



Durable Deck Details

Great ideas that go beyond code to extend the life of a new deck

by Charles Bickford

In order to build decks that are capable of withstanding the effects of gravity, extreme temperatures, and water, experienced builders have learned to adapt their techniques to suit local conditions. Sometimes that means thinking ahead of the manufacturers and coming up with new ways to use a material or combination of materials. Those details, gained through experience, go above and beyond code requirements and are the hallmarks of successful builders. What follows here

is practical advice from deck builders and building scientists on how to build better, longer-lasting decks.

Footings

The depth and size of concrete footings depend on location and soil type, as well as on the deck loads the footings need to support. In northern parts of the country where frost heave is a concern, for example, footings must be dug 48 inches or deeper to meet code. But frost is a re-

lentless adversary, so Boston-area builder Emanuel Silva likes to beef up his footings to make them more robust.

Like many builders, Silva uses cardboard forming tubes, but before placing a form, he enlarges the bottom of the hole to create a footing that will help the concrete resist frost heave. Once the form is in place and the concrete poured, he plants a pair of 4-foot lengths of $\frac{1}{2}$ -inch rebar into the fresh concrete so that the footing below and the pier above will

PHOTO: EMANUEL SILVA

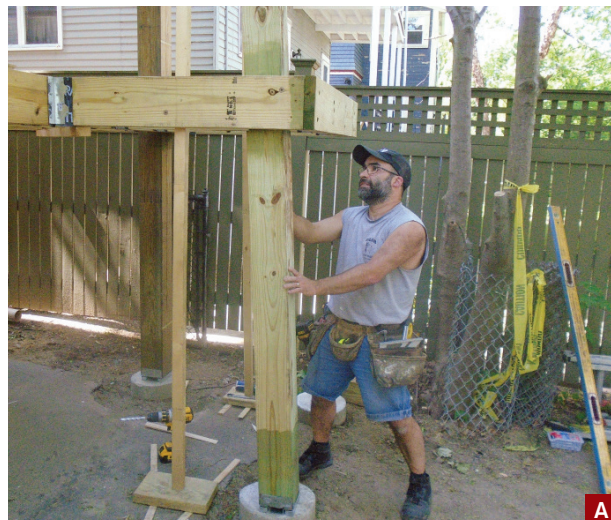


Figure 1. A pair of 1/2-inch rebar rods embedded in the fresh concrete will tie the pier to the expanded footing below the cardboard form, creating a more stable foundation (A). Helical piers can be installed in any weather, have a higher load capacity than concrete, and require less cleanup (B). Though more expensive than concrete piers, they are helpful in poor soil conditions, or where frost heave is a concern.

Figure 2. Cuts and end-grain in PT lumber should always be field-treated with a copper naphthenate-based preservative (A). Many builders use self-adhesive membranes in various widths to protect deck framing from moisture. Here, narrow tape covers the gap between the fascia and rim, while wider pieces of membrane protect corners and doubled framing (B).

have a stronger connection (**Figure 1**).

In Minnesota, heavy clay soils, a long winter freeze-thaw cycle, and some developers' practice of building on reclaimed marshland are elements that can join forces to create frost heave that will dislodge even the deepest footing. That's where Brian Jacobson's company, 4 Quarters Design & Build, is based, and he has stopped using concrete footings

altogether. Instead, his company now uses helical piers, exclusively, to support its decks.

According to Jacobson, installation time with helical piers is a fraction of what it takes to dig and pour concrete. Even though the cost per pier is higher (about \$350 each), the schedule is streamlined because he doesn't have to wait for an inspection or for concrete to cure.

Also, less soil is displaced, so there's no yard clean-up cost. And there's no guessing with helical piers: Their bearing capacity can be measured, and they're not affected by frost heave.

