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# 2022 Denver Energy Code Residential Prescriptive Compliance Path

Community Planning and Development /  
Office of Climate Action, Sustainability and Resiliency  
Presented by Robby Schwarz BUILDTankinc  
June 1, 2023

# INTERPRETATION INSTRUCTIONS

- This session is available in both English & Spanish. Click on the “Interpretation” icon at the bottom of the Zoom window and choose either "English" or “Spanish”
- 
- Esta sesión está disponible en inglés y español. Haga clic en el icono "Interpretación" en la parte inferior de la ventana de Zoom y elija "Inglés" o "Español"

# Training Series



SCAN ME



**Commercial/Multifamily  
(Wednesdays at 12 p.m.)**

**Residential  
(Thursdays at 1 p.m.)**

Electrification May 24

Compliance Overview May 25

Prescriptive Path

May 31

June 1

Performance Paths

June 7

June 8

Contractor/Inspector Part 1

June 14

June 22

Contractor/Inspector Part 2

June 21

June 29

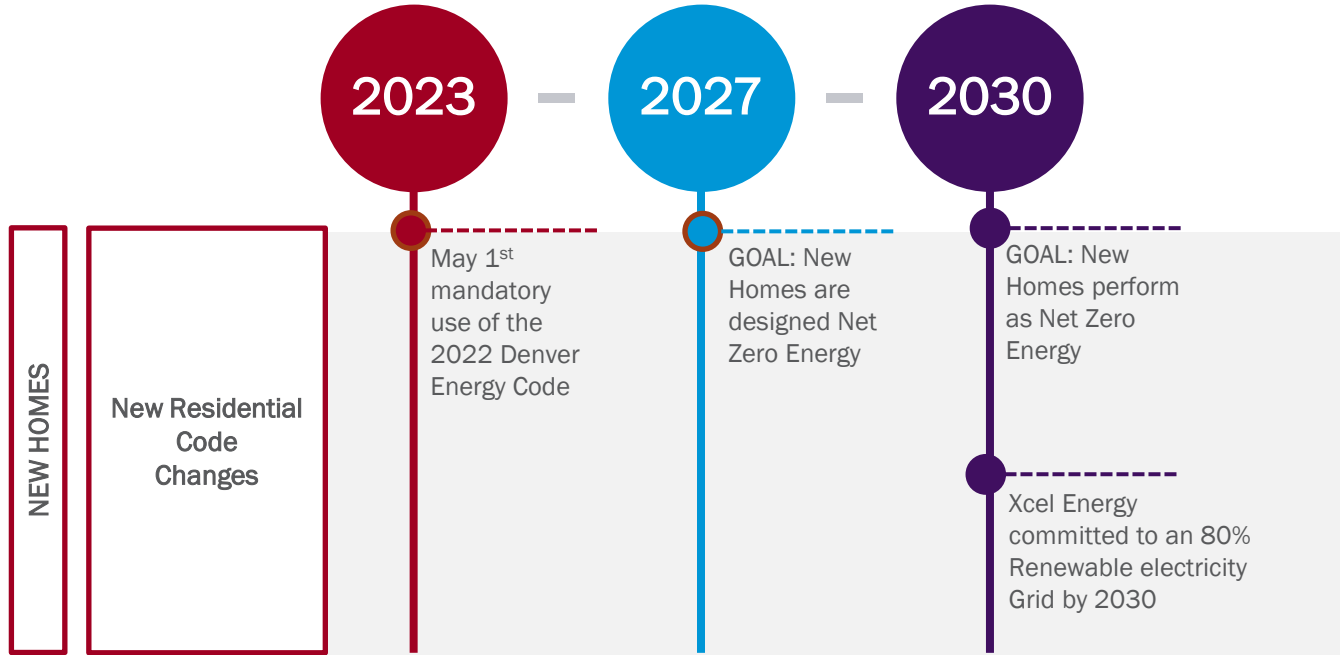
# Questions?

- Time is reserved at the end of the presentation for Q&A
- Please use the Q&A feature to submit your questions



- Responses to all questions not addressed today will be sent out by email to registered participants
- Additional questions may be sent to: [energy.review@denvergov.org](mailto:energy.review@denvergov.org)

# Timeline: Residential Electrification & Performance Goals



# 2022 Denver Energy Code

- This training provides an overview of the **Prescriptive compliance path requirements** of the 2022 Denver Energy Code for Residential projects
- Does not include all changes to the 2022 Denver Energy Code. Please refer to the 2022 Denver Energy Code for specific code language [Denvergov.org/BuildingCode](https://denvergov.org/BuildingCode)
- Denver-specific COMcheck and REScheck are anticipated for Fall 2023

# Net Zero Energy Hub – Codes and Resources

[www.denvergov.org/EnergyCode](http://www.denvergov.org/EnergyCode)

## Resources for:

- New provisions in the 2022 Denver Energy Code
- The Denver Energy Code compliance pathways
- Specifics to each phase of a new building project, from design and construction to alterations and additions
- Training videos to walk you through specific provisions that have been updated since the 2019 Denver Building Code
- Rebates for electrification equipment for existing homes

Home / Government / Agencies, Departments, and Offices / Climate Action, Sustainability & Resiliency / High Performance Buildings and Homes / **Net Zero Energy Hub - Codes and Resources**

## Net Zero Energy Hub - Codes and Resources

This resource hub pulls together information from Denver and pairs it with resources from across the country to help building owners, professionals, and residents:

- Learn about changes in the 2022 Denver Building and Fire Code and the 2022 Denver Green Code
- Understand the importance of building electrification and energy efficiency
- See examples of successful Net Zero Energy building projects in a variety of building types and uses
- Navigate new regulations and requirements with confidence!



### Resources for New Commercial and Multifamily Buildings

Buildings that are regulated by the Denver Commercial Building Code, which include commercial buildings and multi-unit residential buildings that are not regulated by the Denver Residential Code.



### Resources for New Single Family, Duplex, and Townhomes

Any detached one- or two-family dwelling unit and townhomes three stories or less are regulated by the Denver Residential Code.

# Tips for referencing code

2022 Denver Amendments

+

2021 International Energy Conservation Code (IECC)

=

**2022 Denver Energy Code (DEC)**

*Note: Chapter 11 in the Denver Residential Code is replaced in its entirety by the Residential Provisions of the 2022 Denver Energy Code*



# Agenda

- 2022 DEC Compliance Overview
- Building Thermal Envelope
  - Prescriptive Tables & Total UA Alternative
- Additional Efficiency Package Options
- Additional Prescriptive Provisions
- Considerations for Existing Buildings

**Purpose:** This presentation provides an overview of the prescriptive design and permit submittal requirements for residential building projects.

Details on installation, testing, and as-built compliance will be covered in upcoming contractor and inspector trainings

# Definition: Residential Building

*Residential Buildings* are detached one- and two-family dwellings and multiple single-family dwellings (townhouses) and Group R-3 and R-4 buildings **three stories or less in height** above grade plane.



*(DEC Section C202)*

# Definition: All-Electric Property



Photo credit: [Kalen Jesse Photography](#)

An *All-Electric Property* is one that contains no permanently installed equipment or appliances that utilize *combustion*, plumbing for fuel gas or fuel oil or *fuel gas* utility connection, installed within the *building(s)* or site, except for *emergency power systems* and *standby power systems*.

# 2022 DEC Compliance Pathways

Residential projects may select from three compliance options:

Prescriptive	Total Building Performance	Energy Rating Index (ERI)
Each element of the building must meet a minimum standard defined in prescriptive provisions  Additional efficiency options are selected from a standard menu	Energy modeling analysis is used to show an annual energy cost savings for the proposed design over a baseline	Energy rating software is used to show the ERI of the proposed design is less than or equal to the code defined maximum

*See next training in series for more information on Total Building Performance and Energy Rating Index (ERI).*

# Submittal Requirements

Projects submitting for permit must provide:

- Completed **Energy Code checklist** for the selected compliance path
- **Supplemental Reports or Calculations** as required (e.g., REScheck report, ACCA Manual J, S and D Packages)
- **Construction Documents** showing all required elements, stamped & signed by licensed design professional (if applicable)

### 2022 Denver Energy Code - Residential Compliance Checklist

#### Prescriptive Compliance Option

Project Address:

**Legend:** Input Cell

**READ FIRST: Checklist Instructions & Applicability**

Complete the Residential Compliance Checklist by entering relevant information in all tan-colored text boxes. Submit the completed checklist (as a PDF) with the construction documents for permit application.

