

# A Better Wall for Production Builders

Meet NAHB's new wall assembly,  
with a 77% better R-value than a standard 2x4 wall

BY MATTHEW MILLHAM

**D**esigning a better wall system isn't particularly hard. Designing one with a chance of being accepted by production builders, on the other hand, has proven difficult—and that's a problem.

Demand for higher-performance wall systems is growing, partly because of more-stringent energy codes. But builders aren't adopting existing solutions—things like double-wall framing or thick layers of exterior rigid foam over wall sheathing—in significant numbers.

The National Association of Home Builders' (NAHB) Home Innovation Research Labs is trying to lure more builders into constructing high-efficiency walls with the development of its "Extended Plate and Beam" wall system.

Called EP&B for short, Extended Plate and Beam adapts methods that production builders—who build the majority of American homes—already know. At its most basic, EP&B consists of 2x4 studs between 2x6 top and bottom plates, and the extra 2-in. overhang is filled with rigid foam before structural sheathing is attached with

long nails (see drawing right). From there, installing windows, doors, flashing, and cladding is largely the same as for a regular 2x6 wall.

The main advantage to production builders? Installing OSB or plywood outboard of the rigid foam removes the need for furring strips.

## EP&B vs. other walls

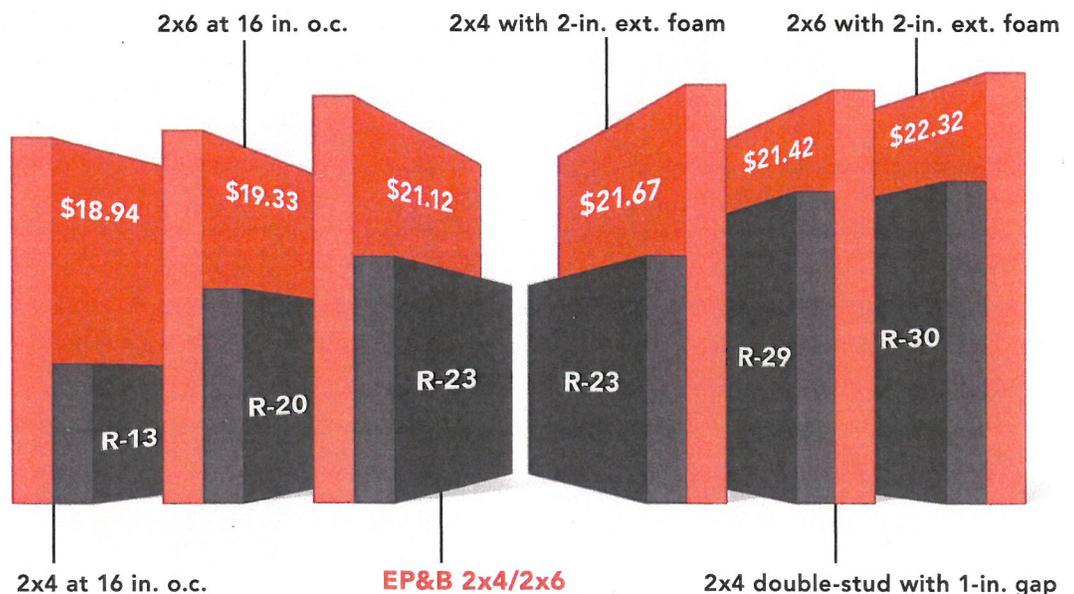
According to calculations made by the Home Innovation Research Labs, the EP&B system costs less to build than either a 2x6 wall with continuous exterior rigid foam or a double-stud wall.

In its most basic configuration, an EP&B wall with 2 in. of extruded polystyrene (XPS) foam and R-13 fiberglass batts has a nominal R-value of R-23. That's a 77% increase in R-value from a conventionally framed 2x4 wall with the same R-13 batt insulation and no foam.

