

DRAFT 3-31-24  
2023 ILLINOIS RESIDENTIAL STRETCH  
ENERGY CODE

AMENDMENTS TO THE 2021 IECC 2<sup>ND</sup>  
PRINTING

DRAFT

## PART 1—SCOPE AND APPLICATION

### SECTION R101 SCOPE AND GENERAL REQUIREMENTS

**R101.1 Title.** This code shall be known as the 2023 Illinois Residential Stretch Energy Conservation Code or Code of ~~[NAME OF JURISDICTION]~~ and shall mean: ~~be cited as such. It is referred to herein as “this code.”~~

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 Residential Provisions, including all published errata but excluding published supplements) and any statutorily authorized adaptations to the incorporated standards adopted by CDB is effective upon adoption by a Municipality and takes the place of the Illinois Energy Conservation Code with respect to residential buildings.

No unit of local government, including any home rule unit, may regulate energy efficient building standards for residential buildings in a manner that is less stringent than the standards established pursuant to this Illinois Residential Stretch Energy Code.

**R101.1.1 Adoption.** The Board shall adopt amendments to this Code and include site energy index standards as established in the Energy Efficient Building Act [20 ILCS 3125/55] as follows:

By June 30, 2024 with a site energy index no greater than .50 of the 2006 IECC;

By December 31, 2025 with a site energy index no greater than .40 of the 2006 IECC;

By December 31, 2028 with a site energy index no greater than .33 of the 2006 IECC;

By December 31, 2031 with a site energy index no greater than .25 of the 2006 IECC.

**R101.2 Scope.** This code applies to *residential buildings, building* sites and associated systems and equipment.

**R101.2.1 Appendices.** Provisions in the appendices shall not apply unless specifically adopted.

**R101.3 Intent.** This code shall regulate the design and construction of *buildings* for the effective use and conservation of energy over the useful life of each building. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

**R101.4 Applicability.** Where, in any specific case, different sections of this code specify different materials, methods of construction or other requirements, the most restrictive shall govern. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall govern.

#### **R101.4.1 Mixed residential and commercial buildings.**

Where a *building* includes both *residential building* and *commercial building* portions, each portion shall be separately considered and meet the applicable provisions of the Illinois Commercial Stretch Code or the Illinois Residential Stretch Code. ~~IECC Commercial Provisions or IECC Residential Provisions.~~

**R101.5 Compliance.** *Residential buildings* shall meet the provisions of the *Illinois Residential Stretch 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 Residential Stretch Code. ~~IECC Residential Provisions. Commercial buildings shall meet the provisions of IECC Commercial Provisions.~~ Minimum compliance shall be demonstrated by submission of:

**R101.5.1 Compliance materials.** The *code official* shall be permitted to approve specific computer software, worksheets, compliance manuals and other similar materials that meet the intent of this code: ~~or~~

**R101.5.2 Professional Seals.** 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 General.** The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. The *code official* shall have the authority to approve an alternative material, design or method of construction upon the written application of the owner or the owner's authorized agent. The code official shall first find that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code for strength, effectiveness, fire resistance, durability, energy conservation and safety. The *code official* shall respond to the applicant, in writing, stating the reasons why the alternative was *approved* or was not *approved*.

**R102.1.1 Above code programs.** ~~The code official or other authority having jurisdiction shall be permitted to deem a national, state or local energy efficiency program to exceed the energy efficiency required by this code.~~

~~Buildings approved in writing by such an energy efficiency program shall be considered to be in compliance~~  
Buildings certified in compliance with the Passive House Institute (PHI) or Passive House Institute U.S. (PHIUS) Passive Building Standards programs or buildings that comply with Appendix RC shall be deemed to meet the requirements 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 402.1.2~~4~~ and 402.1.3 ~~of the 2009 International Energy Conservation Code.~~

## PART 2—ADMINISTRATION AND ENFORCEMENT

### SECTION R103 SCOPE AND ADMINISTRATION

**R103.2 Information on construction documents.** Construction documents shall be drawn to scale on suitable material. Electronic media documents are permitted to be submitted where *approved* by the *code official*. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the *building*, systems and equipment as herein governed. Details shall include the following as applicable:

1. Energy compliance path.
2. Insulation materials and their *R*-values.
3. Fenestration *U*-factors and *solar heat gain coefficients* (SHGC).
4. Area-weighted *U*-factor and *solar heat gain coefficients* (SHGC) calculations.
5. Mechanical system design criteria.
6. Mechanical and service water-heating systems and equipment types, sizes and efficiencies.
7. Equipment and system controls.
8. Duct sealing, duct and pipe insulation and location.
9. Air sealing details.

