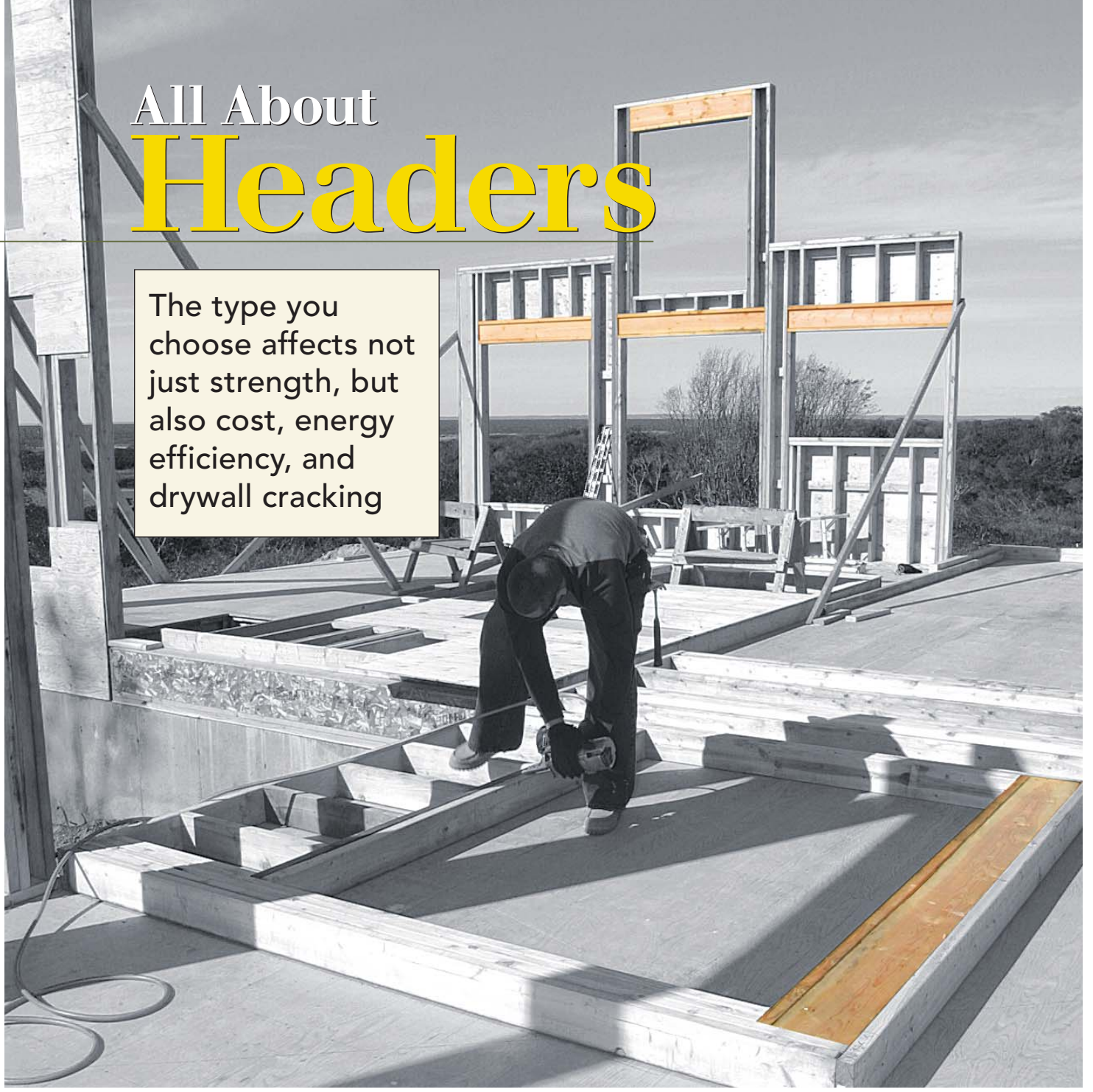
All About Headers

The type you choose affects not just strength, but also cost, energy efficiency, and drywall cracking



BY CLAYTON DEKORNE

Like many carpenters in the Northeast, I was taught to frame window and door headers by creating a plywood-and-lumber sandwich, held together with generous globs of construction adhesive and the tight rows of nails that only a nail gun could deliver. Years later, I learned my energetic efforts to build a better header were an exceptional waste of time and resources. Neither the plywood nor the adhesive contributed much strength, only thickness, and this perfect thickness helped only to conduct heat out of the walls during the severe winters common to the region.

