

Deck Ledgers and I-Joist Floor Systems

by Jim Anderson

Most decks are supported in part by a ledger that is attached to the band joist or rim board of the floor system. Because this connection is critical to the safety of the deck's occupants, both the 2015 IRC and the latest edition of the American Wood Council's *DCA 6 Prescriptive Residential Wood Deck Construction Guide* provide detailed structural design guidance on fastening a deck ledger to a house that has a solid 2-by-lumber band joist. But plenty of homes built today have engineered I-joist floor systems, with rim boards of laminated veneer lumber (LVL) or laminated strand lumber (LSL). Some builders even use OSB or 3/4-inch plywood.

Deck-ledger design guidance for what are referred to as "commodity" engineered wood product (EWP) rim boards can be found in both the IRC and DCA 6. But other kinds of EWPs that come in different densities and thicknesses are also used to make rim boards, making a prescriptive approach to ledger design

more difficult when there is an I-joist floor system. In fact, given the wide range of engineered-lumber types, thicknesses, and manufacturers, there is no "one-size-fits-all" solution for attaching a deck ledger to an EWP rim board.

Manufacturer Recommendations

The capacity of the connection between an engineered rim board and a deck ledger is largely product-dependent, so it's essential to have the latest information from appropriate sources when designing these connections. Instead of drilling a hole and guessing at the rim board's identity and thickness, examine it carefully to find out who made it, and then consult the manufacturer's literature or contact a manufacturer's representative for detailing guidance. Usually a manufacturer's mark can be found stamped directly on the rim-joist material.

Engineered-wood manufacturers typically offer extensive resources to sup-

port the use of their products and to help with appropriate design and detailing, including software and literature that address common situations like deck-ledger installation. When more-complex issues arise, a manufacturer's representative can be consulted.

Code Requirements

The 2015 IRC (R502.1.7) requires EWP rim boards to be manufactured in accordance with APA PRR 410-2011 (with design capacities dictated by that standard), or the rim-board design capacities must be evaluated in accordance with ASTM D7672. Rim boards manufactured in accordance with PRR 410 are referred to as "commodity" rim boards, while those evaluated in accordance with ASTM D7672 are referred to as "proprietary" rim boards. Both approaches are used, but they can result in significant differences in allowable capacities.

Load capacity. Both commodity and proprietary EWP rim boards that meet

Fastener Capacity (in lb.) for Various Deck Ledger-to-Rim Connections

	Lumber (IRC, DCA 6)	Commodity Rim (PRR 410, DCA 6)		Proprietary (Weyerhaeuser) Rim (ASTM D7672)			
				TJ Rim	TimberStrand LSL		
Rim thickness	1.5"	1"	1.125"	1.125"	1.25"	1.5"	≥ 1.75"
1/2" lag screw w/ 1/2" sheathing	385	300	350	480	610	675	725
1/2" bolt w/ 1/2" sheathing	725	300	350	695	725	725	725
1/2" bolt w/ 1" sheathing	615	--	--	615 ^A	615 ^A	615 ^A	615 ^A

^A Tested with 1/2" sheathing and 1/2" of stacked washers, which is permissible per IRC and DCA 6.

Figure 1. Here are allowable capacities for deck-ledger connections using three recognized fastener configurations with sawn-lumber band joists, commodity-engineered-wood rim boards, and proprietary rim boards (in this case, from Weyerhaeuser; similar information is available from other manufacturers who offer proprietary EWP rim boards).

