

*This railing won't hide the view. As a finishing touch to a bedroom hide-away, this cable railing is strong and durable. Because it's see-through, it won't spoil the view.*

# A Balcony Deck



## Durable finish materials hide strong framing connections in a graceful design that overlooks the ocean

BY MICHAEL MAINES

If decks and patios are outdoor living rooms, balcony decks are more like small, private nooks. Just because they're little, though, doesn't make them simple. The fact that balconies don't touch the ground makes them complex and challenging to build. The balcony featured here faces the ocean, which adds another design challenge: stability and durability in the face of hurricane-force winds. In fact, while we were running exterior trim on this house in Maine, two nearby houses were swept off their foundations and into the ocean during a severe storm.

You can support a balcony by using wooden knee braces angled back to the house or by cantilevering the interior floor joists through the wall. The problem with the former method is that wood-to-wood structural connections are rot-prone. The problem with the latter method is that it eventually channels rot into the house.

### Welded stainless-steel connectors anchor the deck to the house

For this project, we decided that the best way to support the balcony was to create a sturdy pressure-treated wood frame that later would be wrapped in PVC trim. An architect in our office consulted with a structural engineer for a plan that would support the necessary loads, be assembled easily, and show off nice proportions.

We used custom-made stainless-steel framing connectors to reinforce the major bracket-and-beam assembly and to tie it to the house framing. It's important to use stainless-steel fasteners on the coast, but it's even more critical when working with ACQ pressure-treated lumber, which is highly corrosive to plain and galvanized steel.

The metal framing connectors were all TIG-welded by a certified welder using 304 stainless steel, which is strong, corrosion-resistant, and easily obtainable. The brackets are strong and durable, but expensive: around \$1500 for the set.

I wanted to through-bolt the brackets to a built-up post inside the wall, but our engineer calculated that more support was needed. For the lower connector, he specified a steel fin that would run through an LVL post inside the wall, which then was through-bolted to hold it in place.

Because we didn't have access to a timber framer's chain mortiser, the best way for us to make the slot for the lower connector's fin was to start the cut with a circular saw, then plunge-cut it with a chainsaw. Fortunately, the chain's thickness matched well with the fin's thickness. The most-complicated framing connector is the top



**Framing members are cut to fit steel connectors.** Sawkerfs are made with a circular saw, then cleaned out with a jigsaw so that the posts and ledger can slip over steel flanges and be bolted in place. The ledger and framing-connector posts are lag-screwed to solid-wall framing.

# Built to Last



Upside-down stainless-steel double joist hanger supports the outer rims.

A 2x10 ledger bolted in place with 3/4-in. pressure-treated spacers allows water and debris to drain.

7/8-in. rim

A 3-ft. 2x12 reinforces the I-joist web.

14-in. I-joist

The boomerang-shaped connector is a heavy-duty gusset plate, tying the horizontal beam to the knee brace.

The top connector resists tension forces by anchoring back into the house's floor framing. Bolting the ledger and knee brace to the house provides shear strength.

4x4 knee brace

2 1/2-in. steel pipe with heavy-duty pipe hanger

A 3-ft. 2x12 reinforces the I-joist web.

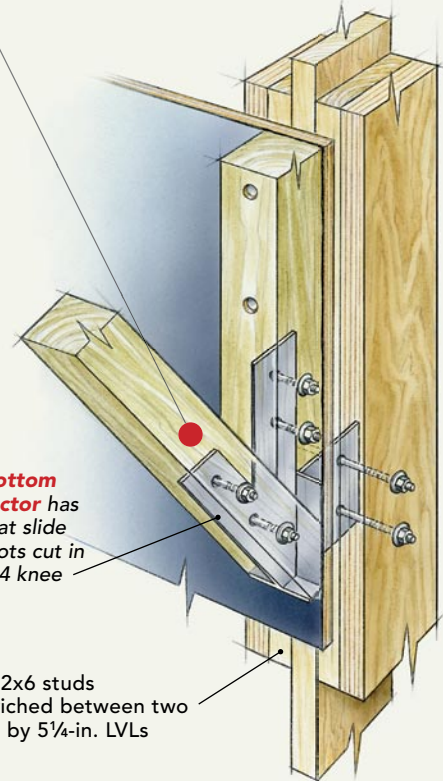
## STEEL CONNECTORS ARE THE HIDDEN HEROES OF THIS BALCONY

Concealed beneath decorative trim boards and rot-resistant framing lumber, custom-made stainless-steel connectors reinforce a pair of knee braces that support the deck and also anchor the framing to the house.



