A Craftsman-Style Coffered Ceiling

Seamless miters and an oil finish raise the trim-carpentry bar

BY DAVE HOLBROOK

Late this past winter, I was hired by Cregg Sweeney of Artisan Builders to supplement his finish carpentry crew by completing the interior of a luxurious new home in South Orleans, Mass. At that time, the building was approaching the two-year mark of continuous construction. There was a seemingly endless list of custom built-ins and trim for every room in the house—many worthy of writing about—but for this article, I'm going to focus only on the beamed ceiling treatment in the living room and adjacent dining room (for an overview, see Reflected Ceiling Plan and Trim Details, page 50). Although each of the ceiling's rectangular "bays" was composed of only four basic elements—a flat bottom and a three-piece vertical fascia—the requirement for virtually seamless miters and a natural oil finish over solid cherry raised the bar considerably.

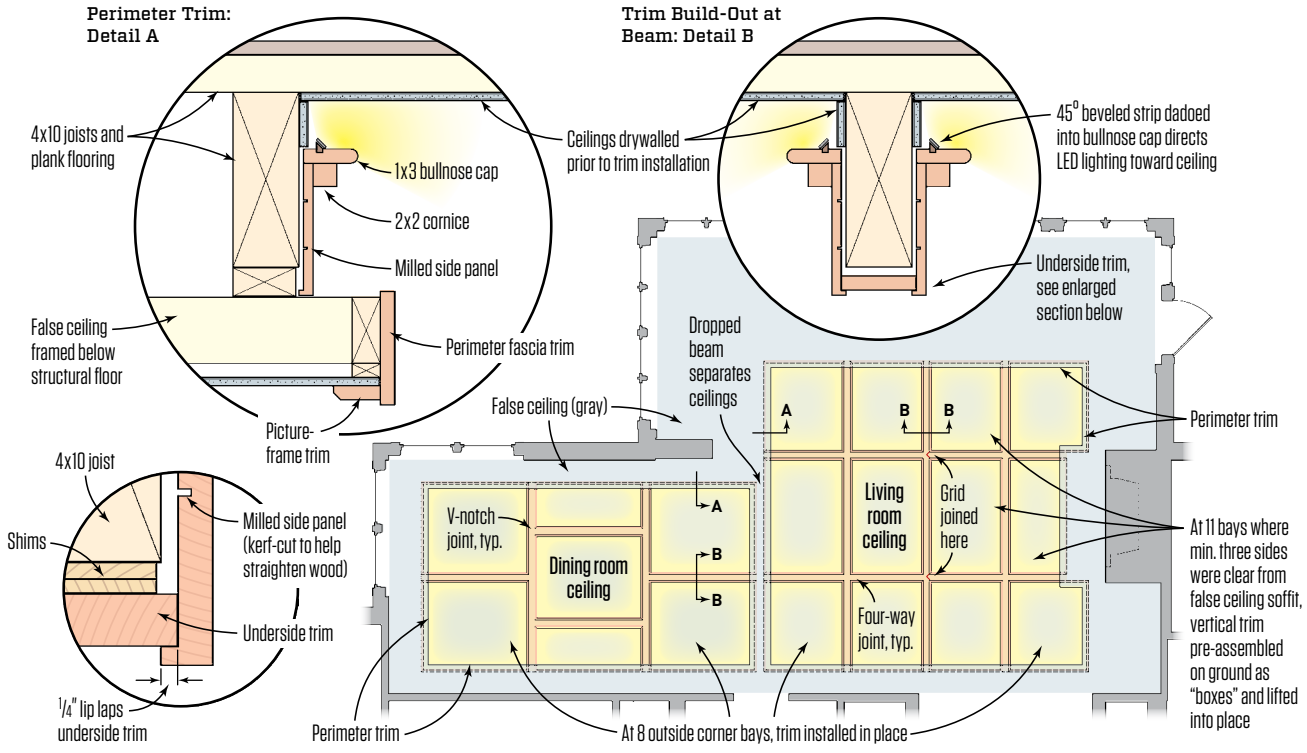
Anticipating a demanding finish regimen, Sweeney's team had framed the ceiling to tight tolerances. When we checked the rough layout, we found no more than 1/8-inch deviations from the planned centerlines. After drawing a map of the layout to develop a cut list, we measured the diagonals to confirm overall square and noted all the field dimensions on the map. Then we set up a laser on a tripod and found the lowest point in the framing. Typical settling and lumber irregularities had caused an overall deviation of about 3/4 inch from general level, including high and low spots. To establish a truly flat and level underside, we referenced the laser against the framing at roughly 2-foot intervals and stacked shims of various thicknesses to the underside of the rough beams **(1)**, gluing and tacking them in place. This took two of us about a day to complete.

