Better Lateral-Load Detail in 2015 Code

by Glenn Mathewson

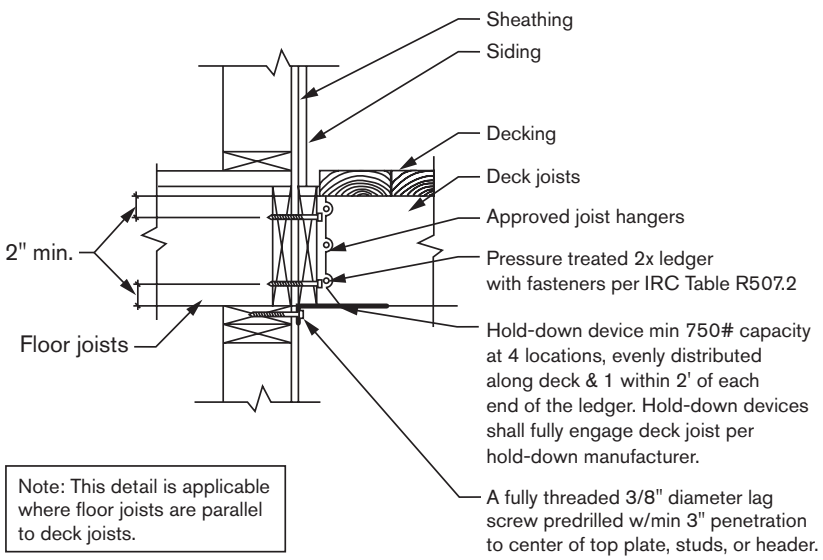
When a lateral load anchor provision (R502.2.2.3) was introduced in the 2009 IRC, builders and code officials were confused about not only how to implement it, but also whether it was even required. While the 2012 IRC may have clarified that the detail was "permitted" rather than required, it still left questions about how to handle lateral loads if *not* by the "permitted" detail.

Many deck builders hoped that in the recently finalized 2015 IRC, the provision would be dropped. It wasn't, but at least this version of the code offers an alternative that doesn't require access to the home's interior and is more effective and easier to install (see illustration below). Also, the new detail doesn't create a thermal bridge, as the older one does (by connecting metal hardware located outside and inside the structure).

Background

The effects of wind, seismic forces, and human movement can be significant on a deck, as it lacks braced walls to both receive lateral loads and act as a mechanism to resist them. To evaluate the magnitude of lateral loads on decks and how well common construction techniques resist them, researchers at Washington State University (WSU) recently analyzed lateral loading conditions on a model 12-foot by 12-foot deck.

2015 IRC Lateral Load Detail



The new "permitted" lateral-load connection detail in the 2015 IRC won't require invasive interior remodeling to install, just hardware that connects the bottom of a joist back to the wall plates, foundation, studs, or window or door headers. Currently there is no widely distributed hardware for this detail, but expect to see some prior to publication of the code in early 2015. Four evenly-spaced connections are required, each of which must resist 750 pounds.

First, they calculated the lateral loads that could be expected from wind and seismic forces. Even worst-case wind speeds, such as might be found on the southern tip of Florida, produced maximum wind-load values of 1,299 pounds on the 12x12 deck, well below the total 3,000-pound stress load capacity of the two 1,500-pound anchors in the 2009 code detail. Calculated seismic lateral loads in high-risk seismic zones were even lower: 517 pounds.

Researchers then set out to measure how much force could be generated by human movement. Decks were constructed with perpendicular and diagonal decking, and impact and harmonic loads were evaluated—with occupants jumping horizontally in unison for impact loading, and swaying in unison to create harmonic loads. Surprisingly, researchers determined that lateral live loads developed by occupants are considerably higher than the lateral loads from wind or seismic forces, potentially up to about 12 pounds per square foot, or 1,728 pounds on the 12x12 deck.

In the final study, two 12x12 decks were built to IRC standards and lag-screwed to a mocked-up house floor, one with lateral load anchors and one without, to determine how much difference the anchors made in resisting lateral loads. Researchers discovered that the anchors seemed to be structurally unnecessary in the tested examples (though that's not necessarily true for every deck). It's important to note that all these tests were performed with screws rather than nails in the joist hangers, because in preliminary testing, researchers found that nailed hangers were insufficient for attaching deck joists to ledgers. To

read more about the WSU research, go to deckmagazine.com/structure/measuring-lateral-loads-on-decks_o.aspx. A video summary can be found at youtube.com/watch?v=nP6QzyxZgAw.

New Detail

Partially as a result of this research, a proposal to remove the existing lateral-load provision was submitted to the IRC development committee. Another proposal provided a second "permitted" detail (shown in the illustration on page 16), based on the same assumed values of resistance in the current IRC:

R507.2.3 Deck lateral load connection. The lateral load connection required by Section R507.1 shall be permitted to be in accordance with Figures R507.2.3(1) or R507.2.3(2). Where the lateral load connection is provided in accordance with Figure 507.2.3(1), hold-down tension devices shall be installed in not less than two locations per deck, and each device shall have an allowable stress design capacity of not less than 1,500 pounds (6672 N). Where the lateral load connection is provided in accordance with Figure R507.2.3(2), the hold-down tension devices shall be installed in not less than four locations per deck, and each device shall have an allowable stress design capacity of not less than 750 pounds (3336 N).

Concerns were raised during the hearings about the joist-ledger connection, especially in light of the WSU findings about nailed joist hangers. Since standard practice is to use hanger nails rather than screws, many stakeholders argued that the IRC detail needed to stay in the code as a "safety" feature, just in case a nailed joist connection is as questionable as WSU researchers believe.

The big news is that an alternative connection method was approved. The new "permitted" detail is installed in four locations rather than two, and requires a hardware connection between the bottom of a joist and a wall plate, foundation, studs, or window or door headers that can resist 750 pounds. The connections must be evenly spaced along the ledger and have the same 3,000-pound total capacity (even though that load value was essentially shown to be excessive by the WSU study) as the method that uses two 1,500-pound anchors.

To read a brief recap of deck-related code proposals, both approved and disapproved, go to nadra.org/code. ❖

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