



# Joist Hangers for Decks

**Choosing the right hangers and fasteners and installing them properly is trickier than it looks**

by Mike Guertin

Joist hangers are not the most visible part of a deck, but they are one of its most important components. If they aren't sized correctly and installed properly with the right nails or screws, the deck won't have the necessary load support, uplift capacity, and lateral rotation resistance. But hangers don't come with printed installation instructions; you need to search through a maze of technical notes, installation notes, load tables, product information, fastener information, and more to uncover everything you need to know in order to select and install joist hangers—and the joists that rest in them—properly and safely.

Or, you can read this article, in which I'll cover the basics.

## Choosing the Right Hanger

Joist hangers are sized by joist depth, and run about 1/2 inch shorter than the nominal size of the joist (you can size deck joists by referring to Table R507.6 in the 2018 IRC, which lists spans for deck joists sized from 2x6 to 2x12). For example, a 2x8 joist hanger is about 6 5/8 inches tall.

Usually, the hanger size is the same as the joist size, but you can use a hanger that is one dimensional size less than the joist depth—a 2x6 hanger can be used with a 2x8 joist, for instance. Keep in mind that the load capacity of the smaller hanger needs to be adequate to support the load on the joist. In the instances I looked at, the load capacities for the shorter hangers exceeded the live, dead, and snow loads required for the

deeper joists, provided the joists didn't have large gaps between the ends and the ledger or beam. If you try to buy joist hangers for 2x12 joists, you'll find that the common 18-gauge hangers used for deck construction top out at the 2x10 size (**Figure 1**).

The end joists on a ledger need a hanger just like the rest of the joists, but using a regular joist hanger with out-turned flanges presents a problem: The outside flange extends beyond the ledger. Extending the ledger an extra couple of inches beyond the end of the deck so you have something to nail the flange to is one solution. Others include attaching the joist to the ledger with toenails (a practice not permitted by the IRC); installing an angle bracket on the inside

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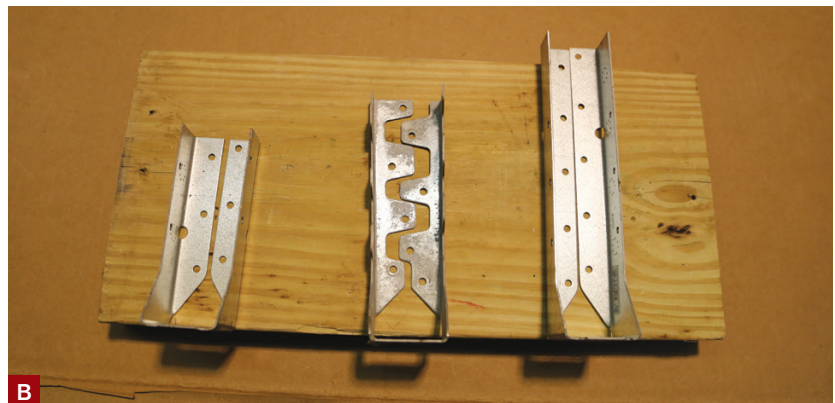
face of the end joist; or smashing the out-turned flange of a regular hanger over onto the end of the ledger and nailing it (a practice definitely not supported or approved by manufacturers).

Fortunately, several years ago hardware manufacturers introduced “concealed flange” (in-turned flange) hangers, on which the ledger flange is bent inward towards the joist pocket and concealed by the joist when it’s installed. Unlike regular hangers that can be installed after the joists are placed, concealed-flange hangers must be installed first and the joists dropped into them. To account for the thickness of the hanger flanges and fasteners, you need to trim the joists that rest in concealed-flange hangers slightly shorter. I usually install these hangers with connector screws, so to account for the extra thickness, I trim the joists short by 1/4 inch.

Concealed-flange hangers are also handy for the deck joists where lateral load hardware will be installed. The flanges on regular joist hangers interfere with the bolts used to install 1,500-lb. lateral load tension ties and the screws used to install 750-lb. lateral load tension ties. By installing concealed-flange hangers on those two or four joists, the tension-tie bolts or screws can be run through the ledger without flange conflict. If the design calls for concealed- or in-turned-flange hangers, Simpson Strong-Tie only makes two sizes in its LUC product—one for 2x6 and 2x8 joists, and a larger size for 2x10 and 2x12 joists. Mitek/USP makes one for each joist size between 2x4 and 2x10 (the one for 2x10s also works for 2x12s) in its JLIF product.

