Advanced Framing

Overview

The majority of homes in King County are built using light weight wood framing, often referred to as "stick built." Advanced framing is a tried and tested approach to stick framing that allows you to do more with less – more performance with less wood. By using standardized dimensions and optimizing the layout and alignment of the joists, studs and trusses, you can build a structurally-sound, code-compliant building that uses less wood, takes less labor to build it, and leaves more space in the walls for insulation to save energy and keep you comfortable.

Definitions

Thermal bridging – Heat loss through the wall or roofs where wood studs or other materials cause breaks or reductions in the amount of insulation.

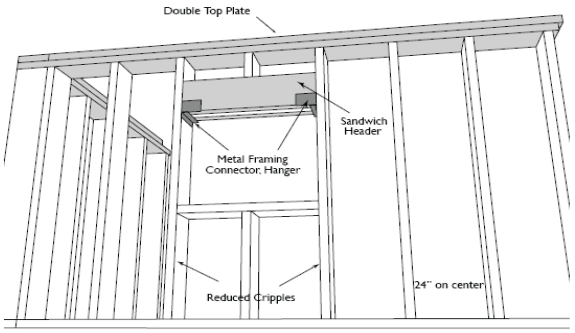
When is This Applicable?

Advanced framing is applicable to most one- and two- story buildings and additions. On taller buildings, it may be applicable for the top two stories only. The International Residential Building Code (IRC 2012 with amendments) includes standard, code-approved advanced framing options (Chapter 6 and Table R602.3 (5) for walls and Chapter 8 for ceilings and roofs). Use of advanced framing and other approaches may be permitted if designed by a structural engineer.

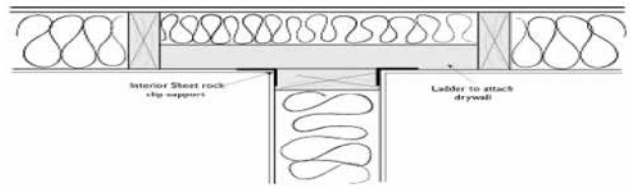
What Makes it Green?

Advanced framing is a win-win technique. It lowers construction cost, resource consumption, and pollution while contributing to a comfortable, more efficient home. Here are some reasons why.

- With fewer nails to pound and cuts to make, framers experienced with advanced framing find it saves time and money and reduces waste.
- With wider spacing between studs, and different stud layouts at openings, corners and wall intersections, and features like raised heel trusses, advanced framing allows more insulation in the walls and ceiling and reduces thermal bridging.



Suggested approaches to advanced framing. The double top plate is only needed if you are not stacking. Source: Olympia Master Builders Built Green® Field Guide.



Ladder blocking at wall intersections accommodates insulation of exterior wall.
Source: Olympia Master Builders Built Green® Field Guide.

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- This increase in insulation and reduced thermal bridging means the walls and ceiling have a more even temperature across the surface to help make your house more comfortable and efficient.
- Reduced energy use for heating reduces environmental impacts and air pollution from producing power or burning fossil fuels.
- There are related requirements for Northwest ENERGY STAR Homes and there are many points available in the Built Green checklist for using advanced framing practices. In both Built Green and LEED for Homes, these practices contribute to better predicted energy performance which earns more points.

Best Practices

There are many key elements of advanced framing that provide benefits; the more elements you include, the more benefits you will achieve.

- Design on 24" or 48" modules.
- Switch stud, joist, and rafter spacing from 16" to 24".
- Prioritize simple forms and standard dimensions over complex forms and irregular dimensions.
- Align openings with at least one edge of a 24" module.
- Design wall heights and eaves to accommodate full depth ceiling insulation.
- Work with a WA State licensed engineer to make an Advanced Framing plan.
- Keep studs, floor joists, and roof trusses in line vertically – called stacking. In some construction, a single top plate may be used with stacked framing.
- Minimize framing around doors and windows by using metal hangers.
- Use open corners to provide space for additional insulation.
- Use flat-stud or ladder blocked intersections to allow full insulation.
- Create headers by "sandwiching" foam insulation between plywood and small framing members.
- Include raised heel height requirements in your roof truss order (cost premium should be minimal if any) and specify R49 instead of R38 ceiling insulation.

Be sure to use sheathing and drywall that is rated for a 24" span. Having fewer studs in contact with wall planes actually reduces risk of deflection due to warped or crowned studs. While some flexible siding materials may bow more over the longer span if not supported by a rigid backer, there are decades of examples of successful advanced framed homes with long-lasting benefits.

Go Further: To enhance the green benefits of advanced framing, source sustainably-harvested wood such as that certified through the Forest Stewardship Council (FSC) – see Resources for more information.

Applicable References/Standards

King County DPER documents:

Chapters 6 and 8 of the King County Residential code (IRC 2012 with amendments) describe the prescriptive options for advanced framing.

