



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

**Public Review Draft**

# **Proposed Addendum ck to Standard 90.1-2016, Energy Standard for Buildings Except Low-Rise Residential Buildings**

**Second Public Review (May 2019)  
(Draft Shows Proposed Independent Substantive  
Changes to Previous Public Review Draft)**

This draft has been recommended for public review by the responsible project committee. To submit a comment on this proposed standard, go to the ASHRAE website at [www.ashrae.org/standards-research--technology/public-review-drafts](http://www.ashrae.org/standards-research--technology/public-review-drafts) and access the online comment database. The draft is subject to modification until it is approved for publication by the Board of Directors and ANSI. Until this time, the current edition of the standard (as modified by any published addenda on the ASHRAE website) remains in effect. The current edition of any standard may be purchased from the ASHRAE Online Store at [www.ashrae.org/bookstore](http://www.ashrae.org/bookstore) or by calling 404-636-8400 or 1-800-727-4723 (for orders in the U.S. or Canada).

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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

Addendum ck proposed new language for Section 11 to address the new proposed renewable energy requirements in addendum BY. The proposed approach allows a proposed design that does not include renewable energy required by Section 10.5.1 a method of trade off against other prescriptive requirements in the Standard. In that case the renewable energy allowance included in the budget building design will be based on a horizontal photovoltaic array with a rated capacity equal but not to exceed the requirement in Section 10.5.1.1. For proposed designs that include an on-site renewable energy system the budget building design allowance will be based on the proposed renewable energy system design with a rated capacity equal but not to exceed the requirement in 10.5.1.1.

This proposed ISC to addendum ck addresses several public review comments. Language was added to clarify that renewable energy systems included in the Proposed Design must be modeled identically in the Baseline model except for the capacity. Performance criteria to be used when estimating on-site renewable energy when none exists in the Proposed Design have also been changed. Panel efficiency was increased to 19.1% and total system losses reduced to 11.3% based on a report published by NREL in November 2018, entitled "U.S. Solar Photovoltaic System Cost Benchmark: Q1 2018".

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: This public review draft makes proposed independent substantive changes to the previous public review draft. These changes are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) except where the reviewer instructions specifically describe some other means of showing the changes. Only these changes to the previous draft 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.]*

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## Addendum ck to 90.1-2016

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*Revise the Standard as follows (IP Units)*

**Table 11.5.1** Modeling Requirements for Calculating Design Energy Cost and Energy Cost Budget

### 15. On-site renewable energy

*On-site renewable energy* in the *proposed design* shall be determined as follows:

- a. Where a complete *system* providing on-site *renewable energy* exists, the model shall reflect the actual *system* type using actual component capacities and efficiencies.
- b. Where a *system* providing on-site *renewable energy* has been designed, the *system* model shall be consistent with design documents.
- c. Where no *system* exists or is specified to provide *on-site renewable energy*, no *system* shall be modeled.

*On-site renewable energy* shall be included in the *budget building design* when required by Section 10.5.1. and shall be determined as follows:

- a. Where a *system* providing *on-site renewable energy* has been modeled in the *proposed design* the same *system* shall be modeled identically in the *budget building design* ~~except the~~ with a rated capacity shall meeting the requirements of Section 10.5.1.1. Where more than one type of *on-site renewable energy* system is modeled the total capacities shall be allocated in the same proportion as in the *proposed design*.
- b. Where no *system* exists or is specified to provide *on-site renewable energy in the proposed design*, *on-site renewable energy* shall be modeled as an unshaded photovoltaic system with the following physical characteristics:
  - Size: Rated capacity per Section 10.5.1.1
  - Module Type: Crystalline Silicon Panel with a glass cover, ~~45%~~ 19.1% nominal efficiency and temperature coefficient of -0.47 %/°C, Performance shall be based on a reference temperature of 77°F (25°C) and irradiance of 317 Btu/ft<sup>2</sup>-hr (1,000 W/m<sup>2</sup>).
  - Array Type: Rack mounted array with installed nominal operating cell temperature (INOCT) of 103°F (45°C).
  - Total System losses (DC output to AC output): ~~44~~ 11.3%
  - Tilt: 0-degrees (mounted horizontally)
  - Azimuth: 180 degrees

If the *on-site renewable energy system* cannot be modeled in the *simulation program* Section 11.4.5 shall be used.

