



2021 IECC RESIDENTIAL ENERGY COMPLIANCE PATHS

BENERGY CODE SUPPORT PROGRAM



SHUMS CODA
ASSOCIATES

COMPLIANCE PATHS: THE BASICS

All projects are required to choose an energy compliance path as part of complying with the International Energy Conservation Code (IECC). The energy compliance path determines parts of building's design and the level of flexibility that will be incorporated into the project.

The energy compliance path is required to be noted on the building plans (R104.3) and is an integral part of performing a plan review or inspections. The compliance path options can be found in Section R401.2 of the 2021 IECC.

Prescriptive— which is an umbrella for three options.

- **Insulation and fenestration criteria (U-Factor) - R402.1.2**
- **R-Value alternative - R402.1.3**
- **Total UA alternative (REScheck) - R402.1.5**

Total Building Performance

Energy Rating Index (ERI) - Two options available

- **On-site renewable energy is not included**
- **On-site renewables are included**

PRESCRIPTIVE

**TOTAL BUILDING
PERFORMANCE**

**ENERGY RATING
INDEX**

**Insulation Fenestration
Criteria (U-factor)**

**On-site renewables are
not included**

R-value Alternative

**On-site renewables are
included**

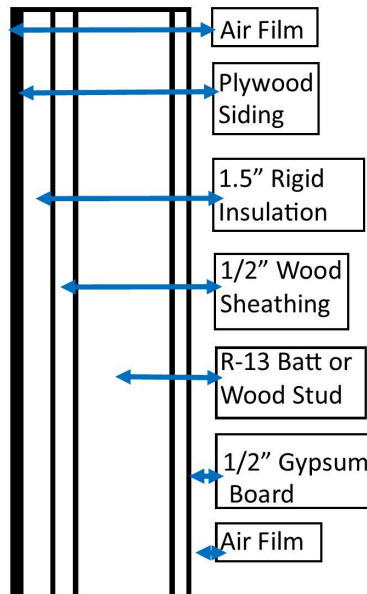
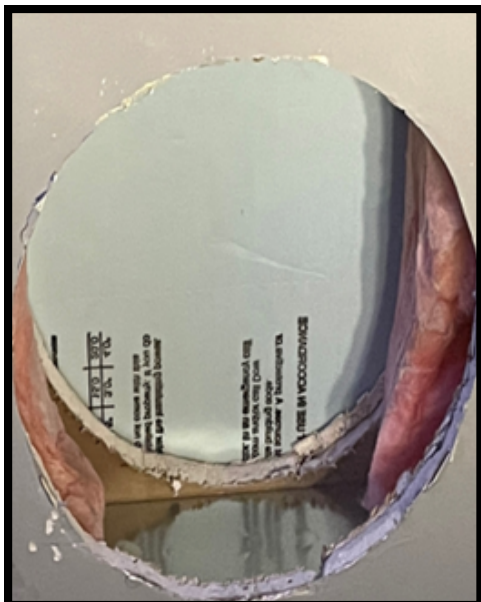
Total UA

Prescriptive- Insulation and Fenestration Criteria (U-Factor)

This option of the prescriptive compliance pathway uses an assembly-by-assembly approach to meet energy code requirements. Due to the extensive documentation it requires, this method is not commonly used. Similar to other prescriptive approaches, it does not allow trade-offs between components — each element of the building envelope, including insulation values, fenestration U-factors, air leakage, mechanical systems, service water heating, and lighting, must independently comply with the code requirements.

Thermal envelope is based on Table R402.1.2

- Calculation of the proposed assembly values based on the ASHRAE Book of Fundamentals, or ASHRAE 90.1 Appendix A are acceptable
- Slab edge insulation and SHGC utilized Table R402.1.3
- Air Barrier and air sealing is based on Table R402.4.1.1
- All sections R401.2 through 404.3 and R408 apply if applicable in the design
- Everything should be placed on the plans— specifically items found in R103.2 and R103.2.1
- An energy compliance report is not required.



| R-Value at Cavity Insulation | R-Value at Stud |
|------------------------------------|--------------------|
| 0.17 | 0.17 |
| 0.59 | 0.59 |
| 7.50 | 7.50 |
| 0.81 | 0.81 |
| 13.00 | 6.88 |
| 0.45 | 0.45 |
| 0.68 | 0.68 |
| 23.20 | 17.08 |

Prescriptive— R-Value Alternative

The R-value prescriptive energy compliance path is the most straightforward and historically the most commonly used method for demonstrating code compliance. Often referred to as the "by-the-book" approach, it follows the principle of “tell me what to do, and I’ll do it.” This method does not allow trade-offs between building components — meaning insulation R-values, fenestration U-factors, air leakage performance, mechanical systems, and lighting provisions must all meet or exceed their individual code-specified requirements. While trade-offs are not permitted, some flexibility is provided through specific allowances outlined in Section R402.2. Professionally this “tell me what to do and I’ll do it” doesn’t sound good. I would recommend just leaving it as the most straight forward and used path.

Thermal envelope is based on Table R402.1.3

- The R-values listed in the table are the minimum values permitted
- The U-factors are the maximum values permitted.
- Air Barrier and air sealing is based on Table R402.4.1.1
- All sections R401.2 through 404.3 and R408 apply if applicable in the design
- Everything should be placed on the plans— specifically items found in R103.2 and R103.2.1.
- An energy compliance report is not required.