### Hangers and Corrosion

All deck hardware is subject to corrosion because it’s used outside and in contact with pressure-treated lumber, which can have corrosive effects on steel and galvanized coatings. Hangers with thicker, G-185 galvanization offer better corrosion resistance, but some building mate-



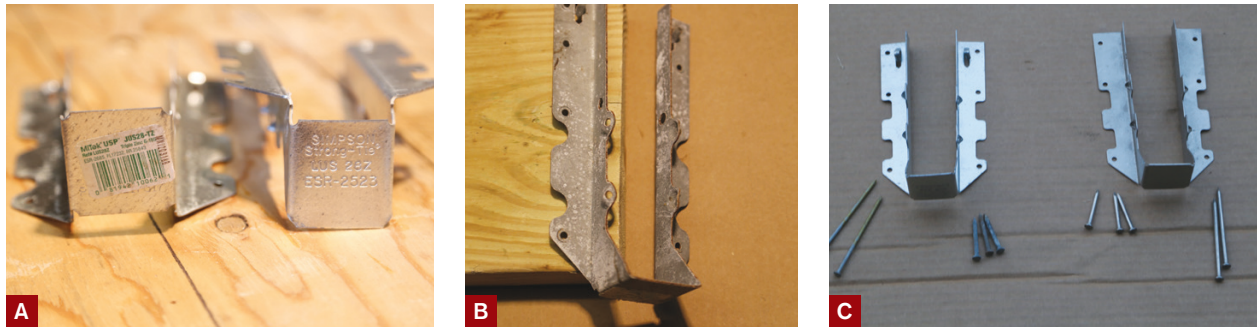
**Figure 1.** Hangers can be used with both their matching nominal joist size and the next size up—2x10 hangers are approved for use with 2x10s and 2x12s, for example (A). Concealed-flange hangers (B) are designed for use at the end of a ledger (C) but can also be used to avoid conflicts with lateral load hardware.

rial dealers may only carry joist hangers with G-90 or G-60 coatings, which are less expensive but are intended for interi-

or use only. When purchasing hardware, check the stamp or label for the level of galvanization (**Figure 2**).



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**Figure 2.** G-185 hangers can be identified by the brand name Triple-Zinc and the letters “TZ” on Mitek/USP products, and by the brand name Zmax and the letter “Z” on Simpson Strong-Tie products (A). After just a few weeks of exposure to salty air, corrosion is visible along the edges of a G-185-coated hanger (B). Stainless steel hardware (C, at right) is the best choice in a coastal environment. Always use fasteners of the same metal as the hanger.

Even G-185-coated hardware may not be suitable for all locations. Stainless steel hardware is a better choice near salt water, alongside roadways on which salt chemicals are used to melt snow and ice in winter, for decks and landings on which the owners may apply ice-melt chemicals, and in regions that receive acid rain.

Stainless steel hardware is expensive, so when owners don’t want to spring for the extra cost, you can reduce some of the corrosive factors by installing an isolation membrane to separate the joist hanger from the treated lumber. Applied to the end of the joists and over the led-

ger or beam where hanger flanges touch the wood, staple-on and self-adhering membrane will break the galvanic reaction. This method won’t solve exposure to salt from coastal proximity, ice-melt products, and acid rain, but it can help (**Figure 3**).

Always use fasteners that are the same metal or have the same coating as the joist hangers. Avoid mixing metals; for example, don’t use stainless steel fasteners with G-185 hardware, or galvanized fasteners with stainless hardware. The less-noble metal (steel with zinc coating) will corrode rapidly in contact with stainless steel.

### Fasteners for Hangers

When you purchase a joist hanger, the fasteners required for installation in each hole on the hardware aren’t listed anywhere. To know, you have to dig into the manufacturer’s load tables, but nail diameters and nail lengths for metal connectors can be confusing. Sometimes, the required nail size is listed by penny size—8d, 10d, or 16d—while other times the size is listed by diameter—0.131 inch, 0.148 inch, 0.162 inch—and by length—1½ inches, 3 inches, 3½ inches. Sometimes, the diameter is indicated by penny size, and the length is listed by inches.



