

GEW147-14

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Revise as follows:

601.3 Application. Buildings and their associated building sites shall comply with Section 601.3.1, Section 601.3.2 or 601.3.3.

601.3.3 Outcome-based compliance. Buildings designed on an outcome basis shall comply with Sections 612, 603, 610, and 611 and the *International Energy Conservation Code*.

603.2.2 Onsite nonrenewable energy. For the purpose of determining compliance with the provisions of Section 603.2, the CO₂e emissions associated with onsite non-renewable energy use shall be calculated in accordance with Section 602.2.2.

610.1.1 Building performance-based and outcome-based compliance. Buildings and surrounding property or building sites where there are multiple buildings on the building site, that are designed and constructed in accordance with Section 601.3.1, performance-based compliance or Section 612.3 Outcome-based compliance, shall be equipped with one or more renewable energy systems that have the capacity to provide not less than 2 percent of the total calculated annual energy use of the building, or collective buildings on the site.

612 OUTCOME-BASED PATHWAY REQUIREMENTS.

612.1 Outcome-based requirements. Compliance for buildings and their sites to be designed on an outcome basis shall be determined by actual measurement of all the energy being used once the building and the energy using elements associated with the building site are in full operation in accordance with Equation 6-3. Where a building has multiple occupancy types, the maximum allowable energy use shall be based on total gross floor area of each occupancy type in relation to the total gross floor area of all occupancy types within the building. Buildings and building sites complying with this section shall also comply with the *International Energy Conservation Code*. Compliance shall be based on a determination of actual energy use in accordance with this section.

Exception: Buildings having one or more uses or occupancies not listed in Table 612.1 or where a mixed use building in accordance with the *International Building Code* includes any occupancies not shown in Table 612.1, shall not be eligible to demonstrate compliance with this code in accordance with Section 612.

**TABLE 612.1
REFERENCE ANNUAL ENERGY USE INDEX (EUIr)**

<u>Climate zone^a</u>	<u>1A</u>	<u>2A</u>	<u>2B</u>	<u>3A</u>	<u>3B</u>	<u>3C</u>	<u>4A</u>	<u>4B</u>	<u>4C</u>	<u>5A</u>	<u>5B</u>	<u>6A</u>	<u>6B</u>	<u>7</u>	<u>8</u>
<u>Use and Occupancy^b</u>	Reference EUIr skBtu/sf/yr														
Business (B)															
Office	154	159	154	151	140	137	167	144	152	179	155	190	176	208	282
Bank	154	159	154	151	140	137	167	144	152	179	155	190	176	208	282
Medical office (non-	115	118	115	113	104	102	125	108	114	134	116	148	131	156	210

Climate zone ^a	1A	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	6A	6B	7	8
diagnostic)															
Storage (S-2)															
Distribution/ Shipping Center	105	67	69	66	64	55	75	70	66	87	81	104	95	119	186
Mercantile (M)															
Grocery/ Food Store	448	476	452	484	450	473	522	479	514	554	511	592	561	633	758
Assembly (A)															
Library (A-3)	234	232	224	230	217	209	254	228	235	275	246	304	277	327	434
Educational (E)															
Elementary/ Middle School	140	139	134	134	128	124	149	132	132	160	141	182	161	193	274
Institutional (I-2)															
Hospital/ Inpatient health	417	422	397	408	388	407	425	366	398	425	374	439	394	446	532

a Climate zones as determined in accordance with by Section C301 of the *International Energy Conservation Code*.

b. Use and occupancy as determined by Chapter 3 of the *International Building Code*.

612.1.1 zEPI. All outcome-based designs shall demonstrate a zEPI of not more than 51 as determined in accordance with Equation 6-3.

$$zEPI = 100 (EUI_a / EUI_r)$$

(Equation 6-3)

Where:

EUI_a = the Actual Annual Energy Use Index for the *building* and *building site* expressed in accordance with Section 612.1.2 and Equation 6-4.

EUI_r = the Reference Annual Energy Use Index for the *building* use and occupancy in Table 612.1 as adjusted by Section 612.1.3 where applicable

612.1.2 Actual energy use intensity (EUIa). The actual energy use intensity (EUIa) of the *building* and *building site* shall be expressed in accordance with this section. On-site renewable energy generation in excess of the generation requirements of Section 610 shall be included in the calculation of the EUIa.

The EUI_a shall be determined in accordance with Equation 6-4 and Sections 612.1.2.1.

$$EUI_a = (AEU_{consumption} - AEU_{renewable})/TCFA \quad \text{(Equation 6-4)}$$

Where:

EUI_a = the energy use intensity of the *building* and *building site*

$AEU_{consumption}$ = the annual energy consumed by the *building* and *building site* from all forms of energy specified in Sections 603.3.1 through 603.3.6 and converted to source Btus in accordance with Sections 602.1.2.2 and 602.1.2.3.

