

CHAPTER 1 [CE] SCOPE AND ADMINISTRATION

SECTION C101 SCOPE AND GENERAL REQUIREMENTS

C101.1 Title. This code shall be known as the *Illinois Energy Conservation Code* or “this Code” and shall mean:

With respect to the State facilities covered by 71 Ill. Adm. Code 600.Subpart B:

This Part, all additional requirements incorporated within Subpart B (including the 2021 International Energy Conservation Code, including all published errata but excluding published supplements that encompass ASHRAE 90.1-2019), and any statutorily authorized adaptations to the incorporated standards adopted by CDB are effective upon adoption.

With respect to the privately funded commercial facilities covered by 71 Ill. Adm. Code 600.Subpart C:

This Part, all additional requirements incorporated within Subpart C (including the 2021 International Energy Conservation Code, including all published errata and excluding published supplements that encompass ASHRAE 90.1-2019), and any statutorily authorized adaptations to the incorporated standards adopted by CDB, are effective upon adoption.

C101.1.2 Adoption. The Board shall adopt amendments to this Code within 12 months after publication of changes to the International Energy Conservation Code. Any such update in this Code shall take effect within 6 months after it is adopted by the Board and shall apply to any new building or structure in this State for which a building permit application is received by a municipality or county, except as otherwise provided by the EEB Act.

C101.1.3 Adaptation. The Board may appropriately adapt the International Energy Conservation Code to apply to the particular economy, population, distribution, geography and climate of the State and construction within the State, consistent with the public policy objectives of the EEB Act.

C101.5 Compliance. *Commercial buildings* shall meet the provisions of the *Illinois Energy Conservation Code* covered by 71 Ill. Adm. Code 600.Subpart C. The local authority having jurisdiction (AHJ) shall establish its own procedures for enforcement of the Illinois Energy Conservation Code. Minimum compliance shall be demonstrated by submission of:

1. Compliance forms published in the ASHRAE 90.1 User's Manual; or
2. Compliance Certificates generated by the U.S. Department of Energy's COMcheck™ Code compliance tool; or
3. Other comparable compliance materials that meet or exceed, as determined by the AHJ, the compliance forms published in the ASHRAE 90.1 User's Manual or the U.S. Department of Energy's COMcheck™ Code compliance tool; or
4. The seal of the architect/engineer as required by Section 14 of the Illinois Architectural Practice Act [225 ILCS 305], Section 12 of the Structural Engineering Licensing Act [225 ILCS 340] and Section 14 of the Illinois Professional Engineering Practice Act [225 ILCS 325].

**SECTION C102
ALTERNATIVE MATERIALS, DESIGN AND
METHODS OF CONSTRUCTION AND
EQUIPMENT**

C102.1.1 Above code programs. No unit of local government, including any home rule unit, may apply energy efficient building standards to privately funded commercial facilities in a manner that is less stringent than the Code as described in 71 Ill. Adm. Code 600. Subpart C. However, nothing in the EEB Act or Subpart C prevents a unit of local government from adopting an energy efficiency code or standards that are more stringent than this Code. The requirements identified in Table C407.2 shall be met.

**SECTION C110
BOARD OF APPEALS**

C110.1 General. In order to hear and decide appeals of orders, decisions or determinations made by the *code official* relative to the application and interpretation of this Code, there may be created a board of appeals. The *code official* shall be an ex officio member of said board but shall not have a vote on any matter before the board. The board of appeals shall be appointed by the governing body and shall hold office at its pleasure. The board shall adopt rules of procedure for conducting its business, and shall render all decisions and findings in writing to the appellant with a duplicate copy to the *code official*.

C110.3 Qualifications. The board of appeals shall consist of members who are qualified by experience and training.

**CHAPTER 2 [CE]
DEFINITIONS**

**SECTION C202
GENERAL DEFINITIONS**

ADD THE FOLLOWING Definitions:

APPROVED SOURCE. An independent person, firm or corporation, *approved* by the building official, who is competent and experienced in the application of engineering principles to materials, methods or systems analyses.

AUTHORITY HAVING JURISDICTION or AHJ. The organization, officer or individual responsible for approving equipment, materials, an installation or procedure.

BOARD. The Illinois Capital Development Board.

COUNCIL. The Illinois Energy Conservation Advisory Council whose purpose is to recommend modifications to the *Illinois Energy Conservation Code*.