PREASSEMBLING THE UNDERSIDE TRIM

To minimize trips up and down ladders to measure, cut, test-fit, recut, shim, and fasten all 230-plus mitered joints (19 bays total, each with at least 12 individual joints), we decided to cut and assemble as much trim as possible on work tables below. Our plan was two-fold: First, we'd assemble the horizontal underside trim into a few large sections and lift them into place; then, in each bay, we'd assemble the fascia trim as four-sided boxes, lifting them into place as well. The 3/4-inch stock was nicely uniform as delivered, but we were limited to 12-foot stock, so we had to plan our cut list accordingly.

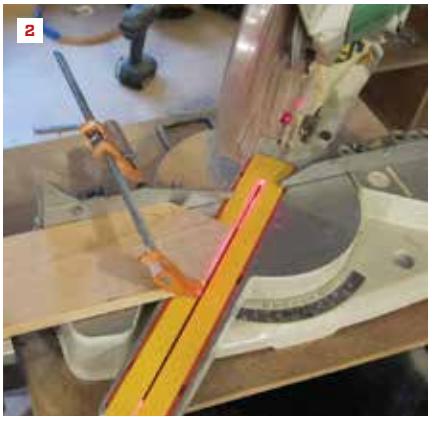
Photos by Dave Holbrook

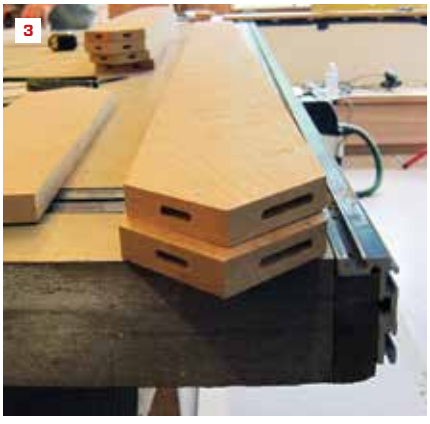
Reflected Ceiling Plan and Trim Details



The coffered ceiling comprised two grids separated by a drop beam, with one grid in the living-room area and the other in the dining area. The two areas were wrapped around their perimeters by a parapet, formed by a false ceiling framed below the structural one (see illustration, above). The ceiling was framed to tight tolerances with an overall deviation of about 3/4 inch from high to low spots. The ceilings in the individual bays and surrounding soffits were drywalled prior to trim installation, and shims were glued and tacked to the underside of the rough beams to establish a level underside for the trim work **(1)**.

Illustration by Tim Healey





Micro-adjusting the saw's cut angle was necessary to achieve absolute accuracy for all eight miter cuts on the underside trim **(2)**. Each board had a wide and a thin slot plunge-cut into it to receive the Domino inserts; the wide slot allowed for a degree of play during assembly **(3)**. The intersecting joints were pieced together with the finish face down **(4)**. The pocket screws and Domino tenons were installed in a fairly tight space **(5)** and were placed in a radial pattern to help avoid one another **(6)**. The resulting four-way mitered joint, held together with Domino tenons, pocket screws, and yellow glue, was a strong connection **(7)**.

Usonian miter. One of the challenges in building the ceiling was joining the four-way miters at the intersections of the highly visible undersides of the beams. Sweeney borrowed this striking detail from a complete restoration of a Frank Lloyd Wright Usonian house he'd worked on in California. In our case, to make that joint strong enough for lifting the trim into place as a unit, we planned to use a combination of Festool Domino tenons, pocket screws, and yellow glue.

Upfront, we did a lot of careful measuring, layout, and trial-and-error to make sure the joint would hold together. We spent some time fine-tuning the cut angle on a rock-solid older-model 10-inch Hitachi sliding compound saw **(2)**. Rather than re-set our hard-won angle for the opposing cut, we registered the opposite end of each 1x5 board against a flip-stop on the saw's extension table and flipped the board to cut the opposing angle. This also ensured exact uniformity between corresponding pieces. We then put one together as a test, ensuring that all eight cuts jointed tightly and that we had true 90-degree angles between the four pieces.