2012 Washington State Energy Code: Section 402 in particular describes framing and the thermal value of wall assemblies.

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Resources

For the complete King County Green Building Handbook and individual Green Sheet PDF files, please visit our website at: http://kingcounty.gov/property/permits/publications/greenbuild.aspx. For additional information, please email dperwebinquiries@kingcounty.gov or call 206-296-6600.

See these related DPER Green Sheets (GS):

- Air Sealing, GSNumber 10
- Insulation , GSNumber 13
- Right Sizing Heating/Cooling Systems, GS Number 17

Additional fact sheets about Advanced Framing include the Department of Energy Advanced Framing Fact Sheet**,** Seattle Department of Planning and Development Tip 341 Advanced Framing**,** and Bellingham's Advanced Methods and Materials AMM400.

The Future of Framing is Here: An article by Joe Lstiburek that appeared in Fine Homebuilding, October/November 2005.

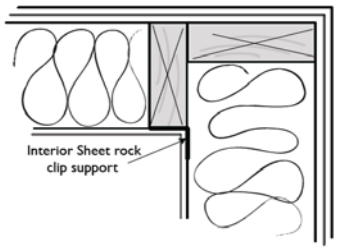
Forest Stewardship Council**:** Promoting environmentally appropriate, socially beneficial, and economically viable management of the world's forests.

Other resources:

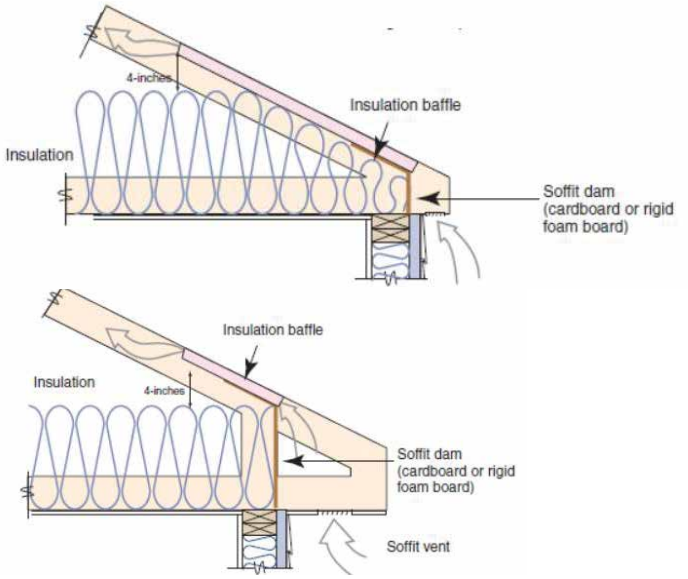
- APAwood.org (advanced framing guide)
- GreenAdvisor.com (pros and cons)

Permit Tips

Be sure to include framing details on your plans and clearly call out the advanced framing techniques. DPER will review the building plan to verify advanced framing code compliance and inspect the advanced framing techniques during an onsite framing inspection.



These stud arrangements enable insulation to be fit into the full depth of the corner with minimal framing. Photo shows a nailer for drywall, drawings shows clip placements. *Photo source: O'Brien & Company. Diagram from the Olympia Master Builders Built Green® Field Guide.*



Standard trusses (top) do not allow for full depth insulation at the exterior, whereas raised heel trusses (above) allow for full dept insulation. *From* https://basc.pnnl.gov/resource-guides/attic-eave-minimum-insulation#block-views-guide-static-blocks-block-2

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TABLE R 602.3(5) SIZE, HEIGHT AND SPACING OF WOOD STUDS

Stud Size (Inches)	Bearing Walls					Nonbearing Walls	
	Laterally unsupported stud height (feet)	Maximum spacing when supporting a roof-ceiling assembly or a habitable attic assembly, only (inches)	Maximum spacing when supporting one floor, plus a roof-ceiling assembly or a habitable attic assembly (inches)	Maximum spacing when supporting two floors, plus a roof-ceiling assembly or a habitable attic assembly (inches)	Maximum spacing when supporting one floor height[a] (inches)	Laterally unsupported stud heighta (feet)	Maximum spacing (inches)
							
2 X 3[b]	-	-	-	-	-	10	16
2 x 4	10	24[c]	16[c]	-	24	14	24
3 x 4	10	24	24	16	24	14	24
2 X 5	10	24	24	-	24	16	24
2 X 6	10	24	24	16	24	20	24

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 square foot = 0.093 m2.

a. Listed heights are distances between points of lateral support placed perpendicular to the plane of the wall. Increases in unsupported height are permitted where justified by analysis.

b. Shall not be used in exterior walls.

c. A habitable attic assembly supported by 2 x 4 studs is limited to a roof span of 32 feet. Where the roof span exceeds 32 feet, the wall studs shall be increased to 2 x 6 or the studs shall be designed in accordance with accepted engineering practice.