

ANSI/ASHRAE Addendum a to  
ANSI/ASHRAE Standard 90.2-2001



# ASHRAE<sup>®</sup> STANDARD

## Energy-Efficient Design of Low-Rise Residential Buildings

Approved by the ASHRAE Standards Committee on June 28, 2003; by the ASHRAE Board of Directors on July 3, 2003; and by the American National Standards Institute on September 25, 2003.

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ASHRAE obtains consensus through participation of its national and international members, associated societies, and public review.

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## FOREWORD

ANSI/ASHRAE Standard 90.2-1993, Energy Efficient Design of New Low-Rise Residential Buildings, was approved in 1993. A complex fenestration load change equation was included in the standard and was required to be used for determining compliance when glass area exceeded 125 ft<sup>2</sup>. A number of objections were raised concerning this equation. To assist the user in determining compliance for buildings with greater fenestration, a simple set of prescriptive requirements has been developed and is proposed in this addendum.

The prescriptive requirements in this addendum were derived under the following conditions: to not exceed the energy use requirements for a residence built in accordance to the requirements of Standard 90.2-1993 with 18% fenestration area (conditioned floor space) equally oriented in each cardinal direction. The load change equation in 90.2-1993 was used to determine energy requirements.

The model used to determine that the energy needs were not exceeded had the following fenestration distribution: 53% west, 26% east, 10.5% north, and 10.5% south.

The model was evaluated for energy consumption in the following 12 U.S. cities: Atlanta, GA; Baltimore, MD; Boston, MA; Dallas, TX; Denver, CO; Los Angeles, CA; Lewiston, ID; Madison, WI; Miami, FL; New York, NY; Phoenix, AZ; and Burlington, VT.

## BSR/ASHRAE ADDENDUM a to 90.2-2001

*Delete Section 5.3.9.1 and replace as indicated below. Note that a new Table 5-4 has been inserted (see the last page of this draft) and all subsequent existing tables in Section 5 have been renumbered.*

**5.3.9.1 Thermal Transmittance Requirements.** Fenestration shall meet the thermal transmittance requirements described in Sections 5.3.9.1.1, 5.3.9.1.2, or 5.3.9.1.3.

**5.3.9.1.1** If the fenestration area is equal to or less than 15% of the conditioned floor area, or is 125 ft<sup>2</sup> or less, then the fenestration shall meet the thermal transmittance requirements shown in Figure 5-15 A/B.

**5.3.9.1.2** If the fenestration area exceeds 15% but is less than or equal to 21% of the conditioned floor area and the skylight area does not exceed 5% of the total fenestration area, then the fenestration shall meet the thermal transmittance requirements shown in Table 5-4.

**5.3.9.1.3** The requirements in Section 5.9 or Section 8 shall be applied when

- a. the fenestration area exceeds 21% of the conditioned floor area,
- b. the fenestration U-factor exceeds the U-factor requirements of Sections 5.3.9.1.1 or 5.3.9.1.2, as applicable, or
- c. the fenestration area exceeds 15% of the conditioned floor area, and the skylight area exceeds 5% of the total fenestration area.

*Delete 5.3.9.2 and replace as indicated below.*

**5.3.9.2 Shading Coefficient Requirements.** Fenestration, when combined with the standard window treatment, shall meet the shading coefficient requirements in Sections 5.3.9.2.1, 5.3.9.2.2, or 5.3.9.2.3.

**5.3.9.2.1** If the fenestration area is equal to or less than 15% of the conditioned floor area or is 125 ft<sup>2</sup> or less, then fenestration, when combined with the standard window treatment, shall meet the shading coefficient requirements shown in Figure 5-16 A/B.

**5.3.9.2.2** If the fenestration area exceeds 15% but is less than or equal to 21% of the conditioned floor area and the skylight area does not exceed 5% of the total fenestration area, then fenestration, when combined with the standard window treatment, shall meet the shading coefficient requirements in Table 5-4.

**5.3.9.2.3** The requirements in Section 5.9 or Section 8 shall be applied when

- a. the fenestration area exceeds 21% of the conditioned floor area,
- b. the fenestration shading coefficient exceeds the shading coefficient requirements of Sections 5.3.9.2.1 or 5.3.9.2.2, as applicable, or
- c. the fenestration area exceeds 15% of the conditioned floor area, and the skylight area exceeds 5% of the total fenestration area.