This checklist identifies the minimum submittal requirements necessary to demonstrate compliance with the energy efficiency requirements of the Denver Building Code (DBC), herein referred to as the Denver Energy Code (DEC). The Denver Energy Code is comprised of the 2022 Denver amendments to the 2021 IECC. Residential provisions of the DEC start on page 300 of the 2022 *Denver Building and Fire Code*, which can be downloaded at [DenverGov.org/BuildingCode](https://denvergov.org/buildingcode).

This checklist is not comprehensive and additional information may be required based on the individual design proposed.

The requirements of the Denver Energy Code shall be coordinated with building assembly sizes and configurations that are in conformance with all other related building code requirements, including but not limited to requirements located in the Denver Residential Code (DRC) for the vapor retarder, weather-resistance of the exterior building envelope, vented or unvented roof assemblies, vented or unvented crawlspace assemblies, the fire-resistance rated construction of the exterior walls and projections, and the structural requirements. The Denver Residential Code, which is comprised of the 2022 Denver amendments to the 2021 IRC, starts on page 183 of the 2022 *Denver Building and Fire Code*.

**The following project types are required to submit a Residential Compliance Checklist:**

- New one- and two-family dwellings
- New additions to one- and two-family dwellings with over 20% area increase in existing above grade gross floor area, or 300 S.F., whichever is less
- Alterations to one- and two-family dwellings with a project work area of 20% of above grade gross floor area, or 300 S.F., whichever is less
- New IRC townhouses
- New R-3 and R-4 Occupancy buildings 3 stories or less above grade plane

**NOTE: This checklist does not apply to Manufactured Homes reviewed and approved by the State of Colorado Division of Housing.**

Project Scope	
Please state if the project scope includes any of the following: <i>Exceptions: Repairs, alterations with less than 20% increase in conditioned floor area, additions with less than 30% increase in conditioned floor area, and change of occupancy to the same or lower energy-demand category are not required to submit this checklist.</i>	<input type="checkbox"/> All-Electric Property <input type="checkbox"/> New Construction <input type="checkbox"/> Addition <input type="checkbox"/> Increase in conditioned space <input type="checkbox"/> Change of Occupancy to Higher Energy-Demand Category
<b>Scope of Project</b> <b>Alteration and Additions Only:</b> For existing homes, provide calculation of the increase in conditioned floor area as a percentage of the total existing above grade conditioned floor area.	<input type="text"/>

Compliance checklists for each pathway and an instructional video on how to complete the checklists can be found [here](#).

# Instructions for CPD Plans Reviewers

- To facilitate inspections, record in Permit Scope of Work text box on permit:
  - One **compliance pathway** from four options
    - » Prescriptive Compliance Path
    - » Prescriptive: Total UA Alternative
    - » Total Building Performance
    - » Energy Rating Index (ERI)
  - Selected **additional energy efficiency packages** (for Prescriptive and Total UA)
  - Proposed **renewable energy system** (DEC R404.7, if applicable)
  - Record if **All-Electric Property**

*Note: dedicated Accela fields for this information are in development*

# Building Thermal Envelope

- Two options for Prescriptive Compliance:

Prescriptive Tables	Total UA Alternative
<p>Meet the assembly <i>U</i>-factor (DEC Table R402.1.2) or component <i>R</i>-value (DEC Table R402.1.3) and fenestration requirements. May follow DEC Section R402.1.4, <i>R-value computation</i>, where insulation is installed in multiple layers</p>	<p>Meet the requirements of section DEC R402.1.5, which allows for tradeoffs between the thermal performance of different assemblies</p>



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# Option 1: Prescriptive Tables

*DEC Sections R402.1.2 through R402.1.4*



# Option 1: Prescriptive Tables

DEC Sections R402.1.2 through R402.1.4

- All building thermal envelope assemblies **must meet either:**
  - **Maximum assembly  $U$ -factors** (DEC Table R402.1.2)
  - **Minimum  $R$ -values by component** (DEC Table R402.1.3)
- 2021 IECC changes  $U$ -factor table to default,  $R$ -values as an alternative
- You can install more insulation but not less

# U-factor vs. R-value

- U-factor describes Thermal Transmittance or the **rate of heat transfer through 1 ft<sup>2</sup> of material**
- Mathematically, U-factor is the reciprocal of R-value
  - $U = 1/R$  and  $R = 1/U$
  - Example:  $1/R-5 = 0.20$  U-factor

U-factor	R-value
Applied to <b>assemblies</b>	Applies to <b>construction components</b> (measured in R-value/inch)
Cannot be added, but can calculate an area weighted U-factor*	Can be added together**

\*The rate of heat transfer through an assembly of different material with different U-factors

\*\*Only where allowed by DEC R402.1.4 R-value computation

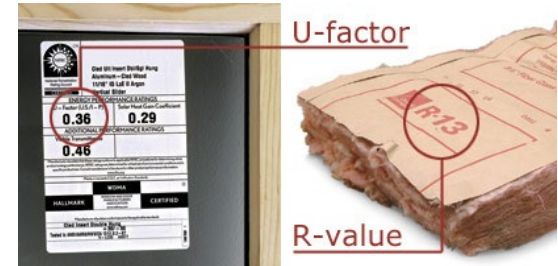
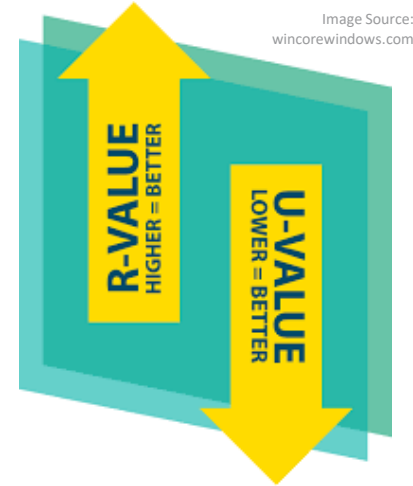


Image Source: finehomebuilding.com

# R-Values

- *R*-value describes a **material's ability to resist heat flow** from more to less
  - The higher the number, the greater the resistance
- The *R*-values in Table R402.1.3 apply to the **insulation materials only**
  - Nominal *R*-Value is the rated insulation value that is provided by the manufacturer

## DEC R402.1.4 R-Value Computation

- Cavity insulation or continuous insulation **alone** shall be used to meet the *R*-value requirements of Table R402.1.3
- Where cavity or continuous insulation is installed in multiple layers:
  - The *R*-values of the cavity insulation layers shall be summed to meet cavity insulation *R*-value requirements
  - The *R*-values of the continuous insulation layers shall be summed to meet continuous insulation *R*-value requirements
- Cavity insulation *R*-values **cannot be used** to determine compliance with the continuous insulation *R*-value requirements
- Computed *R*-values shall not include an *R*-value for other building materials or air films

# 2022 DEC: U-factor/R-value Revisions

Revisions to prescriptive U-factors and R-values increase the thermal performance of some assemblies

Tables R402.1.2 and R402.1.3: Summary of Revised Values

Code	Fenestration U-factor	Skylight U-factor	Glazed Fenestration SHGC	Wood Frame Wall R-value	Floor U-factor / R-value
2022 DEC	0.27/0.25*	0.45	0.40	30 or 20 + 5ci or 13 + 10ci or 0 + 20ci	0.026 / 38
2021 IECC	0.32	0.55	NR	20 + 5ci or 13 + 10ci or 0 + 15ci	0.033 / 30

**\*2022 DEC Footnote:**  
Where the proposed glazing area is Greater than or equal to 15% of the conditioned floor area, the **second lower U-factor shall not be exceeded.**

# Window-to-floor Ratio

DEC R103.2: 10. Total area of glazed vertical fenestration as a percentage of conditioned floor area

