ANSI/ASHRAE Addendum *h* to
ANSI/ASHRAE Standard 90.2-2001

ASHRAE® STANDARD

Energy-Efficient Design of Low-Rise Residential Buildings

Approved by the ASHRAE Standards Committee on May 10, 2004; by the ASHRAE Board of Directors on July 1, 2004; and by the American National Standards Institute on August 5, 2004.

This standard is under continuous maintenance by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the standard. The change submittal form, instructions, and deadlines are given at the back of this document and may be obtained in electronic form from ASHRAE's Internet Home Page, *http://www.ashrae.org*, or in paper form from the Manager of Standards. The latest edition of an ASHRAE Standard and printed copies of a public review draft may be purchased from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: *orders@ashrae.org*. Fax: 404-321-5478. Telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in U.S. and Canada).

ISSN 1041-2336

Approved American National Standard
ANSI

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS, INC.
1791 Tullie Circle, NE • Atlanta, GA 30329

SPECIAL NOTE

This American National Standard (ANS) is a national voluntary consensus standard developed under the auspices of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). Consensus is defined by the American National Standards Institute (ANSI), of which ASHRAE is a member and which has approved this standard as an ANS, as "substantial agreement reached by directly and materially affected interest categories. This signifies the concurrence of more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that an effort be made toward their resolution." Compliance with this standard is voluntary until and unless a legal jurisdiction makes compliance mandatory through legislation.

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

ASHRAE Standards are prepared by a Project Committee appointed specifically for the purpose of writing the Standard. The Project Committee Chair and Vice-Chair must be members of ASHRAE; while other committee members may or may not be ASHRAE members, all must be technically qualified in the subject area of the Standard. Every effort is made to balance the concerned interests on all Project Committees.

The Manager of Standards of ASHRAE should be contacted for:

a. interpretation of the contents of this Standard,
b. participation in the next review of the Standard,
c. offering constructive criticism for improving the Standard,
d. permission to reprint portions of the Standard.

(This foreword is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process.)

FOREWORD

This addendum applies to the changes published in ANSI/ASHRAE Addendum f *to ANSI/ASHRAE Standard 90.2-2001, which permits the use of reflective roofs in hot and humid climates to reduce the use of air-conditioning energy. It designates the Cool Roof Rating Council as a "nationally recognized accredited organization" for determining solar reflectance and thermal emittance values for roofs.*

The Cool Roof Rating Council is a not-for-profit organization that was established for a number of purposes, one of which is to implement and communicate fair, accurate, and credible radiative energy performance rating systems for roof surfaces.

In 2002, the Cool Roof Rating Council completed its task of initiating a roofing product rating program. The intent by the CRRC was to develop a program that was uniform for determining radiative properties of roofing products. The program allows manufacturers and sellers to have the opportunity to label their roofing products. The radiative properties (e.g., solar reflectance and thermal emittance) are determined and verified through both laboratory testing and a process of random testing.

This addendum identifies this program as a way to establish a common and uniform evaluation to determine compliance with the standard. Verification of a roofing product is available through two means: (1) a "label" that may be placed directly on the product, on the wrapping or container, or on the manufacturer's technical literature and (2) the Cool Roof Rating Council's Web site directory (http://www.coolroofs.org).

The new test method (ASTM C1549) recognizes a test procedure that is considered comparable to the ASTM solar reflectance test methods currently cited. Although CRRC-1 cites its own testing procedure, it is effectively identical to the ASTM test. The reason for two test standards is directly related to the date of publication for each document. The CRRC-1 document was produced prior to ASTM producing their document.

Addendum *h* to 90.2-2001

(Addendum h *relates to Addendum* f *to ANSI/ASHRAE Standard 90.2-2001, which was published prior to Addendum* h*. For a free copy of the published text of Addendum* h*, go to the ASHRAE Web site at http://www.ashrae.org/content/ASHRAE/ASHRAE/ArticleAltFormat/200361015467_347.pdf).*

(Revise the exception to Section 5.3.1.1 as follows.)

Exception to 5.3.1.1: For roofs where the exterior surface has either of the following:

(a) a minimum total solar reflectance of 0.65 when tested in accordance with ASTM C1549##, E903[69], or E1918[70] and a minimum thermal emittance of 0.75 when tested in accordance with ASTM E408[71] or C1371[72]; or

(b) a minimum solar reflectance index (SRI) of 75 calculated in accordance with ASTM E1980[73] for medium wind-speed conditions.

The U-factor of the proposed ceiling shall be permitted to be adjusted using Equation 5-3.1 for demonstrating compliance. The values for solar reflectance and thermal emittance shall be determined by a laboratory accredited by a nationally recognized accreditation organization, such as the Cool Roof Rating Council CRRC-1 ## Product Rating Program, and shall be labeled and certified by the manufacturer.

$$U_{ceiling\_adj} = U_{ceiling\_proposed} \times \text{Multiplier} \qquad (5\text{-}3.1)$$

where

$U_{ceiling\_adj}$ = the adjusted ceiling U-factor for use in demonstrating compliance

$U_{ceiling\_proposed}$ = the U-factor of the proposed ceiling, as designed

Multiplier = the ceiling U-factor multiplier from Table 5.3.1

(Revise the exception to Section 5.3.1.2 as follows.)

