Supporting a Cantilevered Bay

Before you build that eye-catching bay onto the side of a house, you have to get the floor framing right

BY MIKE GUERTIN

Plates before joists. Before the cantilevered-bay joists are cut and installed, the wall plates are cut and laid out. At this point, all measurements are checked, and the exact width of the bay is established.

When a client wants to add curb appeal to a new home, I dip into my Mr. Potato Head bag of tricks: a distinctive window here, a reverse gable there, fancy trim details, an entry portico or a porch—and voilà! It's enough to make an architect cringe.

One of the best-selling upgrades is an angled bump-out or bay. It adds a few square feet, creates a distinctive room inside and dresses up the home's exterior. Although I could just install a bay window for light and effect, I find the floor-to-ceiling bay more appealing as well as competitive in cost.

But a bay is only as strong as the floor that it's built on. In this article, I'm going to concentrate on the proper techniques for framing the cantilevered floor that supports a bay. For this project, the bay was 8 ft. wide and extended 2 ft. from the house. The sides of the bay were set at 45°, but they could have been set at any angle.

Cantilevered joists save foundation work

Cantilevering the bay keeps down the cost, about $400 less than an angled foundation. It's also easiest to frame one of these bays when the joists run parallel to the floor framing. In this scenario, the common joists are just lengthened to form the bay joists, eliminating the need for headers and hangers. But I wasn't so lucky on this project. The floor joists of this bay ran perpendicular to the main joists (top photo, facing page).

The cantilever wouldn't be carrying any loads but the bay itself, so I followed the two-thirds in, one-third out cantilever rule of thumb. With a 2-ft. cantilever, the bay joists would be anchored to a tripled floor

joist 4 ft. in from the outside of the house. But I waited to add the second and third joists until just before sheathing the deck. Having only one common joist allowed me to nail through it to attach the bay joists initially. The bay joists follow the 16-in. o. c. layout regardless of exactly where the bay is placed, so first I put in all the 4-ft. joists that fell on each side of the bay area.

Cut and lay out the bay plates first

Before I laid out the exact location of the bay, I cut and laid out the top and bottom plates for the bay walls (photo facing page). Although this step may seem a bit premature, I always want to be certain that the windows will fit and that I'll still have room inside and out for the trim. The plates also help me to figure the length and cut for each joist.

A little basic math and a calculator gave me the plate lengths. With the bay cantilevering 2 ft. and the walls at 45°, I needed to come in 2 ft. from each side for the bay's front plate. With 22½° angles on each end (half of 45°), I cut the plate for the bay's front wall at 4 ft. from long point to long point.

With some help from Pythagoras, I cut the side plates again with 22½° angles on each end and with the outside face measuring 33 15/16 in. long point to short point (short point because the adjoining wall plate is also cut at 22½° to form the inside corner). With the plates laid out on a flat surface, I marked the rough opening for the window centered on the 4-ft. plate.

To get the width of the trim (exterior and interior) to match on both sides of the bay's outside corners, I make sure that the distance is the same from the corners to the edge of the rough openings for all three windows. After the rough openings are marked out, I also make sure that I have enough space left (at least 1 in.) for the inside-corner trim.

Center the bay on the interior

I usually center a bay on the room inside. In this case, that threw it slightly off-center on the exterior, but the difference wouldn't be noticeable. I marked the location of the 8-ft. opening on top of and on the outside face of the sill plate. (On this house, the sill plate is actually the top plate of a framed wall for a walk-out basement.)

Next, I marked the outside corners of the bay on the sill, showing me which joists would cantilever the full distance. The house's rim joists were then run to the locations of the first cantilevered joists inside the 8-ft. layout marks rather than being mitered into the bay's rim joists. The extended rim joists are nailed square to the cantilevered

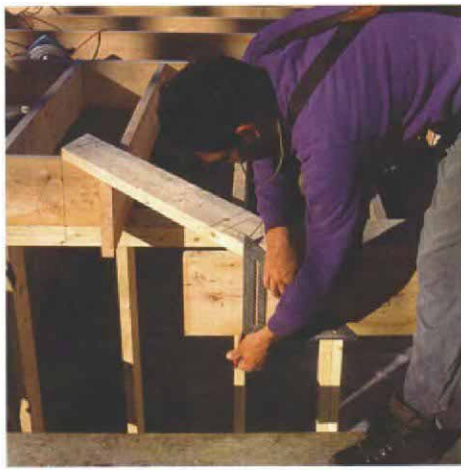
Bay joists hang off the main joist. When the bay joists run perpendicular, they are nailed to a main joist. After the cantilevered joists are attached, the main joist is tripled, and joist hangers are installed.

Setting the overhang. With a 2-ft. cantilever, the longest joists overhang **22½** in. The joists are then tacked in place.

