Installing a Long-Span Header

How to open up an existing bearing wall

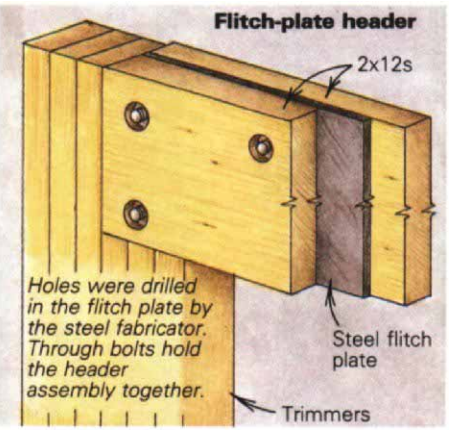
by Matt Holmstrom

One of the most dramatic ways to alter a living space is to tear out a wall or cut a large opening in it. "Open up the floor plan" and "let more light in" are catch phrases every remodeler hears frequently. But many homeowners and novice remodelers find this an intimidating prospect. The work is extremely messy and seems chaotic. And two words—"bearing wall"—keep many people from tackling it. Actually, this is a straightforward job that demands more common sense than technical skill. Whatever the circumstances, the same basic procedure is followed. Advance planning, careful observation and a step-by-step approach will eliminate that "I'm in over my head" panic.

This view is from the newly framed addition toward what had been the exterior wall of the house. My clients wanted the wall opened up in order to turn the rooms into a single space. Note the various explorations that offer clues as to what lies beneath the sheathing.

Know thine enemy—Simply put, a bearing wall is a wall that bears some of the weight of the structure above it. A wall that is not load bearing supports only its own weight and that of the finish materials on it. To remove a non-bearing wall, just demolish it. Removal of a bearing wall, however, will require some temporary structure (called shoring) to support loads while the work is going on, and will require the installation of a permanent load-bearing member (usually a header or beam supported by posts or studs) to take the place of the removed portion of wall. If you expect to have a framed opening by afternoon where there was a wall that morning, much of the work will have to be done before the reciprocating saw comes out of its case.

First, determine if the wall to be altered is in fact a bearing wall. This is usually fairly easy. Generally, a bearing wall is perpendicular to the joists and/or rafters above it. The weight supported by the joists is sitting on the wall. Another clue is to look beneath the wall (in the basement or the crawl space) for indications that the wall is transferring loads to the ground. You might find another framed wall, a beam set on piers or a foundation wall. If the suspect wall is on a second floor, you'll have to figure out what supports it and then look to see what's beneath *that* wall



Sizing the header—The next step, assuming that you are indeed dealing with a bearing wall, is to figure out approximately how much wall you'll need to remove and then size the header. The carpenter's rule of thumb used to be this: for spans 4 ft. or less, the header was made of doubled 2x4s; for up to 6 ft. of span, doubled 2x6s; and so on up to 12 ft. of span and 2x12s. Nowdays, however, the building inspectors in my area always want to see at least 2x10s in a bearing-wall header, so I use these for anything up to 10 ft. Given that the structural integrity of the house depends on correctly sizing this header, I'd recommend that you check with your local building department if you're at all in doubt. In any case, headers less than 12 ft. in length don't call for anything fancy, and you can get the materials at the local lumberyard.

When you're dealing with header spans greater than 12 ft., or if the header will be supporting unusual loads (a large bathtub, perhaps, or a slate roof), you'll need to plan extra carefully. The options for these headers include a steel flitch plate bolted between faces of 2x stock, a steel I-beam, a glue-laminated beam, or perhaps a truss. Cost, availability, delivery time, weight and the available headroom are all factors to consider. A structural engineer or an architect can help you with this decision. In fact, your local building official may require that you consult an engineer or architect before proceeding. With any of these manufactured headers, exact span measurements are crucial—you don't want to trim ½-in. steel plate at the job site if you don't have to. Also, you'll have to allow additional lead time to obtain the header.

Checking the wall—The last part of your preliminary work is to check the wall for mechanical systems and to coordinate with the proper subs if necessary. Wiring, plumbing, and heat ducts may be in the wall and, with a few exceptions, will have to be eliminated or rerouted before the header can be installed. Once you start removing structural members, you can't dilly-dally around waiting for the electrician to show up. If you have the luxury of working in an unoccupied house, you can strip off the wall surfaces now and find out what you're dealing with. Otherwise, some detective work will be necessary.

