

ADDENDA

**ANSI/ASHRAE/IES Addendum be to
ANSI/ASHRAE/IES Standard 90.1-2019**

Energy Standard for Buildings Except Low-Rise Residential Buildings

Approved by ASHRAE and the American National Standards Institute on January 21, 2022, and by the Illuminating Engineering Society on January 18, 2022.

This addendum was approved 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. Instructions for how to submit a change can be found on the ASHRAE® website (<https://www.ashrae.org/continuous-maintenance>).

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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

Addendum be updates the reference year for Standard 140 in Sections 11 and 12 as well as Appendix C and G. ANSI/ASHRAE Standard 140-2020 updates the building thermal envelope and fabric load tests cases (Sections 5.2.1, 5.2.2, and 5.2.3) to address advancements in the state of the art in building performance modeling since their original publication for Standard 140-2001. For these cases, the tested modeling physics includes conduction, convection, and radiative (solar and infrared) heat transfer associated with the following:

- *Various building surfaces and their thermal mass*
- *Windows and solar gains through windows*
- *External shading devices*
- *Internally generated heat*
- *Outside-air infiltration/ventilation*
- *Sunspaces*
- *Variations in thermostat control (deadband and setback)*

Additionally, comments on the Standard 140 test specification since its inception identified ambiguities, further necessitating an update to the original specifications. The update work built on the initial version of the test suite published in ASHRAE Standard 140-2001 through 140-2017 and includes additional test cases, diagnostic outputs, and updated informative example results.

Addendum be adds the requirement that input files from the simulation program used for Standard 140 testing should be made available. Also, the following clarifications were added:

- a. That the version of the software being tested must match that used for 90.1 performance-path modeling*
- b. Which specific Standard 140 tests are required*
- c. That testing is required for each complete simulation program including interface and engine*

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~striketrough~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum be to Standard 90.1-2019

Modify Section 11 as shown (I-P and SI).

11.4.1.4 Simulation Program Testing Requirements

11.4.1.4.1 The *simulation program* shall be tested according to ASHRAE Standard 140, except for Sections 7 and 8 of Standard 140. The required tests shall include building thermal envelope and fabric load tests (Sections 5.2.1, 5.2.2, and 5.2.3), ground coupled slab-on-grade analytical verification tests (Section 5.2.4), space-cooling equipment performance tests (Section 5.3), space-heating equipment performance tests (Section 5.4), and air-side HVAC equipment analytical verification tests (Section 5.5), along with the associated reporting (Section 6).

11.4.1.4.2 The test results and modeler reports shall be posted on a publicly available website and shall include the test results of the ~~simulation program~~ simulation program and input files used for generating the results along with the results of the other ~~simulation programs~~ simulation programs included in ASHRAE Standard 140, Annexes B8 and B16. The modeler report in Standard 140, Annex A2, Attachment A2.7, shall be completed for results exceeding the maximum or falling below the minimum of the reference values ~~or and for missing omitted~~ results.

11.4.1.4.3 The testing shall be performed for the version of the *simulation program* used to calculate the *design energy cost* and *energy cost budget*.

Informative Notes:

1. There are no pass/fail criteria established by this requirement.

2. Based on the Section 3 definition, *simulation program* includes the simulation engine and the corresponding user interface. The testing of a *simulation program* only meets the requirements of Section 11.4.1.4 for that *simulation program* and cannot be used as proxy for documenting compliance of another *simulation program* that uses the same simulation engine.

Modify Section 12 as shown (I-P and SI).

Table 9.4.2-2

Reference	Title
[...]	
ASHRAE 1791 Tullie Circle, NE, Atlanta, GA 30329	
[...]	
ANSI/ASHRAE Standard 140-2017/2020	Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs Evaluating Building Performance Simulation Software
[...]	

Modify Normative Appendix C as shown (I-P and SI).

C3.1.4 *Simulation Program Testing Requirements*

C3.1.4.1 The *simulation program* shall be tested according to ASHRAE Standard 140, except for Sections 7 and 8 of Standard 140. The required tests shall include building thermal envelope and fabric load tests (Sections 5.2.1, 5.2.2, and 5.2.3), ground coupled slab-on-grade analytical verification tests (Section 5.2.4), space-cooling equipment performance tests (Section 5.3), space-heating equipment performance tests (Section 5.4), and air-side HVAC equipment analytical verification tests (Section 5.5), along with the associated reporting (Section 6).

C3.1.4.2 The test results and modeler reports shall be posted on a publicly available website and shall include the test results of the ~~simulation program~~ *simulation program* and input files used for generating the results alongside the results of the other ~~simulation programs~~ *simulation programs* included in ASHRAE Standard 140 Annexes B8 and B16. The modeler report in Standard 140, Annex A2, Attachment A2.7 shall be completed for results exceeding the maximum or falling below the minimum of the reference values ~~or and for missing omitted~~ results.

C3.1.4.3 The testing shall be performed for the version of the *simulation program* used to calculate the *proposed envelope performance factor* and *base envelope performance factor*.

Informative Notes:

1. There are no pass/fail criteria established by this requirement.
2. Based on the Section 3 definition, *simulation program* includes the simulation engine and the corresponding user interface. The testing of a *simulation program* only meets the requirements of Section C3.1.4 for that *simulation program* and cannot be used as proxy for documenting compliance of another *simulation program* that uses the same simulation engine.

Modify Normative Appendix G as shown (I-P and SI).

G2.2.4 *Simulation Program Testing Requirements*

G2.2.4.1 The *simulation program* shall be tested according to ASHRAE Standard 140, except for Sections 7 and 8 of Standard 140. The required tests shall include building thermal envelope and fabric load tests (Sections 5.2.1, 5.2.2, and 5.2.3), ground coupled slab-on-grade analytical verification tests (Section 5.2.4), space-cooling equipment performance tests (Section 5.3), space-heating equipment performance tests (Section 5.4), and air-side HVAC equipment analytical verification tests (Section 5.5), along with the associated reporting (Section 6).

G2.2.4.2 The test results and modeler reports shall be posted on a publicly available website and shall include the test results of the ~~simulation program~~ *simulation program* and input files used for generating the results along with the results of the other ~~simulation programs~~ *simulation programs* included in ASHRAE Standard 140, Annexes B8 and B16. The modeler report in Standard

140, Annex A2, Attachment A2.7 shall be completed for results exceeding the maximum or falling below the minimum of the reference values ~~or~~ and for ~~missing~~ omitted results.

G2.2.4.3 The testing shall be performed for the version of the *simulation program* used to calculate the *proposed building performance* and *baseline building performance*.

Informative Notes:

1. There are no pass/fail criteria established by this requirement.
2. Based on the Section 3 definition, *simulation program* includes the simulation engine and the corresponding user interface. The testing of a *simulation program* only meets the requirements of Section G2.2.4 for that *simulation program* and cannot be used as proxy for documenting compliance of another *simulation program* that uses the same simulation engine.

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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.

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As an industry leader in research, standards writing, publishing, certification, and continuing education, ASHRAE and its members are dedicated to promoting a healthy and sustainable built environment for all, through strategic partnerships with organizations in the HVAC&R community and across related industries.

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