BBS MEMO

Ohio Board of Building Standards July 3, 2013 6606 Tussing Road, P.O. Box 4009,
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Use of the Raised-Heel Truss to meet Residential Energy Conservation Requirements

Many of us may remember, back in the mid 1970's and through the 1990's, that residential model energy codes were more complicated than they are today. For example, there were no prescriptive tables that would allow a builder to simply look up the required ceiling R-value for a given type of assembly and there were no free software tools such as REScheck that perform these calculations for the designer. Instead, there were graphs that identified a required combined thermal transmittance value, U_o, for a given assembly based upon heating degree days. This required complicated heat loss calculations to be performed that accounted for the areas and the thermal transmittance of the individual assembly components. To simplify compliance for the builders and code officials in our state, starting in 1981, the Board of Building Standards adopted a unique Ohio prescriptive option that simply prescribed R-values for the various building components.

Looking back through Ohio residential prescriptive energy code history, one might notice that the prescriptive ceiling/roof/attic insulation R-values applicable to Ohio zones have ranged over the last 3 decades from approximately R-30 to the current value of R-49 found in the Ohio Home Builder's Association (OHBA) alternative option. As required insulation values rise in response to changing energy policies, the space needed to accommodate the insulation increases. Accordingly, the typical methods of construction have changed over the years.

Ceiling/roof/attic areas are often constructed using rafters or standard triangular-shaped trusses. When using rafters or standard trusses to construct sloped roofs, a concealed attic space is often created that is an ideal place for the installation of required insulation. As the roof slopes down toward the eaves, however, the height of the attic space tapers down to a height of just a few inches. The only way to get batt-type insulation in that tapered space is to compress it, resulting in an R-value that is less than the R-value reached when the insulation is not compressed. As a result, when using typical rafter or standard truss construction, insulation values differ from the peak down to the eaves. The disadvantage of this construction is that very little, if any, insulation R-value is over the top plate of the exterior wall and at the eaves, resulting in energy losses and possibly ice damming at this location. (Refer to Figure 1)

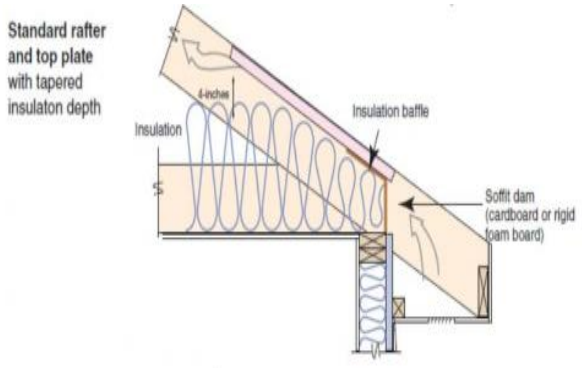

FIGURE 1

Realizing this shortfall in traditional methods of construction, designers developed other unique methods of framing, perhaps the most popular being a raised-heel truss (also known as an "energy truss", a "raised truss", an "Arkansas truss", or advanced framing). This type of framing enables the insulation to be installed to its full height from the peak of the roof, over the top plate of the exterior walls, and all the way to the eaves without having to be compressed to fit. The obvious advantage of this method of construction is that you can achieve a uniform R-value across the ceiling/roof/attic assembly resulting in more accurate heat loss calculations and less energy loss. (Refer to Figure 2)

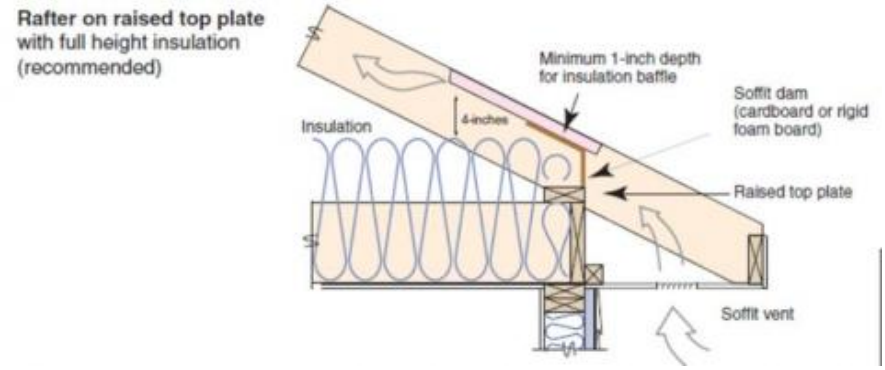

FIGURE 2

Since the 1998 edition of the International Energy Conservation Code (IECC), the model code has recognized this advantage and allowed a relaxation of the ceiling/roof/attic prescriptive R-value requirements for roof framing that allows the insulation, without being compressed, to cover the top plate of the exterior walls. When the builder chooses to use a raised-heel truss or similar method of construction, the Residential Code of Ohio (RCO Section 1102.2.1 and IECC Section 402.2.1) now allows the ceiling R-value to be reduced from R-38 to R-30 when using the RCO Table 1102.1 and the IECC Table 402.1.1, respectively. Similarly, when using the OHBA option, the code (RCO Section 1105.2.2.1) allows the required ceiling R-value to be reduced from R-49 to R-38 if the builder chooses to use a raised-heel truss or similar method of construction and if the R-38 insulation is uncompressed, is installed uniformly across the ceiling, and covers the top plate of the exterior wall. Please note that this is the builder's option. **The code official does not have the authority to require a raised-heel truss.** Either the builder insulates to the higher value or chooses to use a raised-heel truss (or possibly some other method of framing or type of insulation which allows the full height of uncompressed insulation over the exterior wall top plate) to get the credit to insulate to the lesser value.

As mentioned in the 2009 IECC Commentary provided to all building departments, when using rafters or a standard type truss, it is assumed that the insulation will be compressed toward the eaves and requires a higher R-value to make up for the lack of insulation over the wall plate and at the eaves. For example, if using the OHBA option, the R-49 is allowed to be at full depth at the roof peak and compressed to taper down at the eaves. There is no need to add additional types of insulation to achieve a uniform value of R-49 across the ceiling.

If you have further questions regarding this issue, please call the Board's office at 614-644-2613 or E-mail to dic.bbs@com.state.oh.us.