Framing

While building codes specify framing sizes, spans, and intervals, some builders view the code only as an absolute

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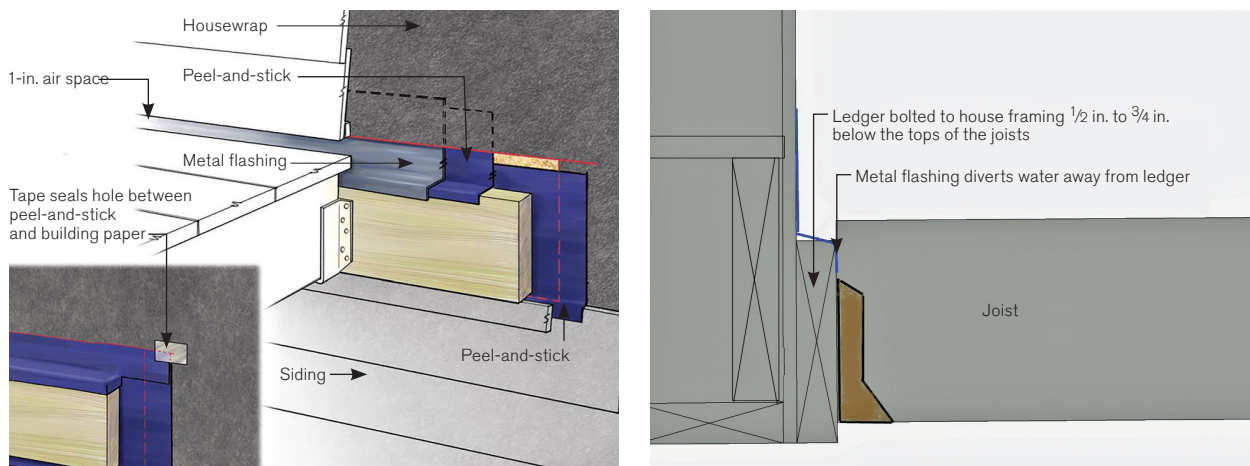


Figure 3. The details of a ledger's flashing must be redundant to keep water away from the house framing. Self-adhesive membrane is applied behind the ledger board; a second piece laps over the ledger and tucks up under the siding. A piece of metal flashing runs underneath the siding and over the top of the ledger (left). Installing the ledger below the level of the joists creates a space that doesn't trap debris and allows water to drain away (right).

minimum requirement. Deck designer, consultant, and former owner of Atlanta-based Peachtree Decks & Porches Bobby Parks says, "I realized a long time ago that you could meet code and still have bounce and joist sag on a deck floor. Taking steps to avoid this, we engineered our projects to fall midway between what residential and commercial code requirements call for, such as designing for 55- to 60-lb., rather than 40-lb., live loads. When spec'ing deck and porch joists, we generally used spans that were 12 inches to 18 inches less than what was allowed in the span charts, and we rarely used 2x8s at all, unless it was a span of 8 feet or less. Ninety percent of my jobs were built with joists 12 inches o.c."

For more strength and less deflection, Brian Jacobson says he uses only 2x12s as joists.

Beefing up the framing may make a deck stronger, but it won't necessarily help it last longer. Many builders *PDB* spoke with believe that the current generation of pressure-treated lumber is more susceptible to rot than pre-2004 CCA-treated wood. As a result, all of these builders field-treat their PT framing with a preservative. That is actually

a code requirement—all cuts and holes made in pressure-treated wood need to be treated with a wood-preservative, preferably one with a copper-naphthenate or oxine-copper (also known as copper 8 quinolinolate) base, whether the material is treated southern yellow pine or any of the incised western species.

Living and working on Washington's damp Olympic peninsula, builder Kim Katwijk is a big advocate for protecting the cut ends of pressure-treated lumber. "Even though the exterior of the lumber is treated, those chemicals don't penetrate into the interior of the piece," he explains. And like a lot of other builders, Katwijk also uses self-adhering membrane as flashing between the framing and decking to protect the wood against rot caused by water that can seep into cracks and around fasteners (**Figure 2**).

Katwijk is a fan of G-Tape, an acrylic adhesive flashing tape that will stick to almost anything, even wet surfaces (gtapeonline.com). But there are other options as well, including Trex Protect, Henry Bluetape, and 3M flashing tape. Austin, Texas, builder Matt Risinger prefers to use Grace's Vycor tape to cover the tops of his deck joists.

