Framing a Gable Roof Over a Bay

Letting ceiling joists cantilever beyond the walls makes this challenging roof detail stronger and easier to build

by Scott McBride

As an inveterate house watcher, I've always been curious about the roof-framing details on turn-of-the-century houses. Recently, I had a chance to examine one carpenter's techniques when the nearby Kilby farmhouse was being remodeled with an addition to match. The house was built in 1910 by a Virginia carpenter named John Mike Hawkins, who incorporated a dramatic two-story octagonal bay into each gable (top photo, facing page). These gable bays not only provide a focal point to the facade of the farmhouse but they also flood the rooms inside with daylight.

Because the bay spans the entire gable end of the house, the roof over the bay presents a unique roof-framing challenge. In order to maintain the regular gable roof without creating a hip where the bay walls angle inward, large triangular sections of soffit are left to extend out beyond the bay on each side. The roof above these soffit sections requires special attention because the rafters need to be suspended so far away from the supporting walls.

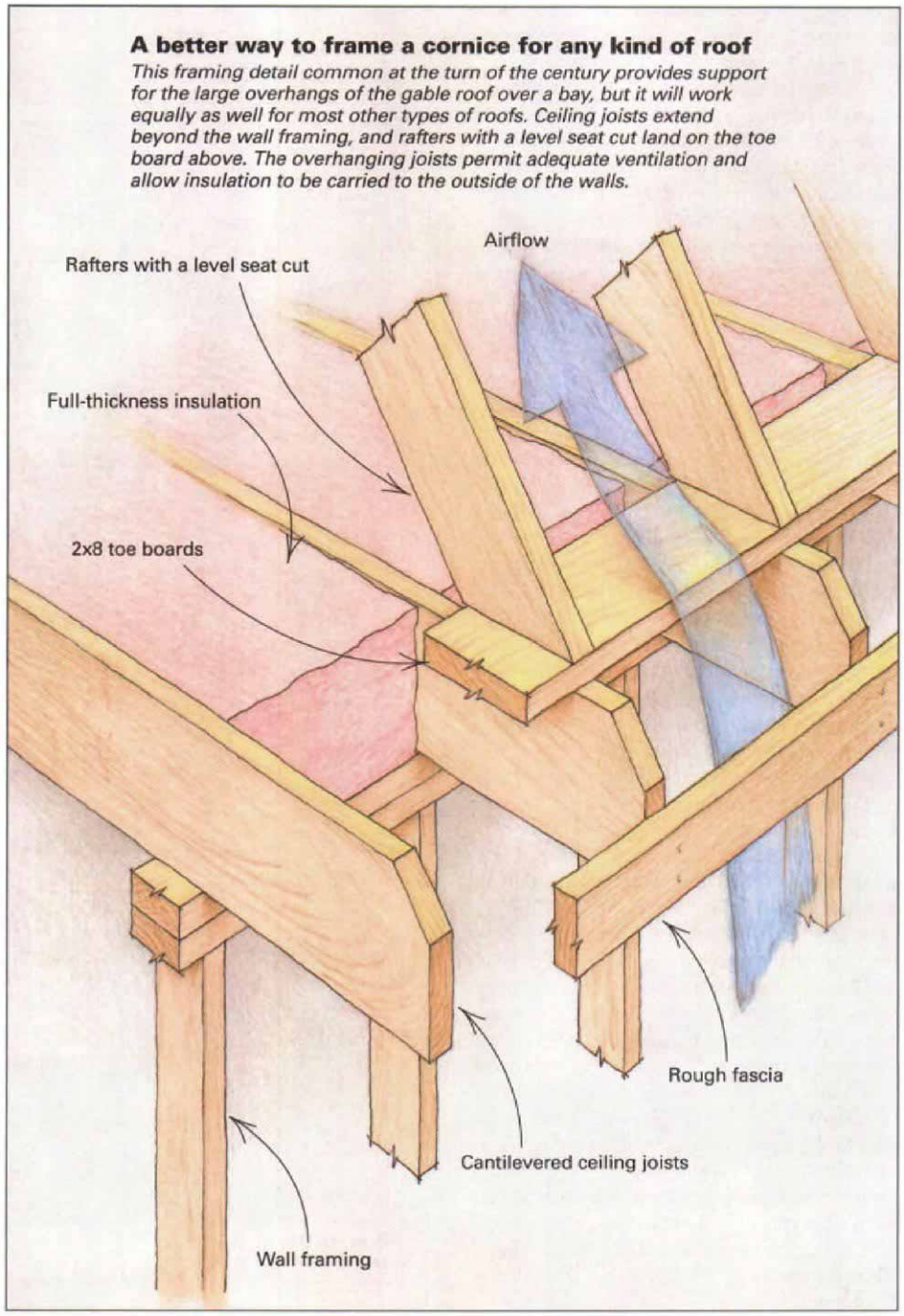
To solve this problem, John Mike installed a toe-board cornice (drawing right). This roof-framing detail was popular for many types of roofs, including the gable-over-bay. The technique emerged in the middle-Atlantic colonies in the 1600's and was used extensively into the early part of the 20th century. I'm surprised this method died out because it seems to offer some distinct advantages over the conventional bird's-mouth-on-plate system of framing a cornice.