- Windows are the weakest link
- Wall R-value vs. window R-value
  - Wall: R-20 – R-30
  - Window:
    - » U 0.35 = R-2.86
    - » U 0.25 = R-4
    - » U 0.15 = R-6.67
- Lower window-to-floor ratio:
  - Higher total wall R-value less heat loss in cold months
  - Less internal heat gain in warm months

## INSULATION + WINDOWS=WHOLE WALL R-VALUE



Image Source: glowindows.com



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# Option 2: Total UA Alternative

*DEC Section 402.1.5*

# Option 2: Total UA Alternative

## DEC Section R402.1.5

- Baseline set by the **U-factors in Table R402.1.2** and assembly areas
- Requires **energy modeling software** to determine the total building thermal envelope area weighted U-factor (UA)
- This allows for **tradeoffs**
- **SHGC requirements** of Table R402.1.2 and **maximum fenestration U-factors** of Section R402.5 also apply

# Total Area Weighted $U$ -factor ( $UA$ )

- The total building thermal envelope  $UA$  (*sum of  $U$ -factor times assembly area for each assembly*) must be **less than or equal to** the total  $UA$  resulting from using the  $U$ -factors in Table R402.1.2 (*multiplied by the same assembly area as in the proposed building*)
- **The  $UA$  calculation shall include the thermal bridging effects of framing materials**
- **Backstops** (to ensure a minimum level of performance) are **included for fenestration  $U$ -factor and SHGC**

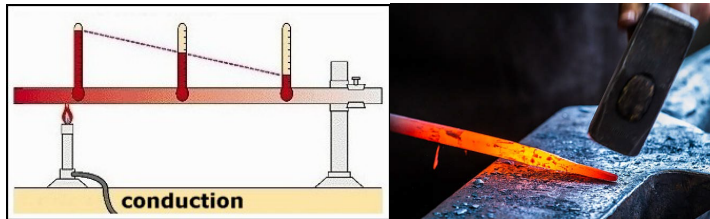
Image Source: SBCMAG.info





# Total UA Alternative

- A method for performing **conductive energy trade-offs**
  - Trading off the  $R$ -values and  $U$ -factors in the thermal envelope
  - Mathematically making the proposed building equal to the  $U$ -factor and  $R$ -value tables



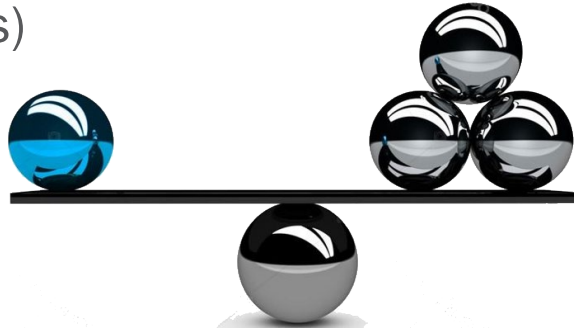
Total UA Compliance Path

Image Source: TES.com

# Tradeoffs

- A tradeoff refers to putting something **more in one assembly** so you can put something **less in another**
  - The energy performance scale remains balanced
- Under Total UA Alternative, you can tradeoff the *U*-factors and *R*-values of different assemblies (the performance compliance paths allow for more flexibility with tradeoffs)

The **blue ball** represents ceiling insulation of R-38 (less than prescriptive R-60)



The **3 silver balls** represent window and wall assemblies that exceed the minimum prescriptive tables, balancing the energy equation

# Software for Total UA Alternative

- Uses a Software Generated **Energy Model**



Image Source: Energy.gov



REMRate and Ekotrope can calculate UA compliance but cannot easily be customized for DEC amendments



# IECC 2021 Building UA Compliance

**Property**  
Example House  
, CO 80211

**Organization**  
BuildTank, Inc.  
Robby Schwarz  
303-927-0025

**Inspection Status**  
Results are projected



DOE - SF\_GasFurnace\_Heated  
Basement - CZ5 Base Study House  
Initial House Design @ 2021 IECC

**Builder**

**This report is based on a proposed design and does not confirm field enforcement of design elements.**

## Elements

- Ceilings
- Above-Grade Walls
- Windows, Doors and Skylights
- Slab Floor:
- Framed Floors
- Foundation Walls
- Rim Joists

**Overall UA (Design must be equal or lower):**

Building UA

IECC Reference	As Designed
39.5	49.7
42.9	47.9
43.0	43.9
340.3	318.6

## Requirements

- 402.1.5 Total UA alternative compliance passes by 9.4%
- 402.3.2 Average SHGC: 0.40 Max SHGC: 0.40
- R402.4.1.2 Air Leakage Testing
- 403.3.1 Duct Insulation
- R404.1 Lighting Equipment Efficiency
- Mandatory Checklist Mandatory code requirements that are not checked by Ekotrope must be met.
- R403.0.2 Mechanical Ventilation Efficacy
- R403.6.1 Mechanical Ventilation Energy Recovery
- R403.3.6 Duct Leakage
- R403.5.2 Hot water pipe insulation
- R402.5 Area-weighted average fenestration SHGC
- R402.5 Area-weighted average fenestration U-Factor
- R402.4.1.3 Prescriptive Air Leakage
- IRC M1505.4.3 Mechanical Ventilation Rate
- R408.2 Additional efficiency package options

**Design exceeds requirements for IECC 2021 Prescriptive compliance**

Name: Robby Schwarz  
Organization: BuildTank, Inc.

Signature: [Signature]  
Digitally signed: 1/31/2023

# 2021 IECC Building UA Compliance

**Property**  
Best House Ever  
, CO 80237

**Organization**  
BuildTank, Inc.  
303-927-0025  
Robby Schwarz

**HERS**  
Confirmed  
4/2/2021  
Rating No:KLZV/QqBL  
Rater ID:9124083



**Weather:** Denver Intl AP, CO  
2021 IECC test house  
DRH House for Denver.big

**Builder**  
DRH

## Elements

Shell UA Check

- Ceilings
- Basement Walls

## Mandatory Requirements

- Insulation R-Value Check (per Section 403.3.1)
- Window U-Value and SHGC Check (per Section 402.5)
- Mechanical Ventilation Efficacy (per Section 403.6)
- Mechanical Ventilation Energy Recovery (per Section 403.6)
- Mechanical Ventilation Rate (per Section 403.6)
- Mechanical Ventilation Rate (per Section 403.6)
- Mechanical Ventilation Rate (per Section 403.6)

## Insulation Levels

2021 IECC	As Designed
37.9	26.1
79.8	79.0
74.7	70.8
97.1	80.3
289.5	256.2

- PASSES
- PASSES
- PASSES
- PASSES
- PASSES
- PASSES
- PASSES

This home MEETS the overall thermal performance requirements and verifications of the International Energy Conservation Code based on a climate zone of 5B. (Section 402, International Energy Conservation Code, 2021 edition.) In fact, this home exceeds the requirements by 11.5%.

Name: Robby Schwarz  
Organization: BuildTank, Inc.

Signature: [Signature]  
Date: 10 May 2023

REMRate - Residential Energy Analysis and Rating Software v16.3.4  
This information does not constitute any warranty of energy savings or savings.  
© 1985-2022 NORESOCO, Boulder, Colorado.

**REMRate and Ekotrope can calculate UA compliance but cannot easily be customized for DEC amendments. Therefore, these reports cannot be used for 2022 DEC UA Compliance.**



# Software Basics

- The software creates a **reference home** which the home you are analyzing is compared to in order to quantify performance or demonstrate compliance
- Reference Home/Design
  - A standard set of house specifications that generate specific, consistent, and quantifiable energy performance
- Types of reference homes:
  - **UA Alternative Reference home**
  - R405 Total Building Performance Reference Home
  - R406 IECC ERI Reference home
  - RESNET HERS ERI Reference home
  - Energy Star Reference home
  - User defined Reference home used by Utilities



Image Source: Patch.com

# REScheck Compliance Certificate



## Generated by REScheck-Web Software Compliance Certificate

Project DOE SF house on Basement 2021 IECC

Energy Code: **2021 IECC**  
Location: **Denver, Colorado**  
Construction Type: **Single-family**  
Project Type: **New Construction**  
Orientation: **Bldg. faces 0 deg. from North**  
Conditioned Floor Area: **3,564 ft<sup>2</sup>**  
Glazing Area: **19%**  
Climate Zone: **5 (6020 HDD)**  
Permit Date:  
Permit Number:

Construction Site: Owner/Agent: Designer/Contractor:

### Compliance: Passes using UA trade-off

Compliance: **11.0% Better Than Code** Maximum UA: **329** Your UA: **292**

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.