To hold the miters together, we plunge-cut mortise slots into the solid cherry with the Domino joiner. The Domino provides three mortise widths—one snug, one elongated, and one even wider—to allow for some lateral adjustment when pieces are aligned **(3)**. We cut a snug mortise on one face of each miter, and an elongated slot on the opposing face, paying close attention to which piece went where in the assembly. We then pieced together the intersecting joints with the finish face down, just as it would be when lifted into position **(4)**. To help properly assemble the joint, we marked the mortise and pocket-screw layout on each joint. It was a tight configuration **(5)** with the fasteners placed in a radial pattern **(6)**. But when the glue was dry on our test piece **(7)**, the joint was robust and we couldn't break it apart.

The assembled sections of trim were lifted onto site-built plywood hangers **(8)**. The larger, living-room grid was lifted in two sections that were joined together in the air **(9)**. The trim was then secured tightly to the underside of the beams with lengths of shipping strapping, which allowed the author's crew to fine-tune the trim's alignment along the A and B axis. The crew used a laser line to shoot through the living room to the dining room to line the grids up **(10)**. With the trim in place, the 1x5 cherry was then blind-screwed with trim-head screws to the beams **(11)**.

V-notch miter. In the dining area, the alignment of the bays shifts from linear to offset. The junctions called for a "downscale" version of the four-way joint, in which only one double-mitered end intersects the running edge of the perpendicular member in a reciprocal V-notch, like an arrow penetrating a target. We employed the combination of Dominoes, pocket screws, and glue to make the connections.

Lifting the bottom trim. Since it would be too unwieldy to lift a 17 1/2-foot-square assembly, we broke the living room assembly into two grids, one larger than the other, that we'd join together after the lift. To do so, we needed access to the reverse side, so we installed site-built plywood hangers to suspend the grids below the beams **(8)**. We inserted Domino tenons and glued and screwed the grids together **(9)**. Pulling these joints tightly together overhead resulted in a less seamless appearance than we were able to achieve on the table.

To adjust the grid once it was raised to its final position against the framing shims, we held it in place with plastic shipping straps and staples. This let us move it slightly side-to-side **(10)**. Because each bay had to be precisely aligned visually with each adjacent bay, and because we planned to assemble the finished sides as boxes with only 1/8-inch clearance between them and the grid, we needed absolutely parallel alignment and perfectly square openings. We stretched a string the full length of each beam axis before permanently attaching the grid. We adjusted the alignment as needed, drilled pilot holes, and fastened the grid **(11)**.

PREASSEMBLING FASCIA BOXES

Turning to the vertical trim build-out, we began by cutting all the solid cherry pieces to length, again using a flip-stop for uniformity. Sweeney had taken the main, 7 1/2-inch-wide side pieces to his

The fascia was composed of a 1x8 side panel (milled to obtain a 1/4-inch lip at the bottom and kerf cut to relieve cupping), a 2x2 "cornice," a 1x3 bullnose cap, and a bevel strip dadoed into the cap, which directs LED strip lighting toward the ceiling **(12)**. A site-built jig was used to accurately align the 2x2 on the 1x8 panel **(13)**. Corner miters were splined together **(14)** to form individual boxes, which were glued and clamped together **(15)**. It was critical when joining these corners to keep the 1/4-inch lip on the side panels aligned **(16)**. Floor-to-ceiling springboards and clamps hold the completed boxes in place **(17)**.

shop and plowed 5/16 inch out of the back in two passes on a 12-inch joiner. He left the bottom 1/4 inch of the boards intact, creating a lip that would overlap the bottom grid and cover the joint between sides and bottom. In addition, because much of our wider, 1x8 cherry stock was lightly cupped, we ran parallel saw kerfs on the back, allowing us to force the boards flat when joined at the corners.

Each fascia consisted of three visible pieces: the side panel, a 2x2 "cornice," and a 1x3 bullnose cap over the cornice. A fourth piece—a bevel strip dadoed into the cap—was added to direct the LEDs toward the ceiling **(12)**. We made simple jig **(13)** to hold the three pieces in uniform alignment. The jig registered against the bottom lip on the side panel and positioned the 2x2 at a predetermined spacing. We glued and screwed the 2x2 from the back, and the bullnose piece from the top. The bevel strip, cut from scrap mahogany, was glued into the dado and wouldn't be visible from the floor.

Trouble spots. As careful as we were with the assembly, we struggled to maintain an exact alignment when joining the miters; there were minor discrepancies at the several of the junctions. The most crucial alignment was at the bottom lip, which had to meet the 1x5 underside trim as seamlessly as possible. In these cases, we compromised on the alignment of the 2x2 and bullnose and "faked" the joint flush later with a little carving and sanding.

