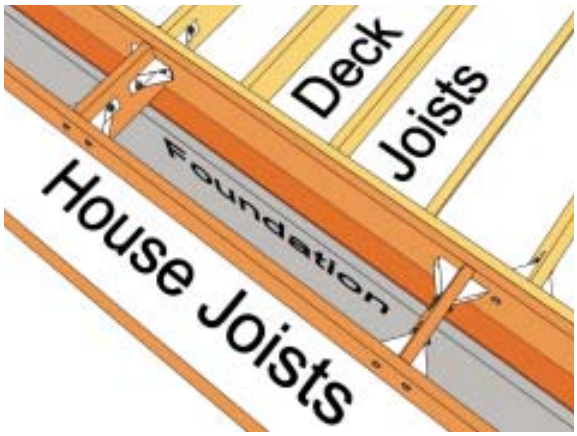
Why Do Decks Need Lateral Anchors?

Q The ledger attachment requirements recently adopted at the 2007 ICC conference include both a prescriptive bolting schedule and a lateral attachment requirement. The bolting requirements make sense, but why do I also need to add the lateral attachment? What is a lateral anchor? And isn't it going to be a headache to align the house joists with the deck joists for that? What if the deck is being attached to a part of the house where the joists run parallel to the wall?

A Michael Morse, president of DeckLok Bracket Systems, responds: Formerly, the IRC required only that decks be designed to safely transfer all anticipated live and dead floor loads to the foundation. What the code did not do is define how the lateral loads (away from the main structure) were to be transferred to the foundation. This lack of a lateral connection requirement has had devastating results. A segment on CBS's "The Early Show" in 2005 cited experts as saying that deck collapses in the United States occurred at a rate of one per week. A study done by our company, which manufactures the DeckLok lateral anchor, validated that statistic.



COURTESY DECKLOK BRACKET SYSTEMS

Most of the decks we studied had been well built. The collapsed decks that we saw usually had fallen as a complete unit, still structurally sound and intact even after hitting the ground. No deck was overloaded. That is, the total load on the decks at the time of collapse was far less than the load they were designed to carry (50 lb./square foot x square footage = design load). The decks themselves were not the cause.

The failures were at the deck-to-house connection. This includes the deck joists, the ledger board, the house rim joist, and the house floor joists. Of the collapses we studied that occurred between January 2000 and December 2006, 92 percent were attributed to the failure of the deck-to-house connection. Decks detach from houses due to failure of the critical connectors to keep the two structures together.

The IRC has now recognized the deck-to-house connection to be the weak link. A deck ledger board that is through-bolted to the rim board still relies on the nails connecting the rim board to the joists for the connection to the house foundation. The house rim board and its connection to the house joists was never designed to support additional living space or to resist a lateral force trying to pull it out of the building. It was designed to resist racking of the house and its floor joists.

Lag bolts join the rim board and the ledger board to create a laminated beam that carries the vertical load imposed on a deck to the house foundation. The lateral anchors are designed to resist horizontal or lateral loads. They keep the rim joist–ledger board beam from pulling away from the house. Each type of connector performs a separate job, and both are necessary.

Use a lateral anchor for a lateral attachment. You wouldn't use a drywall screw to hold a ceiling fan box or electrical conduit as plumbing. Although each of those examples has the same basic shape as the proper material, each also is engineered with critical properties to perform the intended function. Lateral anchors are specifically engineered to maximize the performance of the deck-to-house connection. They are designed to work with the floor joists, to flex and distort to preserve the holding power of the assembly, and to resist ripping through the 2-by floor joist.

Unlike conventional hold-down brackets, which are often substituted for them, lateral

anchors are flexible and sized to work with 2-by joists. Hold-down brackets are designed to resist uplift, to help keep a house from lifting off its foundation. To my knowledge, the Deck-Lok bracket is the only product on the market specifically engineered as a lateral attachment bracket.

The lateral load connection shown in the IRC is a simplistic example in which the house floor joists and deck joists align both laterally and horizontally. Deck builders will not usually be so lucky, but the connection can still be made. One option is to anchor the ledger board to the house floor joists and, with a separate bolt and anchor, tie the deck joist to the rim board.

The concept is the same no matter which way the joists run. The deck must be tied into the structure of the house. In cases when the deck ledger runs parallel to the house's floor joists, install blocking between the outer two floor joists and bolt lateral anchors to each of those joists. This will create a structural connection between the deck ledger board and the house floor system.

Many installation configurations have already been designed and are available for viewing and download at DeckLok Bracket Systems' Web site (www.deck-lok.com).

Stiffening a Bouncy Deck

Q I'm laying new deck boards on an old frame that is in good structural condition. The owners asked if I could do something to alleviate some of the bounciness in the deck. I checked the joist sizing and even though it meets the building code, there is a bit of deflection — any ideas?

A Mike Guertin, a builder and remodeler in East Greenwich, R.I., and a siding, roofing, and deck specialist at Hanley Wood's JLC Live, DeckExpo, and Remodeling shows, responds: I run into this all the time. Though the joists on an old deck meet the span requirements of the building code, the natural deflection can be unsettling, especially when groups gather on the deck. I use a few strategies to "stiffen up" a deck, depending on the circumstances and design.

