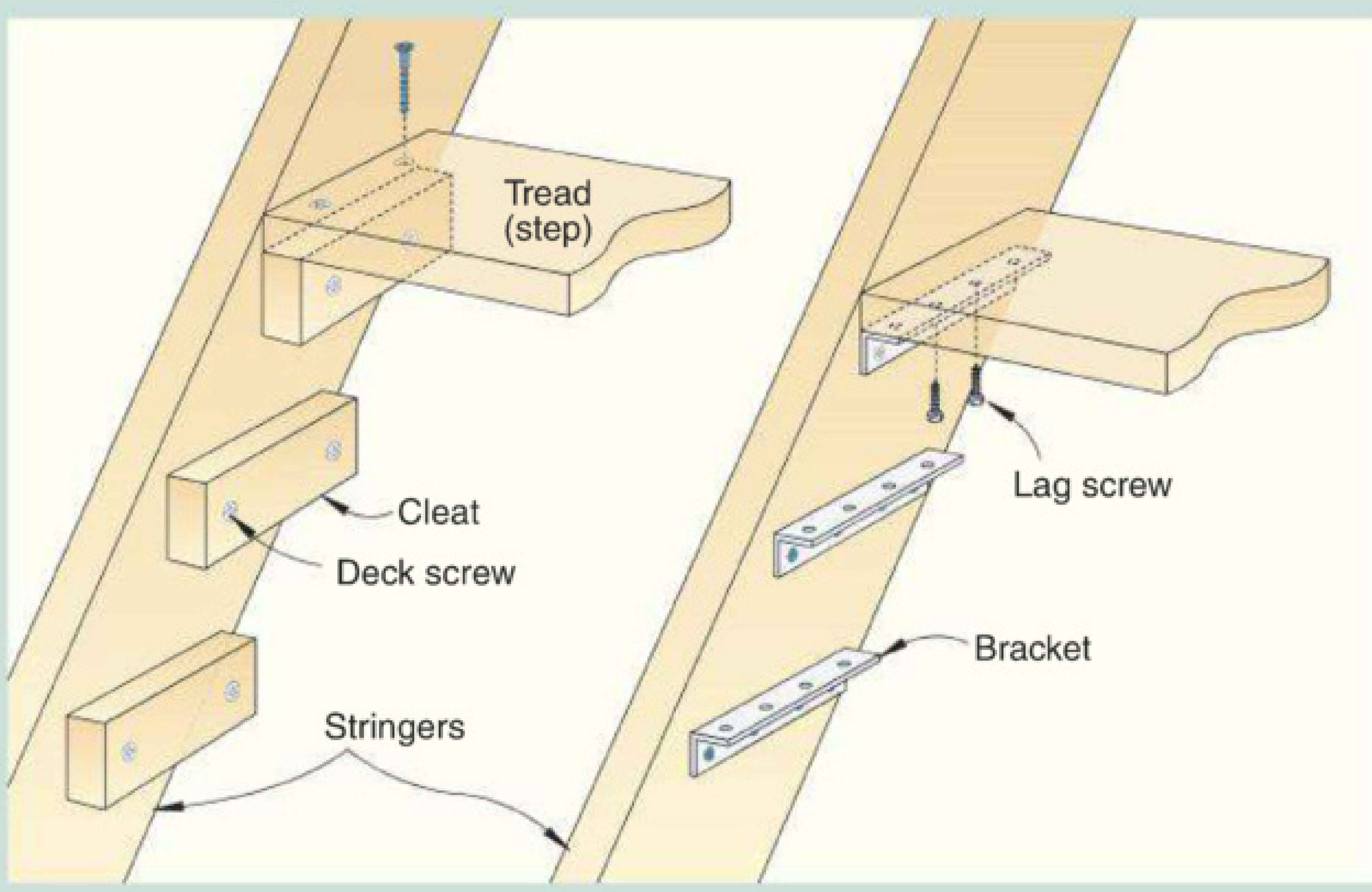
Once the treads are in place, chamfer the edges to improve their appearance. You can use a palm sander or a sanding block and 80-grit paper. A block plane also would work. Whatever the method, keep the chamfered edge as consistent as possible.

making closed stringers

1 outline the treads
Using a framing square and the same techniques for marking an open stringer (*previous page*), outline the tread locations on the stringer stock. Make the top and bottom cuts and test-fit the stringer between the deck and ground. You'll be able to position the stair cleats much easier (Step 2) if you outline the thickness of the tread and mark the location of the cleat.

2 attach stair brackets
You can fasten stair brackets to the closed stringers either before or after attaching the stringers to the deck. (Use brackets and fasteners required by your local code.) If you're doing it before, set the 2×12 on a work surface, with the brackets and fasteners within reach. Position one end of the bracket on the line, and drill one fastener hole. Drive the fastener at this end, line up the bracket, and repeat.

a solid stringer alternative



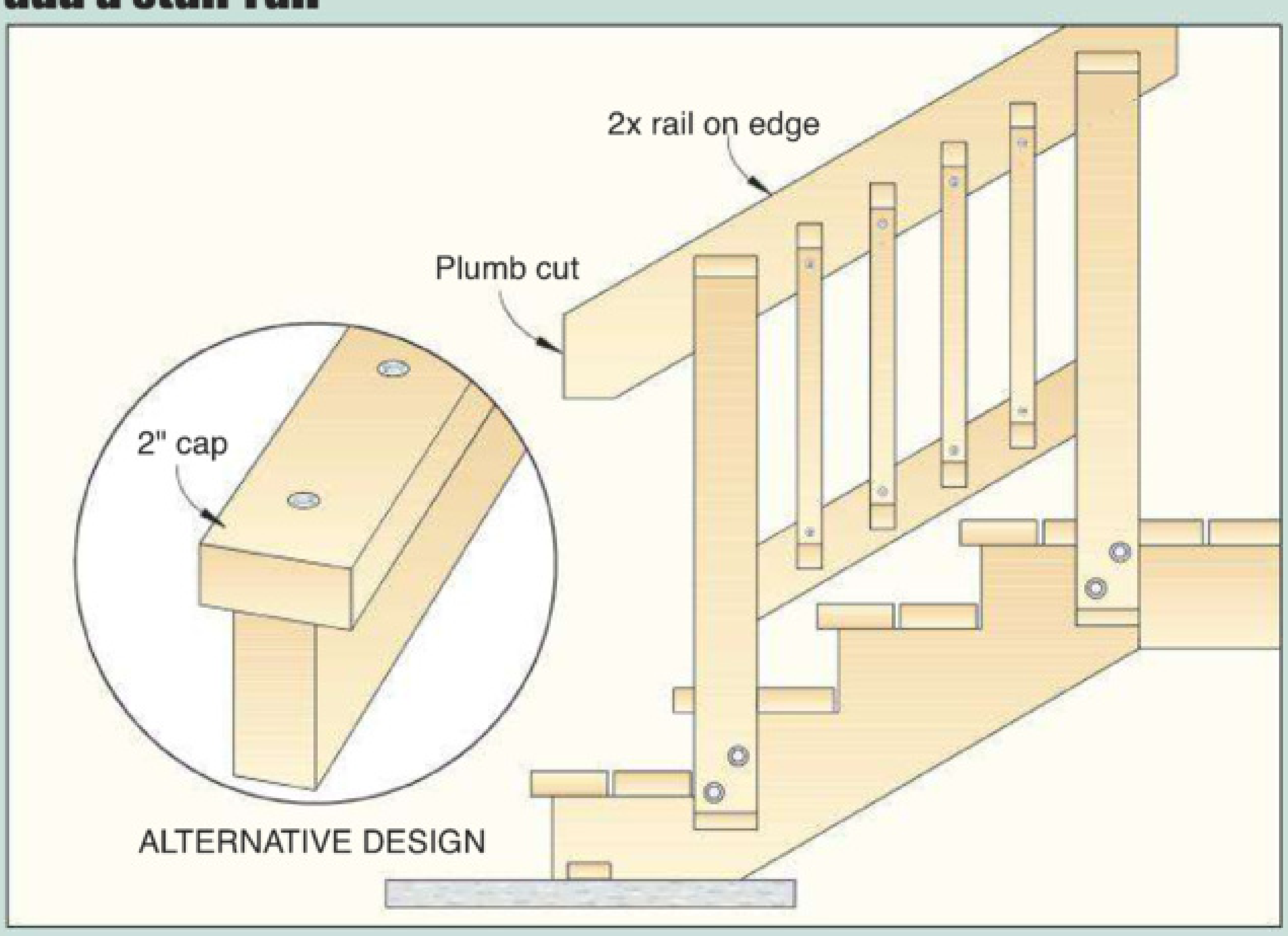
Depending on the width of the stairs, closed stringers may be used alone or with notched stringers in the middle of wider stairs. After you attach the stringers to the deck, you can fasten the treads either to wooden cleats or metal stair brackets. Brackets are fastened from underneath, which is more difficult, but leaves them less visible. Don't rely on screws driven from the outside of the stringer into the ends of the treads.

3 attach the stringers
Mark the framing for the top of the stringers and snap a level chalk line. Attach the stringers to the framing with framing angles, then square them. Fasten the stringers to the landing and the cleats to the stringers, if you haven't done so already.

4 attach the treads

Fasten the treads to the brackets with the fastener recommended by code. Depending on the height of the stairs and the amount of room underneath, this can be difficult. Always work from the top down to make it easier to reach under the treads. Fasten the ends of the treads first, then the middle brackets.

add a stair rail

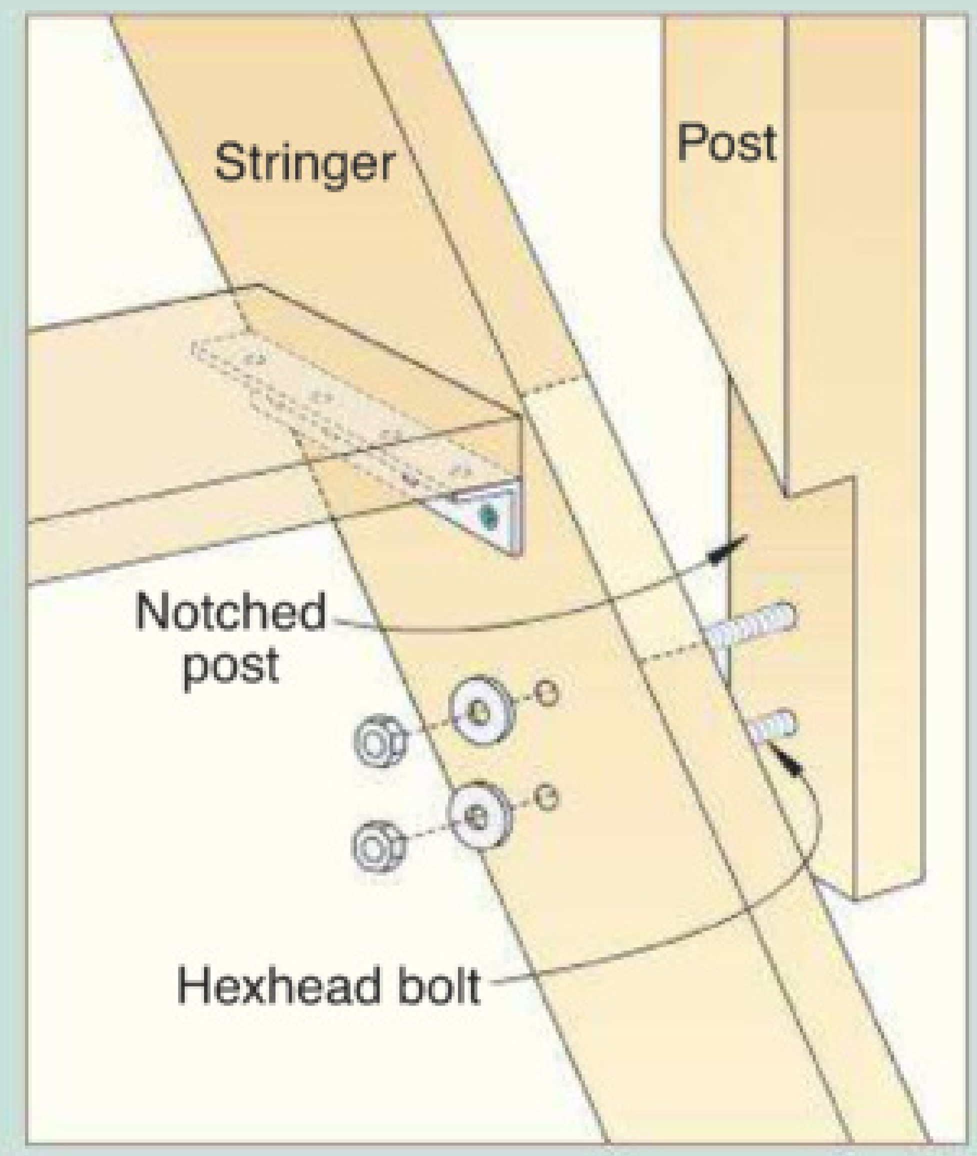


Match the stair railing with the deck railing style. Use similar balusters spaced at the same interval.

Handrails must be easy to grasp. Adding a 2× cap rail will make the stairway safer for you, your family, and guests.

Prepare and fasten posts and balusters the same way as for the deck railing (*pages 71–74*). Make plumb cuts on the top rail.

notching a post



If posts support both the stringer and a stair railing, consider notching the posts to improve the looks of your stairs. Set the post in place, plumb it, then mark the intersection of the stringer and post. Cut the notch and fasten with carriage bolts.

caution

FOR COMFORT AND SAFETY, ADD HANDRAILS

Municipal codes generally require a railing on stairs containing three or more risers. But all stairs can be made safer by adding a railing. Everyone understands the added security of having a solid object to grasp when moving from one step to the next. Railings are important if your deck is going to be used by the very young or old. Think safety even if your deck has a one-step level change. Avoid stumbles by adding a strip of yellow reflective tape to steps for greater visibility.

basic brick projects

Installing brick pavement is well within the abilities of do-it-yourselfers.

before you begin...

Drainage: Be sure to grade the area with a pitch of about 1" per 4', away from any adjacent building.

Edging: Pressure-treated wood can be used as edging for simple projects with straight edges. Brick-edging products (plastic, aluminum, and steel are choices) are required any time you have curves, and they also offer greater longevity. It's usually easiest to install edging along one or two sides, lay brick, and then finish the edging. Note: The barbecue pad illustrated here was so small that a complete frame was constructed in advance, but this is not typical.

Cutting: Brick can be cut using a type of chisel called a brick set. For minimal cutting, this might be all you need. But saws provide a cleaner cut and also are easier to use, so they're recommended for projects that require a lot of cutting. Appropriate saw blades can be purchased for circular saws. Alternatively, you can rent wet saws with diamond blades; these are easy to use and minimize dust.

Base material: Several types of base material can be used for brick paving. Road base is as good as any, and you can purchase it in bulk from most materials suppliers. You can buy base by the bag at home improvement centers, but this form will cost more.

1 excavate
Outline the shape of the area to be paved. Excavate at least 6" beyond the edges of the area. The thickness of the brick, added to 4" of base and 1" of sand, equals about 8", so you'll need to excavate about 7" deep. (You want the pavement to be about 1" above grade for drainage.) Dig only as deep as necessary, because backfilling with loose soil may lead to settling. After excavation, the ground should be firm, fairly smooth, and slightly pitched for drainage.

2 add base
Four inches of base is adequate for most patios and paths; in northern climates, use 6". Extend the base material 6" past the intended edge of the pavement. Level the base, keeping it more or less uniform in depth, and then compact it. A manual tamper, shown here, is acceptable for small areas. For larger areas, it's worthwhile to rent a vibrating compactor.

The do-it-yourselfer's most common mistake is using inadequate base. Scraping off the grass and laying brick on 1" of sand is a sure path to a poor-quality patio. For brick paving that lasts many years without problems, prepare 4" to 6" of base material.

4 laying the brick
Start laying bricks in one corner or along one edge, and work your way across. Place the bricks onto the sand and gently tap with a rubber mallet for minor adjustments. A slight gap (⅛" maximum) between bricks is beneficial, so don't worry about entirely eliminating the gaps. If necessary, work from on top of the bricks you've already laid so you don't disturb the leveled sand. When finished, secure the remaining edging according to product instructions.

3 add sand

Add 1" of sand on top of the base. Then, screed the sand to create a level bed on which to lay the pavers. A notched 2×6 board, shown *above*, makes an effective screed if a single piece can span from one edge to the other. For larger areas, lay lengths of 1" pipe on to the base before adding sand. Then, drag the screed board over the pipes to level the sand. (Don't forget to remove the pipes.) Avoid walking on the freshly leveled sand.

Photographers: brick patterns, Andy Lyons; all others, Pete Krumhardt.

5 fill seams

The last step is to spread a light layer of sand onto the brick and sweep it over the seams with a broom. Move the sand back and forth across the bricks until the seams are filled. This helps lock the pavers together. Sweep off excess sand, but do not wash or blow it off, which would scour the sand out of the seams.

maintenance

Brick requires little maintenance, but one issue that often arises is moss and algae growth. Some people like moss on their bricks, but if you're not one of them, annually scrub the brick with a stiff broom or brush, using a solution of water and bleach in a 1:1 ratio. This will minimize unwanted growth.

Another issue is weed growth. While it's inevitable that some weeds will manage to germinate and grow between bricks, they're usually easy to pull by hand or with a hand tool. Use a general-purpose weed killer or, for a chemical-free solution, boiling water. Either way, you won't harm the brick.

Avoid using pressure washers and high-power leaf blowers on your bricks—they scour sand out of the joints.

pavement patterns

Brick can be laid in various patterns, according to personal preference. All are suitable for durable, attractive pavement. One practical difference is the amount of cutting required along straight edges.

Basket Weave
A classic pattern that installs with little or no cutting.

Running Bond
A simple pattern that requires cutting half bricks on the edges.

Stack Bond
Though plain, this pattern is easy to lay and requires minimal cutting.

Herringbone
An interesting pattern, but one that requires more cutting.

install railings

Railings do more than add a safety feature to your deck. They establish the style and the limits of the space. Your local building codes will define standards of a safe deck railing, as shown at *right*. But those standards probably won't affect your nearly endless number of design choices and construction techniques.

The most common railings are similar to a traditional picket fence. A typical framework consists of 4×4 posts bolted to the outer joists, spanned by 2×4 rails and a 2×6 cap rail, with the balusters providing the infill and much of the style.

The photos on these pages show a simple, attractive design, and like most railings, the rails are attached first, then balusters, then the cap rail.

When installing the posts, the deck overhang can get in the way, but you can either notch the posts or notch the decking so the bottoms of the posts rest flat against the joist. Notching the decking reduces the possibility of weakening the posts.

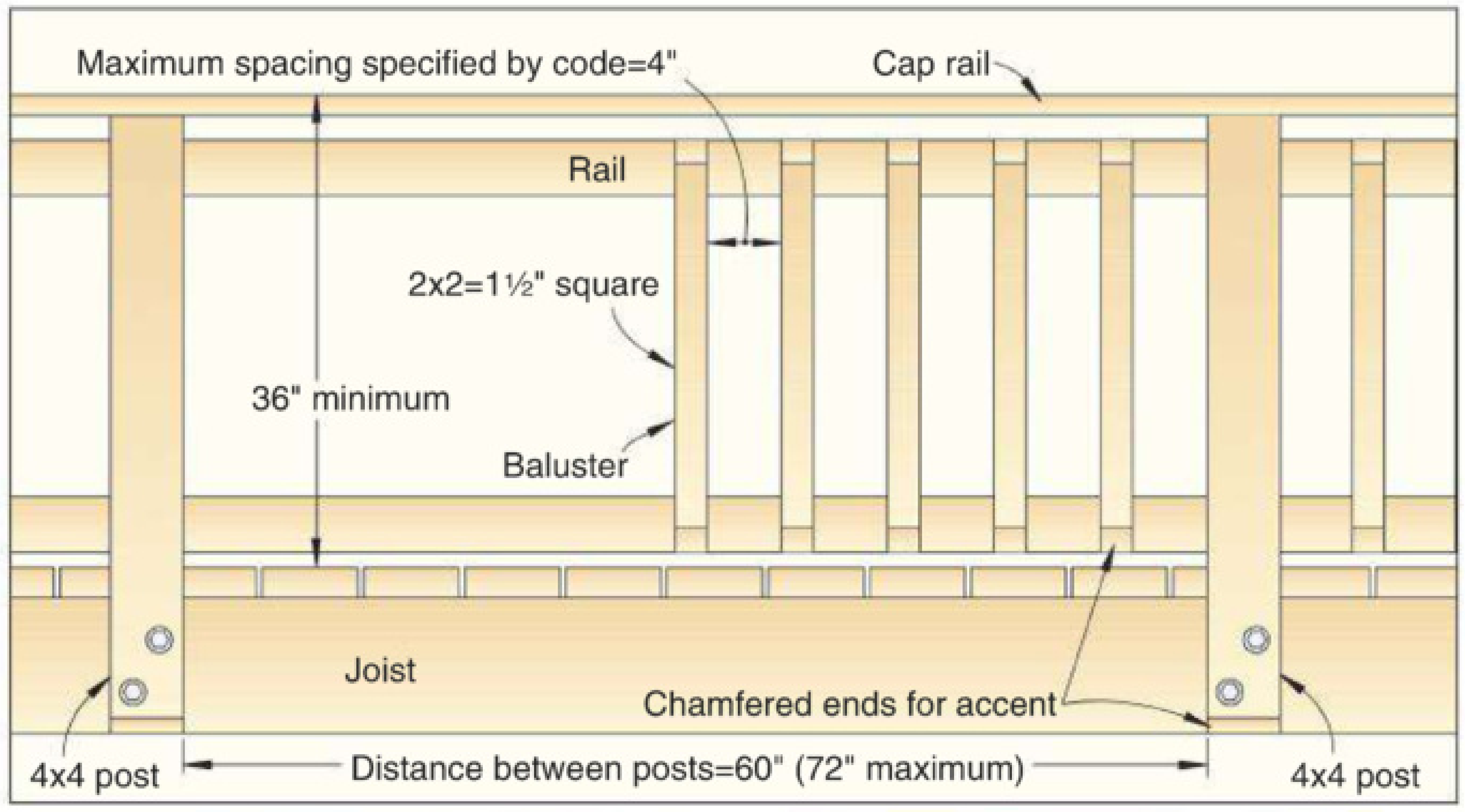
To prevent sagging railings, keep the spans between posts at 6' or less, and use rails-on-edge designs. Bolt each post to the frame with two 7⁄16" bolts. Creating level lines is especially important because railings are seen against the background of the house. Use a water level—not a line level or level-and-long-board—to place railing elements.

calculate baluster spacing

Building codes specify the maximum baluster spacing. Here's how to calculate uniform baluster spacing.

Add the width of one baluster (here, 1½") and the maximum spacing (4"). Divide this total (5½") into the distance between posts to find the number of balusters: 60"÷5½"=10.9. Round up to 11 balusters.

Then calculate the actual spacing. Multiply the number of balusters (11) by the baluster width (1½"): 11×1½"=16½". Subtract that from the distance between posts (60"): 60"-16½"=43½". Divide this by the number of spaces, which is always one more than the number of balusters, to determine the final spacing between balusters: 43½"÷12=3.625 or 3⅝".



1 gang-cut the posts

Cut your posts to a height equal to the height of the railing plus the thickness of the decking and width of the outer joists—less the thickness of the cap rail. Build a jig so you can cut posts to the same length. Chamfer the bottoms of the posts as an accent.

2 mark the bolt holes

Mark the location of the bolt holes—about 1" in from the sides of the post and 1½" from the top and bottom of the joist. Stagger the holes to reduce splits. A template will keep the holes consistent. Then drill holes the same diameter as the bolts.

you'll need

TIME: About 16 hours to build railings for a 12×16' deck
SKILLS: Measuring, cutting, fastening, leveling
TOOLS: Circular saw, mitersaw, jigsaw, post level, 4' level, 2' level, drill, spade bits, twist drill, socket wrench, spacing jig, hammer, water level, chisel

3 notch the decking
Measure each post before you mark the notch on the decking—the width of pressure-treated stock is often inconsistent. Mark the sides of the notch ⅛" wider than the post so you don't have to force it to fit. Use a jigsaw to notch the decking. Number each notch and its corresponding post on masking tape.

4 attach the posts
Hold each post in position and have a helper plumb it with a post level. Whether working alone or with a helper, clamp the post to the joist. Using the holes in the post as a guide, drill holes of the same size through the joist. Insert carriage bolts through the holes, and tighten washered nuts with a socket wrench.

5 attach the rails
You can attach rails flat or on edge, with toenailed fasteners, wooden cleats, or metal brackets. Whatever method you use, drill pilot holes to prevent splitting.

anchoring the end of the railing

Instead of fastening a post where the deck meets the house, use a 2×4 end rail. Cut the 2×4 to the height of the railing and fasten it to the house with 5" lag screws and washers. This connection is far sturdier than a post fastened to the joists and will add stability to the entire length of the railing.

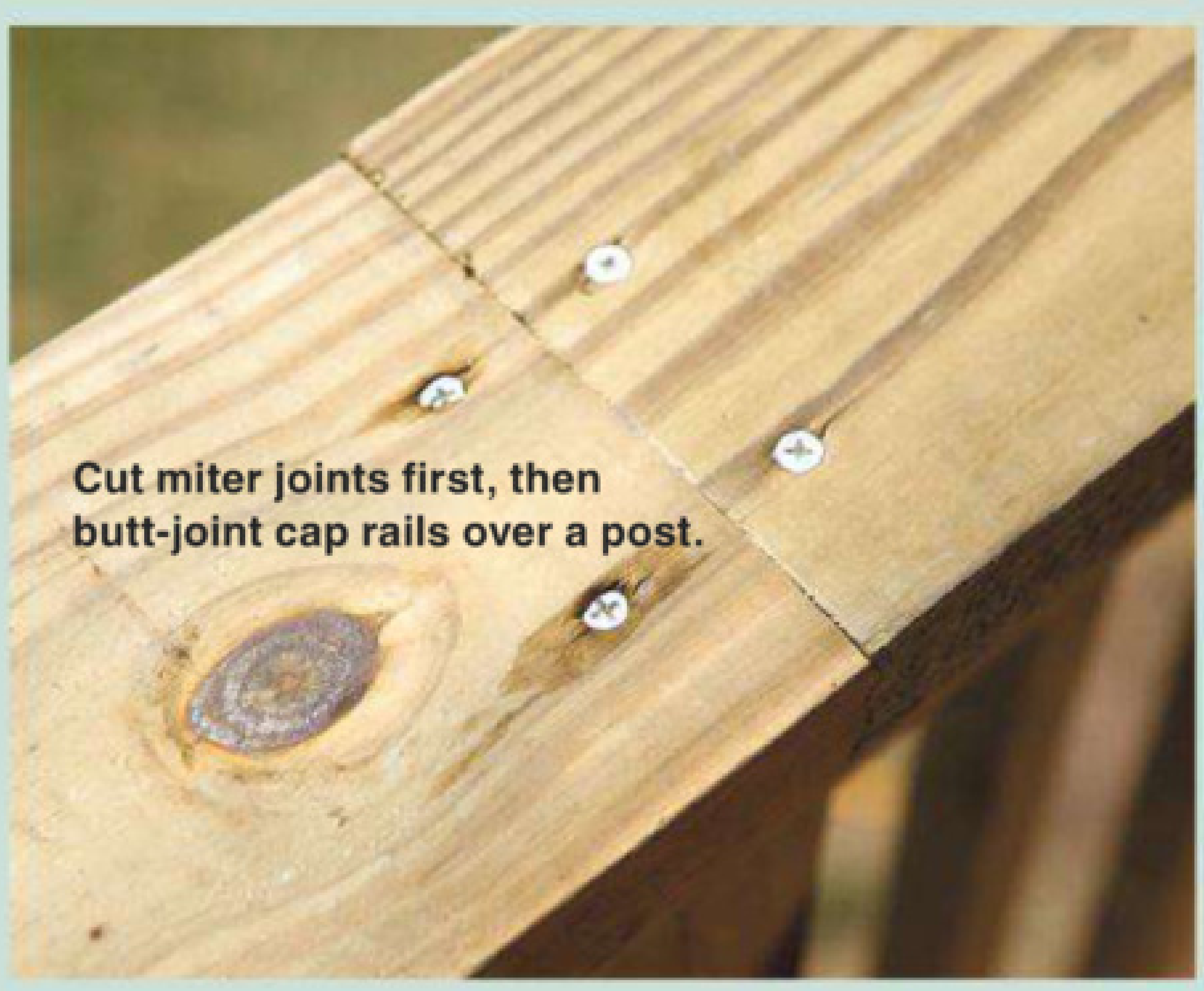
6 cut the balusters

Cutting the same-size balusters will be almost impossible without a cutting jig. Assemble the jig so it supports the end of the baluster and puts the cut end along the fence of your mitersaw. To speed along the process, clamp the balusters together and cut several of them at the same time on your circular saw.

7 install the balusters

When fastening the balusters, use a jig to plumb them and space them uniformly. Check every fourth or fifth baluster with a 2' level to make sure it's plumb. Baluster stock is not always a consistent width; you may have to adjust the spacing slightly to make everything come out right.

joints in the top rail



If a single cap rail won't span the entire length of your railing, you'll need to join shorter pieces with a butt joint. First, cut the mitered corner and make sure it fits tightly. Measure from the corner to the center of a post and crosscut the cap rail to length. Repeat for the opposite piece. Drive two fasteners on both sides of the butt joint.

production notching

Use the same techniques for gang-cutting other railing members when you notch posts. Gang them (clamp together with their faces flush) and use a T-square when you outline the dimensions of the notch. Cut what you can with a circular saw (use a guide, if possible); then chisel out the rest, as shown on *next page*.

notching a post

Whether gang-cutting a number of posts or notching a single post, cut kerfs into the notched side with a circular saw. The closer the cuts, the more precise your notch will be.

Remove the waste wood from the notch with a hammer, and clean out the face of the notch with a sharp 1" wood chisel. Do not sand the surface; sanding will result in rolled edges.

cutting perfect miters

Make your miters match. One reason a miter shows a gap is that the corner is not square. You can't square the corner, but you can modify the miter. Cut both sides of the joint and tack the cap rail into place. Cut through the joint with a circular saw, remove the pieces, and refasten them tightly.

8 fasten the cap rail

Cap rails are usually cut from 2×6 stock. Cut the rail to length and miter-cut one end. If the board is not long enough to span a railing section, cut a scarf joint into the other end, so it will be centered on a post. Fit the cap rail on top of the railing with an even overhang on each side. Attach the cap rail with two 3" screws into each post and one screw into the top rail every 2' between posts.