Toe boards simplify cornice framing—In a toe-board cornice the ceiling joists overhang the outside walls of the house. The overhanging joist ends support the soffit, the fascia and the rafters. The toe board is a wide piece of framing lumber—in this case a 2x8—laid flat on the top outside ends of the ceiling joists. The toe board ties the joists together and provides a platform for the rafters to land on directly over the joists. Like the roof ridge, the toe board isn't being counted on to carry any weight; rather, it stabilizes the structure and aids in the construction process.

One of the chief advantages of the toe-board system is that no soffit lookouts are required. In conventional cornice framing, lookouts are the pieces of wood that run horizontally from the

A better way to frame a cornice for any kind of roof

This framing detail common at the turn of the century provides support for the large overhangs of the gable roof over a bay, but it will work equally as well for most other types of roofs. Ceiling joists extend beyond the wall framing, and rafters with a level seat cut land on the toe board above. The overhanging joists permit adequate ventilation and allow insulation to be carried to the outside of the walls.



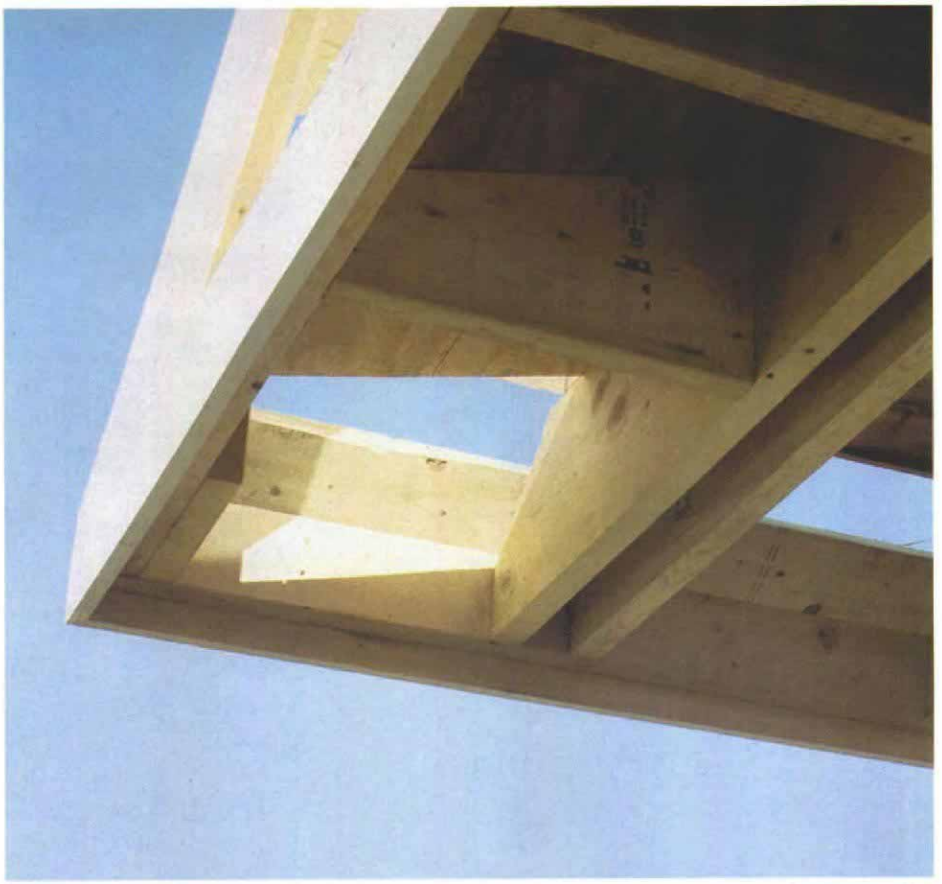
Drawing: Christopher Clapp

A dramatic facade, but a builder's challenge. The gable roofs on this turn-of-the-century farmhouse overhang the octagonal bays below, lending an impressive air to the facade. During construction of a recent addition, the builders copied the original cornice framing to support the cantilevered gable ends and rediscovered a useful technique that simplifies rafter and cornice construction while allowing full insulation over exterior walls.

Cantilevered ceiling joists extend beyond the top plates of the bay. As the walls of the bay angle inward, the overhang of the ceiling joists increases. The toe board on top of the joists ties everything together and provides solid nailing for the rafters.

A pleat in the roof connects two different pitches. The span of the gable roof over the bay was reduced to make the roof look more proportionate and less top heavy. To maintain the ridgeline, the builder created a jog in the eaves and a pleat in the roof that join the two different pitches. This pleat was framed with hip and valley rafters that run side by side from the corners of the jog and meet at the ridge (photo below).