Bay starts here. After the bay joists are tacked in place, the outside edge of the bay is carried up from the face of the sill onto the rim joist.

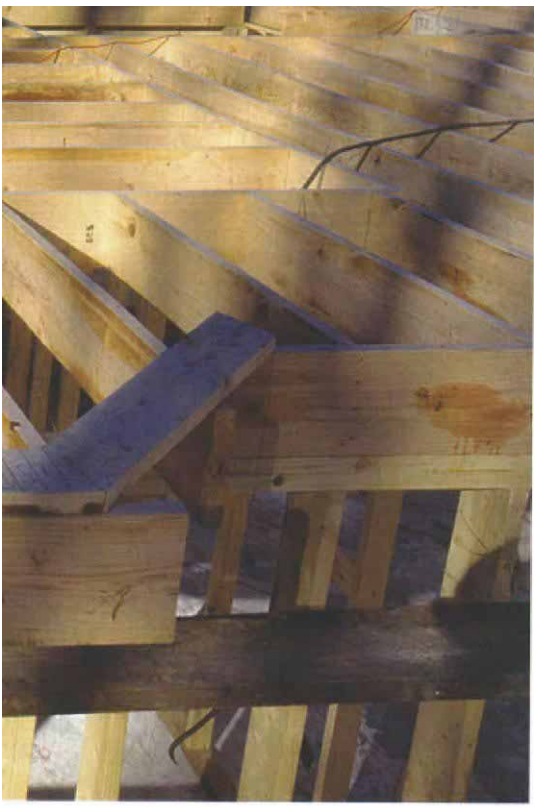
Outer rim joist is left long. Rim-joist stock is nailed to the cantilevered joists and left long until cutlines are transferred from the plates.

Precut wall plates provide the shape of the bay. The bay plates are laid on top of floor joists and rim joists that were run long and needed to be cut.



Cutlines are squared down from the plates. Lines are extended down from the corners of the plates for the rim-joist cuts, and the lengths of cantilevered side joists are marked **1½** in. from the outside edge of the plate.

Cut down where they stood. The cantilevered side joists and the outside rim joist are cut to length in place.



Interlocking joist connection. The main rim joist on the house was run to the first cantilevered joist and nailed, keeping both joists plumb and square, and providing a solid landing place for the angled rim joist.

Wait—those joist hangers are upside down! To prevent uplift, joist hangers are nailed on top of the bay joists as well as on the bottom, where they support the weight of the floor.

joists to hold them straight and plumb, and in turn, they provide a more solid place to secure and plumb the bay's rim joists where they meet the house wall.

The cantilevered bay joists were put in next. The joists that fell in the middle 4-ft. section of the bay cantilevered by 22½ in. (2 ft. less the thickness of the rim; photo center left, p. 75). These joists were tacked to the sill and nailed to the common joist. The joists that fell on the angled sidewalls were left a little long and cut to exact length later.

When all the joists were nailed in, I ran a string to straighten the main rim joist and then drew square lines up from the lines I'd made earlier on the sills, indicating the outside edges of the bay (photo center right, p. 75). The rim joist for the outer wall of the bay was then cut and nailed in, left long to be cut to exact length later (bottom photo, p. 75).

Use plates to mark the joist cuts

With the joists in place, I next set the bay's wall plates in position over the cantilevered joists and rim (top photo, facing page). At the outside corners of the plates, I squared down a cutline indicating where to miter the bay's rim joist (photo bottom left, facing page).

A line was also drawn along the outside edge of the sidewall plates onto the tops of the joists that were left long. This line is the perimeter of the bay, so holding a 2x block inside the line and drawing a second line allowed for the rim joist and gave me the actual cutline. After squaring down the cutlines, the joists were trimmed at 45° bevels (photo bottom right, facing page). If the amount of waste is more than about a foot, I rough-cut the length so that the cutoff isn't heavy and unwieldy. Finally, I cut, fit and installed the angled rim joists (center photo).

With all the floor framing for the bay complete, I tripled the main joist that the bay hung from and installed two joist hangers on each of the cantilevered joists, one right side up and the other upside down (photo bottom left). The theory is that the upside-down hanger prevents the joist from lifting from the weight of the cantilever. Some framing crews block between the cantilevered joists at the sill plate, but I prefer to leave the space open to slide in insulation later.

With floor framing done, I finished sheathing the main deck (see "Framing Floors," *FHB* #117, pp. 52-59), extending the sheathing over the cantilever (photo bottom right). I left the walls and roof of the bay until the entire house was framed. The house walls give me a nice surface for attaching the bay roof, and a roomy exterior deck wrapped around the bay, disguising the fact that it was sitting on a sturdy cantilevered floor framing. □

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Sheathing completes the floor framing. With the bay joists on regular centers, the deck sheathing can be cut and extended to include the bay without changing the sheathing pattern.