

GEW25-14

202, 302.1, 302.1.1, 601.3, 601.3.1, 602.1, 602.1.2, 602.1.2.1, 602.1.2.3, 602.2, 602.2.1, 602.2.2, 602.2.3, A106, A106.1

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Delete without substitution:

SECTION 202 DEFINITIONS

ZERO ENERGY PERFORMANCE INDEX (zEPI). A scalar representing the ratio of energy performance of the proposed design compared to the average energy performance of buildings relative to a benchmark year.

Revise as follows:

302.1 Requirements determined by the jurisdiction. The jurisdiction shall indicate the following information in Table 302.1 for inclusion in its code adopting ordinance.

1. The jurisdiction shall indicate whether requirements for residential buildings, as indicated in Exception 1 to Section 101.3, are applicable by selecting “Yes” or “No” in Table 302.1. Where “Yes” is selected, the provisions of ICC 700 shall apply and the remainder of this code shall not apply.
2. ~~Where the jurisdiction requires enhanced energy performance for buildings designed on a performance basis, the jurisdiction shall indicate a zEPI of 46 or less in Table 302.1 for each occupancy required to have enhanced energy performance.~~
3. 2. Where “Yes” or “No” boxes are provided, the jurisdiction shall check the box to indicate “Yes” where that section is to be enforced as a mandatory requirement in the jurisdiction, or “No” where that section is not to be enforced as a mandatory requirement in the jurisdiction.

**TABLE 302.1
REQUIREMENTS DETERMINED BY THE JURISDICTION**

Section	Section Title or Description and Directives	Jurisdictional Requirements	
CHAPTER 6. ENERGY CONSERVATION, EFFICIENCY AND CO₂e EMISSION REDUCTION			
<u>302.1, 601.3, 602.1</u>	Performance-based compliance: The jurisdiction shall indicate whether performance-based energy compliance, as determined in accordance with Section 602.1 is required for buildings with a total floor area of more than 25,000 square feet.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
302.1, 302.1.1, 601.3, 601.3.1 602.1	zEPI of Jurisdictional Choice – The jurisdiction shall indicate a zEPI of 46 or less in each occupancy for which it intends to require enhanced energy performance. Enhanced energy performance: Where the jurisdiction intends to require enhanced energy performance for buildings designed on a performance basis, the jurisdiction shall indicate a required minimum reduction in net energy use for such buildings. The minimum reduction set by the jurisdiction shall be not less than 5 percent as calculated in accordance with Section 602.1.	Occupancy: _____ zEPI: _____	Minimum Reduction in Net Energy Use: %
604.1	Automated demand response infrastructure	<input type="checkbox"/> Yes	<input type="checkbox"/> No
CHAPTER 10. EXISTING BUILDINGS			
1007.2	Evaluation of existing buildings	<input type="checkbox"/> Yes	<input type="checkbox"/> No
1007.3	Post Certificate of Occupancy zEPI annual energy use, energy demand, and CO ₂ e emissions reporting	<input type="checkbox"/> Yes	<input type="checkbox"/> No

(portions of table not shown remain unchanged)

302.1.1 zEPI of 46 or less. Where a zEPI of 46 or less is indicated by the jurisdiction in Table 302.1, buildings shall comply on a performance basis in accordance with Section 601.3.1.

Exception: Buildings less than 25,000 square feet (2323 m²) in *total building floor area* pursuing compliance on a prescriptive basis shall be deemed to have a zEPI of 51 and shall not be required to comply with the zEPI of Jurisdictional Choice indicated by the jurisdiction in Table 302.1.

Revise as follows:

601.3 Application. Buildings and their associated building sites shall comply with Section 601.3.1 or Section 601.3.2— except that, where indicated by the jurisdiction under the Chapter 6 provisions of Table 302.1, buildings with a total building floor area of more than 25,000 square feet and their associated building sites shall be designed on a performance basis in accordance with Section 601.3.1

602.1 Performance-based compliance. Compliance for buildings and their sites to be designed on a performance basis shall be determined by predictive modeling. Predictive modeling shall be determined in accordance with Section C407 of the *International Energy Conservation Code*. The proposed design shall not use more energy than the standard reference design. Where indicated under the Chapter 6 provisions of Table 302.1, the proposed design shall further reduce annual energy use by not less than the amount indicated in Table 302.1, as compared to the energy used by the standard reference design. ~~use source energy kBtu/sf-y unit measure based on compliance with Section 602.1.1 and CO₂e emissions in Section 602.3.~~ Where a building has mixed uses, all uses shall be included in the performance-based compliance.