The rafter ends get only one cut at the bottom. A single seat cut is all that is required for each rafter as it lands on the toe board above a corresponding ceiling joist.



Tapered blocking frames the pediment cornice. This attractive detail on the gable begins with tapered 2x blocks that are installed between the last ceiling joist and the rough fascia of the pediment. The blocking forms the pitched roof above the pediment cornice, and it provides sound nailing for the roof sheathing.

rafter tails back to the walls to support the soffit. They are usually tedious to install and offer bouncy nailing at best. With narrow soffits I have sometimes spanned the short distance between the fascia and the nailer on the wall without using lookouts. But wider conventional cornices do require this additional framing to support the soffit material, especially when the soffit is split by a run of continuous soffit vent. Lookouts are unnecessary with a toe-board cornice because the ceiling joists provide solid nailing for the soffit material.

The toe-board cornice has other advantages as well. Because the rafter ends land on the toe board, they require only a single level seat cut, compared with the four cuts required for a conventional rafter tail (two for the bird's mouth and two for the tail). The wide toe board is safer to walk on while raising the rafters than the narrow wall plate. The toe board also is easier to get at with a hammer when nailing the rafters.

The rafter in a toe-board cornice is raised higher above the plate, leaving more room over the wall for insulation and creating better soffit-to-ridge airflow (drawing p. 62). In that respect the toe-board cornice acts like a raised-heel truss. The toe-board technique results in a higher soffit elevation that admits more light into the second-story windows, an advantage in cold climates but a possible liability in warmer ones. The higher soffit also allows more space for a wider frieze board between the soffit and the tops of the windows (top photo, p. 63). To my eye a wide frieze board is attractive all by itself, but a wide frieze board also provides a nice backdrop for decorative corbels or brackets.

Cantilevered joists make roof framing independent of walls—Al Clarke, who remodeled the Kilby house, used John Mike's original work as a reference when he built the addition. Al began the roof framing of the addition by letting the ceiling joists overhang the second-story walls and fastening them together with the 2x8 toe boards. Each rafter landed on the toe board above its corresponding ceiling joist (bottom photo, facing page).

Where the gable roof extends over the bay, the toe boards prove particularly useful. As the walls of the bay angle inward, the wall plates that normally would carry the overhanging gable rafters get closer together. It would be difficult to frame a straight gable roof over the bay in the conventional manner. Instead, the overhang of the ceiling joists simply increases as the angled bay walls veer inward and the rafters land conveniently on top of the toe boards (bottom photo, p. 63).

John Mike created a pediment in the overhanging gable. This detail is recognized by the triangular shape formed by the rakes on the sides of the gable and the cornice fascia returning across its base. To support this overhanging pediment, the rough-fascia boards on both sides were extended past the last attic joist, and the skip sheathing on the roof was cantilevered to help support the barge rafter from above. Then tapered blocking was installed to span the gap between the rough fascia of the pediment and the last attic joist (photo left). This tapered blocking provides nailing for the soffit that's underneath, and it also forms the pitched roof above the pediment cornice.

A pleat in the roof improves proportions—John Mike Hawkins had executed the gable-over-bay detail on many houses, but something about it must have bothered him. Perhaps the large roof mass of the gable overhanging the slender column formed by the two-story bay looked somewhat precarious and gave the gable a top-heavy appearance. When he contracted to build the farmhouse for the Kilby family, Hawkins altered the design to improve its proportions.

His solution was to decrease the span of the overhanging gable slightly while maintaining the ridgeline of the main roof. This decision meant that the eaves' cornice would take a brief 45° jog around the ends of the bay (top photo, facing page). The break in the eaves combined with the continuous ridge required a subtle manipulation of the roof surface, sort of like a tailor sewing a pleat in a fine garment.

First, the ceiling joists and toe boards were stepped in to form the jog in the eaves. Then the bulk of the main roof-common rafters was set up with the end of the ridge cantilevered out over the bay. Framing the "pleat" on each side of the roof required an irregular hip and irregular valley placed side by side. (Don't worry: I'll spare you the mathematical machinations for figuring out the cheek cuts.) The bottoms of the valley and hip rafters strike the inside and outside corners of the jog in the eaves (bottom photo, facing page), and their tops converge at a point on the ridge.

Jack rafters fill in the roof surface between the valley rafter and the ridge and between the hip rafter and the eaves. The hip and valley rafters themselves are so close together that no jack rafters are required between them. The march of the common rafters resumes from the jog out to the overhanging gable end, but with one important modification. Because the span of the gable has been reduced and the height of the ridge is the same, the pitch of the common rafters above the bay is slightly steeper than the pitch of the main roof-common rafters (top photo, facing page). The final common rafter was doubled to accommodate the 2x4 framing of the gable.

John Mike's scaled-down gable produced its desired effect. Al Clarke and his crew duplicated Hawkins' original finish details on the farmhouse addition, including scrolled modillions and wagon-wheel gable louvers. In addition to being a home, the expanded Kilby house now serves as a day camp for kids. □

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