



DENVER AMENDMENT PROPOSAL FORM FOR PROPOSALS TO THE 2019 DENVER BUILDING CODE AMENDMENTS AND THE 2021 INTERNATIONAL CODES

DENVER
THE MILE HIGH CITY

2021 CODE DEVELOPMENT CYCLE

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2) One proposal per this document is to be provided with clear and concise information.

Is a separate graphic file provided ("X" to answer): ___ Yes or _x_ No

3) Highlight the code and acronym that applies to the proposal

<u>Acronym</u>	<u>Code Name</u>	<u>Acronym</u>	<u>Code Name</u>
DBC-AP	Denver Building Code–Administrative Provisions	IPC	International Plumbing Code
IBC	International Building Code	IRC	International Residential Code
IECC	International Energy Conservation Code	IFGC	International Fuel Gas Code
IEBC	International Existing Building Code	IMC	International Mechanical Code
IFC	International Fire Code	DGC	Denver Green Code

Please provide all the following items in your amendment proposal.

Code Sections/Tables/Figures Proposed for Revision:

Instructions: If the proposal is for a new section, indicate (new), otherwise enter applicable code section.

NEW

401.4 Energy Rating Index Compliance Alternative or 401.5 Passive House Compliance Alternative (Project Elective)

Strike and add as follows

401.1 (4.1) Scope. This section specifies requirements for energy efficiency for *residential buildings* and appliances, and for *on-site renewable energy systems*.

401.2 (4.2) Compliance. The energy systems shall comply with Section 401.3 and one of the following Project Electives:

- 1. ~~Section 401.4, "Passive House Approach"~~
- 2. ~~Section 401.5, "Net Zero Approach"~~
- 3. ~~Section 401.6, "Energy Rating Approach."~~
- 1. Section 401.3, "Energy Rating Index Zero Energy Approach."
- 2. Section 401.4, "Passive House Approach"

~~**401.4 (4.4) Energy Rating Approach (Project Elective).** The rated design of the *building project* shall have an Energy Rating Index score of less than or equal to 50 when compared to the *ERI reference design* determined in accordance with RESNET/ICC 301. The ERI value shall include onsite power production calculated in accordance with RESNET/ICC 301. All space heating and cooling systems, water heating, cooking equipment and clothes dryers shall be electric.~~

~~**401.4.1(4.4.1) Verification by approved agency.** Verification of compliance with this section shall be completed by an approved third party.~~

~~401.4.2(4.4.2) Documentation.~~ Documentation showing how the ERI for the *residential building* was determined shall be in accordance with Sections ~~401.4.2.1 and 401.4.2.2.~~ Additional documentation shall be provided in accordance with Section ~~401.4.2.3.~~

~~401.4.2.1(4.4.2.1) Compliance software tools.~~ Software tools used for determining ERI shall be Approved Software Rating Tools in accordance with RESNET/ ICC 301.

~~401.4.2.2(4.4.2.2) Compliance report.~~ Compliance software tools shall generate a report documenting that the ERI of the rated design complies with Section 401.4 or 401.5. The compliance documentation shall include the following information:

- ~~1. Address or other identification of the residential building.~~
- ~~2. An inspection checklist documenting the building component characteristics of the rated design. The inspection checklist shall show results for both the *ERI reference design* and the rated design, and shall document all inputs entered by the user necessary to reproduce the results.~~

~~401.4.2.3(4.4.2.3) Additional documentation.~~ The *building official* shall be permitted to require the following documents:

- ~~3. Documentation of the building component characteristics of the *ERI reference design*.~~
- ~~4. A certification signed by the builder providing the building component characteristics of the rated design.~~
- ~~5. Documentation of the actual values used in the software calculations for the rated design.~~
- ~~6. Within 24 months of occupancy, documentation that on an annual basis, the energy consumed on site by the *building project* is equal to or less than that which was calculated for the rated design to comply with Section 401.4 or 401.5.~~

