2024 IECC

NBI, representing the California Statewide Utility Codes and Standards Team, has submitted public comments into the ICC process to advance the 2024 IECC. The proposed public comments cover a wide range of measures and improve the code by adding additional efficiency, clarifying requirements, and creating greater flexibility for code users and local jurisdictions. Learn more at newbuildings.org/code_policy/2024-iecc-national-model-energy-code-base-codes.

Revise text as follows:

R405.2 TOTAL BUILDING THERMAL ENVELOPE UA

NEW LANGUAGE IN RED FONT

SECTION R405
~~TOTAL~~ SIMULATED BUILDING PERFORMANCE

R405.2 Simulated performance ~~Performance-based~~ compliance. Compliance based on total building performance requires that a *proposed design* meets all of the following:
1. The requirements of the sections indicated within **Table R405.2**.
2. The proposed total building thermal envelope UA, which is the sum of the U-factor times assembly area, shall be ~~greater~~ less than or equal to the building thermal envelope UA using the prescriptive U-factors from Table R402.1.2 multiplied by 1.08 in Climate Zones 0, 1, and 2, and ~~1.15~~ 1.10 in Climate Zones 3 through 8 in accordance with Equation 4-2. ~~levels of efficiency and solar heat gain coefficients in Table R402.1.1 or R402.1.3 of the 2009 International Energy Conservation Code~~. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.

For Climate Zones 0-2: $UA_{\text{Proposed design}} \leq 1.08 \times UA_{\text{Prescriptive reference design}}$
For Climate Zones 3-8: $UA_{\text{Proposed design}} \leq$ ~~1.15~~ 1.10 $\times UA_{\text{Prescriptive reference design}}$

Reason Statement: California's Statewide Utility Codes and Standards Team submitted a detailed analysis in support of the recommended multiplier for total building thermal envelope UA in the IECC Residential Consensus Committee Results of Ballot #2 (attached below). The analysis investigated whether the proposed 1.15 multiplier is an appropriate target for all climate zones using 2015 IECC prescriptive envelope requirements as a benchmark for minimum allowed envelope performance. The analysis indicated that a multiplier of 1.10 be used for the total building thermal envelope UA in Climate Zones 3-8. To avoid using a multiplier that might represent a net decrease in energy efficiency in 2024 IECC R405.2, we recommend that once all other envelope measures have been finalized that additional analysis is undertaken by PNNL to choose a multiplier that at a minimum maintains a level of envelope performance in 2024 IECC equivalent to the 2015 IECC prescriptive envelope. Until that analysis is completed, we suggest updating the multiplier from 1.15 to 1.10.

ANALYSIS OF IECC TOTAL BUILDING THERMAL ENVELOPE UA

Introduction

On behalf of the California Utility Codes and Standards Team, and in response to the REPI-122-21 proposal, TRC and 2050 Partners performed an analysis of the total building thermal envelope UA. REPI-122-21 states the following:

> "The proposed total building thermal envelope UA, which is the sum of U-factor times assembly area, shall be less than or equal to the building thermal envelope UA using the prescriptive U-factors from Table R402.1.2 multiplied by 1.15 in accordance with Equation 4-1.
>
> $UA_{Proposed\ design} \leq 1.15 \times UA_{Prescriptive\ reference\ design}$ (Equation 4-1)"

This analysis investigates whether the 1.15 multiplier is an appropriate target for all climate zones, using the 2015 IECC requirements as a benchmark for the minimum allowed envelope performance.

Methodology

The team evaluated UA for one single-family prototype house in different climate zones. The building geometry was consistent with PNNL's 2021 IECC determination (Salcido, Chen, Xie, & Taylor, 2021a), also reflected in DOE's prototype building files (US Department of Energy, 2021). Assumptions for these models, which utilized the most common foundation types for each climate zone, are summarized in Table 1.