Slab-on-grade tradeoffs are no longer considered in the UA or performance compliance path in REScheck. Each slab-on-grade assembly in the specified climate zone must meet the minimum energy code insulation R-value and depth requirements.

### Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Prop. U-Factor	Req. U-Factor	Prop. UA	Req. UA
Ceiling: Raised or Energy Truss	1,188	13.0	47.0	0.016	0.024	19	29
Wall - Front: Wood Frame, 16" o.c. Orientation: Front	592	20.0	5.0	0.044	0.045	21	22
Door 2: Solid Door (under 50% glazing) Orientation: Front	24			0.170	0.320	4	8
Window 2: Vinyl Frame Orientation: Front	89			0.300	0.320	27	28
Wall - Right: Wood Frame, 16" o.c. Orientation: Right side	592	20.0	5.0	0.044	0.045	22	23
Window 2: Wood Frame Orientation: Right side	89			0.300	0.320	27	29
Wall - Back: Wood Frame, 16" o.c. Orientation: Back	592	20.0	5.0	0.044	0.045	20	20

A 2022 Denver Energy Code specific version of REScheck is in development

Boxed area enlarged on next slide

# REScheck Compliance Certificate

## Compliance Verification

**Compliance: Passes using UA trade-off**

Compliance: **11.0% Better Than Code**      Maximum UA: **328**      Your UA: **292**

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.

**Slab-on-grade tradeoffs are no longer considered in the UA or performance compliance path in REScheck. Each slab-on-grade assembly in the specified climate zone must meet the minimum energy code insulation R-value and depth requirements.**

Visit [EnergyCodes.gov/REScheck](https://EnergyCodes.gov/REScheck) for more information on how to use REScheck for your project.

# Interim REScheck Workaround

The 2022 Denver Energy Code will not be available in REScheck until Fall 2023

- **Envelope Compliance**
  - 2022 DEC includes revisions to some U-factors in Table R402.1.2
  - To demonstrate compliance with the 2022 DEC, **additional calculations using the amended U-factors** must be provided with a REScheck compliance report based on the 2021 IECC
- **Additional Efficiency Package Options**
  - Additional Efficiency Package selected in REScheck under 2021 IECC does not impact the UA calculations and **DOES NOT** count toward compliance with DEC Section R408
  - Residential projects must show all selected measures using on **2022 Denver Energy Code Residential Prescriptive Checklist**

**Table 1.** 2022 Denver Energy Code Amendments to Table R402.1.2 Maximum Assembly *U*-factors and Fenestration Requirements

Assembly	2021 IECC	2022 DEC
Fenestration <i>U</i> -factor (Glazing area < 15% of conditioned floor area)	0.32*	0.27
Fenestration <i>U</i> -factor (Glazing area >= 15% of conditioned floor area)	0.32*	0.25
Skylight <i>U</i> -factor	0.55	0.45
Floor <i>U</i> -factor	0.033	0.026

*\*Revised for Climate Zone 5 over 4,000 ft elevation, per IECC footnote f*



# Interim REScheck Workaround

## Suggested Calculation Instructions

*\*Does not impact the UA calculations and DOES NOT count toward compliance with DEC Section R408*

1. Follow the guidelines within REScheck using 2021 IECC to create a compliance certificate report.

a) Energy Code: Select 2021 IECC (does not include 2022 DEC)

The screenshot shows the REScheck-Web interface for a project titled "Example Project (2022 DEC) - Energy Code: 2021 IECC". The "Energy Code" dropdown menu is set to "2021 IECC". The "Compliance Method" is set to "UA Trade-Off". The "Efficiency Package(s)" section shows "1 Required 1 Proposed" and "Efficient HVAC Performance" is selected. A blue arrow points from the text box "a) Energy Code: Select 2021 IECC (does not include 2022 DEC)" to the "Energy Code" dropdown menu. An orange arrow points from the "Edit Efficiency Package(s)" button to the "Efficiency Package Requirement" dialog box.

b) Select an Efficiency Package (req'd to create a report)

The dialog box titled "Efficiency Package Requirement" contains the following text: "Select the additional efficiency package option(s) to be implemented in the building. A minimum of one additional efficiency package is required. (See Section R408 for details)". Below this, there are four checkboxes: "Enhanced Envelope Performance" (unchecked), "Efficient HVAC Performance" (checked), "Efficient Service Water Heating Performance" (unchecked), and "Efficient Thermal Distribution Performance" (unchecked). At the bottom, there are "Required 1" and "Proposed 1" labels, and "Cancel" and "Continue" buttons.

## Interim REScheck Workaround

# Suggested Calculation Instructions

- Using the 2021 IECC REScheck compliance report, calculate the 2022 DEC Maximum UA using the amended U-factors.

a) Calculate the **glazing area** (total glazed vertical fenestration) as a percentage of conditioned floor space to determine the maximum fenestration U-factor.



Generated by REScheck-Web Software

## Compliance Certificate

Project Example Project (2022 DEC)

Energy Code: **2021 IECC**  
Location: **Denver, Colorado**  
Construction Type: **Single-family**  
Project Type: **New Construction**  
Orientation: **Bldg. faces 180 deg. from North**  
Conditioned Floor Area: **3,000 ft<sup>2</sup>**  
Glazing Area: **2%**  
Climate Zone: **5 (6020 HDD)**  
Permit Date:  
Permit Number:  
Construction Site:  
123 Main St.  
Denver, CO 80208

Owner/Agent:

Step 2a. Glazing Area Calculation:  
Assumption: 50% of door is glazed

Total area of glazed vertical fenestration =  
5 x 16 sf (windows) + 50% x 32 sf (door glazing) = 96 sf  
Conditioned floor area = 3,000 sf  
% Glazing = 96/3,000 = **3.2% < 15%**

Per DEC Table R402.1.2 footnote f, **maximum fenestration U-factor for this project = 0.27**

### Compliance: Passes using UA trade-off

Compliance: **6.7% Better Than Code** Maximum UA: **478** Your UA: **446**

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.

Slab-on-grade tradeoffs are no longer considered in the UA or performance compliance path in REScheck. Each slab-on-grade assembly in the specified climate zone must meet the minimum energy code insulation R-value and depth requirements.

# Interim REScheck Workaround

## Suggested Calculation Instructions

- Using the 2021 IECC REScheck compliance report, calculate the 2022 DEC Maximum UA using the amended U-factors.

b) For each assembly with a U-factor amended in the 2022 DEC (fenestration, skylights, and floors), multiply the “Gross Area” by the amended U-factor to calculate the 2022 DEC “Req. UA” value.

Multiply Gross Area by amended U-factor to calculate adjusted Req. UA

Amended U-factor per 2022 DEC Table R402.1.2 (typ.)

### Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Prop. U-Factor	Req. U-Factor	Prop UA	Req. UA
my Ceiling: Flat Ceiling or Scissor Truss	3,000	50.0	0.0	0.026	0.024	77	72
mySkylight: Metal Frame	20			0.500	0.550	10	11
Wall 1: Wood Frame, 24" o.c. Orientation: Front	1,200	25.0	5.0	0.039	0.045	46	53
Door 2: Solid Door (under 50% glazing) Orientation: Front	32			0.700	0.320	22	10
Wall 2: Wood Frame, 24" o.c. Orientation: Front	1,200	25.0	5.0	0.039	0.045	45	52
Window 1: Metal Frame Orientation: Front	16			0.250	0.320	4	5
Window 2: Metal Frame Orientation: Front	16			0.250	0.320	4	5
Window 3: Metal Frame Orientation: Front	16			0.250	0.320	4	5
Wall 3: Wood Frame, 24" o.c. Orientation: Front	1,200	25.0	5.0	0.039	0.045	46	53
Window 3: Metal Frame Orientation: Front	16			0.250	0.320	4	5
Wall 4: Wood Frame, 24" o.c. Orientation: Front	1,200	25.0	5.0	0.039	0.045	46	53
Window 4: Metal Frame Orientation: Front	16			0.250	0.320	4	5
Floor 1: All-Wood Joist/Truss	3,000	35.0	0.0	0.028	0.033	84	99
Basement: Solid Concrete or Masonry Orientation: Unspecified Wall height: 8.0' Depth below grade: 7.0' Insulation depth: 7.0'	1,000	0.0	15.0	0.050	0.050	50	50

Highlighted assemblies have amended U-factors in 2022 DEC

Doors are treated as fenestration in REScheck

# Interim REScheck Workaround

## Suggested Calculation Instructions

- Using the 2021 IECC REScheck compliance report, calculate the 2022 DEC Maximum UA using the amended U-factors.

c) When all 2022 DEC “Req. UA” values have been calculated, add up all values in the “Req. UA” column to find the 2022 DEC “Maximum UA”

Adjusted Req. UA,  
used to determine  
DEC Maximum UA

### Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Prop. U-Factor	Req. U-Factor	Prop. UA	Req. UA
my Ceiling: Flat Ceiling or Scissor Truss	3,000	50.0	0.0	0.026	0.024	77	72
my Skylight: Metal Frame	20			0.500	<del>0.550</del> 0.450	10	<del>21</del> 9
Wall 1: Wood Frame, 24" o.c. Orientation: Front	1,200	25.0	5.0	0.039	0.045	46	53
Door 2: Solid Door (under 50% glazing) Orientation: Front	32			0.700	<del>0.320</del> 0.270	22	<del>10</del> 8.6
Wall 2: Wood Frame, 24" o.c. Orientation: Front	1,200	25.0	5.0	0.039	0.045	45	52
Window 1: Metal Frame Orientation: Front	16			0.250	<del>0.320</del> 0.270	4	<del>5</del> 4.3
Window 2: Metal Frame Orientation: Front	16			0.250	<del>0.320</del> 0.270	4	<del>5</del> 4.3
Window 3: Metal Frame Orientation: Front	16			0.250	<del>0.320</del> 0.270	4	<del>5</del> 4.3
Wall 3: Wood Frame, 24" o.c. Orientation: Front	1,200	25.0	5.0	0.039	0.045	46	53
Window 3: Metal Frame Orientation: Front	16			0.250	0.320	4	5
Wall 4: Wood Frame, 24" o.c. Orientation: Front	1,200	25.0	5.0	0.039	0.045	46	53
Window 4: Metal Frame Orientation: Front	16			0.250	<del>0.320</del> 0.270	4	<del>5</del> 4.3
Floor 1: All-Wood Joist/Truss	3,000	35.0	0.0	0.028	<del>0.033</del> 0.026	84	<del>99</del> 78
Basement: Solid Concrete or Masonry Orientation: Unspecified Wall height: 8.0' Depth below grade: 7.0' Insulation depth: 7.0'	1,000	0.0	15.0	0.050	0.050	50	50

## Interim REScheck Workaround


# Suggested Calculation Instructions

*Note:* This may be an iterative process.

2. d) Compare the calculated 2022 DEC “Maximum UA” to “Your UA” (the UA for your design) provided in the REScheck report

$$\text{“Your UA”} \leq \text{DEC “Maximum UA”}$$

If reduced envelope UA per R408.3 is selected as an additional efficiency package for compliance with R408, reduce DEC “Maximum UA” before comparing to “Your UA”

 **Generated by REScheck-Web Software**  
**Compliance Certificate**

Project	Example Project (2022 DEC)
Energy Code:	<b>2021 IECC</b>
Location:	<b>Denver, Colorado</b>
Construction Type:	<b>Single-family</b>
Project Type:	<b>New Construction</b>
Orientation:	<b>Bldg. faces 180 deg. from North</b>
Conditioned Floor Area:	<b>3,000 ft<sup>2</sup></b>
Glazing Area:	<b>2%</b>
Climate Zone:	<b>5 (6020 HDD)</b>
Permit Date:	
Permit Number:	
Construction Site:	123 Main St. Denver, CO 80208

DEC “Maximum UA”:  
Sum of all adjusted  
Req. UA (see step 2c)

DEC Maximum UA: **450**

Designer/Contractor:

**446 ≤ 450**  
Passes 2022 DEC

**Compliance: Passes using UA trade-off**

Compliance: **6.7% Better Than Code**    ~~Maximum UA: 478~~    Your UA: **446**

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.

*Slab-on-grade tradeoffs are no longer considered in the UA or performance compliance path in REScheck. Each slab-on-grade assembly in the specified climate zone must meet the minimum energy code insulation R-value and depth requirements.*



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# Additional Efficiency Package Options

*DEC Section R408*

# Additional Efficiency Package Options

2022 DEC **greatly expands the options** for additional efficiency packages in Section R408

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**New credit method** increases flexibility for compliance while promoting more energy efficient buildings than previous code cycles

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**All-electric properties have an easier path** to compliance to promote building electrification and align with Zero Energy goals

## Additional Efficiency Package Options

# What does it mean for my project?

Buildings following the prescriptive path must select **additional efficiency packages** to achieve a minimum credit total based on building type.

Requirements for <b>All-Electric Properties</b>	Requirements for <b>All Other Buildings</b>
Compliance with High <b>OR</b> Premium Performance Electric Space Heating package (R408.8.2 OR R408.3)	<b>18 Credits</b> from Table R408.1
Compliance with High Performance Electric Water Heating in Conditioned <b>OR</b> Unconditioned Space package (R408.10.2 OR R408.10.3)	
<b>3 Credits</b> form Table R408.1	



# Additional Efficiency for All-Electric Properties

Choose one measure from Space Heating and Water Heating:

Required Measures for All-Electric Properties	
Category	Measure
Space heating equipment efficiency (select one)	R408.8.2: High Performance Electric Space Heating
	R408.8.3: Premium Performance Electric Space Heating
Water heating equipment efficiency (select one)	R408.10.2: High Efficiency Electric Water Heating in conditioned space
	R408.10.3: High Efficiency Electric Water Heating in unconditioned space

- Space Heating
  - R408.8.2: Defines **High Performance Heat Pumps** as COP  $\geq 1.75$  (at 5 °F) and HSPF  $\geq 10$  (non-ducted) or 9 (ducted) and **limits total electric resistance load**
  - R408.8.3: Defines **Premium Performance Heat Pump** technology as HSPF  $\geq 11.2$
- Water Heating
  - R408.10.2/R408.10.3 : Defines **High Efficiency Electric Water Heating** as UEF  $\geq 2$

# Additional Efficiency for All-Electric Properties

AND Choose 3 credits from list below:

Category	Credit Value	Measure
Energy Star Appliance	4	R408.2: Energy Star Appliances
Reduced envelope UA (select only one)	2	R408.3.1: $\geq 5\%$ reduction in total UA
	3	R408.3.2: $\geq 7.5\%$ reduction in total UA
	4	R408.3.3: $\geq 10\%$ reduction in total UA
Reduced air leakage (select only one)	2	R408.4.1: $\leq 2$ ACH50 air leakage rate
	3	R408.4.2: $\leq 1$ ACH50 air leakage rate
Low duct leakage	2	R408.5: $\leq 2$ CFM of total duct leakage
Duct location	5	R408.6: Ducts in Conditioned Space
Heat/Energy Recovery Ventilation (select only one)	4	R408.9.1: High Performance Heat/Energy Recovery Ventilation
	7	R408.9.2: Premium Performance Heat/Energy Recovery Ventilation
Drain water heat recovery (select only one)	2	R408.11.1: Drain Water Heat Recovery Units
	3	R408.11.2: High Performance Drain Water Heat Recovery Units
High efficacy lighting	2	R408.12: High Efficacy Lighting
Demand responsive controls	1	R408.13: Demand Responsive Thermostats
Controls	1	R408.14: Controls

