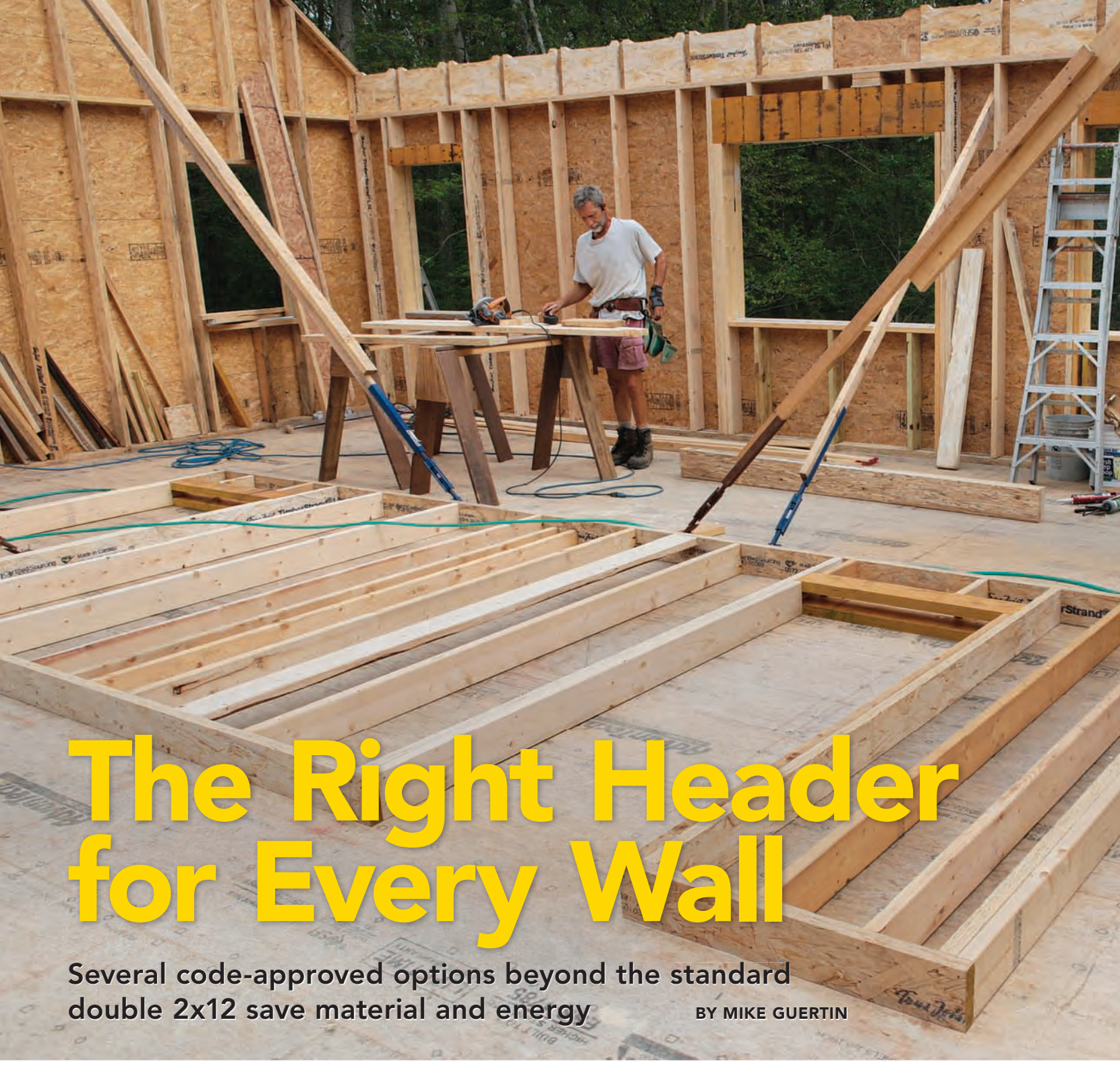


The Right Header for Every Wall

Several code-approved options beyond the standard double 2x12 save material and energy

BY MIKE GUERTIN

When I started framing houses in the late 1970s, the standard header for almost any size window and door opening was a double 2x12 with a ½-in. plywood spacer to bring the header flush with the stud edges in a 2x4 wall. When the header is pushed hard to the double top plate of an 8-ft.-high wall, its bottom sets up window and door head jambs 6 ft. 10 in. off the floor, perfect for standard 6-ft. 8-in. doors.