9 snug the corners

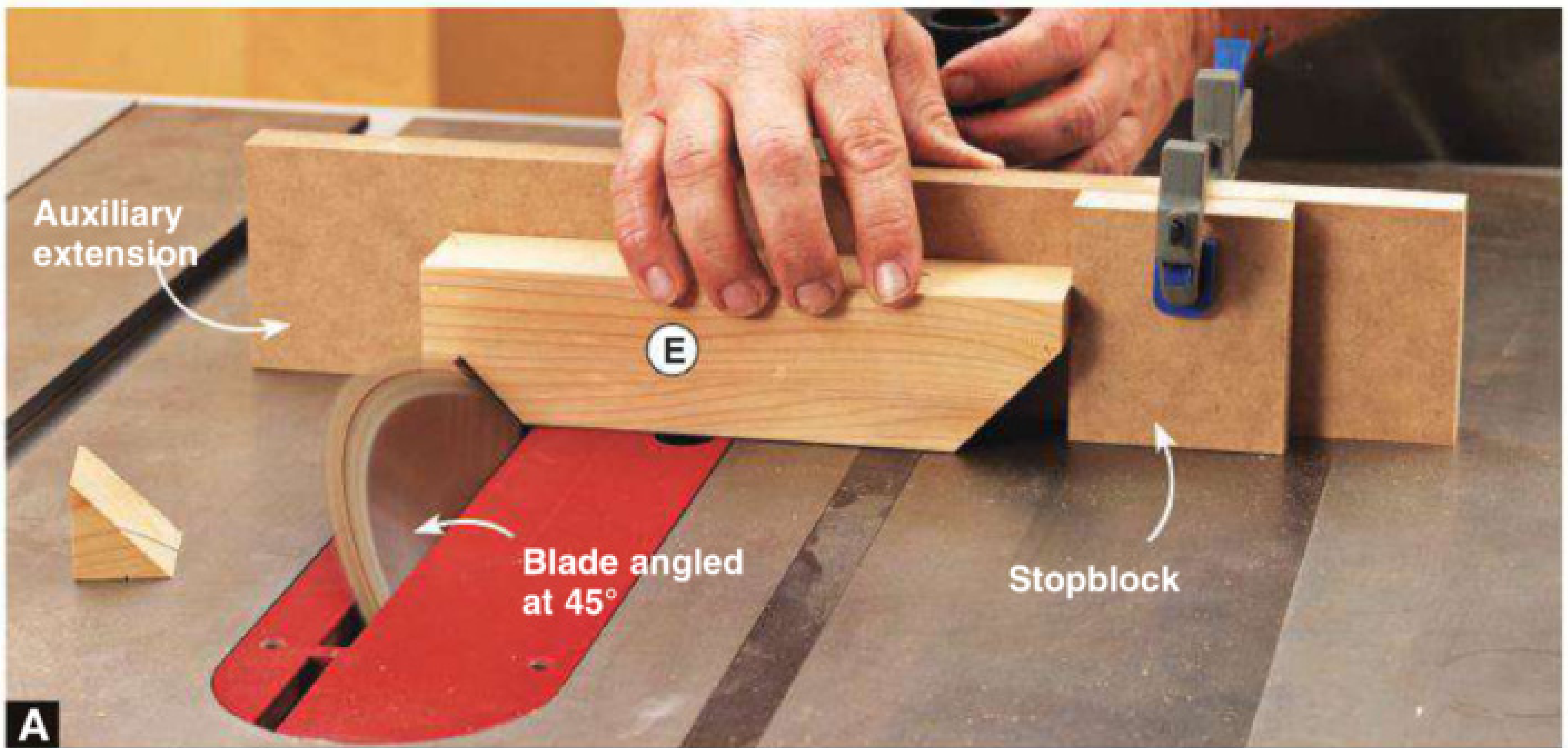
Miter joints add style to the corners of a deck, but they are difficult to cut straight, and they often separate after about a year. Cut the miter as shown *above* and drive #8 screws to draw the sides of the joint together. Then drive fasteners down into the posts.

elegant arched trellis

Whether used as a home for climbing plants or a privacy screen for a deck or patio, expect this latticed beauty to capture the envious eyes of neighbors.

at a glance

- Overall dimensions are 104" wide × 8" deep × 86½" high.
- PVC lattice never needs painting.
- For the board feet of lumber and other items needed to build this project, see *pages 79-80*.



BEVEL-CUT THE CLEAT ENDS

Using an auxiliary extension with a stopblock on your miter gauge, bevel-cut an end of the cleat (E). Flip the cleat, and cut the other end.

Don't let the impressive looks of this project fool you. You need only basic skills, portable power tools, and common construction materials available at your local home center to build it. With super-simple butt joinery, full-size patterns to easily form the curved parts, and measurements no finer than ¼", you'll find this beautiful yard accessory the perfect weekend project.

start with the posts and crossarms

1 From the straightest pressure-treated 4×4 (3½×3½" actual) posts you can find, crosscut the end posts (A) and center posts (B) to the needed lengths to reach the frost line for your area. (Check with your local building department for the frost-line depth.) The minimum lengths are 90½" for the end posts and 91¾" for the center posts, where shown on **Drawing 1** on *page 77*. These lengths include a below-grade length of 24" for safe support of the structure.

2 Using your portable circular saw, cut 4¼" rabbets ¾" deep onto the front and back faces of the end posts (A) at the crosscut ends, where shown on **Drawing 1**. For help on doing this, see the **Shop Tip**, *right*.

3 From 1×6 (¾" thick actual) cedar, cut the crossarms (C) to the size listed in the **Materials List**. To make a template for marking the crossarm shaped ends and locations for the mounting holes, cut a 4¼×11" piece from ¼" hardboard. Photocopy the full-size crossarm end pattern on *page 82*. Spray-adhere the pattern to the hardboard. Bandsaw or jigsaw and sand the template to the pattern lines. Then drill a small hole (ours was ⅛"), sized to accept an awl or a nail for marking purposes, through the template at the centerpoints for the four mounting holes.

4 Noting that the crossarms at each end of the trellis are mirror-image pairs, align the shaped end of the template with the *outside* end of a crossarm. Draw the shape and mark centerpoints for the four mounting holes. Then align the other end of the template with the *inside* end of the crossarm, and mark centerpoints for only two mounting holes, where shown. Repeat for the other crossarms. (For two of the crossarms, you'll need to flip over the template for marking.)

5 Using a bandsaw or jigsaw, cut the ends of the crossarms to shape. Then drill countersunk shank holes through the crossarms, where marked.

6 From 2×6 (1½" thick actual) cedar, cut the two crossarm mounting blocks (D) and 15 cleats (E) to the sizes listed. Drill countersunk mounting holes through the face of the mounting blocks, where dimensioned on **Drawing 1a**. Set the blocks aside.

7 On one cleat (E), mark the 45° beveled ends, where dimensioned on **Drawing 2**. Angle your tablesaw blade to 45° and bevel-cut the ends of the cleat, as shown in **Photo A**. (You also can use a mitersaw to cut the bevels.) Repeat for the remaining cleats.

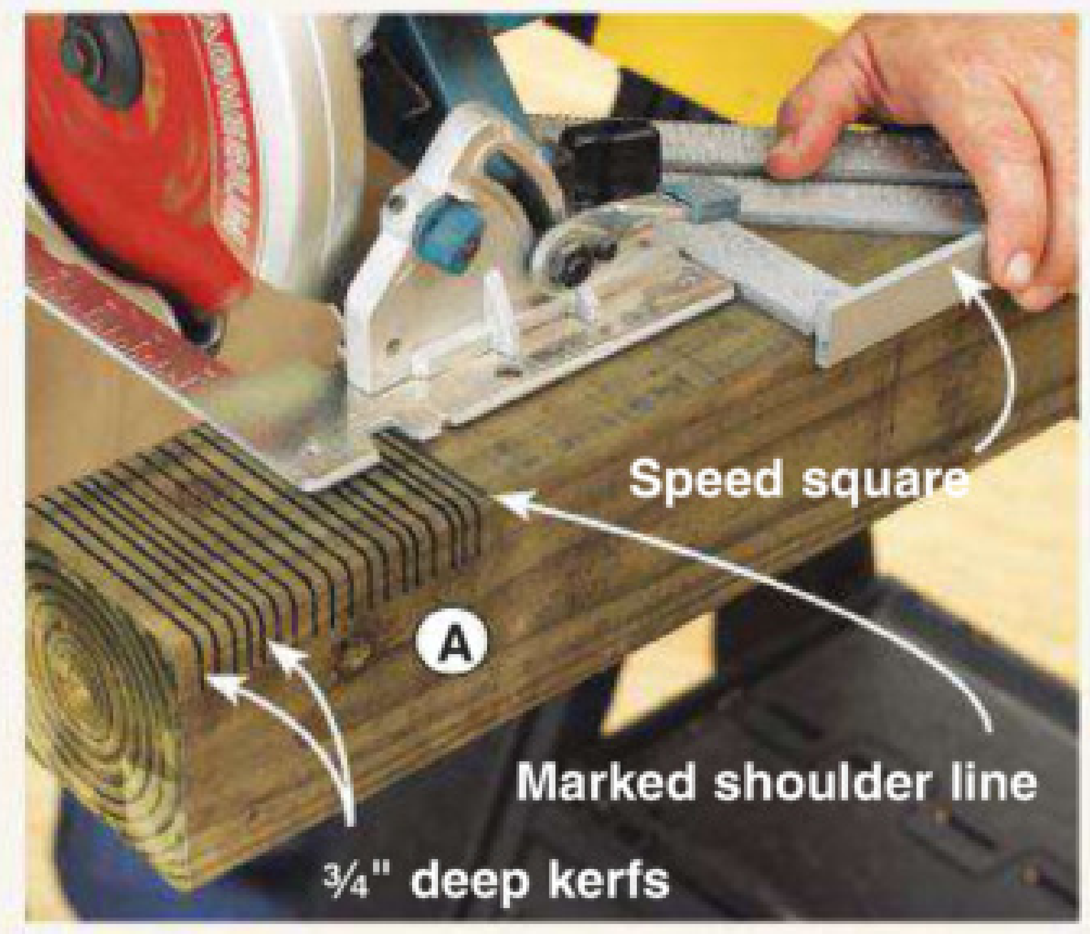
8 Mark on one cleat the locations for the two ¾" dadoes ¾" deep to fit the crossarms (C) and arch segments (H). Refit your tablesaw with a ¾" dado blade set at 90°. Then reposition the stopblock to align a marked dado location on the cleat with the blade. Using the same cut-and-flip process, cut the ¾"-deep dadoes into the cleat. (You also can cut the dadoes using a jigsaw.) Repeat for the other cleats.

9 Position five cleats (E) on each pair of crossarms (C), where dimensioned on **Drawing 1**. Then nail the cleats to the crossarms. (To prevent splitting the soft cedar, we drilled ¹⁄₁₆" pilot holes before driving the nails.) Set the remaining five cleats aside.

shoptip

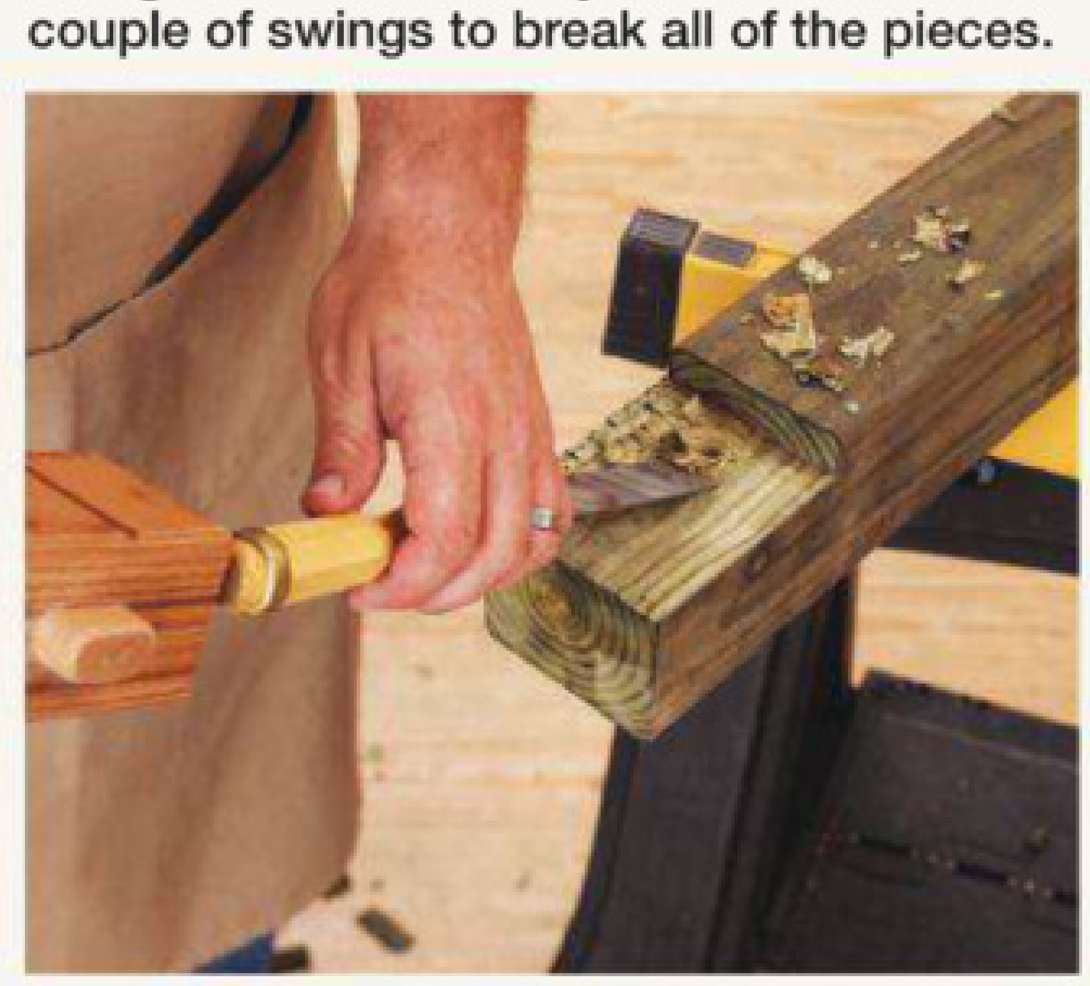
3 easy steps for safely cutting large rabbets in long stock

To cut the 4¼" rabbets ¾" deep in the ends of the trellis 4×4 end posts (A), use a square to lay out the rabbets. Then clamp the posts onto sawhorses. Adjust your portable circular saw for a ¾"-deep cut. Form the rabbets, as shown *below*.



Step 1: Using a guide, such as a speed square, cut a series of kerfs approximately ⅛" apart across the width of the marked rabbet, stopping at the shoulder line.

Step 2: Break away the remaining thin pieces from the rabbet with a hammer. Using moderate force, you'll need to take a couple of swings to break all of the pieces.

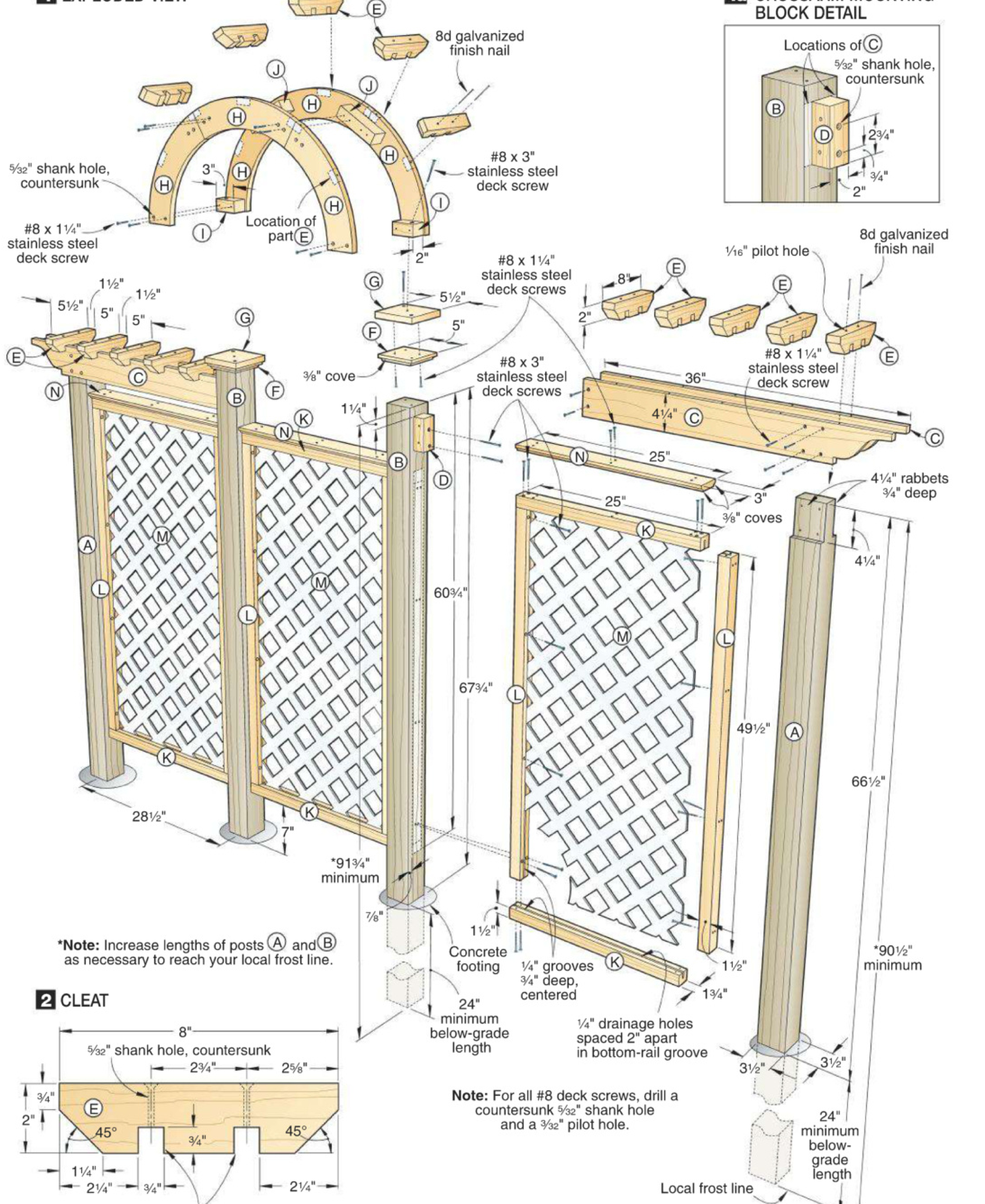


Step 3: Using a mallet and a chisel at least 1" wide, pare away the remaining material to smooth the rabbet. To avoid dig-ins, hold the chisel with the bevel facedown.

1 EXPLODED VIEW

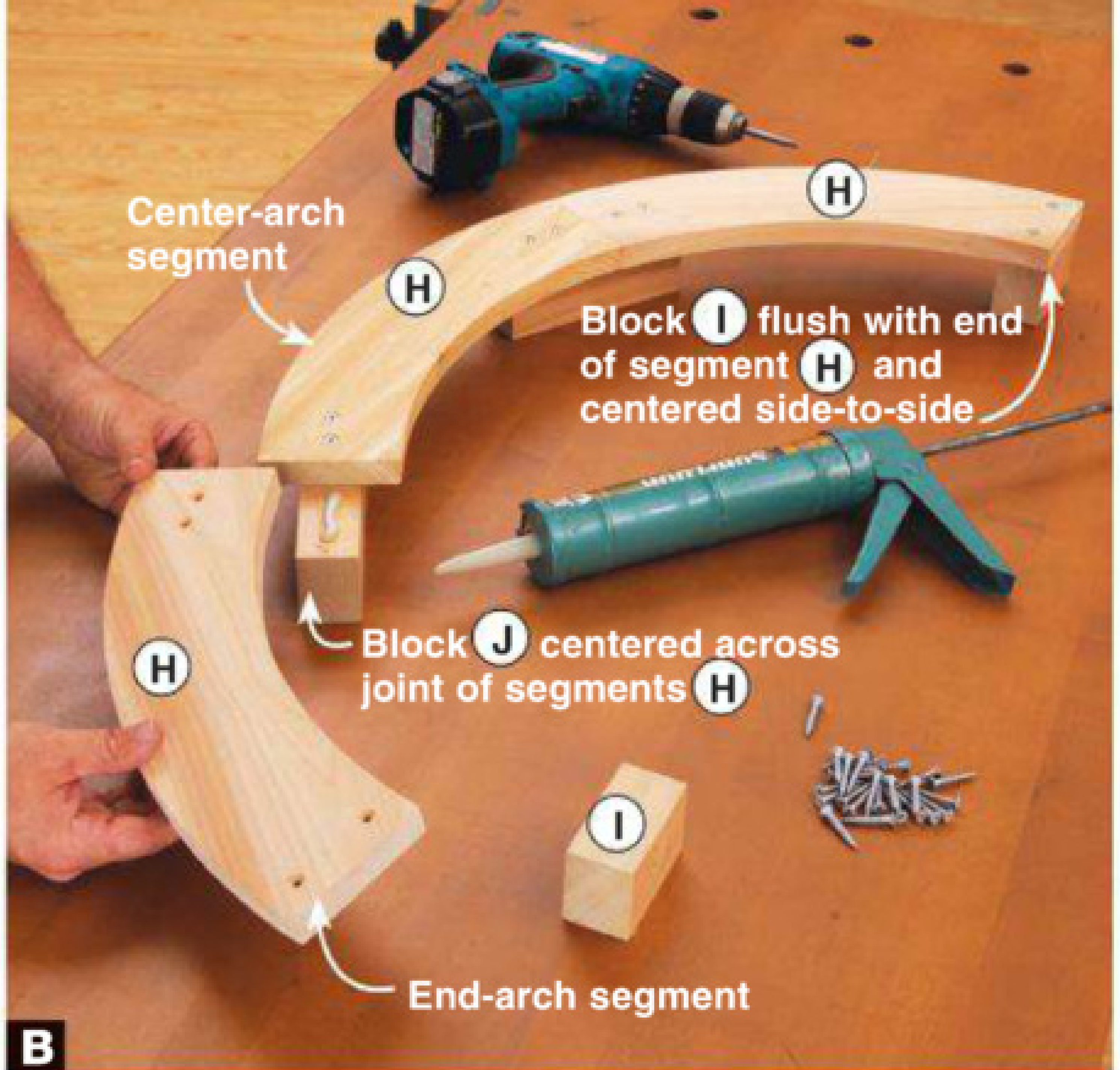
1a CROSSARM MOUNTING BLOCK DETAIL

2 CLEAT



***Note:** Increase lengths of posts (A) and (B) as necessary to reach your local frost line.

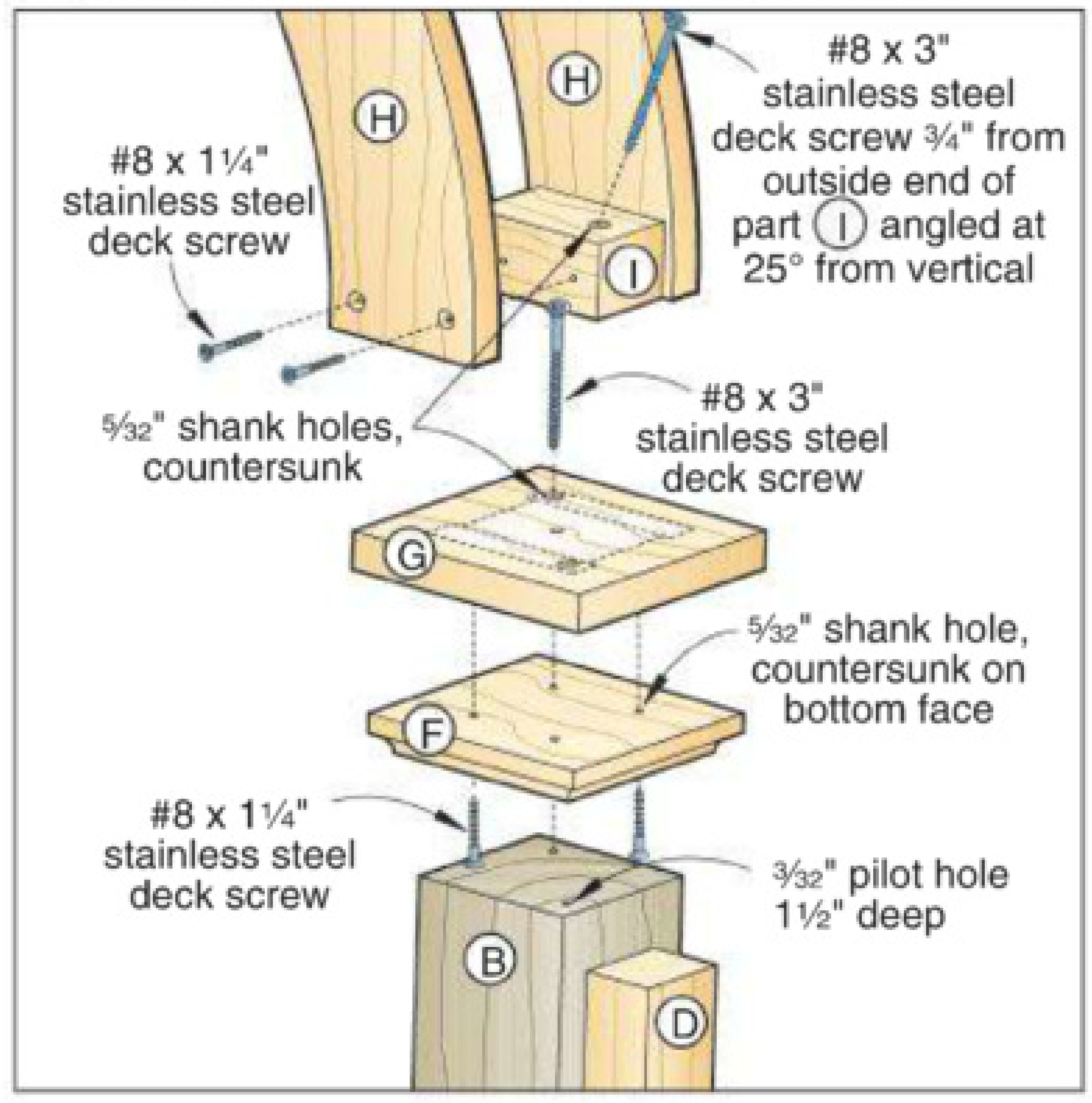
Note: For all #8 deck screws, drill a countersunk 5⁄32" shank hole and a 3⁄32" pilot hole.



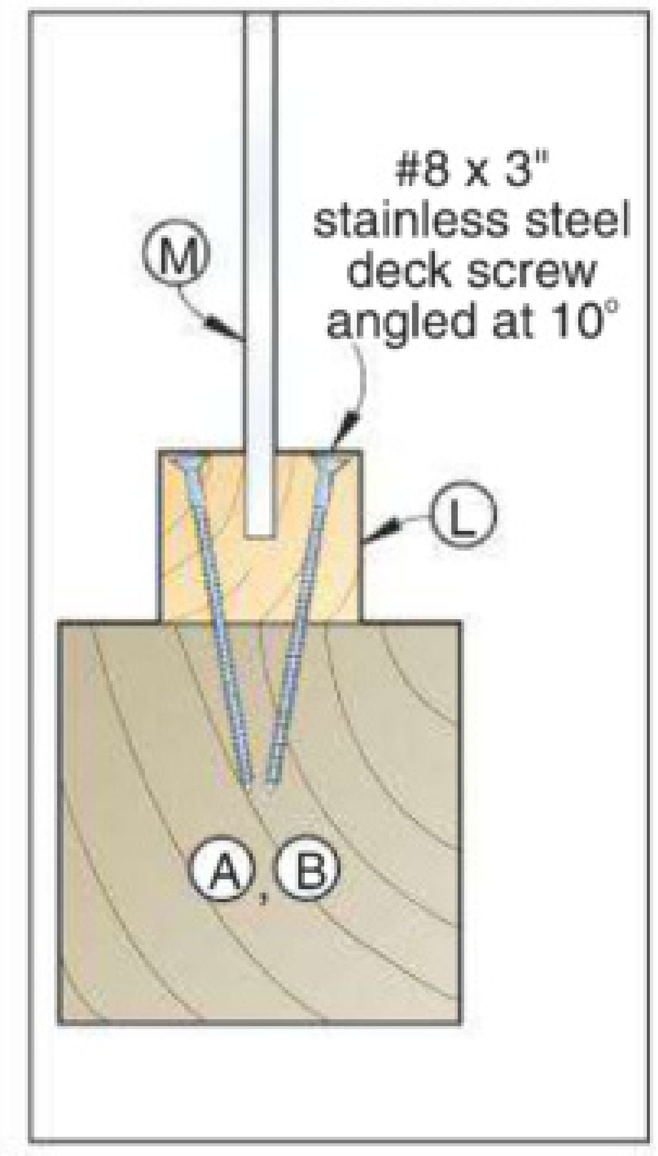
B FORM THE SEGMENTED ARCH

Fasten two end-arch segments (H) and a center-arch segment to the mounting blocks (I, J), positioning the blocks as shown.

3 CAPS AND ARCH MOUNTING DETAIL



4 LATTICE-FRAME MOUNTING TOP SECTION VIEW



on to the post caps and arch assembly

1 From ¾"-thick stock, cut the sub caps (F) and caps (G) for the center posts (B) to the sizes listed. Then, using your router table and a pushblock for safety, rout a ⅜" cove along the bottom edges of the sub caps, where shown on **Drawing 1**.

2 Using a construction adhesive (we used Liquid Nails Subfloors and Decks Adhesive, LN-602), adhere the sub caps, centered, to the bottom of the caps. Then drill two countersunk mounting holes through the bottom face of the sub caps into the caps, where shown on **Drawing 3**, and drive the #8×1¼" deck screws. Now drill two mounting holes through the top face of the caps for attaching the assemblies to the posts.

Note: We used corrosion-resistant stainless steel screws, suitable for use with the cedar and pressure-treated lumber, to assemble the trellis. To reduce cost, you also can use double hot-dipped galvanized screws, but you may get staining around them in the cedar from the tannic acid.

3 From ¾"-thick stock, cut six 5½×16" pieces to form the arch segments (H). Then, from ¼" hardboard, cut a same-size piece to make a template for drawing the arch-segment shape and marking the mounting-hole locations. Photocopy the full-size arch-segment half pattern on *page 81*. Spray-adhere the pattern to the hardboard. Bandsaw or jigsaw to shape, and sand to the pattern lines. Now drill a ⅛" (or suitable size) hole for marking through the template at the centerpoints of the eight mounting holes.

4 Position the template on an arch segment (H) with the bottom edges aligned. Draw the shape on the segment. Then mark the locations of the appropriate pair of mounting holes (for an inside or outside end) on both ends, where shown on the pattern and **Drawing 1**. Repeat for the remaining segments.

5 Bandsaw or jigsaw and sand the arch segments to shape. Then drill the countersunk mounting holes.

6 From 1½"-thick stock, cut the end-arch mounting blocks (I) and the two center-arch mounting blocks (J) to the sizes listed.

7 To assemble the arch, fasten two end-arch segments (H) and a center-arch segment to the end-arch mounting blocks (I) and center-arch mounting blocks (J), where shown on **Drawing 1** and in **Photo B**. Secure the parts with construction adhesive and #8×1¼" deck screws. Next, turn the assembly over, and attach the remaining three arch segments to the blocks. Now nail the five cleats (E) that you set aside earlier to the arch assembly, positioning the cleats where shown on **Drawing 1** and the arch-segment pattern.

now let's make the lattice-frame parts

1 From 1½"-thick stock, cut the lattice-frame rails (K) and stiles (L) to the sizes listed. Using a ¼" dado blade in your tablesaw or a ¼" straight bit in your router with an edge guide, cut a centered groove ¾" deep along the *inside* face of the rails and stiles, where shown on **Drawing 1**, to fit your ¼" lattice parts (M).

