3.3.3 Radiant Barriers

Radiant Barrier Requirements

§151(f)2

The prescriptive requirements call for a radiant barrier in climate zones with significant cooling loads (2, 4, and 8 through 15). The radiant barrier is a reflective material that reduces radiant heat transfer caused by solar heat gain in the roof. Radiant barriers reduce the radiant gain to air distribution ducts and insulation located below the radiant barrier. In the performance approach, radiant barriers are modeled as separate adjustments to the heating U-factor and the cooling U-factor. The duct efficiency is also affected by the presence of a radiant barrier, with the performance approach.

Radiant Barrier Construction Practice

To qualify, a radiant barrier must have an emittance of 0.05 or less. The product must be tested according to ASTM C-1371-98 or ASTM E408-71(2002) and must be certified by the Department of Consumer Affairs[2]. Radiant barriers must also meet installation criteria as specified in Section 4.2.1 of the *Residential ACM Manual* (Section 4.2.1 is also reproduced in Appendix D of this document).

The most common way of meeting the radiant barrier requirement is to use roof sheathing that has a radiant barrier bonded to it in the factory. Oriented strand board (OSB) is the most common material available with a factory-applied radiant barrier. The sheathing is installed with the radiant barrier (shiny side) facing down toward the attic space. Alternatively, a radiant barrier material that meets the same ASTM test and moisture perforation requirements that apply to factory-laminated foil can be field-laminated. Field lamination must use a secure mechanical means of holding the foil to the bottom of the roof decking such as staples or nails that do not penetrate all the way through the roof deck material.

Other acceptable methods are to drape a foil type radiant barrier over the top of the top chords before the sheathing is installed, stapling the radiant barrier between the top chords after the sheathing is installed, and stapling the radiant barrier to the underside of the truss/rafters (top chord). For these installation methods, the foil must be installed with spacing requirements as described in Section 4.2.1 of the *Residential ACM Manual*. . The minimum spacing requirements do not apply to this installation since it is considered a “laminated” system.

Installation of radiant barriers is somewhat more challenging in the case of closed rafter spaces when sheathing is installed that does not include a laminated foil. Foil may be field-laminated after the sheathing has been installed by “laminating” the foil as described above to the roof sheathing between framing members. This construction type is described in the Residential ACM Manual, Section 4.2.1.

See Figure 3-12 for drawings of radiant barrier installation methods.

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[2] Certification of radiant barriers is required by CCR, Title 24, Part 12, Chapter 12-13, Standards for Insulating Material.