When high-performance homes gained market share in the late 1980s, the building industry looked for options to reduce the amount of lumber used to build headers—or to eliminate conventional headers altogether—in order to save resources, minimize thermal bridging, and provide more space for insulation. Double 2x12 headers are often oversize for the load, but they're still the standard. In most cases, there is no structural advantage to installing headers that are larger than required, and there are downsides. Not only do they cost more than right-size headers, but the deeper a lumber header is, the more likely it is to lead to drywall cracks as green lumber dries or dried lumber expands during seasonal humidity changes.

When I look at the prescriptive options available in the IRC, I'm surprised by how many builders still frame the way I did nearly 40

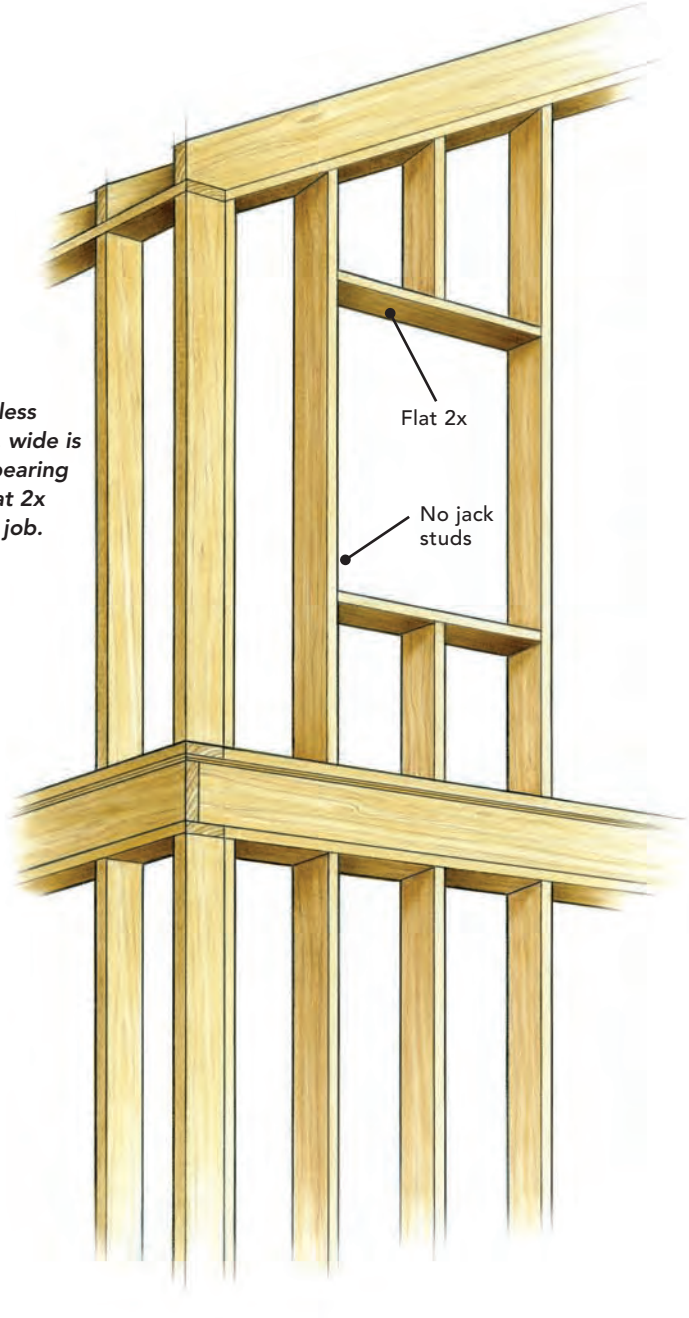
Drawings: Don Mannes

DO YOU EVEN NEED A HEADER?

The 2015 IRC says, "Load-bearing headers are not required in interior or exterior nonbearing walls. A single flat 2-inch by 4-inch member may be used … for openings up to 8 feet in width" (R602.7.4).

