Framing Roofs WITH STEEL

Simple connection details make framing gable roofs with steel as easy as working with wood

by Jon Henderlong

My family business, Generation Homes, has been building steel-framed houses in northwestern Indiana for about five years. Most of the 25 houses we build annually are small- to mid-sized duplexes, starter homes, or mid-sized homes, priced in the $130,000 to $240,000 range, and we've found steel framing to be a good fit with this competitive market. In an earlier article ("Floor Framing with Steel," 8/00), I discussed the approach my company takes to framing floors with steel. In this article, I'll look at some of the details we use for framing roofs with steel.

Stick Framing vs. Trusses

Some builders who frame with steel prefer to use wood trusses for roofing (see "Making the Switch to Steel," 6/00). Steel trusses are another option, but we've passed up both in favor of stick framing with conventional steel track and C-section material. Given the relatively simple roof forms we ordinarily use — most of our houses have simple gable roofs, with an occasional hip roof — this is the cheapest way to go, and it simplifies scheduling because we don't have to coordinate our construction schedule with truss deliveries or crane availability.

Light but tough. The uniformity of steel is nice for walls, but it's especially evident in roof framing. Steel rafters are absolutely straight, so there's no need to inspect each one for crown before cutting. They're also lighter and easier to handle than wood. Yet the 16- and 18-gauge material that we use for joist and rafter stock is surprisingly rugged. We once had a set of steel rafters blown flat by a windstorm (the crew hadn't had time to brace them as the storm moved in), and although the attached ceiling joists were bent, none of the rafters were damaged. We were able to unscrew them from the joists and continue to use them. Wood rafters subjected to the same treatment would have been splintered beyond repair.

Framing the Ridge

The basic reference for anyone interested in framing with steel is the

Prescriptive Method (NAHB Research Center, 301/249-4000), which consists of a series of pre-engineered span tables, fastening schedules, construction details, and related information for use by builders, architects, and code officials. In short, it is the light-gauge steel industry's version of the span tables and standardized practices that the wood industry developed decades ago, and it provides a complete system for residential construction with light-gauge steel framing. In some areas, though, we've found that the methods dictated by the *Prescriptive Method* are unnecessarily complex and time-consuming. One example of this is at the ridge assembly of a gable roof.

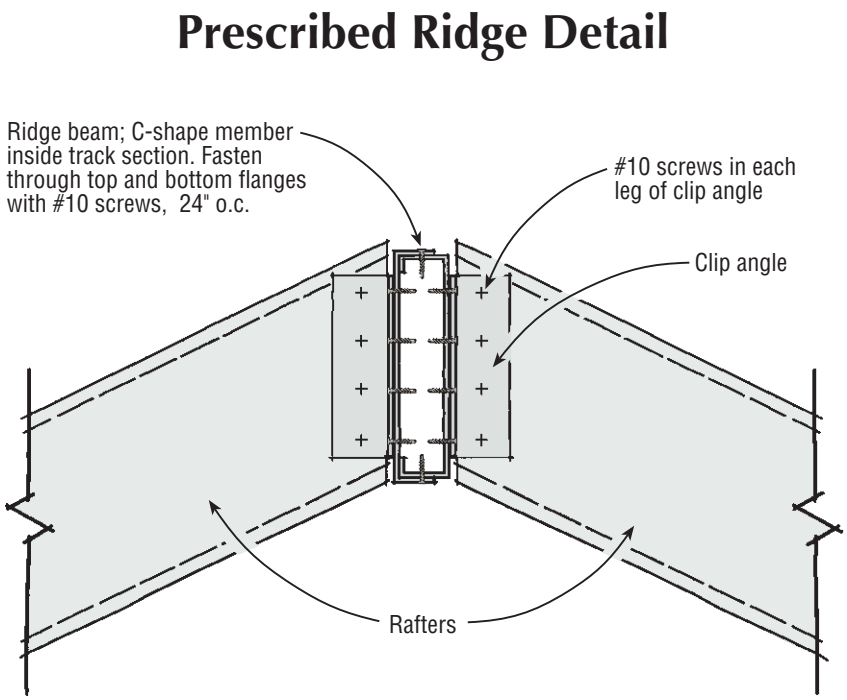

Figure 1. The gable ridge connection specified by the *Prescriptive Method* can be built without an engineer's stamp, but it's both time and material intensive.

Figure 2. In this simplified ridge detail, the flange of one rafter is notched and the two are lapped together and fastened with six #10 self-tapping hex-head screws. For maximum strength, the notched portion of the rafter should be as short as possible. This approach requires an engineer's approval.

Beyond the Prescriptive Method. The *Prescriptive Method* detail calls for a ridge member consisting of a nested C-section and track, with the rafters cut to the required angle and fastened to the ridge with clip angles (see Figure 1).

Our ridge detail eliminates both the ridge member and the clip angles. Instead, we simply cut a section of flange from the end of one rafter and overlap and screw the rafters together to form what is essentially a gusset (Figure 2). A C-shaped stud, typically 5 1/2 inches wide by 8 feet long, is screwed to both rafters as a collar tie.

Pre-approved details. Because this ridge detail is a departure from the *Prescriptive Method,* it must be approved by an engineer before use. We've dealt with this by putting this and all of our other nonstandard details in a spiral-bound book, which we've had stamped by our engineer. As long as we don't exceed the design criteria set by the engineer, we can use these alternatives as often as we like. This approach satisfies the building inspector — we've provided him with his own copy of the book — and eliminates the need for separate stamps on each set of plans.

Gable-End Walls and Eaves

There are several ways to frame gable-end walls, but our approach is to cut a section of flange from the upper end of each gable-end stud with a circular saw equipped with an abrasive blade. A short right-angle cut forms an attachment flange that's bent outward with a pair of duckbill locking pliers. The bottom of the stud is screwed to a track section on top of the wall below, and the upper end is screwed to the end rafter (Figure 3).

Limitations of all-steel eaves. In a conventionally steel-framed roof, the rafters extend all the way to the eaves, and a track member is screwed to the outboard ends to serve as a subfascia. We've found this to be ineffective for several reasons.

First, it results in a fascia that's perpendicular to the plane of the roof. The detail common to our area, and the one

Figure 3. Gable-end studs are notched and bent to form attachment flanges before being screwed to the end rafters (left). Note the green layout line on the stud, drawn with a permanent marker before the flange is formed with duckbill locking pliers (right).

we prefer, uses a vertical fascia and a horizontal soffit. To do that with steel, you need to have a subfascia custom-made on a roll former or use one made from a cut-down track section attached with clip angles. And, no matter how it's put together, an all-steel eaves detail makes life difficult for the siding contractor, since the aluminum fascia and vinyl soffit can only be fastened to the steel framing with screws.

Steel frame, wood eaves. To avoid those problems, we've devised a way to use wood members for the rafter eaves and subfascia. We stop the steel rafter flush with the exterior wall framing and fasten short lengths of 2x4 to them with an air nailer (Figure 4). After making a plumb cut at the end of each rafter tail, we nail a wood subfascia in place.

We also use a wood subfascia at the rake, by extending the OSB roof sheathing a foot or so beyond the outside wall and air nailing a 2x6 subfascia to the sheathing. The siding sub then installs the finish fascia and soffit the usual way, with light-gauge trim nails.

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Figure 4. To simplify installation of the soffit and fascia, short sections of 2x4 stock are air nailed to the rafter tails (left). The rafters are screwed to the ceiling joists, forming a rigid assembly (below).