2 To allow water drainage, drill ¼" holes spaced 2" apart in the grooves in the three bottom rails (K), where shown. Then drill countersunk mounting holes angled at 10° on the inside faces of the stiles (L), where shown on **Drawings 1** and **4**, for attaching the lattice frames to the posts (A, B) later.

3 Using your tablesaw or jigsaw, cut the ¼" PVC lattice (M) to size. The lattice flexes easily, so use a support stand or a helper to keep it flat while you cut it.

4 From ¾"-thick stock, cut the lattice-frame caps (N) to size. Then rout a ⅜" cove along the front and back edges of the caps on the bottom face, where shown. Set the caps aside.

time to prime and paint, and assemble the frames

1 Prime and paint all of the parts, except for the lattice. (We applied one coat of Behr Premium Plus Oil-Based Primer Sealer No. 434 followed by two coats of Behr Premium Plus Porch & Floor Paint, Low-Lustre Ultra Pure White No. 6050.)

2 Assemble and clamp together (no glue) the three lattice frames with the lattice (M) captured in the grooves in the rails (K) and stiles (L) and the ends of the rails flush with the outside faces of the stiles, where shown on **Drawing 1**. Drill a pair of countersunk mounting holes through the top and bottom rails at both ends into the stiles, centered on the 1½" thickness, where shown. Now drive the #8×3" deck screws.

3 With the coves facing down, position the lattice-frame caps (N) on the top rails (K), flush with the rail ends and centered front-to-back. (The top rails do not have the drainage holes.) Drill three pairs of countersunk mounting holes through the caps and into the rails, where shown. Then drive the #8×1¼" deck screws.

plant the posts, and mount the lattice frames

***Caution:** Before you dig the postholes, call the "One Call" phone number for your state or province, and ask to have the buried pipes and wires on your property located and marked. If you can't find the number, call the North American One Call Referral System at 888-258-0808.*

ATTACH AND LEVEL A 2×6 AS A GUIDE FOR EASY ALIGNMENT OF THE POSTS

With the end post (A) plumb and braced with 1×3s, attach an 8'-long 2×6 to the post with the top edge aligned with the top tape.

Holding the free end of the 2×6 level with the front face 1¾" back from the center of the postholes, screw the 2×6 to a 1×3 stake.

1 On a flat area, mark the center locations for the four holes for the posts (A, B) spaced 28½" on center, where dimensioned on **Drawing 1**.

2 Referring to **Drawing 5** and using a posthole digger or an auger, dig 10"-diameter holes, centered on the marked locations, to the needed depth to reach your frost line plus another 6" for a gravel base. Pour 6" of gravel into the holes.

3 To make it easy to set the posts at the correct height and to position the lattice frames (K/L/M/N) between the posts, draw alignment lines around the posts. Referring to **Drawing 1** and measuring from the top ends, mark lines for grade level at 66½" for end posts (A) and 67¾" for center posts (B). Then mark lines 7" above these lines on all of the posts for aligning the bottoms of the lattice frames. For better visibility, wrap blue easy-release painter's tape around the posts, aligning the top of the tape with the marked lines at the two locations.

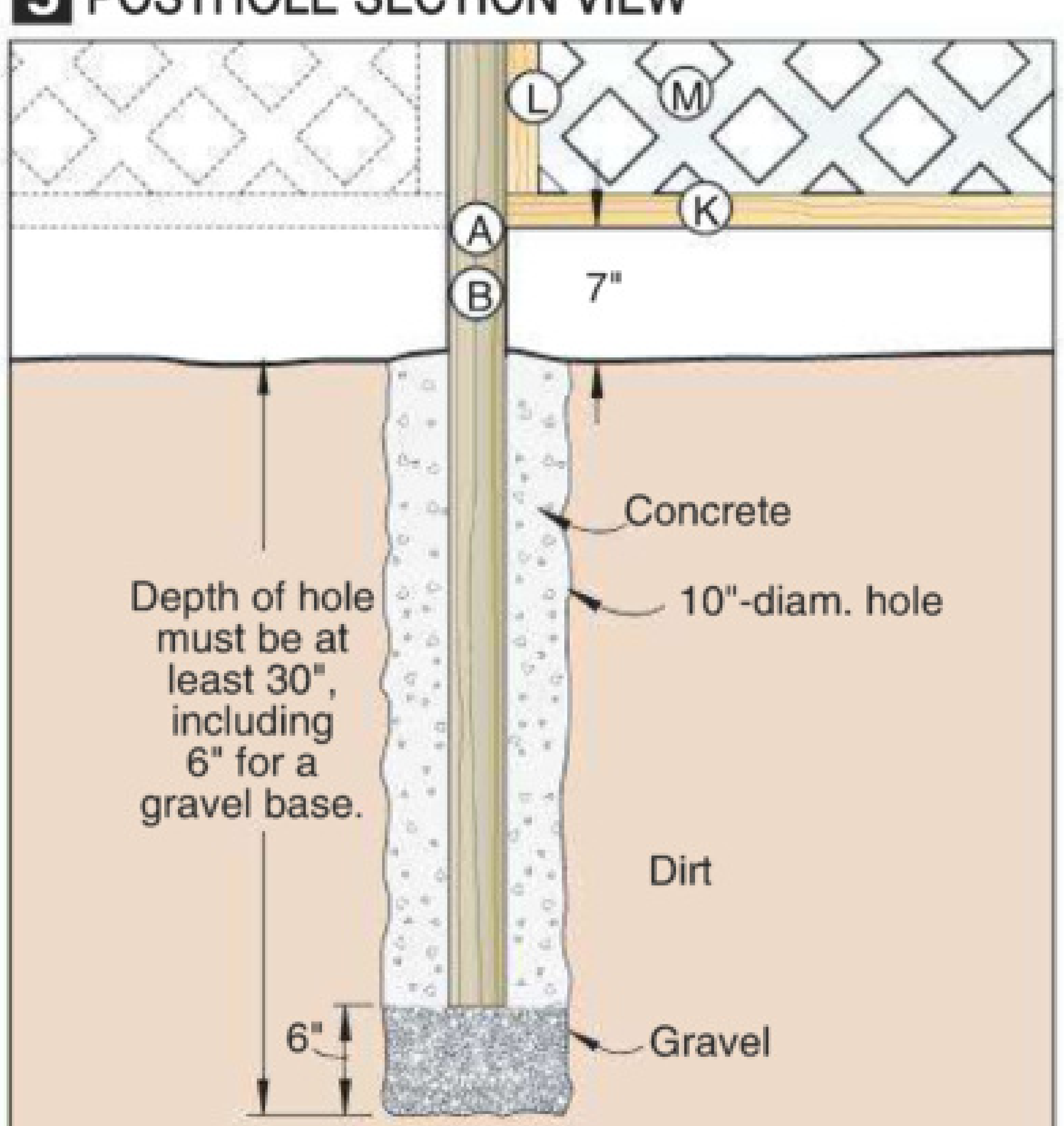
4 Place an end post (A) centered in an outer hole with the rabbets in the top positioned where shown on **Drawing 1**. Check that the top edge of the bottom tape is even with grade level. Add or remove gravel as needed to adjust the post height.

5 Plumb the post using a level. Then brace it using 1×3s fastened with #8×1¼" deck screws, as shown in **Photo C**. To establish a level reference to easily position and align the remaining posts, attach one end of an 8'-long 2×6 to the back face of the post with a #8×3" deck screw and the other end to a 1×3 stake with a #8×1¼" deck screw, as shown in **Photos C** and **D**.

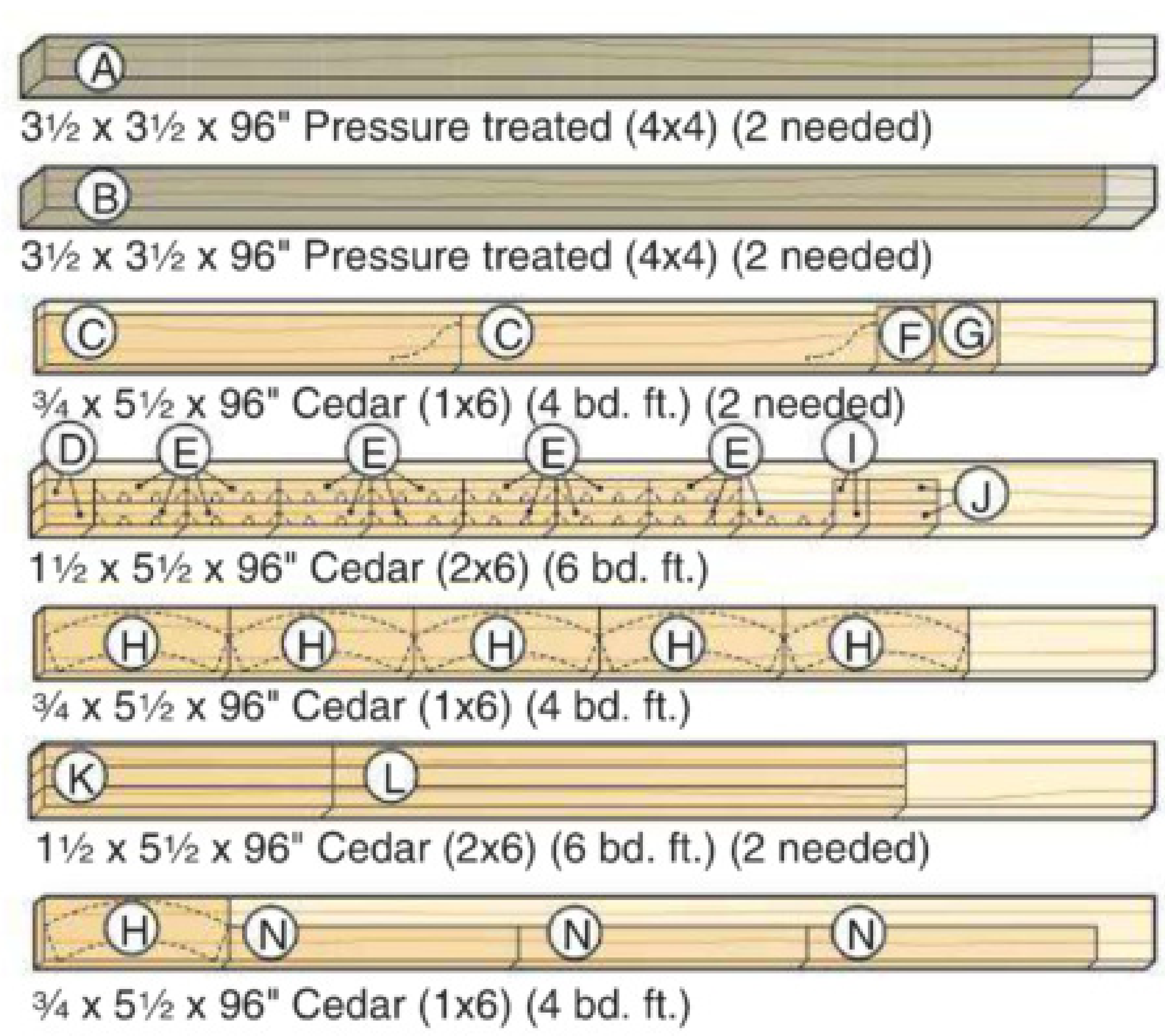
6 Position a lattice frame (K/L/M/N), with the bottom rail (K) that has drainage holes down, on the end post (A), with the bottom face of the rail even with the top edge of the top tape and the frame centered front-to-back. Clamp the frame to the post, and drive the screws through the predrilled angled holes in the stiles (L) into the post, as shown in **Photo E**. To give clearance for the drill chuck, use a long screwdriver bit. (We used a 6"-long Phillips bit, available at home centers.)

7 Place a center post (B) in the adjacent hole tightly against the lattice frame attached to the end post (A). Add or remove gravel to align the top tape on the post with the top edge of the 2×6. Drive #8×3" deck

5 POSTHOLE SECTION VIEW



Cutting Diagram



ATTACH THE LATTICE FRAME

With the lattice frame (K/L/M/N) clamped in position to the end post (A), drive #8x3" deck screws through the stiles (L) into the post.

MOUNT THE CROWNING ARCH

With the arch assembly (E/H/I/J) centered on the caps (G), drive a #8×3" deck screw through each block (I) into the cap.

screws through the 2×6 into the post to hold it in position. As before, center the lattice frame front-to-back on the center post and screw it to the post. Repeat the process to install the remaining center and end posts and lattice frames. Then fill the holes with concrete, where shown on **Drawing 5**.

add the crossarm and arch assemblies

1 Screw the crossarm mounting blocks (D), centered front-to-back, to the sides of the center posts (B), where dimensioned on **Drawing 1**. Then slide a crossarm assembly (C/E) into position over the rabbeted end of an end post (A), where shown, with the bottoms of the crossarms (C) and mounting block flush. Drive the screws through the predrilled holes in the crossarms into the end post and mounting block. Repeat for the other assembly.

2 Center the cap assemblies (F/G) on the center posts (B), and secure them with #8×3" deck screws, where shown on **Drawing 3**. Then center the ends of the arch assembly (E/H/I/J) on the caps (G). Drill an angled mounting hole through each end-arch mounting block (I), where shown, and drive the screws, as shown in **Photo F**.

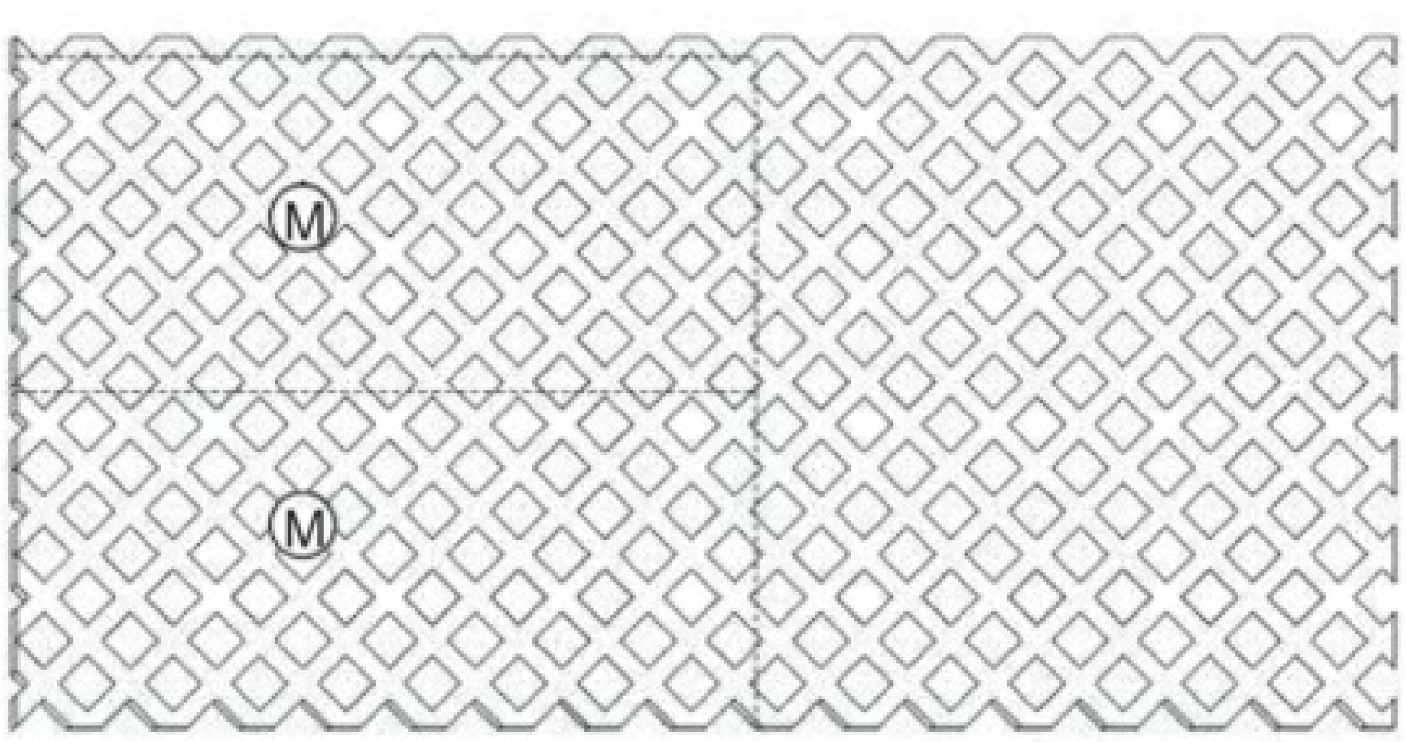
3 After the concrete cures, remove the 1×3 bracing. Fill the screw holes with acrylic caulk, and touch up with paint. Now, plant some flowers and climbing plants, and rest awhile to admire your handiwork.

Written by **Owen Duvall** with **Jeff Mertz**
Project design: **Kevin Boyle**
Illustrations: **Roxanne LeMoine; Lorna Johnson**

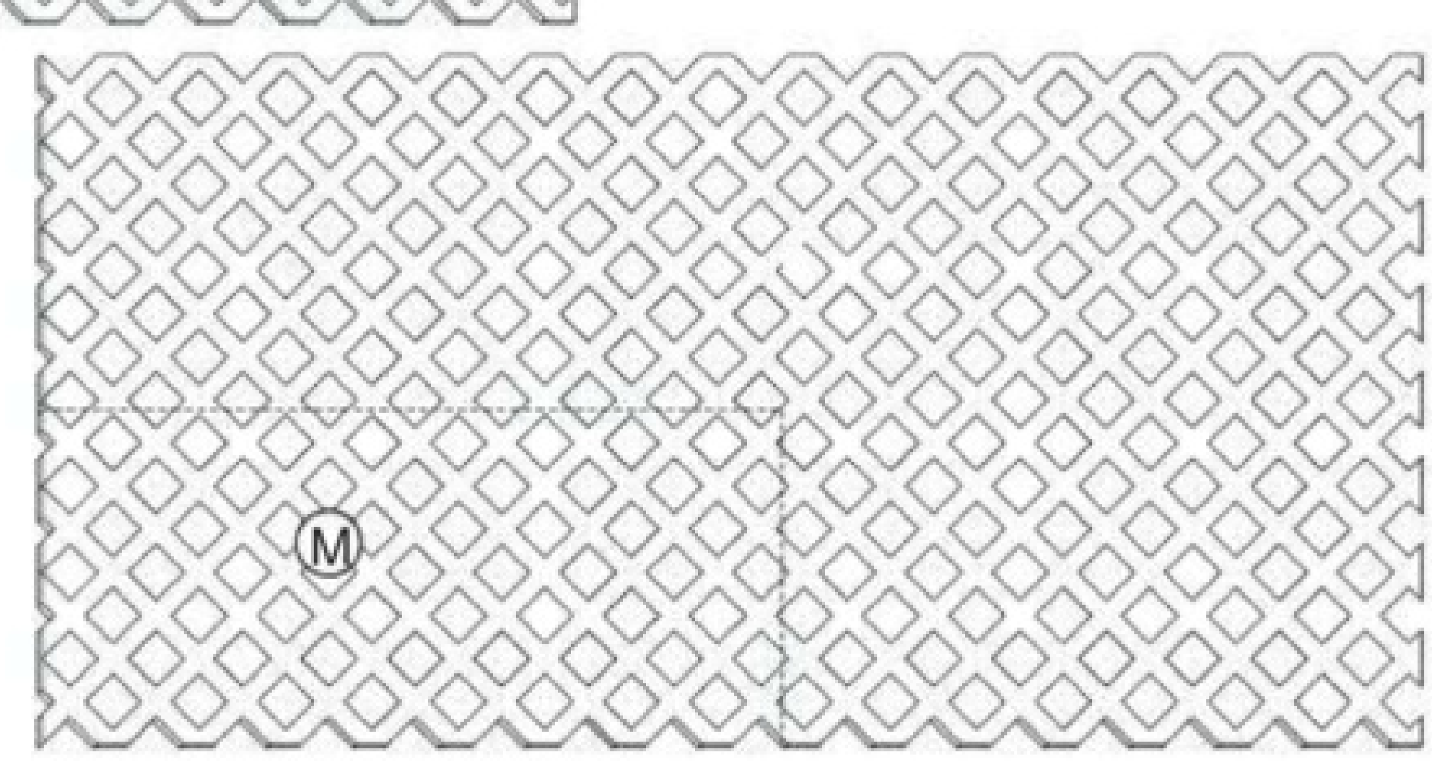
materials list

Part		FINISHED SIZE T	W	L	Matl.	Qty.
A	end posts	3½"	3½"	†	PT	2
B	center posts	3½"	3½"	†	PT	2
C	crossarms	¾"	4¼"	36"	C	4
D	crossarm mounting blocks	1½"	2"	4¼"	C	2
E	cleats	1½"	2"	8"	C	15
F	sub caps	¾"	5"	5"	C	2
G	caps	¾"	5½"	5½"	C	2
H*	arch segments	¾"	5 3/16"	16"	C	6
I	end-arch mounting blocks	1½"	2"	3"	C	2
J	center-arch mounting blocks	1½"	2"	6"	C	2
K	lattice-frame rails	1½"	1¾"	25"	C	6
L	lattice-frame stiles	1½"	1¾"	49½"	C	6
M	lattice	¼"	23½"	51"	L	3
N	lattice-frame caps	¾"	3"	25"	C	3

*Parts initially cut oversize. See the instructions.
†The minimum lengths are 90½" for end posts (A) and 91¾" for center posts (B). This includes a below-grade length of 24" for safe support of the structure. Increase lengths of posts as needed to reach your local frost-line depth.
Materials key: PT–pressure-treated, C–cedar, L–diagonal-pattern PVC lattice.
Supplies: Spray adhesive, construction adhesive, 8d galvanized finish nails, #8×1¼" and #8×3" stainless steel deck screws, easy-release painter's tape, 50-pound bags of gravel (4), concrete (one 60-pound bag per 12" depth of posthole), acrylic caulk.
Blades and bits: Dado-blade set, ⅜" cove and ¼" straight router bits, 6"-long Phillips bit.

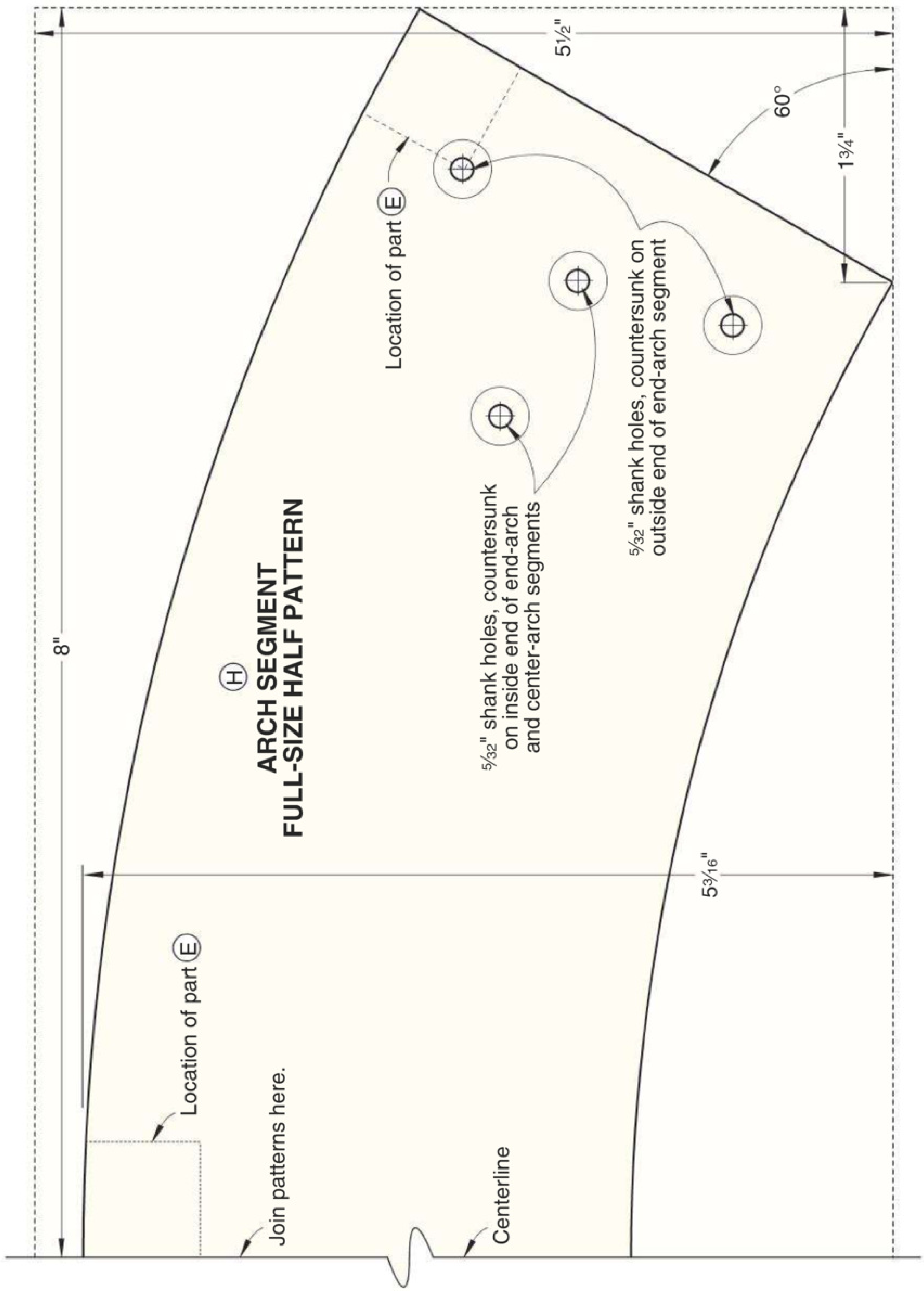


¼ x 48 x 96" PVC lattice

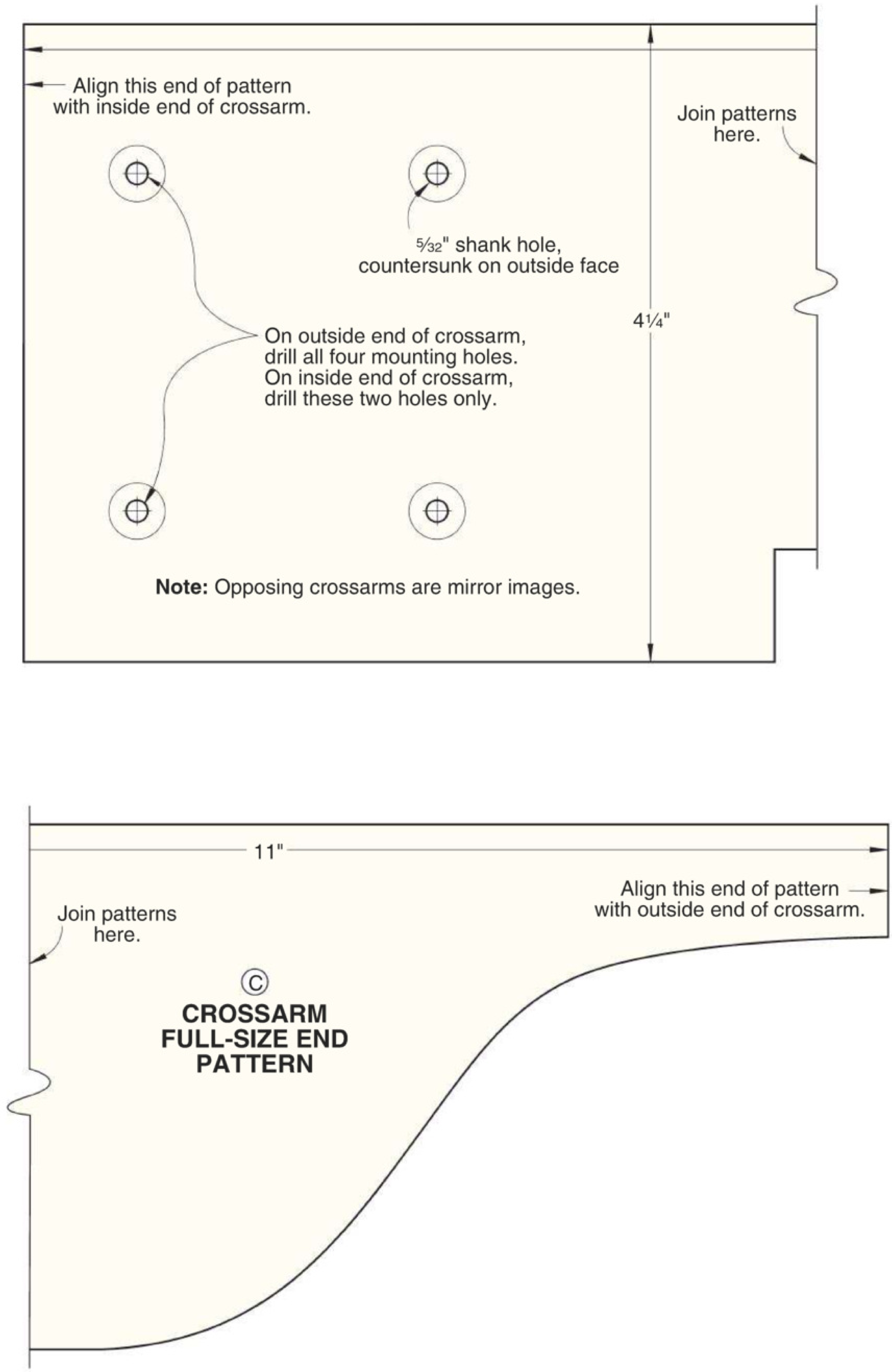


¼ x 48 x 96" PVC lattice

Find more great outdoor projects at:
woodmagazine.com/outdoor



ARCH SEGMENT
FULL-SIZE HALF PATTERN
H
8"
5½"
60°
1¾"
5³⁄₁₆"
Location of part E
Location of part E
⁵⁄₃₂" shank holes, countersunk on inside end of end-arch and center-arch segments
⁵⁄₃₂" shank holes, countersunk on outside end of end-arch segment
Join patterns here.
Centerline



Align this end of pattern with inside end of crossarm.
Join patterns here.
5⁄32" shank hole, countersunk on outside face
4¼"
On outside end of crossarm, drill all four mounting holes. On inside end of crossarm, drill these two holes only.
Note: Opposing crossarms are mirror images.
11"
Align this end of pattern with outside end of crossarm.
Join patterns here.
C
CROSSARM FULL-SIZE END PATTERN

grand entrance

Build an inviting approach to your backyard with this arbored garden gate.

Nothing adds more to the allure (and privacy) of your backyard "secret garden" than a stately garden gate. For this project, we borrowed the construction of the overhead arbor from the garden arbor featured on *page 89*. Build it as an addition to your existing fence, and walking into your backyard will never be the same.