**R103.2.1 Building thermal envelope depiction.** The *building thermal envelope* shall be represented on the construction documents.

**R103.2.2 Solar-ready system.** Where a solar-ready zone is provided, the construction documents shall provide details for dedicated roof area, structural design for roof dead and live load, ground snow load, and routing of conduit or pre-wiring from *solar-ready zone* to electrical service panel or plumbing from *solar-ready zone* to *service water heating system*.

### SECTION R105 INSPECTIONS

**R105.1 General.** Construction or work for which a permit is required shall be subject to inspection by the *code official* or his or her designated agent, and such construction or work shall remain visible and able to be accessed for inspection purposes until *approved*. It shall be the duty of the permit applicant to cause the work to remain visible and able to be accessed for

inspection purposes. Neither the *code official* nor the jurisdiction shall be liable for expense entailed in the removal or replacement of any material, product, system or building component required to allow inspection to validate compliance with this code.

**R105.2 Required inspections.** The *code official* or his or her designated agent, upon notification, shall make the inspections set forth in Sections R105.2.1 through R105.2.5.

**R105.2.1 Footing and foundation inspection.** Inspections associated with footings and foundations shall verify compliance with the code as to *R*-value, location, thickness, depth of burial and protection of insulation as required by the code and *approved* plans and specifications.

**R105.2.2 Framing and rough-in inspection.** Inspections at framing and rough-in shall be made before application of interior finish and shall verify compliance with the code as to: types of insulation and corresponding *R*-values and their correct location and proper installation; fenestration properties such as *U*-factor and SHGC and proper installation; air leakage controls as required by the code; and *approved* plans and specifications.

**R105.2.3 Plumbing rough-in inspection.** Inspections at plumbing rough-in shall verify compliance as required by the code and *approved* plans and specifications as to types of insulation and corresponding *R*-values and protection, and required controls. *Where the solar-ready zone is installed for solar water heating, inspections shall verify pathways for routing of plumbing from solar-ready zone to service water heating system.*

**R105.2.4 Mechanical rough-in inspection.** Inspections at mechanical rough-in shall verify compliance as required by the code and *approved* plans and specifications as to installed HVAC equipment type and size, required controls, system insulation and corresponding *R*-value, system air leakage control, programmable thermo- stats, dampers, whole-house ventilation, and minimum fan efficiency.

**Exception:** Systems serving multiple dwelling units shall be inspected in accordance with Section C105.2.4.

**R105.2.5 Electrical rough-in inspection.** Inspections at electrical rough-in shall verify compliance as required by the code and the *approved* plans and specifications as to the locations, distribution, and capacity of the electrical system. *Where the solar-ready zone is installed for electricity generation, inspections shall verify conduit or pre-wiring from solar-ready zone to electrical panel.*

**R105.2.6~~5~~ Final inspection.** The *building* shall have a final inspection and shall not be occupied until *approved*. The final inspection shall include verification of the installation of all required *building* systems, equipment and

controls and their proper operation and the required number of high-efficacy lamps and fixtures.

**R105.3 Reinspection.** A *building* shall be reinspected where determined necessary by the *code official*.

**R105.4 Approved inspection agencies.** The *code official* is authorized to accept reports of third-party inspection agencies not affiliated with the *building* design or construction,

## SECTION R202 GENERAL 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.

**AUTOMOBILE PARKING SPACE.** A space within a building or private or public parking lot, exclusive of driveways, ramps, columns, office and work areas, for the parking of an automobile.

**DEMAND RESPONSE SIGNAL.** A signal that indicates a price or a request to modify electricity consumption for a limited time period.

**DEMAND RESPONSIVE CONTROL.** A control capable of receiving and automatically responding to a *demand response signal*.

**ELECTRIC VEHICLE (EV).** An automotive-type vehicle for on-road use, such as passenger automobiles, buses, trucks, vans, neighborhood electric vehicles, and electric motorcycles, primarily powered by an electric motor that draws current from a building electrical service, *EVSE*, a rechargeable storage battery, a fuel cell, a photovoltaic array, or another source of electric current.

**ELECTRIC VEHICLE READY SPACE (EV READY SPACE).** An *automobile parking space* that is provided with a branch circuit and either an outlet, junction box or receptacle, that will support an installed *EVSE*.

**ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE).** Equipment for plug-in power transfer including the ungrounded, grounded and equipment grounding conductors, and the electric vehicle connectors, attached plugs, personal protection system and all other fittings, devices, power outlets or apparatus installed specifically for the purpose of transferring energy between the premises wiring and the *electric vehicle*.

**SOLAR-READY ZONE.** A section or sections of the roof or building overhang designated and reserved for the future installation of a solar photovoltaic or solar thermal system.

**GAS HEAT PUMP SPACE HEATING SYSTEM.** Gas heat pump space heating systems consist of an outdoor combustion unit and heat exchanger(s) inside the building. The outdoor combustion unit is installed outside the building envelope and uses the heat of combustion to drive a refrigeration cycle that pumps heat into the building. Annual fuel utilization efficiencies (AFUE) greater than 120% and 140% are achieved by pumping the heat of combustion and additional heat from the ambient air into the building. The heat is then distributed indoors via forced air hydronic air handler(s), via floors and other radiant systems, or through combinations of forced air and radiant systems.

**RESIDENTIAL BUILDING.** ~~For this code, includes detached one and two family dwellings and townhouses as well as Group R 2, R 3 and R 4 buildings three stories or less in height above grade plane.~~ 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 stories above grade, where occupants are primarily permanent.

## SECTION R401 GENERAL

**R401.1 Scope.** This chapter applies to residential buildings.

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

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

**R401.2.1 Prescriptive Compliance Option.** The Prescriptive Compliance Option requires compliance with Sections R401 through R404 and R408.

**R401.2.2 Total Building Performance Option.** The Total Building Performance Option requires compliance with Section R405.

**R401.2.3 Energy Rating Index Option.** The Energy Rating Index (ERI) Option requires compliance with Section R406.

**R401.2.4 Tropical Climate Region Option.** The Tropical Climate Region Option requires compliance with Section R407.

~~**R401.2.5 Additional energy efficiency.** This section establishes additional requirements applicable to all compliance approaches to achieve additional energy efficiency.~~

- ~~1. For buildings complying with Section R401.2.1, one of the additional efficiency package options shall be installed according to Section R408.2.~~
- ~~2. For buildings complying 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 R405.2 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.~~
  - ~~2.3 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.~~

**R401.3 Certificate.** A permanent certificate shall be \* completed by the builder or other *approved* party and posted on a wall in the space where the furnace is located, a utility room or an *approved* location inside the *building*. Where located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory *label*, service disconnect *label* or other required labels. The certificate shall indicate the following:

1. The predominant *R*-values of insulation installed in or on ceilings, roofs, walls, foundation components such as slabs, *basement walls*, *crawl space walls* and floors and ducts outside *conditioned spaces*.
2. *U*-factors of fenestration and the *solar heat gain coefficient* (SHGC) of fenestration. Where there is more than one value for any component of the building envelope, the certificate shall indicate both the value covering the largest area and the area weighted average value if available.
3. The results from any required duct system and building envelope air leakage testing performed on the building.
4. The types, sizes and efficiencies of heating, cooling and service water-heating equipment. Where a gasfired unvented room heater, electric furnace or baseboard electric heater is installed in the residence, the certificate shall indicate “gas-fired unvented room heater,” “electric furnace” or “baseboard electric heater,” as appropriate. An efficiency shall not be indicated for gas-fired unvented room heaters, electric furnaces and electric baseboard heaters.
5. Where on-site *photovoltaic panel* systems have been installed, the array capacity, inverter efficiency, panel tilt and orientation shall be noted on the certificate.
6. For buildings where an Energy Rating Index score is determined in accordance with Section R406, the Energy Rating Index score, both with and without any on-site generation, shall be listed on the certificate.
7. The code edition under which the structure was permitted, and the compliance path used- **and where applicable, the additional efficiency measures selected for compliance with R408.**

## SECTION R403 SYSTEMS

**R403.1 Controls.** Not less than one thermostat shall be provided for each separate heating and cooling system. **The primary heating or cooling system serving the dwelling unit shall comply with Sections R403.1.1, R403.1.2, and R403.1.3.**

**R403.1.1 Programmable thermostat.** The thermostat controlling the primary heating or cooling system of the *dwelling unit* shall be capable of controlling the heating and cooling system on a daily schedule to maintain different temperature set points at different times of day and different days of the week. This thermostat shall include the capability to set back or temporarily operate the system to maintain *zone* temperatures of not less than 55°F (13°C) to not greater than 85°F (29°C). The thermostat shall be programmed initially by the manufacturer with a heating temperature setpoint of not greater than 70°F (21°C) and a cooling temperature setpoint of not less than 78°F (26°C).