The bottom connector has fins that slide into slots cut in the 4x4 knee brace.

Three 2x6 studs sandwiched between two 1 1/2-in. by 5 1/4-in. LVLs



## FRAMING DETAILS MAKE A BOMBPROOF DECK THAT WON'T ROT

The materials and construction details have to protect this deck from hurricanes, windblown rain, and the risk of corrosion from being in a coastal location.



① Spacers keep the ledger off the house, allowing water to drain away.

② Diagonal blocking acts as a sway brace to solidify the deck in high winds.

③ Lead flashing directs water away from the upright post. Drain holes in the bottom of the posts allow water to escape if it finds a way in.

④ Gaps between doubled framing members allow water to drain through.

⑤ All framing connectors and fasteners are stainless steel for corrosion resistance.

2½-in.-dia. steel pipe through the joists. As shown in the drawing (facing page), we attached a heavy-duty pipe hanger, or stirrup, to the pipe, and we used a length of ½-in. threaded rod and a coupler to connect with the stainless-steel threaded rod that was welded to the framing connector.

### Plan the framing to promote drying

Another common weak spot in deck framing occurs when framing members are sandwiched together to create a built-up beam. Pressure-treated lumber can last for 20 years or more, but with good detailing, it can last a lot longer. The gap between deck boards lets in water, dirt, and other debris. That debris collects in the seam between framing members, eventually weakening the wood. I plan my decks with gaps between doubled members and easy pathways for water to drain.

The doubled 2x10s making up the balcony's horizontal beams are spaced the thickness of the steel framing connectors sandwiched between them. Two beams that extend from the upper framing connectors support an outer doubled beam, which is secured with upside-down stainless-steel joist hangers. This outer beam doesn't need to be spaced because it is covered by synthetic decking, which keeps water and debris out of the joint. The deck's floor joists are supported between the outer beam and the ledger with normally oriented stainless-steel joist hangers.

The ledger is connected to the house with stainless-steel through-bolts and ¾-in. pressure-treated spacers behind the ledger to allow water and debris to drain.

Over time, connections could loosen as the deck sways from high winds and heavy usage. To prevent this, we installed diagonal sway blocking into the floor system. In the rush of framing, we nearly forgot to add blocking for the top-mounted posts for the railing system.

### The materials look good and last

We decided to use PVC trim for its low-maintenance features and because it would be easy to form to a curve on the bottom side of the knee braces. The homeowner also wanted synthetic decking for low maintenance and good looks. We used Trex Brasilia decking ([www.trex.com](http://www.trex.com)) for its rich color and realistic grain pattern.

Because this balcony offers an ocean view from the master bedroom, we didn't want to use a clunky railing. We settled on a Feeny cable-rail system ([www.cablerail.com](http://www.cablerail.com)). Feeny

one. It connects the deck's horizontal and vertical framing members, and also has the job of keeping the balcony from pulling off the wall. If you imagine the bottom connector acting as a hinge, then the top one could be imagined as a latch.

Most decks are simply bolted to the rim joists of the house, but our deck could easily pull the OSB rim joist on our I-joist floor

right out of the house. We could have added floor framing to fasten the connector to, but by the time this detail was figured out, the floor had been framed and sheathed. Our engineer came up with a simple, cost-effective solution. With construction adhesive and nails, we scabbed 3 ft. of solid 2x12s to the webs of the I-joists, drilled through the ones adjacent to the connectors, and slipped

## DURABLE TRIM DRESSES UP THE STRUCTURE



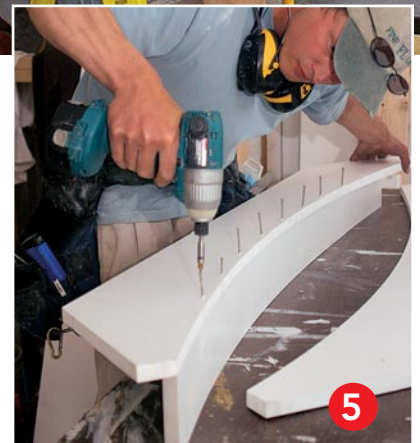
**Plastic trim holds** paint well and stands up to the salt air. We preassemble the trim boxes as much as possible, then fine-tune their fit. We apply the upright posts before installing the ceiling; then we fit the knee braces.