602.1.1 zEPI. Performance-based designs shall demonstrate a zEPI of not more than 51 as determined in accordance with Equation 6-1 for energy use reduction and shall demonstrate a CO₂e emissions reduction in accordance with Section 602.2 and Equation 6-2 for CO₂e.

$$zEPI = 57 \cdot (EUI_p/EUI) \quad \text{(Equation 6-1)}$$

where:

~~EUI_p = the proposed energy use index in source kBtu/sf-y for the proposed design of the building and its site calculated in accordance with Section 602.1.2.~~

~~EUI = the base annual energy use index in source kBtu/sf-y for a baseline building and its site calculated in accordance with Section 602.1.2.~~

602.1.2 Base annual energy use index. The proposed energy use index (EUI_p) of the building and building site shall be calculated in accordance with Equation 6-1 and Appendix G to ASHRAE 90.1, as modified by Sections 602.1.2.1 through 602.1.2.3. The annual energy use shall include all energy used for building functions and its anticipated occupancy.

602.1.2.1 Modifications to Appendix G of ASHRAE 90.1. The performance rating in Section G1.2 of ASHRAE 90.1 shall be based on energy use converted to consistent units in accordance with Sections 602.1.2.2 and 602.1.2.3, instead of energy cost.

**TABLE 602.1.2.1
ELECTRICITY GENERATION ENERGY CONVERSION FACTORS BY EPA eGRID SUB-REGION^a**

eGRID 2007 SUB-REGION ACRONYM	eGRID 2007 SUB-REGION NAME	ENERGY CONVERSION FACTOR
AKGD	ASCC Alaska Grid	2.97

AKMS	ASCC-Miscellaneous	1.76
ERCT	ERCOT-All	2.93
FRCC	FRCC-All	2.97
HIMS	HICC-Miscellaneous	3.82
HIOA	HICC-Oahu	3.14
MORE	MRO-East	3.40
MROW	MRO-West	3.41
NYLI	NPCC-Long-Island	3.20
NEWE	NPCC-New-England	3.01
NYCW	NPCC-NYCAWestchester	3.32
NYUP	NPCC-Upstate-NY	2.51
RFGE	RFCEast	3.15
RFCM	RFC-Michigan	3.05
RFCW	RFC-West	3.14
SRMW	SERC-Midwest	3.24
SRMV	SERC-Mississippi-Valley	3.00
SRSO	SERC-South	3.08
SRTV	SERC-Tennessee-Valley	3.11
SRVC	SERC-Virginia/Carolina	3.13
SPNO	SPP-North	3.53
SPSO	SPP-South	3.05
CAMX	WECC-California	2.61
NWPP	WECC-Northwest	2.26
RMPA	WECC-Rockies	3.18
AZNM	WECC-Southwest	2.95

a. Sources: EPA eGrid2007 version 1.1, 2005 data; EPA eGrid regional gross grid loss factors; EIA Table 8.4a (Sum tables 8.4b and 8.4c) and Table 8.2c (Breakout of Table 8.2b), 2005 data.

602.1.2.3 Nonrenewable energy. In calculating the annual energy use index for fuel other than electrical power, 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 Btu's and multiplying by the conversion factor in Table 602.1.2.2. The conversion factor for energy sources not included in Table 602.1.2.2 shall be 1.1. Conversion factors for purchased district heating shall be 1.35 for hot water and 1.45 for steam. The conversion factor for district cooling shall be 0.33 times the value in Table 602.1.2.1 based on the EPA eGRID Sub- region in which the building is located.