Keeping the structure free of areas that will trap debris that can soak up water and become little reservoirs of rot is another challenge.

To protect the ledger, for example, Rhode Island builder Mike Guertin uses multiple layers of self-adhesive membrane and noncorrosive metal to flash behind, above, and over the ledger board. He also sets the ledger 1/2 inch to 3/4 inch lower than the top of the joists to create a space between the first decking board against the house and the flashing that rests on top of the ledger. This detail allows the flashing to be sloped to drain water away from the house without becoming trapped by the decking (**Figure 3**).

Guertin also mentioned a product that promotes drainage between a deck ledger and the house: Deck2Wall Spacers (deck2wallspacer.com). These are code-approved discs made of glass-filled polypropylene that are fastened to the back of a ledger to create a structurally sound attachment that drains water away from the ledger and house flashing.

Maine Deck Brackets serve the same purpose (deckbracket.com), but because they are made of aluminum, they must

ILLUSTRATION BY CHUCK LOCKHART



Figure 4. Deck2Wall's code-approved spacers are fastened to the back of the ledger to promote drainage between the house and ledger (A). Made of solid aluminum, Maine Deck Brackets also create a structurally sound method of keeping water away from the house and ledger (B). PT plywood or PVC spacers can be used to create drainage gaps between the 2-by layers of a built-up beam, preventing water from being trapped between doubled framing members (C). Gapping miters at intersecting deck boards will allow water to quickly drain away from vulnerable end cuts (D). PT spacers between the fascia and framing and a membrane cap over the gap will minimize potential water damage to the rim joists (E).

be flashed to prevent a galvanic reaction between the bracket and the treated lumber (**Figure 4**).

To keep water from collecting between double or triple rim and support beams, Emanuel Silva likes to separate the 2-by layers using PT plywood or PVC spacers. He assembles the beams on temporary supports and places the spacers at regular intervals so that water will drain from the assembly. He staggers the 2-by joints by at least 6 feet.

Deck boards that are installed with too small of a gap between them can trap debris and prevent water from easily draining off the deck. To ensure good drainage and create a consistent gap between adjacent deck boards, Kim Katwijk uses a $\frac{3}{8}$ -inch-thick spacer as a guide when installing square-edged decking.

Another potential moisture trap is between the rim joist and the fascia trim.

To provide drainage, Mike Guertin nails $\frac{3}{8}$ -inch-thick PT rippings to the rim joist at 16-inch intervals prior to fascia installation.

Corrosion

There's also the problem of corrosion, principally the galvanic reaction between the copper that's a major component in the chemicals used to pressure-treat wood, and the hardware and fasteners used to build a deck. Manufacturers recommend that builders use hot-dipped galvanized hardware and fasteners, whose thicker zinc coating will act as a sacrificial barrier to longer withstand the corrosion (look for a label indicating the rating of ASTM A153, Class C or D.)

Stainless steel is also an option, but many builders avoid it because of the higher cost. (A stainless 2x6 hanger made by Simpson costs about \$7, while the gal-

vanized version of the same hanger goes for about 90 cents.) Check out "BRANZ Study Focuses on Fastener Corrosion," by Skip Walker (Oct/Nov 2016), for more information.

To limit corrosion, Emanuel Silva uses self-adhesive membrane as a barrier wherever metal connectors and PT framing come in contact (**Figure 5**). Another builder who uses this approach is Brian Jacobson, who wraps the ends of joists with G-Tape where they'll come in contact with galvanized hangers.