~~401.5(4.5) Net Zero Approach (Project Elective).~~ The rated design of the *building project* shall have an Energy Rating Index score of less than or equal to ~~45 without OPP and 0 with OPP~~ when compared to the *ERI reference design* determined in accordance with RESNET/ICC 301. The ERI value shall include onsite power production calculated in accordance with RESNET/ICC 301. The following conditions shall also be met:

- ~~a. All space heating and cooling systems, water heating, cooking and clothes dryers shall be electric.~~
- ~~b. The building or dwelling unit shall be tested and verified as having an air leakage rate not exceeding two air changes per hour. Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g.~~
- ~~c. The building shall be provided with a heat recovery or energy recovery ventilation system. The system shall be balanced with a minimum sensible heat recovery efficiency of 65% at 32°F and at rated air flow.~~

~~401.5.1(4.5.1) Documentation and verification.~~ Buildings shall comply with Sections 401.4.1 through 401.4.2.3.

Add NEW SECTION AS FOLLOWS:

New residential buildings may choose a compliance alternative outlined in Section 401.4 or 401.5

R401.3 Energy Rating Index Zero Energy Compliance Approach

R401.3.1 Scope. This section establishes criteria for compliance using an Energy Rating Index (ERI) analysis developed per ANSI/RESNET/ICC 301.

R401.3.2 ERI compliance. Compliance based on the ERI requires that the rated design meets all of the following:

1. The requirements of the sections indicated within Table R401.3.
2. Maximum ERI values indicated in Table R401.3.1.

**TABLE R401.3
REQUIREMENTS FOR ENERGY RATING INDEX**

SECTION ^a	TITLE
General	
R401.2.5	Additional efficiency packages
R401.3	Certificate
Building Thermal Envelope	
R402.1.1	Vapor retarder
R402.2.3	Eave baffle
R402.2.4.1	Access hatches and doors
<u>R402.2.8</u> <u>R402.2.8.1</u>	<u>Basement Walls</u> <u>Basement Wall Insulation</u> <u>Installation</u>

R402.2.9.1	Slab-on-grade floor insulation installation
R402.2.10.1	Crawl space wall insulation installation
R402.4.1.1	Installation
R402.4.1.2	Testing
R402.4.2	Fireplaces
R402.4.3	Fenestration air leakage
R402.4.4	Rooms containing fuel burning appliances
R402.4.5	Recessed lighting
R402.4.6	Electrical and communication outlet boxes (air Sealed boxes)
Mechanical	
R403.1	Controls
R403.2	Hot water boiler temperature reset
R403.3 except Sections R403.3.2, R403.3.3 and R403.3.6	Ducts
R403.4	Mechanical system piping insulation
R403.5.1	Heated water calculation and temperature maintenance systems
R403.5.3	Drain water heat recovery units
R403.6	Mechanical ventilation
R403.7	Equipment sizing and efficiency rating
R403.8	Systems serving multiple dwelling units
R403.9	Snow melt and ice systems
R403.10	Energy consumption of pools and spas
R403.11	Portable spas
R403.12	Residential pools and permanent residential spas
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
404.2	Interior lighting controls
R406.3	Building thermal envelope

R401.3.3 Energy Rating Index. The Energy Rating Index (ERI) shall be determined in accordance with the most recent publication of the ANSI/RESNET/ICC 301 standard.

R401.3.4 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 score without and with on-site power production (OPP) less than or equal to the appropriate value indicated in Table **R401.4.1** when compared to the *ERI reference design*.

**TABLE 401.4.1
MAXIMUM ENERGY RATING INDEX**

<u>CLIMATE ZONE</u>	<u>ENERGY RATING INDEX WITHOUT RENEWABLE</u>	<u>ENERGY RATING INDEX WITH RENEWABLE</u>
<u>5</u>	<u>45</u>	<u>0</u>

R401.3.5 Verification by approved agency. Verification of compliance with Section R401.3 as outlined in Sections /R406.3.2 and R406.3.4 shall be completed by an *approved* third party. Verification of compliance with **Table R401.3** shall be completed by the authority having jurisdiction or an *approved* third-party inspection agency in accordance with Section R105.4.