**R403.1.2 Heat pump supplementary heat.** Heat pumps having supplementary electric-resistance heat shall have controls that, except during defrost, prevent supplemental heat operation when the heat pump compressor can meet the heating load.

**R403.1.3 Demand responsive thermostat.** The thermostat shall be provided with a *demand responsive control* capable of communicating with the Virtual End Node (VEN) using a wired or wireless bi-directional communication pathway that provides the homeowner the ability to voluntarily participate in utility demand response programs, where available. The thermostat shall be 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).

Thermostats controlling single stage HVAC systems shall comply with Section R403.1.2.1. Thermostats controlling variable capacity systems shall comply with Section R403.1.2.2. Thermostats controlling multi-stage HVAC systems shall comply with either Section R403.1.2.1 or R403.1.2.2. Where a *demand response signal* is not available the thermostat shall be capable of performing all other functions.

**Exception:** Assisted living facilities.

**R403.1.3.1 Single stage HVAC system controls.** Thermostats controlling single stage 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.

**R403.1.3.2 Variable capacity and two stage HVAC system controls.** Thermostats controlling variable capacity and two stage HVAC system shall be provided with a *demand responsive control* that complies with the communication and performance requirements of AHRI 1380.

**R403.5.4 Demand responsive water heating** 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 R403.5.4 or another equivalent approved standard.

Exceptions:

1. Water heaters that are capable of delivering water at a temperature of 180°F (82°C) or greater.
2. Water heaters that comply with Section IV, Part HLW or Section X of the ASME Boiler and Pressure Vessel Code.
3. Water heaters that use 3-phase electric power

**TABLE R403.5.4  
DEMAND RESPONSIVE CONTROLS FOR WATER HEATING**

Equipment Type	Controls	
	Manufactured Before 7/1/2025	Manufactured On or After 7/1/ 2025
Electric storage water heaters	AHRI Standard 1430-2022 (I-P) or 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.	AHRI Standard 1430-2022 (I-P)

## SECTION R404 ELECTRICAL POWER AND LIGHTING SYSTEMS

**R404.4 Electric vehicle power transfer infrastructure.** New automobile parking spaces for one- and two-family dwellings and townhouses shall be provided in accordance with this section. All other new *residential* parking facilities shall be provided with electric vehicle power transfer infrastructure in accordance with Section C405.14 of the Illinois Commercial Stretch Energy Code.

**R404.4.1 Quantity.** Each *dwelling unit* with a designated attached or detached garage or other onsite private parking provided adjacent to the *dwelling unit* shall be provided with one *EV ready space*.

**R404.4.2 EV ready spaces.** Each branch circuit serving *EV ready spaces* used to comply with Section R404.4 shall comply with all of the following:

1. Terminate at an outlet or enclosure located within 3 feet (914 mm) of each *EV ready space* it serves.
2. Be sized for a minimum EV charging load of 7.2 kVA.
3. The panelboard or other electrical distribution equipment directory shall designate the branch circuit as “For electric vehicle supply equipment (EVSE)” and the outlet or enclosure shall be marked “For electric vehicle supply equipment (EVSE).”
4. Where a circuit is shared or managed, it shall be in accordance with NFPA 70.

**R404.5 Electric readiness.** Systems using fossil fuel: water heaters, household clothes dryers, conventional cooking tops, conventional ovens and space heating equipment shall comply with the requirements of Sections R404.5.1 through R404.5.5

**R404.5.1 Cooking products.** An individual branch circuit outlet with a rating not less than 240-volts, 40-amperes shall be installed, and terminate within three feet of conventional cooking tops, conventional ovens or cooking products combining both.

**Exception:** Cooking products not installed in an individual dwelling unit.

**R404.5.2 Household clothes dryers.** An individual branch circuit outlet with a rating not less than 240-volts, 30-amperes shall be installed, and terminate within three feet (304 mm) of each household clothes dryer.

**Exception:** Clothes dryers that serve more than one dwelling unit and are located outside of a dwelling unit.

**R404.5.3 Water heaters.** Locations of fossil fuel water heaters shall comply with all of the following:

1. An individual branch circuit outlet with a rating not less than either 240-volts, 30-amperes shall be installed, and terminate within three feet (304 mm) of each fossil fuel water heater.