In essence, the code doesn't require a header unless the end of a floor joist, roof rafter, or truss lands on that wall or there's a concentrated load bearing over the opening. You don't even need to install structural jack studs, since there is no load for them to bear.

A header also isn't required when a window or door is narrow enough to fit between studs on layout. This is more typical with framing on 24-in. centers. Then, when a window is less than 22 in. wide, you don't need a header; you just install 2x head and sill boards to box out the rough opening.



When an opening less than 8 ft. wide is in a nonbearing wall, a flat 2x does the job.

years ago. I guess bigger and beefier looks stronger and impresses clients, and I admit that it's easier to use the same-size headers throughout a house whether for a large patio door or a narrow window. Thoughtful header design takes planning and organization, but it's a better way to build. Shallower headers, single-ply headers, engineered lumber, innovative use of rim joists, and even no headers at all save material, money, and energy. □

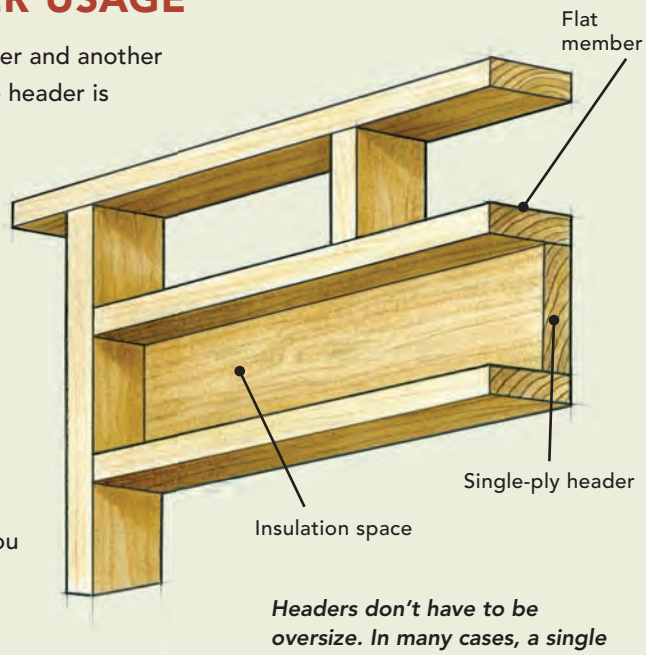
Mike Guertin is a builder and remodeler in East Greenwich, R.I.
Photos courtesy of the author, except where noted.

RIGHT-SIZE HEADERS OPTIMIZE LUMBER USAGE

Sizing a header for the load it will carry is pretty simple, can be done without an engineer, and usually results in headers that use less material. For conventionally framed houses, tables in the IRC help you determine the right-size header for the opening width and the load it supports. In the 2012 IRC and earlier versions, the header span table for exterior bearing walls (R502.6[1]) was published in chapter 5, "Floors"—hardly a logical spot—and the table only included two-ply, three-ply, and four-ply headers. The 2012 IRC added a table for single-ply headers in chapter 6. The 2015 IRC consolidated this information in a single exterior-wall-header table (R602.7[1]) in chapter 6. This section includes similar tables for headers in interior walls and porches.

In addition to their listing in the table, single-ply headers have a subsection requiring that one 2x flat board be installed at the bottom of the header and another one on the top (unless the header is tight to the top plate).

The header options are listed by the number of plies (one to four) and the lumber size (2x4 to 2x12). While only three building widths (20 ft., 28 ft., and 36 ft.) are shown, the code permits you to interpolate for building widths between those listed. If you don't want to interpolate, you can just use the spans listed for the next-larger building width. Also in the tables are columns labeled *NJ*, meaning "number of jack studs" required under each end of the header.



Headers don't have to be oversize. In many cases, a single ply of lumber works, leaving additional room for insulation.

EXAMPLE: Find a header for an opening in an exterior wall on the first floor of a two-story house with a center-bearing wall. The house is 28 ft. wide, the rough-opening width is 3 ft. 2 in., and the snow load is 30 lb. per sq. ft. or less (found in IRC chapter 3).

