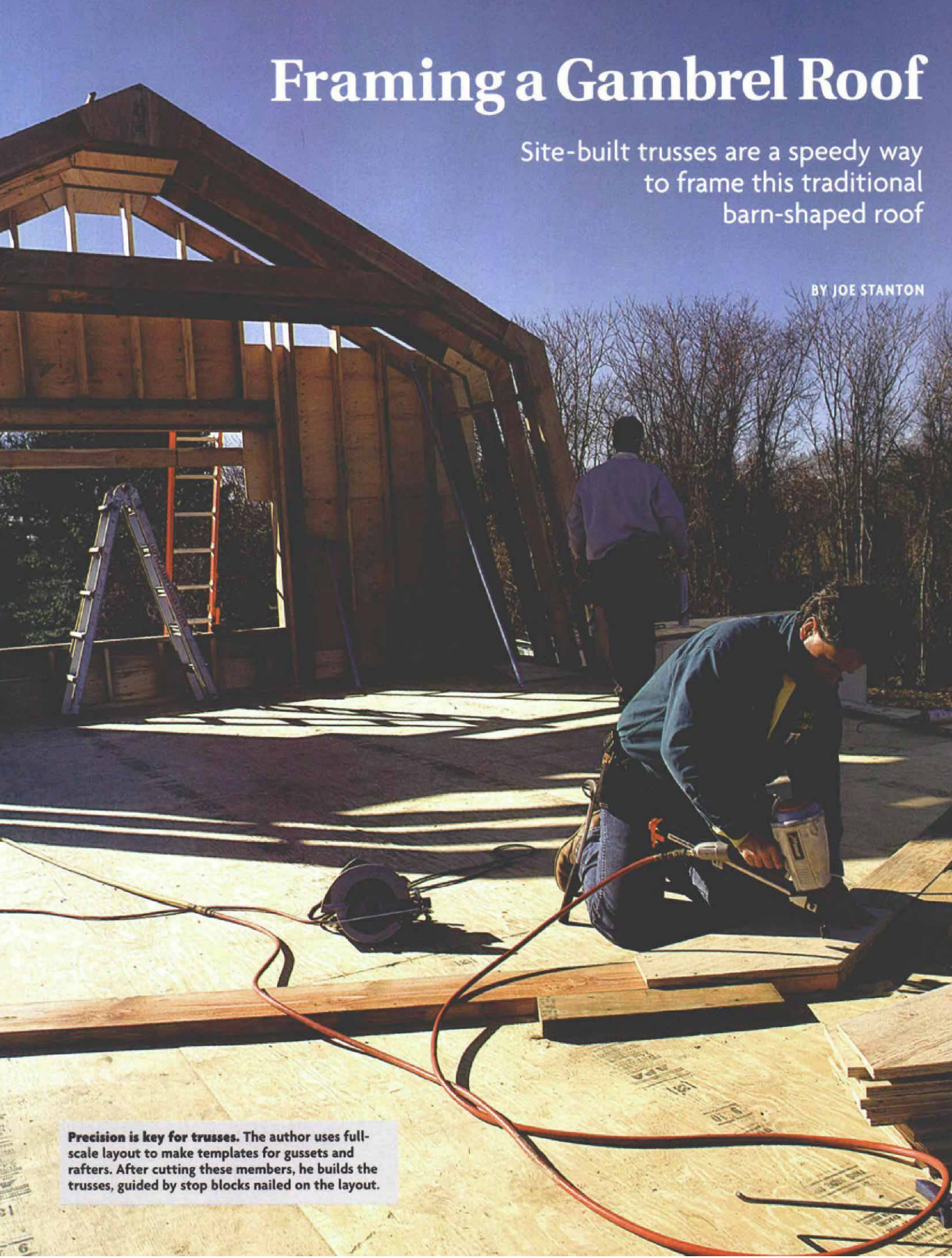
Framing a Gambrel Roof

Site-built trusses are a speedy way to frame this traditional barn-shaped roof

BY JOE STANTON



Precision is key for trusses. The author uses full-scale layout to make templates for gussets and rafters. After cutting these members, he builds the trusses, guided by stop blocks nailed on the layout.