Demand Response Signal - means a signal that indicates a price or a request to modify electricity consumption for a limited time period.

Demand Responsive Control – means a control capable of receiving and automatically responding to a demand response signal.

EEB ACT. The Energy Efficient Building Act [20ILCS 3125].

Photosynthetic Photon Efficacy (PPE) – means a photosynthetic photon flux divided by input electric power in units of micromoles per second per watt, or micromoles per joule as defined by ANSI/ASABE S640.

CHAPTER 4 [CE] COMMERCIAL ENERGY EFFICIENCY

SECTION C402 BUILDING ENVELOPE REQUIREMENTS

C402.4.1.3 Fenestration Orientation

The vertical fenestration shall comply with equation either (a) or (b) a. $AW \leq (AT)/4$ and $AE \leq (AT)/4$
b. $AW \times SHGCW \leq (AT \times SHGCC)/5$ and $AE \times SHGCE \leq (AT \times SHGCC)/5$

where

A_w = west-oriented vertical fenestration area (oriented within 45 degrees of true west to the south and within 22.5 degrees of true west to the north in the northern hemisphere)

A_e = east-oriented vertical fenestration area (oriented within 45 degrees of true east to the south and within 22.5 degrees of true east to the north in the northern hemisphere)

AT = total vertical fenestration area

$SHGCC$ = $SHGC$ criteria in Table C402.4

$SHGCE$ = $SHGC$ for east-oriented fenestration

$SHGCW$ = $SHGC$ for west-oriented fenestration

Exceptions:

1. Buildings with shade on 75% of the east- and west-oriented vertical fenestration areas from permanent projections, existing buildings, existing permanent infrastructure, or topography at 9 a.m. and 3 p.m., respectively, on the summer solstice (June 21).
2. Alterations and additions with no increase in vertical fenestration area.
3. Buildings where the west-oriented and east-oriented vertical fenestration area does not exceed 20% of the gross wall area for each of those façades, and $SHGC$ on those façades is no greater than 90% of the criteria in Table C402.4.

C402.5.1 Air barriers. A continuous air barrier shall be provided throughout the building thermal envelope. The air barriers shall be permitted to be located on the inside or outside of the building envelope, located within the assemblies composing the envelope, or any combination thereof. The air barrier shall comply with Sections

C402.5.1.1 and C402.5.1.2. For roof air barriers on existing buildings, refer to Section C503.1 or C504.2.

Exception: Air barriers are not required in buildings located in *Climate Zone 2B*.

C402.5.1.1 Air barrier construction. The continuous air barrier shall be constructed to comply with the following:

1. The air barrier shall be continuous for all assemblies that are the thermal envelope of the building and across the joints and assemblies.
2. Air barrier joints and seams shall be sealed, including sealing transitions at joints between dissimilar materials. The joints and seals shall be securely installed in or on the joint for its entire length so as not to dislodge, loosen or otherwise impair its ability to resist positive and negative pressure from wind, stack effect and mechanical ventilation.
3. Penetrations of the air barrier shall be caulked, gasketed or otherwise sealed in a manner compatible with the construction materials and location. Sealing shall allow for expansion, contraction and mechanical vibration. Paths for air leakage from the building to the space between the roof deck and roof covering used as an air barrier, shall be caulked, gasketed or otherwise covered with a moisture vapor-permeable material. Joints and seams associated with penetrations shall be sealed in the same manner or taped. Sealing materials shall be securely installed around the penetration so as not to dislodge, loosen or otherwise impair the penetrations' ability to resist positive and negative pressure from wind, stack effect and mechanical ventilation. Sealing of concealed fire sprinklers, where required, shall be in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.
4. Recessed lighting fixtures shall comply with Section C402.5.10. Where similar objects are installed that penetrate the air barrier, provisions shall be made to maintain the integrity of the air barrier.

SECTION C405 ELECTRICAL POWER AND LIGHTING SYSTEMS

C405.4 Lighting for plant growth and maintenance.

All permanently installed luminaires used for plant growth and maintenance shall have a [photosynthetic photon efficacy](#) as defined in accordance with [ANSI/ASABE S640](#) of not less than 1.7 $\mu\text{mol/J}$ for greenhouses and not less than 2.2 $\mu\text{mol/J}$ for all other indoor growing spaces.

Exception: The following buildings are exempt:

1. Buildings with no more than 40kW of aggregate horticultural lighting load.
2. Cannabis facilities subject to 410 ILCS 705/10-45- the Cannabis Regulation and Tax Act.