Girder spans and header spans for exterior walls

(Maximum spans for Douglas fir–larch, hem-fir, southern pine, and spruce-pine-fir, and required number of jack studs)

Girders and headers supporting	Size	Ground snow load (lb. per sq. ft.)																	
		30						50						70					
		Building width (ft.)																	
		20		28		36		20		28		36		20		28		36	
		Span	NJ	Span	NJ	Span	NJ	Span	NJ	Span	NJ	Span	NJ	Span	NJ	Span	NJ	Span	NJ
Roof, ceiling, and one center-bearing floor	1-2x8	3-11	1	3-5	1	3-0	1	3-7	1	3-0	2	2-8	2	-	-	-	-	-	-
	1-2x10	5-0	2	4-4	2	3-10	2	4-6	2	3-11	2	3-4	2	-	-	-	-	-	-
	1-2x12	5-10	2	4-9	2	4-2	2	5-5	2	4-2	2	3-4	2	-	-	-	-	-	-
	2-2x4	3-1	1	2-9	1	2-5	1	2-9	1	2-5	1	2-2	1	2-7	1	2-3	1	2-0	1
	2-2x6	4-6	1	4-0	1	3-7	2	4-1	1	3-7	2	3-3	2	3-9	2	3-3	2	2-11	2
	2-2x8	5-9	2	5-0	2	4-6	2	5-2	2	4-6	2	4-1	2	4-9	2	4-2	2	3-9	2
	2-2x10	7-0	2	6-2	2	5-6	2	6-4	2	5-6	2	5-0	2	5-9	2	5-1	2	4-7	3
	2-2x12	8-1	2	7-1	2	6-5	2	7-4	2	6-5	2	5-9	3	6-8	2	5-10	3	5-3	3
	3-2x8	7-2	1	6-3	2	5-8	2	6-5	2	5-8	2	5-1	2	5-11	2	5-2	2	4-8	2

1. Locate the group in the left column that matches the situation.

2. Find the applicable snow load in the upper row.

3. Below the snow load, choose the building width.

4. Below the building width, look in the span column and find at least one span that matches or exceeds your opening (3 ft. 2 in. or greater). The closest in this case is 3 ft. 5 in.

5. Move directly left from the chosen span to the size column to find a header configuration. Use any header design for openings equal to or greater than yours. For spans up to 3 ft. 5 in., you can use a single 2x8 or two 2x6s, which could span up to 4 ft.

Photo facing page: Dan Thornton

INTERPOLATION

If the house width falls between the three provided in the IRC, header spans can be interpolated with some simple math. For example, let's use the same rough opening and house configuration as before, except that in this case the house is 26 ft. wide. We'll use a single 2x8 header.

Begin with the difference in span for a given header configuration between the building width on each side of the actual building width. At 20 ft., a single 2x8 can span 3 ft. 11 in. At 28 ft., it can span 3 ft. 5 in., so the header span difference is 6 in. over 8 ft. To find the difference per foot, divide 6 in. by 8 ft.:

6 in. ÷ 8 ft. = 0.75 in. per ft.

Since the 26-ft.-wide building is 6 ft. wider than the 20-ft. width from the table, calculate the following:

0.75 in. per ft. × 6 ft. = 4.5 in.

Subtract the above number from the header span for a 20-ft.-wide building to find the allowable header span for a 26-ft.-wide building:

3 ft. 11 in. – 4.5 in. = 3 ft. 6.5 in.

Why header spans change

Today's lumber isn't as strong as the old-growth material of years past, so lumber-rating authorities have been reducing the rated structural capacity of most species. One way that those reductions are manifest is in shorter header spans. If your code jurisdiction adopts a more recent version of the IRC, you may have to change your header sizes according to the revised table.