R401.3.6 Documentation. Documentation of the software used to determine the ERI and the parameters for the *residential building* shall be in accordance with Sections R401.3.6 through R401.3.9.

R401.3.6.1 Compliance software tools. Software tools used for determining ERI shall be *Approved Software Rating Tools* in accordance with ANSI/RESNET/ICC 301.

R401.3.6.2 Compliance report. Compliance software tools shall generate a report that documents that the home and the ERI score of the *rated design* complies with Sections R401.3.2, R401.3.3, R401.3.4. Compliance documentation shall be created for the proposed design and shall be submitted with the application for the building permit. Confirmed compliance documents of the built *dwelling unit* shall be created and submitted to the code official for review before a certificate of occupancy is issued. Compliance reports shall include information in accordance with Sections R401.3.6.2.1 and R401.3.6.2.2.

R401.3.6.2.1 Proposed compliance report for permit application. Compliance reports submitted with the application for a building permit shall include the following:

1. Building Street address, or other *building site* identification.
2. Declare ERI on title page and building plans.
3. The name of the individual performing the analysis and generating the compliance report.
4. The name and version of the compliance software tool.
5. Documentation of all inputs entered into the software used to produce the results for the reference design and/or the rated home.
6. A certificate indicating that the proposed design has an ERI less than or equal to the appropriate score indicated in Table R406.5 when compared to the ERI reference design. The certificate shall document the building component energy specifications that are included in the calculation, including: component level insulation *R-values* or *U-factors*; assumed duct system and building envelope air leakage testing results; and the type and rated efficiencies of proposed heating, cooling, mechanical ventilation, and service water-heating equipment to be installed. If on-site renewable energy systems will be installed, the certificate shall report the type and production size of the proposed system.
7. When a site-specific report is not generated, the proposed design shall be based on the worst-case orientation and configuration of the rated home.

R401.3.6.2.2 Confirmed compliance report for a certificate of occupancy. A confirmed compliance report submitted for obtaining the certificate of occupancy shall be made site and address specific and include the following:

1. Building Street address or other *building site* identification.
2. Declaration of ERI on title page and on building plans.
3. The name of the individual performing the analysis and generating the report.
4. The name and version of the compliance software tool.
5. Documentation of all inputs entered into the software used to produce the results for the reference design and/or the rated home.
6. A final confirmed certificate indicating that the confirmed rated design of the built home complies with Sections R406.2 and R406.4. The certificate shall report the energy features that were confirmed to be in the home, including: component-level insulation *R-values* or *U-factors*; results from any required duct system and building envelope air leakage testing; and the type and rated efficiencies of the heating, cooling, mechanical ventilation, and

service water-heating equipment installed. Where on-site renewable energy systems have been installed on or in the home, the certificate shall report the type and production size of the installed system.

R401.3.7 Renewable energy certificate (REC) documentation. Where on-site renewable energy is included in the calculation of an ERI, one of the following forms of documentation shall be provided to the code official:

1. Substantiation that the RECs associated with the on-site renewable energy are owned by, or retired on behalf of, the homeowner.
2. A contract that conveys to the homeowner the RECs associated with the on-site renewable energy, or conveys to the homeowner an equivalent quantity of RECs associated with other renewable energy.

R401.1.3.8 Additional documentation. The *code official* shall be permitted to require the following documents:

1. Documentation of the building component characteristics of the *ERI reference design*.
2. A certification signed by the builder providing the building component characteristics of the *rated design*.
3. Documentation of the actual values used in the software calculations for the *rated design*.

R401.3.8 Specific approval. Performance analysis tools meeting the applicable subsections of Section R401.3 shall be *approved*. Documentation demonstrating the approval of performance analysis tools in accordance with Section **R401.3.6.1** shall be provided.

R401.3.9 Input values. Where calculations require input values not specified by 2021 IECC Sections R402, R403, R404 and R405, those input values shall be taken from ANSI/RESNET/ICC 301.