$AEU_{renewable}$ = the annual energy produced by *onsite renewable energy systems* in excess of the production required by Section 610 and converted to source Btus by multiplying onsite Btu production by a factor of 1.

TCFA = the total conditioned floor area of the building

612.1.2.1 Measurement of AEU's. The AEU's shall be determined from metering, utility billing or other form of measurement in accordance with Section 603.

612.1.3 Reference energy use intensity (EUIr). The reference energy use intensity shall be determined utilizing Table 612.1. The EUIr value from Table 603.1 shall be adjusted based on the monthly weighted average percentage of occupied floor area during the 12-month compliance period as documented in accordance with 612.3.2. For buildings with multiple use or occupancy designations in Table 612.1, the EUIr shall be adjusted based on the weighted area average of the use or occupancy.

612.2 Annual direct and indirect CO₂e emissions. The emissions associated with the EUIa shall be less than or equal to the CO₂e emissions associated with the CO₂e emissions in accordance with the EUIr determined in Section 612.1.3. The CO₂e emissions calculations for the building and building site shall be determined in accordance with Sections 612.2.1 and 612.2.2 and Equation 6-5.

$CO_{2ea} \leq (CO_{2er} \times zEPI) / 100$ **(Equation 6-5)**

where:

zEPI = the minimum score as prescribed by Section 612.1.1

CO_{2ea} = emissions associated with the EUIa of the building as determined in accordance with Section 612.1.2

CO_{2er} = emissions associated with the EUIr as determined in accordance with Section 612.1.3

612.2.1 Onsite electricity. For the purpose of determining compliance with the provisions of Section 612.2, the CO₂e emissions associated with onsite electricity use shall be calculated in accordance with Section 602.2.1.

612.2.2 Onsite nonrenewable energy. For the purpose of determining compliance with the provisions of Section 612.2, the CO₂e emissions associated with onsite non-renewable energy use shall be calculated in accordance with Section 602.2.2.

612.3 Compliance. Compliance with Section 612 shall be determined in accordance with Sections 612.3.1 through 612.3.4

612.3.1 Issuance of temporary certificate of occupancy. Where the code official determines a building and its site are in compliance with this code other than Section 612, the code official shall issue a Temporary Certificate of Occupancy as authorized in Section 111.3 of the *International Building Code*.

612.3.2 Reporting of energy use and CO₂e emissions. Within 36 months of issuance of the temporary certificate of occupancy, the building owner shall provide the code official with documentation, in a form acceptable to the code official and certified by a registered design professional, of a continuous 12-month period where the building complies with Sections 612.1 and 612.2. The occupancy or use type for the occupied period utilized in Section 612.1.3 shall be indicated in the documentation and include the time periods and square footage of the building occupied by all building tenants.

612.3.3 Certificate of occupancy. Upon compliance with Section 612.3.2, the building shall be issued a Certificate of Occupancy.

612.3.4 Non-compliance. Should the building owner fail to comply with Section 612.3.2, the owner shall be deemed non-compliant and be issued a violation.

NOTE: This version of the code change proposal has been updated to include all reported errata.

Reason: This proposal for the establishment of an outcome-based approach to compliance with energy requirements is intended to address numerous issues impacting code departments, designers, building owners and energy efficiency advocates. To address these diverse needs, stakeholders representing these segments of the industry have come together to begin addressing these issues. While discussed in greater depth below, the following list represents some of the challenges addressed by this proposal:

Code departments have limited resources available to enforce building codes—particularly energy codes.

Energy use is highly measurable yet current code pathways anticipate results from designs, not actual building performance.

Designers often do not have the flexibility to use the latest technologies in achieving energy efficiency requirements.

Effectively capture all energy saving strategies including those not currently covered under the IECC including building orientation.

Reducing energy use at the systems level is required but this approach has not been handled effectively in the IECC.

Energy uses not covered within the existing code framework (i.e., plug loads) are a growing percentage of energy use associated with buildings.

For 35 years, since the first energy codes, there has been no consideration in the codes for how buildings actually perform – only criteria prescribing how they are to be designed and constructed. The provisions in virtually all energy codes and standards are based on a number of prescribed criteria that must be satisfied by specific products, materials and components of a building. The closest these documents come to actual performance of a building is a simulation of how a building as designed is expected to perform compared to the same identical building but assumed to just meet the provisions in the code. In effect, this creates a custom energy budget for each and every building based on a prescriptive foundation.

Unfortunately, many of those criteria do not allow for application of new technologies such as innovative window materials or creative design approaches such as passive solar, building form and shape, and orientation. In order to establish an actual EUI (EUIa) for a building the code must provide a methodology for measuring and expressing the energy use of a building and subsequently be able to compare it to the target reference EUI (EUIr) as part of the compliance verification process.

