

# zEPI Compliance Option

IECC: SECTION C202, (New), SECTION C401, C401.1, C401.2, C408 (New), TABLE C408.1.1.1 (New), C408.1.1.2 (New), C105.2.6, C402.5.7, C406.4, SECTION C409

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## 2018 International Energy Conservation Code

### SECTION C202 GENERAL DEFINITIONS

**Add new text as follows:**

**ZERO ENERGY PERFORMANCE INDEX (zEPI).** A value representative of the ratio of energy performance based on the proposed design compared to the average energy performance of a comparative baseline building and its site.

### SECTION C401 GENERAL

**C401.1 Scope.** The provisions in this chapter are applicable to commercial *buildings* and their *building sites*.

**Revise as follows:**

**C401.2 Application.** Commercial buildings shall comply with one of the following:

1. The requirements of ANSI/ASHRAE/IESNA 90.1.
2. The requirements of Sections C402 through C405 and ~~C408-C409~~. In addition, commercial buildings shall comply with Section C406 and tenant spaces shall comply with Section C406.1.1.
3. The requirements of Sections C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404, C405, C407 and ~~C408-C409~~. The building energy cost shall be equal to or less than 85 percent of the standard reference design building.
4. The requirements of Section C408 to achieve near-net zero energy performance.

**Add new text as follows:**

**C408 Near Net-Zero Energy Performance C408.1 Near net-zero energy performance.** Performance-based designs shall demonstrate a zEPI of 30 or below as determined in accordance with Equation xxx-1.

$zEPI = 57 \times \text{Proposed building performance} / \text{Baseline building performance}$  (Equation xxx-1)

where:

Proposed building performance = The proposed building performance in source kBtu for the proposed design of the building and its site calculated in accordance with Section C408.1.1.

Baseline building performance = The baseline building performance in source kBtu for a baseline building and its site in accordance with Section C408.1.1.

75 = a fixed value representing the performance of a baseline building designed to comply with ASHRAE 90.1-2004.

**C408.1.1 Modeling methodology.** The proposed building performance and the baseline building performance of the building and building site shall be calculated in accordance with Appendix G to ASHRAE 90.1, as modified by Sections C408.1.1.1 and C408.1.1.2. The energy use modeling shall include all energy used for building and site functions and anticipated occupancy.

**C408.1.1.1 Energy units.** The building performance calculations in Section G3 of ASHRAE 90.1 shall be based on energy use instead of energy cost. Energy use shall be converted to consistent units by multiplying the nonrenewable energy fossil fuel use at the utility meter or measured point of delivery to Btus and multiplying by the conversion factor in Table C408.1.1.1 based on the geographical location of the building.

**C408.1.1.2 Site to source electric power conversion.** In calculating the proposed building performance and the baseline building performance, electric energy used shall be calculated in source energy by multiplying the electric power use at the utility meter or measured point of delivery in Btus by the conversion factor in Tables C408.1.1.1 and C408.1.1.2 based on the geographical location of the building.

**TABLE C408.1.1.1  
ELECTRICITY GENERATION ENERGY CONVERSION FACTORS BY EPA eGRID SUB-REGION**

<b>eGRID 2010 SUB-REGION ACRONYM</b>	<b>eGRID 2010 SUB-REGION NAME</b>	<b>ENERGY CONVERSION FACTOR</b>
<u>AKGD</u>	<u>ASCC Alaska Grid</u>	<u>3.15</u>
<u>AKMS</u>	<u>ASCC Miscellaneous</u>	<u>1.90</u>
<u>ERCT</u>	<u>ERCOT All</u>	<u>3.08</u>
<u>FRCC</u>	<u>FRCC All</u>	<u>3.26</u>
<u>HIMS</u>	<u>HICC Miscellaneous</u>	<u>3.67</u>
<u>HIOA</u>	<u>HICC Oahu</u>	<u>3.14</u>
<u>MORE</u>	<u>MRO East</u>	<u>3.50</u>
<u>MROW</u>	<u>MRO West</u>	<u>3.64</u>
<u>NYLI</u>	<u>NPCC Long Island</u>	<u>3.47</u>
<u>NEWE</u>	<u>NPCC New England</u>	<u>3.03</u>
<u>NYCW</u>	<u>NPCC NYC/Westchester</u>	<u>3.21</u>
<u>NYUP</u>	<u>NPCC Upstate NY</u>	<u>2.66</u>
<u>RFCE</u>	<u>RFC East</u>	<u>3.28</u>
<u>RFCM</u>	<u>RFC Michigan</u>	<u>3.35</u>
<u>RFCW</u>	<u>RFC West</u>	<u>3.29</u>
<u>SRMW</u>	<u>SERC Midwest</u>	<u>3.40</u>
<u>SRMV</u>	<u>SERC Mississippi Valley</u>	<u>3.20</u>
<u>SRSO</u>	<u>SERC South</u>	<u>3.20</u>
<u>SRTV</u>	<u>SERC Tennessee Valley</u>	<u>3.30</u>
<u>SRVC</u>	<u>SERC Virginia/Carolina</u>	<u>3.24</u>
<u>SPNO</u>	<u>SPP North</u>	<u>3.57</u>
<u>SPSO</u>	<u>SPP South</u>	<u>3.26</u>
<u>CAMX</u>	<u>WECC California</u>	<u>2.89</u>
<u>NWPP</u>	<u>WECC Northwest</u>	<u>2.32</u>
<u>RMPA</u>	<u>WECC Rockies</u>	<u>3.82</u>
<u>AZNM</u>	<u>WECC Southwest</u>	<u>3.10</u>
<u>None</u>	<u>Not included</u>	<u>3.15</u>

