**REPI-126-21-MOD [replaces the version in the monograph; no longer strikes the envelope backstop but creates a single one; shows approved REPI-21 and 131 for context only, and lowers the ERI Max values]**

Proponents: Robby Schwarz, BUILDTank, Inc., representing BUILDTank, Inc. (robby@btankinc.com)

2021 International Energy Conservation Code

Revise as follows:

**R401.2.5 (N1101.13.5) Additional energy efficiency.**

This section establishes additional requirements applicable to all compliance approaches to achieve additional energy efficiency.

1. For buildings complying with Section R401.2.1, one of the additional efficiency package options shall be installed according to Section R408.2.
2. For buildings complying under with Section R401.2.2, the building shall meet one of the following:
	1. One of the additional efficiency package Options in Section R408.2 shall be installed without including such measures in the proposed design under Section R405; or
	2. The proposed design of the building under Section R405.3 shall have an annual energy cost that is less than or equal to 95 percent of the annual energy cost of the standard reference design.
3. ~~For buildings complying with the Energy Rating Index alternative Section R401.2.3, the Energy Rating Index value shall be at least 5 percent less than the Energy Rating Index target specified in Table R406.5.~~

The option selected for compliance shall be identified in the certificate required by Section R401.3.

R406.2 (N1106.2) ERI compliance.

Compliance based on the Energy Rating Index (ERI) requires that the rated design meets all of the following:

1. The requirements of the sections indicated within Table R406.2.
2. Maximum ERI values indicated in ~~of~~ Table R406.5.

**TABLE R406.2 (TABLE N1106.2) REQUIREMENTS FOR ENERGY RATING INDEX**

|  |  |
| --- | --- |
| SECTIONa | TITLE |
| General |
| ~~R401.2.5~~ | ~~Additional efficiency packages~~ |

Revise as follows:

R406.3 Building thermal envelope. ~~Building and portions thereof shall comply with Section R406.3.1 or R406.3.2.~~

~~R406.3.1 On-site renewables are not included~~.

~~Where on-site renewable energy is not included for compliance using the ERI analysis of Section R406.4, t~~The proposed total *building thermal envelope* UA, which is 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. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.

UAProposed design ~~=~~ ≤ 1.15 × UAPrescriptive reference design (Equation 4-1)

~~R406.3.2 On-site renewables are included~~. ~~Where on-site renewable energy is included for compliance using the ERI analysis of Section R406.4,~~ ~~the~~ *~~building thermal envelope~~* ~~shall be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or Table R402.1.4 of the 2018~~ *~~International Energy Conservation Code~~*~~.~~

Revise as follows:

R406.4 (N1106.4) Energy Rating Index.

The Energy Rating Index (ERI) shall be determined in accordance with ANSI/RESNET/ICC 301. ~~except for buildings covered by the~~ *~~International Residential Code~~* ~~, the ERI reference design ventilation~~ ~~rate shall be in accordance with Equation 4-2.~~

~~Ventilation rate, CFM = (0.01 × total square foot area of~~

~~house) + [7.5 × (number of bedrooms + 1)]~~

~~(Equation 4-2)~~

Energy used to recharge or refuel a vehicle used for transportation on roads that are not on the building site shall not be included in the *ERI reference design* or the *rated design*. ~~For compliance purposes, any reduction in energy use of the rated design associated with on-site renewable~~ ~~energy shall not exceed 5 percent of the total energy use.~~

R406.5 (N1106.5) ERI-based compliance.

Compliance based on an ERI analysis requires that the *rated proposed design* and confirmed built dwelling be shown to have an ERI less than or equal to the appropriate value indicated in Table R406.5 when compared to the *ERI reference design*, as follows:~~.~~

1. Where on-site renewables are not installed, the maximum ENERGY RATING INDEX NOT INCLUDING OPP applies.
2. Where on-site renewables are installed, the maximum ENERGY RATING INDEX INCLUDING OPP applies.
	1. Exception: Where the ERI analysis excludes OPP, the maximum ENERGY RATING INDEX NOT INCLUDING OPP shall be permitted*.*

TABLE R406.5 (TABLE N1106.5) MAXIMUM ENERGY RATING INDEX

|  |  |  |
| --- | --- | --- |
| CLIMATE ZONE | ENERGY RATING INDEX NOT INCLUDING OPP | ENERGY RATING INDEX INCLUDING OPP |
| 0- 1 | ~~52~~ 51 | 40  |
| 2 | ~~52~~ 51 | 40  |
| 3 | ~~51~~ 50 | 40  |
| 4 | ~~54~~ 53 |  40  |
| 5 | ~~55~~ 54 | 40  |
| 6 | ~~54~~ 53 |  40 |
| 7 | ~~53~~ 52 | 40 |
| 8 | ~~53~~ 52 | 40 |

Reason:

The current ERI compliance alternative is overly complicated due to a lack of understanding of the energy modeling that produces an ERI index score. Because of this the Code ERI score is significantly different than other ERI system generated scores which creates a lack of confidence in the compliance path, energy modeling in general, and ERI scores specifically.

