BUILDING AMERICA TOP INNOVATIONS HALL OF FAME PROFILE

INNOVATIONS CATEGORY:

1. Advanced Technologies and Practices

1.1 Building Science Solutions

Advanced Framing Systems and Packages

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, reducing the cost of materials. and reducing the cost of labor in terms of the time it takes to handle, cut, install, drill, and attach to studs. 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 has developed best practices for advanced framing and effectively demonstrated their compelling cost and energy savings. This innovation is now being applied by home builders across the nation.

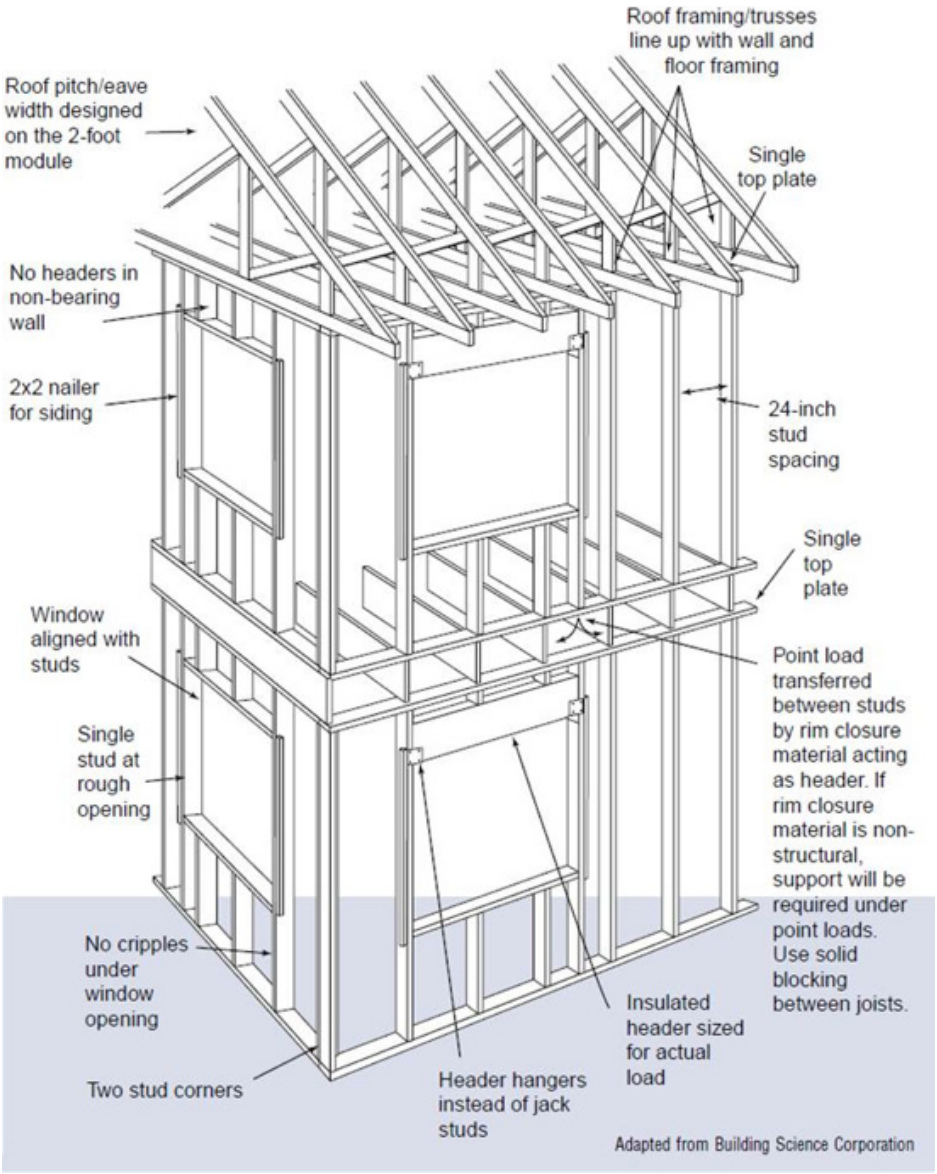
Adding more framing than necessary for structural support wastes lumber and increases labor. In one study of a 2,910-square-foot home, switching from 2x4, 16-inch on-center framing to 2x6, 24-inch on-center framing reduced board feet of lumber by 1,634 feet and cut costs by $171. When other advanced framing measures were added, like switching to single top plates, 24-inch spacing of interior wall studs, and open headers, lumber costs were reduced $1,117 (Baczek, Yost, and Finegan 2002). This is consistent with other research estimates for material and labor cost savings up to $1,000 per home for production builders (Lstiburek and Grin 2010).

Extraneous framing also reduces the wall's thermal resistance because it occupies cavity space that could be filled with insulation. Extra studs also increase thermal bridging since wood transfers heat almost four times faster than insulation. In one study Building America researchers found energy savings of 13% compared to standard construction (Lstiburek and Grin 2010).

Advanced framing begins with wall framing. Wood-framed houses have traditionally been designed for 2x4 studs spaced 16-inches on-center. Building America field tests have confirmed that exterior framed walls can be adequately supported with advanced framing techniques using 2x6 studs spaced 24-inches on-center. One study with the U.S. Army Construction Engineering Laboratory has shown that advanced framed walls can even meet hurricane zone shear-resistance requirements if properly designed (Wilcoski et al. 2002). Techniques for reducing framing include 2-stud corners, 2-stud interior/exterior wall intersections, open and insulated headers, reduced studs around windows and doors, single top plates, locating windows to align with wall framing, and designing all framing components including roof, ceiling and floor joists, and wall studs on a two-foot module (see diagram next page).

"Prospective buyers walking these homes during construction notice the difference almost immediately.... Things "line up" and everything seems more "rational" because of that. The approach exudes quality."

Joe Lstiburek,
Building Science Corporation



This drawing shows many aspects of advanced framing, including alignment of wall, ceiling, and floor studs on a two-foot grid, which requires planning to implement but yields significant material savings since most sheet goods are sold in two-foot increments.

Key Lessons Learned

- Some change is better than no change. Builders may choose to implement advanced framing incrementally, or one change at a time.
- Successful implementation often requires thorough and repeated training of framing contractors.
- Using single top plates and 24-inch on-center stud spacing requires vertical alignment of framing members from roof rafter to wall framing to floor joists to adequately support structural load. This must be incorporated into the house plans.

REFERENCES

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