Next Generation Advanced Framing — Innovation Description

Building America research of the U.S. Department of Energy proves faster, smarter ways to employ three advanced framing techniques. It is well known that advanced framing techniques that reduce the amount of framing in stud-framed walls improve the thermal performance of the walls by allowing more room for insulation and reducing thermal bridging—the heat transfer that happens through wood framing that extends from the inside surface to the outside surface of the wall. Unfortunately, even though the benefits are known, builders have been slow to adopt advanced framing methods because some of the techniques are difficult to apply, trades are not familiar with these nonstandard techniques, and implementation can require design and materials changes.

One Building America team, the Partnership for Home Innovation (PHI) led by the Home Innovation Research Labs (HIRL) (formerly the National Association of Home Builders Research Center), has investigated this issue, to find simpler, cost-effective methods for implementing advanced framing techniques. It has tested three advanced framing techniques that improve the thermal performance of the building enclosure, reduce the cost of energy-efficient construction, and simplify the construction process, all while accommodating higher levels of building perimeter insulation.

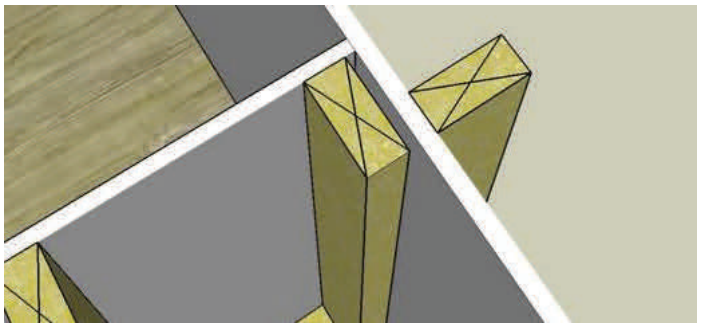
These new framing solutions are 1) continuous drywall at interior partitions, 2) rim joist window headers, and 3) continuous sheathing for raised heel trusses. This new set of framing solutions builds on prior experience with these well known advanced framing practices, while addressing several key obstacles to implementation of high-performance wall systems. PHI testing has proven that these techniques are practical for builder implementation. PHI's research has resulted in amendments to the 2015 International Residential Code (IRC) that were approved in the fall of 2013.

Continuous Drywall at Interior Partitions Drywall typically serves as the interior air barrier for the home's thermal envelope or building shell. One weak spot in this air barrier is the corners of rooms where sheets of drywall come together; the air seal here relies on the integrity of the tape and mudding. HIRL tested an approach to installing drywall continuously along the inside of the exterior walls of the home. To do this, all interior walls are framed so that a ¾ to 1-inch gap is left between the interior wall and the exterior wall. To stabilize the interior wall framing, it is anchored to the top plate with flat plate connectors. At the drywalling stage, drywall is slipped through this gap as it is installed along the interior side of the exterior walls in one continuous path. Then, interior walls are drywalled. The drywall sheets along the exterior walls are installed so that seams do not align with room corners. This simple technique provides significant improvement in air tightness for stud-framed walls.

Rim Joist Window Headers In two-story homes, the space above the first-floor windows and doors is often composed of solid wood such as two or three 2x10s or 2x12s to equal the thickness of the wall. The reasoning behind this solid header is to adequately support the building load above the window or door opening. Research by HIRL has shown that the rim joist for the second floor, which typically sits about 1 to 2 feet above the window frame, has adequate structural strength to support the building load, so no additional framing other than the king studs on each side of the door or window is needed to carry the load. The framied space above the door or window is left open and can be insulated like the rest of the wall. This technique makes use of the rim joist already present for structural support, saving time, labor, and materials costs, while adding to the overall thermal performance of the wall.

Continuous Sheathing for Raised Heel Trusses For builders used to building with standard trusses, using raised heel trusses could seem complicated, time consuming, and expensive. Concerns about adequate support led builders to install blocking at each rafter bay to hold the trusses in place, a difficult, labor-intensive job. HIRL found that a simpler solution provided adequate support—installing oversized oriented strand board (OSB) wall sheathing that extends up along the back of the raised heel providing bracing for the trusses. The sheathing layer doubles as a wind baffle, allowing the insulation to fill the space above the outer walls to full height without spilling over into the soffit vents. Air flow is still provided through the space between the roof rafters above the top of the wall sheathing and below the roof sheathing. This solution saves time and money by eliminating the separate steps of installing blocking and baffles. The only additional cost is the purchase of taller OSB panels but 9- and 10-foot lengths are readily available. This technique is easier to air seal than other raised heal truss approaches and also provides some wind uplift resistance as the roof truss is more firmly tied to the wall.

Home Innovation Research Labs teamed with Winchester Homes and Camberley Homes to employ advanced framing and other high-performance techniques in the construction of this house that cut whole house energy use by 30 percent.



Offsetting the interior wall framing from the exterior wall framing allows drywall to be slid between the two rather than stopping at each corner so the drywall can form a continuous air barrier along the exterior wall.

The interior wall framing is anchored to the top plate of the exterior with a flat plat connector.

The rim joist for the second-story floor provides adequate structural strength so solid headers are not needed above first-story windows, allowing more room for insulation.

When OSB or plywood wall sheathing is extended up the wall, it provides adequate support for raised heel trusses so no extra blocking is needed. The sheathing also serves as an insulation baffle.

References: “High-R Walls for New Construction Structural Performance: Integrated Rim Header Testing,” A. DeRenzis, V. Kochkin, and J. Wiehagen, NAHB Research Center. 2013.

“Winchester/ Camberley Homes New Construction Test House Design, Construction, and Short-Term Testing in a Mixed-Humid Climate,” D. Mallay, J. Wiehagen, and A. Wood, NAHB Research Center. 2012.