



Built for Comfort

Although keeping costs low informs decisions about the envelope and mechanical systems, homeowner comfort gets the final say

BY SEAN GROOM

With the 2017 ProHOME framed and dried-in, the attention turns to the components that will make the house net-zero capable, including different forms of insulation and the mechanical systems. Because this is a production-built house, Paul and Tim Biebel are trying to maximize performance while keeping costs—including labor costs that rise with more complicated assemblies—as low as possible. The walls are insulated with cellulose, held in the cavities with a membrane that acts as the primary air barrier. Sealants and spray foam air-seal tricky places like plates as well as window and door openings. The choice between double- and triple-pane windows for a cold-climate net-zero house can be hotly debated, but the decision to use triple-pane windows on this project is driven

by homeowner comfort. As with any high-performance house, the ProHOME has separated the heating and cooling system from the ventilation system. To maximize efficiency, the Biebels rely on a heat pump for heating and cooling and an ERV to maintain indoor air quality. Because it's a spec house, though, they recognize that future homeowners will have different ideas about what constitutes a comfortable temperature and are likely to value efficiency and comfort differently. To make sure they have happy clients, Paul and Tim are willing to spend a little more money—even if it means a small loss in efficiency—to ensure that owners are comfortable. □

Sean Groom is a contributing editor. Photos by Brian McAward, unless otherwise noted.

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WALLS



Double-stud walls. The exterior walls are framed on the ground and lifted into place. The inner walls are then framed in place.

LEDGER



A hung floor. The floor joists are attached to a ledger on the inner wall. A strip of Intello Plus is installed behind the ledger to create a continuous air barrier.

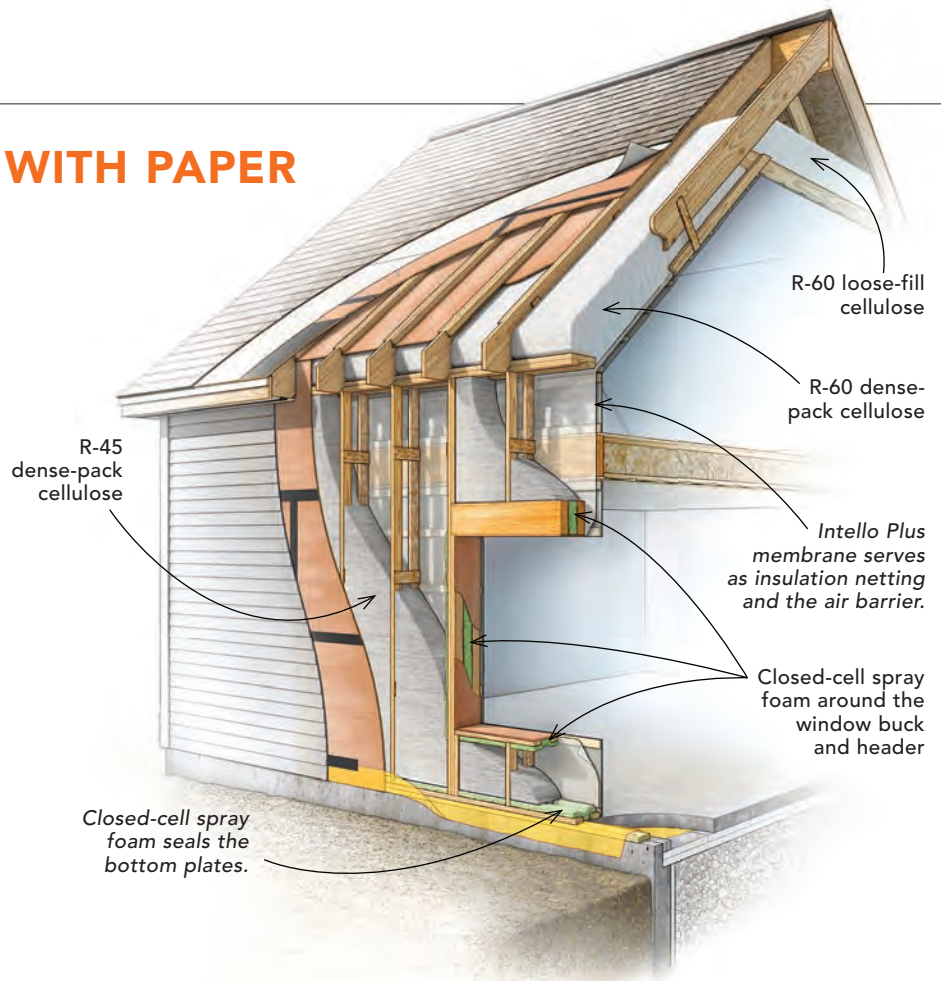
THICK WALLS PACKED WITH PAPER

Insulation is key in this high-performance house. The high R-values in the walls and roof keep the heating and cooling loads of the all-electric house low enough to offset with a PV array between 8kw and 10kw. The double-stud wall system not only has the production-framing advantage of being fast and straightforward to construct, but the depth of the wall can be set to accommodate the 12 in. of cellulose insulation needed for R-45 walls.

Cellulose provides R-3.2 to R-3.8 per inch, is relatively inexpensive, and is a recycled material. In the ProHOME, it's dense packed in the walls, and also dense packed to R-60 in the furred-down rafter bays of the sloped second-floor ceiling. Loose-fill cellulose is blown over the flat attic to R-60 as well.

There is at least one area, though, where spray foam is needed to meet the R-60 target: the ceiling of the bump-out off the first-floor great room. Having a spray rig on site also offers further air-sealing opportunities. The most important area to air-seal is the bottom plates of the double-stud walls and the gap between them. The foam air-seals between the interior wall plate and the slab (a potential weak point) and provides a vapor barrier between the slab and the cellulose.

The ProHOME's primary air barrier is on the interior of the wall in the form of Pro Clima's Intello Plus membrane. All



seams, edges, and penetrations of the Intello Plus are taped with Pro Clima's Tescon Vana air-sealing tape. To ensure the integrity of the air barrier, the framing crew installs strips of the Intello Plus behind ledgers and intersecting walls so they can be overlapped and sealed to the primary runs of Intello Plus to create a continuous air barrier. On the second floor, the Intello Plus is run over the walls and ceiling before any of the interior walls are framed.

The Intello Plus also serves two other functions: It is the cellulose netting for the dense-pack insulation and is transparent enough to allow the stud bays to be inspected visually, and the Intello Plus is also a "smart," or vapor-variable, vapor retarder. It is vapor impermeable during dry winters, preventing indoor humidity from entering the wall, and it is vapor open during more humid summers, allowing the walls to dry to the inside.

SECOND FLOOR



No-swell subflooring. AdvanTech subflooring stands up to the weather until the house is dried in. To eliminate squeaks, the subflooring is installed with AdvanTech subfloor adhesive on the top of the TJs.

RIDGE



Structural ridge. Weyerhaeuser Eastern Parallam PSLs are used for the ridge beam and the posts carrying the roof load to the foundation.

ROOF



A quickly dried-in roof. Once the Zip System sheathing is nailed in place, the crew tapes the seams with Zip System tape and the roof is dried in.