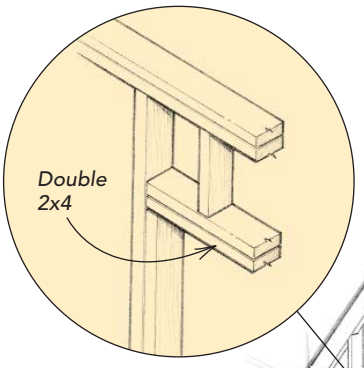
At the same time I was laying up lumber sandwiches, young production framers on the West Coast were framing headers efficiently using single-piece 4x12s. They needed only to be chopped to length and filled the wall space above openings, eliminating the need for maddeningly short cripple studs between the top of the header and the wall plate. Nowadays, however, such massive materials are relatively scarce and remarkably expensive, even on the West Coast. So although solid-stock headers certainly save labor, they no longer provide an economical alternative.

With these experiences in mind, I set out to discover some practical alternatives, surveying a number of expert framers in different regions of the country. Header framing varies widely from builder to builder and from region to region. Even when factors such as wall

Photo: Roe A. Osborn

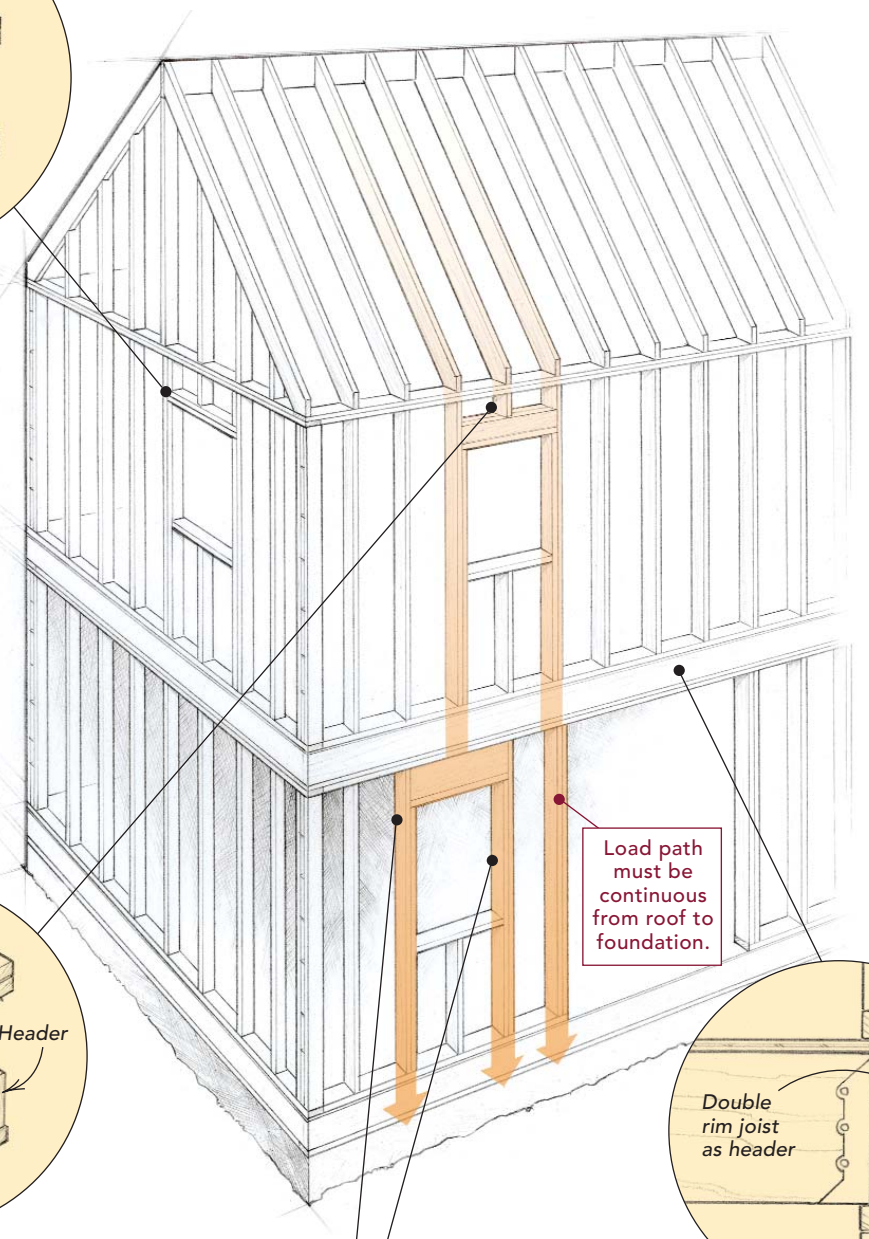
LIKE A BRIDGE OVER A RAVINE, A HEADER SPANS A WINDOW OR DOOR

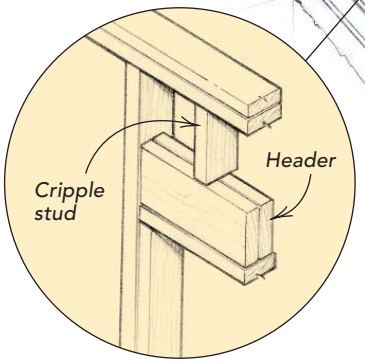
Headers are short beams that typically carry roof and floor loads to the sides of openings for doors or windows. Jack studs take over from there, carrying the load to the framing below and eventually to the foundation. That's called the load path, and it must be continuous. The International Residential Code (IRC, the most common code nationwide) has a lot to say about headers, including the tables you need to determine the size header required for most situations. If it's not in the IRC, you need an engineer.



Where you don't need a structural header

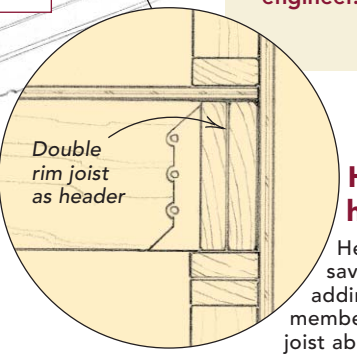