**Figure 3.** Applying a staple-on isolation membrane or a self-adhering membrane to joist ends (above left) and the ledger (above right) reduces the rate of galvanic reaction between the treated lumber and the metal hanger.



**Figure 4.** Be sure to match the nail diameter and length to the joist-hanger manufacturer's requirements (top). If you are using connector screws (bottom), they must be the same brand as the hardware and approved for use with the specific hardware you're installing.

If you use a smaller diameter or shorter length fastener than a connector requires, then you have to apply a load reduction. If you use a larger diameter nail than a hole requires, you will end up either deforming the hardware or stripping the galvanized coating off the nail. Your best bet is to check the manufacturer's hardware table—as confusing as it may look—and select the right nail for each hole (**Figure 4**).

Luckily, it's pretty simple to size joist-hanger nails. The nails that penetrate through the ledger or beam flange are listed as 10d diameter (0.148 inch) x 3 inches long. The diagonal nails that

enter through the side of the joist and penetrate into the ledger or beam are the same—10d diameter (0.148 inch) x 3 inches minimum. If you're installing the joists to a single-ply ledger (1 1/2 inches thick), the 3-inch-long nails will poke through the wall. When the ledger is in direct contact with the wall sheathing, this may not be a problem. But if you space the ledger off the wall by 1/2 inch [as permitted in the Deck Ledger Connection to Band Joist - Table R507.9.1.3(1)], then you may want to use only 1 1/2-inch nails—which is what most installers use.

Technically, using 1 1/2-inch-long nails from the hanger flanges into the ledger

or beam instead of the required 3-inch nails means you should reduce the gravity/download capacity of the hanger by 0.64. But I ran a few tributary load calculations with allowable maximum joist span and live/dead/snow load combinations, and the down-load on any hanger never exceeded one-half of the hanger capacity. So even if we do multiply a hanger load by 0.64 to come up with the reduced load, there's still enough load capacity to handle deck joists framed to a single 2-by ledger.

Instead of nails, you can now use metal-connector screws made specifically for use with hardware. Keep in mind that metal-connector screws are brand-specific; you can't use one brand's screws with the joist hangers from another company. Nor can you use a screw not intended for use with hardware.

Metal-connector screws come in different diameters (#9, #10) and lengths (1 1/2 inches, 2 1/2 inches), and in most cases, the load capacities of connector screws are similar to those of nails. You might think that substituting a 2 1/2-inch screw for the 3-inch diagonal shear nail on a hanger would result in a load reduction, but the opposite is the case: There's usually increased capacity. Connector screws are more expensive than nails but can be faster and easier to install, especially in tight quarters where swinging a hammer or maneuvering a metal-connector nailer into position is difficult.

### Hanger Installation

I like to install hangers on the beam or ledger before placing joists, because I think it's faster to install the fasteners and roll the joists into place that way. But there's a downside: If the joists are of inconsistent depth, the surface of the deck framing will vary, which can especially be a problem with more-flexible composite decking. So before I set the hangers, I check the depth of the joists; usually, there are just a few that are more than 1/8 inch deeper or shallower than



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the rest. I either position the hangers for those joists to adjust for the difference of depth from the norm, or I cluster those joists near the middle of the deck and graduate them up and down so the crown in the deck that results from the tops of the joists being slightly higher than either end of the deck is blended and less noticeable.

To ensure all joists are set at the same position, I install the hangers using a “T” jig that has a top leg to ride the ledger and a 1<sup>9</sup>/<sub>16</sub>-inch-wide upright whose length is equal to the depth of the joist. A couple of tack nails hold the “T” in place while I fasten the hanger to the ledger or beam (Figure 5).