Analysis published by the United States Department of Energy (DOE) estimates the cost of this particular wall assembly at \$21.12 per sq. ft. of framing when sided with fiber cement—\$2.18 more than a regular 2x4 wall, including materials and labor. In other words, for

## COST COMPARISON

The EP&B wall's developers tested and compared the nominal R-value and cost per sq. ft. to construct various wall assemblies. Costs per sq. ft. and nominal R-values for walls clad in fiber-cement siding are shown here. By their analysis, their assembly costs more than standard 2x6 walls, but \$0.55 per sq. ft. less than the International Energy Conservation Code's (IECC) prescriptive 2x4 wall with 2 in. of exterior rigid foam.



## EXTENDED PLATE AND BEAM WALL

Designed to appeal to production builders, Extended Plate and Beam walls include a layer of rigid-foam insulation between the structural sheathing and the studs. At its most basic, the walls consist of 2x4 studs between 2x6 top and bottom plates. The plates are flush with the studs on the interior, but 2 in. proud of the studs on the exterior. This 2-in. overhang is filled with 2 in. of rigid-foam insulation, and the entire wall is skinned over with structural sheathing fastened with long nails.

2-in. XPS rigid-foam insulation (XPS, faced EPS, and polyiso rigid foams are acceptable. If only one side is faced, facing must be installed toward the cavity.)

Windows framed with 2x4 framing

To provide shear resistance, structural sheathing is attached directly to extended plates, and continuous between top and bottom plates. Vertical seams must be staggered and break on studs.

Double rim can act as a header for the openings below (joist hangers required) and can be inset 1 in. to accommodate rigid-foam insulation.

Cavity insulation

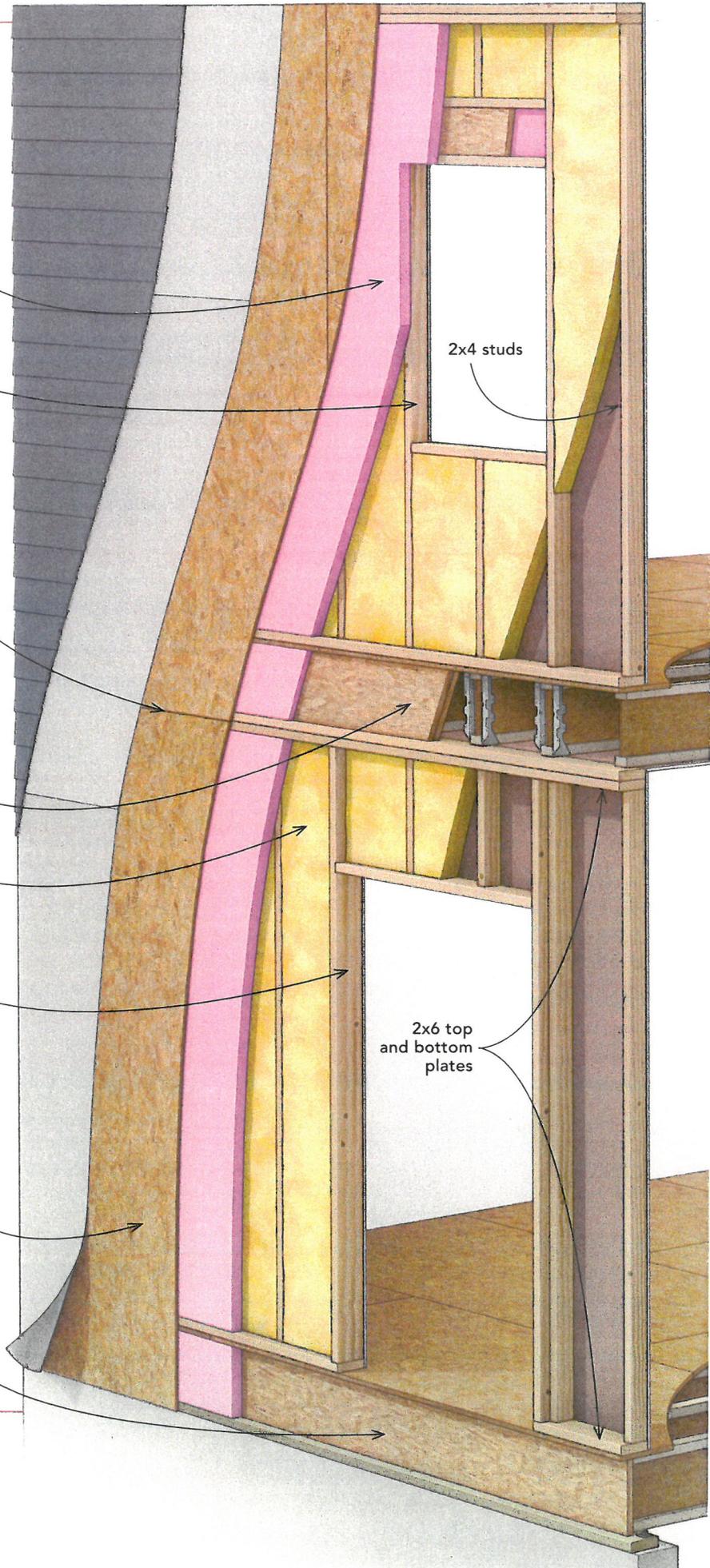
Doors framed with 2x4s (typical) or 2x6s (sliders or heavy-duty)