In a gable-end wall that doesn't support a load-bearing ridge, or in an interior nonbearing partition, headers up to 8 ft. in length can be built with the same material as the wall studs. Inside, a single 2x is often sufficient, although a double 2x is helpful for securing wide trim. In a gable-end wall, however, a double 2x is needed to help resist the bending loads exerted by the wind.





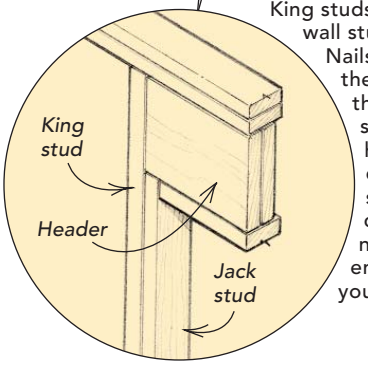
Cripple studs fill the void

If the header doesn't fill the space all the way to the top plate, cripple studs are used to carry the load from the rafters, joists, or trusses above to the header below. For nonbearing headers, the IRC requires no cripples if the distance to the top plate is less than 24 in.



Hidden header

Here's a wood-saving trick. By simply adding an additional member to it, the rim joist above an opening can serve as a header. Two caveats: You'll need to use joist hangers to transfer the load to the header. And if a standard header of this size requires double jack studs, so does a double rim joist.



Kings high, jacks low

King studs are the same height as the wall studs, running plate to plate. Nails driven through them into the header's end grain stabilize the header. Jack studs are shorter and fit below the header to carry loads downward. Because longer-spanning headers usually carry greater loads, you may need an extra jack under both ends of big headers. Check your building code.

Drawings: Dan Thornton

thickness and load conditions are made equal, building traditions and individual preferences make for a wide range of header configurations. The examples shown here are just a few of the options possible when you mix and match features, notch cripple studs, and sift in engineered materials. But they aptly demonstrate a number of practical considerations that must be kept in mind when framing a good header.