SECTION C406 ADDITIONAL EFFICIENCY REQUIREMENTS

C406.1 Additional energy efficiency credit requirements. New buildings shall achieve a total of 10 credits from Tables C406.1(1) through C406.1(5) where the table is selected based on the use group of the building and from credit calculations as specified in relevant subsections of Section C406. Where a building contains multiple-use groups, credits from each use group shall be weighted by floor area of each group to determine the weighted average building credit.

Credits from the tables or calculation shall be achieved where a building complies with one or more of the following:

1. More efficient HVAC performance in accordance with Section C406.2.
2. Reduced lighting power in accordance with Section C406.3.
3. Enhanced lighting controls in accordance with Section C406.4.
4. On-site supply of renewable energy in accordance with Section C406.5.
5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.
6. High-efficiency service water heating in accordance with Section C406.7.

7. Enhanced envelope performance in accordance with Section C406.8.
8. Reduced air infiltration in accordance with Section C406.9
9. Where not required by Section C405.12, include an energy monitoring system in accordance with Section C406.10.
10. Where not required by Section C403.2.3, include a fault detection and diagnostics (FDD) system in accordance with Section C406.11.
11. Efficient kitchen equipment in accordance with Section C406.12.
12. HVAC demand responsive controls and more efficient HVAC performance in accordance with Section C406.2 and Section C406.13.
13. Water heating demand responsive controls and high-efficiency service water heating in accordance with Section C406.7 and Section C406.14.

Modify Table C406.1(1) as follows:

Table C406.1(1) Additional Energy Efficiency Credits for Group B Occupants

Climate Zone:	4A	5A
C406.13 HVAC demand responsive controls	2	2
C406.14 Water heating demand responsive controls	1	1

Modify Table C406.1(2) as follows:

Table C406.1(2) Additional Energy Efficiency Credits for Group R and I Occupancies

Climate Zone:	4A	5A
C406.13 HVAC demand responsive controls	4	3
C406.14 Water heating demand responsive controls	1	1

Modify Table C406.1(3) as follows:

Table C406.1(3) Additional Energy Efficiency Credits for Group E Occupancies

Climate Zone:	4A	5A
C406.13 HVAC demand responsive controls	4	4
C406.14 Water heating demand responsive controls	1	1

Modify Table C406.1(4) as follows:

Table C406.1(4) Additional Energy Efficiency Credits for Group M Occupancies

Climate Zone:	4A	5A
C406.13 HVAC demand responsive controls	4	3
C406.14 Water heating demand responsive controls	x	x

Modify Table C406.1(5) as follows:

Table C406.1(5) Additional Energy Efficiency Credits for Other* Occupancies

Climate Zone:	4A	5A
C406.13 HVAC demand responsive controls	3	3
C406.14 Water heating demand responsive controls	2	2

C406.1.1 Tenant spaces. Tenant spaces shall comply with sufficient options from Tables C406.1(1) through C406.1(5) to achieve a minimum number of 5 credits, where credits are selected from Section C406.2, C406.3, C406.4, C406.6, C406.7 or C406.10. Where the entire building complies using credits from Section C406.5, C406.8, C406.9, or C406.13 tenant spaces shall be deemed to comply with this section.

Exception: Previously occupied tenant spaces that comply with this code in accordance with Section C501.

C406.13 HVAC demand responsive controls. Buildings shall be provided with demand responsive controls capable of executing the following actions in response to a demand response signal:

1. Automatically increasing the zone operating cooling set point by the following values: 1°F (0.5°C), 2°F (1°C), 3°F (1.5°C), and 4°F (2°C).
2. Automatically decreasing the zone operating heating set point by the following values: 1°F (0.5°C), 2°F (1°C), 3°F (1.5°C), and 4°F (2°C).

Where a demand response signal is not available the heating and cooling system controls shall be capable of performing all other functions. Where thermostats are controlled by direct digital control including, but not limited to, an energy management system, the system shall be capable of demand responsive control and capable of adjusting all thermal setpoints to comply. The demand responsive controls shall comply with either Section C406.13.1 or Section C406.13.2

C406.13.1 Air conditioners and heat pumps with two or more stages of control and cooling capacity of less than 65,000 Btu/h. Thermostats for air conditioners and heat pumps with two or more stages of control and a cooling capacity less than 65,000 Btu/h (19 kW) shall be provided with a demand responsive control that complies with the communication and performance requirements of AHRI 1380.