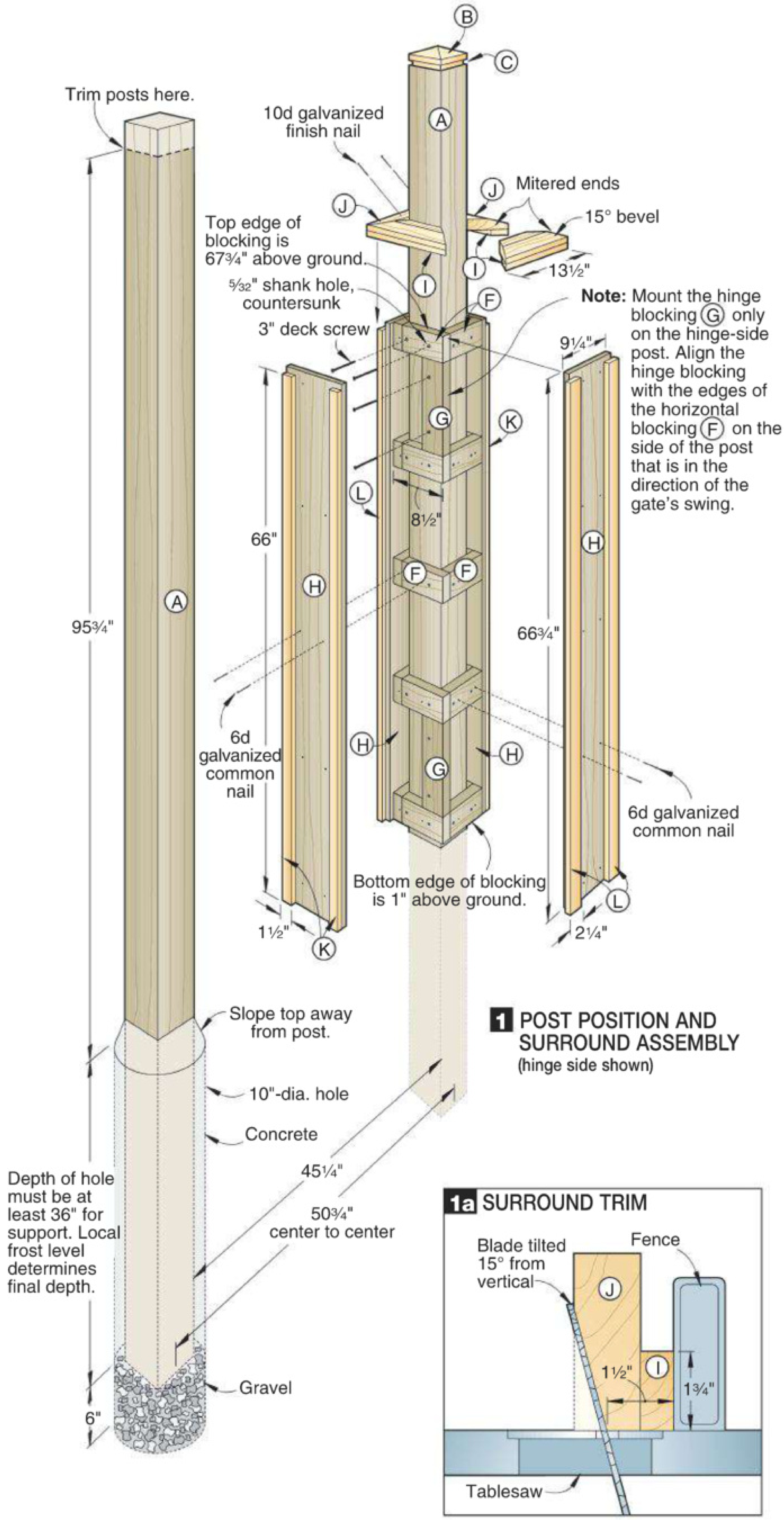
plant a pair of posts

1 Once you determine your gate's location, dig two 10"-diameter holes with their centers 50¾" apart. (To accurately locate and temporarily brace your posts, download the article "Be a Post Master" at woodmagazine.com/postmaster.) To properly support the gate, the posts must extend at least 36" below grade. (Because of the frost line in our location, our posts extended 42" below grade. Check with your local building code enforcement official.) Dig holes deep enough to allow for a 6" layer of gravel at the bottom for drainage, where shown on **Drawing 1**.

2 With the gravel in place, position two 6×6"×12' (5½×5½" actual) pressure-treated posts (A) in the holes, plumb them, and brace them in place. Make sure that the 45¼" distance *between* the posts is uniform top to bottom. Set them in concrete, as shown on **Drawing 1**.

Note: Our gate is 38½" wide. When the posts are boxed and trimmed, there will be 3/8" gaps between the gate and the posts' corner battens (K, L).

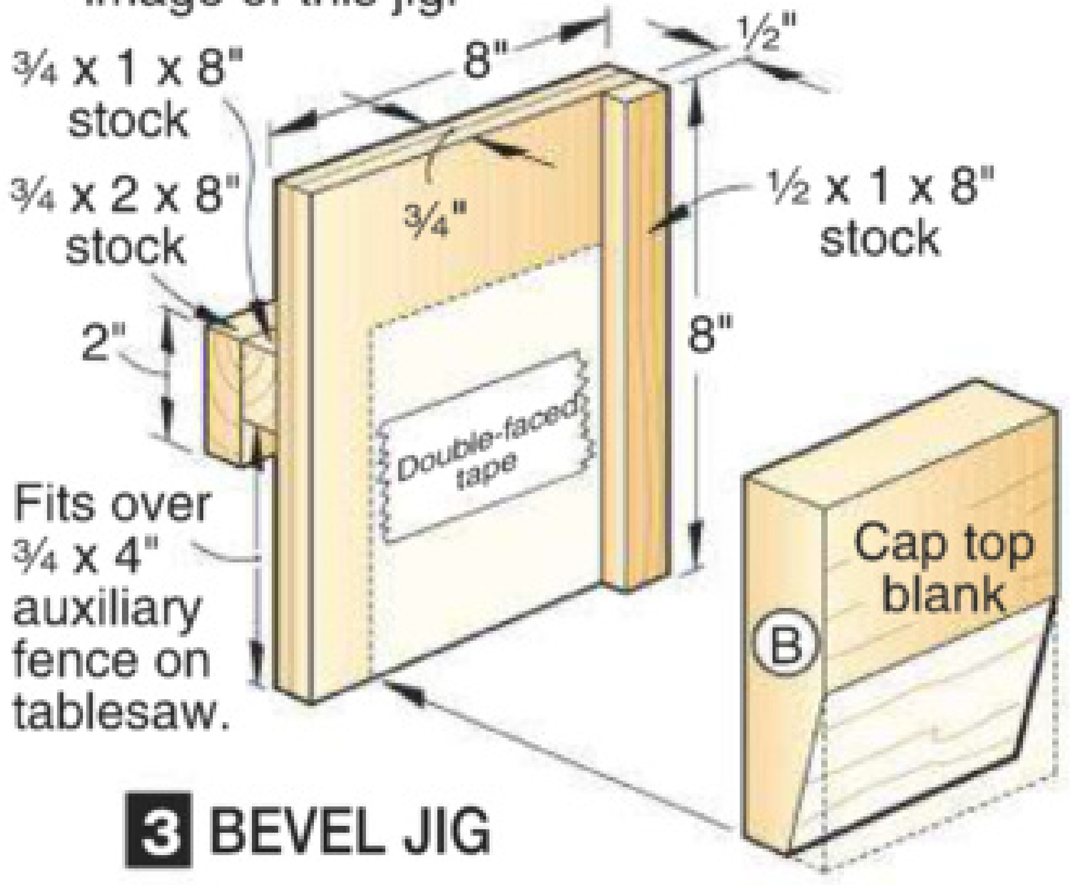
3 When the concrete hardens, remove the bracing from the posts. To trim the posts to finished height, make a mark 95¾" up from grade on one post. Using a straight board and a level, transfer this top mark to the other post. Measure the offset on your portable circular saw between the edge of its base and the blade. Measure this offset distance down from the marked top line, and draw a level line around all four sides of each post. Temporarily nail a short board to one side of the first post with its top edge at this lower line. Setting your circular saw to its maximum depth, use the board to guide your saw as you make the cut. In this manner, work your way around the post's other three sides. Finish cutting through the post with a handsaw. Repeat this procedure on the other post, making them even in height.



1 POST POSITION AND SURROUND ASSEMBLY
(hinge side shown)

1a SURROUND TRIM

Note: Jig shown is for a left-tilting tablesaw. For a right-tilting tablesaw, build the mirror image of this jig.



3 BEVEL JIG

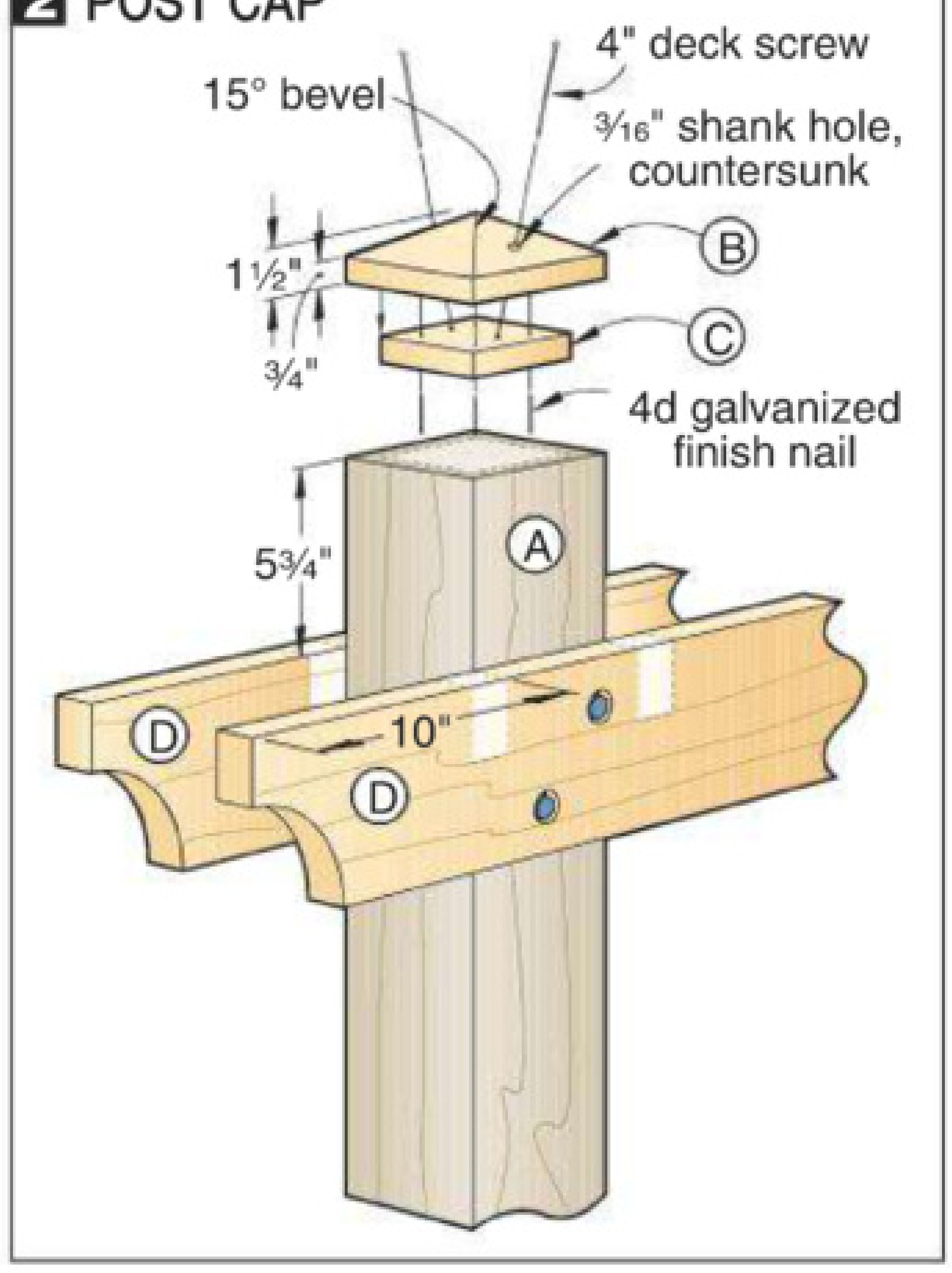
A bevel jig that runs on an auxiliary fence makes beveling the cap tops accurate, and safe as well.

4 For the post caps, start by cutting two 1½×5½×5½" blanks for the cap tops (B) and two ¾×4½×4½" cap bases (C). Bevel the 1½"-thick cap tops, where shown on **Drawing 2**. To make these cuts, we built the auxiliary fence and bevel jig shown on **Drawing 3**. Use double-faced tape to hold the cap top blanks to the jig. Cut one face, rotate the blank 90°, cut, and repeat until all four bevels are cut, as shown in **Photo A**. Glue and nail the cap bases, centered, to the cap tops, using an exterior glue and 4d galvanized finish nails. Sand the cap bevels to 120 grit. Drill countersunk shank holes through the caps where shown. Apply construction adhesive, position the caps, and drive the screws.

cut the parts for the overhead arbor

1 Cut the two main joists (D) to the lengths in the **Materials List**. Then make the marking/trimming template shown

2 POST CAP



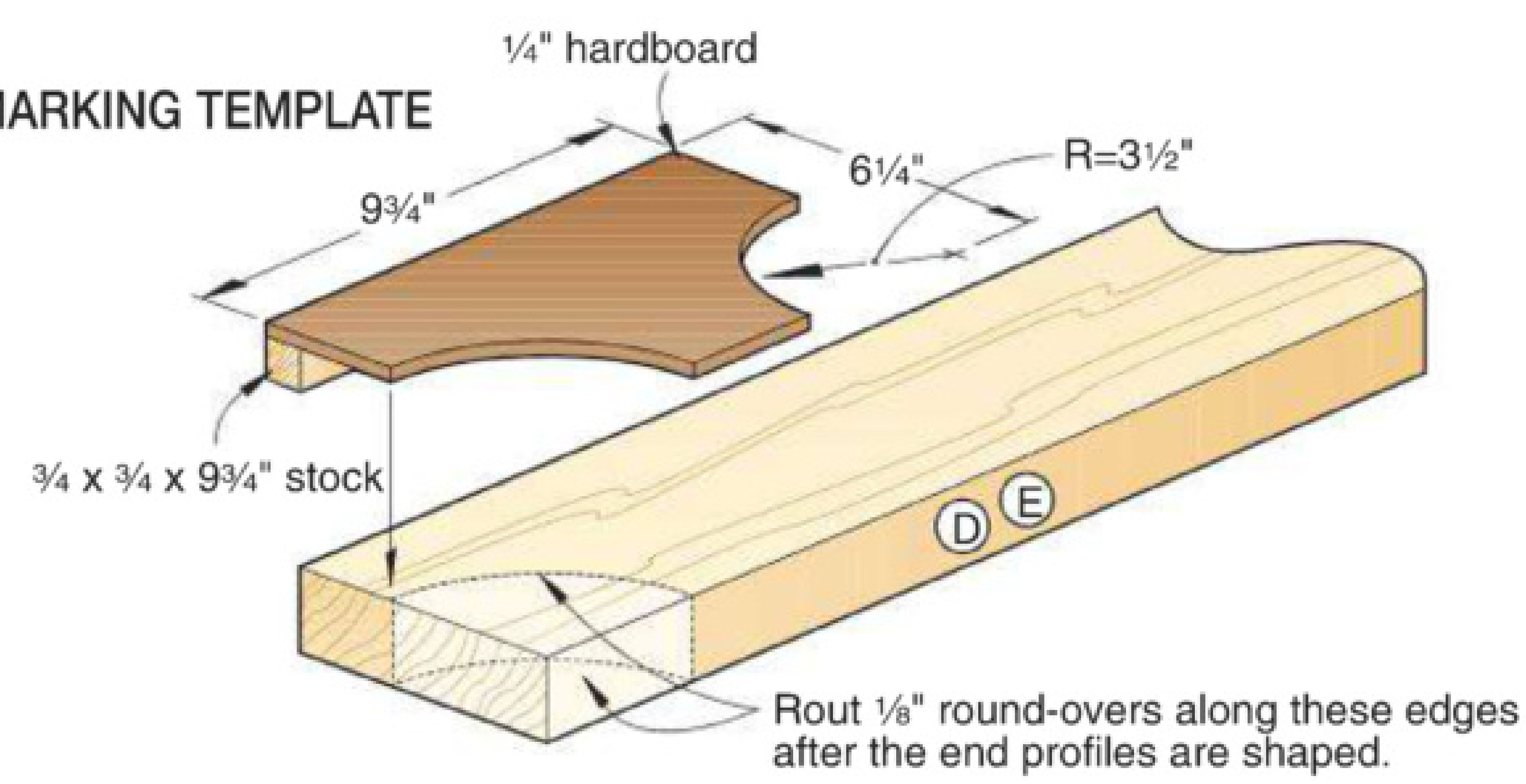
on **Drawing 4**, and use it to mark the 3½"-radius cutouts on the parts' ends, where shown on **Drawing 5**. Jigsaw close to the lines. Chuck a flush-trim bit in your handheld router. Clamping the template to each part to guide the bit, rout the final profile. For smooth routing, rout from the cutout's "heel" to the part's end. Chuck a ⅛" round-over bit in your router (to match the joists' factory edges), and rout the end profiles' edges. Drill the counterbored ⅜" holes where shown.

2 Cut the cross joists (E) to the length in the **Materials List**. Form the end cutouts, shown on **Drawing 5**, in the same manner as those on the main joists.

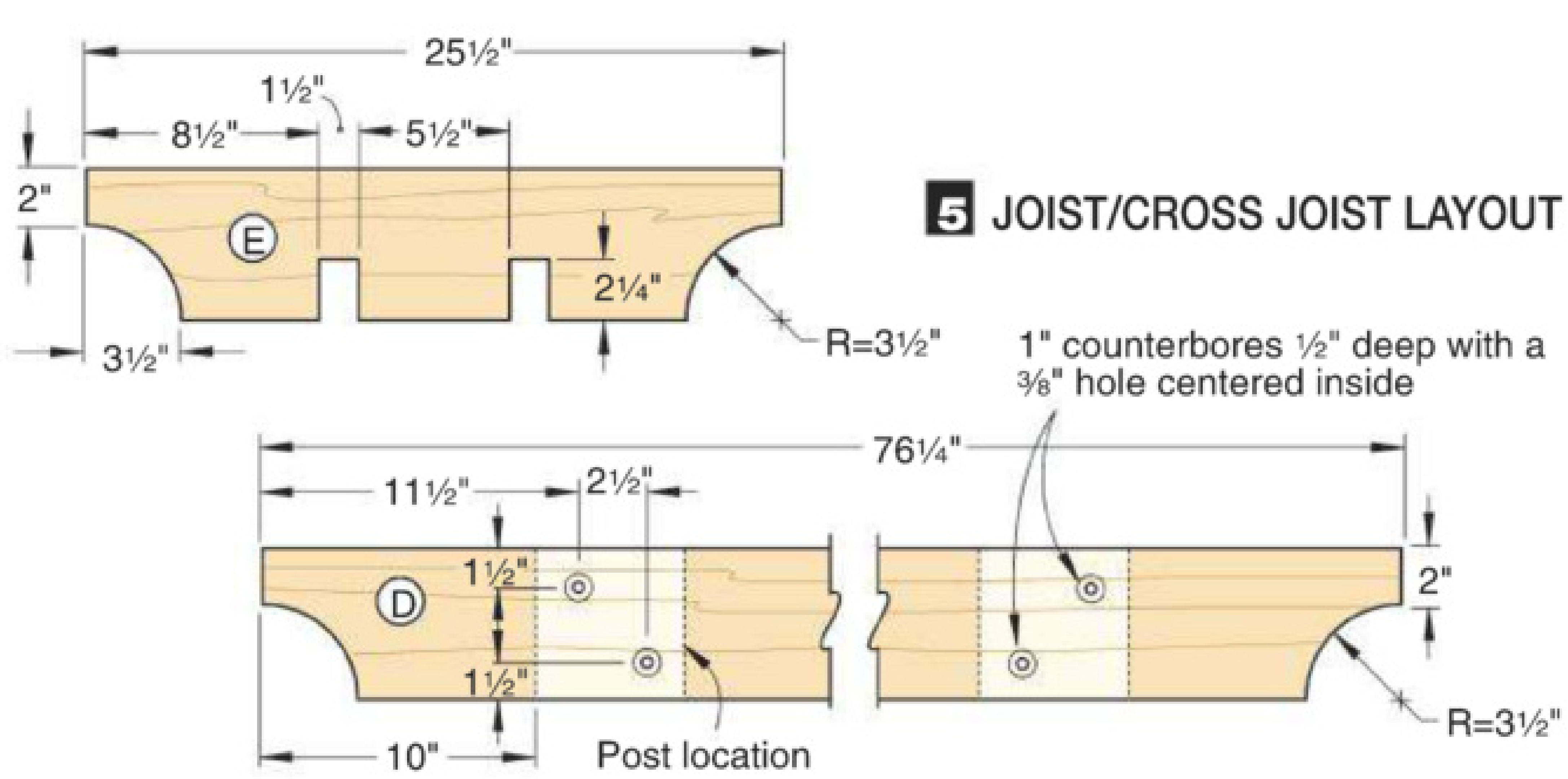
3 Turn the cross joists upside down on a pair of sawhorses, and clamp them together with their ends and top edges flush. Using a square, draw lines across the parts' bottom edges for the 1½"-wide notches, where dimensioned on **Drawing 5**. Adjust your portable circular saw to cut 2¼" deep. Guided by a straightedge clamped to the cross joists, make two cuts to define the notches' sides. Then cut a series of closely spaced kerfs through the waste between these two cuts. Finally, clean out the notches with a 1" chisel. Check the fit of your 1½" stock in the notch. For good appearance and easy assembly, you'll want a close, but not tight, fit.

Note: *Check the actual dimension of your 6×6 posts. If necessary, adjust the spaces between the notches in the cross joists (E) to match this dimension.*

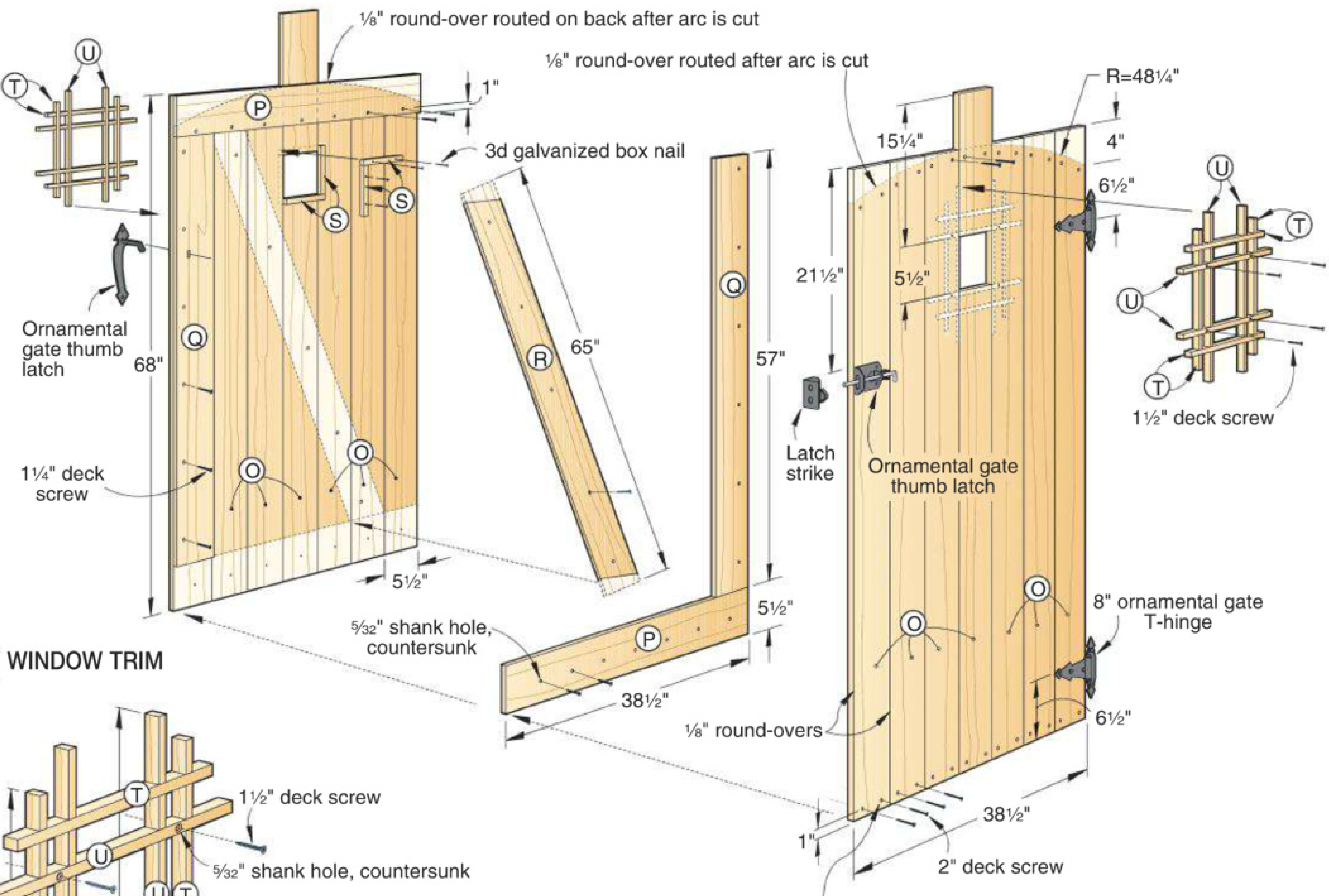
4 MARKING TEMPLATE



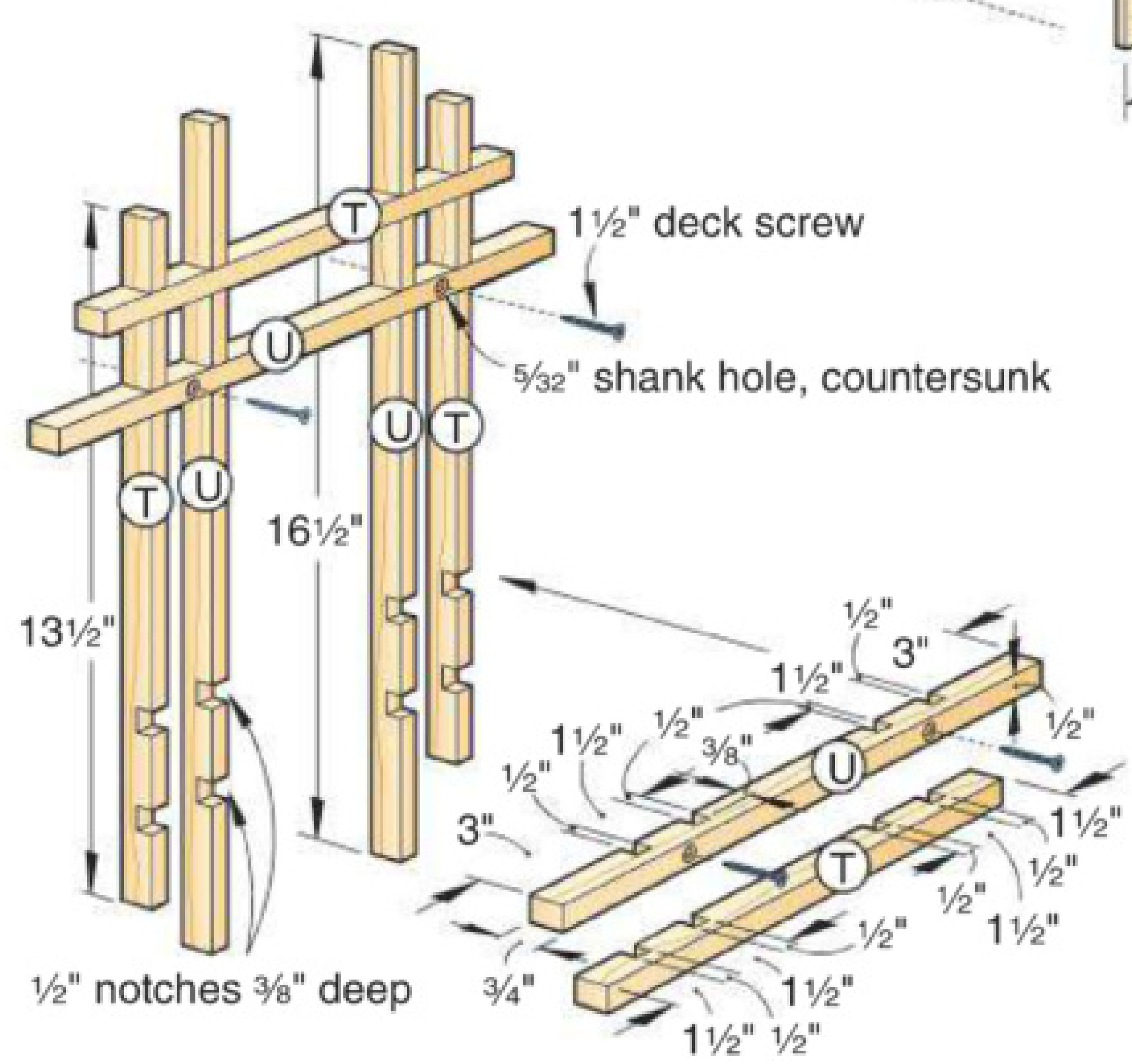
5 JOIST/CROSS JOIST LAYOUT



6 GATE EXPLODED VIEW



6a WINDOW TRIM



4 Sand all your arbor parts with 120-grit sandpaper. Prime the parts, including the top 36" of the posts, with an exterior-grade latex primer. Take special care to coat the end grain and the notches. When the primer dries, lightly sand with 220-grit sandpaper. Finish the parts with two coats of exterior latex paint.

build a sturdy gate

1 Cut 1×6 boards (3/4×5 1/2") to length for the slats (O). Chuck a 1/8" round-over bit in your handheld router, and rout their outside ends and edges. Pick out two center slats, and crosscut them for the window, 15 1/4" from the top end, where shown on **Drawing 6**.

2 Clamp together seven slats (O) edge to edge, facedown, positioning the long portion of one of the cut slats in the center. Make sure the bottom ends are flush and the assembly is square. Insert the short portion of the center slat, leaving a 5 1/2"-long space for the window, where shown on **Drawing 6**. Measure the width of the assembly for the exact length of the rails (P), and cut them to this length. Cut stiles (Q) to the length in the **Materials List**.

3 Glue and clamp the bottom rail (P) in place. (We used polyurethane glue.) Drill countersunk shank holes, centered on the rail's width and on each slat, where shown on **Drawing 6**. Drive the screws. Glue, clamp, drill, and screw the stiles (Q), and then the top rail (P), in place. When drilling the shank holes into the top rail, once again center each hole on a slat, but drill them 1" from the rail's bottom edge.

4 Cut the brace (R) to the length shown in the **Materials List**. Lay it diagonally across the assembly with its top end opposite the hinge side. Mark and cut the end angles, as shown on **Drawing 6**. Drill countersunk shank holes, and glue and screw the brace in place.

5 Cut the window cleats (S) to size, apply glue, and nail them in place around the window with 3d galvanized box nails.

6 Apply glue to the rails, stiles, brace, and cleats. Clamp the remaining slats in place with the cut slat in the center. Using a thin wood strip bent to the curve shown on **Drawing 6**, mark the door's top arc. Drill countersunk shank holes into the slats where shown. Drive the screws, and remove the clamps. Cut the top arc with a jigsaw, and sand it smooth. Rout 1/8" round-overs on both edges.

7 Cut the long and short window trim (T, U) to size. Install a ½" dado blade in your tablesaw, and raise it to cut ⅜" deep. Attach an auxiliary extension to your miter gauge, and form the notches, where shown on **Drawing 6a**. Apply glue to the joints, and assemble the trim. With the glue dry, drill countersunk shank holes, and screw the trim in place around the gate's window.