2. The space for containing the future water heater shall have a height of not less than 7 ft (2 m), a width of not less than 3 ft (1 m), a depth of not less than 3ft (1 m) and with a volume of not less than 700 ft<sup>3</sup> (20 m<sup>3</sup>).

**Exception:**

1. Water heaters in a centralized water heating system serving multiple dwelling units in an R-2 occupancy which comply with Section C405.17.
2. Where the space containing the water heater provides for air circulation sufficient for the operation of a heat pump water heater, the minimum room volume shall not be required.

**R404.5.4 Combustion space heating.** A designated exterior location(s) in accordance with the following:

1. Natural drainage for condensate from cooling equipment heat pump operation or a condensate drain located within 3 feet (914 mm), and
2. A dedicated branch circuit in compliance with IRC Section E3702.11 based on heat pump space heating equipment sized in accordance with R403.7 and terminating within 3 feet (914 mm) of the location with no obstructions. Both ends of the branch circuit shall be labeled “For Future Heat Pump Space Heater.”

**R404.5.5 Electrification-ready circuits.** The unused conductors required by Sections R404.5.1 through R404.5.4 shall be labeled with the word “spare.” Space shall be reserved in the electrical panel in which the branch circuit originates for the installation of an overcurrent device. Capacity for the circuits required by Sections R404.5.1 through R404.5.4 shall be included in the load calculations of the original installation.

**R404.6 Renewable energy infrastructure.** The building shall comply with the requirements of R404.6.1 or R404.6.2.

**R404.6.1 One- and two- family dwellings and townhouses.** One- and two-family dwellings and townhouses shall comply with Sections R404.6.1.1 through R404.6.1.4.

**Exceptions:**

1. A dwelling unit with a permanently installed on-site renewable energy system.
2. A dwelling unit with a solar-ready zone area that is less than 500 square feet (46 m<sup>2</sup>) of roof area oriented between 110 degrees and 270 degrees of true north.
3. A dwelling unit with less than 500 square feet (46m<sup>2</sup>) of roof area oriented between 110 degrees and 270 degrees of true north.
4. Dwelling units where 50 percent of the solar-ready area is shaded from direct-beam sunlight by natural



objects or by structures that are not part of the building for more than 2500 annual hours between 8:00 a.m. and 4:00 p.m.

**R404.6.1.1 Solar-ready zone area.** The total area of the solar-ready zone shall not be less than 250 square feet (23.2 m<sup>2</sup>) and shall be composed of areas not less than 5.5 feet (1676 mm) in one direction and not less than 80 square feet (7.4 m<sup>2</sup>) exclusive of access or set back areas as required by the *International Residential Code*.

**Exception:** Dwelling units in townhouses three stories or less in height above grade plane and with a total floor area less than or equal to 2,000 square feet (186 m<sup>2</sup>) per dwelling shall be permitted to have a solar-ready zone area of not less than 150 square feet (14 m<sup>2</sup>).

**R404.6.1.2 Obstructions.** Solar-ready zones shall be free from obstructions, including but not limited to vents, chimneys, and roof-mounted equipment.

**R404.6.1.3 Electrical service reserved space.** The main electrical service panel shall have a reserved space for a dual pole circuit breaker and shall be labeled "For Future Solar Electric." The reserved space shall be at the opposite (load) end of the busbar from the primary energy source.

**R404.6.1.4 Electrical interconnection.** An electrical junction box shall be installed within 24 inches (610 mm) of the main electrical service panel and shall be connected to a capped roof penetration sleeve or a location in the attic that is within 3 feet (914 mm) of the solar-ready zone by a minimum 1 inch (25 mm) nonflexible metallic conduit or permanently installed wire as approved by the code official. Where the interconnection terminates in the attic, location shall be no less than 12 inches (35 mm) above ceiling insulation. Both ends of the interconnection shall be labeled "For Future Solar Electric".

**R404.6.2 Group R occupancies.** Buildings in Group R-2, R-3 and R-4 shall comply with Section C405.15 of the Illinois Commercial Stretch Energy Code.

## SECTION R405 TOTAL BUILDING PERFORMANCE

**R405.1 Scope.** This section establishes criteria for compliance using total building performance analysis. Such analysis shall include heating, cooling, mechanical ventilation and service water-heating energy only.