C406.13.2 All other HVAC systems. Thermostats for HVAC systems shall be provided with a demand responsive control that complies with one of the following:

1. Certified OpenADR 2.0a VEN, as specified under Clause 11, Conformance
2. Certified OpenADR 2.0b VEN, as specified under Clause 11, Conformance
3. Certified by the manufacturer as being capable of responding to a demand response signal from a certified OpenADR 2.0b VEN by automatically implementing the control functions requested by the VEN for the equipment it controls
4. IEC 62746-10-1
5. The communication protocol required by a controlling entity, such as a utility or service provider, to participate in an automated demand response program
6. The physical configuration and communication protocol of CTA 2045-A or CTA 2045-B.

C406.14 Water heating demand responsive controls.

Electric storage water heaters with a rated water storage volume of 40 gallons (150L) to 120 gallons (450L) and a nameplate input rating equal to or less than 12kW shall be provided with demand responsive controls in accordance with Table C406.14 or another equivalent approved standard.

**TABLE C406.14
DEMAND RESPONSIVE CONTROLS FOR WATER HEATING**

Equipment Type	Controls	
Electric storage water heaters	Manufactured before 7/1/2025	Manufactured on or after 7/1/2025
	ANSI/CTA-2045-B Level 1 and also capable of initiating water heating to meet the temperature set point in response to a demand response signal.	ANSI/CTA-2045-B Level 2, except “Price Stream Communication” functionality as defined in the standard.

**SECTION C407
TOTAL BUILDING PERFORMANCE**

Modify Table C407.2 as follows:

**TABLE C407.2
REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE**

SECTION ^a	TITLE
Envelope	
C402.4.1.3	Fenestration Orientation

Modify Table C407.4.1(1) as follows:

TABLE C407.4.1(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

Vertical fenestration other than opaque doors	Area The proposed vertical fenestration area; where the proposed vertical fenestration area is less than 40 percent of the above- grade wall area. 40 percent of above grade wall area; where the proposed vertical fenestration area is 40 percent or more of the above grade wall area Fenestration orientation shall comply with C402.4.1.3	As proposed
	U-factor: as specified in Table C402.4	As proposed
	SHGC: as specified in Table C402.4 except that for climates with no requirement (NR) SHGC = 0.40 shall be used. Fenestration SHGC shall comply with C402.4.1.3	As proposed
	External shading and PF: none	As proposed

SECTION C503 ALTERATIONS

C503.2.1 Roof Replacement. *Roof replacements* shall comply with Section C402.1.3, C402.1.4, C402.1.5 or C407 where the existing roof assembly is part of the *building thermal envelope* and contains insulation entirely above the roof deck. In no case shall the *R*-value of the roof insulation be reduced or the *U*-factor of the roof assembly be increased as part of the *roof replacement*.

Exceptions: Where compliance with Section C402.1 cannot be met due to limiting conditions on an existing roof, an *approved* design shall be submitted with the following:

1. *Construction documents* that include a report by a *registered design professional* or an *approved source* documenting details of the limiting conditions affecting compliance with the insulation requirements.
 2. *Construction documents* that include a roof design by a *registered design professional* or an *approved source* that minimizes deviation from the insulation requirements.
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Referenced Standards

ASME

ASME

Two Park Avenue
New York, NY 10016-5990

BPVC

Boiler and Pressure Vessel Code

AHRI

Air-Conditioning, Heating, & Refrigeration Institute

2111 Wilson Blvd, Suite 500

Arlington, VA 22201

1380-2019

Demand Response through Variable Capacity HVAC Systems in Residential and Small Commercial Applications

ANSI

American National Standards Institute

25 West 43rd Street, 4th Floor

New York, NY 10036

ANSI/CTA-2045-A-2018

Modular Communications Interface for Energy Management

ANSI/CTA-2045-B-2019

Modular Communications Interface for Energy Management

CTA

Consumer Technology Association

1919 S. Eads Street

Arlington, VA 22202

ANSI/CTA-2045-B

Modular Communications Interface for Energy Management
C404.11

IEC

IEC Regional Centre for North America

IEC International Electrotechnical Commission

446 Main Street 16th Floor

Worcester, MA 016808

IEC 62746-10-1 - 2018

Systems interface between customer energy management system and the power management system – Part 10-1: Open automated demand response

CHAPTER 1 [RE] SCOPE AND ADMINISTRATION

SECTION R101 SCOPE AND GENERAL REQUIREMENTS

R101.1 Title. This code shall be known as the *Illinois Energy Conservation Code* or “this Code”, and shall mean:

With respect to the residential buildings covered by 71 Ill. Adm. Code 600.Subpart D:

This Part, all additional requirements incorporated within Subpart D (including the 2021 International Energy Conservation Code, including all published errata but excluding published supplements) and any statutorily authorized adaptations to the incorporated standards adopted by CDB is effective upon adoption.