8 Prime the gate with exterior acrylic latex primer, taking care to fully coat the end grain. Finish with two coats of acrylic latex paint.

now, put it all together

1 Clamp the main joists (D) to the posts, where shown on **Drawing 7**. Check the joists for level front-to-back and side-to-side. Using the counterbored holes in the joists as guides, drill pilot holes into the posts. Slip washers on the lag screws, and drive them.

2 Place the cross joists (E), where shown on **Drawing 7**. The notches in the cross joists fit over the main joists. Drill countersunk shank holes through the cross joists at each notch. Drive 4" deck screws through the cross joists into the main joists.

box and trim the posts

1 From pressure-treated 2×4 stock, cut the horizontal and hinge blocking (F, G) to size. Fasten the blocking to the posts with 3" deck screws, where shown on **Drawing 1**. Install the hinge blocking (G) on only the hinge-side post, flush with the corner that is in the direction of the gate's swing.

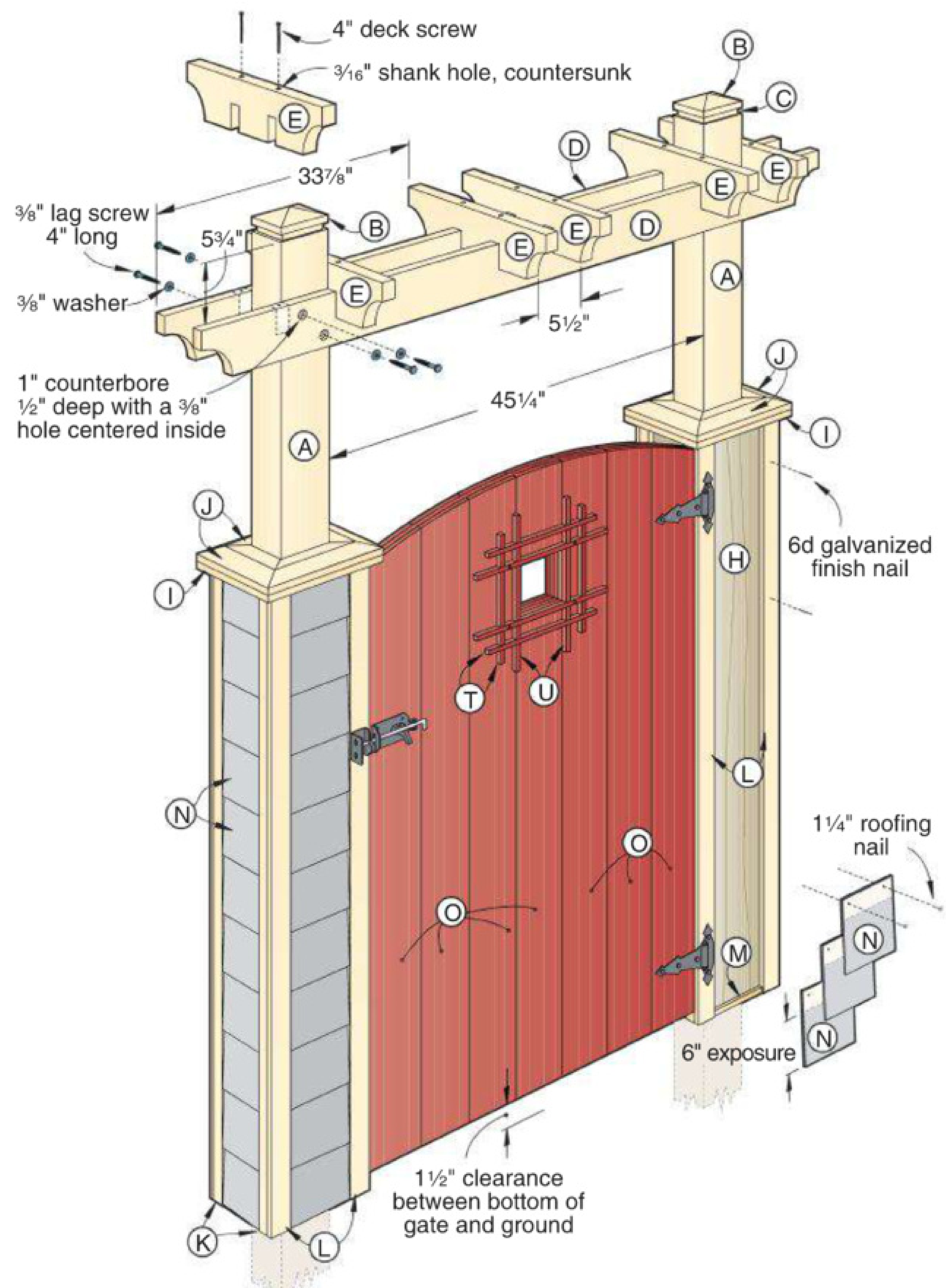
2 From pressure-treated plywood, cut the surround sides (H) to size. Using construction adhesive and 6d common galvanized nails, attach the sides to the blocking. Keep the top edges of the sides and the top blocking flush.

3 Cut eight ¾×1¾×14½" pieces of cedar for the trim base (I), and eight 1½×4×14½" pieces of cedar for the beveled trim (J). Glue and clamp blanks for the surround trim (I/J), keeping one edge of the assembly flush, as shown on **Drawing 1a**. Use an exterior glue. (We used polyurethane glue.) With the glue dry, cut the bevels, where shown.

4 Miter-cut the surround trim (I/J) to fit around the tops of the surrounds. Gluing the corners together, nail the surround trim to the blocking (F) with 10d galvanized finish nails.

5 Cut the narrow battens (K) and wide battens (L) to size. Nail them to the corners of the post surrounds with 6d galvanized finish nails, where shown on **Drawing 7**.

7 FINAL ASSEMBLY



apply the shingles

1 Rip two 7⁄16×¾×30" blanks for the starter strips (M). From these blanks, cut pieces to fit around the bottom of each post surround. Nail them in place with 4d galvanized box nails.

2 Using an inexpensive 7¼" carbide-tipped blade in your tablesaw, trim 18"-long fiber-cement shingles (N) to width, then cut the lengths in half, making 8 15⁄16"-long shingles. You'll get two 8 15⁄16"-long shingles out of each 18"-long one, so for the 88 shingles needed, you'll have to purchase at least 44 of the 18"-long shingles. See the **Buying Guide** for fiber-cement shingle information.

Note: The ¼"-thick 18"-long fiber-cement shingles shown that cover the columns come in 6", 8", and 12" widths. Because the between-the-battens width of our sides is 7", we used only 8"-wide shingles.

3 Fasten the shingles with a couple of dabs of construction adhesive and 1¼" roofing nails, maintaining the 6" exposure, where shown on **Drawing 7**. Keep the course lines even all around each post box. Because nothing overlaps the top course, trim these shingles to 6" before nailing them in place.

Note: If a fence is to be attached to the gate post surrounds, you may want to attach it before applying the shingles. Then fit shingles around fence members.

4 Caulk the joint between the surround trim (I/J) and the post. Fill any nail holes. Prime and paint the shingles, battens, and trim. Touch up the paint on the posts and arbor where needed.

hang the gate, and you're finished

1 Position the gate between the shingled post surrounds, flush with the corner battens, as shown on **Drawing 7**. Raise it 1½" off the ground with scrapwood blocks, and insert shims between the gate and the corner battens so the gaps at both sides are equal in width

2 Position the hinges, where shown on **Drawing 7**, and mark the screw locations. (We used black-painted 8" ornamental gate T-hinges, available at hardware stores and home centers.) Drill pilot holes, and fasten the hinges to the gate, and then the post surround, as shown in **Photo B**. Use the 1½"-long lag screws provided with the hinges to fasten the hinge to the gate, but use 4"-long lag screws for fastening into the post surround. Locate the T-ends of the hinges so the pilot holes for the 4" lag screws go through the corner batten and side into the hinge blocking (G).

3 Remove the shims and blocking. Install the latch according to the instructions packaged with it. (We used an ornamental gate thumb latch that matches the hinges.)

materials list

Posts	FINISHED SIZE T	W	L	Matl.	Qty.
A* posts	5½"	5½"	†	PT	2
B cap tops	1½"	5½"	5½"	C	2
C cap bases	¾"	4½"	4½"	C	2
Pergola					
D main joists	1½"	5½"	76¼"	C	2
E cross joists	1½"	5½"	25½"	C	6
Post Surrounds					
F horizontal blocking	1½"	3½"	7"	PT	40
G hinge blocking	1½"	3½"	12 5/16"	PT	2
H sides	¾"	9¼"	66¾"	PP	8
I* trim base	¾"	1¾"	13½"	C	8
J* beveled trim	1½"	4"	13½"	C	8
K narrow battens	¾"	1½"	66"	C	8
L wide battens	¾"	2¼"	66"	C	8
M* starter strips	7/16"	¾"	7"	C	8
N* shingles	¼"	7"	8 15/16"	FC	88
Gate					
O slats	¾"	5½"	68"	C	14
P rails	¾"	5½"	38½"	C	2
Q stiles	¾"	5½"	57"	C	2
R* brace	¾"	5½"	65"	C	1
S window cleats	¾"	¾"	6¼"	C	4
T short window trim	½"	¾"	13½"	C	8
U long window trim	½"	¾"	16½"	C	8

*Parts initially cut oversize. See the instructions.

†Length varies. See the instructions.

Materials Key: PT–pressure-treated lumber, C–cedar, PP–pressure-treated plywood, FC–fiber-cement shingles.

Supplies: Gravel, concrete mix (approximately 3 cubic feet), 3d galvanized box nails, 4d galvanized box nails, 4d galvanized finish nails, 6d galvanized finish nails, 10d galvanized finish nails, 6d galvanized common nails, 1¼" roofing nails, 4" deck screws (16), 3" deck screws, 2" deck screws, 1½" deck screws, 1¼" deck screws, 3/8" lag screws 4" long (8), 3/8" flat washers (8), 5/16" lag screws 4" long (4), 8" ornamental gate T-hinges (2), ornamental gate thumb latch, exterior glue, construction adhesive, caulk, exterior wood filler, sandpaper, exterior primer, exterior paint, wood shims. For the bevel jig: ¾×8×8" plywood, ¾×1×8" stock, ¾×2×8" stock, and ½×1×8" stock. For the marking/trimming jig: ¼×6¼×9¾" hardboard and ¾×¾×9¾" stock.

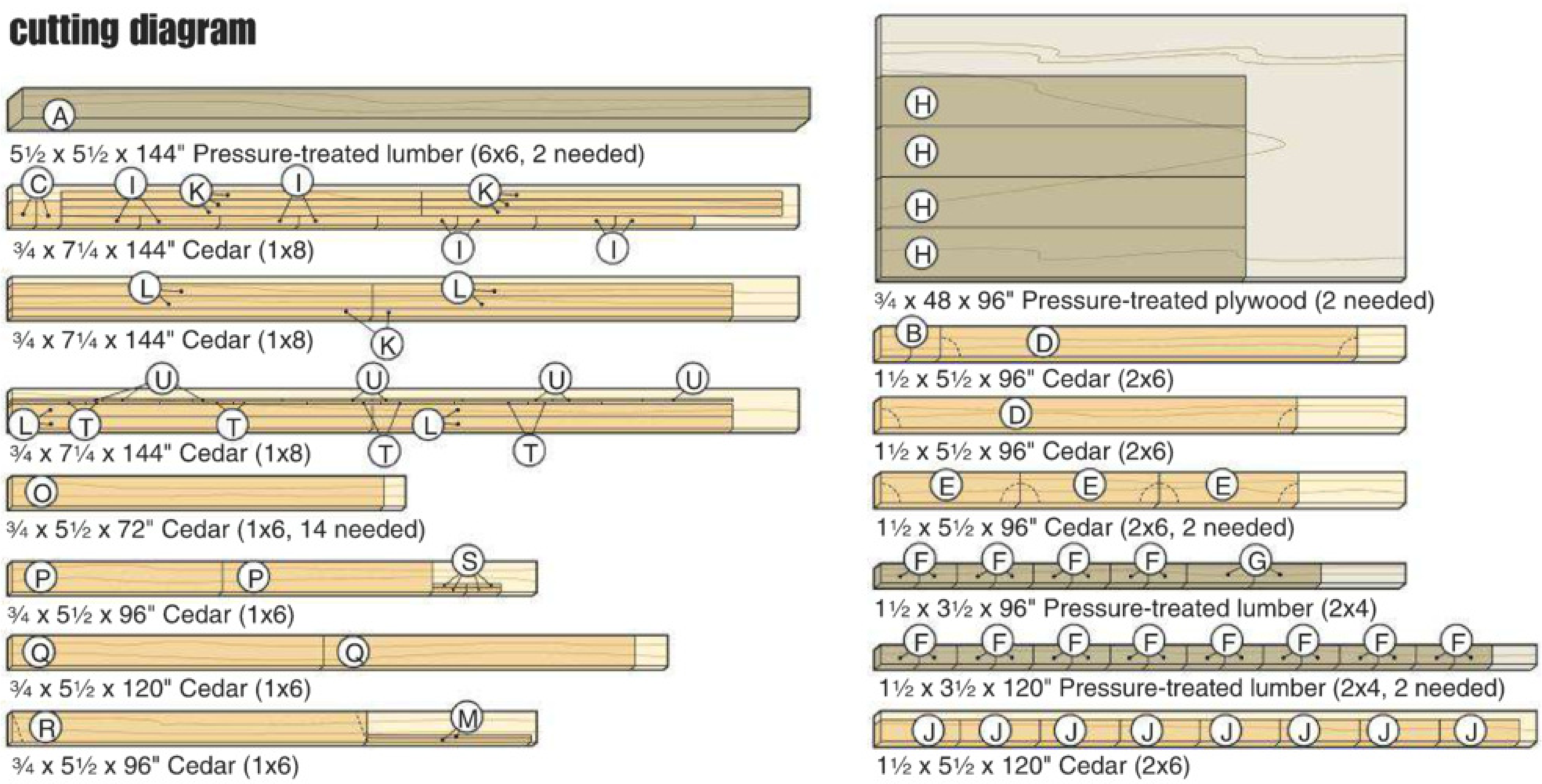
buying guide

Fiber-cement shingles. For Hardie Shingleside Heritage Single Shingle product and dealer information, call James Hardie Building Products, 888-542-7343, or go to jameshardie.com

Written by **Jan Svec** with **Kevin Boyle**
Project design: **Kevin Boyle**; **James R. Downing**
Illustrations: **Roxanne LeMoine**; **Kim Downing**

First, mount the hinge's strap on the gate. Then, using the holes in the hinge's T as guides, drill pilot holes in the surround, and drive the lag screws.

cutting diagram



garden arbor

This freestanding structure lets you venture beyond the deck.

Here's an elegant, timeless retreat that provides the perfect place in which to relax and watch the world go by.

We combined a porch swing from our library of *WOOD* Plans® (see details *below*) with a simple arbor design.

plant four posts on a level spot

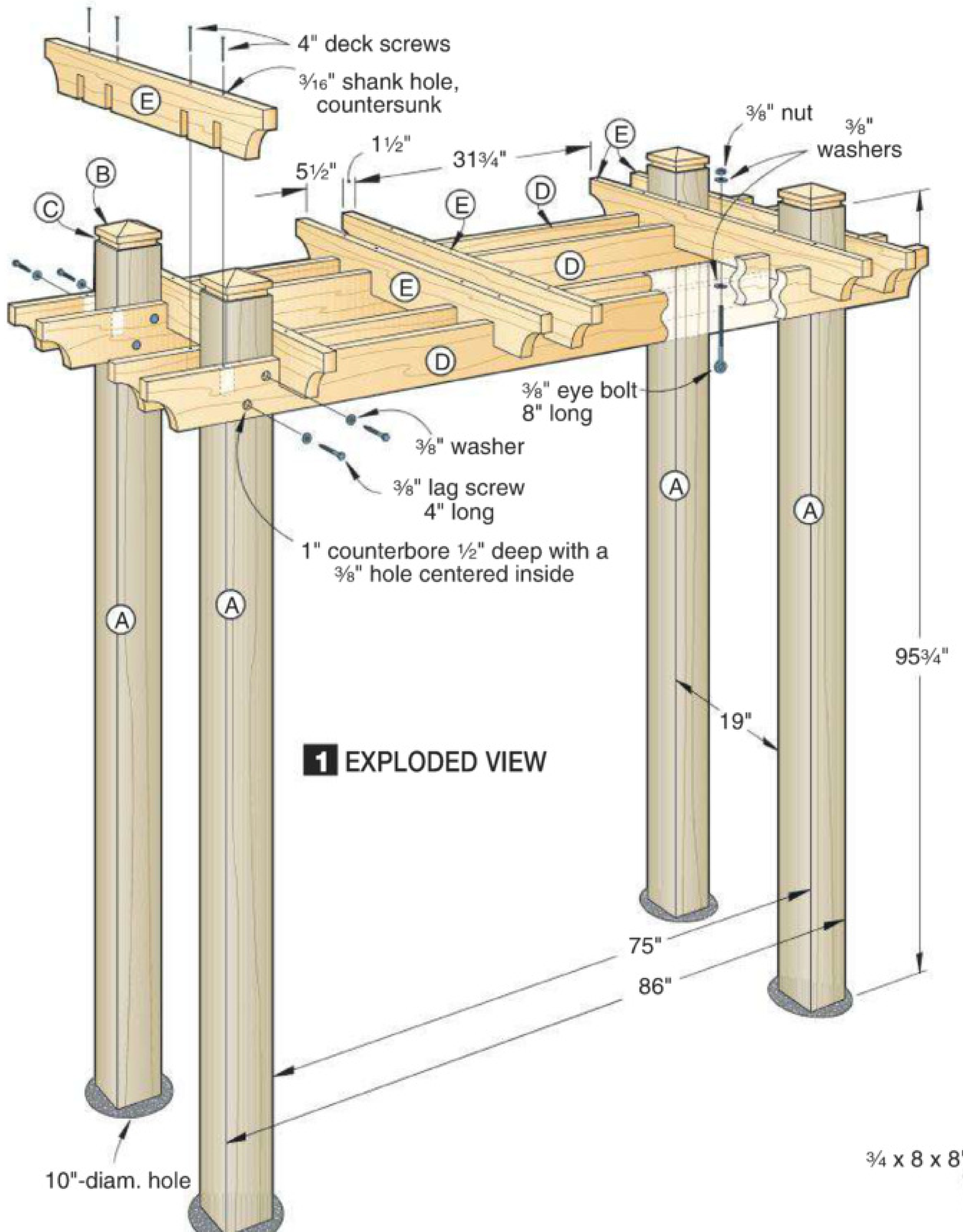
1 Dig four 10"-diameter holes, spaced where shown on **Drawing 1**. (For details on how to accurately locate and temporarily brace your posts, see "Be a Post Master" at woodmagazine.com/postmaster.) To support the swing, the posts extend at least 36" below grade. (Because of the frost line in our location, our posts extended 42" below grade.) Check your local requirement. Dig holes deep enough to allow for a 6" layer of gravel at the bottom for drainage, as shown on **Drawing 1a**.

Note: *Our swing is 58½" wide. The pergola is sized to leave about 8" of clearance at each end between swing and posts. If you choose a different swing, you may have to modify the pergola.*

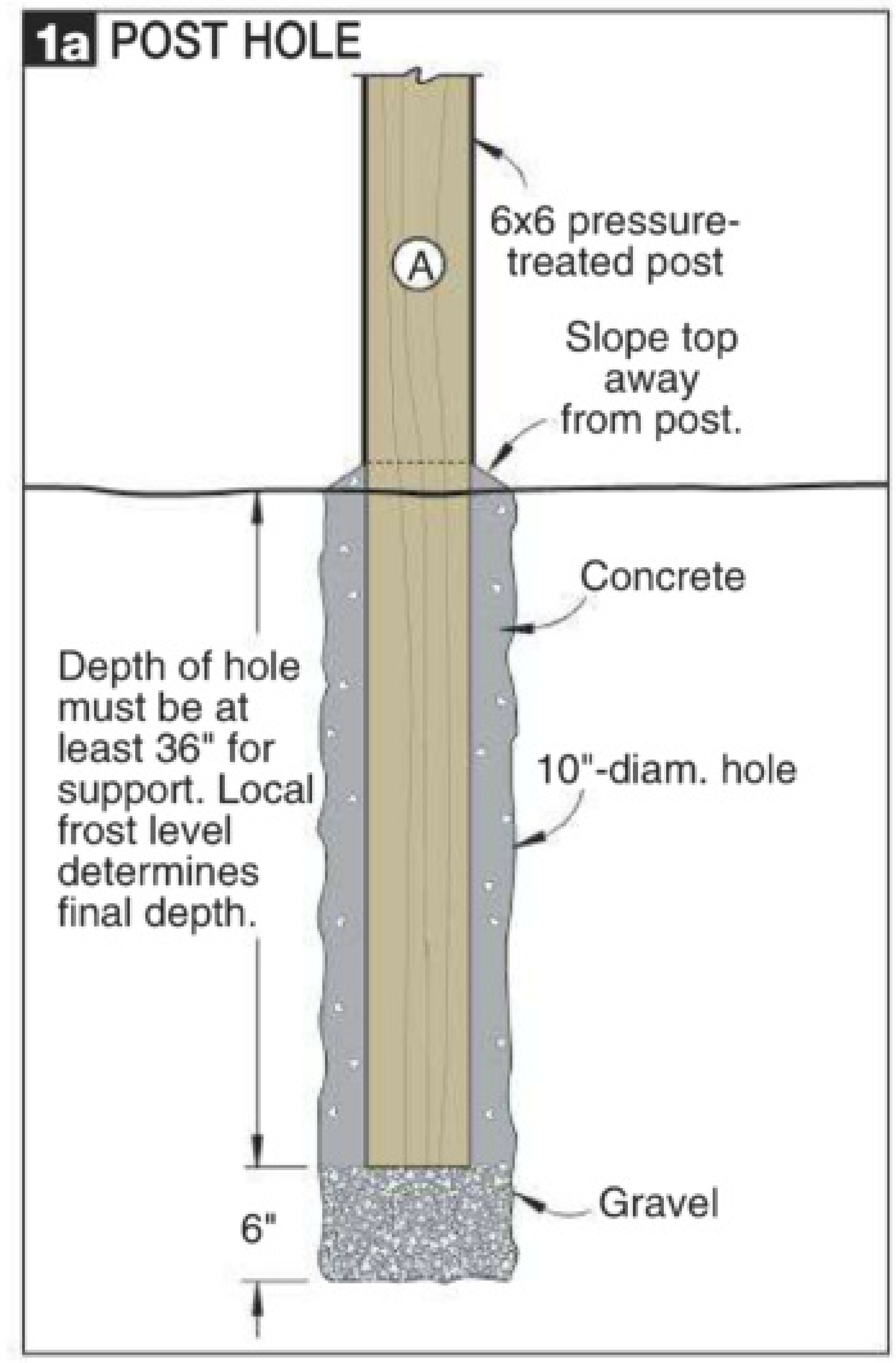
2 Position four 6×6"×12' (5½×5½" actual) pressure-treated posts (A) in the holes, plumb them, and brace them in place. Make sure that the distance between the posts is the same at the top as at the grade. Set them in concrete, as shown on **Drawing 1a**.

3 When the concrete hardens, remove the bracing from the posts. Make a mark 95¾" up from grade on one post. Using a straight board and a level, transfer this top mark to the other posts. Measure the offset on your portable circular saw between the edge of its base and the blade. Measure this offset distance down from the marked top line, and draw a level line around all four sides of each post. Temporarily nail a short board to one side of the first post with its top edge at this

Detailed plans to build the swing shown at *left* are available for $10.95 by calling 888-636-4478 or writing WOOD Plans, P.O. Box 349, Kalona, IA 52247. Plan no. WP-OFS-1002.

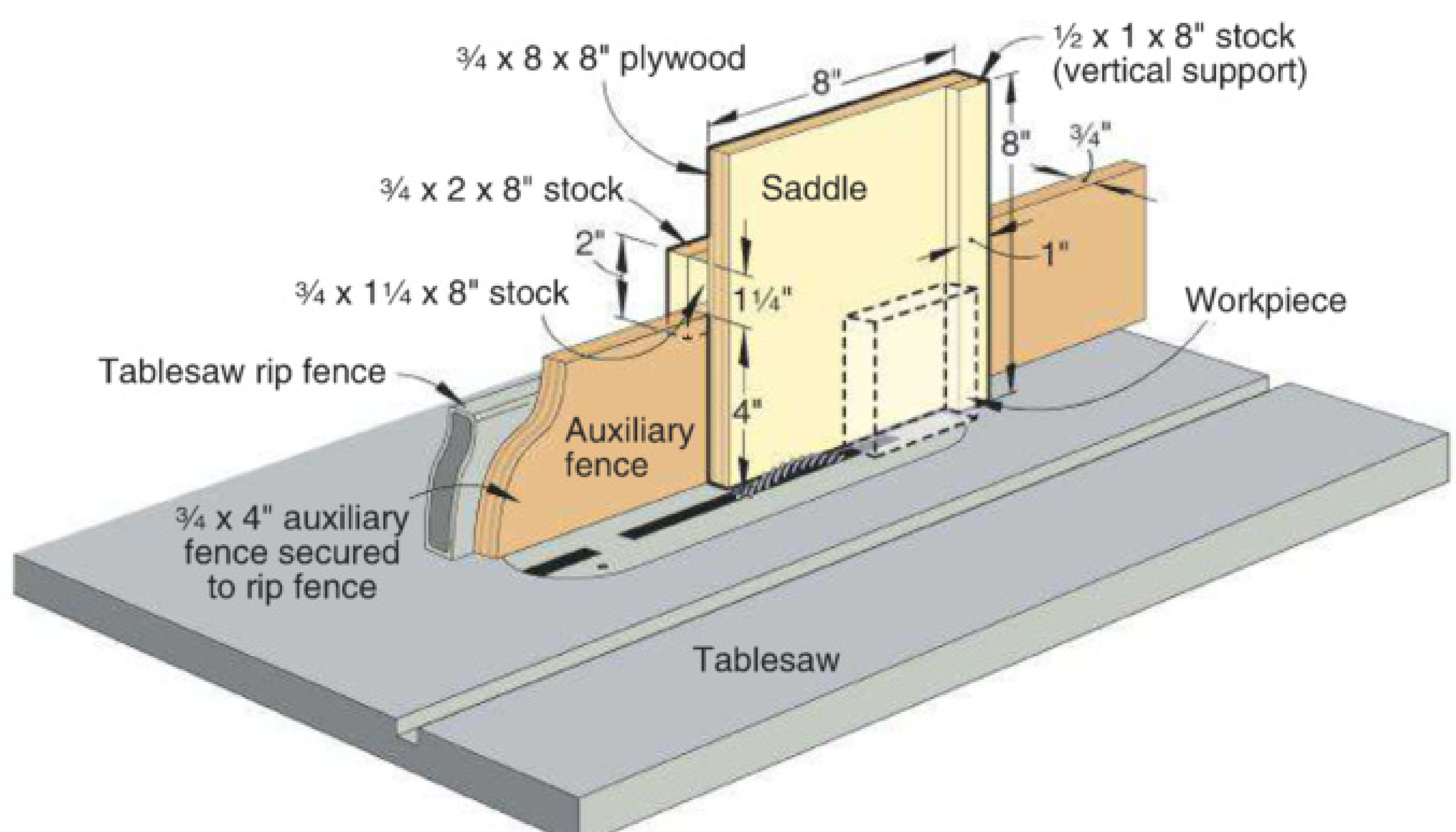


1 EXPLODED VIEW



lower line. Setting your saw to its maximum depth, use the board to guide your saw as you make the cut. In this manner, work your way around the post's three other sides. Finish cutting through the post with a handsaw. Repeat this procedure on the three other posts, making them even in height.

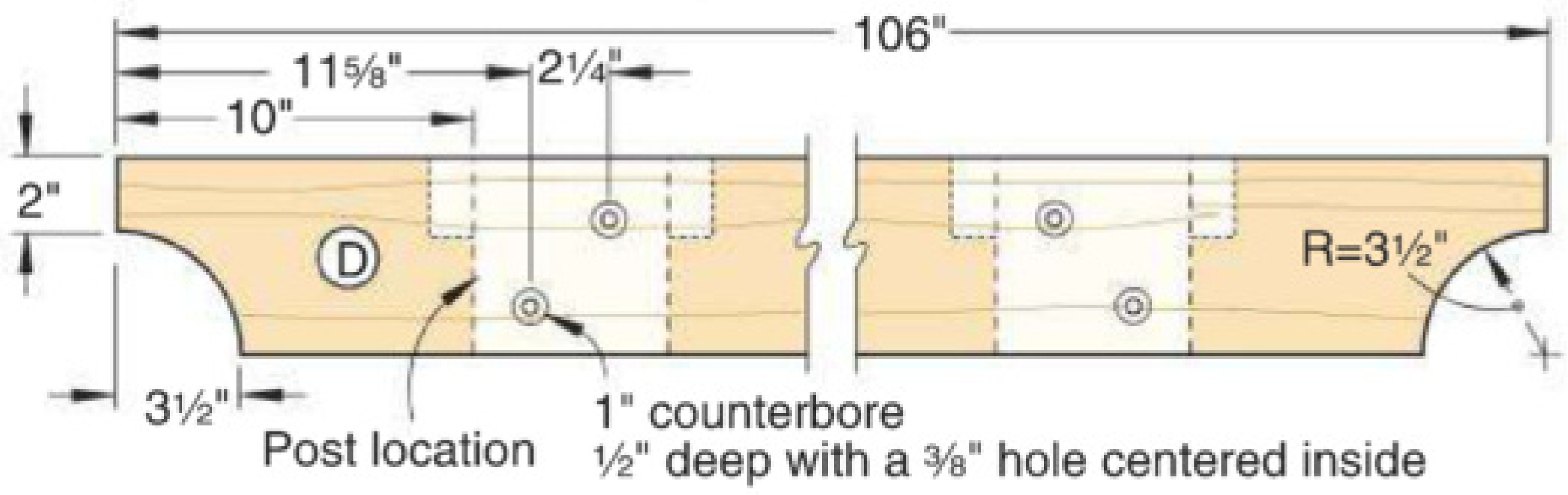
4 For the post caps, start by cutting four cap tops (B) and cap bases (C) to the size listed in the **Materials List**. Bevel the 1½"-thick cap tops, where shown on **Drawing 5**. To make these cuts, we used the auxiliary fence and sliding saddle shown in **Drawing 2**. To hold the blank, drive a wood screw through the back of the jig into the blank's center. Cut one face, rotate 90°, cut, and repeat until all four bevels are cut, as shown in **Photo A** on *page 85*. Glue and nail the cap bases, centered, to the cap tops, using an exterior glue and 4d galvanized nails. Sand the caps to 120 grit and set them aside.



