R-1: Wall Framing (R402.2.3)

Summary: Require wood-frame walls achieving compliance via the R-value table (Table R402.1.2) to use 24-in o.c. framing if the required insulation level and chosen insulation type would result in 2x6 framing. This proposal encourages one major element of advanced framing, a well-known and proven concept which aims to minimize the thermal bridging of wood framing members in walls. Where 24-in o.c. framing is possible, its initial cost is generally lower than that of standard framing. Where it cannot be used (e.g., for structural reasons), the U-factor table, which is not modified by this proposal, allows flexibility.

DOE proposal R-1 was revised on December 18, 2015.

Stakeholder Feedback: There were six public comments received for proposal R-1. Comments are summarized below, followed by a DOE review:

- Three comments expressing general support.
- One comment suggesting that merely making framing members thicker (2x6 vs 2x4) is not a smart approach.
  
  Review: The proposal does not promote thicker framing members (where they are not otherwise necessary) but requires wider stud spacing when framing members are thicker. The proposal has been modified to clarify the language.

- Two comments expressing concerns about enforceability and confusion from the use of the term "advanced framing," which has a more complex definition outside the code.
  
  Review: The proposal has been modified to eliminate the term "advanced framing" and to clarify what is meant by spacing studs at 24" o.c.

- One comment suggesting that the energy savings from this proposal is too small to justify the complexity of the change.
  
  Review: While the savings of this change are relatively small (about ¼ of 1% of IECC-regulated end uses), the proposed change will encourage builders to investigate and adopt advanced framing concepts, which go beyond the simple stud spacing requirement of this proposal.

- One comment noting that this proposal would apply a minimum stud spacing requirement, which could cause conflict with the IRC, where structural strength of walls is regulated against a maximum spacing requirement.
  
  Review: The proposal has been modified to eliminate any changes to the U-factor table, making the wider stud spacing applicable only if a builder opts for the R-value compliance approach. If there is any conflict with structural requirements, the U-factor alternative can be used exactly as before.

In response to these comments, DOE has revised the proposal as follows:

- The term "advanced framing" has been eliminated. Instead, an explicit definition of 24" o.c. framing is given in the text of the requirement. Text requiring insulation in header cavities was eliminated because such is already required elsewhere in the IECC (Table R402.4.1.1). Other wording changes were made to clarify the text.

- Changes to the U-factor table have been eliminated. Thus the proposal encourages wider spaced framing for homes complying via the simple R-value approach, but the U-factor approach remains unchanged and can be used if there is any conflict with the IRC’s structural requirements.
IECC PROPOSAL:

Add new Section R402.2.3 as follows and renumber subsequent sections:

R402.2.3 Wood frame wall stud spacing. Where Section R402.1.2 and Table R402.1.2 would require 2x6 or larger framing members in exterior above-grade walls spacing of studs shall be not less than 24 inches on-center.

Exceptions:

1. Framing members shall be permitted to be closer than 24 inches on-center at doors, windows, wall junctions, and other wall elements requiring additional framing members for structural purposes.
2. Walls in low-rise multifamily residential buildings shall not be required to use 24-inch o.c. framing.

Reason. This proposal promotes the use of wider stud spacing where structurally feasible, to reduce the thermal bridging in exterior walls, improve energy efficiency, reduce wood resource consumption, and lower builder costs. This technique is often cited as the primary element of systems referred to as “advanced framing” or “optimum value engineering.” These techniques have been known and used for many decades and have become popular in beyond-code programs, such as Building America, where thousands of homes have exploited advanced framing concepts for their cost-effectiveness, and have been proven to be structurally sound (in many/most homes) and energy efficient. This proposal would encourage the use of such techniques by requiring that buildings complying via the simple R-value table (R402.1.2) utilize the most common element of advanced framing in walls that would require 2x6 (or larger) framing members to accommodate the required insulation level. Thus, the proposal would primarily impact homes in colder climates where improved wall U-factor has the greatest benefit. Where advanced framing techniques cannot be used for structural reasons, builders would have the option of using the U-factor approach (Table R402.1.4), which is unchanged by this proposal.

Advanced wall framing techniques have been demonstrated and encouraged through DOE’s Building America program as well as other beyond-code programs for many years. These programs as well as industry groups have raised awareness of the techniques and proved their viability as a preferred approach.

Energy Savings: PNNL conducted an energy analysis of advanced wall framing assuming the framing members are spaced 24 inches on center instead of 16 inches on center. The wider stud spacing results in a lower wall framing fraction of 22% for the 24-inch spacing compared to the 25% wall framing fraction typical of the traditional 16 inch spacing. The corresponding improvement in the wall U-factor results in up to 0.25% energy cost savings of IECC-regulated end-uses (heating, cooling, lighting and water heating).

The U.S. Department of Energy (DOE) develops its proposals through a public process to ensure transparency, objectivity and consistency in DOE-proposed code changes. Energy savings and cost impacts are assessed based on established methods and reported for each proposal, as applicable. More information on the process utilized to develop the DOE proposals for the 2018 IECC can be found at: https://www.energycodes.gov/development/2018IECC.

Cost Impact. Advanced wall framing as defined here involves increasing the spacing between the wooden studs, thus reducing the framing area and as a result improving the U-factor of the wall. Because spacing the framing members in such a manner reduces material and labor costs, 24” o.c. wall framing is always expected to be cost-

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3. http://www.builderonline.com/building/building-science/5-ways-to-build-better-homes-for-less-money_o
effective when it is otherwise a feasible construction option. When 24" o.c. wall framing is not feasible due to structural or other design constraints, builders may use Section 402.1.4 (U-factor alternative).

Cost-effectiveness: Because advanced framing as defined in this proposal reduces first costs and improves energy efficiency, the proposed change is cost-effective.