# Additional Efficiency for All Other buildings

Table R408.1 Additional Energy Efficiency Credits (Options for All Other Buildings)		
Category	Credit Value	Measure
Energy Star Appliance	4	R408.2: Energy Star Appliances
Reduced envelope UA (select only one)	2	R408.3.1: $\geq 5\%$ reduction in total UA
	3	R408.3.2: $\geq 7.5\%$ reduction in total UA
	4	R408.3.3: $\geq 10\%$ reduction in total UA
Reduced air leakage (select only one)	2	R408.4.1: $\leq 2$ ACH50 air leakage rate
	3	R408.4.2: $\leq 1$ ACH50 air leakage rate
Low duct leakage	2	R408.5: $\leq 2$ CFM of total duct leakage
Duct location	5	R408.6: Ducts in Conditioned Space
Space cooling equipment efficiency (select only one)	1	R408.7.1: High Performance Space Cooling
	2	R408.7.2: Premium Performance Space Cooling
Space heating equipment efficiency (select only one)	2	R408.8.1: High Performance Gas Space Heating
	8	R408.8.2: High Performance Electric Space Heating
	10	R408.8.3: Premium Performance Electric Space Heating
Heat/Energy Recovery Ventilation (select only one)	4	R408.9.1: High Performance Heat/Energy Recovery Ventilation
	7	R408.9.2: Premium Performance Heat/Energy Recovery Ventilation
Water heating equipment efficiency (select only one)	2	R408.10.1: High Efficiency Gas Water Heating
	6	R408.10.2 High Efficiency Electric Water Heating in conditioned space
	4	R408.10.3 High Efficiency Electric Water Heating in unconditioned space
	8	R408.10.4: Premium Efficiency Electric Water Heating in conditioned space
	5	R408.10.5: Premium Efficiency Electric Water Heating in unconditioned space
Drain water heat recovery (select only one)	2	R408.11.1: Drain Water Heat Recovery Units
	3	R408.11.2: High Performance Drain Water Heat Recovery Units
High efficacy lighting	2	R408.12: High Efficacy Lighting
Demand responsive controls	1	R408.13: Demand Responsive Thermostats
Controls	1	R408.14: Controls

Choose 18  
credits from  
Table R408.1:

## Additional Efficiency Package Options

# Envelope Efficiencies

### Reduced Envelope UA (R408.3)

Total UA of the building thermal envelope designed to be **5%, 7.5% or 10%** lower than the Total UA using *U*-factors of Table R402.1.2

### Reduced Air Leakage (R408.4)

The air leakage rate of the building shall be no greater than **2 ACH** (for 2 credits) or **1 ACH** (for 3 credits)

**Energy Tip:** Investments in building envelope efficiencies can reduce home heating and cooling loads, allowing for smaller equipment

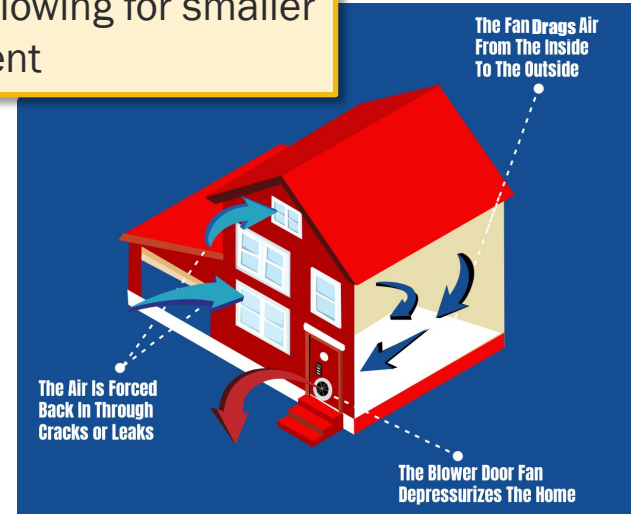


Image Source: AirZoneTampaBay.com

## Additional Efficiency Package Options

# HVAC Efficiencies

### Low duct leakage (R408.5)

Postconstruction leakage rate less than 2 CFM per 100 sf of conditioned floor area

### Duct location (R408.6)

All ducts shall be located within conditioned space

**Energy Tip:** Well sealed and insulated ducts reduce energy losses, leading to lower energy bills

### Space cooling equipment efficiency (R408.7)

Sets minimum SEER for high and premium performance space cooling equipment

### Space heating equipment efficiency (R408.8)

Sets criteria for high performance gas heating, and high and premium performance electric heating

### Heat/Energy recovery ventilation (R408.9)

Sets minimum SRE for high or premium performance energy recovery ventilation systems

## Additional Efficiency Package Options

# Appliance, Lighting, & Controls Efficiencies

### EnergyStar Appliances (R408.2)

Install EnergyStar qualified refrigerator, dishwasher, clothes washer and dryer

### Drain water heat recovery (R408.11)

Sets minimum efficiency criteria for regular and high-performance drain water heat recovery units

### Demand responsive controls (R408.13)

All thermostats must have demand responsive controls

### Water heating equipment efficiency (R408.10)

Sets criteria for high and premium efficiency gas and electric water heating (location dependent)

### High efficacy lighting (R408.12)

Hard wired lighting with minimums for lamp and luminaire efficacy

### Heat pump programmable controls (R408.14)

Thermostats with user configurable supplemental heat must meet certain requirements

# Additional Efficiency Package Options

## Submittal Requirements

Required Measures for All-Electric Properties			
Category	Measure	Selected?	
Space heating equipment efficiency (select one)	R408.8.2: High Performance Electric Space Heating	<input type="checkbox"/>	
	R408.8.3: Premium Performance Electric Space Heating	<input type="checkbox"/>	
Water heating equipment efficiency (select one)	R408.10.2: High Efficiency Electric Water Heating in conditioned space	<input type="checkbox"/>	
	R408.10.3: High Efficiency Electric Water Heating in unconditioned space	<input type="checkbox"/>	
Table R408.1 Additional Energy Efficiency Credits (Options for All-Electric Properties)			
Category	Credit Value	Measure	Selected?
Energy Star Appliance	4	R408.2: Energy Star Appliances	<input type="checkbox"/>
Reduced envelope UA (select only one)	2	R408.3.1: ≥ 5% reduction in total UA	<input type="checkbox"/>
	3	R408.3.2: ≥ 7.5% reduction in total UA	<input type="checkbox"/>
	4	R408.3.3: ≥ 10% reduction in total UA	<input type="checkbox"/>
Reduced air leakage (select only one)	2	R408.4.1: ≤ 2 ACH50 air leakage rate	<input type="checkbox"/>
	3	R408.4.2: ≤ 1 ACH50 air leakage rate	<input type="checkbox"/>
Low duct leakage	2	R408.5: ≤ 2 CFM of total duct leakage	<input type="checkbox"/>
Duct location	5	R408.6: Ducts in Conditioned Space	<input type="checkbox"/>
Heat/Energy Recovery Ventilation (select only one)	4	R408.9.1: High Performance Heat/Energy Recovery Ventilation	<input type="checkbox"/>
	7	R408.9.2: Premium Performance Heat/Energy Recovery Ventilation	<input type="checkbox"/>
Drain water heat recovery (select only one)	2	R408.11.1: Drain Water Heat Recovery Units	<input type="checkbox"/>
	3	R408.11.2: High Performance Drain Water Heat Recovery Units	<input type="checkbox"/>
High efficacy lighting	2	R408.12: High Efficacy Lighting	<input type="checkbox"/>
Demand responsive controls	1	R408.13: Demand Responsive Thermostats	<input type="checkbox"/>
Controls	1	R408.14: Controls	<input type="checkbox"/>
<b>Total Selected Credits</b> (Minimum of 3 Required)		Click or tap here to enter text.	

Include (as screenshot or similar) the completed table on a sheet within the permit drawing set.