We'd also installed splines across the miters to restrain future movement **(14)**. I cut the spline grooves on a sliding miter saw in two passes to get the 3/16-inch width required, using the saw's depth stop to limit the cut. We cut cherry splines on the table saw, keeping the grain oriented perpendicular to the joint. To ensure a straight cut across cupped boards, I clamped them flat to the sliding miter saw bed and pulled the blade across at a 45-degree tilt.

We then used Clam Clamps (miterclamp.com) and Maestro

Low-voltage wiring was tacked up clear of the top cap, ready for connection to the LED lighting **(18)**. At outside corners, the two-way projection of the false ceiling's perimeter prevented the insertion of a preassembled frame (a minimum of three sides clear was needed), so the trim build-out had to be installed in place **(19)**. Fascia trim was installed around the false ceiling's perimeter in both the living and dining areas. The perimeter trim was preassembled on the floor. Mortise slots were plunge-cut **(20)**, Domino tenons inserted **(21)**, and Clam Clamps were used to hold the joint together while the glue set up **(22)**.

M1201 spring clamps to join the mitered corners of the individual units **(15)**. The clamps were essential because the corner joints of the fascia boxes were extremely difficult to pull together.

In addition to the cupped wood, we found that the 12-inch Bosch miter saw we were using for the miter cuts flexed across its armature, throwing the cuts up to 2 degrees out of true. Once this was diagnosed, I overcame the problem by applying a little opposing force as I cut. Since we couldn't re-trim the pieces without throwing off our tightly held dimensional tolerances, and starting over would have been enormously costly, we had to proceed with them as is; nearly every joint was a trial. We installed lots of trim-head screws, along with glue, to hold the joint together **(16)**.

Installing the fascia boxes. As we completed the boxes and allowed the glue to dry, we installed them in their respective bays. In some cases, to press the lip tightly against the bottom grid, we had to use floor-to-ceiling springboards **(17)** and then shoot finish nails through the sides into the framing. In some cases, we added trim-head screws, later concealing the heads with 1/4-inch-diameter bungs. Generally, this strategy worked pretty well, with only a few seams refusing to close tightly; these we filled with paper-thin rips of cherry, which would be invisible in the finish.

Wiring for the low-volt LED strips was already installed, so we tacked it up clear of the top cap, ready for connection **(18)**. The 3/8-inch-wide, almost paper-thin LED strip comes with a self-adhesive strip on the back to secure it to the mounting surface.

Outside corners. Preassembly streamlined much of the final installation, but the coffered ceiling area was defined by a false ceiling framed around its perimeter, below the structural one. At outside corners, its two-way projection prevented our inserting a fully preassembled frame. We were able to preassemble the elements of

The completed assemblies were lifted into place (23), with the bottom edge falling an inch below the ceiling drywall. A narrow picture-frame trim was run around the fascia and joined with Domino inserts at the mitered corners. The picture frame was glued, clamped, and finish-nailed to the fascia in place **(24)**. Test patches of pure tung oil were made on a V-notch miter to get an idea of the final finish **(25)**. The dimmable LED strip lighting allows for a range of lighting—from a bright commercial feel to a cozy background glow **(26)**.

one side and one end of the trim, but the rest of the box had to be put together in place. We glued down the bullnose pieces individually all the way around in those eight corners, with no visible loss of quality; it just took longer **(19)**.

WRAP-AROUND FASCIA

To complete the ceiling, we added cherry fascia trim to the vertical edge of the false-ceiling perimeter in both the living and dining areas. All the corners required miter joints difficult to execute accurately in place, so we again resorted to preassembly on the floor. We plunge-cut mortise slots **(20)**, inserted Domino tenons **(21)**, and then used Clam Clamps to hold the joint together while the glue set up **(22)**. Later, we back-screwed the joints, then lifted the fascia assemblies into place as single units **(23)**. To cover the gap between the back of the fascia and the drywall, we installed a narrow picture-frame trim, which we glued, clamped, and finish-nailed to the fascia **(24)**.

FINISHING UP

With all the trim installed, we chiseled flush and hand-sanded any misalignments in the upper joints and used random-orbital finishing sanders for the final surface prep. The pure tung-oil finish has yet to be applied, but we tested it in a few places **(25)** and it looks like it'll work out well. Once the electricians completed wiring the LEDs and finally threw the switch, we were pretty stunned **(26)**. The dimmable lighting takes the ambiance from a bright commercial feel, similar to a bank or library, to a cozy background glow.

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