Big headers need more studs

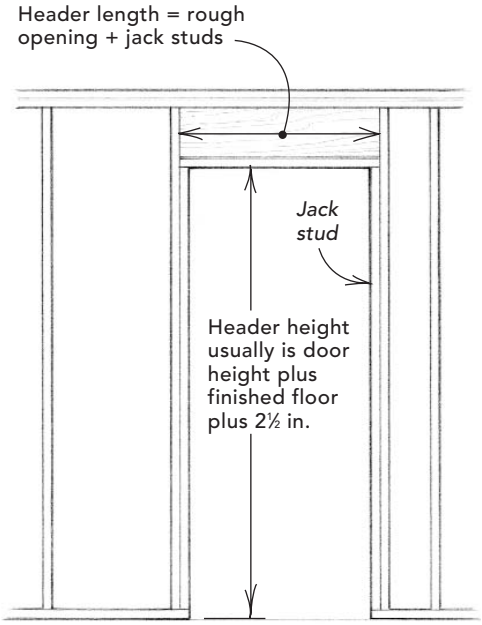
A header transfers loads from the roof and floors above to the foundation below by way of jack studs (drawing p. 63). This means the header not only must be deep enough (depth refers to the height of a beam: 2x10s are deeper than 2x6s) for a given span to resist bending under load, but also must be supported by jack studs on each end that are part of a load path that continues to the foundation.

The International Residential Code (IRC) specifies not only header size but also the number of jack studs for most common situations. While most windows and doors require just one jack stud at each end, long spans or extreme loads may call for two or more jack studs to increase the area bearing the load. If the loads on any header are concentrated over too small an area, the wood fibers at the ends of the header can be

Installation guidelines

Typically, header height is established by the door height, and window headers are set at this same height. In homes having 8-ft. ceilings, a header composed of 2x12s or of 2x10s with a flat 2x4 or 2x6 nailer on the bottom accommodates standard 6-ft. 8-in. doors, as shown in the drawing below.

In a custom home with cathedral ceilings and tall walls, however, header heights can vary widely. And if the doors are a nonstandard height, you'll need to figure out the header height. Finding the height of the bottom of the headers above the subfloor is a matter of adding up the door height, the thickness of the finished-floor materials, and 2½ in. (to allow space for the head jamb and airspace below the door). There are exceptions. Pocket doors typically require a rough opening at least 2 in. higher than a standard door. Windows may include arches or transoms, which affect the rough opening's height.



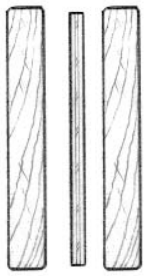
To find the header length for windows, add 3 in. to the manufacturer's rough-opening dimension if there is to be one jack stud on each side, or 6 in. if two jacks are called for. For doors with single jack studs, add 5½ in. to the door width to allow for jack studs, door jambs, and shim space. If double jacks are needed, then the header should be 8½ in. longer than the door width.

These guidelines follow one fundamental rule of framing rough openings: Know your windows and doors. If you don't have the window or door on site, at the very least check the manufacturer's catalog to verify the rough-opening dimensions. Don't rely on the plans alone, and when in doubt, call the manufacturer.

HEADERS SAWN LUMBER:

Built-up plywood and lumber

In this header sandwich, plywood adds only thickness so that the header will fit flush to each face of the wall. There is little strength added, even if the header is spiked together with construction adhesive between each layer. Construction adhesive adds nothing to the strength of a beam.



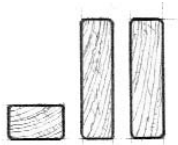
Before assembling this (or any other header), crown the lumber, marking it clearly with a lumber crayon, and keep the crown up. Rip plywood ½ in. narrower than the lumber to prevent the pieces from hanging over the edges, especially if the lumber has a crown.

Solid-stock header

Once standard fare for West Coast production framers, a solid header made with a single 4x12 tucks tight under the top plates in a wall, eliminating the need for short cripple studs. Although this option saves substantial labor, the availability of full-dimension lumber is limited mainly to the West Coast. Even there, solid-stock headers are expensive and may not be cost-effective unless the opening requires the load-bearing capacity of such large-dimension stock.

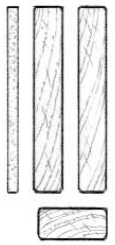
Double 2x6 header

Fine Homebuilding contributing editor Mike Guertin, whose day job is building houses in Rhode Island, uses the smallest allowable header depth to span the opening. While he must toenail cripples above each header, he argues that this header is the most economical. For starters, it conserves lumber. It also reduces the area of solid material in the wall, thus reducing thermal bridging. While the area is kept to a minimum, Guertin is also careful to keep the header to the outside of the wall, providing a gap that may be insulated with foam or wet-spray cellulose when the rest of the wall is insulated. A 2x3 nailed to the lower edge of the header provides attachment for trim.