Gambrel roofs can be a challenge (photo facing page). Dealing with two roof pitches instead of one seems to complicate matters disproportionately. Also, most gambrel roofs require a kneewall to support the knuckle, or the joint between the upper and lower roof slopes. You have to build the kneewall first, then brace it straight and work around the wall and its braces while installing two sets of rafters. The work is cumbersome, and when you're done, this kneewall takes away from the available floor space below the gambrel.

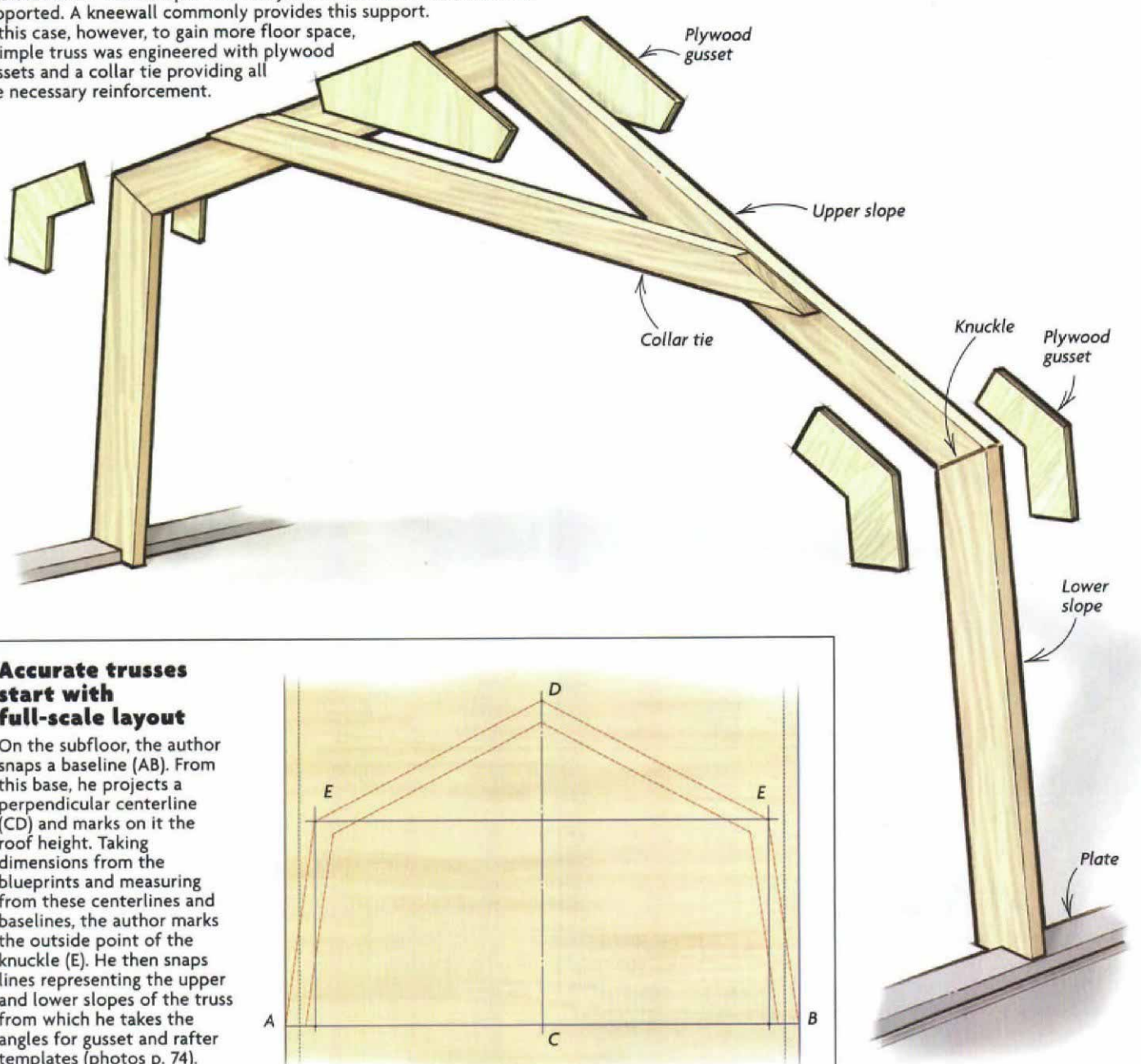
However, I recently framed a gambrel designed by Michael McKinley (sidebar p. 77) using site-built trusses (drawing below) and found that this method offers several benefits over conventional framing. Site-built gambrel trusses go together quickly and negate the need for a supporting kneewall under the knuckle. (A short kneewall, added after the roof was framed, maintained some gambrel roofline as the ceiling while providing a plumb wall for hanging pictures.) Be aware that gambrel trusses may require an architect's or structural engineer's stamp of approval.

