

**ANSI/ASHRAE/ICC/USGBC/IES Addendum ar to  
ANSI/ASHRAE/ICC/USGBC/IES Standard 189.1-2017**

# **Standard for the Design of High-Performance Green Buildings**

## **Except Low-Rise Residential Buildings**

*The Complete Technical Content of the International Green Construction Code<sup>®</sup>*

Approved by the ASHRAE Standards Committee on January 20, 2018; by the ASHRAE Board of Directors on January 24, 2018; by the International Code Council on January 3, 2018; by the USGBC Board of Directors on January 31, 2018; by the IES Board of Directors on January 8, 2018; and by the American National Standards Institute on February 2, 2018.

These addenda were 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<sup>®</sup> 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

The energy performance criteria in Section 7.5 currently includes energy cost and carbon emissions. Addendum ar adds a third criteria based on source energy and zero energy performance index.

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

### Addendum ar to Standard 189.1-2017

**Add the following to Section 7.5. (Note: Equations, though not underlined, are new.)**

**7.5.3 Zero Energy Performance Index.** The zero energy performance index ( $zEPI_{2004}$ ) of the *proposed design*, including *on-site renewable energy systems*, shall be less than the target ( $zEPI_{2004 Target}$ ).  $zEPI_{2004}$  and  $zEPI_{2004 Target}$  shall be calculated as described below:

$$zEPI_{2004} = \frac{\sum_i PDE_i \times r_i}{\sum_i BBE_i \times r_i}$$

where

$zEPI_{2004}$  = zero energy performance index relative to the Standard 90.1 baseline as defined in the performance rating method of Standard 90.1, Normative Appendix G

$PDSE_i$  = proposed design site energy use for energy type  $i$

$BBSE_i$  = baseline building site energy use for energy type  $i$ ; created following the rules in Standard 90.1, Normative Appendix G

$r_i$  = source energy conversion factor for energy type  $i$ ; value taken from Table 7.5.3.

$$zEPI_{2004} = \frac{BBUSE + (BBRSE \times BPF) - RECSE}{BBUSE + BBRSE}$$

where

$zEPI_{2004 Target}$  = zero energy performance index target required for achieving compliance with the standard, unitless

$BBUSE$  = baseline building *unregulated energy use* expressed in source units

$BBRSE$  = baseline building *regulated energy use* expressed in source units.

$BPF$  = building performance factor taken from Table 7.5.3, unitless

**Table 7.5.3 National Average Source Energy Conversion Factors**

Energy Type	Conversion Factor, $r$
Electricity, imported	3.15
Electricity, exported renewable	3.15
Natural gas	1.09
Fuel oil (1, 2, 4, 5, 6, diesel, kerosene)	1.19
Propane and liquid propane	1.15
Steam	1.45
Hot water	1.35
Chilled water	1.04
Coal or other	1.05

The values in this table represent national averages for the United States.

$RECSE$  = renewable energy production determined from Section 7.4.1.1.1 and converted to source energy

**Informative Note:** Informative Appendix I details a methodology for converting  $zEPI_{2004}$  to  $zEPI$ .  $zEPI_{2004}$  using Standard 90.1, Normative Appendix G, to define the baseline building. The traditional definition of  $zEPI$  uses the median energy of the existing building stock in the year 2000 as the baseline. The traditional  $zEPI$  definition is used by the Architecture 2030 program and other programs.

**Add the following Informative Appendix I.**

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

## INFORMATIVE APPENDIX I zEPI CONVERSION METHODOLOGY

The procedures in Section 7.5.3 result in a  $zEPI$  target ( $zEPI_{2004 Target}$ ) and a  $zEPI$  rating ( $zEPI_{2004}$ ) that use Standard 90.1, Normative Appendix G, to define the baseline building. The traditional baseline for  $zEPI$  uses CBECS 2003 to approximate the building stock at the turn of the millennium. Both  $zEPI_{2004 Target}$  and  $zEPI_{2004}$  can be converted to the traditional baseline by applying the multipliers in Table I-1.

$$zEPI = zEPI_{2004} \times M$$

$$zEPI_{Target} = zEPI_{2004-Target} \times M$$

where

**Table I-1 zEPI Conversion Factors, *M***

	<b>1A</b>	<b>2A</b>	<b>3A</b>	<b>4A</b>	<b>5A</b>	<b>6A</b>	<b>7</b>	<b>2B</b>	<b>3B</b>	<b>4B</b>	<b>5B</b>	<b>6B</b>	<b>3C</b>	<b>4C</b>	<b>8</b>
Multifamily	0.93	0.86	0.81	0.78	0.79	0.79	0.76	0.86	0.91	0.80	0.80	0.79	0.82	0.77	0.74
Healthcare/hospital	0.82	0.83	0.82	0.83	0.86	0.86	0.87	0.81	0.82	0.82	0.85	0.86	0.87	0.83	0.85
Hotel/motel	0.80	0.85	0.88	0.92	0.95	0.98	1.01	0.83	0.87	0.91	0.95	0.97	0.91	0.93	1.03
Office	0.75	0.76	0.71	0.71	0.72	0.72	0.70	0.75	0.73	0.71	0.72	0.72	0.78	0.72	0.68
Restaurant	0.92	0.93	0.92	0.92	0.92	0.91	0.90	0.93	0.94	0.92	0.92	0.92	0.94	0.93	0.88
Retail	0.61	0.62	0.59	0.61	0.61	0.61	0.61	0.61	0.59	0.61	0.60	0.62	0.61	0.64	0.61
School	0.83	0.83	0.79	0.81	0.82	0.84	0.83	0.82	0.81	0.80	0.83	0.84	0.84	0.80	0.75
Semiheated warehouse	2.07	0.94	0.80	0.68	0.61	0.56	0.54	1.02	1.06	0.74	0.66	0.60	0.88	0.75	0.49
All others	0.93	0.81	0.78	0.78	0.78	0.78	0.79	0.81	0.83	0.78	0.78	0.80	0.81	0.79	0.77

For climate zones 0A/0B, use the values for 1A/1B, respectively.

zEPI ≡ zero energy performance index using CBECS 2003 as the baseline

zEPI<sub>Target</sub> ≡ zero energy performance index target using CBECS 2003 as the baseline

zEPI<sub>2004</sub> ≡ zero energy performance index using Standard 90.1, Appendix G, as the baseline

zEPI<sub>2004 Target</sub> ≡ zero energy performance index target using Standard 90.1, Appendix G, as the baseline

**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.