602.2 Annual direct and indirect CO₂e emissions. The CO₂e emissions calculations for the building and building site shall be determined in accordance with Sections 602.2.1 and 602.2.2. The emissions associated with the proposed design shall be less than or equal to the CO₂e emissions associated with the standard reference design in accordance with Equation 6-2.

$$CO_2e_{pd} \geq (zEPI \times CO_2e_{srbd})/57 \quad \text{(Equation 6-2)}$$

where:

$zEPI$ = the minimum score in accordance with Section 602.1.1.

CO_2e_{pd} = emissions associated with the proposed design.

CO_2e_{srbd} = emissions associated with the standard reference budget design in accordance with Section 602.1.2.

602.2 Annual direct and indirect CO₂e emissions. CO₂e emissions for building and building site for the proposed design shall be less than or equal to the CO₂e emissions for the standard reference design. The CO₂e emissions shall be determined in accordance with Section 7 of ASHRAE 105, utilizing the annual energy use figures from Section 602.1.

602.2.1 Onsite electricity. Emissions associated with use of electric power shall be based on electric power excluding any renewable or recovered waste energy covered under Section 602.2.1. Emissions shall be calculated by converting the electric power used by the building at the electric utility meter or measured point of delivery, to MWh, and multiplying by the CO₂e conversion factor in Table 602.2.1 based on the EPA eGRID Sub-region in which the building is located.

**TABLE 602.2.1
ELECTRICITY EMISSION RATE BY EPA eGRID SUB-REGION^a**

eGRID 2007 SUB-REGION ACRONYM	eGRID 2007 SUB- REGION NAME	2005 CO ₂ e RATE (lbs/MWh)
AKGD	ASCC Alaska Grid	1270
AKMS	ASCC Miscellaneous	515
ERCT	ERCOT All	4417
FRCC	FRCC All	4416
HIMS	HICC Miscellaneous	1595
HIOA	HICC Oahu	18591
MORE	MRO East	1971
MROW	MRO West	1957
NYLI	NPCC Long Island	1651
NEWE	NPCC New England	999
NYCW	NPCC NYC/Westchester	874
NYUP	NPCC Upstate NY	774
RFCE	RFC East	1224
RFCM	RFC Michigan	1680
RFCW	RFC West	1652
SRMW	SERC Midwest	1966

eGRID-2007 SUB-REGION ACRONYM	eGRID-2007 SUB- REGION NAME	2005-CO ₂ e RATE (lbs/MWh)
SRMV	SERC-Mississippi Valley	1094
SRSO	SERC-South	1601
SRTV	SERC-Tennessee Valley	1623
SRVC	SERC-Virginia/Carolina	1220
SPNO	SPP-North	2106
SPSO	SPP-South	1780
CAMX	WECC-California	768
NWPP	WECC-Northwest	958
RMPA	WECC-Rockies	1999
AZNM	WECC-Southwest	1391

a.Sources: EPA eGRID2007 Version 1.1, 2005 data; EPA eGrid regional gross grid loss factor.

602.2.2 Onsite nonrenewable energy. Emissions associated with the use of nonrenewable energy sources other than electrical power such as natural gas, fuel oil, and propane shall be calculated by multiplying the fossil fuel energy used by the building and its site at the utility meter by the national emission factors in Table 602.2.2 and the conversions required by this section. Emissions associated with fossil fuels not specified in Table 602.2.2 shall be calculated by multiplying the fossil fuel used by the building at the utility meter by 250. Emissions associated with purchased district energy shall be calculated by multiplying the energy used by the building at the utility meter by 150 for hot water and steam, and for district cooling, the factors from Table 602.2.2 based on the EPA eGRID Sub-region in which the building is located.

**TABLE 602.2.2
FOSSIL FUEL EMISSION FACTORS**

EMISSION RATE (lb/MMBtu HHV)	NATURAL GAS AS STATIONARY FUEL	FUEL OIL AS STATIONARY FUEL	PROPANE AS STATIONARY FUEL
CO ₂ e	137.35	200.63	162.85

For SI: MMBtu = 1,000,000 Btu = 10 terms; HHV = High-heating value.