Lay out trusses full size on the floor

With the upper floor sheathed, I snapped chalklines for the 2x6 plates on which the trusses would stand. This step is no different than if I were framing walls. Next, however, I laid out the gambrel trusses full scale on the

ANATOMY OF A GAMBREL ROOF

Unlike most roofs, gambrels have an upper and a lower slope. The intersection of these slopes means a joint in the rafters that must be supported. A kneewall commonly provides this support. In this case, however, to gain more floor space, a simple truss was engineered with plywood gussets and a collar tie providing all the necessary reinforcement.



Accurate trusses start with full-scale layout

On the subfloor, the author snaps a baseline (AB). From this base, he projects a perpendicular centerline (CD) and marks on it the roof height. Taking dimensions from the blueprints and measuring from these centerlines and baselines, the author marks the outside point of the knuckle (E). He then snaps lines representing the upper and lower slopes of the truss from which he takes the angles for gusset and rafter templates (photos p. 74).

Drawings: Dan Thornton

FULL-SCALE LAYOUT GETS THE ANGLES RIGHT

Laying out the multiple angles of a gambrel roof using a framing square is a frustrating task. Full-scale layout on the floor ensures precision.

1. Start by taking the roof dimensions from the blueprints. Such dimensions as wall and ceiling height and room width are critical. Transfer them correctly from the plans, and the roof angles will necessarily follow.

2. Lay out the points of the peak, knuckle and truss seat on the floor. From these points, the author snaps lines representing the truss tops and bottoms.

3. Guided by the snapped lines, the author creates templates for the truss members and gussets.


1


2


3

floor, taking the dimensions directly from the architect's plans (photo above left).

To facilitate the layout, I snapped a baseline square to the sidewalls and added a centerline perpendicular to the baseline (drawing p. 73). From these lines, I measured to locate the knuckle and peak. With these points set, I snapped chalklines that represent the trusses' framing members (top photo), then measured the length and miter angles of the rafters that would be assembled into trusses.

I also used the full-scale layout to make a cardboard pattern for the ¾-in. plywood gussets that reinforce the knuckle and the peak joints (photo bottom right). The pattern is then copied onto more-durable Masonite. These gussets are 32 in. long, a size that's structurally adequate and that minimizes plywood waste.

I selected some straight stock and made a pair of pattern rafters, or templates. To double-check these templates, I placed them on the layout lines and verified the fit. Then I cut a pile of rafters. The seat cut where the rafter meets the plate is critical. To stop lateral motion, the 2x8 rafters are notched to fit the inside of the 2x6 plates (photo bottom right, facing page).

Turning the second floor into a truss factory

To make sure the assembled trusses were uniform, I nailed stop blocks next to the lay-





GAMBREL TRUSSES ARE RAISED MUCH AS REGULAR TRUSSES

1. Plumb and brace the gable truss first. Strapping made of 1x3s is used to space and brace succeeding trusses.

2. Joist hangers tie the ridge for a conventionally framed dormer to trusses. The dormer roof is simply an extension of the upper gambrel.

3. The seat-cut detail keeps trusses from spreading outward. The inner tail of the truss is cut short so that it won't touch the deck, ensuring that the roof load is borne by the 2x6 plate and not by the plywood deck.



DETAILING THE ROOF

Eave details for this cedar-shingle gambrel are added after sheathing, tar paper and sleepers.

1. Sleepers atop the deck vent the roof. These sleepers are continuous from soffit to ridge. Skip sheathing nailed to the sleepers provides nailing for the cedar shingles.

2. A flared roof overhang softens the angles of the gambrel. Curved plywood forms are sandwiched and nailed to the sleepers, tying the overhang to the roof.