Prescriptive— Total UA Alternative

Considered to be the most flexible method for the prescriptive path, because it allows for some trading of the thermal envelope with the exception of the Solar Heat Gain Coefficient (SHGC) of the fenestration and slab-on-grade insulation. This method follows the "twin building" concept. It begins with a reference design building that uses the default values specified in Table R402.1.2 of the IECC, with the exception of the Solar Heat Gain Coefficient (SHGC). The proposed design building incorporates the thermal envelope values selected by the designer. Compliance is determined by comparing the two models in a report that uses overall U-factor analysis. If the report demonstrates that the proposed design is at least as energy-efficient as the reference design, then the project complies with the IECC requirements.

Thermal envelope may allow trading

- Energy compliance report required to show proposed total UA is $<$ to the referenced total UA.
- REScheck is a free software – often utilized by architects
- Ekotrope an REM/Rate can be utilized, but are not free - often utilized by energy raters
- Air Barrier and air sealing is based off of Table R402.4.1.1
- All sections R401.2 through 404.3 and R408 apply if applicable in the design
- Everything should be placed on the plans— specifically items found in R103.2 and R103.2.1



Generated by REScheck-Web Software

Compliance Certificate

Project: Hope's new

| | |
|-------------------------|-----------------------|
| Energy Code: | 2024 IECC |
| Location: | Arvada, Colorado |
| Construction Type: | Single-family |
| Project Type: | New Construction |
| Project SubType: | None |
| Conditioned Floor Area: | 2,000 ft ² |
| Glazing Area: | 10% |
| Climate Zone: | 5 (6158 HDD) |
| Permit Date: | |
| Permit Number: | |
| All Electric: | false |
| Is Renewable: | false |
| Has Charger: | false |
| Has Battery: | false |
| Has Heat Pump: | false |

Construction Site: _____ Owner/Agent: _____ Designer/Contractor: _____

Compliance: Passes using UA trade-off

Compliance: **0.6% Better Than Code** Maximum UA: **337** Your UA: **335**
The % Better or Worse Than Code Index reflects how close to compliance the house is based on code trade-off rules. It DOES NOT provide an estimate of energy use or cost relative to a minimum-code home.

[Envelope Assemblies](#)

| Assembly | Gross Area or | Cavity | Cont. | Prop. | Req. | Prop. | Req. |
|----------|---------------|--------|-------|-------|------|-------|------|
|----------|---------------|--------|-------|-------|------|-------|------|

Total Building Performance



The Total Building Performance compliance path uses energy modeling to allow trade-offs between systems and components, enabling compliance through overall performance rather than prescriptive values. This approach also follows the twin building concept, where a Standard Reference Design is modeled using the default values found in the applicable column of Table R405.5.2(1). The Proposed Design reflects the actual intended values for the building, as specified in the same table.

To demonstrate compliance, the proposed design must show that the annual energy cost for heating, cooling, mechanical ventilation, and service water heating is equal to or less than that of the standard reference design. An energy compliance report must be submitted at both the permit stage and again at Certificate of Occupancy (CO) to confirm that the installed systems maintain compliance.

Commonly used software for this method includes **REM/Rate** and **Ekotrope**, though other programs may be acceptable if they meet the requirements outlined in Section R405.5.

- Energy Compliance report required at permit submittal and for CO
- Must comply with all sections that are listed as mandatory outside of section R405
- Air Barrier and air sealing is based off of Table R402.5.1.1
- Verified by a third party

| Design | IECC 2021 Performance | As Designed |
|--|-----------------------|--------------|
| Heating | \$469 | \$453 |
| Cooling | \$111 | \$117 |
| Water Heating | \$165 | \$165 |
| Mechanical Ventilation | \$44 | \$23 |
| SubTotal - Used to determine compliance | \$788 | \$758 |

Energy Rating Index—ERI

This compliance path option is another performance based method using a scoring system, again using the twin building concept. The standard reference design building utilizes the prescriptive values found in the 2006 IECC, and then any values can be utilized for the proposed design with the exception of the established backstop for the thermal envelope values. The ERI demonstrates how much the project is better than the same building using the 2006 IECC prescriptive values. The important thing to know is the **lower the score, the better**.

**On-site renewables are
not included**

If the project is not including on-site renewable energy into the calculation for the ERI score, then the project would follow the requirements of Section R406.3.1. (This does not mean that on-site renewable energy is not installed, just that they choose to not include it in the calculation of their ERI score.)

**On-site renewables are
included**

If the project does include on-site renewable energy into the calculation for the ERI score, then the project would follow the requirements of Section R406.3.2.

Compliance is based on the ERI score. Scores less than or equal to the numbers in R406.4 would mean a house is as efficient as the referenced design. Project must comply with R401.2.5 for additional energy efficiency by having a score that 5% better than what is listed in Table R406.5

- Energy Compliance report required with the specified items of R406.6.2
- Two reports required: permit submittal and for certificate of occupancy
- Ekotrope, or REMRate, or other accepted software per R406.6.1
- Score of 100 is a 2006 prescriptive building the lower the number indicates the percentage better than a building designed to the 2006 IECC.
- Table R406.2 must be complied with for requirements that are considered to be mandatory outside of section R406
- Verified by a third party