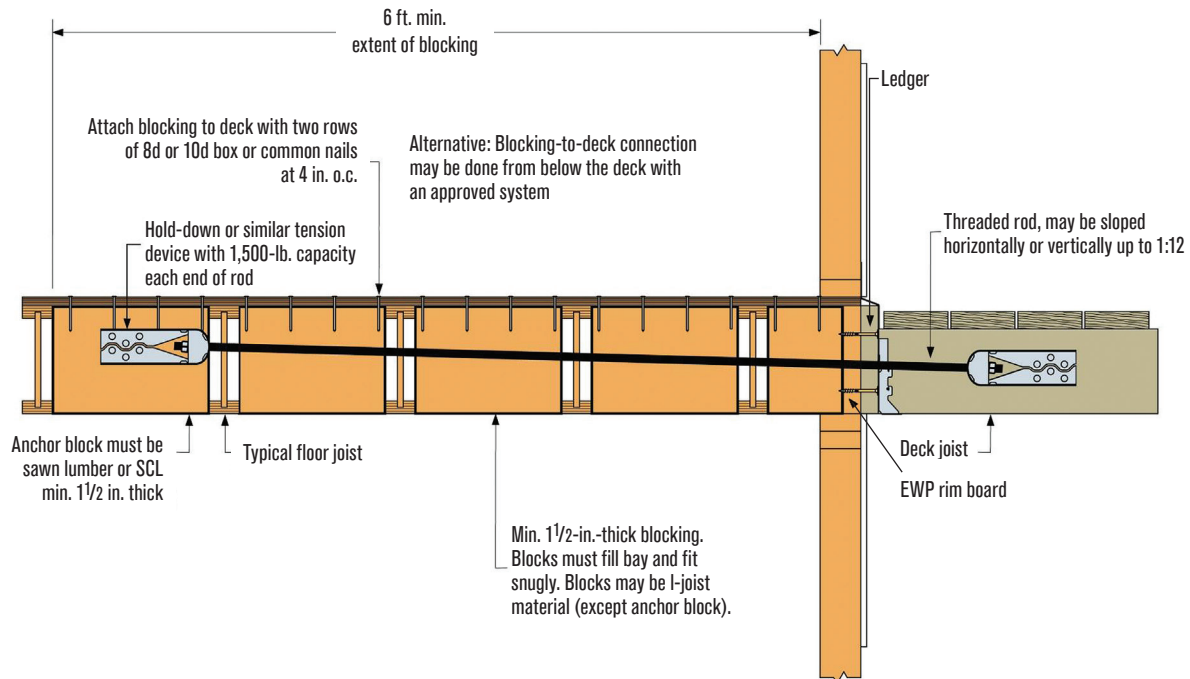


Figure 2. When a deck is attached to a house with an I-joist floor system where the joists are parallel to the rim joist, blocking and fasteners must be added as shown before installing the lateral load anchors. A similar detail is available from WIJMA for when the I-joists are oriented perpendicular to the rim joist.

IRC requirements are specifically tested to evaluate the deck-ledger-to-rim-board load capacity, and can be compared with each other as well as with sawn lumber (**Figure 1**).

As the table indicates, rim-board thickness is not the only factor in determining capacity. Adjusting IRC ledger-connection design values for sawn-lumber band joists based on thickness and trying to apply them to EWP rim boards will yield inaccurate results, ranging from slightly conservative in most cases for commodity rim boards to very conservative for proprietary rim boards (note that published rim-to-ledger connection capacities for 1³/₄-inch-thick TimberStrand LSL rim board have equal or greater values than sawn lumber in all cases, despite being thinner).

EWP beam vs. EWP rim board. Can an engineered-wood beam product, such as 1³/₄-inch-thick LVL, be used as a rim board? The answer is “maybe,” but don’t

assume that the increased thickness relative to many common rim boards makes it an appropriate substitute in all cases. Engineered rim boards have specific testing and manufacturing requirements that may not be met by all engineered beam products. Prior to using any product as rim board, it’s important to verify that the specific product being considered has been appropriately evaluated and is approved by the manufacturer for this use.

Lateral Connections

Whether connecting the deck to a sawn lumber band joist or to an EWP product, remember that this framing member plays a critical role in ensuring a continuous lateral load path as well as support for deck ledgers. The primary connections that ensure a continuous load path and adequate structural performance to resist loads include the following:

- Bottom-plate-to-rim-board nailing

- Floor-sheathing-to-rim-board nailing
- Rim-board-to-sill-plate or rim-board-to-top-plate nailing

In addition to requiring the floor sheathing to be properly connected to the rim board and the rim board to the sill plate or wall top plate, the IRC requires the deck to be attached to the structure for lateral load resistance with a minimum of two connectors capable of supporting 1,500 lb. each, or four connectors capable of supporting 750 lb. each (2015 IRC, R507.2.4). While DCA 6 includes recommended details for attaching a deck to a lumber-framed floor system with band joists installed both parallel and perpendicular to the floor joists, similar details for connection to I-joist floor systems have been adapted from the DCA 6 details and are published by the Wood I-Joist Manufacturers Association (WIJMA) at i-joist.org (**Figure 2**). ♦

Jim Anderson is an engineer at Weyerhaeuser.