**The preassembled posts go up first.**

**(1)** Furring strips flank these posts to keep the width consistent. The edges are mitered to accept the face, which is applied next. **(2)** We make a trammel out of a couple of strips of sheathing to cut a pattern for the sides of the curved knee braces.

**(3)** With a bearing-guided router bit, we cut all the sides. **(4)** Each side has to be fine-tuned to fit perfectly. **(5)** When the sides fit perfectly, we assemble the curved knee braces. PVC trim makes this easy because it's so flexible.



## WORKING WITH PLASTIC TRIM

While plastic trim takes paint well and won't rot, there are some nuances to working with it. We have a love/hate relationship with this stuff: We hate the drawbacks, but we love the way our exterior-trim details look.

### Don't back-bevel the miter joints.

Because you need a solid gluing surface for the joints, you can't cut miters at 46° rather than 45° as you can with wood. The joints have to be perfect so that they can provide a big glue surface for when the Azek moves in response to temperature changes.





offers powder-coated heavy-duty aluminum posts and rails that work together as a system, and they also have pretty good technical support for optimizing the design. The system went together without a hitch.

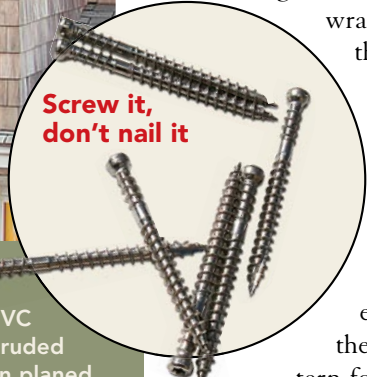
### Assemble the trim ahead of time

Working high in the air—or even a few feet above a deck, as we were here—is never as efficient as working at bench height. We assembled as many of the trim components as we could on the ground. The vertical posts were wrapped and capped with a PVC “box.” The corners were mitered and the three pieces assembled with Azek glue (PVC cement specially made for Azek trim; [www.azek.com](http://www.azek.com)) and stainless-steel screws. We have tried regular plumbers’ PVC cement, but the set time is too quick for us.

After the last two pieces of the upright were glued and screwed and the floor framing wrapped with a fascia, we installed the ceiling boards under the balcony. We wanted to hide the framing but allow water and debris to drain through, so we spaced the chamfered 1x6 PVC boards about  $\frac{3}{8}$  in. apart. After the ceiling was up, we wrapped the brackets by assembling three sides of the curved brace. We made a pattern for the side of the curved brace using a router with a trammel arm, then used the pattern with a flush-trim bit to make the remaining sides.

It was more complicated than the average deck, but this balcony does its job well. It provides a place to watch the sunrise over the ocean, it looks like it belongs on the house, and it won’t require much effort to keep looking good. Most important, it is never going anywhere. □

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**Screw it, don't nail it**

Because PVC trim is extruded rather than planed, its thickness varies; this makes joinery challenging. Double-threaded trim screws make adjusting joints simple, and the small heads are easily hidden with some exterior-grade putty. The manufacturer’s PVC cement is a better choice than standard plumbers’ cement because it allows longer setup times for fine-tuning the joints.



**Details make the difference.** We glue miter joints to minimize the effect of shrinkage in composite decking. We also like to round over the end cuts on deck boards to match the radius of their sides. The only visible fasteners are those securing the outer frame. The Eb-Ty hidden-fastener system uses plastic biscuits that fit into a slot along the length of the deck boards.

**Support the stock.** PVC is easy to bend, so it’s easy to work with for curves. But it’s also a pain in the neck. Tablesaws need long infeed and outfeed tables, miter saws need long extension wings, and carrying long pieces can be a two-person job.



**Cut long.** These plastic trim boards contract in the cold and expand when it’s hot, so cut accordingly. In winter, we add between  $\frac{1}{8}$  in. and  $\frac{1}{4}$  in. to the overall length, depending on temperature. In summer, we cut to the measured length or add just  $\frac{1}{16}$  in.