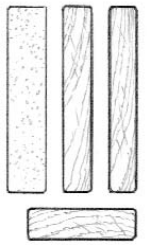
Double 2x10 header

A common header variant is used by North Carolina builder John Carroll. Built from double 2x10s, a stud-width nailer flat-framed along the bottom edge eases attaching sheathing or trim. Because this header is less than the full thickness of the wall, it allows for a piece of ½-in. foam to add a bit of insulation.



Insulated header

Custom-builder David Crosby of Santa Fe prefabs insulated headers from 2x10s and 2-in. extruded polystyrene foam. This option works particularly well in the cold mountains of northern New Mexico, where air temperatures can fall well below zero on winter nights. Even adding some ½-in foam to a double 2x header in a 2x4 wall improves thermal performance. While lumber in New Mexico is typically quite dry, due to the arid climate, Crosby ties the header to the jack stud with metal framing plates to control header shrinkage that could open gaps in the trim.



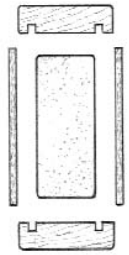
More nails aren't better

While most carpenters tend to think that more nails are a sign of good workmanship, headers need to be nailed with only one 10d common nail every 16 in. along each edge.

HEADERS
ENGINEERED WOOD: COSTS MORE, DOES MORE

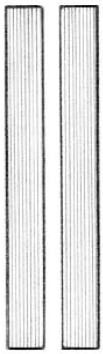
Store-bought insulated headers

Essentially a double-webbed I-joist with a chunk of rigid foam wedged in the middle, these engineered SW-II headers from Superior Wood Systems (www.swi-joist.com; 800-375-9992) offer insulation, strength, and light weight. You may have a hard time finding them locally, though, because they're new enough that distribution varies regionally. Price varies as well, depending on freight costs and markup. Hammond Lumber in Bangor, Maine, sells 14-ft. long, 5½-in. by 11¼-in. SW-II headers for about $90.



Laminated-veneer lumber

Engineered lumber, shown in this header made from two pieces of 1¾-in. by 16-in. LVL (laminated-veneer lumber), offers some advantages over sawn lumber. While it's more expensive for smaller headers, engineered lumber is available in depths that can span distances sawn lumber simply isn't up to. And it's typically more stable, resulting in fewer drywall cracks.

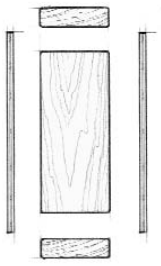


Parallel-strand lumber

Parallel-strand lumber, such as TrusJoist MacMillan's Parallam (www.trusjoist.com), is available as stud-width stock. Performing much like the LVL above it, parallel-strand header stock is pricier than solid sawn lumber but 1½ times as stiff and 3 times as strong. For more on engineered lumber, see *FHB* #150, pp. 56-61.

Structural box beam

A box-beam header is a viable way to site-build long-span headers. A technical bulletin, *Nailed Structural-Use Panel and Lumber Beams* (available online from the APA Engineered Wood Association at www.apawood.org/pdfs/managed/Z416-S.pdf), outlines the design and fabrication of these stud and plywood beams. Because they end up being thicker than the studs, these plywood beams are better suited for long-span headers in an unfinished garage, where the exact thickness is a slight concern. For a 2x6 wall, though, you can make a box beam using 2x4 blocking and nominal ¾-in. structural plywood. A ½-in. furring strip brings such headers to the full wall thickness. And they can be stuffed with insulation.



crushed. This can cause the header to drop, which in turn can crack drywall or, particularly with patio doors and casement windows, cause the door or window to jam.

Header hangers, such as the Simpson HH Series (www.strongtie.com; photo below), can be used to eliminate jack studs altogether. I've used them in some remodeling situations when I needed to squeeze a patio door or a wide window into an existing wall that didn't have quite enough space for double jack studs. One jack and a Simpson HH Series hanger did the trick.

How big a header do you need?

Unless you're an engineer, the easiest way to size headers built with dimensional lumber is to check span charts, such as those in the IRC. The old rule of thumb is that headers made of double 2x stock can span safely in feet half their depth in inches. So by this rule, a double 2x12 can span 6 ft.

However, header spans vary not only with size, but also with lumber grade and species, with the width of the house, with your area's snow load, and with the number of floors to be supported. Consequently, the IRC provides 24 scenarios in which that double 2x12 header can span a range from 5 ft. 2 in. to 9 ft. 9 in. Check the code.