Table R408.1 Additional Energy Efficiency Credits (Options for All Other Buildings)			
Category	Credit Value	Measure	Selected?
Energy Star Appliance	4	R408.2: Energy Star Appliances	<input type="checkbox"/>
Reduced envelope UA (select only one)	2	R408.3.1: ≥ 5% reduction in total UA	<input type="checkbox"/>
	3	R408.3.2: ≥ 7.5% reduction in total UA	<input type="checkbox"/>
	4	R408.3.3: ≥ 10% reduction in total UA	<input type="checkbox"/>
Reduced air leakage (select only one)	2	R408.4.1: ≤ 2 ACH50 air leakage rate	<input type="checkbox"/>
	3	R408.4.2: ≤ 1 ACH50 air leakage rate	<input type="checkbox"/>
Low duct leakage	2	R408.5: ≤ 2 CFM of total duct leakage	<input type="checkbox"/>
Duct location	5	R408.6: Ducts in Conditioned Space	<input type="checkbox"/>
Space cooling equipment efficiency (select only one)	1	R408.7.1: High Performance Space Cooling	<input type="checkbox"/>
	2	R408.7.2: Premium Performance Space Cooling	<input type="checkbox"/>
Space heating equipment efficiency (select only one)	2	R408.8.1: High Performance Gas Space Heating	<input type="checkbox"/>
	8	R408.8.2: High Performance Electric Space Heating	<input type="checkbox"/>
	10	R408.8.3: Premium Performance Electric Space Heating	<input type="checkbox"/>
Heat/Energy Recovery Ventilation (select only one)	4	R408.9.1: High Performance Heat/Energy Recovery Ventilation	<input type="checkbox"/>
	7	R408.9.2: Premium Performance Heat/Energy Recovery Ventilation	<input type="checkbox"/>
Water heating equipment efficiency (select only one)	2	R408.10.1: High Efficiency Gas Water Heating	<input type="checkbox"/>
	6	R408.10.2: High Efficiency Electric Water Heating in conditioned space	<input type="checkbox"/>
	4	R408.10.3: High Efficiency Electric Water Heating in unconditioned space	<input type="checkbox"/>
	8	R408.10.4: Premium Efficiency Electric Water Heating in conditioned space	<input type="checkbox"/>
	5	R408.10.5: Premium Efficiency Electric Water Heating in unconditioned space	<input type="checkbox"/>
Drain water heat recovery (select only one)	2	R408.11.1: Drain Water Heat Recovery Units	<input type="checkbox"/>
	3	R408.11.2: High Performance Drain Water Heat Recovery Units	<input type="checkbox"/>
High efficacy lighting	2	R408.12: High Efficacy Lighting	<input type="checkbox"/>
Demand responsive controls	1	R408.13: Demand Responsive Thermostats	<input type="checkbox"/>
Controls	1	R408.14: Controls	<input type="checkbox"/>
<b>Total Selected Credits</b> (Minimum of 18 Required)		Click or tap here to enter text.	

Complete the table in Section 1 (All-Electric Properties) or Section 2 (All-Other Buildings) in the 2022 DEC Prescriptive Checklist



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# Additional Prescriptive Provisions



# Required Provisions for Prescriptive Path

## DEC Section R401 General

- Certificate & Homeowner Manual

## DEC Section R402 Building Thermal Envelope

- Specific insulation installation requirements
- Air barrier, air sealing, and insulation installation
- Blower door testing

## DEC Section R403 Mechanical Systems

- HVAC Design
- Duct leakage testing regardless of location
- Duct located outside conditioned space
- Water Heater location

## DEC Section R404 Electrical Power & Lighting Systems

- 100% high-efficacy lighting
- New interior and exterior lighting controls
- Electric Vehicle (EV) charging
- Electric ready infrastructure
- Solar-Ready Zone
- Minimum onsite renewables

## DEC Section R408 Additional Efficiency Package Options

*This slide highlights some notable provisions in each section and is not comprehensive – see code sections for all requirements*

# DEC R402.2 Specific Insulation Requirements.

- In addition to the requirements of Section R402.1, **insulation shall meet the specific requirements** of Sections R402.2.1 through R402.2.12
- Installation requirements that can't be traded off
  1. Ceilings With Attic
  2. Ceiling Without Attic
  3. Eave Baffles
  4. Attic Hatches and doors
  5. Mass Walls
  6. Steel-frame ceilings, walls, and floors
  7. Floors
  8. Basement Walls
  9. Slab on Grade
  10. Crawl Space walls
  11. Masonry Veneer
  12. Sunroom and Heated Garage



Image Source: Alibaba.com

# DEC R402.2.1 Ceilings with attics

R-49 shall be deemed to satisfy the requirement for R-60 **wherever the full height of uncompressed R-49 insulation extends over the wall top plate at the eaves**

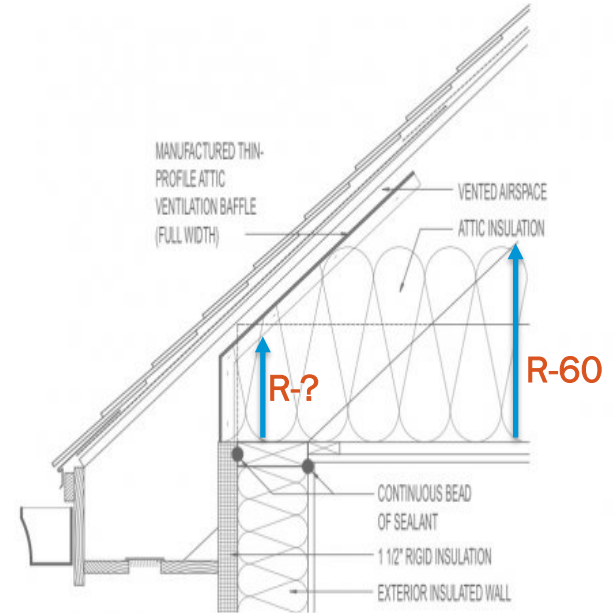
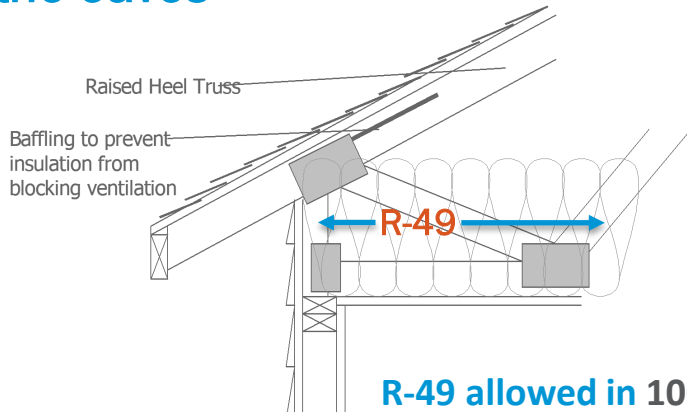


Image Source: [Building America Solution Center](#)

# Air Barrier, Air Sealing, and Insulation Installation

**TABLE R402.4.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION<sup>a</sup>**

<b>Component</b>	<b>AIR BARRIER, AIR SEALING CRITERIA</b>	<b>Insulation Installation</b>
General requirements	A continuous air barrier shall be installed in the building envelope. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.

Upcoming contractor/inspector trainings will dive into the R402.2 Specific insulation requirements and Table R402.4.1.1 Air Barrier, Air Sealing, and Insulation Installation requirements in more detail



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# Prescriptive Compliance: Considerations for Existing Buildings

*DEC Chapter 5 [RE]*

# Existing Buildings

Residential renovations can affect the energy use of the building as a whole – the DEC address such renovations in order to maintain, if not improve, the conservation of energy by the renovated or altered building

Work Category	Definition
Repair	The reconstruction or renewal of any part of an <i>existing building</i> for the purpose of its maintenance or to correct damage.
Alteration	Any construction, retrofit or renovation to an existing structure other than <i>repair</i> or <i>addition</i> . Also, a change in a building, electrical, gas mechanical, or plumbing system that involves an extension, addition or change to the arrangement, type, or purpose of original installation.
Addition	An extension or increase in the <i>conditioned space</i> floor area, number of stories or height of a building or structure.
Change of Occupancy or Use	A change in the occupancy classification of a building or a change in the use of a building or portion of a building that involves a change in the application of the requirements of this code.

# Considerations for Existing Building Projects

## Question

## Answer

Does your **project scope fall into more than one work category** (addition, alteration, repair, or change of occupancy)?