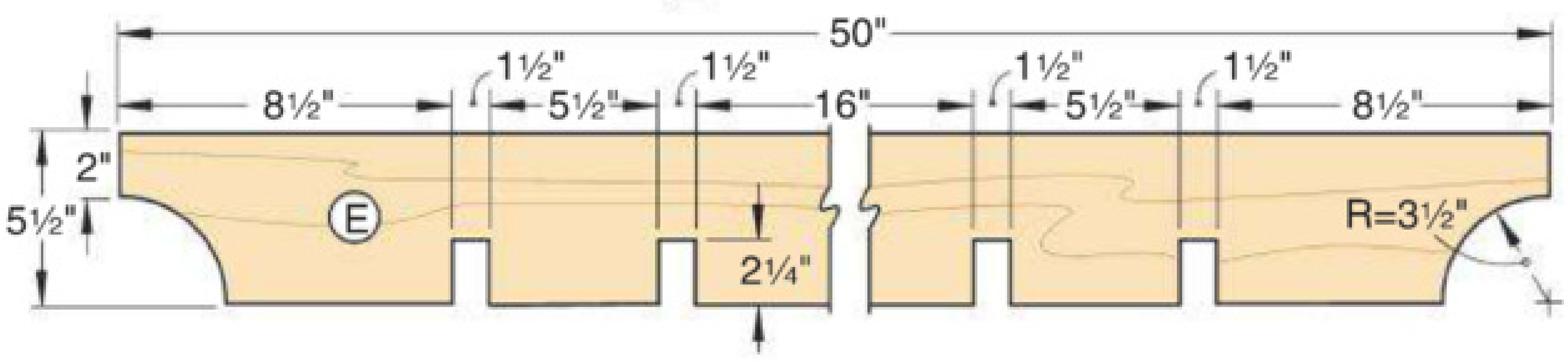
2 RIP-FENCE SADDLE

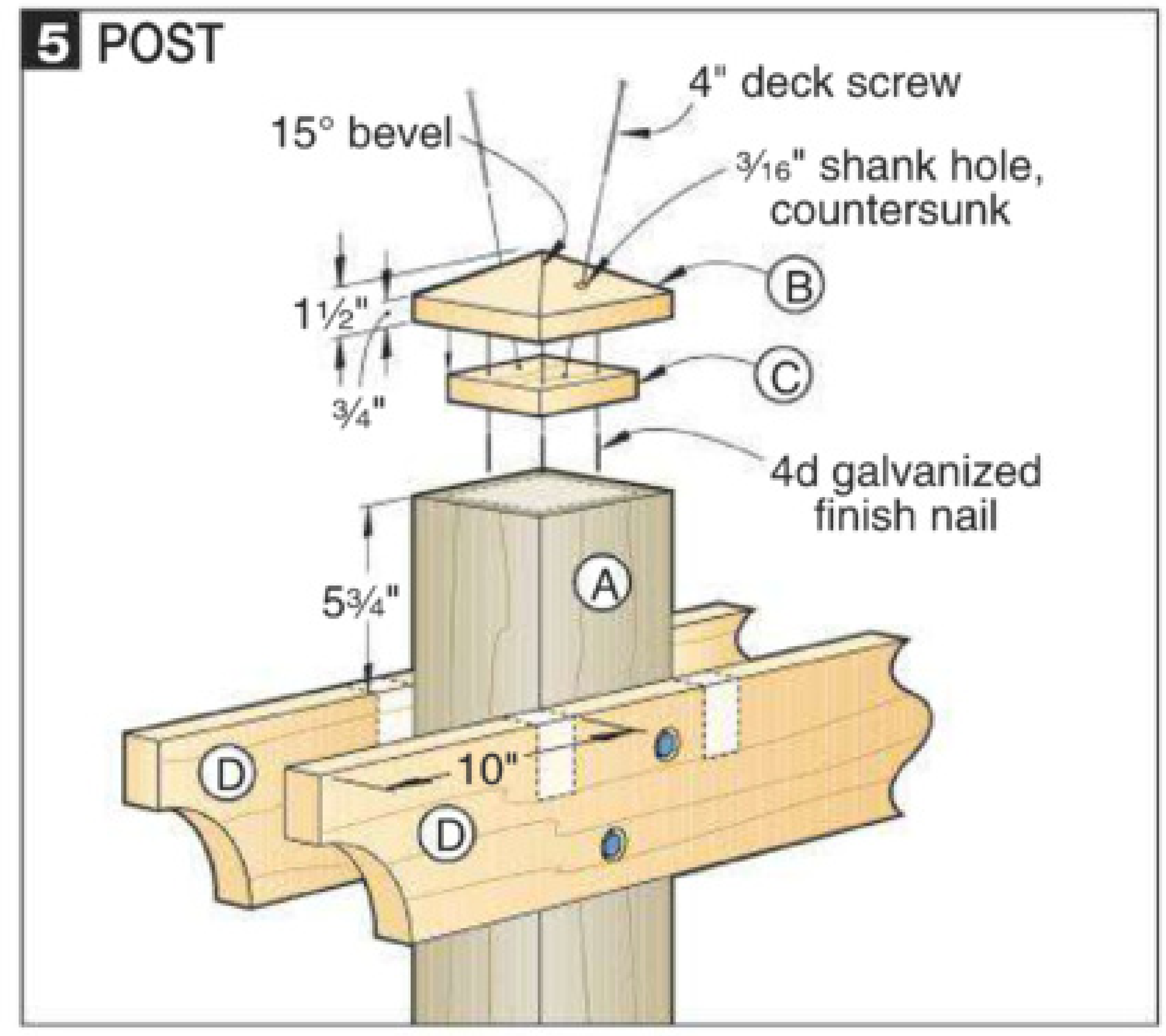
Build this auxiliary wood fence and mating saddle to bevel-cut the post caps for the arbor. Use one hand to push the saddle and workpiece across the blade, and your other hand to keep the saddle riding firmly on the auxiliary fence. Wax the mating pieces if necessary for easy sliding. Note: Our auxiliary fence is screwed securely to our metal tablesaw rip fence, with the top edge of the fence sitting 1" above the top edge of the metal fence. The auxiliary fence must be 90° to the saw table. Size your wood fence so the saddle rides smoothly, without free play, along the top edge of the auxiliary fence.

3 MAIN JOIST



4 CROSS JOIST





cut the parts for the overhead grid

1 Cut the main joists (D) to the length in the Materials List. Form the end cutouts, shown on **Drawing 3**. Drill the counterbored ⅜" holes where shown.

2 Cut the cross joists (E) to the length in the **Material List**. Form the end cutouts, shown on **Drawing 4**, in the same manner as those in the main joists.

3 Turn the cross joists upside down on a pair of sawhorses, and clamp them together with their ends and edges flush. Lay out the notch locations, where shown on **Drawing 4**. Form the notches.

Note: Check the actual dimension of your 6×6 posts. The spaces between the paired notches in the cross joists (E) must match this dimension.

4 Sand all your pergola parts with 120-grit sandpaper. Prime all of the parts, including the posts, with an exterior-grade latex primer. Take special care to coat the end grain and the notches. When the primer dries, lightly sand with 220-grit sandpaper. Finish the parts with two coats of exterior latex paint.

Fasten the main joists to the posts with lag screws and flat washers.

With a helper at the other end, drop the cross joists in place over the main joists.

now, put it all together

1 Apply construction adhesive and screw the post caps (B/C) to the posts, where shown on **Drawing 5**.

2 Clamp the main joists (D) to the posts, where shown on **Drawings 1** and **5**. Make sure the joists are level side-to-side and that the front pair of joists is level with the back pair. Using the counterbored holes in the joists as guides, drill pilot holes into the posts. Drive in the lag screws, as shown in **Photo A**.

3 Place the cross joists (E), where shown on **Drawing 1**. The notches in the cross joists fit over the main joists, as shown in **Photo B**. Drill countersunk shank holes through the cross joists at each notch. Drive 4" deck screws through the cross joists into the main joists.

4 Drill ⅜" holes for the eye bolts, centered between the posts and in the thickness of the cross joists, where shown on **Drawing 1**. Touch up the paint where needed. With the paint dry, install the eye bolts, and hang the swing.

Written by **Jan Svec** with **Kevin Boyle**
Project design: **Kevin Boyle**; **James R. Downing**
Illustrations: **Roxanne LeMoine**; **Kim Downing**

materials list

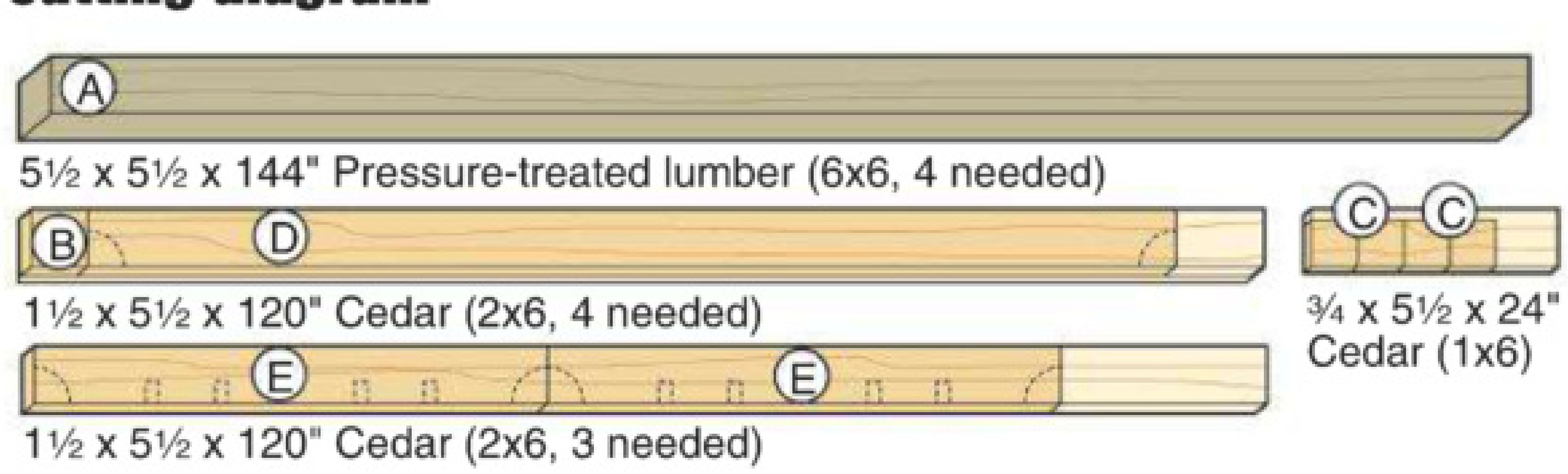
Part	FINISHED SIZE T	W	L	Matl.	Qty.
A posts	5½"	5½"	†	PT	4
B cap tops	1½"	5½"	5½"	C	4
C cap bases	¾"	4½"	4½"	C	4
D main joists	1½"	5½"	106"	C	4
E cross joists	1½"	5½"	50"	C	6

†Length varies depending on depth of frost line. See the instructions.

Materials Key: PT–pressure-treated lumber, C–cedar.

Supplies: ⅜" lag screws 4" long (16), ⅜" flat washers (20), 4" deck screws (32), 4d galvanized finish nails, ⅜" eye bolts 8" long (2), ⅜" nuts (2), construction adhesive, primer, paint, gravel, concrete mix (approximately 5 cubic feet).

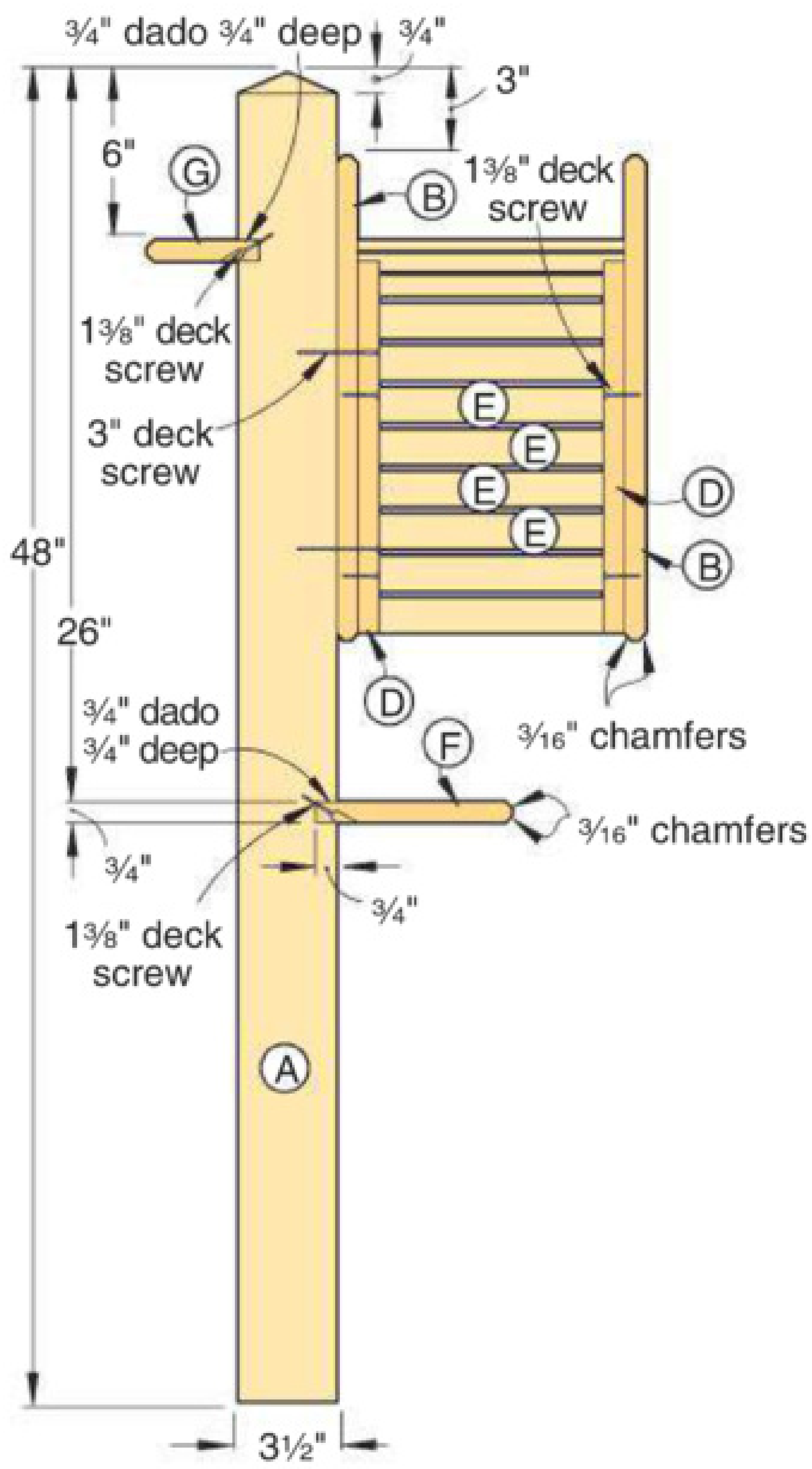
cutting diagram



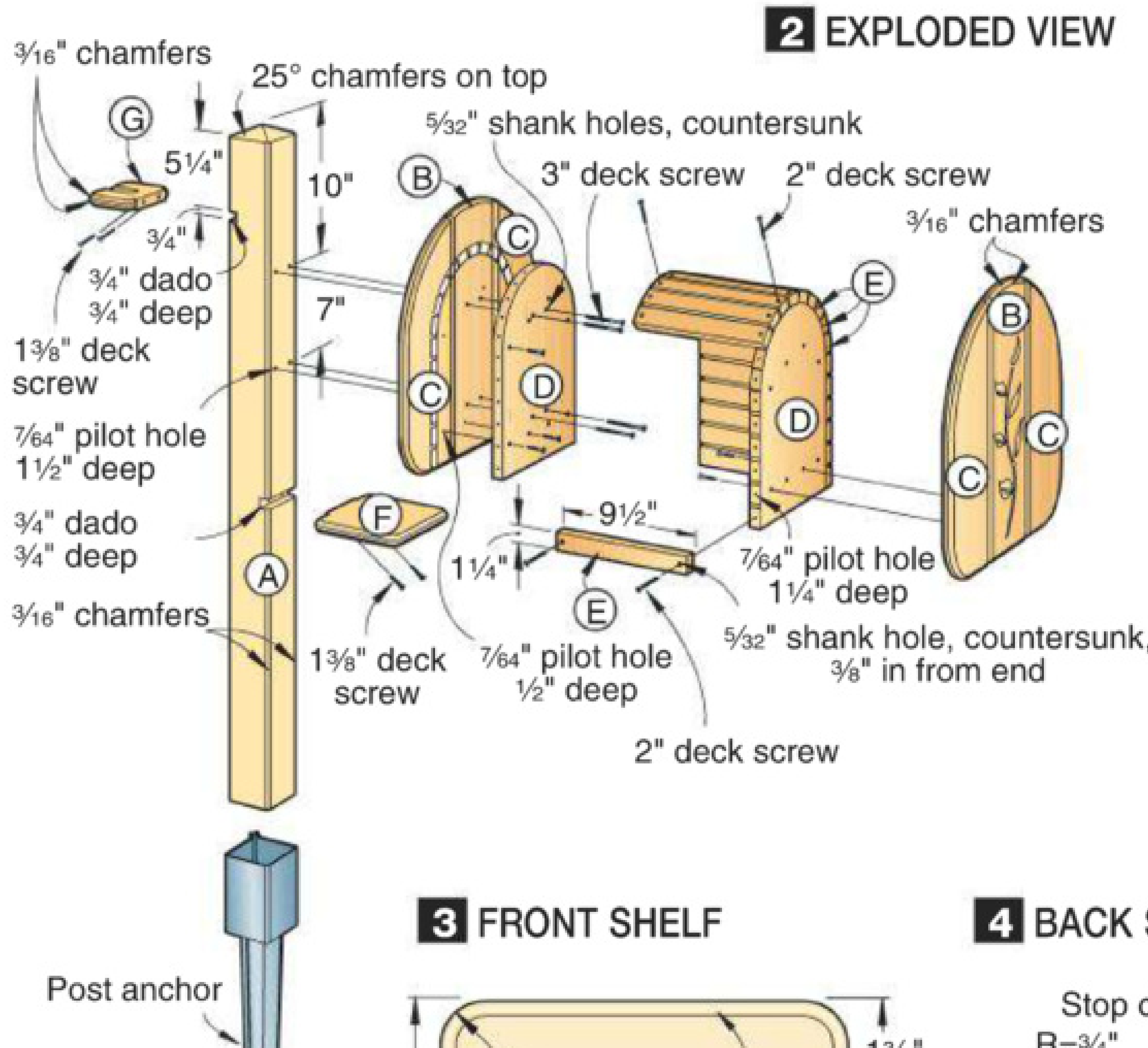
handy hose holder

Unkink your garden hose once and for all with this decorative and sturdy hanger. Capable of stowing more than 100' of hose, and a couple of sprinkler heads as well, you can mount it beside the house, directly on a fence, or anywhere that's convenient.

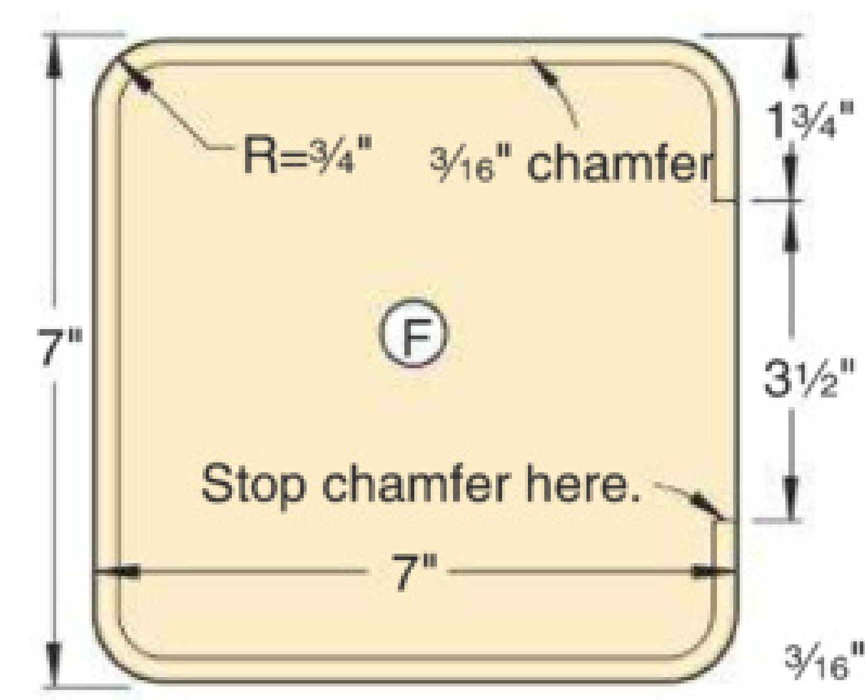
1 SIDE SECTION VIEW



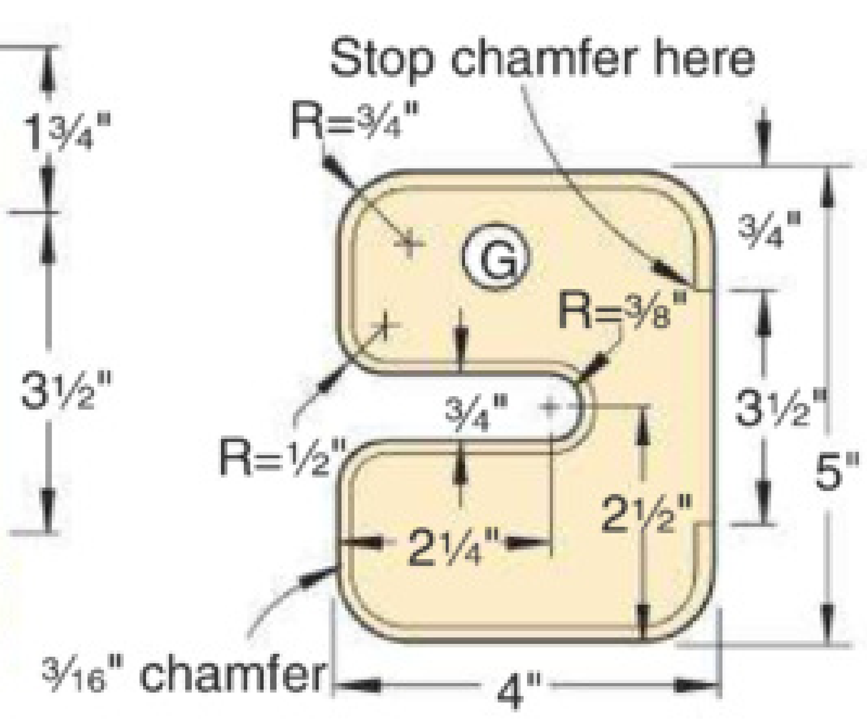
2 EXPLODED VIEW



3 FRONT SHELF



4 BACK SHELF



prepare a post

1 Cut the post (A) to length. (We cut it on a sliding compound mitersaw.) Tilt the saw blade to 25°, and miter-cut a chamfer on each face at the top.

2 Form two ¾×¾" dadoes in the post, where shown on **Drawing 1**. You can saw them on a tablesaw equipped with a dado blade or rout them.

3 Rout a 3/16" chamfer along each edge of the post, where shown in **Drawing 2**.

build a pair of panels

1 Cut stock for center (B) and side panels (C). (We cut six 18" lengths of 1×6 stock.) Stack the pieces in pairs, aligning the edges and ends flush. Tape each set together with masking tape.

2 Enlarge the gridded patterns supplied on the *next page*. Make one full-size pattern for part B and two for part C. (You'll need one for the right-hand side panel and one for the left.) Adhere the pattern for part B to the top of one stack; a pattern for part C to the top of each of the other two. Align the straight edges of the patterns with the boards' edges. Bandsaw to shape, cutting slightly outside the pattern line. Sand to the line, and separate the pieces.

3 Scrollsaw the ivy design in the front center panel (B). Drill a ⅛" blade-start hole inside each cutout area, and cut out the pattern on a scrollsaw fitted with a large blade.

4 Rout a 3/16"-chamfer all around the edge on both sides of each piece.

5 Edge-glue stock to make two ¾×13½×10" blanks for the inner supports (D). (We glued up three pieces of 1×4 cedar for each blank, using polyurethane glue for moisture resistance. A 6'-long board yielded more than enough stock.) Stack the two blanks, and tape them together for stack-cutting.

6 Make a full-size copy of the gridded **Inside Support** pattern. Adhere the pattern to the top of the stacked blanks, and bandsaw the two parts. Saw outside the line, then sand to it. Drill eight 5/32" holes through both pieces where shown. Separate the parts, and drill the four holes for the post screws in the back piece. Countersink the screw holes on the appropriate side.

7 Attach the face panels (B, C) to the inside supports (D), where shown on the patterns. Space parts B and C ¼" apart. To accent the cut-out ivy design, apply green paint (we used Krylon exterior paint) to the area of the inside support face behind the cutout before attaching the center panel (B).

8 Attach the back assembly (B/C/D) to the post (A) with 3"-long screws.

you can hang it up

1 Cut the slats (E) to the size shown on the **Materials List** on *page 94*. Set a stopblock on an auxiliary miter-gauge fence for accuracy when trimming each of the parts to length. Cut several ¼" scrapwood spacer blocks to ensure uniform spacing when you install the slats.

2 Drill and countersink a centered 5/32" shank hole ⅜" from each end of each slat. Set a fence and stopblock on your drill press to do this.

3 Attach the slats to the back panel (the one fastened to the post) first. Start with the slats at both lower corners and at the top center on part D. Guiding through the shank hole, drill a pilot hole into part D. After you screw the three starting slats in place, position the slat next to one of the lower ones, drill the pilot hole, and screw it into place. Continue around to the top center slat. As you work around the curve, place the spacer blocks right at the face of the slats rather than pushing them all the way down to part D. Attach the slats on the other side, working from the bottom up.

4 Following the same procedure, install the front panel.

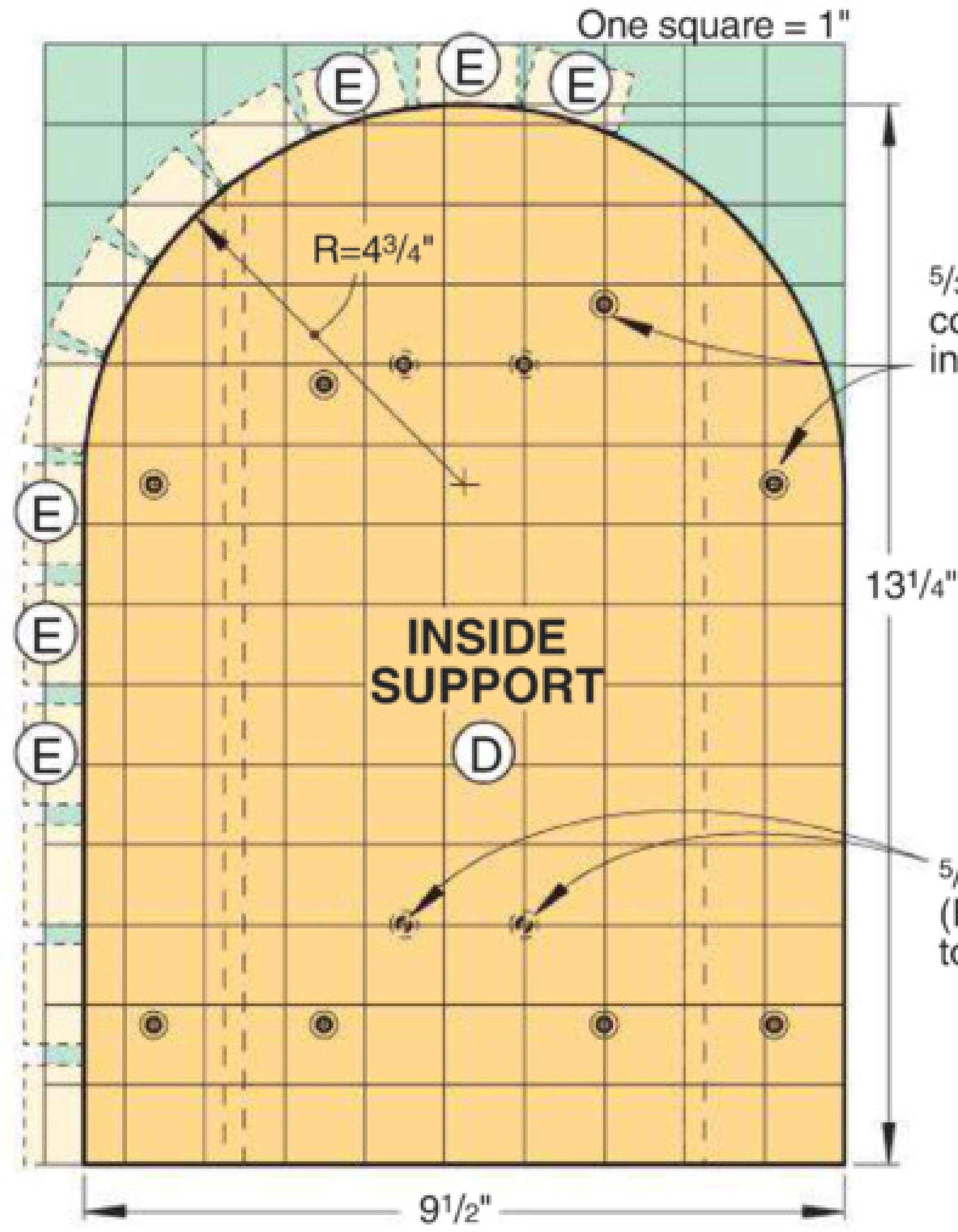
5 Cut out the front and back shelves (F, G), referring to **Drawings 3** and **4**. Rout chamfers where shown.

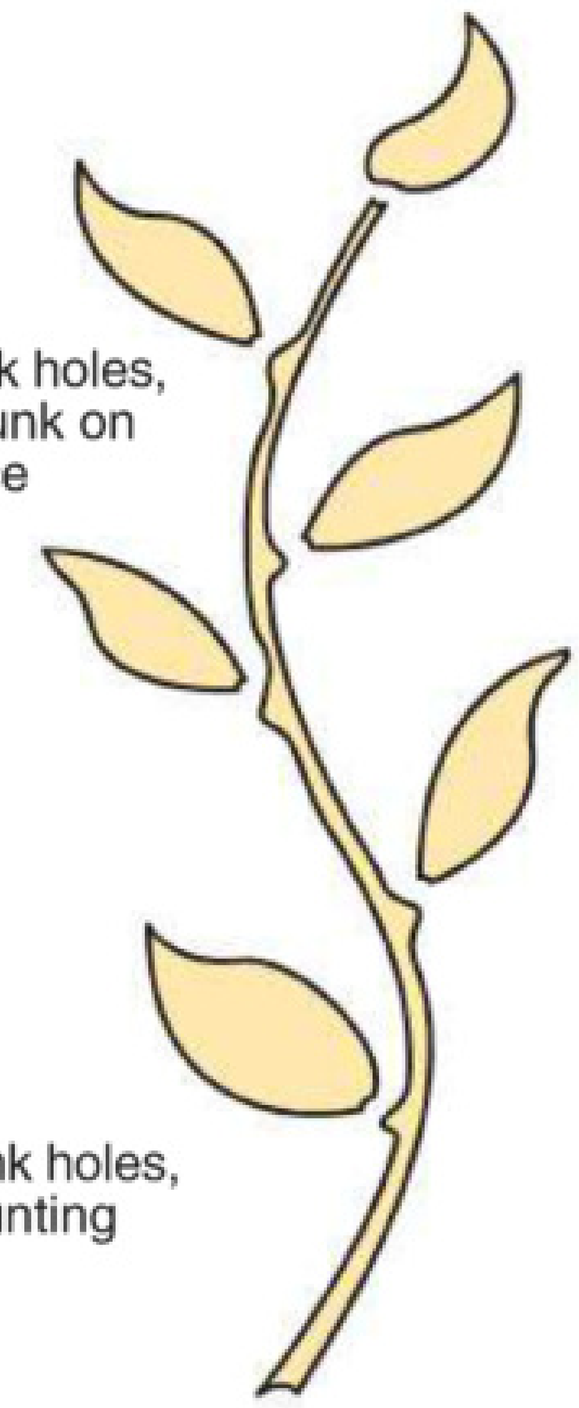
6 Glue and screw the shelves into their dadoes.

