Revised thermal insulation requirements

by **Mark S. Graham**

In 1999, the American Society for Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Inc. updated its Standard 90.1, "Energy Standard for Buildings Except Low-Rise Residential Buildings." The standard, which currently is in the process of being incorporated into state energy and building codes, provides updated minimum energy-efficiency guidelines for building components, including roof assemblies.

ASHRAE 90.1-89, the standard's 1989 edition, is the technical basis for buildings' minimum insulation requirements found in the Energy Policy Act of 1992. As a result, the standard has been adopted by many states and building code jurisdictions as the criteria for defining buildings' minimum thermal insulation requirements.

Revisions

ASHRAE 90.1-99 contains numerous improvements from the 1989 version, including enhancements in efficiency levels; an expanded scope to include existing buildings; expanded climatic data; simplification of efficiency requirements; and availability in English and metric units.

The standard should help achieve greater energy savings for building owners. For example, when the standard is applied to conventional office and retail buildings, ASHRAE claims it should result in site energy savings of about 16 percent and source energy savings of about 20 percent above the previous edition.

Users of the updated standard will notice that instead of the relatively complex formulas used in ASHRAE 90.1-89, minimum thermal insulation requirements for roof assemblies can be determined by using tables in ASHRAE 90.1-99.

Thermal insulation criteria for roof assemblies are provided in Section 5.3.1.1—Roof Insulation. Separate criteria are provided for "roofs with insulation entirely above deck," "metal building roofs" and "attics and other roofs." Minimum insulation requirements for roof assemblies meeting any of these criteria are provided in Table 5.3—Building Envelope Requirements. Values for assembly maximum U-value and insulation minimum R-value also are provided.

Data for Table 5.3 are derived from appropriate tables in Normative Appendix B—Building Envelope Requirements. This appendix contains 26 tables providing U- and R-value requirements based on climatic data—ranges of heating degree-days base 65 F (18 C) (HDD65) and cooling degree-days base 50 F (10 C) (CDD50) variables. Specific HDD65 and CDD50 data for 876 U.S. and international cities are provided in Tables D-1, D-2 and D-3.

ASHRAE intends for authorities that adopt ASHRAE 90.1-99 to provide specific values in Table 5.3 derived from Normative Appendix B and Tables D-1, D-2 and D-3 for use in their jurisdictions. If jurisdictions properly adopt ASHRAE 90.1-99 and complete Table 5.3, construction industry professionals need only refer to Table 5.3 to determine minimum insulation requirements.

Roof reflectivity

ASHRAE 90.1-99 provides limited criteria for allowing reductions in required amounts of thermal insulation for buildings with reflective roof surfaces. An exception contained in Section 5.3.1.1 of the standard allows the required roof assembly thermal insulation amount derived from Table 5.3 to be decreased when roof surfaces have minimum total solar reflectances of 0.70 and minimum thermal emittances of 0.75. These values are representative of highly reflective roof surfaces.

Specific amounts of allowable thermal insulation reductions as results of qualifying roof reflectivity are determined using roof U-value multipliers provided in Table 5.3.1.1B. These multipliers range from 0.77 to 1.0 based on the applicable HDD65 value.

For HDD65 values greater than 3,600, no reduction is allowed in required thermal insulation amounts. HDD65 values less than 3,600 are representative of some Southern climates.

Closing thoughts

Your state energy and local building code jurisdictions may adopt ASHRAE 90.1-99—the standard already has been adopted in the 2001 version of the *International Energy Conservation Code.*

Users of ASHRAE 90.1-99 likely will find the standard easier to use, and using the standard may result in different required thermal insulation amounts for roof assemblies than the previous edition.

Mark S. Graham is NRCA's associate executive director of technical services.