Add a Beam

My first choice is to add a beam at the center of the joist span to pick up the bounce. This works great for decks close to the ground without usable space beneath them that a beam and posts would interfere with.

Since the extra beam is not necessary to meet building code span requirements for the deck, I usually don't excavate to full frost depth for the footings. I just dig to suitable subsoil (usually 18 inches in my area) and place precast footings to support the posts. If there is a chance that the deck will be enclosed as living space or a three-season room, then size the footings and dig them to frost depth for the extra loads.

Add Sister Joists

Since you're removing the old deck boards anyway, another simple solution to take out the bounce is to add extra joists. You can sister every joist with a mate — but that may be overkill. I've often had good results just sistering every third or fourth joist to reduce the spring.

If the deck is high enough off the ground, try slipping a few sister joists into just one section of the deck to determine the optimal sister frequency before removing the old decking; then have your customers check the new feel of the test area. Add more sister joists until the customers are happy with the results. This is a great solution when there is usable space beneath the deck that you don't want to encumber with a beam or posts.

Solid Blocking — Under the Right Conditions

Solid-wood joist blocking will sometimes help reduce bounce, but the joists and the blocks need to be dry and the blocks must fit very tight. I purposely cut blocks a whisker too long and sledgehammer them into place. Nail them in a straight line, not staggered. You can add one, two, or three rows of blocking to help stiffen the floor.

I don't recommend this solution for areas with wide annual humidity swings. Even if you install blocking when everything is dry and tight, seasonal joist swelling can push blocking away and leave small gaps when the joists dry out again.

Extra-Thick or Dense Decking

The simplest solution may be just to install thicker or denser decking. Using 2-by decking instead of 1-by or 5/4 can help alleviate the bouncy feeling. And composite-decking brands aren't all the same. Denser or stiffer decking tends to transfer loads better between joists and make a deck feel less bouncy. And screwing the decking down to joists instead of nailing or using hidden deck fasteners can help joists to share the load and reduce bounce.

You can use many of these solutions in combination to achieve the desired results.

Lighting for Exterior Stairs

Q I have been told that I have to illuminate my deck stairs. What are the requirements for this illumination?

A Glenn Mathewson, a building inspector in Westminster, Colo., responds: The 2000 IRC introduced a requirement for illumination of all stairways in residential buildings. The main body of the code section detailing this requirement has remained relatively unedited through the 2003 and 2006 IRCs. The code sections discussed here are from the 2006 IRC, which includes the following:

R303.6 Stairway Illumination. *All interior and exterior stairways shall be provided with a means to illuminate the stairs, including the landings and treads. ... Exterior stairways shall be provided with an artificial light source located in the immediate vicinity of the top landing of the stairway.*

The previous sentences are two of the sections of the code that refer to exterior stairways. The first sentence specifies which areas of interior and exterior stairways are to be lit; the second sentence specifies where the light for an exterior stairway must be located. As long as all the landings and treads are illuminated, the requirement in the first sentence is satisfied; theoretically, the light source could be a single floodlight on the corner of the house 30 feet away or multiple low-voltage lights mounted to the guardrail posts at the side of the stairway.

The second sentence provides additional criteria for where the light source must be located: "in the immediate vicinity of the top landing of the stairway." The phrase "immediate vicinity" is subjective, however — my idea of "immediate vicinity" may be different from yours or your inspector's. Nevertheless, according to this portion of the code section, the hypothetical floodlight 30 feet from the stairway would probably not satisfy the requirement; an additional light source would be required.

Many jurisdictions interpret the second sentence as a "specific requirement" and the first as a "general requirement." In IRC chapter one, "Administration," Section R102.1 states, "Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall be applicable." In applying this section, many jurisdictions would require illumination only of the top landing of an exterior stairway, on the basis that that is the specific requirement.

I think that interpretation is wrong, however, as there is no conflict between the two requirements. One requires "a means to illuminate" the stairs, and the other specifies the general location of "an artificial light source."

Another subjective part of the illumination requirement for exterior stairways is that no measurable unit of illumination is specified, which will ultimately lead to variations in enforcement by code officials. Assessing the level of artificial illumination in daylight hours, when most inspections are performed, is difficult, and without the requirement of a definitive, measurable quantity of illumination, there's little limitation of a code official's judgment as to what is "illuminated" and what is not.

There's more. The last sentence of Section R303.6.1, and the exception that follows, states:

R303.6.1 Light activation. *... The illumination of exterior stairways shall be controlled from inside the dwelling unit. Exception: Lights that are continuously illuminated or automatically controlled.*

A common way of approaching this requirement is to replace the porch light outside the door leading to the deck with a floodlight aimed at the top landing of the stairway. For this to work, the light source must be "in the immediate vicinity of the top landing" and must illuminate all treads and other landings, as well. If this is not possible or desired, other light sources controlled from inside the home that would meet those requirements will need to be installed.

The exception allows for more flexibility in lighting options, such as the limited use of low-voltage lighting. A photocell, for example, illuminating for the full duration of dark hours, could be considered "continuous," and a motion sensor, activated when the deck is occupied, could be considered "automatic."

The use of a timer or photocell-timer combo would be questionable, because its automatic capabilities would depend on how the timer was set; that might not be considered sufficient to satisfy the light activation requirements.

As with all discussions about building codes, always double-check with the local authority that has jurisdiction. ❖