7 Apply a clear outdoor finish. Then, drive in the post anchor or dig a hole to set the post in concrete.

Project Design: **Charles I. Hedlund**
Photographs: **Hetherington Photography**
Illustrations: **Roxanne LeMoine; Lorna Johnson**

INSIDE SUPPORT GRIDDED PATTERN





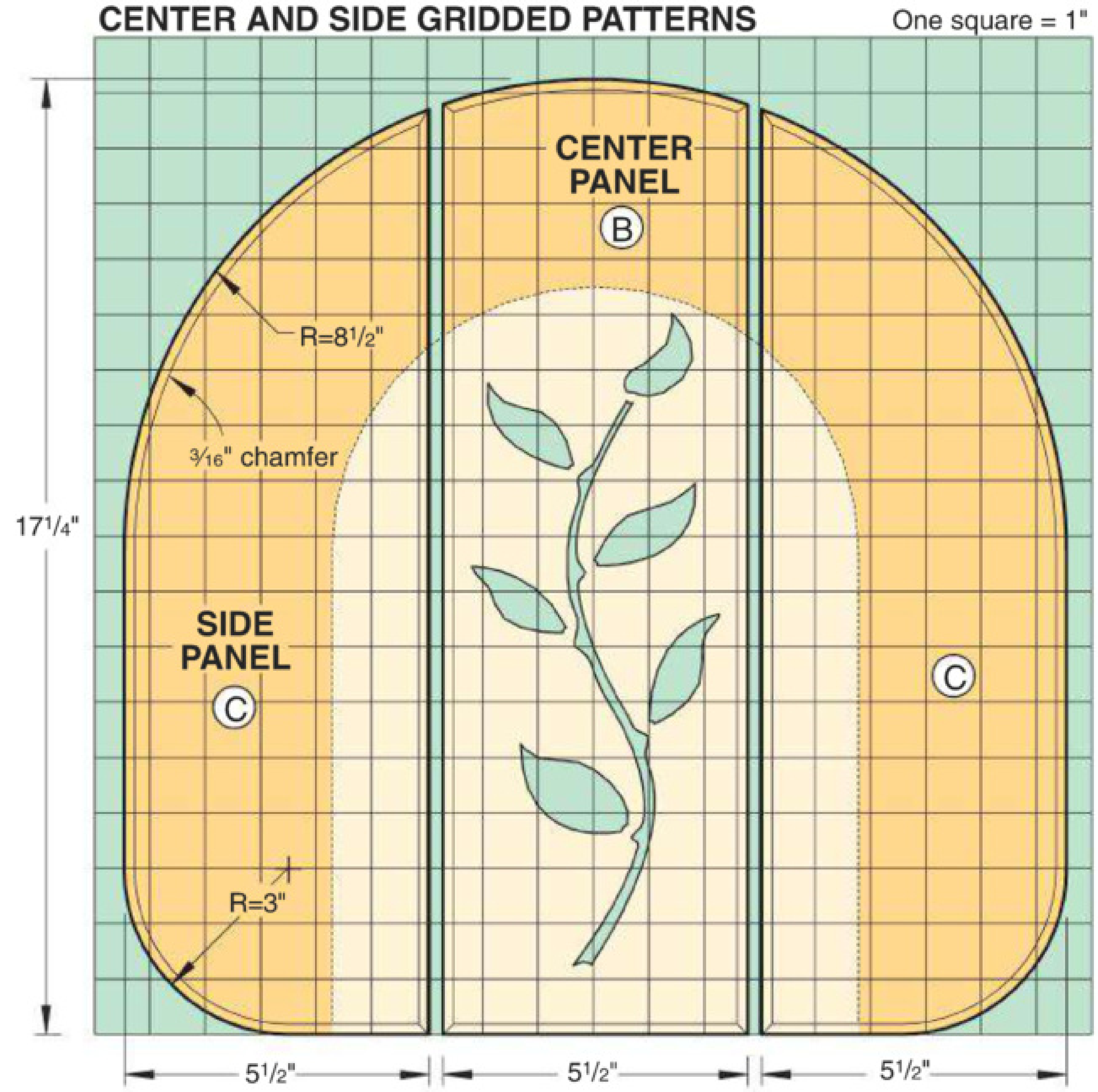
FRONT PANEL IVY PATTERN
(Enlarge 400% for full size.)

materials list

Hose Holder	FINISHED SIZE T	W	L	Matl.	Qty.
A post	3½"	3½"	48"	C	1
B center panels	¾"	5½"	17¼"	C	2
C side panels	¾"	5½"	16⅝"	C	4
D inner supports	¾"	13¼"	9½"	C	2
E slats	¾"	1¼"	9½"	C	23
F front shelf	¾"	7"	7"	C	1
G back shelf	¾"	5"	4"	C	1

Material Key: C–choice of redwood, cypress, or cedar.
Supplies: 1⅜", 2", and 3" deck screws, post anchor, finish.

CENTER AND SIDE GRIDDED PATTERNS



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raised to last a lifetime

As easy to work with as wood, a composite material forms a raised planting bed that will last decades.

Better resistance to the elements is a key advantage of composite lumber when compared with wood. Increasingly used in place of pressure-treated wood for decking, composite lumber also is more frequently used for other garden structures.

For this project, we chose composite decking. Although not designed specifically for use in raised beds, the material should look great for years to come and require little maintenance. In addition, composite decking is available in several colors, allowing us to add a decorative touch to our bed design. This decking comes in standard decking lumber dimensions, and can be cut and joined with ordinary woodworking tools. See *page 2 1* for details about specialty screws.

Composite decking costs more than pressure-treated wood, but prices are dropping as the availability increases. For the additional cost, however, you get a structure with greater aesthetic appeal and one that should far outlast a wood bed.

A do-it-yourselfer with a little project experience should be able to complete this raised bed in one weekend. The design and construction are simple, but several cuts require precision to look their best. Beginners may want to enlist the help of a more experienced woodworker.

Our central raised bed is 4×4', with two 4×6' wings, but you can readily alter the dimensions to suit your yard.

Designed to stand up to the elements, composite lumber provides a durable alternative to wood for raised beds. Several months after construction, the bed in this photo brims with tomatoes, zucchini, peppers, and herbs. Annual flowers fill in the gaps.

the results

During one growing season, the bed performed well. The sides did not bulge, and all the joints held firm. The cap boards held up to the weight of an adult who frequently sat on them to pull weeds.

The lumber color did not fade noticeably. In addition, the occasional use of a string trimmer to maintain the lawn next to the bed did not scar the boards. Cleaning the boards required only a gentle scrub with a brush and a rinse with a hose. After a season of use, the bed looks almost as it did when built.

Written by **Eric Liskey**
Photographer: **Andy Lyons**
Illustrator: **Top Dog Illustration; Lorna Johnson**
How-to Photographer: **Kim Cornelison**

Composite lumber is available in different colors, so we added decorative trim in a complementary hue.

materials list

Part		FINISHED SIZE T	W	L	Matl.	Qty.
A	cap boards	5/4	5½"	52"	CO	6
B	cap boards	5/4	5½"	74"	CO	2
C	cap boards	5/4	5½"	77"	CO	2
D	bottom level	1½"	7¼"	120"	CO	1
E	bottom level	1½"	7¼"	118½"	CO	2
F	bottom level	1½"	7¼"	72"	CO	1
G	top level	1½"	7¼"	48"	CO	2
H	both levels	1½"	7¼"	45"	CO	5

Materials Key: CO–composite.

tools and materials

Tools

- Mitersaw*
- Jigsaw
- Tablesaw*
- Electric drill with drill bits and a No. 2 square drive (for screws)
- 3-pound drilling hammer or sledgehammer (to drive stakes)
- Tape measure
- Flat wood file
- Hammer

Hardware

- Two hundred 2½" stainless-steel screws
- Composite lumber, see **Materials List** *above right* for details.
- Six 12'-long 2x8s in light brown
- Five 12'-long 5/4s in dark brown
- Two 8'-long 2x4s in light brown

(*The cuts made by the mitersaw and tablesaw could be made by a skilled do-it-yourselfer with a circular saw, though the finished joints may not be as tight.)

Corner Trim Detail

1 Each of the four bottom-level corners is trimmed with two 5/4 pieces: one 2¼×7¼" and one 3¼×7¼".

2 The corner on the back side of the upper level (not visible in diagram *below*) is trimmed with two 5/4 pieces: one 2¼×14½" and one 3¼×14½".

3 The remaining three upper-level corners are each trimmed with two 5/4 pieces: one 2¼×6" and one 3¼×6".

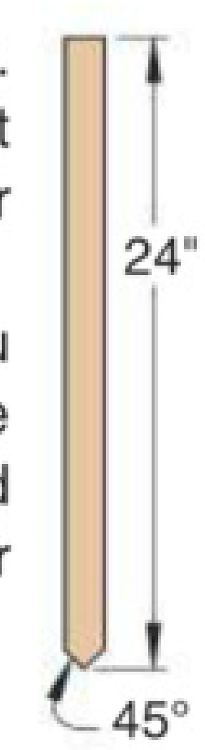
Cleats

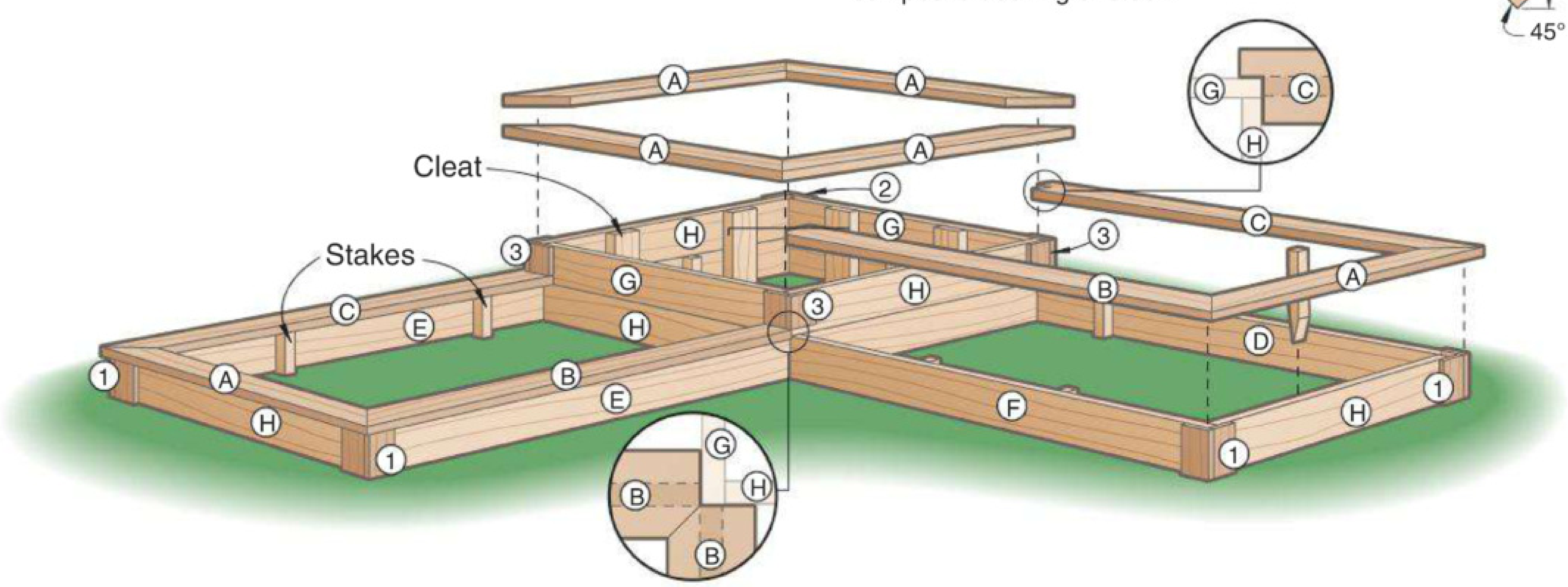
Eight cleats secure the upper level of the center section to the lower level. Each cleat is a 14" long 2×4.

Stakes

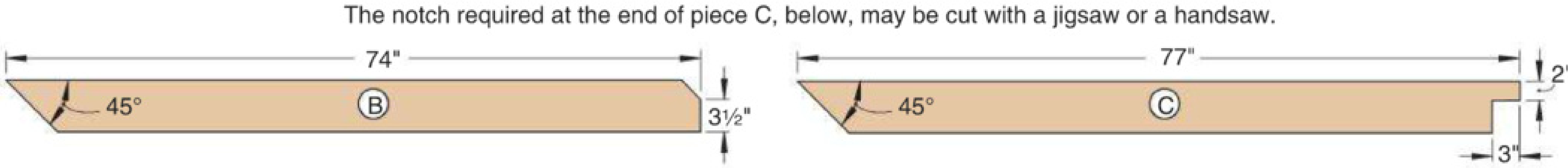
For the stakes, cut fourteen 1½×24" pieces from 2×4. (See diagram, *right*.) A mitersaw set at 45° is the easiest way to cut a pointed end. If you're skilled with a circular saw, you may cut the stakes freehand.

In place of making composite decking stakes, you can purchase heavy-duty steel stakes such as those used to retain concrete forms. However, avoid wood stakes, which will not last nearly as long as either composite decking or steel.

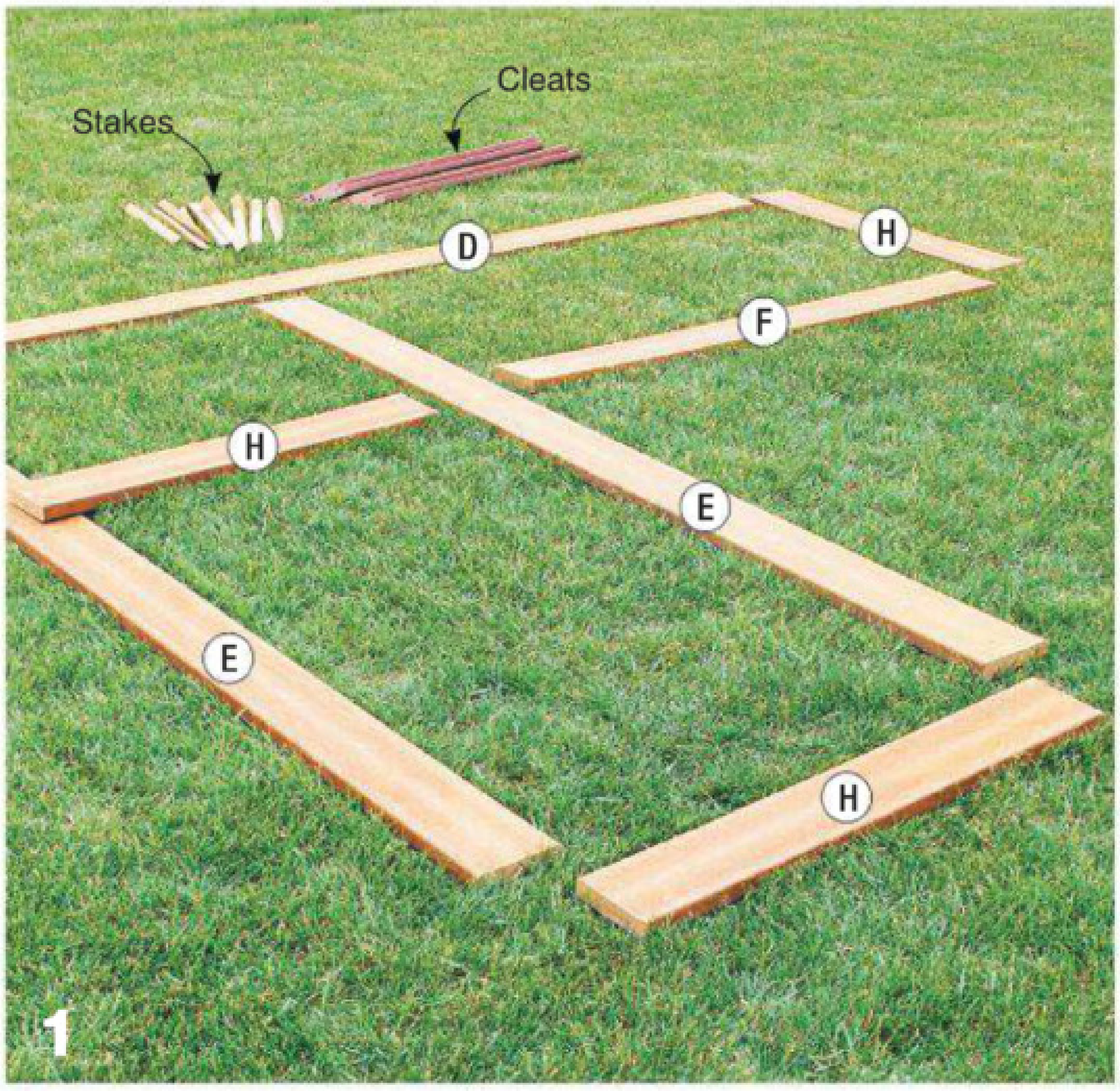




The notch required at the end of piece C, below, may be cut with a jigsaw or a handsaw.



If the bed is more than 2" higher on one end or corner, level the site before staking the bed in place.



bed assembly

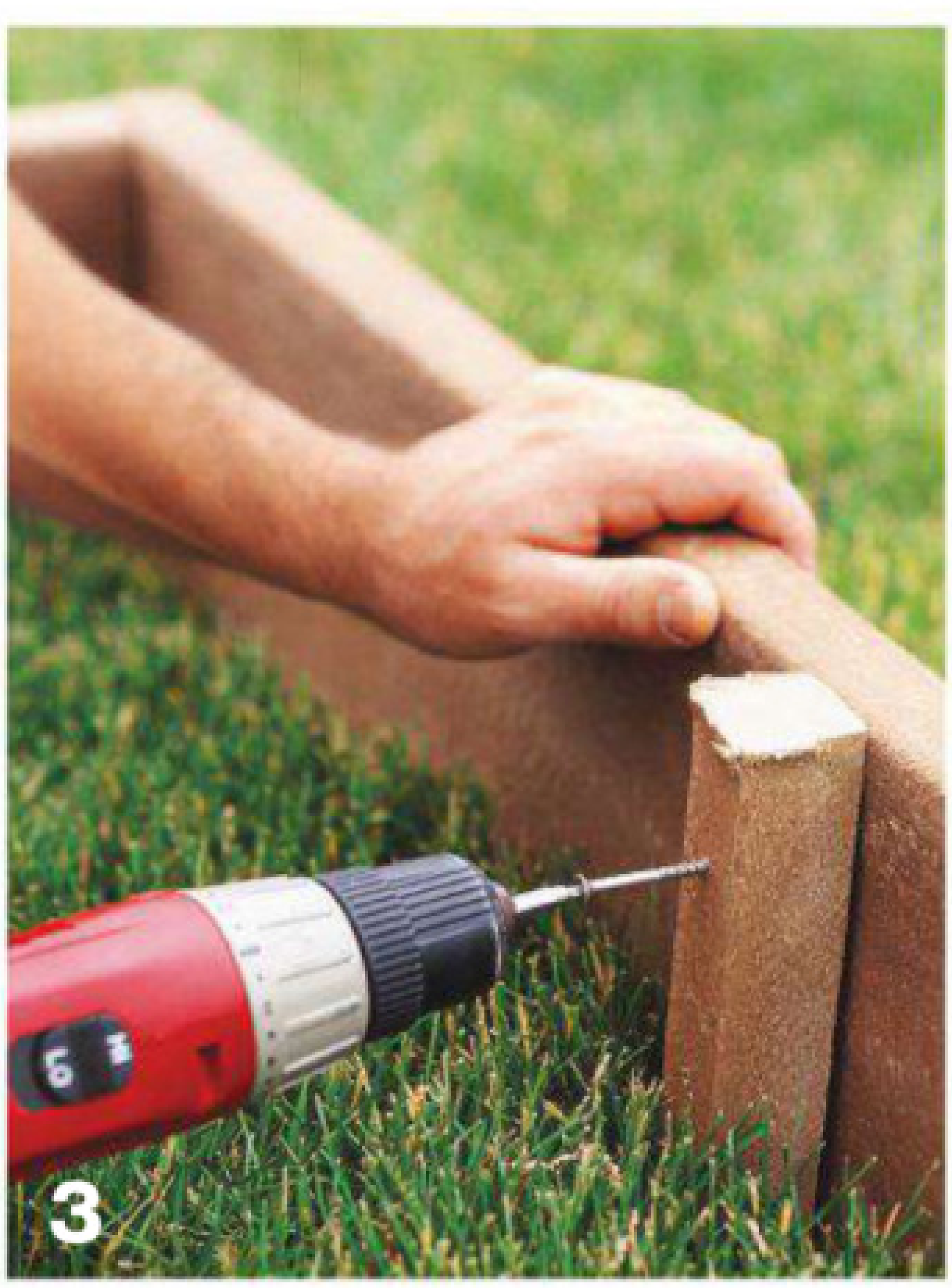
Photo 1 Begin by laying out the 2×8s for the bottom level.

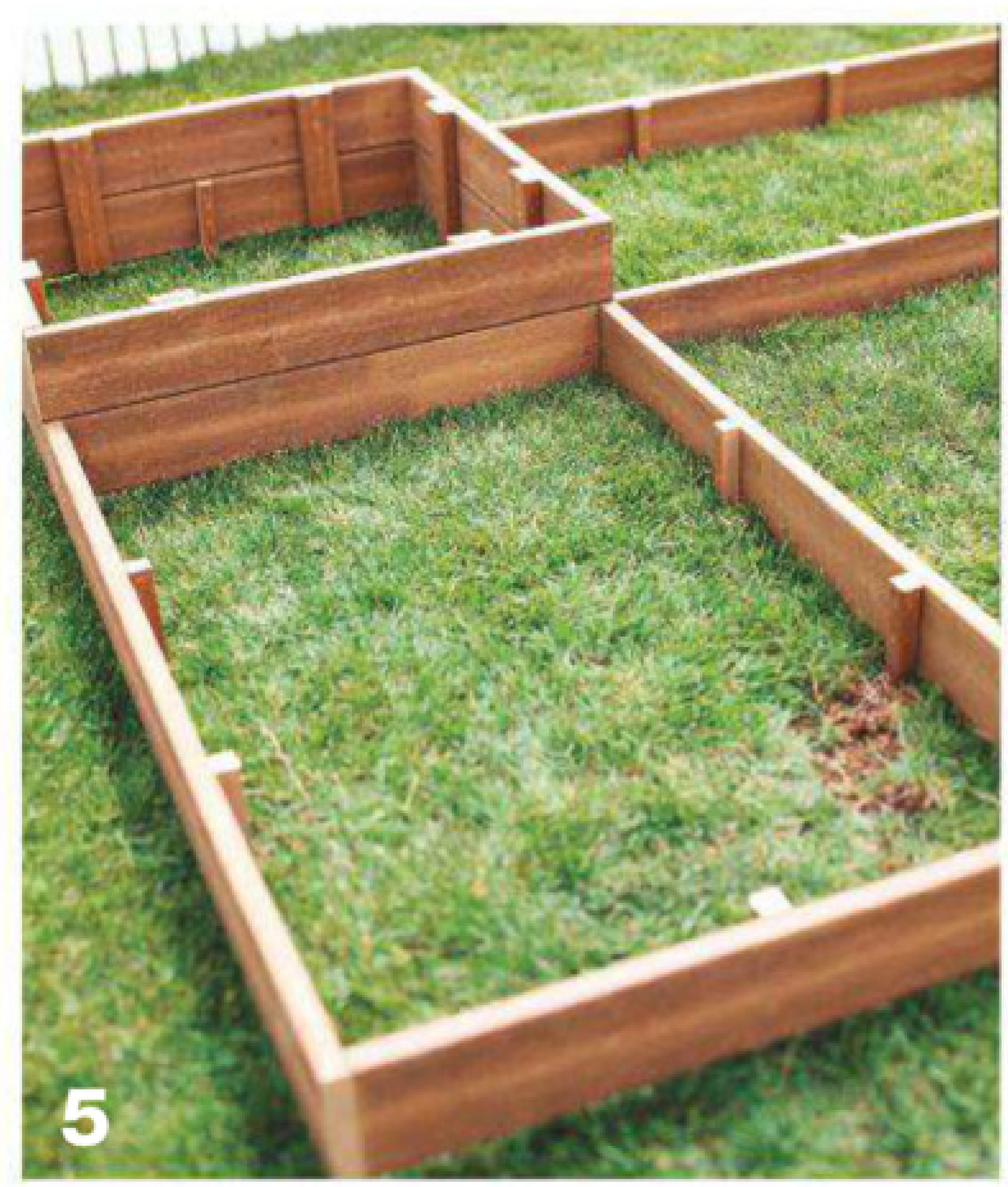
Photo 2 Join the bottom-level pieces with simple butt joints, using three screws at each joint. Drill pilot holes, but countersinking isn't necessary. Note: Where the three sections intersect at the inside corner (circled in **Photo 2**), attach one piece—either piece F or piece H—with a butt joint, and the other with screws driven at an angle from the inside of the bed. These screws will be buried and invisible.

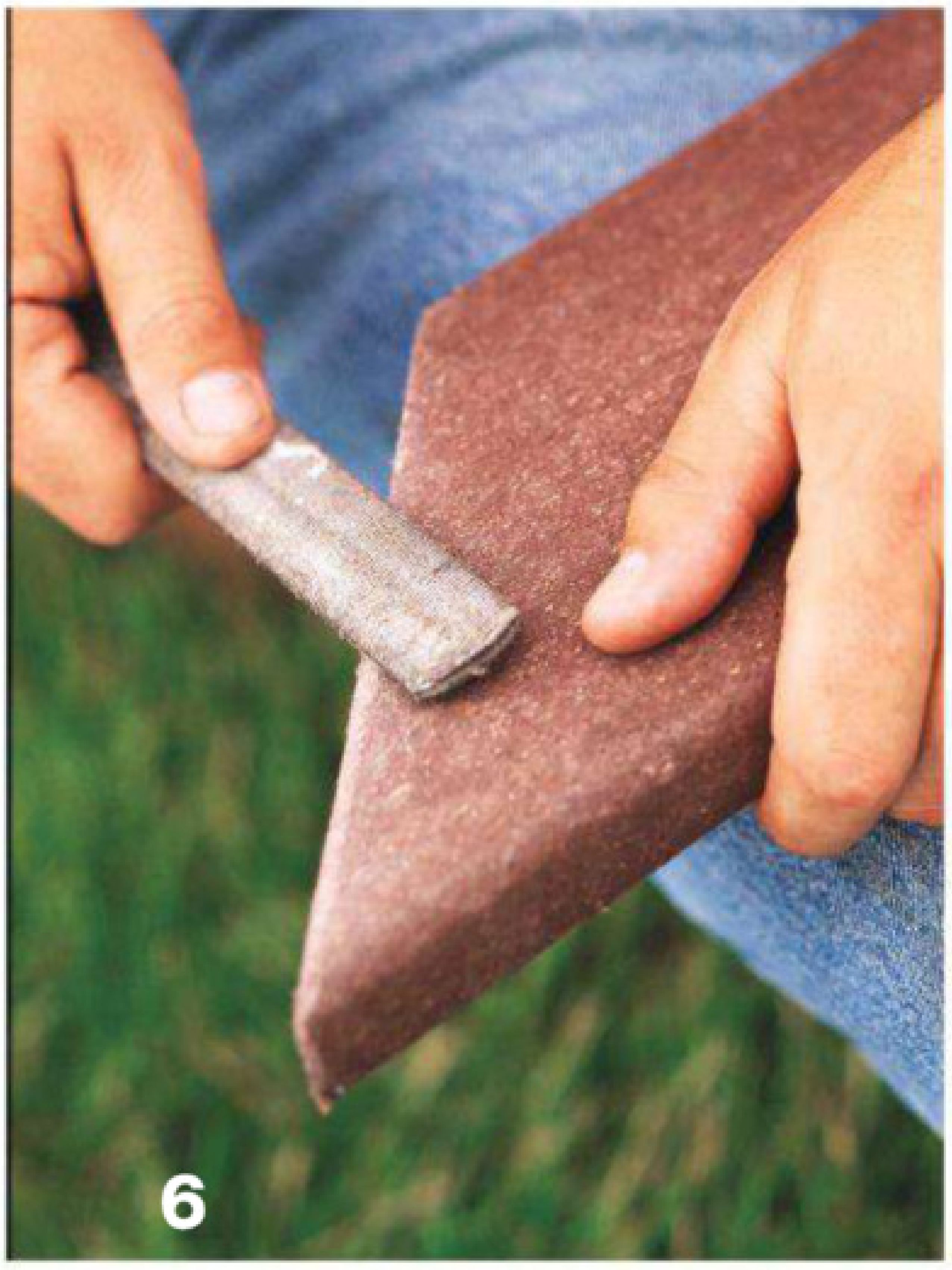
Photo 3 After assembling the bottom level but before driving any stakes into the ground, confirm that your garden site is level and the assembly is square. When you're satisfied with the location and layout, drive 1½×1½×24" stakes into the ground on the inner sides of the boards so the stake tops are flush with the top edges of the boards. (A 3-pound drilling hammer is ideal for this task.) Use two evenly spaced stakes on each 6' side and one stake in the center of each 4' side. Attach the boards to the stakes with three screws each.