Let’s being with backstops. The singular backstop has been added back in, but the reality is that it should never be a problem of the home to achieve the 1.15% better UA because of the ERI requirement without OPP. This proposal requires an ERI compliance score without onsite renewables/onsite power production (OPP) and with OPP if renewables are used. It should be noted that ERI scores can only account for renewable energy that is generated on site. Offsite utility solar or wind energy, community solar gardens, and the like cannot be incorporated into the generation of an ERI score at this time.

Backstops in the current ERI compliance path complicate use of an ERI score, making the ERI compliance path the most restrictive path that is far from equal to the energy performance achieved by the other available compliance options. The objective of the current incorporated backstops is to ensure that one cannot build a poorly performing thermal envelope and then install either good mechanical systems or OPP to drive the ERI score down to a specific compliant level. This is a valid concern but one that can be handled in a much simpler way.

This proposal uses an energy modeled ERI score without OPP installed to be the backstop that protects the quality of the installed R-values and U- values of the building thermal envelope. In addition, it uses the requirement table to ensure installation of energy components in the home follow the IECC. Additions have been added to the requirement table ensuring parity of requirements across compliance paths. (The requirement table has already been reviewed so is included only for context, with the exception of the need to Strike the last component of the table R406.3 Building Thermal Envelope because the ERI score itself will be the envelope backstop moving forward. I have reduced the ERI score by 5% which the Additional Energy Efficient Option Packages is requiring which makes sense to just require that handle via the R408 Section. There may be a desire to lower the ERI score more which I am fine with, but it should be understood that my maximizing the thermal envelope and mechanical systems in a home the ERI score can only be brought down to a 40-35 level. To get to zero from there, it is all OPP. This is why the ERI score itself can be used as a building thermal envelope back stop itself.

An ERI score set in the 50’s and calculated before OPP is installed requires that the builder install R-values and U-values in the envelope that are better than the current 2021 IECC requirements. In fact, the modeling shows that the builder is also required to install mechanical equipment that is better than federal minimums to obtain an ERI score without OPP to meet the ERI score requirements of the past and for this proposal. Therefore, it makes sense to simplify the compliance path, allow for flexibility in developing energy specifications for the house, while at the same time ensuring that the building thermal envelope cannot be less efficient than that required by the prescriptive compliance options. This is all done by setting an ERI compliance score in the 50’s before OPP is installed on the home.

This proposal also requires that a score be developed with OPP. Currently the score has been set to be the same as the score without OPP meaning that the code is not mandating that renewables be installed on the home. However, a simple amendment by a progressive jurisdiction could change the two required scores to achieve climate action or other community goals they may have. For example, if the ERI score was set at 40 without OPP it would be at a about the tipping point where you can’t get lower after maximizing the thermal envelope and mechanical system performance and before renewables would have to be added. So, a jurisdiction could also amend the ERI score with OPP to be zero and mandate zero energy homes. This mandate, however, allows the builder to determine what works best for them for how to achieve the ERI score of 40 without OPP.

As the Building thermal envelope is protected in this proposal by having an ERI score before OPP requirement, I am proposing that the ERI score remain the same per climate zone because they are all in the 50’s. There is no requirement to install OPP but a requirement if it is installed that the score with OPP be equal to or better than the score requirement without OPP.

Next Ventilation: The ventilation debate has been politicized in the current R406 ERI compliance option. I am not here to say that a few more or less cubic feet of air to ventilate a house is good or bad. All I know is that the primary reason for the diversion of the IECC ERI score and the true ANSI/RESNET/ICC standard 301 ERI score is the amended ventilation rate that has been implemented in the IECC adoption of the ERI compliance path. Although the average difference in ERI score is around 10 points, I have seen them differ by as much as 16. This divergence impacts not only the credibility of the ERI compliance process but of Energy Modeling as well. Since the IECC has accepted the ANSI/RESNET/ICC 301 standard as the standard by which to develop an ERI score I propose that the standard be used rather than be significantly amended. The biggest issue we need to keep at the forefront is that all IECC compliant homes are built tight to a specific IECC requirement and are ventilated. This proposal does not change that. All homes will be mechanically ventilated. The upside is more use of a compliance path.

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

This proposal does not change cost implications of using the ERI compliance option. Because the ERI score without OPP have not changed the path is still not as flexible as other compliance options. However, it is easier to use and is more likely to be used without significant amendment.