401.4.1 Passive House Institute US (PHIUS) Certification. Achieve certification with the PHIUS+ 2018 Passive Building Standard and provide documentation in accordance with Section 401.4.1.1

401.4.1.1 Documentation. Provide documentation to the *building official* demonstrating the following.

1. Prior to the issuance of a building permit, documentation of a PHIUS+ 2018 Certification Contract from PHIUS and a list of compliance features including the amount of renewable energy to be installed to achieve a zero-energy home.
2. Prior to the issuance of a certificate of occupancy, a copy of the final report ~~submitted on a form~~ that is approved by PHIUS to document compliance with the PHIUS+ 2018 Standard.

401.4.2 Passive House Institute (PHI) Certification. Achieve certification with the PHI Passive House Standard and provide documentation in accordance with Section 401.4.2.1.

401.4.2.1 Documentation. Provide documentation to the *building official* demonstrating the following.

1. Prior to the issuance of a building permit, signed documentation from a PHI accredited Passive House Certifier of intent to certify the building and a list of compliance features, including the amount of renewable energy required to be installed to achieve a zero-energy home.
2. Prior to the issuance of a certificate of occupancy, a copy of the final report ~~submitted on a form~~ that is approved by PHI to document compliance with the Passive House Standard.

Supporting Information (Required):

The purpose of this proposal is to establish performance compliance alternative for the City of Denver's Green Code and metrics used to determine compliance with 2030 goal of zero energy homes. The proposal narrows the compliance alternative from 3 to two.

The ERI compliance alternative proposal creates a maximum performance ERI score both without onsite power production (OPP) and with onsite power production (OPP). It also expands on requirement TABLE 401.3 that is used in the IECC to ensure installation requirements in the IECC are installed properly. It does this by requiring all things that are associated with installation that are required by the prescriptive path be installed when using this compliance alternative in the IECC and or the DGC.

This proposal is based on research that has identified inconsistency with the IECC energy Rating Index to justify use of a non-modified ANSI/RESNET/ICC Standard 301 ERI score. It also recognizes that setting ERI compliance scores without and with OPP is a means to ensure a sound thermal envelope that is equal to the or better than the IECC prescriptive path yet offers designers and builders greater flexibility to specify energy features and building techniques to determine the most cost-effective way to achieve compliance.

The IECC Section R406 ERI score requirements are 50 without OPP and 40 with OPP for the City of Denver. The Denver Green Code Section 401.3 requirements are 45 without and ZERO with OPP. These numbers are in alignments with the current city goals and desired time frame that has been stated to achieve zero energy new homes

In the Denver Green Code this proposal is proposing that the old Energy Rating compliance approach and the NET Zero Energy Approach be replaced with this Energy Rating Index Compliance Alternative as it better aligns with the Cities IECC R406 ERI compliance alternative and also meets the need and goal of achieving Zero energy homes in the Denver Green Code.

The second compliance alternative the US or German Passive House programs with the addition of onsite renewables to achieve a zero-energy home. The proposal updates the PHUIS compliance alternative to the newest standard and ensure that planning and implementation of onsite renewables is taking place to achieve a zero-energy home. Passive House program requirements replace IECC requirements to achieve parity between the ERI and Passive house compliance approaches.

Bibliography and Access to Materials (as needed when substantiating material is associated with the amendment proposal):

Other Regulations Proposed to be Affected

***For proposals to delete content from the 2019 Denver Green Code in conjunction with adding it to other mandatory Denver codes and/or regulations, only.**

Please identify which other mandatory codes or regulations are suggested to be updated (if any) to accept relocated content.

Referenced Standards:

List any new referenced standards that are proposed to be referenced in the code.

Impact:

How will this proposal impact cost and restrictiveness of code? ("X" answer for each item below)

Cost of construction: Increase ___ Decrease ___ No Impact

Cost of design: Increase ___ Decrease ___ No Impact

Restrictiveness: Increase ___ Decrease ___ No Impact

Departmental Impact (City use only):

This amendment proposal increases/decreases/is neutral to the cost of plans review.

This amendment increases/decreases/is neutral to the cost of inspections.