

Dropping the Deck Ledger

by Glenn Mathewson

When we first began building residential decks, there was no scientific research that determined we should use ledgers, joists, beams, and posts the way we did. It just happened that we'd want a deck to be about the same level as the home's first floor, and connecting a ledger to the band joist, with deck joists hangered from its side, seemed to make sense—until it didn't.

As problems started to crop up with some of our ad hoc ledger connections, researchers and code officials began to pay closer attention to these details. As a result, now we know better than to fasten a ledger over existing exterior cladding or veneer; you've got to cut through the cladding to the framing. The ledger flashing can't be stuffed up behind the siding; no, it has to be laced in shiplap-style with the water-resistive barrier. And no longer is it acceptable to drive lag screws through the ledger into the wall and "call it good" when they snug up. Now, the IRC has strict guidance for spacing between fasteners and edge clearances. And whether you use bolts or lag screws to fasten the ledger to the framing, the inside of the band joist must be accessible to either thread a nut or verify what the lag screw is holding. What about anchored brick veneer, stucco, or adhered stone—how do we get around that? Here's where we lower our sights—to the foundation instead of the band joist.

One or two steps down. For ground-level decks, the foundation just below the wood framing is attractive for connection. There's no cladding, no flashing to lace with the WRB, no need to open up floor framing to see what's inside. The IRC

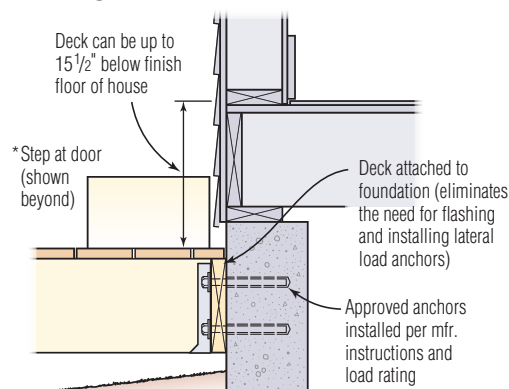
doesn't provide a fastening schedule for attaching a ledger to a concrete foundation, but with a little data from the hardware manufacturer, it's not hard to figure out. In many designs, two steps from a back door or a landing with steps is an easy way to bring the occupants down to this slightly lower deck level while avoiding the hassles of a ledger connection to wood framing.

Dropping the ledger. But what if the owner doesn't want the deck dropped down from the interior floor? Can we drop the ledger instead, like we drop beams?

The answer can be found in the IRC. Typically, we think of deck loads being carried down from the joists to the ground through a ledger on one side and a beam or rim joist on the other. To transfer these loads, Section R507.6.1 in the 2021 IRC requires a minimum of 1½ inches of bearing on wood or metal. We generally think of this as bearing on top of a beam or in the saddle of a hanger, but a ledger provides 1½ inches of bearing surface as well. The section also describes fastening methods intended to prevent joists from rotating: *Joists bearing on top of a multiple-ply beam or ledger shall be fastened in accordance with Table R602.3(1). Joists bearing on top of a single-ply beam or ledger shall be attached by a mechanical connector.*

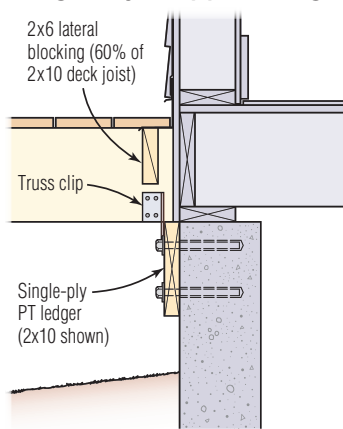
I think this is a subtle but solid nod to the idea of supporting joists on top of a ledger. A single member below, such as a single-ply beam or typical ledger, is large enough for the bearing surface but isn't practical for angled and often haphazardly installed toenails to fully engage. For this reason, mechanical connectors, such as truss clips, are required. It's

Ledger-to-Foundation Connection



*Note: the IRC requires at least one side-hinged door with no more than one 7¾" step to a landing. All the other exterior doors of the house can be up to 15½" down to a landing.

Single-Ply Dropped Ledger



A step (or two) down to the deck is usually needed when a deck ledger is anchored to a concrete foundation rather than to the house framing (far left). Instead of hanging the deck joists from the ledger, installing them so that they bear on the ledger (like a dropped beam) allows the deck to be flush with the house floor framing (left).