3. Treated bottom skip sheathing ensures durability. Following the curve of the plywood forms, skip sheathing provides a nail base for cedar shingles.







Photos right, bottom left this page: Andy Engel

out lines and assembled the trusses on the floor. Each gusset was glued with PL 400 construction adhesive (OSI Sealants Inc.; 800-321-3578; www.osisealants.com). Additionally, each gusset was nailed to the rafters with 6d nails. After nailing the gussets to one side of each truss, my crew flipped it over and affixed additional gussets and the collar tie to the other side.

We built the gable truss first (this truss needed no collar tie or gussets on the outside because the wall sheathing made the truss rigid). With the gable truss raised and braced plumb, we began assembling and setting trusses one by one (top photo, p. 75). The remaining trusses were connected to the gable truss and to each other with 1x3 strapping at the ridge and at each knuckle. We removed the strapping after the roof had been sheathed.

This roof included several shed dormers. These dormers, which we framed conventionally, tie together the gambrel trusses on each side of the dormers with the ridge (photo bottom left, p. 75). Extending the gambrel's upper slope to the front wall of the dormer creates the dormer roof.

This roof is vented above the sheathing

To leave the maximum space for insulating between the 2x8 rafters, this roof is vented above the sheathing. Here's how.

After completing the sheathing, my crew flashed and covered the roof with #30 tar paper. Then we ran sleepers on 16-in. centers above the trusses and rafters (photo top left, facing page). This particular roof was to be covered with cedar shingles, so the skip sheathing for the shingles was nailed over the sleepers (photo right, facing page). In this way, the sleepers provided a vent channel from soffit to ridge. By quickly covering the roof sheathing with tar paper, we could conveniently manage the slow work of cedar roofing without slowing the interior work.

One thing that these trusses did not provide was a roof overhang. To provide an overhang and to soften the angles of the roof, the architect had designed a curved, flared overhang. I played with several curves, holding mock-ups in place for the approval of the owner and the architect. Once they were both happy, we built assemblies of 2x material and plywood that sandwiched around the lower sleepers (photo bottom left, facing page) and provided a form for the skip sheathing. □

Joe Stanton owns JMS Builders in Westerly, RI. Photos by Scott Gibson, except where noted.

Thoughts about gambrel-roof design

By Michael McKinley

I've designed houses with gambrel roofs for a variety of reasons. One use for a gambrel roof is blending a new house into an older neighborhood. Historic examples of gambrels are found in periods ranging from the colonial to the Arts and Crafts.

Roof-height restrictions, often imposed by local zoning, may pre-empt the use of a conventional gable roof over a second floor. The gambrel roof is the most efficient way to create a usable second-floor area when building height is limited. The geometry of a gambrel enables adjustment of the angle of the lower-roof pitch to maximize interior headroom and to flatten the upper roof's pitch to minimize the overall height of the house. Generally, the upper pitch of the roof should not be less than a 3-in-12 to maintain the shingle warranties.

The headroom below the lower roof will be low. Also, the kneewall required to support most gambrels does take away some floor space. The truss I designed for the house in this article minimizes this problem because it eliminates the need for a kneewall. But even the space behind a kneewall can be used efficiently for built-ins and closets, and also for running mechanicals.

While the endwalls of gambrel roofs offer lots of space for windows that can admit an enormous amount of natural light, you'll probably need dormers for light in the center. Dormers also provide an opportunity to create scale, rhythm and balance (photo below).

To some, the gambrel may appear too angular. As I did in the house in this article, the lower slope of the roof can be flared to form deep overhangs and to soften the angles.

Gambrel roofs are highly visible, so the roofing material assumes a special importance. Wood shingles are my material of choice, and they create a unified look when the house is sided with wood clapboards.

Finally, many homeowners are attracted to the gambrel roof because of its dramatic interior look. If ceiling lines follow the gambrel and dormer shapes, then the interior spaces can take on a sculptural quality.

—Michael McKinley is an architect in Stonington, Connecticut.



From agrarian to elegant. Gambrel roofs are used in barns to provide cheap space and to reduce rafter spans. In houses, gambrels add interest and allow a two-story home to have a relatively low roofline.

Photo this page: Andy Engel