Unfortunately, there's no getting around the fact that the screws or nails used to attach the hardware are driven into the treated lumber without the protection of a membrane. Again, manufacturers advise using the thickest hot-dipped galvanized treatment available. If you're using stainless steel hardware, stainless steel nails and screws meant for



Figure 5. Covering the top surfaces of a galvanized post base with strips of self-adhesive membrane before setting the post in place helps to isolate the metal connector from the corrosive effects of pressure-treated lumber (A). Though newer PT formulations aren't as corrosive as ACQ-treated lumber, many builders still wrap joist ends with self-adhesive flashing tape prior to hardware installation (B).

use in structural connectors are available from Simpson Strong-Tie and USP. The latter company also offers a third choice in hardware and fasteners—its Gold Coat line of galvanized hardware, which has a flexible polymer coating touted to be more durable than the plain hot-dipped variety.

Worried about using galvanized fasteners on his decks, Brian Jacobson now uses stainless steel fasteners with galvanized hardware, on the theory that the stainless steel that is embedded in the PT will last longer than HDG fasteners. While acknowledging the risk of possible galvanic reaction between the dissimilar metals, he says, “The only corrosion possible is going to occur at the intersection of the nail and the hanger, which is an area the circumference of the nail and about 1/16 inch wide. I can live with that.”

Wildfire

In addition to worrying about gravity, rot, and corrosion, builders in some areas of the country need to think about the seasonal threat of wildfires. According to the National Fire Protection Association, more than 3,000 homes were lost to wildfires in 2016. Interestingly, the state that lost the most homes was not perpetually dry California, but Tennessee, a state with normally temperate weather that suffered widespread fires as a result of a record drought that year. As national weather patterns continue to shift in unpredictable ways, protection from fire should be on more builders' radars.

Stephen Quarles is the Chief Scientist for Wildfire and Durability at the Insurance Institute for Business & Home Safety (disastersafety.org) in Richburg,

S.C. He authored “Protect Your Property from Wildfire – California Edition,” a thorough and detailed guide (available as a PDF at the Institute's website) to making houses less susceptible to wildfire.

Quarles says that because decks are usually open underneath and have a walking surface of spaced boards, they are susceptible to windblown embers from nearby fires. These embers can travel hundreds of yards from an active fire and then ignite dry vegetation, like pine needles, that collects between the deck boards and joists and beneath the deck. Given the right circumstances, they can start a fire on their own, even on a well-maintained structure. So, the first lessons are to keep combustible vegetation away from the house, keep decks swept clean of debris in fire season, and don't discount the dangers of windblown embers.

PHOTOS: 5A, EMANUEL SILVA; 5B, 4 QUARTERS DESIGN AND BUILD



Figure 6. In testing conducted by the Institute for Business and Home Safety to simulate a wildfire environment, sample decks were exposed to windblown embers (which can start fires hundreds of yards from an active fire). Results showed that higher-density and solid decking were more fire resistant than low-density and hollow decking. Another key fire-resistant detail: Metal flashing that covers the first 6 inches of siding will help prevent windblown embers from building up at the intersection of the house and deck.

Even though California's building code specifies the use of certain decking products for fire safety (2-inch-thick cedar or redwood, for instance), Quarles notes that tropical hardwoods, higher-density wood-plastic composites, and lumber treated with fire retardant were less vulnerable to ignition than the lower-density woods (such as redwood) when exposed to wind-blown embers during testing. Solid decking generally performs better than hollow or channeled deck boards (**Figure 6**).

The publication also recommends incorporating a corrosion-resistant flash-

ing along the base of the exterior house walls where they intersect with the decking. A flashing height of 6 inches or more can protect the siding from burning embers that accumulate at a deck's edges.

Finishes

In the article "Wood Myths: Facts and Fictions about Wood," Paul Fisette, wood scientist and professor emeritus of the Building and Construction Technology Program at the University of Massachusetts at Amherst, addressed the problem of wood degradation on decks. He recommended an application of water

repellent to pressure-treated decking prior to construction and a periodic re-treatment afterwards to keep the wood from drying out, splitting, checking, and ultimately, absorbing water and rotting. Stephen Smulski, of Wood Science Specialists, adds that liberally applying water repellent by brush minimizes surface distortion but is usually effective for only about two years before reapplication is needed. ♦

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PHOTO: INSURANCE INSTITUTE FOR BUSINESS & HOME SAFETY