*Delete 5.3.9.3 and 5.3.9.4 without substitution.*

*Change 5.3.10 as indicated below.*

**5.3.10 Single-Family House Requirements Above 10,000 HDD65.** The requirements in Table 5-2 shall be used for locations with HDD65 greater than 10,000. The U-factor and SC requirements in Table 5-2 are applicable to those buildings where the fenestration area is less than or equal to 15% of the conditioned floor area. When the fenestration area exceeds 15% of the conditioned floor area, Sections 5.3.10.1, 5.3.10.2, or 5.3.10.3 shall apply.

**5.3.10.1** If the fenestration area exceeds 15% but is less than or equal to 18% of the conditioned floor area and the skylight area does not exceed 5% of the total fenestration area, then the fenestration U-factor shall not exceed 0.33.

**5.3.10.2** If the fenestration area exceeds 18% but is less than or equal to 21% of the conditioned floor area and the skylight area does not exceed 5% of the total fenestration area, then the fenestration U-factor shall not exceed 0.29.

**5.3.10.3** The requirements in Section 5.9 or Section 8 shall be applied when

- a. the fenestration area exceeds 21% of the conditioned floor area,
- b. the fenestration U-factor exceeds the U-factor required under Sections 5.3.10.1 or 5.3.10.2, as applicable, or
- c. the fenestration area exceeds 15% of the conditioned floor area, and the skylight area exceeds 5% of the total fenestration area.

*Delete 5.5.9.1 and replace as indicated below.*

**5.5.9.1 Thermal Transmittance Requirements.** Fenestration shall meet the thermal transmittance requirements shown in Sections 5.5.9.1.1, 5.5.9.1.2, or 5.5.9.1.3.

**5.5.9.1.1** If the fenestration area is less than or equal to 15% of the conditioned floor area or is 125 ft<sup>2</sup> or less, then the fenestration shall meet the thermal transmittance requirements shown in Figure 5-35.

**5.5.9.1.2** If the fenestration area exceeds 15% but is less than or equal to 21% of the conditioned floor area and the skylight area does not exceed 5% of the total fenestration area, then the fenestration shall meet the thermal transmittance requirements shown in Table 5-4.

**5.5.9.1.3** The requirements in Section 5.9 or Section 8 shall be applied when

- a. the fenestration area exceeds 21% of the conditioned floor area,
- b. the fenestration U-factor exceeds the U-factor requirements of Sections 5.5.9.1.1 or 5.5.9.1.2, as applicable, or
- c. the fenestration area exceeds 15% of the conditioned floor area, and the skylight area exceeds 5% of the total fenestration area.

*Delete 5.5.9.2 and replace as indicated below.*

**5.3.9.2 Shading Coefficient Requirements.** Fenestration, when combined with the standard window treatment, shall meet the shading coefficient requirements in Sections 5.5.9.2.1, 5.5.9.2.2, or 5.5.9.2.3.

**5.3.9.2.1** If the fenestration area is equal to or less than 15% of the conditioned floor area or is 125 ft<sup>2</sup> or less, then fenestration, when combined with the standard window treatment, shall meet the shading coefficient requirements shown in Figure 5-36.

**5.3.9.2.2** If the fenestration area exceeds 15% but is less than or equal to 21% of the conditioned floor area and the skylight area does not exceed 5% of the total fenestration area, then fenestration, when combined with the standard window treatment, shall meet the shading coefficient requirements in Table 5-4.

**5.3.9.2.3** The requirements in Section 5.9 or Section 8 shall be applied when

- a. the fenestration area exceeds 21% of the conditioned floor area,
- b. the fenestration shading coefficient exceeds the shading coefficient requirements of Sections 5.5.9.2.1 or 5.5.9.2.2, as applicable, or
- c. the fenestration area exceeds 15% of the conditioned floor area, and the skylight area exceeds 5% of the total fenestration area.

*Delete 5.5.9.3 and 5.5.9.4 without substitution.*

*Change 5.5.10 as indicated below.*

*Note: Table 5-6 referenced below is Table 5-5 in the published standard. Renumbering of Tables 5-4 through the end of Section 5 resulted from the addition of a new table, Table 5-4 as shown in this addendum.*

**5.5.10 Multifamily Structure Requirements Above 10,000 HDD65.** The requirements in Table 5-5 shall be used for locations with HDD65 greater than 10,000. The U-factor and SC requirements in Table 5-6 are applicable to those buildings where the fenestration area is less than or equal to 15% of the conditioned floor area. When the fenestration area exceeds 15% of the conditioned floor area, then Sections 5.5.10.1, 5.5.10.2, or 5.5.10.3 shall apply.