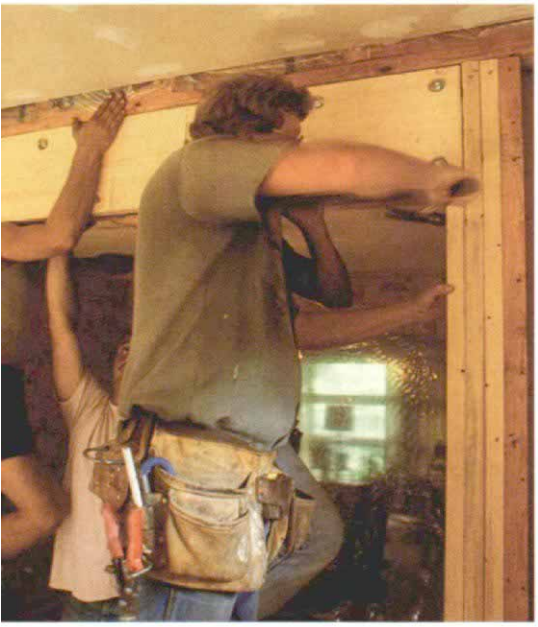
Water pipes and heating ducts are pretty easy to track. If there is much plumbing in the wall, you've picked the wrong wall to tear out—it gets to be quite a job. As for wiring, wall outlets in the work zone are not always a problem. If wires come up through the sole plate, outlets can be left alone until the struc-

Drawing: Michael Mandarano

tural work is completed. But any wire that comes down through the top plate will have to go right away; that usually means switches will have to be relocated.

A case study—Once all the preliminary work is done, you're ready to proceed with wall removal. By now you know approximately what size opening you are going to cut in the bearing wall; the header materials are on hand; and you have dealt with, or are prepared to deal with, any mechanicals in the wall. Things go quickly now. In one or two working days, depending on the complexity of the job, you'll have a new opening ready to finish. I recently opened up a bearing wall and replaced a good portion of it with a header. Here's how it worked out.

With the header in place, trimmers were quickly positioned and nailed to the king studs. Then the header was toenailed to the framing.



We were called in to build an addition to a brick-veneer ranch house. To make the month-long project easier on our clients, we removed a portion of the brick veneer, built the addition, then removed the load-bearing wall between old and new (photo previous page). That way, the exterior wall was never opened to the outdoors. Because the house had a hip roof, all exterior walls were bearing walls. In addition to supporting the old roof rafters and ceiling joists, the wall we removed would have to support the new ceiling joists of the addition.

In order to open the dining room to the new addition, we would have to replace most of the bearing wall with a 15-ft. header and appropriate support framing. One end of the header would rest on new studs added to what remained of the original wall; the other end would sit in a framed pocket formed by the junction of the old wall and the addition wall. One framing concession to our later tie-in had been building the floor of the addition slightly off level to match the existing floor; we didn't want to draw attention to the juncture of old and new.

For the header I opted for a ½-in. steel flitch plate bolted between a pair 2x12s (drawing previous page). The plate cost about $150, and our local steel fabricator had it ready on just a few days' notice. Because the finished opening would be approximately 15 ft. wide, I ordered the plate 15-ft. 9 in. long. That would allow 4½ in. of support under each end, which is what our building inspector asked for. The 11-in. width of the plate would allow us to fit it completely within the depth of the 2x12s.

Temporary 2x shoring in the foreground of the photo below was placed to support the ceiling loads before the structural portions of the bearing wall just behind it could be removed. Lifting the flitch-plate header into place called for plenty of manpower and some well-choreographed moves. The left end of the header fits into a framed pocket in an existing wall, while the right end will be supported on new 2x framing.

The wall contained a few switches, an outlet, an exterior light fixture and two hot-air supply ducts in the portion we planned to remove. The electrician eliminated all these wiring circuits when he roughed in the wiring for the addition. If you plan to leave any wiring in a wall during demolition, however, find the panel box and shut off all circuits to the area before beginning demolition. As for the hot-air ducts, we decided to disassemble them once the wall was stripped; the HVAC guy would later reroute them to supply the new addition.

Stripping the wall—It's incredible how much mess and debris even a small demolition job creates. I try to isolate the work area from the rest of the house and minimize the mess as best I can. Masking tape held 6-mil plastic sheeting over every opening that led to the rest of the house. If there are appliances or large pieces of furniture that can't be moved from the work area, I cover them with plastic sheets or drop cloths. I tape red rosin paper over nearby finished floor surfaces because plastic sheets are just too slippery—they're not tough enough, either. Besides, the paper is cheap and fairly tough, and the 3-ft. wide rolls are easy to handle. To absorb direct hits from dropped tools and falling debris, I lay a sheet of plywood over any finished floor adjoining the wall. Now's the time to remove all trim, doors, hardware or anything else that you want to save. Make sure you store them in another location, too. Once you start tearing into the wall, a certain inertia of demolition takes over and anything can just disappear in the debris.