If yes, you **must follow the requirements of each applicable section.**

**For additions:** What is the **increase in conditioned floor area** as a percentage of the total existing above grade conditioned floor area?

Additions that **do not exceed a 20% increase or 300 sf, whichever is less**, are **not required** to provide air barrier details, or heating and cooling equipment sizing calculations.

Does the project qualify as a **historic building**?

If it meets one of the conditions in the code, **the historic building is exempted** from most 2022 DEC provisions.

# Prescriptive is Simplified for Existing Homes

- DEC Section R408 Additional Efficiency Package Options **is NOT required** for additions, alterations or repairs following the prescriptive path
- Most 2022 DEC specific provisions apply only to new construction
  - Solar-ready zone and minimum onsite renewables **are not required for existing buildings**
  - Electric Vehicle (EV) charging requirements **may apply if new** garage or carport, new on-site parking space
- **No electrification requirements for existing homes**
  - If replacing or installing new space or water heating equipment, [consider benefits of electrifying and learn more about available programs and rebates](#)



# Two Types of Additions

## Changes in Space Conditioning

Unconditioned or low-energy space is changed to conditioned space



*Examples:* finishing an existing attic or basement, turning an unconditioned garage into a new bedroom

## All Other Additions

The addition is comprised of all new, added conditioned space



## Prescriptive Compliance for Additions

# Building Envelope Assemblies

## DEC Section R502

- Two options for new building envelope assemblies:
  1. **Prescriptive Tables**
  2. **Total UA Alternative**
    - » DEC R502.2: Total UA of existing building with addition and any alterations **must be less than or equal to** the Total UA of the original existing buildings
    - » Likely requires upgrades to existing envelope assemblies
- Must also meet provisions for **specific insulation requirements, fenestration, and air barrier and air sealing**
  - Comply with DEC R402.1 through R402.4

# Prescriptive Compliance for Additions

## Air Leakage Testing

DEC Section R502.3.1 Exceptions by addition type:

### Changes in Space Conditioning

- Pre- and post-blower door testing required
- The air leakage rate with addition and any alterations **must be less than** air leakage rate of original existing building

### All Other Additions

- New envelope assemblies are **exempt from air leakage testing**
- Third-party inspections may be required if envelope assemblies fail to exhibit envelope tightness based on physical inspection

## Prescriptive Compliance for Additions

# Additional Provisions

### DEC Section R502.3

#### New HVAC ducts

#### Meet requirements of R403

- *Exception:* ducts extended from existing heating and cooling system



#### New Service Hot Water Systems

#### Meet requirements of R403.5

- Includes new DEC provisions for location and demand response



#### New Lighting Systems

#### Meet requirements of R404.1

- 100% high-efficacy lighting



# Prescriptive Compliance for Alterations

## DEC Section R503.1.1 Building Thermal Envelope

- Envelope assemblies that are part of the alteration must follow the **Prescriptive Tables**
- Comply with limited prescriptive provisions (see section)
- **Exceptions:**
  1. Storm windows over existing windows
  2. Existing ceiling, wall or floor cavities exposed during construction (fill with insulation)
  3. Construction where existing roof, wall or floor cavity is not exposed
  4. Roof recover
  5. Roofs without insulation in cavity: must insulate above or below sheathing if exposed
  6. Surface-applied window film on existing single pane windows






### Replacement Fenestration

- Replacement windows must meet *U*-factor & SHGC requirements of Table R402.1.3
- An area-weighted average may be used when multiple windows are replaced

## Prescriptive Compliance for Alterations

# Additional Provisions (*same as Additions*)

### DEC Section R502.3

<b>New HVAC ducts</b>	Meet requirements of <b>R403</b> <ul style="list-style-type: none"><li>• <i>Exception:</i> ducts extended from existing heating and cooling system</li></ul>	
<b>New Service Hot Water Systems</b>	Meet requirements of <b>R403.5</b> <ul style="list-style-type: none"><li>• Includes new DEC provisions for location and demand response</li></ul>	
<b>New Lighting Systems</b>	Meet requirements of <b>R404.1</b> <ul style="list-style-type: none"><li>• 100% high-efficacy lighting</li><li>• <i>Note:</i> IECC exception removed in 2022 DEC</li></ul>	

# Repairs

- Repairs must follow the requirements of **DEC Sections R501.3 and R504.**
  - Components of a building or system must be maintained to **meet the requirements of the code edition under which they were installed**
  - Work on nondamaged components necessary for the required repair or damaged components is considered part of the repair **and does not need to meet the requirements for alterations**
- **Repairs include:**
  - Glass-only replacements in an existing sash and frame
  - Roof repairs
  - Replacement of only the bulb, ballast, or both within an existing luminaire, provided the installed interior lighting power is not increased

## Prescriptive Compliance for Change of Occupancy or Use

DEC Specific  
Amendment

**DEC Section R505.1:** A project with a change or occupancy or use to residential must meet the applicable requirements of Chapter 5 [RE] for additions, alterations, and repairs

- If changing **from a lower energy-demand category** (*IBC occupancies F, H, or S*), must meet all requirements for new construction, unless change does not result in increased energy demand
- **Exception for Total UA Alternative:** Total UA of proposed design may be up to 110% of the Total UA calculated using *U*-factors in Table R402.1.4



# Existing Home Support and Resources

[www.denvergov.org/HomeEnergy](http://www.denvergov.org/HomeEnergy)

- Resources for:
  - Rebates for existing homes
  - How to electrify your home and work with contractors
  - Income Qualified Rebates

[www.denvergov.org/CAREContractorResources](http://www.denvergov.org/CAREContractorResources)

- Resources for:
  - Instructions for Installers Applying for Rebates



## Space Heating and Cooling

Heating and cooling account for the majority of energy we use in our homes. As the grid moves to 100% renewable power, electric appliances like heat pumps are the clear path to reducing carbon emissions generated by our homes.



## Water Heating

Your water heater might not be the first thing you think of when changing your home appliances to electric. But it can be a great place to try a heat pump and improve efficiency and indoor air quality!



## Home Solar

Adding solar to your home or subscribing to a solar co-op is a great way to save money on your utilities bills and reduce carbon emissions from your house. Learn about all the ways we can help you become a solar household as well!



## Income Qualified Rebates

Qualified households are eligible for additional rebates and incentives to offset the costs of equipment upgrades. Learn whether you might qualify, and find out how to work with our partners at Energy Resource Center to start saving.



## Healthy Homes Program

The Healthy Homes Program will provide extensive home energy and weatherization upgrades for income qualified homes where someone in the household also has a respiratory condition. If you think you might qualify, reach out to our program partners.



## Electric Vehicles

Electrifying your home includes more than just the house itself. Your transportation can also be electrified, which improves our city's air quality and eliminates expensive trips to the gas station. Learn about the other benefits of electric vehicles and how you can save money when you purchase one.

# How is electrification in existing buildings going for you?

CASR's existing building electrification team would love to hear stories and feedback from contractors and building professionals about how heat pump installation is going for you!

If you'd like to share your experience with CASR email [electrification@denvergov.org](mailto:electrification@denvergov.org)

# Summary

Prescriptive projects have two options for **building thermal envelope**:

- Prescriptive Tables & Total UA Alternative
- REScheck workaround needed until DEC updates available in Fall 2023

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New credit method for **Additional Efficiency Packages** (DEC Section R408) expands options and flexibility while incentivizing electrification

- Applies to all new projects following the prescriptive compliance option

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The prescriptive path is simplified for projects on **existing homes**

- Specific requirements and considerations vary by project type

# Questions?

- Please use the Q&A feature to submit your questions



- Responses to all questions not addressed today will be sent out by email to registered participants
- Additional questions may be sent to: [energy.review@denvergov.org](mailto:energy.review@denvergov.org)

# Thank you!

*For more information, visit:*

[Denvergov.org/EnergyCode](https://denvergov.org/EnergyCode)

[Denvergov.org/BuildingCode](https://denvergov.org/BuildingCode)

*Contact us:*

Questions about code: [energy.review@denvergov.org](mailto:energy.review@denvergov.org)

Questions about programs & resources: [sustainability@denvergov.org](mailto:sustainability@denvergov.org)