**5.5.10.1** If the fenestration area exceeds 15% but is less than or equal to 18% of the conditioned floor area and the skylight area does not exceed 5% of the total fenestration area, then the fenestration U-factor shall not exceed 0.33.

**5.5.10.2** If the fenestration area exceeds 18% but is less than or equal to 21% of the conditioned floor area and the skylight area does not exceed 5% of the total fenestration area, then the fenestration U-factor shall not exceed 0.29.

**5.5.10.3** The requirements in Section 5.9 or Section 8 shall be applied when

- a. the fenestration area exceeds 21% of the conditioned floor area,
- b. the fenestration U-factor exceeds the U-factor required under Sections 5.5.10.1 or 5.5.10.2, as applicable, or
- c. the fenestration area exceeds 15% of the conditioned floor area, and the skylight area exceeds 5% of the total fenestration area.

Add a new Table 5-4 as follows and renumber existing tables in Section 5.

**TABLE 5-4  
Prescriptive Fenestration Requirements**

<b>U-Factor Requirements</b>		
Figure 5-15 A/B or Figure 5-35 Requirements	If fenestration area >15% and ≤18% of conditioned floor area	If fenestration area >18% and ≤21% of conditioned floor area
U = 1.31 U = 0.87 U = 0.49 U = 0.36	U = 1.31 U = 0.81 U = 0.44 U = 0.33	U = 0.87 U = 0.65 U = 0.41 U = 0.29
<b>Shading Coefficient Requirements</b>		
Figure 5-16 A/B or Figure 5-36 Requirements	If fenestration area >15% and ≤18% of conditioned floor area	If fenestration area >18% and ≤21% of conditioned floor area
SC = 0.70 SC = 0.50	SC = 0.70 <sup>1</sup> SC = 0.50 <sup>2</sup>	SC = 0.70 <sup>1</sup> SC = 0.50 <sup>2</sup>

<sup>1</sup> If the required U = 1.31 (based on Figure 5-15 A/B or Figure 5-35), then SC = 0.63.

<sup>2</sup> If the required U = 1.31 (based on Figure 5-15 A/B or Figure 5-35), then SC = 0.43.

To use this table:

Step 1: Find the U-factor and shading coefficient (SC) from Figures 5-15 A/B or 5-35 and Figures 5-16 A/B or 5-36, respectively, based on the specified HDD and CDH.

Step 2: Find the row in the column labeled “Figure 5-15 A/B or Figure 5-35” and “Figure 5-16 A/B or Figure 5-36” for the U-factor and SC, respectively.

Step 3: Using the row in Step 2, determine the required U-factor and SC based on that row and the value in the column corresponding to the proposed area of fenestration unit in the proposed design.

## **POLICY STATEMENT DEFINING ASHRAE'S CONCERN FOR THE ENVIRONMENTAL IMPACT OF ITS ACTIVITIES**

ASHRAE is concerned with the impact of its members' activities on both the indoor and outdoor environment. ASHRAE's members will strive to minimize any possible deleterious effect on the indoor and outdoor environment of the systems and components in their responsibility while maximizing the beneficial effects these systems provide, consistent with accepted standards and the practical state of the art.

ASHRAE's short-range goal is to ensure that the systems and components within its scope do not impact the indoor and outdoor environment to a greater extent than specified by the standards and guidelines as established by itself and other responsible bodies.

As an ongoing goal, ASHRAE will, through its Standards Committee and extensive technical committee structure, continue to generate up-to-date standards and guidelines where appropriate and adopt, recommend, and promote those new and revised standards developed by other responsible organizations.

Through its Handbook, appropriate chapters will contain up-to-date standards and design considerations as the material is systematically revised.

ASHRAE will take the lead with respect to dissemination of environmental information of its primary interest and will seek out and disseminate information from other responsible organizations that is pertinent, as guides to updating standards and guidelines.

The effects of the design and selection of equipment and systems will be considered within the scope of the system's intended use and expected misuse. The disposal of hazardous materials, if any, will also be considered.

ASHRAE's primary concern for environmental impact will be at the site where equipment within ASHRAE's scope operates. However, energy source selection and the possible environmental impact due to the energy source and energy transportation will be considered where possible. Recommendations concerning energy source selection should be made by its members.