R101.1.2 Adoption. The Board shall adopt amendments to this Code within 12 months after publication of changes to the International Energy Conservation Code. Any such update in this Code shall take effect within 6 months after it is adopted by the Board and shall apply to any new building or structure in this State for which a building permit application is received by a municipality or county, except as otherwise provided by the EEB Act.

R101.1.3 Adaptation. The Board may appropriately adapt the International Energy Conservation Code to apply to the particular economy, population distribution, geography, and climate of the State and construction within the State, consistent with the public policy objectives of the EEB Act.

R101.5 Compliance. *Residential buildings* shall meet the provisions of the *Illinois Energy Conservation Code* covered by 71 Ill. Adm. Code 600. Subpart D. The local authority having jurisdiction (AHJ) shall establish its own procedures for enforcement of the Illinois Energy Conservation Code. Minimum compliance shall be demonstrated by submission of:

1. Compliance Certificates generated by the U.S. Department of Energy’s REScheck™ code compliance tool; or
2. Other comparable compliance materials that meet or exceed, as determined by the AHJ, the U.S. Department of Energy’s REScheck™ code compliance tool; or

3. The seal of the architect/engineer as required by Section 14 of the Illinois Architectural Practice Act [225 ILCS 305], Section 12 of the Structural Engineering Licensing Act [225 ILCS 340] and Section 14 of the Illinois Professional Engineering Practice Act [225 ILCS 325]

SECTION R102 ALTERNATIVE MATERIALS, DESIGN AND METHODS OF CONSTRUCTION AND EQUIPMENT

R102.1.1 Above code programs. No unit of local government, including any home rule unit, may regulate energy efficient building standards for residential building in a manner that is either less or more stringent than the standards established pursuant to this Code. Buildings shall be considered to be in compliance with this code where such buildings also meet the requirements identified in Table R405.2 and the building thermal envelope is greater than or equal to levels of efficiency and solar heat gain coefficients (SHGC) in Tables 402.1.1 and 402.1.3 of the 2009 International Energy Conservation Code.

However, the following entities may regulate energy efficient building standards for residential buildings in a manner that is more stringent than the provisions contained in this Code:

- i) A unit of local government, including a home rule unit, that has, on or before May 15, 2009, adopted or incorporated by reference energy efficient building standards for residential buildings that are equivalent to or more stringent than the 2006 International Energy Conservation Code;
- ii) A unit of local government, including a home rule unit that has, on or before May 15, 2009, provided to the Capital Development Board, as required by Section 10.18 of the Capital Development Board Act, an identification of an energy efficient building code or amendment that is equivalent to or more stringent than the 2006 International Energy Conservation Code; and
- iii) A municipality with a population of 1,000,000 or more.

SECTION R110 MEANS OF APPEALS

R110.1 General. In order to hear and decide appeals of orders, decisions or determinations made by the *code official* relative to the application and interpretation of this code, there may be created a board of appeals. *The code official shall be an ex officio member of the board of appeals but shall not have a vote on any matter before the board.* The board of appeals shall be appointed by the governing body and shall hold office at its pleasure. The board shall adopt rules of procedure for conducting its business, and shall render all decisions and findings in writing to the appellant with a duplicate copy to the *code official*.

R110.3 Qualifications. The board of appeals shall consist of members who are qualified by experience and training.

CHAPTER 2 [RE] DEFINITIONS

SECTION R202 GENERAL DEFINITIONS ADD THE FOLLOWING Definitions:

APPROVED SOURCE. An independent person, firm or corporation, *approved* by the building official, who is competent and experienced in the application of engineering principles to materials, methods or systems analyses.

AUTHORITY HAVING JURISDICTION or AHJ. The organization, officer or individual responsible for approving equipment, materials, an installation or procedure.

BOARD. The Illinois Capital Development Board.

