



BUILDING AMERICA TOP INNOVATIONS 2013 PROFILE

INNOVATIONS CATEGORY:

1. Advanced Technologies and Practices
- 1.1 Building Science Solutions

TOP INNOVATOR:

PHI

Next Generation Advanced Framing

Building America field studies involving thousands of homes have documented significant material, labor, and energy savings when production builders implement advanced framing techniques. Advanced framing can reduce the number of studs in the walls by up to one-third. Actual savings have exceeded \$1,000 per home. Studies show the resulting improvement in thermal performance can yield 13% energy savings.



BUILDING AMERICA TOP INNOVATIONS

Recognizing Top Innovations in Building Science – The U.S. Department of Energy's Building America program was started in 1995 to provide research and development to the residential new construction and remodeling industry. As a national center for world-class research, Building America funds integrated research in market-ready technology solutions through collaborative partnerships between building and remodeling industry leaders, nationally recognized building scientists, and the national laboratories. Building America Top Innovation Awards recognize those projects that have had a profound or transforming impact on the new and retrofit housing industries on the road to high-performance homes.

Building America research 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 (formerly known as the National Association of Home Builders Research Center), has been investigating this issue, seeking to find simpler, cost-effective methods for implementing advanced framing techniques. They have 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

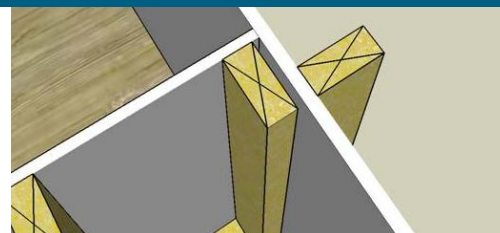
Drywall typically serves as the interior air barrier for the home's thermal envelope or building shell. One weak spot in this air barrier is the corners of rooms where sheets of drywall come together; the air seal here relies on the integrity of the tape and mudding. Home Innovation Research Labs tested 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. Research by Home Innovation Research Labs 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 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 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. Home Innovation Research Labs found that a simpler solution provided adequate support—installing oversized 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 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 heel truss approaches and also provides some wind uplift resistance as the roof truss is more firmly tied to the wall.



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 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

NAHB Research Center. 2013. *High-R Walls for New Construction Structural Performance: Integrated Rim Header Testing*. http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/highr_walls_new_construction.pdf

NAHB Research Center. 2012. *Winchester/Camberley Homes New Construction Test House Design, Construction, and Short-Term Testing in a Mixed-Humid Climate*. http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/winchester_camberley_mixedhumid.pdf

U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy

For more information, visit:
www.buildingamerica.gov

PNNL-SA-98659 September 2013

Printed with a renewable-source ink on paper containing at least 50% wastepaper, including 10% post consumer waste.

The U.S. Department of Energy's Building America program is engineering the American home for energy performance, durability, quality, affordability, and comfort.