$\frac{7}{16}$ -in.-thick (minimum) structural sheathing (OSB or plywood), oriented vertically and attached with  $3\frac{1}{2}$ -in. by 0.131-in. nails 3 in. o.c. around the perimeter and 6 in. o.c. in the field.

Rim at foundation can be inset 2 in. to accommodate rigid foam, but sheathing must be installed continuously from top plate to sill plate and fastened to the sill plate per the nailing schedule.

2x4 studs

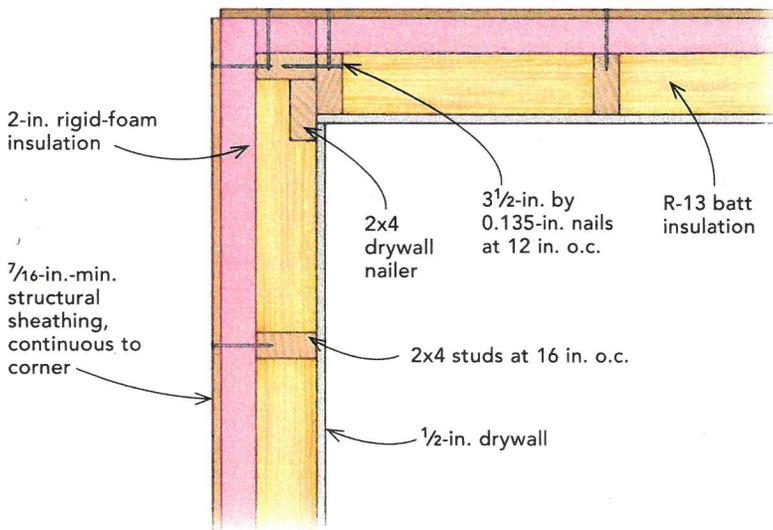
2x6 top and bottom plates



# CORNER DETAILS

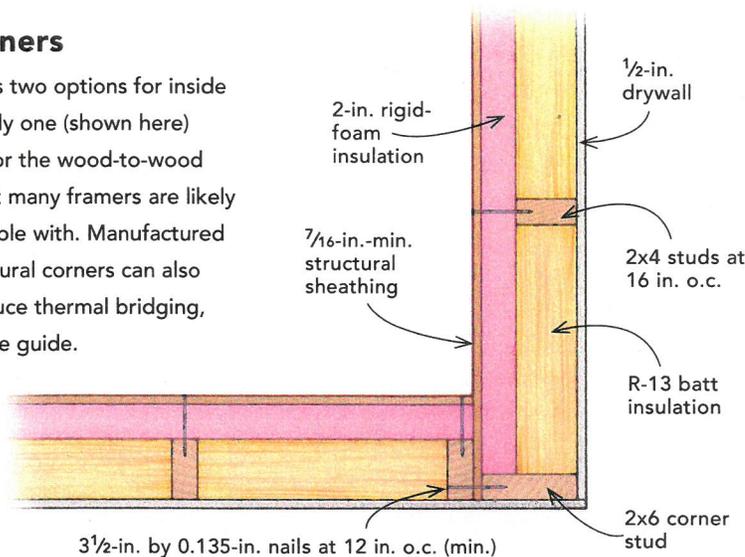
## Outside corners

The Home Innovation Research Labs developed a guide to the Extended Plate and Beam wall system that details a handful of ways to connect inside and outside corners. For outside corners, there's only one option (shown here) that allows for rigid foam to wrap around the entire corner. Other options result in additional thermal bridging, or a significantly reduced R-value at the corners. Manufactured insulated structural corners can also be used to reduce thermal bridging, according to the guide.



## Inside corners

The guide gives two options for inside corners, but only one (shown here) that provides for the wood-to-wood connection that many framers are likely to be comfortable with. Manufactured insulated structural corners can also be used to reduce thermal bridging, according to the guide.



**For more information about Extended Plate and Beam walls,** including a builder's guide and analysis of the concept, check out the Home Innovation Research Labs' website, [homeinnovation.com](http://homeinnovation.com). Visit [GreenBuildingAdvisor.com](http://GreenBuildingAdvisor.com) for editor Martin Holladay's take on the EP&B system, covered in his weekly "Musings of an Energy Nerd" blog.

an 11.5% premium, they saw a 77% bump in nominal R-value.