COUNCIL. The Illinois Energy Conservation Advisory Council whose purpose is to recommend modifications to the *Illinois Energy Conservation Code*.

EEB ACT. The Energy Efficient Building Act [20ILCS 3125].

LOCAL EXHAUST. An exhaust system that uses one or more fans to exhaust air from a specific room or rooms within a dwelling.

RESIDENTIAL BUILDING. Means a detached one-family or two-family dwelling or any building that is three stories or less in height above grade that contains multiple dwelling units, in which the occupants reside on a primarily permanent basis, such as a townhouse, a row house, an apartment house, a convent, a monastery, a rectory, a fraternity or sorority house, a dormitory, and a rooming house; provided, however, that when applied to a building located within the boundaries of a municipality having a population of 1,000,000 or more, the term “RESIDENTIAL BUILDING” means a building containing one or more dwelling units, not exceeding four (4) stories above grade, where occupants are primarily permanent.

WHOLE HOUSE MECHANICAL VENTILATION SYSTEM. An exhaust system, supply system, or combination thereof that is designed in accordance with Section R403.6 to mechanically exchange indoor air with outdoor air when operating continuously or through a programmed intermittent schedule to satisfy the whole house ventilation rate. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

CHAPTER 4 [RE] RESIDENTIAL ENERGY EFFICIENCY

SECTION R401 GENERAL

R401.2 Application. Residential buildings shall comply with Section R401.2.6 and either Sections R401.2.1, R401.2.2, R401.2.3, R401.2.4 or R401.2.5.

Exception: Additions, alterations, repairs and changes of occupancy to existing buildings complying with Chapter 5.

R401.2.5 Phius Alternative Compliance Option. The Phius Alternative Compliance Option requires compliance with Section R409.

R401.2.6 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 with Section R401.2.2, the building shall meet one of the following:
 - 2.1. 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
 - 2.2. 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.

SECTION R402 BUILDING THERMAL ENVELOPE

Modify Table R402.1.2 as follows:

TABLE R402.1.2
MAXIMUM ASSEMBLY U-FACTORS^a AND
FENESTRATION REQUIREMENTS

CLIMATE ZONE	CEILING U-FACTOR
4 except Marine	0.026
5 and Marine 4	0.026

Modify Table R402.1.3 as follows:

TABLE R402.1.3
INSULATION MINIMUM R-VALUES AND
FENESTRATION REQUIREMENTS BY COMPONENT^a

CLIMATE ZONE	CEILING R-VALUE
4 except Marine	49
5 and Marine 4	49

R402.2.1 Roof/Ceilings with attics. Where Section R402.1.3 requires R-49 insulation in the ceiling or attic, installing R-38 over 100 percent of the ceiling or attic area requiring insulation shall satisfy the requirement for R-49 insulation wherever the full height of uncompressed R-38 insulation extends over the wall top plate at the eaves. Where Section R402.1.3 requires R-60 insulation in the ceiling or attic, installing R-49 over 100 percent of the ceiling or attic area requiring insulation shall satisfy the requirement for R-60 insulation wherever the full height of uncompressed R-49 insulation extends over the wall top plate at the eaves. This reduction shall not apply to the insulation and fenestration criteria in Section R402.1.2 and the Total UA alternative in Section R402.1.5.

R402.2.2 Roof/Ceilings without attic spaces. Where Section R402.1.3 requires insulation R-values greater than R-30 in the interstitial space above a ceiling and below the structural roof deck, and the design of the roof/ceiling assembly does not allow sufficient space for the required insulation, the minimum required insulation R-value for such roof/ceiling assemblies shall be R-30. Insulation shall extend over the top of the wall plate to the outer edge of such plate and shall not be compressed. This reduction of insulation from the requirements of Section R402.1.3 shall be limited to 500 square feet (46 m²) or 20 percent of the total insulated ceiling area, whichever is less. This reduction shall not apply to the Total UA alternative in Section R402.1.5.

R402.2.8.1 Basement wall insulation installation.

Where basement walls are insulated, the insulation shall be installed from the top of the basement wall down to 10 feet (3048 mm) below grade or to **within 6 inches (152 mm)** of the basement floor, whichever is less.

SECTION R403 SYSTEMS

R403.3 Ducts. Ducts and air handlers shall be **insulated, sealed, tested and** installed in accordance with Sections R403.3.1 through R403.3.7. **Where required by the code official, duct testing shall be conducted by an approved third party.** A written report of the results of the test shall be signed by the party conducting the test and provided to the **code official**.