602.2.3 Annual direct and indirect CO₂e emissions associated with onsite use of fossil fuels and purchased district energy. Emissions associated with the use of natural gas, fuel oil and propane shall be calculated by multiplying the natural gas, fuel oil, and propane delivered to the building at the utility meter by the corresponding emission factors in Table 602.2.2. Emissions associated with fossil fuels not listed shall be calculated by multiplying the fossil fuel delivered to the building at the utility meter by 250. Emissions associated with purchased district heating shall be calculated by multiplying the heating energy delivered to the building at the utility meter by 150 for hot water and steam, and for district cooling, the factors from Table 602.2.1 based on the EPA eGRID Sub-region in which the building is located.

603.3.7 Renewable and waste energy. Equipment and systems providing energy from renewable or waste energy sources which is included in the determination of the building zEPI, annual energy use of the proposed design in accordance with Section 602.1 shall be capable of being metered to allow a

determination of the output of equipment and systems in accordance with Sections 603.3.7.1 through 603.3.7.5.

Revise as follows:

**TABLE A106
ENERGY CONSERVATION AND EFFICIENCY**

SECTION	DESCRIPTION	MINIMUM NUMBER OF ELECTIVES REQUIRED AND ELECTIVES SELECTED
A102.2	The jurisdiction shall indicate a number between and including 0 and up to and including 10 to establish the minimum total number of project electives that must be satisfied.	—
A106.1	zEPI Annual net energy use reduction project electives	<input type="checkbox"/> Yes <input type="checkbox"/> No
A106.1	zEPI Annual net energy use is at least 5 points 10 percent lower than required by Table 302.1	<input type="checkbox"/> 1 elective
A106.1	zEPI Annual net energy use is at least 40 points 20 percent lower than required by Table 302.1	<input type="checkbox"/> 2 electives
A106.1	zEPI Annual net energy use is at least 45 points 30 percent lower than required by Table 302.1	<input type="checkbox"/> 3 electives
A106.1	zEPI Annual net energy use is at least 20 points 40 percent lower than required by Table 302.1	<input type="checkbox"/> 4 electives
A106.1	zEPI Annual net energy use is at least 25 points 50 percent lower than required by Table 302.1	<input type="checkbox"/> 5 electives
A106.1	zEPI Annual net energy use is at least 30 points 60 percent lower than required by Table 302.1	<input type="checkbox"/> 6 electives
A106.1	zEPI Annual net energy use is at least 35 points 70 percent lower than required by Table 302.1	<input type="checkbox"/> 7 electives
A106.1	zEPI Annual net energy use is at least 40 points 80 percent lower than required by Table 302.1	<input type="checkbox"/> 8 electives
A106.1	zEPI Annual net energy use is at least 45 points 90 percent lower than required by Table 302.1	<input type="checkbox"/> 9 electives
A106.1	zEPI Annual net energy use is at least 54 points 100 percent lower than required by Table 302.1	<input type="checkbox"/> 10 electives
A106.2	Mechanical systems project elective	<input type="checkbox"/> Yes <input type="checkbox"/> No
A106.3	Service water heating	<input type="checkbox"/> Yes <input type="checkbox"/> No
A106.4	Lighting systems	<input type="checkbox"/> Yes <input type="checkbox"/> No
A106.5	Passive design	<input type="checkbox"/> Yes <input type="checkbox"/> No
A106.6	Renewable energy systems—5 percent	<input type="checkbox"/> Yes <input type="checkbox"/> No
A106.6	Renewable energy systems—10 percent	<input type="checkbox"/> Yes <input type="checkbox"/> No
A106.6	Renewable energy systems—20 percent	<input type="checkbox"/> Yes <input type="checkbox"/> No

A106.1 ~~zEPI~~ Annual net energy use reduction project electives. Project electives for buildings pursuing performance-based compliance in accordance with Section 601.3.1 shall be in accordance with the portions of Table A106 that reference Section A106.1, ~~Equation 6-4~~ and the calculation procedures specified in Section ~~602.1~~ 602.1.2.1.

Add new standard(s) as follows:

ASHRAE

ANSI/ASHRAE 105-2013 Standard Methods of Determining, Expressing, and Comparing Building Energy Performance and Greenhouse Gas Emissions

Reason: The current zEPI language is difficult to understand, adopt, modify and enforce. The zEPI multiplier requires modification at each adoption cycle to align the zEPI multiplier relative ratio of the efficiency of the current ASHRAE 90.1 (2013) and the baseline "100 level" CBECs building. Otherwise, the path-to-net-zero multiplier is ineffective.