LVL
Laminated-veneer lumber

LSL
Laminated-strand lumber

Insulated header

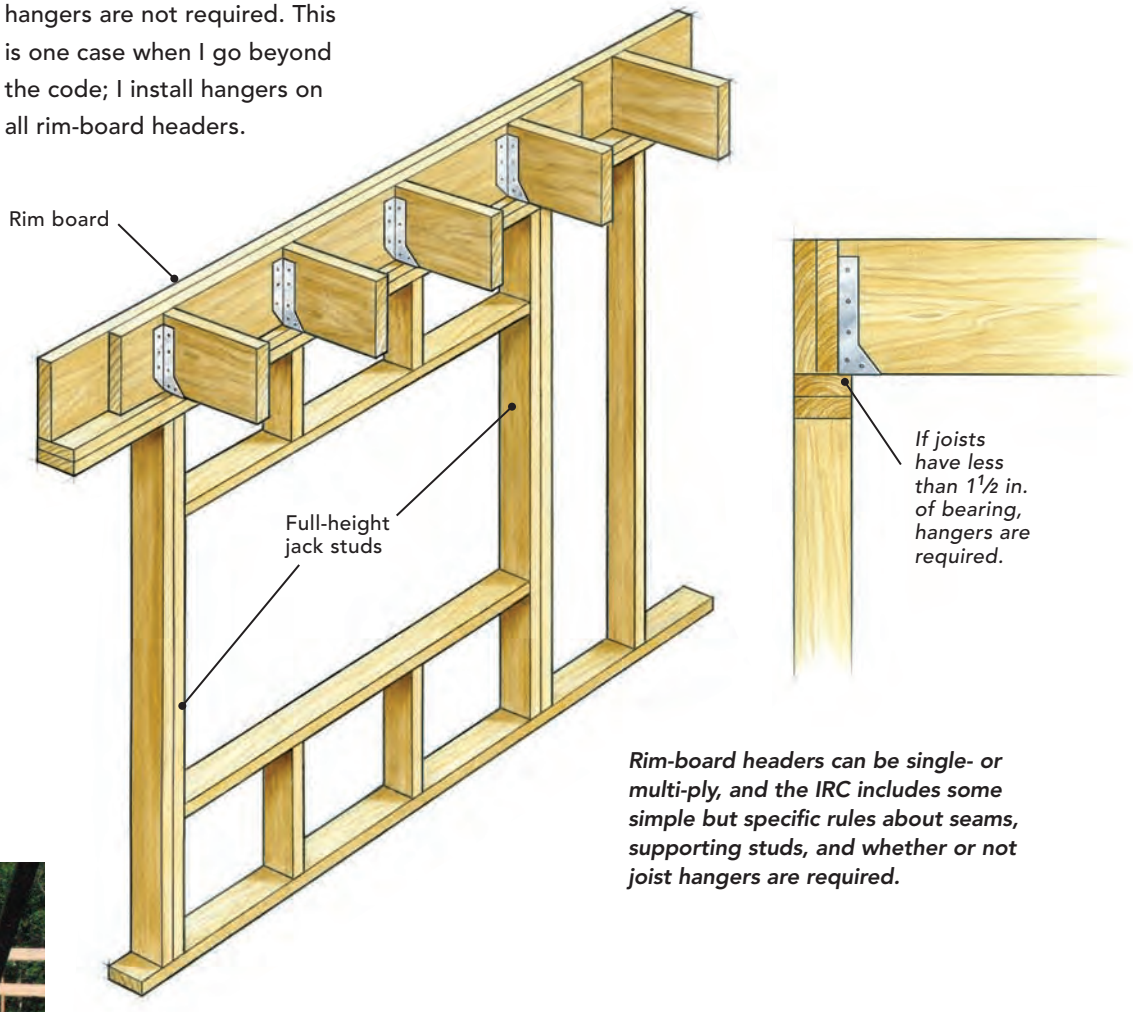
ENGINEERED-LUMBER HEADERS

LVL, LSL, and insulated headers are usually more consistent in size and less prone to shrinking and swelling than sawn-lumber headers, which is one reason many builders have adopted them. Some companies make headers in a laminated sandwich with a rigid insulating-foam core or face. (The one shown here is from SJS Components.) Engineered-lumber manufacturers provide header-span tables similar to the ones listed in the IRC, making it easy to size them. I've used engineered lumber as single-ply headers, multi-ply headers, and rim-board headers. In many cases, the engineered-lumber members can span greater distances compared to sawn-lumber headers of similar sizes. It's important to check the manufacturer's instructions, as there may be special-use conditions not covered in the code.