Exception to 5.3.1.2: For roofs where the exterior surface has either of the following:

(a) a minimum total solar reflectance of 0.65 when tested in accordance with ASTM C1549##, E903[69], or E1918[70] and a minimum thermal emittance of 0.75 when tested in accordance with ASTM E408[71] or C1371[72]; or

(b) a minimum solar reflectance index (SRI) of 75 calculated in accordance with ASTM E1980[73] for medium wind-speed conditions.

The U-factor of the proposed ceiling shall be permitted to be adjusted using Equation 5-3.1 for demonstrating compliance. The values for solar reflectance and thermal emittance shall be determined by a laboratory accredited by a nationally recognized accreditation organization, such as the Cool Roof Rating Council CRRC-1 ## Product Rating Program, and shall be labeled and certified by the manufacturer.

$$U_{ceiling\_adj} = U_{ceiling\_proposed} \times \text{Multiplier} \qquad (5\text{-}3.1)$$

where

$U_{ceiling\_adj}$ = the adjusted ceiling U-factor for use in demonstrating compliance

$U_{ceiling\_proposed}$ = the U-factor of the proposed ceiling, as designed

Multiplier = the ceiling U-factor multiplier from Table 5.3.1

(Revise the exception to Section 5.5.1.1 as follows.)

Exception to 5.5.1.1: For roofs where the exterior surface has either of the following:

(a) a minimum total solar reflectance of 0.65 when tested in accordance with ASTM C1549##, E903[69], or E1918[70] and a minimum thermal emittance of 0.75 when tested in accordance with ASTM E408[71] or C1371[72]; or

TABLE 5.3.1
Ceiling U-value Multiplier

HDD 65	(HDD18)	Ceilings with Attics	Ceilings without Attics
0-360	(0-200)	1.50	1.30
361-900	(201-500)	1.30	1.30
901-1800	(501-1000)	1.20	1.30
1801-2700	(1001-1500)	1.15	1.30
2701-3600	(1501-2000)	1.10	1.20
> 3600	(> 2000)	1.00	1.00

(b) a minimum solar reflectance index (SRI) of 75 calculated in accordance with ASTM E1980[73] for medium wind-speed conditions.

The U-factor of the proposed ceiling shall be permitted to be adjusted using Equation 5-3.1 for demonstrating compliance~~:~~. The values for solar reflectance and thermal emittance shall be determined by a laboratory accredited by a nationally recognized accreditation organization, such as the Cool Roof Rating Council CRRC-1 ## Product Rating Program, and shall be labeled and certified by the manufacturer.

$$U_{ceiling\_adj} = U_{ceiling\_proposed} \times \text{Multiplier} \qquad (5\text{-}3.1)$$

where

$U_{ceiling\_adj}$ = the adjusted ceiling U-factor for use in demonstrating compliance

$U_{ceiling\_proposed}$ = the U-factor of the proposed ceiling, as designed

Multiplier = the ceiling U-factor multiplier from Table 5.3.1

(Revise the exception to Section 5.5.1.2 as follows.)

Exception to 5.5.1.2: For roofs where the exterior surface has either of the following:

(a) a minimum total solar reflectance of 0.65 when tested in accordance with ASTM C1549##, E903[69], or E1918[70] and a minimum thermal emittance of 0.75 when tested in accordance with ASTM E408[71] or C1371[72]; or

(b) a minimum solar reflectance index (SRI) of 75 calculated in accordance with ASTM E1980[73] for medium wind-speed conditions.

The U-factor of the proposed ceiling shall be permitted to be adjusted using Equation 5-3.1 for demonstrating compliance~~:~~. The values for solar reflectance and thermal emittance shall be determined by a laboratory accredited by a nationally recognized accreditation organization, such as the Cool Roof Rating Council CRRC-1 ## Product Rating Program, and shall be labeled and certified by the manufacturer.

$$U_{ceiling\_adj} = U_{ceiling\_proposed} \times \text{Multiplier} \qquad (5\text{-}3.1)$$

where

$U_{ceiling\_adj}$ = the adjusted ceiling U-factor for use in demonstrating compliance

$U_{ceiling\_proposed}$ = the U-factor of the proposed ceiling, as designed

Multiplier = the ceiling U-factor multiplier from Table 5.3.1

(Add the word "normative" to the title of Section 10 as follows.)

10. NORMATIVE REFERENCES

(Add the following reference to Section 10.)

##. ASTM C1549-02, Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.

(This appendix is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)

INFORMATIVE APPENDIX B
INFORMATIVE REFERENCES

This appendix contains informative references for the convenience of users of Standard 90.2-2001 and to acknowledge source documents when appropriate.

Address/Contact Information

CRRC
Cool Roof Rating Council
1738 Excelsior Avenue
Oakland, CA 94602
(T) 866-465-2523
(T) 510-482-4420
(F) 510-482-4421
http://www.coolroofs.org

Subsection No.	Reference	Title/Source
Exceptions to 5.3.1.1., 5.3.1.2, 5.5.1.1, and 5.5.1.2	CRRC-1	Cool Roof Rating Council Product Rating Program-2002

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.