Builders can also build an EP&B wall with 2x6 studs and 2x8 plates. But because a 2x8 is only 7 1/4 in. wide, the remaining overhang leaves room for only 1 3/4 in. of rigid foam, producing a nominal R-29 wall with XPS and fiberglass batts. (Builders can rip 2x10s down to 7 1/2 in. to get a full 2 in. of foam and an R-30 wall.) By comparison, a standard 2x6 wall with fiberglass batts has a nominal R-value of R-20, according to DOE analysis.

While the system reduces thermal bridging at the studs, the rigid foam doesn't cover the plates (or, in its most basic configuration, the rim joists), resulting in more thermal bridging—and in most cases more air leakage—than systems with continuous insulation.

## The devil is in the framing and fastening details

The Home Innovation Research Labs produced a manual, titled "A Builder's Guide: Extended Plate & Beam Wall System," which gives options for various framing details.

The manual notes that EP&B walls need 3 1/2-in. nails every 3 in. on the edges of sheathing panels and every 6 in. along studs for adequate bracing. While this approach works in most of the country, it is not suitable for high-seismic or high-wind areas.

The "Beam" in Extended Plate and Beam refers to the rim joists, which can be doubled up so that structural headers over openings aren't necessary. Thermal bridging can be further reduced—by more than 95% overall, according to developers—if the rim is inset to accommodate rigid-foam insulation. Doing this can, however, add complexity.

Siding weighing less than 3 lb. per sq. in. can be fastened to the sheathing with standard nails, though heavier siding requires fasteners that extend to the studs.

## Awaiting code approval

This system is not yet recognized by the International Residential Code, though its developers are hoping to get approval at upcoming code hearings.

Until codes change, local code officials may give this approach a thumbs-down unless a builder submits engineering documents validating the system's soundness. □

Matthew Millham is an associate editor. Contributions by Martin Holladay, editor of [GreenBuildingAdvisor.com](http://GreenBuildingAdvisor.com).