The purpose of this section is to allow the design team in conjunction with the owner/developer the freedom to achieve a common and uniform objective that applies equally, without exception, to all buildings of the same type and in the same climate zone – something not included in current energy codes and standards. The significance of actual validation of achieving that objective is through measurement of actual building operation as it is intended to be occupied. Energy simulation is part of the current models, but such modeling is not known as a good predictor of actual energy performance. It is an appropriate comparison of the merits of different design considerations.

This proposed outcome procedure is unique and offers communities the option to gain valuable experience and knowledge with a method and accurate results far beyond the traditional procedures of design for energy conservation. An analogy can be made between the outcome based requirements for a building to the purchase and use of an automobile. When purchasing a vehicle you are given information about the vehicle's performance in its specifications and the mileage that is anticipated for its operation. However, your personal performance and mileage may be quite different. Only by checking the actual mileage can you know whether what was stated is being achieved.

Similarly, under traditional energy codes and standards, when the building is completed and is occupied there is no way to know whether the decisions for a specific design or material or orientation resulted in actual energy savings. This proposed outcome approach provides a real target, allows design options and flexibility and then provides real answers as to whether what was planned has been achieved in a way that has never been done before.

An outcome-based framework accommodates actual conditions in existing buildings better than prescriptive or modeled-performance approaches. Owners of existing buildings are allowed to invest in a strategy that achieves performance improvements without specifically having to meet code minimums which may not reflect how the building was originally constructed. Outcome-based pathways allow for designs to incorporate operations and management or tenant behavior.

In addition to the National Institute of Building Sciences, this proposal is supported by:

- New Buildings Institute
- Institute for Market Transformation
- Colorado Chapter, International Code Council

SECTION-BY-SECTION ANALYSIS FOR OUTCOME-BASED PATHWAY PROPOSAL TO INTERNATIONAL GREEN CONSTRUCTION CODE

Edits in Existing Sections:

601.3 Establishes the outcome-based pathway as an acceptable method for compliance with the *Energy Conservation, Efficiency and CO₂e Emission Reduction* chapter of the IgCC.

601.3.3 Defines the provisions to be applied when pursuing the Outcome-based pathway, including setting the International Energy Conservation Code as a minimum requirement.

610.1.1 Like in the performance-based pathway, the outcome-based pathway requires a building to have renewable energy systems onsite that can produce at least 2 percent of the annual building energy use.

New Section 612 Establishing Outcome-Based Pathway Requirements

612.1 Establishes the outcome-based pathway as an actual measurement of energy use once in full operation. For buildings with multiple occupancy types, the gross floor area of each type is used to determine compliance. If an occupancy type is not included in the table then this pathway cannot be used.

612.1.1 Establishes the equation to be used in determining the target energy use. The target is based on the ratio of a building's actual energy use to a reference value provided in Table 60X.1. The actual use should be 51 percent or better than the values in the table. The table is based on data from the 2003 Commercial Buildings Energy Consumption Survey conducted by the U.S. Department of Energy's Energy Information Administration. The equation is based on source Btus.

612.1.2 The building's actual energy use in equation 6-3 is calculated based on non-renewable source energy used onsite on a square foot basis. Renewable energy above the Section 610 requirement is not included in the calculation.

612.1.2.1 The actual energy use shall be determined by methodologies expressed in Section 603.

612.1.3 The reference energy use is determined by using Table 60X.1 for the building occupancy type and climate zone. The reference is adjusted to account for actual occupied floor area.

612.2 In addition to compliance with energy use requirements, the IgCC requires compliance with greenhouse gas emission requirements. The actual and reference energy use determined in 60X.1 is used to calculate greenhouse gas emissions in relation to the zEPI.

612.2.1 The greenhouse gas emissions for onsite electricity use is determined using the same calculations as in the performance-based pathway (602.2.1)

612.2.2 The greenhouse gas emissions for onsite, non-renewable energy use is determined using the same calculations as in the performance-based pathway (602.2.2)

612.3 Compliance is to be determined post-occupancy

612.3.1 Upon the satisfaction of the code official that all other code requirements are met, a temporary certificate of occupancy is issued.

612.3.2 The energy use and CO₂e calculations determined under this pathway are to be determined and reported to the code official in an acceptable format. The compliant report covers 12 months that meet the target requirements within the 36 month period. The results are to be certified by a registered design professional.

612.3.3 The building is considered compliant and the owner is issued a final certificate of occupancy if they provide an affirmative report as required in section 60X.3.2.

612.3.4 If the building owner is unable to produce the results required within three years of issuance of the temporary certificate of occupancy, the building is in violation of this section of the code.

Cost Impact: Will not increase the cost of construction.