403.3.6 Duct Leakage. The total leakage of the ducts, where measured in accordance with Section R403.3.5, shall be as follows:

1. Rough-in test: The total leakage shall be less than or equal to 4.0 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m) of **conditioned floor area** where the air handler is installed at the time of the test. Where the air handler is not installed at the time of the test, the total leakage shall be less than or equal to 3.0 cubic feet per minute (85 L/min) per 100 square feet (9.29 m) of **conditioned floor area**.

Exception: If the HVAC duct system is serving less than or equal to 1,500 square feet of **conditioned floor area**, the allowable duct leakage with the air-handler installed shall be 60 cubic feet per minute or less.

2. Postconstruction test: Total leakage shall be less than or equal to 4.0 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m) of conditioned floor area.

Exception: If the HVAC duct system is serving less than or equal to 1,500 square feet of conditioned floor area, the allowable duct leakage shall be 60 cubic feet per minute or less.

3. Test for ducts within thermal envelope: Where all ducts and air handlers are located entirely within the building thermal envelope, total leakage shall be less than or equal to 8.0 cubic feet per minute (226.6 L/min) per 100 square feet (9.29 m) of conditioned floor area.

Exception: If the HVAC duct system is serving less than or equal to 750 square feet of conditioned floor area, the allowable duct leakage with the air-handler installed shall be 60 cubic feet per minute or less.

R403.6 Mechanical ventilation. The buildings or **dwelling units** complying with Section R402.4.1 shall be provided with ventilation that complies with the requirements of **this section** or the *International Mechanical Code*, as applicable, or with other **approved** means of ventilation. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

R403.6.4 Recirculation of air. Exhaust air from bathrooms and toilet rooms shall not be recirculated within a residence or circulated to another **dwelling unit** and shall be exhausted directly to the outdoors. Exhaust air from bathrooms, toilet rooms and kitchens shall not discharge into an **attic**, crawl space or other areas inside the building. This section shall not prohibit the installation of ductless range hoods where installed in accordance with the manufacturer's instructions, and where mechanical or natural ventilation is otherwise provided, listed and labeled ductless range hoods shall not be required to discharge to the outdoors.

R403.6.5 Exhaust equipment. Exhaust fans and whole-house ventilation fans shall be **listed and labeled** as providing the minimum required airflow in accordance with ANSI/AMCA 210-ANSI/ASHRAE 51.

R403.6.6 Whole-house mechanical ventilation system. Whole-house mechanical ventilation systems shall be designed in accordance with Sections R403.6.6.1 through R403.6.6.4.

R403.6.6.1 System design. The whole-house ventilation system shall consist of one or more supply or exhaust fans, or a combination of such, and associated ducts and controls. Local exhaust or supply fans are permitted to serve as such a system. Outdoor air ducts connected to the return side of an air handler shall be considered to provide supply ventilation.

R403.6.6.2 System controls. The whole-house mechanical ventilation system shall be provided with controls that enable manual override. Controls shall include text or a symbol indicating their function.

R403.6.6.3 Mechanical Ventilation Rate. The whole-house mechanical ventilation system shall provide outdoor air at a continuous rate as determined in accordance with Table R403.6.6.3 (1) or Equation 4-0.

$$\text{Ventilation rate in cubic feet per minute} = (0.01 \times \text{total square foot area of house}) + [7.5 \times (\text{number of bedrooms} + 1)] \text{ Equation 4-0}$$

Exceptions:

1. Ventilation rate credit. The minimum mechanical ventilation rate determined in accordance with Table R403.6.6.3(1) or Equation 4-0 shall be reduced by 30 percent, provided that both of the following conditions apply:
 - 1.1 A ducted system supplies ventilation air directly to each bedroom and to one or more of the following rooms:
 - 1.1.1. Living room.
 - 1.1.2 Dining room.
 - 1.1.3 Kitchen.
 - 1.2 The whole-house ventilation system is a balanced ventilation system.
2. Programmed intermittent operation. The whole-house mechanical ventilation system is permitted to operate intermittently where the system has controls that enable operation for not less than 25 percent of each 4-hour segment and the ventilation rate in Table R403.6.6.3(1), by Equation 4-0 or by Exception 1 is multiplied by the factor determined in accordance with Table R403.6.6.3(2)

R403.6.6.3.1 Different Occupant Density. Table R403.6.6.3(1) assumes two persons in a dwelling unit and an additional person for each additional bedroom. Where higher occupant densities are known, the airflow rate shall be increased by 7.5 cfm (3.5 L/s) for each additional person. Where *approved* by the *authority having jurisdiction*, lower occupant densities may be used.