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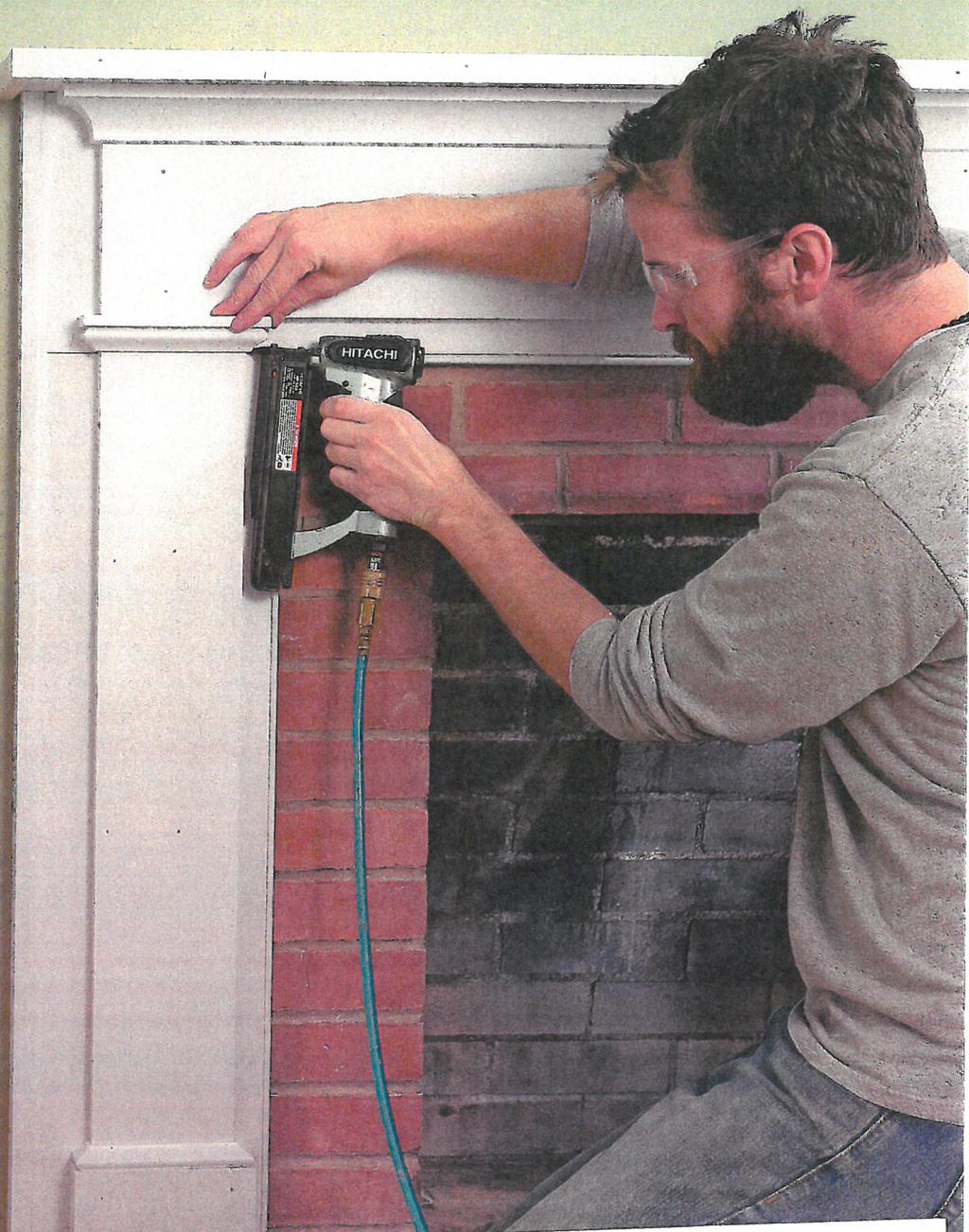
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