RIM-BOARD HEADERS USE EXISTING FRAMING

Why does a header have to be framed into an exterior wall when there's already a rim board in the floor framing above the top plate? A rim board often can bridge a window or door opening, and as of the 2015 IRC, there is a subsection on them (R602.7.2). Rim-board headers are sized according to the same table used to size regular headers, and in many cases the single-ply rim board you're already installing may eliminate the need for a conventional header below. In situations where the loads are greater or the opening is larger, the rim board can be sistered with additional material (photo). In all cases, there can be no joints in a rim-board header over the opening and for 6 in. past the outer bearing studs. The number of outer studs framing each end of the rough opening must at least equal half the studs displaced by the opening, assuming you are using the maximum stud spacing permitted in table R602.3(5). This may sound confusing, but it's easy in practice. If there would be two studs falling in the opening, then you would need one jack stud at the left side of the opening and another at the right side.

According to the IRC, as long as floor joists have at least 1½ in. of top plate to bear on (say, a single rim board on a 2x4 top plate), hangers are not required. This is one case when I go beyond the code; I install hangers on all rim-board headers.



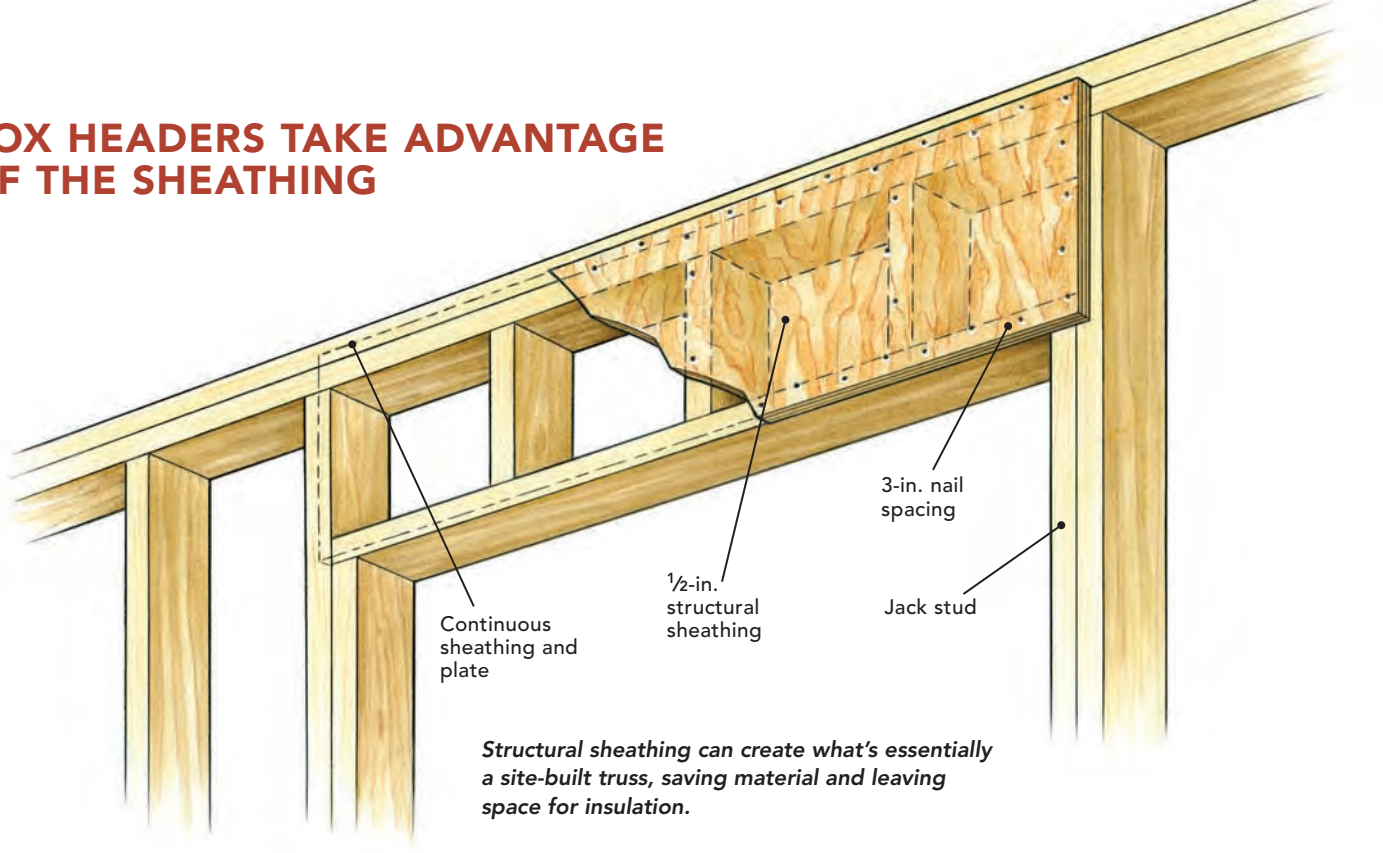
Rim-board headers can be single- or multi-ply, and the IRC includes some simple but specific rules about seams, supporting studs, and whether or not joist hangers are required.