ILLUSTRATIONS BY TIM HEALEY

important to note there is no magnitude of load resistance called out for these connectors, and that's not an oversight. These connections are intended to prevent joists from moving laterally and are not intended to resist any lateral live loads generated by occupants or wind, nor any uplift loads. This is no different from hangers connecting joists to the side of a ledger or beam; hangers are also designed only to transmit vertical loads and to resist joist rotation. The face nails through the hanger are not designed to resist lateral live loads any more than toenails or truss clips.

When a home's sheathing and cladding extend out over the foundation wall enough that a double-ply ledger is required to provide enough bearing for the joists, are there any issues in anchoring both ledger layers to the foundation at the same time? That is a trickier question, and the code doesn't provide an answer. This would depend on the concrete anchor and how its load rating is determined. An anchor going through both ledger plies will ultimately stick farther out of the concrete and take a load 3 inches, rather than 1½ inches, away. This "technically" puts more torque (moment) on the anchor. That said, I would not be worried about it. This is another example where the code provision would be stretched a bit and would require review by a knowledgeable and rational building inspector. A two-ply member (beam or doubled-up ledger) has sufficient material to connect to via the 2021 IRC's Table R602.3.1, which calls for nothing more than three toenails.

Brick veneer is a common cladding in my area and is typically installed flush with the foundation wall on top of a brick ledge cast into the foundation. As long as the brick doesn't extend down to grade, a single-ply ledger can simply be anchored to the foundation wall.

Sometimes the brick veneer extends below grade. In these cases, no one really knows what is behind the veneer and where the top of the concrete or masonry is located. Anchors

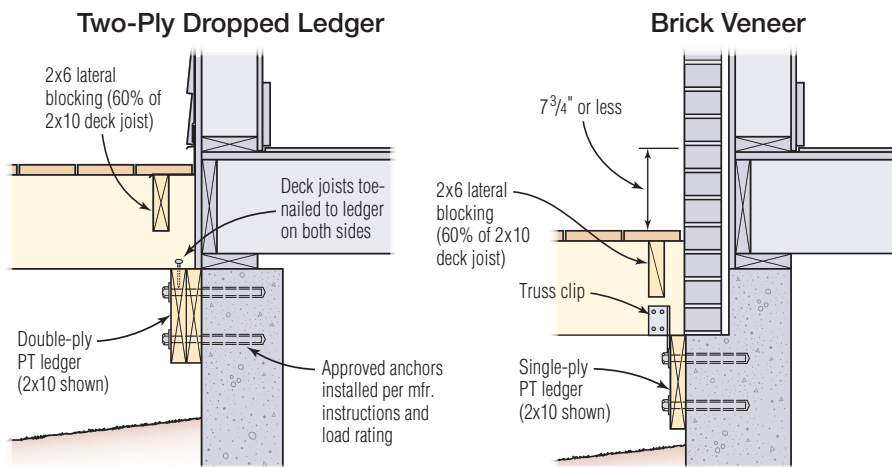
have specific installation requirements with edge distances and concrete vs. masonry (CMU). You can't install anchors through the brick veneer. In these cases, I would not recommend attachment through the brick to the foundation.

Lateral loads. Section R507.6.2 is titled "Deck joist lateral restraint," but don't confuse this with the connections we just discussed or lateral live-load design methods. This section is about joist rotation, and as mentioned, hangers provide this restraint. Without hangers in a dropped ledger design, blocking is necessary between the joists, but it must be only 60% or more of the height. So 2x6 blocks work for 2x10 joists, while 2x12 joists would require 2x8 blocking. Though not stated in the code, the blocks don't have to be directly above the ledger. They could be a few inches away from the ledger and exterior wall to allow for drainage and ventilation. The fewer materials sandwiched against each other in deck construction, the better.

For lateral load design, nothing about a dropped ledger precludes the use of either lateral-load-anchor method provided in the IRC. The point of these connections is to be independent of the ledger. A dropped ledger is most advantageous for ground-level decks and attaching to the foundation, so bracing between the posts is also effective for lateral load restraint, likely eliminating the need for the anchors into the house.

With less conventional methods of construction, it's important to analyze each loading fundamental and evaluate whether it's satisfied. For a dropped ledger, we get 1½ inches of bearing, we secure the joist in place with clips, we resist joist rotation with blocking, and we recognize lateral live loads are not restrained. We provide lateral-load connectors or other bracing methods. If you think outside of the box, just be sure you've got the same or equivalent contents. ❖

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A double-ply dropped ledger may be required to provide adequate bearing for the ends of the deck joists (far left), but this detail requires careful review of the load ratings for the concrete anchors and inspector approval. When there is brick veneer cladding, anchor the ledger to the foundation below the brick ledge and never to the brick itself (left).