



**BSR/ASHRAE/IES Addendum cr
to ANSI/ASHRAE/IES Standard 90.1-2016**

**Public Review Draft
Proposed Addendum cr to
Standard 90.1-2016, Energy Standard
for Buildings Except Low-Rise
Residential Buildings**

**First Public Review (May 2019)
(Draft Shows Proposed Changes to Current Standard)**

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(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. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)

FOREWORD

Currently, Section 11 and Appendix G allow unlimited trade-offs between building envelope and other building systems. Studies such as “Preserving Envelope Efficiency in Performance Based Code Compliance” (PNNL-24359, BA Thornton, GP Sullivan, MI Rosenberg, MC Baechler) and “Can High-Performance Equipment Lead to a Low-Performance Building?” (D Jonlin, B Thornton, M Rosenberg) have concluded that weaker building envelopes can permanently limit building energy performance even as lighting and HVAC components are upgraded over time, because retrofitting the envelope is less likely and more expensive. This issue has been raised by states and jurisdictions around the country. A language to limit the envelope tradeoffs on projects following performance path of compliance, aka the envelope backstop, will be included in the New York City and Washington State energy codes among others.

The proposed addendum builds on this prior work, striving to preserve design flexibility and minimize documentation effort while improving the long-term building performance. Projects can comply with the proposed envelope backstop by either meeting the prescriptive envelope requirements in Section 5.5 or using Section 5.6 “Building Envelope Trade-Off Option” to demonstrate that the energy cost penalty from the proposed below-code envelope does not exceed the set margins. The backstop margins (15% for residential building area types and 7% for nonresidential building area types) were tested on projects in climate zones 2A, 4A and 6A, building types including multifamily, hotel, office, school/university and stand-alone retail, light weight and mass wall construction, with high and low window area. Examples of tested projects and the backstop compliance outcomes are shown in the table below.

Building Type	CZ	Wall Construction	WWR	Wall U-value	Window U-value	SHGC	Pass Backstop?
Multifamily	2A/4A/6A	steel frame	20%	0.124	0.65	0.68	No
Multifamily	2A/4A	mass	20%	0.189	0.65	0.68	Yes
Office	2A/4A/6A	steel frame	20%	0.124	0.65/0.45/0.45	0.68	Yes
Multifamily, N/S long axis	2A/4A/6A	steel frame	70%	0.064/0.64/0.049	0.54/0.38/0.36	0.25/0.36/0.4	Yes
Multifamily, E/W long axis	2A/4A/6A	steel frame	70%	0.064/0.64/0.049	0.54/0.38/0.36	0.25/0.36/0.4	No
Office, N/S long axis	2A/4A/6A	steel frame	70%	0.084/0.64/0.049	0.54/0.38/0.36	0.25/0.36/0.4	Yes
Office, E/W long axis	2A/4A/6A	steel frame	70%	0.084/0.64/0.049	0.54/0.38/0.36	0.25/0.36/0.4	No

It is expected that most projects following the Building Envelope Trade-Off Option will use ComCheck to document compliance with the envelope backstop, with the scope of required inputs limited to description of the proposed envelope.

This addendum impacts an optional performance path in the standard designed to provide increased flexibility and therefore was not subjected to cost effectiveness analysis.

[Note to Reviewers: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and strikethrough (for deletions) unless the instructions specifically mention some other means of indicating the changes. Only these changes are open for review and comment at this time. Additional material is provided for context only and is not open for comment except as it relates to the proposed substantive changes.]

Addendum cr to 90.1-2016

Revise the Standard as follows (IP Units)

11.2 Compliance

Compliance with Section 11 will be achieved if

- a. all requirements of Sections 5.4, 6.4, 7.4, 8.4, 9.4, and 10.4 are met;
- b. the *design energy cost*, as calculated in Section 11.5, does not exceed the *energy cost budget* as calculated by the *simulation program* described in Section 11.4; and
- c. the *energy efficiency* level of components specified in the *building* design meet or exceed the *efficiency* levels used to calculate the *design energy cost*; and
- d. One of the following is met:

1. The *building envelope* complies with Section 5.5, “Prescriptive Building Envelope Compliance Path”; or
2. Using Section 5.6, “Building Envelope Trade-Off Option”, the *proposed envelope performance factor* shall not exceed the *base envelope performance factor* by more than 15% in multifamily, hotel/motel and dormitory *building* area types. For all other *building* area types, the limit shall be 7%. For buildings with both *residential* and *nonresidential* occupancies, the limit shall be based on the area weighted average of the *gross conditioned floor area*.