Building up headers

When building multi-ply headers, you should start with the IRC's fastening schedule (table R602.3[1]), which covers two-ply headers with a ½-in. plywood or OSB spacer, presumably for a 2x4 wall. (No fastening schedule is given for other headers.) The schedule calls for 16d common nails at 16 in. on center or 16d box nails at 12 in. on center. I run two rows of nails on 2x6 to 2x10 headers and add a third row in the middle of 2x12 headers.

In 2x6 walls, I usually frame double headers by sandwiching 2-in. rigid foam between

BOX HEADERS TAKE ADVANTAGE OF THE SHEATHING



Structural sheathing can create what's essentially a site-built truss, saving material and leaving space for insulation.

Box headers are made by installing structural-sheathing panels to the outside face or to the inside and outside faces of the framing between the top plate and a flat 2x at the head of a rough opening. The sheathing and framing combine to act as a truss. Because they are built with a minimal amount of lumber, there is more space to fill with insulation. Box headers can be used only in walls supporting just a roof and a ceiling, and in walls supporting a roof, a ceiling, and one center-bearing floor with an interior center-bearing wall. The IRC lists spans for 9-in.-tall and 15-in.-tall box headers.

Two-sided box headers have greater spans than single-sided ones. All you have to do is follow a few conditions outlined in figure R602.7.3. Begin by framing in the cripple studs between the top plate and a flat 2x at the head of the rough opening, and support the flat 2x with the same number of jack studs the code requires for a conventional header of that length. Make sure the structural sheathing and top plate continue through the opening without any joints. Follow the fastening schedule: 8d common nails spaced every 3 in. and driven into the plates and the cripples. The sheathing must be a nominal ½ in. thick, and its strength axis must run parallel with the wall length. (The strength axis of most structural sheathing aligns with the sheets' long edges.) In many cases, the exterior wall sheathing alone can be used to create a one-sided box header. For instance, in a 28-ft.-deep house with two stories and a center-bearing wall, a one-sided 9-in.-tall box header can span up to 3 ft.

Two-sided box headers give greater spans, but the interior structural panel is applied to the face of the studs, requiring you to pad out all the studs to match the plane before installing drywall. Alternatively, if you're framing walls from 2x6s, you can rip ½ in. off the plate, the tops of the king studs, and the head board. This isn't allowed with a 2x4 wall.

If you're already framing with ½-in. structural sheathing, then one-sided box headers are easy to incorporate. Just keep joints in the sheathing and top plate from falling above the opening, and nail the perimeter of the header properly. If the house is being sheathed with 7/16-in. OSB, you can install pieces of ½-in. panels just for box headers. The slight difference in thickness won't cause any problems.

1¾-in. LVL stock or 2½-in. rigid foam between 2x stock. Because nails aren't long enough to penetrate both plies and the foam, I use 5-in. or 5½-in. Fasten Master FlatLok or HeadLok screws, or 5-in. Simpson Strong-Tie SDWS screws.

The low-profile heads on these screws sit flush with the surfaces of the lumber, so they don't interfere with sheathing or drywall. I space the screws roughly 16 in. apart about 2 in. down from the edges of the header.

I rarely frame walls with 2x4s, but when I do, I use ½-in. rigid foam between the plies of built-up headers rather than OSB or plywood. Even though the R-value of the foam is small, it breaks the thermal bridge somewhat.