**Figure 5. The author prefers to install joist hangers prior to hanging joists, using a site-built T-jig to quickly and accurately place the hangers. When using this method, be sure that the joists are uniformly sized.**

### Tight or Loose Fit?

Any gap greater than  $\frac{1}{8}$  inch between the end of a deck joist and the ledger or beam results in load reduction for uplift capacity and down load (gravity load). Simpson Strong-Tie's load table doesn't deduct anything from the rated hanger load values for gaps up to  $\frac{1}{8}$  inch but lists specific allowable loads for gaps between  $\frac{1}{8}$  inch and  $\frac{3}{8}$  inch. For gaps that exceed  $\frac{3}{8}$  inch, there is no load data and the company doesn't support the installation. Mitek/USP's technical bulletin USP#990 has load reduction multipliers in  $\frac{1}{16}$ -inch increments, starting at a gap of  $\frac{1}{8}$  inch (1.00 or 100% of maximum load capacity). Two USP tables outline the two main loads: gravity loads and uplift loads. Gravity load multipliers for common joist hangers allow for up to a  $\frac{3}{4}$ -inch gap with a 0.40 multiplier. The uplift load multipliers end at a  $\frac{1}{2}$ -inch gap with a 0.35 multiplier (essentially one-third of the maximum uplift capacity).

While the gravity/down load capacities don't suffer as significantly for gaps up to  $\frac{3}{8}$  inch, the uplift capacities do. In part, this is due to the diagonal shear nails that penetrate through the end of the joist and into the ledger or beam. Once the gap is greater than the set-back position of the fastener hole, the fastener no longer captures the end of the joist (see photos, below). So when a deck is framed with a cantilever, there isn't any uplift capacity for joists with wide gaps, and the joists could lift out of the hanger when the cantilevered end is loaded.

Rotation is another issue. The side flanges on joist hangers stabilize the joists from rotation when a load is applied on top. If the decking boards are nailed or screwed to the top of the ledger board or rim beam and the top of the joists, then the joists are stabilized by the decking. But when hidden fasteners are used to install decking or the deck board isn't adequately fastened to both the deck joists and the ledger or beam, then the sides of the hangers have

to do the stabilizing work. With a wide gap, the joist is no longer fully retained by the side flanges.

On concealed-flange hangers, the fasteners are driven perpendicular to the joist. With no diagonal shear fasteners, there is no uplift load reduction and the minimal down load reduction won't exceed the maximum live/dead load for a given joist depth and maximum span for gaps up to  $\frac{3}{8}$  inch.



**As gap size between the joist and ledger increases, the holding power of diagonal shear nails decreases, reducing the joist hanger's uplift capacity.**



**Figure 6.** Paslode's pneumatic metal-connector nailer (A) and DeWalt's battery-powered nailer (B) have probe tips to guide nails into the hardware holes. Bostitch's pneumatic nailer (C) exposes the nail tip, which is placed in the hole before the gun is fired. Placement is critical since a misfire can damage the joist hanger or send a nail hurling back towards the operator.

Joist hangers can also be installed after the joists have been toenailed in place. The challenge is sinking the toenail heads so they don't interfere with hanger installation. The advantage to installing the joists first is the tops can be flushed with the ledger if there is a variation in depths.

Whichever method you choose, make sure the seat (bottom) of the hanger is square and tight to the bottom of the joist, the side flanges are snug to the joist, and the side flanges are flat against the ledger or beam.

### Tool-Driven Connector Nails

Metal-connector nailers speed nail installation but can be tricky. Some tools have a probe nose, while others use the tip of the collated nail to index the nail with the hole. In either case, it's critical to make sure the hanger is securely in place before triggering the tool, as the impulse of the nailer can shift the hanger out of position. Also, make sure the force you apply to the tool is in line with the direction of the nail. If you force the tip of the probe or nail in the direction of the magazine, the nail may not hit the hole. Misplaced nails are not permitted by the manufacturers, so if you misdrive a nail, you should remove it and discard the joist hanger (**Figure 6**).

Most nailers will only drive 1½-inch or 2½-inch nails, so you won't be able to drive the diagonal shear nails (3-inch minimum length required for nails). You'll still need to hand drive those nails or use connector screws. Or you can use a palm nailer to drive nails individually. Make sure to adjust the depth of drive so the nails don't overdrive and deform the joist hanger. Check all the nails driven with a nailer to see that they are seated as well. It may take a hammer blow to finish off a proud nail or two. ❖

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