G1.2.1 Performance Rating Calculation

This *performance rating method* requires conformance with the following provisions:

- a. All requirements of Sections 5.4, 6.4, 7.4, 8.4, 9.4, and 10.4 shall be met. These sections contain the mandatory provisions of the standard and are prerequisites for this rating method.
- b. The interior lighting power shall not exceed the *interior lighting power allowance* determined using either Tables G3.7 or G3.8 and the methodology described in Sections 9.5.1 and 9.6.1.
- c. One of the following is met:
 1. The *building envelope* complies with Section 5.5, “Prescriptive Building Envelope Compliance Path”; or
 2. Using Section 5.6, “Building Envelope Trade-Off Option”, the *proposed envelope performance factor* shall not exceed the *base envelope performance factor* by more than 15% in multifamily, hotel/motel and dormitory *building* area types. For all other *building* area types, the limit shall be 7%. For buildings with both *residential* and *nonresidential* occupancies, the limit shall be based on the area weighted average of the *gross conditioned floor area*.

Note to Reviewer: Addenda AD and AI also modify the language in Section 11.2.

Addenda AD and AV also modify the language in G1.2.1.

If these addenda are published, these sections will appear as follows:

11.2 Compliance

The proposed building design shall comply with all of the following:

- a. Sections 5.2.1, 6.2.1, 7.2.1., 8.2.1, 9.2.1, and 10.2.1
- b. A *design energy cost*, as calculated in Section 11.5, that does not exceed the *energy cost budget* as calculated by the *simulation program* described in Section 11.4
- c. The *energy efficiency* level of installed components and systems that meets or exceeds the *efficiency* levels used to calculate the *design energy cost*.
- d. One of the following is met:
 1. The *building envelope* complies with Section 5.5, “Prescriptive Building Envelope Compliance Path”; or
 2. Using Section 5.6, “Building Envelope Trade-Off Option”, the *proposed envelope performance factor* shall not exceed the *base envelope performance factor* by more than 15% in multifamily, hotel/motel and dormitory *building* area types. For all other *building* area types, the limit shall be 7%. For buildings with both *residential* and *nonresidential* occupancies, the limit shall be based on the area weighted average of the *gross conditioned floor area*.
- e. Verification, testing, and *commissioning* requirements of Section 4.2.5 shall be met
- f. Proposed *building systems*, controls, or *building envelope* documented in Section 11.7(b) that do not have criteria in Sections 5 through 10 shall have verification or testing to document proper installation and operation in accordance with Section 4.2.5.

G1.2.1 Mandatory Provisions

The proposed *building* design shall comply with all of the following:

- a. Sections 5.2.1, 6.2.1, 7.2.1, 8.2.1, 9.2.1, and 10.2.1; and
- b. Interior lighting power shall not exceed the *interior lighting power allowance* determined using either
 1. Table G3.7 and the methodology described in Section 9.6.1, or
 2. Table G3.8 and the methodology described in Section 9.5.1; and
- c. One of the following is met:
 1. The *building envelope* complies with Section 5.5, “Prescriptive Building Envelope Compliance Path”; or
 2. Using Section 5.6, “Building Envelope Trade-Off Option”, the *proposed envelope performance factor* shall not exceed the *base envelope performance factor* by more than 15% in multifamily, hotel/motel and dormitory *building* area types. For all other *building* area types, the limit shall be 7%. For buildings with both *residential* and *nonresidential* occupancies, the limit shall be based on the area weighted average of the *gross conditioned floor area*.

- d. Energy efficiency levels of installed components and *systems* that meet or exceed the efficiency levels used to calculate the *proposed building performance*.
- e. Verification, testing, and *commissioning* requirements of Section 4.2.5 shall be met.
- f. Proposed *building systems*, controls or *building envelope* documented in Section G1.3(c) that do not have criteria in Sections 5 through 10 shall have verification or testing to document proper installation and operation in accordance with Section 4.2.5.