**C408.1.1.2  
U.S. AVERAGE BUILDING FUELS ENERGY CONVERSION FACTORS BY FUEL TYPE**

<b>FUEL TYPE</b>	<b>ENERGY CONVERSION FACTOR</b>
<u>Natural Gas</u>	<u>1.09</u>
<u>Fuel Oil</u>	<u>1.19</u>
<u>LPG</u>	<u>1.15</u>
<u>Purchased District Heating - Hot Water</u>	<u>1.35</u>
<u>Purchased District Heating - Steam</u>	<u>1.45</u>
<u>District Cooling</u>	<u>0.33 x value in Table C408.1.1.1</u>
<u>Other</u>	<u>1.1</u>

Revise as follows:

**C105.2.6 Final inspection.** The final inspection shall include verification of the installation and proper operation of all required building controls, and documentation verifying activities associated with required *building commissioning* have been conducted in accordance with Section ~~C408~~C409.

**C402.5.7 Vestibules.** Building entrances shall be protected with an enclosed vestibule, with all doors opening into and out of the vestibule equipped with self-closing devices. Vestibules shall be designed so that in passing through the vestibule it is not necessary for the interior and exterior doors to open at the same time. The installation of one or more revolving doors in the building entrance shall not eliminate the requirement that a vestibule be provided on any doors adjacent to revolving doors.

**Exceptions:** Vestibules are not required for the following:

1. Buildings in *Climate Zones* 1 and 2.
2. Doors not intended to be used by the public, such as doors to mechanical or electrical equipment rooms, or intended solely for employee use.
3. Doors opening directly from a *sleeping unit* or dwelling unit.
4. Doors that open directly from a space less than 3,000 square feet (298 m<sup>2</sup>) in area.
5. Revolving doors.
6. Doors used primarily to facilitate vehicular movement or material handling and adjacent personnel doors.
7. Doors that have an air curtain with a velocity of not less than 6.56 feet per second (2 m/s) at the floor that have been tested in accordance with ANSI/AMCA 220 and installed in accordance with the manufacturer's instructions. Manual or automatic controls shall be provided that will operate the air curtain with the opening and closing of the door. Air curtains and their controls shall comply with Section ~~C408.2.3~~C409.2.3.

**C406.4 Enhanced digital lighting controls.** Interior lighting in the building shall have the following enhanced lighting controls that shall be located, scheduled and operated in accordance with Section C405.2.2.

1. Luminaires shall be configured for continuous dimming.
2. Luminaires shall be addressed individually. Where individual addressability is not available for the luminaire class type, a controlled group of not more than four luminaries shall be allowed.
3. Not more than eight luminaires shall be controlled together in a *daylight zone*.
4. Fixtures shall be controlled through a digital control system that includes the following function:
  - 4.1. Control reconfiguration based on digital addressability.
  - 4.2. Load shedding.
  - 4.3. Individual user control of overhead general illumination in open offices.
  - 4.4. Occupancy sensors shall be capable of being reconfigured through the digital control system.
5. Construction documents shall include submittal of a Sequence of Operations, including a specification outlining each of the functions in Item 4.
6. Functional testing of lighting controls shall comply with Section ~~C408~~C409.

## **SECTION ~~C408~~C409**

### **MAINTENANCE INFORMATION AND SYSTEM COMMISSIONING**

**Reason Statement:** This proposal adds a compliance option for projects or jurisdictions striving for a near net-zero energy performance metric.

The zEPI methodology was created by Charles Eley and first introduced to codes in the *International Green Construction Code*. It served as a means of calculating energy performance modeling that would simplify the ability of moving the IgCC energy performance target to net zero energy within several code cycles. With the technical content of the IgCC now being developed by ASHRAE 189.1, this unique approach has been lost.

zEPI points to a unit on a scale that goes from a theoretical 100 to zero, where 100 equals actual performance for existing buildings as identified in the 2003 CBECS database. The 75 on that scale is a fixed number representing the energy performance level of the ASHRAE 90.1-2004, which is the baseline model using ASHRAE Appendix G.

The zEPI target in this proposal is 30 or below, which represents an energy performance level that is 70% better in terms of energy efficiency/conservation than a 2013 CBECS building. Based on data from many built "net zero" and Passive House buildings, 30 is a reasonable target for the building envelope and systems, where the remaining energy consumed by the building can be accommodated with on-site renewables in many climate and insulation zones.

The section has been added to Chapter CE 4 as Section C408, renumbering the existing C408 (Maintenance Information and System Commissioning) and all related subsections to C409. References to this section have been edited

accordingly.

**Cost Impact:** The code change proposal will not increase or decrease the cost of construction. It is a compliance option for projects or jurisdictions seeking a higher level of energy performance than the base code. Even if selected, many projects have been designed and built using a near net-zero energy goal at no increase in cost over conventional energy performance goals.

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zEPI Compliance Option

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