The trouble with cripples

Header size often is based on factors other than strength requirements. Many framers purposely oversize headers to avoid filling the space between the header and the double top plate with short studs (cripple studs, or cripples). In a nominal 8-ft.-tall wall, a typical cripple stud measures 6 in. to 7 in. Such short studs are ungainly and are prone to splitting when they are nailed in place. Yet a double 2x12 header can be tucked beneath the double top plate, filling this miserable space and creating a proper opening for common 6-ft. 8-in. doors. Alternatively, builder John Carroll relies on a double 2x10 header with a 2x6 nailed flat along the bottom edge, which provides nailing for the head trim in a 2x6 wall.

However, such deep headers are oversize and add considerable cost, not to mention waste wood. Most window and door openings are only 3 ft. or so and might only require 2x6 headers. But perhaps the biggest drawback of wide lumber is that there's more of it to shrink. Framing lumber may have a moisture content of 19%. Once the heat is turned on, lumber typically dries to a moisture content of 9% to 11%, shrinking nominal 2x10s and 2x12s as much as ¼ in. across the grain. On the other hand, 2x6s might shrink only half that.

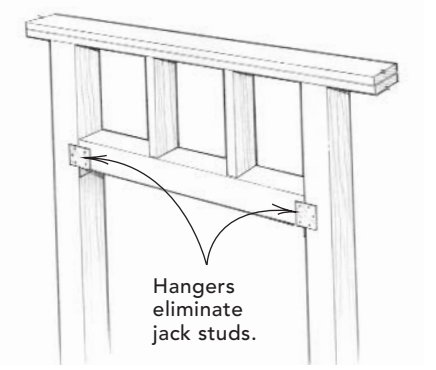
Shrinkage reduces the depth (or height) of the header; because the header is nailed firmly to the double top plate, a gap usually opens above the jack studs. As the header shrinks, it tends to pull up the head trim, which has been nailed to it, opening unsightly gaps in the casing and cracking any drywall seam spanning the header. The gap above the jack stud now means the header isn't supporting any load—until the first wet snowfall or heavy winds bring a crushing load to bear on the wall and push the gap closed, causing the top plates to sag, which can crack the drywall in the story above.

Shrinkage can be reduced using drier lumber, preferably at about 12%. However, lumber this dry may be difficult to find unless you can condition it yourself. As an alternative for spanning a large opening, consider using engineered materials (facing page). Laminated-veneer lumber (LVL) or parallel-strand lumber (PSL) shrinks much less than ordinary lumber.

If wide dimensional lumber is unavoidable, structural engineer Steve Smulski suggests that cracking can be minimized by not fastening the drywall to the header. This way, the header moves independently of the drywall, which then is less likely to crack. To prevent trim from moving as the header shrinks, attach the top piece of trim to the drywall only, using a minimal number of short, light-gauge finish nails and a bead of adhesive caulk.

Hang your header

Sometimes, particularly in remodeling, there just isn't room for a jack stud. The IRC permits header hangers, such as Simpson's HH4 for 2x4 walls and HH6 for 2x6 walls, to substitute for single jack studs. These hangers are spiked with 16d common nails to the king stud.



Avoiding condensation

In cold climates, uninsulated headers can create a thermal bridge. According to Smulski, the uninsulated header makes the wall section above windows and doors significantly colder than the rest of the wall (the same is true of solid-frame corners; see "Framing Corners," *FHB* #113, pp. 54-59). When the difference between the inside and outside air temperatures is extreme, condensation may collect on these cold surfaces, and in the worst cases, mold and mildew may begin to grow.

To avoid condensation, it's important that any uninsulated header doesn't contact both the sheathing and the drywall. Unless you're building 2x4 exterior walls using full-thickness headers such as solid lumber or ones built out to 3½ in. with plywood, avoiding this situation is simple. Keep the header flush to the outside of the framing so that it contacts the sheathing. Because most other types of headers are narrower than the studs, there will be some airspace between the header and the drywall, which makes a dandy thermal break. In cold climates, a 2x10 insulated header, like the one used by David Crosby of Santa Fe, N. M., works well (photo p. 65). Another option that avoids solid lumber is a manufactured insulated I-beam header (photo facing page). □

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Photos by Scott Phillips, except where noted.