This house had fiberboard sheathing on the exterior side of the wall to be removed and plaster over rock lath on the interior. I drew a rough layout of the opening directly on the plaster, allowing more than enough length for the header and a few studs ganged on each end; this determined where to cut the plaster. After removing trim and the existing window and door, we tackled the work. We stripped the plaster right up to the ceiling along the entire length of the header, so we had a good view of the doubled top plate our header would be supporting. After cutting plaster, we always clean up the mess to avoid grinding plaster dust into the finish flooring (oak in this case); protective paper can't always contend with the fine, gritty powder left by this kind of demolition (that goes for drywall demolition, too). A shop vac is almost a necessity here.

Building the header—With the wall framing exposed (but not yet cut), the new header, king studs and trimmer studs can all be laid out, and the header can be built. A header of this length (15-ft. 9 in.) and weight needs three trimmer studs on each end for support. Normally, if the exact position of the new wall opening is not critical, I try to use an existing stud as one king stud for the new header, and I begin my final layout off this.

Here, the kitchen-window stud was my starting point. This was 6⅞ in. back from the drywall face of our perpendicular addition wall. I sistered a new stud against this old one, shimming between them to get it plumb. This would be the king stud for the new header. The remaining 5⅜ in. between this stud and the intersecting wall face could be filled nicely with three trimmer studs (4½ in.), a ⅜-in. filler of plywood or drywall and ½-in. drywall. The result would be a nice outside corner where the walls intersect. Then I toenailed the opposing king stud into place 189 in. away from the first king stud. I left the bottom plate in place for now.

The toughest part of this project turned out to be moving the steel flitch plate. It weighed 295 lb., and it took two men one-half hour to slide the plate off the truck racks and maneuver it onto sawhorses without damaging fingers or backs. Assembling the header was comparatively easy. I had hand-picked two straight 16-ft. 2x12s at the lumberyard. You want as little crown as possible in any header, but here even ⅛ in. of crown would have been difficult to deal with when it came to fitting the header into position. Any problems in fitting such a long, heavy header could mean more than wasted time—it could result in personal injury.

The flitch plate had been predrilled by the steel fabricator, so assembly was simply a matter of marking the hole alignment on the 2x stock, drilling and countersinking the holes, and securing the whole affair with ⅜-in. by 3½-in. bolts, nuts and washers. We lugged the completed header into the addition and set it at the base of the stripped wall. The only way two men could move this monster was by sliding it along "leapfrogged" sawhorses up to the door, and then sliding it along the addition subfloor. Before we could begin to remove the last of the old wall, however, we had to shore up the ceiling to support ceiling and roof loads.

Setting the shoring—There are two ways I know of to build shoring, and I used both on this job. One method calls for building a 2x6 stud wall to support loads; we did this in the addition (top photo, facing page). Line up the studs under every second joist you have to support (every 32 in. o. c. in this case). The second shoring method calls for a beam (two sistered 2x6s) and two or three posts to support it against the ceiling loads; we did this in the dining room. The first method takes longer to build, but is probably more stable than the second. It spreads the load better, too. I use the second method under an uneven plaster ceiling—it minimizes ceiling damage, and I don't have to spend time locating ceiling joists in the plaster. To be effective, the shoring must be snug against the ceiling, but not so snug that it causes damage.

I usually use 2x6s for shoring walls. They're a little more rigid than 2x4s, and less likely to split when you bang them into place. The shoring should be set about 2 ft. from the bearing wall so that there's plenty of room to maneuver a stepladder between shoring and wall.

After the shoring was in, we completed the demolition by cutting away the rest of the wall studs. The easiest way is to cut each stud in half with a reciprocating saw and remove it, then cut the nails protruding from the top and bottom plates. Use bi-metal blades in your reciprocating saw (I buy ones labeled: "For nail-embedded wood"); they cost more but last much longer for this kind of work. If you bend a blade (and you will), simply straighten it with pliers and get back to work.

Installing the header—You'll often be working in a small, cluttered area, so choreograph the installation: who will be where, which end of the header will go in first. I used a disc sander to bevel slightly one end of the header along its width. This made it considerably easier to slide the header between the king studs. After recruiting help in the form of two carpenter friends who were working nearby, I leaned the precut trimmer studs against the wall near each end of the opening. The rest happened fast: the four of us (with a bit of help from a friend) lifted the header up and slipped one end in first, while a man on each end knocked the first trimmers in place and quickly tacked them to the king stud (bottom photo facing page). Then the header was driven the rest of the way in with a 3-lb. hammer and a scrap block, and an additional two trimmers were nailed off on each end, with two more studs behind the king stud. After toenailing the header into the top plate, we cut out the bottom plate flush with each end trimmer and pulled up for a rest. Our opening was framed and would be ready to finish once the shoring came down. □

Matt Holmstrom is a remodeling contractor who prefers to work on older homes. Photos by Bill Hoy.

The effect of removing a wall is dramatic. In this case, the original front door was directly in front of this basement door.