Table 1. Representative Models by Climate Zone

CZ	Representative City	Foundation Type
1A	Miami, FL	Slab on grade
2A	Houston, TX	Slab on grade
3A	Atlanta, GA	Slab on grade
4A	New York, NY	Crawlspace
5B	Denver, CO	Heated basement
6A	Rochester, MN	Heated basement
7	International Falls, MN	Heated basement
8	Fairbanks, AK	Crawlspace

To recommend multipliers for each climate zone, the team compared proposed 2024 prescriptive U-factor requirements to the 2015 prescriptive envelope requirements, using the Ekotrope[1] software to calculate total UA. The proposed 2024 prescriptive U-factor

[1] https://www.ekotrope.com/

requirements are identical to the 2021 requirements in Table R402.1.2, except for proposed changes to the fenestration U-factor for climate zones 5-8 (REPI-28-21)[2] and proposed changes to the ceiling U-factor and R-value for climate zones 2-8 (REPI-33). The U-factor reference design properties for 2021 IECC, 2015 IECC, and the proposed 2024 IECC are summarized in Table 2. Changes between code years are highlighted for emphasis.

*Table 2. Summary of U-factor Reference Design Properties**

CZ	Fenestration U-Factor			Ceiling U-Factor			Wood Frame Wall U-factor	
	2024 (Proposed)	2021	2015	2024 (Proposed)	2021	2015	2021	2015
1A	0.50	0.50	0.50	0.035	0.035	0.035	0.084	0.084
2A	0.40	0.40	0.40	0.030	0.026	0.030	0.084	0.084
3A	0.30	0.30	0.35	0.030	0.026	0.030	0.060	0.060
4A	0.30	0.30	0.35	0.026	0.024	0.026	0.045	0.060
5B	0.28	0.30	0.32	0.026	0.024	0.026	0.045	0.060
6A	0.28	0.30	0.32	0.026	0.024	0.026	0.045	0.045
7	0.27	0.30	0.32	0.026	0.024	0.026	0.045	0.045
8	0.27	0.30	0.32	0.026	0.024	0.026	0.045	0.045

*There are no U-factor changes from 2015 to 2021 in floor, basement wall, or crawlspace requirements

The UA results for the 2015, 2021, and 2024 reference designs (designated as 2015 RD, 2021 RD and 2024 RD), are summarized in Table 2.

Table 3. UA Results by Climate Zone and Code Year

CZ	UA		
	2015 RD	2021 RD	2024 RD
1A	498.3	498.3	498.3
2A	452.7	448.0	452.9
3A	383.7	339.9	344.8
4A	350.0	297.0	299.4
5B	368.9	327.8	319.0
6A	338.1	327.8	319.0
7	338.1	327.8	315.4
8	284.8	274.5	266.2

[2] Note that REPI-28-21 also proposes changes to skylight requirements, but there are no skylights in the residential prototype buildings.

Results and Recommendations

Using the UA results above, TRC recommends climate zone-specific multipliers that would allow for envelope performance equivalent to the 2015 IECC envelope requirements. These results are summarized in Table 3.

Table 4. UA Multiplier Results by Climate Zone

CZ	Multiplier		
	2015/2024	With adjustment*	Recommended Multiplier
1A	1.00	1.00	**1.00**
2A	1.01	1.00	**1.00**
3A	1.13	1.11	**1.10**
4A	1.18	1.17	**1.10**
5B	1.17	1.17	**1.10**
6A	1.07	1.07	**1.10**
7	1.08	1.09	**1.10**
8	1.08	1.07	**1.10**

* Due to an inconsistency in the modeling software, we were not able to create representative models to exactly match the reference design UA for models with basements (climate zones 5, 6, and 7). An adjustment was made based on the discrepancy between the 2021 reference design UA and modeled UA.

Therefore, we recommend that Equation 4.1 in REPI-122-21 be updated as follows.

$UA_{Proposed\ design} \leq M_{CZ} \times UA_{Prescriptive\ reference\ design}$, where M_{CZ} is defined by:

Climate Zone	M_{CZ}
1, 2	1.00
3, 4, 5, 6, 7, 8	1.10

REFERENCES

Salcido, R., Chen, Y., Xie, Y., & Taylor, T. (2021a, June). *National Cost Effectiveness of the Residential Provisions of the 2021 IECC.* Retrieved from www.energycodes.gov: https://www.energycodes.gov/sites/default/files/2021-07/2021IECC_CostEffectiveness_Final_Residential.pdf

US Department of Energy. (2021). *Prototype Building Models*. Retrieved from Prototype Building Materials: https://www.energycodes.gov/prototype-building-models