R403.6.6.3.2 Airflow Measurement. The airflow rate required is the quantity of outdoor ventilation air supplied and/or indoor air exhausted by the whole-house

mechanical ventilation system installed, and shall be measured using a flow hood, flow grid, or other airflow measuring device. Ventilation airflow of systems with multiple operating modes shall be tested in all modes designed to meet Section R403.6.6.3. Where required by the *code official*, testing shall be conducted by an *approved* third party. A written report of the results of the test, indicating the verified airflow rate, shall be signed by the party conducting the test and provided to the *code official*.

R403.6.6.4 Local exhaust rates. Local exhaust systems shall be designed to have the capacity to exhaust the minimum air flow rate determined in accordance with Table R403.6.6.4.

TABLE R403.6.6.3(1) (M1505.4.3(1))
CONTINUOUS WHOLE-HOUSE MECHANICAL VENTILATION SYSTEM AIRFLOW RATE REQUIREMENTS

DWELLING UNIT FLOOR AREA (square feet)	NUMBER OF BEDROOMS				
	0 – 1	2 – 3	4 – 5	6 – 7	> 7
	Airflow in CFM				
< 1,500	30	45	60	75	90
1,501 – 3,000	45	60	75	90	105
3,001 – 4,500	60	75	90	105	120
4,501 – 6,000	75	90	105	120	135
6,001 – 7,500	90	105	120	135	150
> 7,500	105	120	135	150	165

For SI: 1 square foot = 0.0929 m², 1 cubic foot per minute = 0.0004719 m³/s

TABLE R403.6.6.3(2)
INTERMITTENT WHOLE-HOUSE MECHANICAL VENTILATION RATE FACTORS^{a, b}

RUN-TIME PERCENTAGE IN EACH 4-HOUR SEGMENT	25%	33%	50%	66%	75%	100%
Factor ^a	4	3	2	1.5	1.3	1.0

- a. For ventilation system run time values between those given, the factors are permitted to be determined by interpolation.
b. Extrapolation beyond the table is prohibited.

TABLE R403.6.6.4
MINIMUM REQUIRED LOCAL EXHAUST RATES FOR ONE- AND TWO-FAMILY DWELLINGS

AREA TO BE EXHAUSTED	EXHAUST RATES
Kitchens	100 cfm intermittent or 25 cfm continuous
Bathrooms-Toilet Rooms	Mechanical exhaust capacity of 50 cfm intermittent or 20 cfm continuous

For SI: 1 cubic foot per minute = 0.0004719 m³/s

- a. The listed exhaust rate for bathrooms-toilet rooms shall equal or exceed the exhaust rate at a minimum static pressure of 0.25 inch water column in accordance with Section R403.6.5.

SECTION R409 PHIUS ALTERNATIVE COMPLIANCE OPTION

R409.1 Scope. This section establishes criteria for compliance via the Phius 2021 Standard.

R409.2 Phius Standard compliance. Compliance based on the Phius 2021 Standard will include its United States Department of Energy (USDOE) Energy Star and Zero Energy Ready Home co-requisites, and either performance calculations by Phius-approved software or through the use of the Phius 2021 Prescriptive Path.

R409.2.1 Phius documentation. Prior to the issuance of a building permit, the following items must be provided to the code official:

1. A list of compliance features.
2. A Phius precertification letter.

R409.2.2 Project certificate. Prior to the issuance of a certificate of occupancy, the following item must be provided to the code official:

1. A Phius 2021 (or later) project certificate.

SECTION R503 ALTERATIONS

R503.1.1.2 Roof Replacement. Insulation shall comply with Section R402.1. Alternatively, where limiting conditions prevent compliance with Section R402.1, an *approved* design that minimizes deviation from Section R402.1 shall be provided for the following alterations:

1. Roof replacements or a roof *alteration* that includes removing and replacing the *roof covering* where the *roof assembly* includes insulation entirely above the roof deck, where limiting conditions require use of an *approved* design to minimize deviation from Section R402.1 for a Group R-2 *building*, a registered design professional or other *approved source* shall provide *construction documents* that identify the limiting conditions and the means to address them.