The options for local modification are difficult to understand by an adopting jurisdiction, as well as the method to select the level of enhanced energy performance.

The use of the regional conversion factors further complicate the understanding. And the use of 2005 EIA eGRID data to create the multiplication factors is an outdated method using decade-old view of regional energy use. The 2005 data does not take into account either the substantial increases in renewable energy (wind, solar, etc.) or the phase-out of coal fired power plants. This is the reason that no other sustainable program uses the eGRID regional data for "source energy" and CO₂e reporting. LEED, Energy Star and ASHRAE Standards utilize national source energy figures. IgCC is an international standard and for US energy reporting, national figures (or locally selected figures) should be used.

The intent is to simplify the method for a performance/modeled energy compliance path through **X** steps:

Step 1: Simplify the 302.1 and Table 302.1 methodology for local adoption and selection of "level a modeled/performance design should be above code". The intent of the 2010 IgCC was to allow local jurisdiction to require performance (modeling) path of the design to 10% above the current code (for all structures over 25,000 Sq. Ft.). The % above code could be modified by the local jurisdiction. The revised 302.1 is clearer about how the jurisdiction sets the improvement above code. Current code is unclear on how the zEPI correlates to current code.

Step 2: Use the IECC as the energy code. The IgCC is an overlay code to the I-codes, not ASHRAE 90.1. The modeling of energy performance should be relative to the IECC. IECC C407 is the performance modeling methodology for the I-Codes.

Using ASHRAE 90.1 as the energy code baseline in the current IgCC does not show the building energy performance relative to the IECC, much less if the building is even compliant with the IgCC. If wanting to compare energy performance relative to 90.1, ASHRAE 189.1 is an available compliance path.

Step 3: Section 602 is inordinately complex and uses a proxy that is not substantiated through any energy modeling or other calculation. The zEPI requires updating at every code cycle to match current energy code performance (actually it requires analyzing ASHRAE 90.1). The Equation 6-1 is simplified to require: The design building shall use 10% less energy (or the figure selected by the local jurisdiction) than a baseline IECC building.

Step 4: It also simplifies the emissions reporting methodology. Source energy figures are controversial and are relative to means and methods that are NOT under the control of the building. The current tables with eGRID data will be a full decade out of date when the 2015 IgCC is released. Putting requirements for minimum code compliance based on these figures is not within the scope of a building code. The design and construction of tomorrow's buildings should not be based on the rough estimates of yesterday's energy distribution grid. Carbon emissions information is recognized as important information for an Owner to use in their construction decisions. However CO₂e is difficult as a minimum hurdle "enforcement tool" in code. CO₂e should be a reporting requirement for the baseline and design conditions and is all that is required. The reporting methodology is now made easier with the updated release of ASHRAE Standard 105 (Standard Methods of Determining, Expressing, and Comparing Building Energy Performance and Greenhouse Gas Emissions). This ASHRAE standard can reference the latest eGRID via an ANSI standard methodology, yet leaves flexibility to the local jurisdiction to set multipliers the local authority might desire. The City of Tacoma, Washington, has its own electric utility that owns enough hydroelectric generation to provide over 80% of its power from this renewable source. They may wish to use a different multiplier for their CO₂e reporting.

Step 5: Path to net zero. Outside organizations can take the time to develop on their own a multiplier for the EUI of IECC/IgCC buildings to show the "path to zero". But setting an arbitrary multiplier in code as a minimum requirement for obtaining a certificate of occupancy should not be included in the IgCC.

Step 6: Table A106.1 for the electives for performance modeling beyond the Section 602 level is updated for a post-zEPI.

Cost Impact: Will not increase the cost of construction. The methodology will simplify methods of compliance for the construction community as well as for the enforcing jurisdictions.

Analysis: A review of the standard proposed for inclusion in the code, ASHRAE105-2013 with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28), will be posted on the ICC website on or before April 1, 2014.

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