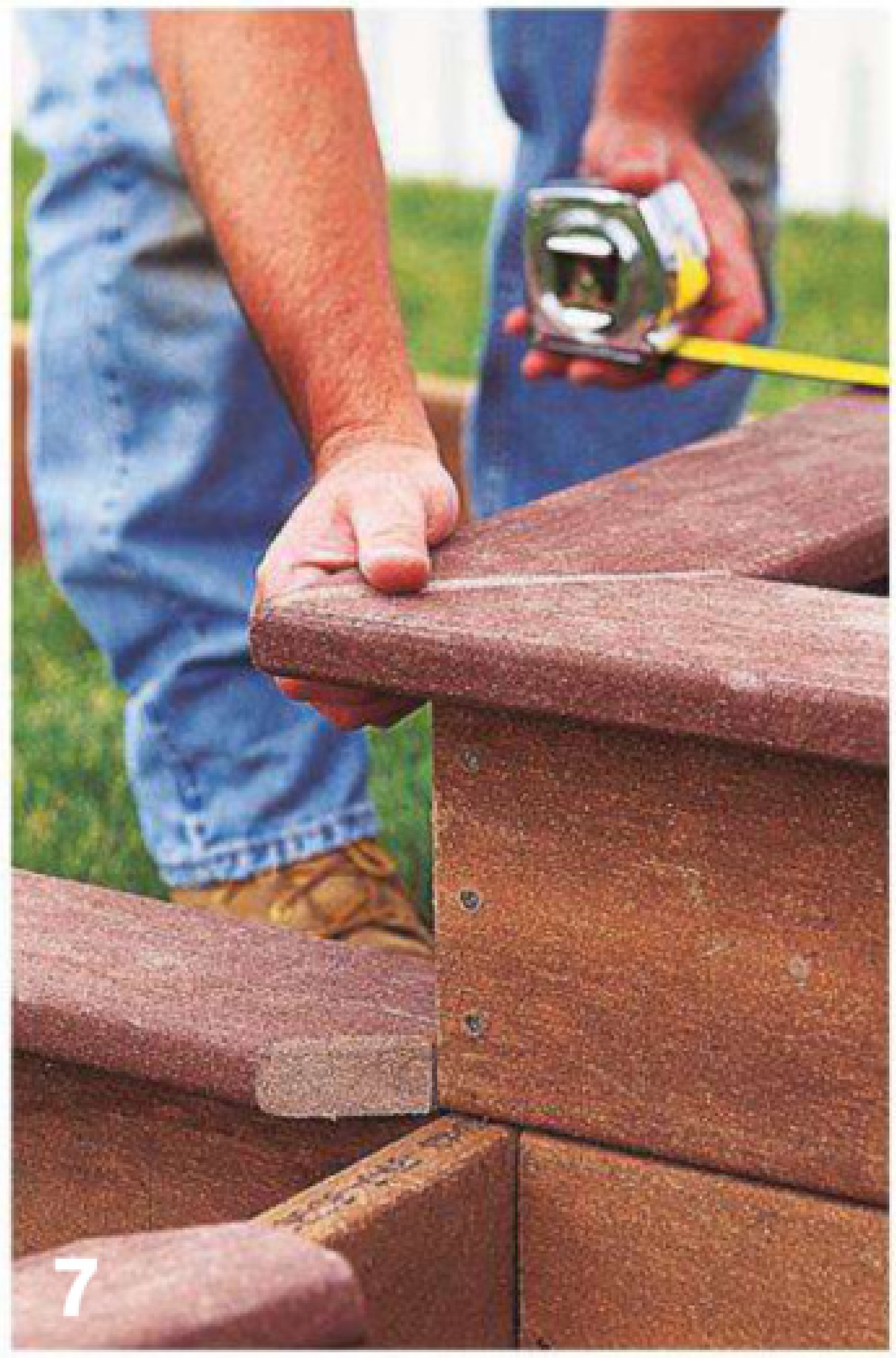
Photo 4 Construct the 4×4' top level using two G pieces and two H pieces. Join each corner with three screws, then lift the entire top-level structure and set it in place on top of the bottom level. Secure the sections with the 14"-long 2×4 cleats; attach with six screws (three in the top, three in the bottom).

Photo 5 The basic structure of the bed is now complete.









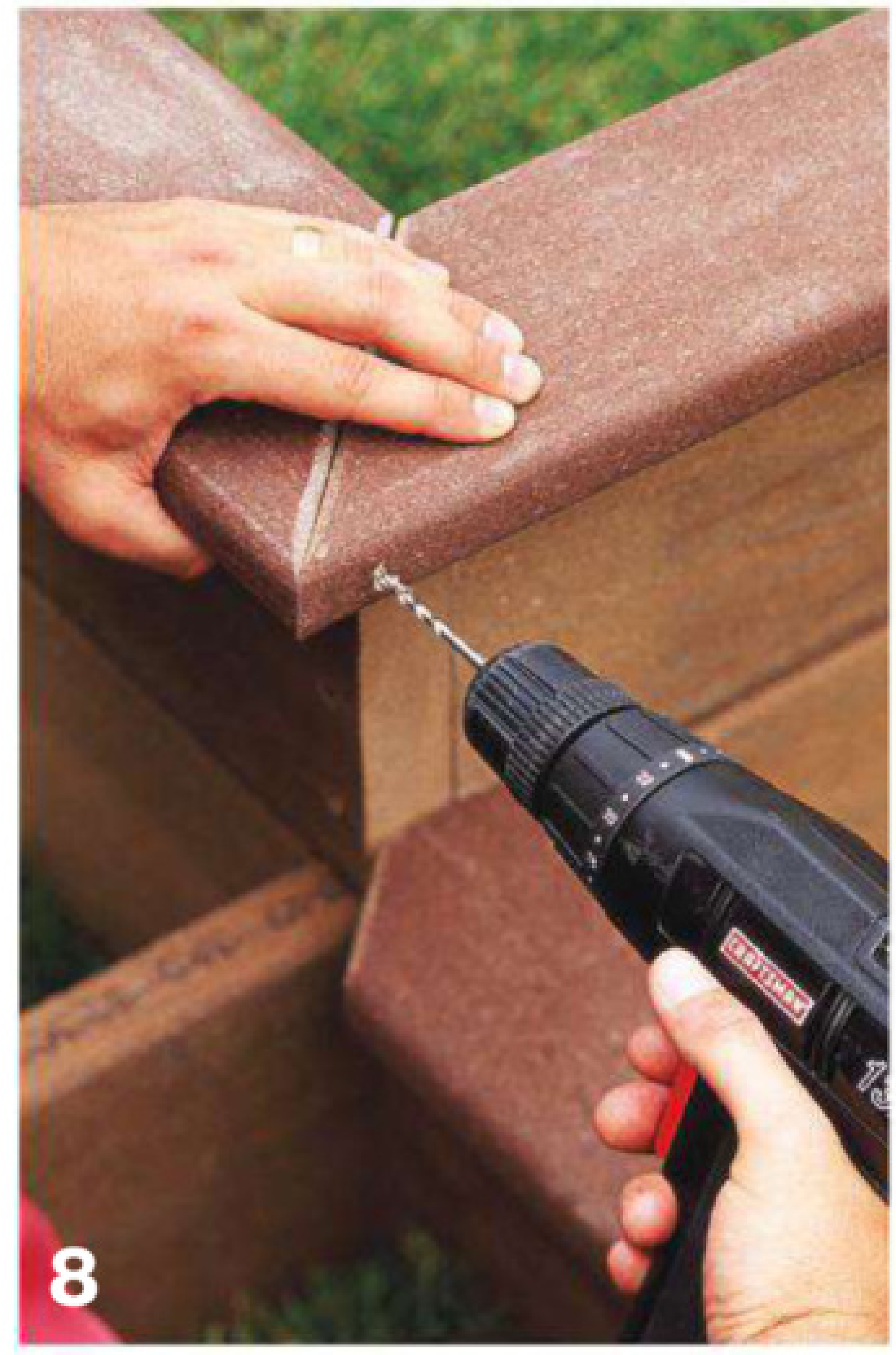


Photo 6 Before attaching the cap boards, round over the edges of the mitered corners with a flat wood file to disguise minor unevenness and gaps in the joint.

Photo 7 Place the cap boards on top of the base; align and check placement with a tape measure. Be sure the overhang on opposite edges is the same before attaching cap boards with screws. When boards are in place, drill pilot holes straight down through each cap board into the base boards; attach with screws. Drive in each screw so the head is recessed ⅛"–¼". Then tap the composite decking with a hammer until it flattens over the screwhead and partially conceals it.

Photo 8 To strengthen each corner and keep it level and even, use a a horizontal screw to secure the corners of the cap.

Photo 9 Attach the 5/4 decorative trim pieces to each corner. To attach the pieces, drive the screws from the inside of the corners so the screwheads aren't visible on the outside. Be sure not to drive the screws too far, or the tips will protrude on the outside.

Photo 10 Before filling the finished bed with soil, till the underlying ground to avoid layering between the original ground and the new soil. If perennial weeds or grasses are present, place a weed fabric over the original soil to keep weeds from growing up through the soil that fills the bed.

Photo 11 Fill the bed with good topsoil. The design requires about 1 cubic yard of soil. ♣

maintain & troubleshoot decks

High-quality building materials, good construction techniques, and planned maintenance will add many years to the life of a deck. Yet, even the best constructed deck has inherent weak spots:

- between the house and ledger
- where posts are connected
- boards with exposed end grain
- railing joints
- any notched joints
- joints in the decking

By finding and repairing problems early, you can avoid expensive repairs later. Inspect your deck thoroughly at least once a year. If possible, inspect beneath the deck surface. If your deck is too close to the ground for you to crawl under it, remove some decking boards to get a good look.

Look for soft spots, indicating rot. Poke the wood with a screwdriver. If part of your deck seems to be in worse shape than others, try to find the source of the problem before attempting a repair. Perhaps water damage is occurring due to faulty gutters or the accumulation of leaves or dirt.

If you find potentially serious problems at the ledger, posts, beams, or joists, consult a professional. You can make most repairs yourself, but some are complicated projects.

you'll need

TIME: An annual inspection should take one or two hours
SKILLS: Diagnosing rotting wood and analyzing potential structural failures
TOOLS: Sledgehammer, hammer, carpenter's level, circular saw, line or water level

check beneath the deck

Inspect beneath your deck. Put on old clothes, and bring a flashlight and a screwdriver with you. Poke the undersides of decking boards, all around the ledger, posts, stringers, and treads, and in any other joints and crevices.

check the ledger

The connection between the deck and the house is particularly critical. Check that flashing is in good condition. Use a probe to inspect for water damage on the ledger. Check for fungi, blue or black stains, and little piles of sawdust indicating the presence of termites or carpenter ants. Tighten all fasteners.

check the posts

Check posts most carefully at the ground line and at the post top. Use a probe to inspect for rot by sticking it into various parts of the post and comparing the ease of penetration. Try to find out if there are soft spots inside the post, where rot often begins. Inspect and secure the post's connection with the foundation.

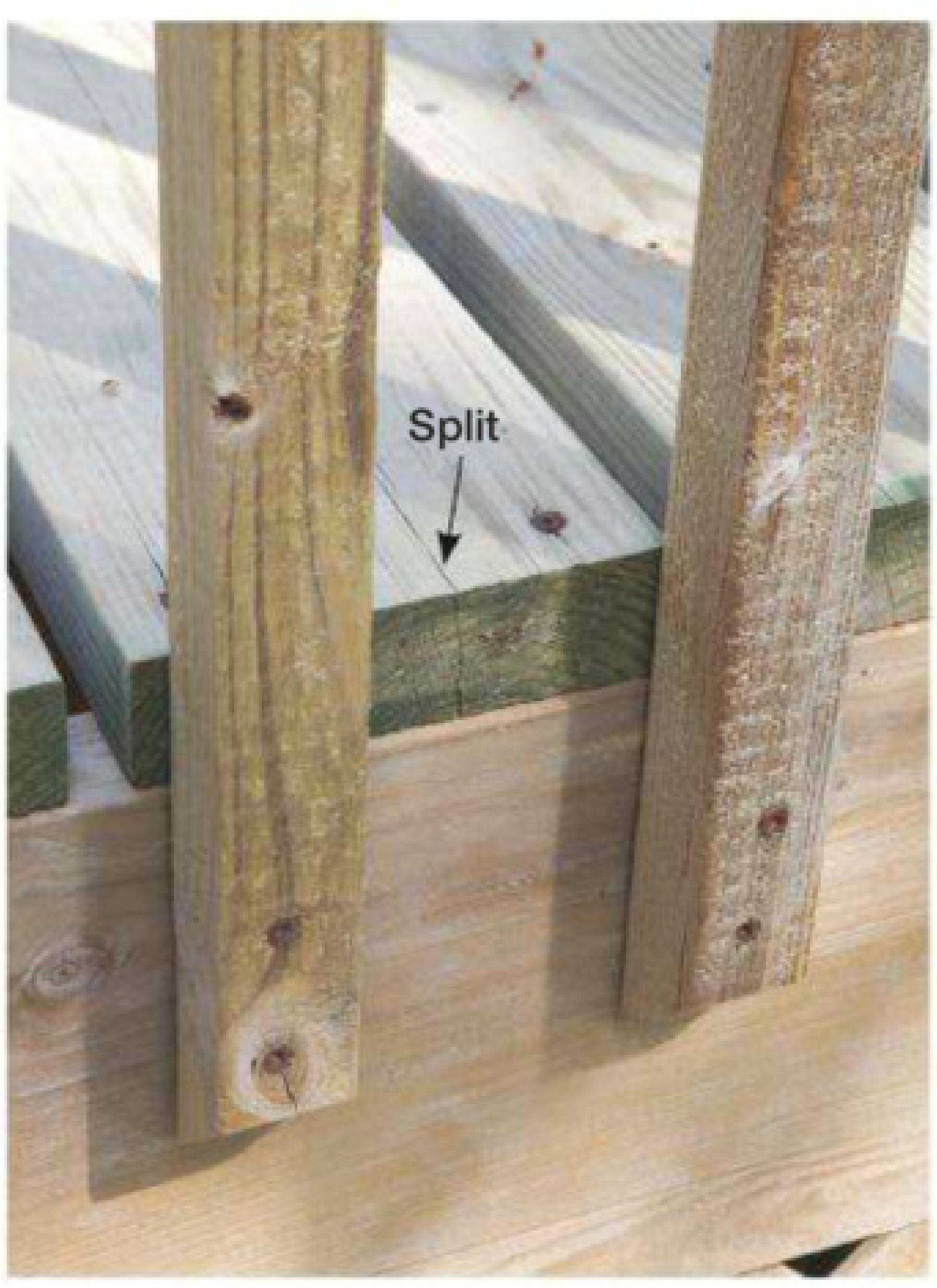
maintain and troubleshoot decks

look for the loose ones

Loose decking may not indicate a structural problem and may only require retightening the fasteners. Tighten the ones you can and mark the ones that need replacement. If the decking is damaged, remove it and install new boards and fasteners.

clutter will rot

Dirt, leaves, or other natural debris that collects between the decking or in other crevices can hold moisture for weeks. That can easily cause rot, but is easily prevented with regular cleaning. Pressure-washing is an effective way to clean out crevices.



check the decking

Decking boards that split at the ends will often continue to separate along their length. You can try cutting the boards flush with the joists and sealing the cut ends, but in most cases it's better to replace split boards with new ones. For internal cracks, sand the surface and apply several coats of sealer.

check the railings

Railings, and especially stair rails, often have to withstand extra strain. Inspect posts for damage and make sure all fasteners are secure and tight. Look at the ends of all rails for water damage. Replace damaged balusters.

clean your deck

Because you see your deck change slowly, you might not notice when it's time to clean or refinish it. Make a calendar to help you stay ahead of the dirt and grime.

Little things can have big results. Sweeping and removing debris, for example, helps reduce trapped moisture and the chances of rot. Cleaning gives a drab deck a fresh, new look. You'll be surprised how much bigger a clean deck looks.

- Sweep the surface once a week—more often, if the weather requires it.
- Scrub the deck with warm water and a mild detergent monthly.
- If simple washing does not get it clean enough, or if you want to lighten the color of the deck, buy a deck-cleaning product.
- If the wood is dirty and weathered, clean it with an oxalic acid-based deck cleaner and water. Scrub an area with a stiff natural-bristle brush. Rinse, allow it to dry, and repeat, if necessary. Wear protective clothing as recommended—oxalic acid is extremely caustic.
- To clear away all the dirt at once—along with any debris, dirt stuck in joints, or loose paint—rent a power washer (with 1,200-psi pressure). Clean the deck with a fan-tip nozzle so you won't damage the surface. Used improperly, a high-pressure power washer can erode and gouge the surface of lumber (called a washboard effect).

Questions on decks or other home improvement projects? Ask at:
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remove mildew

If your decking is cedar, a spot of black slime may not be mildew—it could be a natural substance that sometimes leaches out. Just wash it off with a mild soap-and-water solution. If you have other types of wood, or if the black slime persists and seems related to moisture, then it may be mildew. It won't affect the strength of your wood, but you should get rid of it.

Use a commercial deck cleaner or mix 1 part chlorine bleach to 3 parts water. Use a stiff brush to work the solution into the wood. Rinse thoroughly with clean water, and let the deck dry. This solution also can restore some of the natural color to the deck. When you apply the next coat of finish to the deck, be sure it contains a mildew retardant.

avoid corrosion with stainless steel

Steel fasteners used on decks usually are galvanized to prevent corrosion that could stain the surrounding wood. Over time, most galvanized fasteners begin to corrode. Double-coated and anodized decking screws resist corrosion better than electroplated galvanized screws, but even they may lose their coatings over time.

If you live in an area with particularly high humidity or where the deck may be exposed to saltwater, corrosion will begin sooner. In these cases, stainless steel fasteners may be a bargain in the long run, because they won't corrode. They look great, too. See *page 21* for more details.

for pests, get a pro

Termites and other wood-borers can feast on your deck. Pressure-treated lumber rated for ground contact should resist insect infestation, but redwood and cedar aren't guaranteed to be pest-free.

Termites and wood-borers like to eat in the dark, so they tunnel along the grain lines inside the wood, where you can't see them. So, by the time you notice the damage, it's too late. If you see tunnels running inside a board or small piles of fine sawdust at the edge of a board, contact a professional exterminator.

replace popped nails

As decking shrinks, nail heads may need to be hammered in farther. Over time, however, nails may start loosening in their holes. In this case, carefully remove the nails with a flat pry bar. Put a piece of scrap wood under the bar to keep from denting the surface of your deck. Replace the nails with 3" decking screws. Or drive new nails into the old holes in the decking, but at a different angle.

continued on page 103


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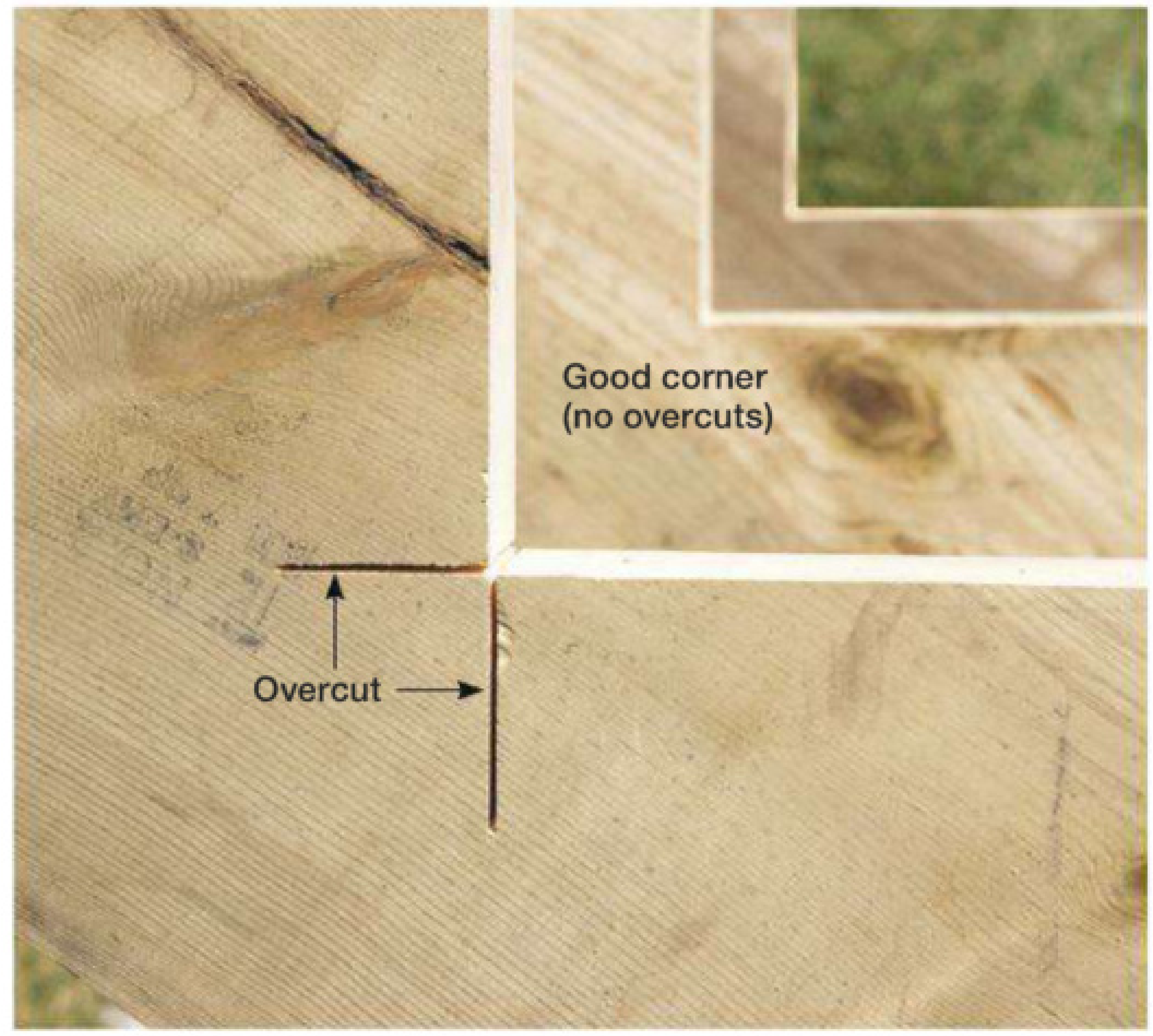
continued from page 101

check the rail cap

Rail caps, especially mitered and cantilevered caps, can separate at the seams. Usually, you can't rejoin the existing pieces. Start with wood of the same species as the rest of your railing, and replace one or both sides of the rail.

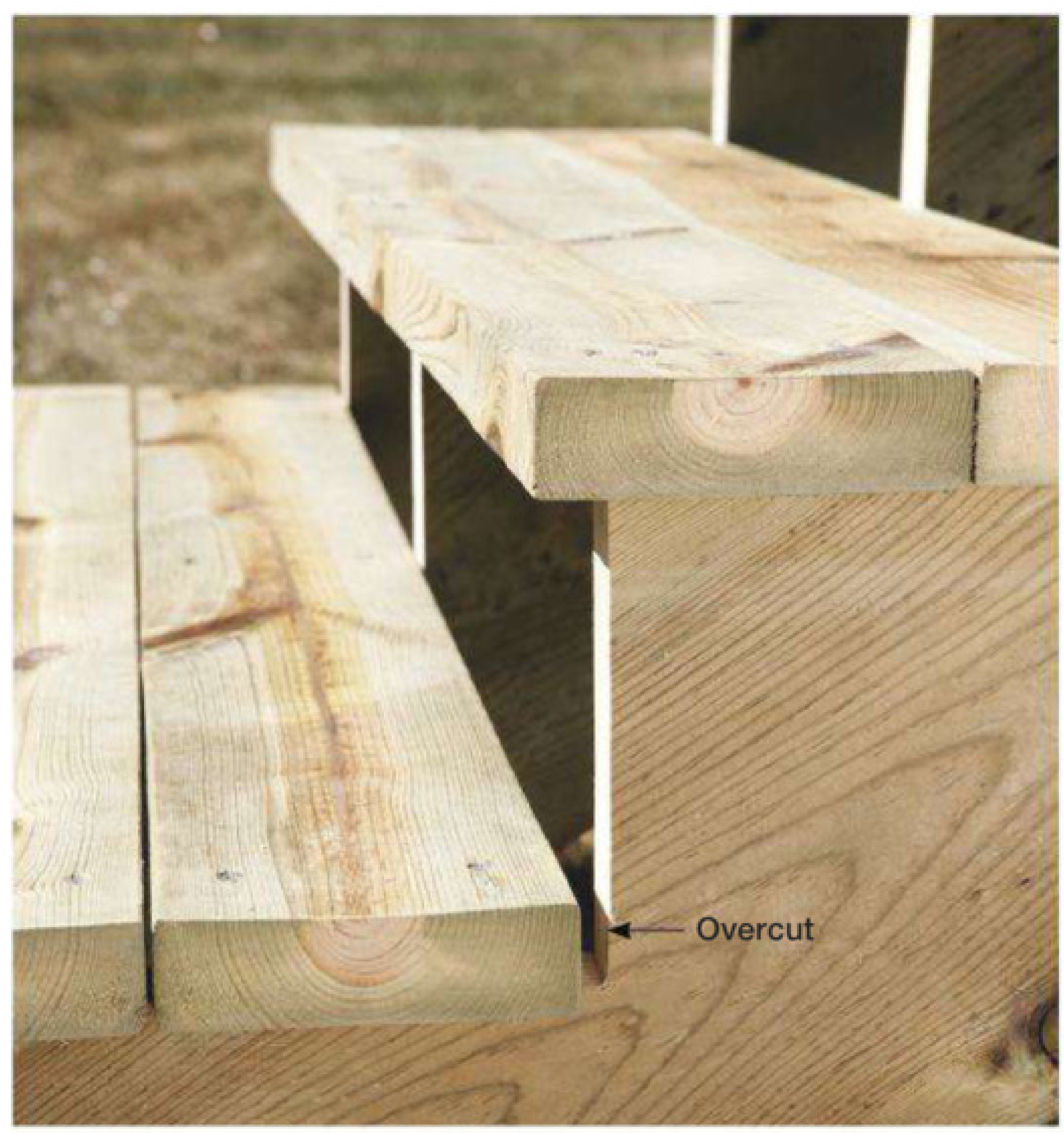


inspect stringer cuts

If you have a deck with stairs, pay attention to the stringers. Look underneath or pull off the treads and make sure the runs and rises are not overcut. If they are, they'll collect water and may eventually break. Replace stringers that have overcuts.

check the perimeter

Moisture can get into the joint if a decking board is not flush with the framing and doesn't overhang it. If your deck has this fault, replace the last three or four boards, spacing them so the last board overhangs the framing.



check the treads

Overcuts, as shown *above*, are not the only problem to look for when checking your stairs. Misaligned treads and treads less than 10" deep also can pose problems. Replace them with new material.

continued on page 105

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 continued from page 103

repair a deck

It's not unusual to find several damaged decking boards on a deck that's otherwise in good condition. Replacing a board or two is not difficult, and the replacements are more likely to stay attached if you refasten them with 3½"–to 4" deck screws.

New boards, if they are of the same species as the old ones, will blend in with the color of the old boards after a year or two. But you don't have to wait that long to make all the boards look the same. If you clean and refinish the entire deck, the new and old wood will look almost alike.

Decking boards should have gaps about ⅛" wide between them so water can seep through the deck and dry it out after a rainfall. If a gap is filled with debris, clean it out with a stiff broom. If that doesn't work, use a putty knife. With a circular saw, widen gaps that have closed. Watch the depth of your cut—don't cut the joists.

If you find several framing members that are substantially rotten, consider tearing down the deck (*page 27*) and starting over. However, if the boards are not severely damaged, or if you are certain that only a few are rotten, repairs may solve those problems. If you are not sure, consult a professional deck builder.

If a deck feels spongy when you jump on it, it may be underbuilt, with joists or beams that are too small for their spans (*page 58*). If you have room to work underneath, you may be able to shore up a weak deck by installing a new beam with posts and footings. However, this is slow, tedious work. To add some extra strength, install a row of blocking at the middle of the joists (*page 57*) and support it with a post or two.

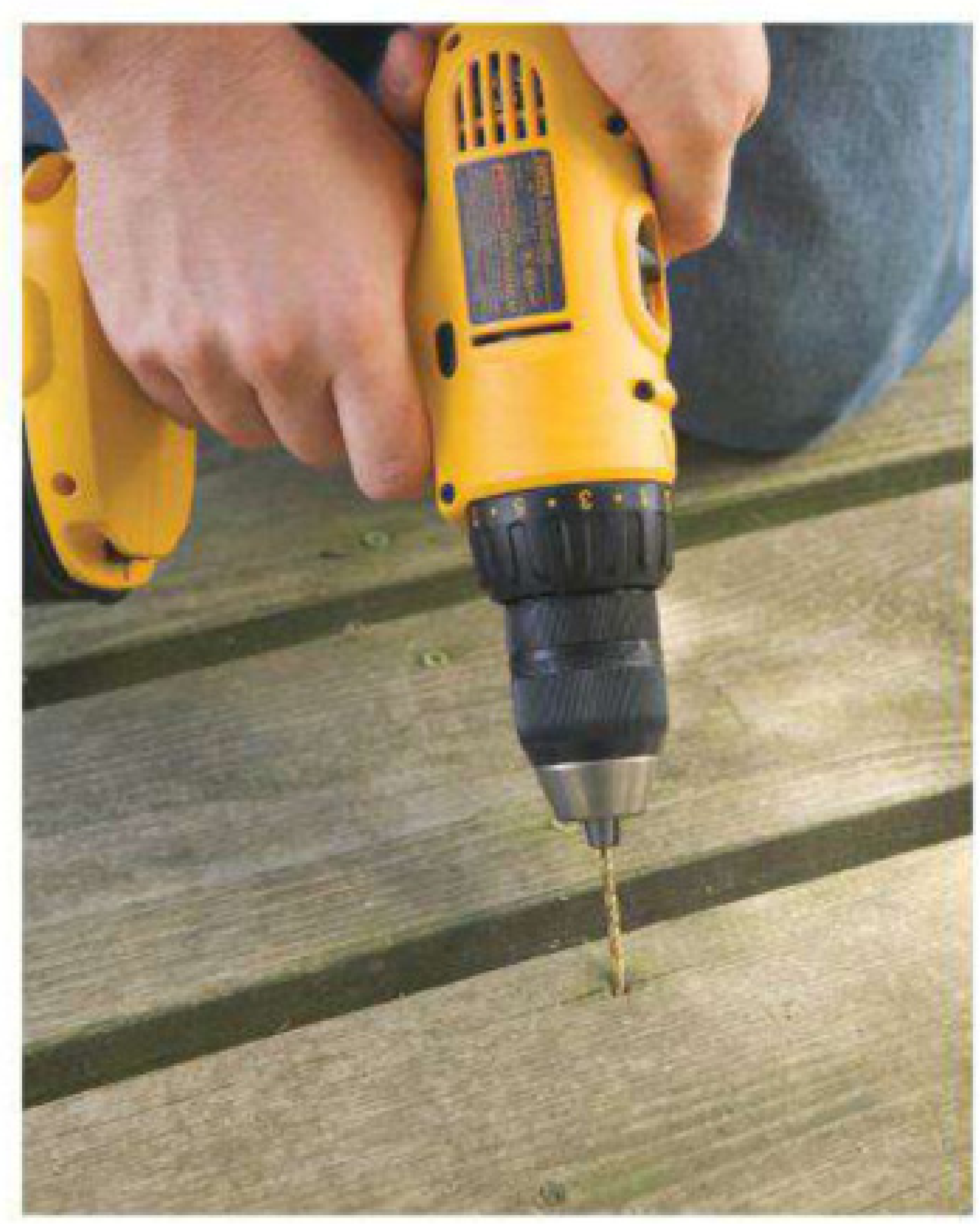
repair the cap rail

1 mark the new rail
If the cap rail is mostly in good condition, clean the joints with a putty knife and seal them. If a joint is rotted, remove the cap and use it to mark the angle for cutting new wood (of the same species).

2 fasten the corners
Miter the replacement rail first, then cut the other end to length. Snug both faces of the corner by clamping them with a scrap 2×4. Drill pilot holes and drive one 3" screw into each edge and two into each post.

repair warped decking

1 add a fastener
Often, an additional fastener will bring a warped board into its proper place. Predrill the decking (but not the joist) and drive a screw next to the existing fasteners. Or remove the old fasteners and drive a new set of 3½" screws.



2 angle a screw
An angled fastener has more holding power than one driven perpendicular to the decking. Clamp a warped board down and predrill it at an angle. Drive the screw. You may have to wait a week for the board to partially flatten, then drive in a longer screw to pull it down more.