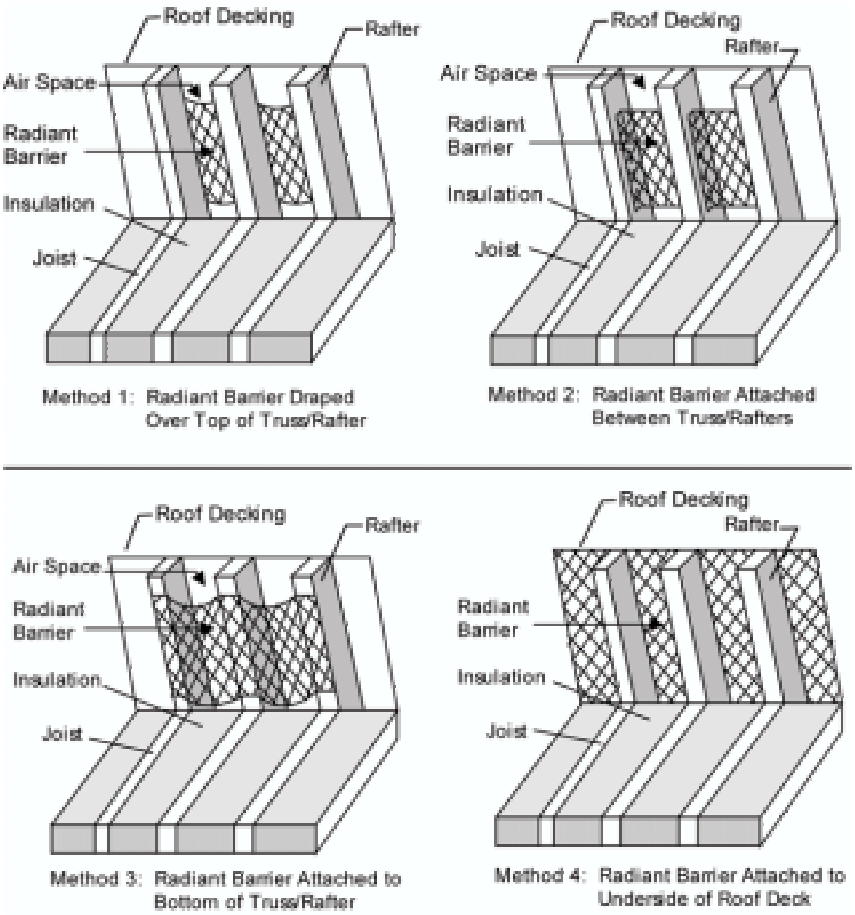

Figure 3-12 – Methods of Installation for Radiant Barriers

3.3.4 Wall Insulation

Mandatory Measures

§150(c)

The mandatory measures require that wood-framed walls above grade have at least R-13 insulation installed in the cavities between the framing members. However, the prescriptive measures for Alternative Component Package C requires more insulation than the minimum requirements in all climate zones. Likewise, Alternative Component Package D requires more insulation than the minimum requirements in climate zones 1 and 11 through 16.

Wall constructions with insulation that is not penetrated by framing members, or with metal framing, comply with this mandatory measure if they have a U-factor lower than 0.102, which is the U-factor of a wood-framed wall with R-13 insulation. Entry A3 in Table IV.9 in Joint Appendix IV is the basis for the U-factor criterion.

Insulation may be of greater insulating value in certain areas of the wall and of lesser insulating value in other areas of the wall provided that the area-weighted U-factor does not exceed 0.102 to show equivalence to an R-13 wall.

There are several cases where the mandatory measures for wall insulation do not apply or apply in a special way. These include the following:

- The mandatory measures apply to framed foundation walls of heated basements or heated crawl spaces that are located above grade, but not to the portion that is located below grade.
- Existing wood-framed walls of an addition that are already insulated with R-11 insulation need not comply with the mandatory R-13 wall insulation, but this exception applies only with the performance method. See Exception 1 to §152(a).
- Rim joists between the stories of a multi-story building are deemed to comply with these mandatory measures if they have R-13 insulation installed on the inside of the rim joist and carefully fitted between the joists.

Prescriptive Requirements – Framed Walls

§151(f)1.A.

The Package D prescriptive requirements (Standards Table 151-C, also in Figure 3-13 below and Appendix B of this document) call for R-19 wall insulation in climate zones 11 through 13 and R-21 wall insulation in climate zones 1 and 14 through 16. R-13 insulation is required in other climate zones. The Package C requirements call for significantly more insulation (see Standards Table 151-B, also in Appendix B of this document).

Wood-framed walls may comply by specifying and installing the minimum R-value indicated. For metal-framed walls, or as an alternative to meeting the installed R-value in wood-framed walls, the designer may choose any wall construction from Joint Appendix IV that has a U-factor equal to or less than the U-factor of a wood-framed wall with the required insulation.

For climates where R-13 is required, the maximum U-factor is 0.102 (Joint Appendix Table IV.9, entry A3). For climates where R-19 is required, the maximum U-factor is 0.074 (IV.9, A5). In climates where R-21 is required, the maximum U-factor is 0.069 (IV.9, A6).

Metal-framed assemblies will require rigid insulation in order to meet the maximum U-factor criteria. U-factors for metal-framed walls are given in Joint Appendix Table IV.11.