**R405.2 Performance-based compliance.** Compliance based on total building performance requires that a *proposed design* meets all of the following:

1. The requirements of the sections indicated within Table R405.2.
2. The *proposed total building thermal envelope UA*, which is the sum of the U-factor times assembly area, shall be ~~greater~~ less than or equal to the building thermal envelope UA using the prescriptive U-factors from Table R402.1.2 multiplied by 1.10 in accordance with Equation 4-1. ~~levels of efficiency and solar heat gain coefficients in Table R402.1.1 or R402.1.3 of the 2009 International Energy Conservation Code.~~  
$$U_{A_{\text{Proposed design}}} \leq 1.10 \times U_{A_{\text{Prescriptive reference design}}}$$
 (Equation 4-1)
3. ~~An~~ The site energy use ~~annual energy cost~~ of the *proposed design* ~~that is~~ shall be less than or equal to 71 percent ~~the annual energy cost~~ of the site energy use of the *standard reference design*. ~~Energy prices shall be taken from a source approved by the code official, such as the Department of Energy, Energy Information Administration's State Energy Data System Prices and Expenditures reports. Code officials shall be permitted to require time of use pricing in energy cost calculations.~~

**Exception:** ~~The energy use based on source energy expressed in Btu or Btu per square foot of conditioned floor area shall be permitted to be substituted for the energy cost. The source energy multiplier for electricity shall be 3.16. The source energy multiplier for fuels other than electricity shall be 1.1.~~

**TABLE R405.2  
REQUIREMENTS FOR TOTAL BUILDING  
PERFORMANCE**

**SECTION R406  
ENERGY RATING INDEX COMPLIANCE  
ALTERNATIVE**

<b>SECTION<sup>a</sup></b>	<b>TITLE</b>
<b>General</b>	
R401.2.5	Additional energy efficiency
R401.3	Certificate
<b>Building Thermal Envelope</b>	
R402.1.1	Vapor retarder
R402.2.3	Eave baffle
R402.2.4.1	Access hatches and doors
R402.2.10.1	Crawl space wall insulation installations
R402.4.1.1	Installation
R402.4.1.2	Testing
R402.5	Maximum fenestration <i>U</i> -factor and SHGC
<b>Mechanical</b>	
R403.1	Controls
R403.3, including R403.3.1, except Sections R403.3.2, R403.3.3 and R403.3.6	Ducts
R403.4	Mechanical system piping insulation
R403.5.1	Heated water circulation 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
<b>Electrical Power and Lighting Systems</b>	
R404.1	Lighting equipment
R404.2	Interior lighting controls
R404.4	Electric Vehicle Power Transfer Infrastructure
R404.5	Electric readiness
R404.6	Renewable energy infrastructure

**R406.1 Scope.** This section establishes criteria for compliance using an Energy Rating Index (ERI) analysis.

**R406.2 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 R406.2.
2. Maximum ERI of Table R406.5.

a. Reference to a code section includes all the relative subsections except as indicated in the table.

**TABLE R406.2  
REQUIREMENTS FOR ENERGY RATING INDEX**

SECTION <sup>a</sup>	TITLE
<b>General</b>	
R401.2.5	Additional efficiency packages
R401.3	Certificate
<b>Building Thermal Envelope</b>	
R402.1.1	Vapor retarder
R402.2.3	Eave baffle
R402.2.4.1	Access hatches and doors
R402.2.10.1	Crawl space wall insulation installation
R402.4.1.1	Installation
R402.4.1.2	Testing
<b>Mechanical</b>	
R403.1	Controls
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
<b>Electrical Power and Lighting Systems</b>	
R404.1	Lighting equipment
R404.2	Interior lighting controls
R404.4	Electric Vehicle Power Transfer Infrastructure
R404.5	Electric readiness
R404.6	Renewable energy infrastructure

a. Reference to a code section includes all the relative subsections except as indicated in the table.

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

~~**R406.3.1 On-site renewables are not included.** Building thermal envelope. Where on-site renewable energy is not included for compliance using the ERI analysis of Section R406.4, †The proposed total building thermal envelope UA, which is sum of U- factor times assembly area, shall be less than~~

or equal to the building thermal envelope UA using the prescriptive U-factors from Table R402.1.2 multiplied by 1.105 in accordance with Equation 4-21. ~~The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.~~

UAProposed design  $\leq 1.105 \times$  UAPrescriptive reference design  
(Equation 4-21)

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

**R406.4 Energy Rating Index.** The Energy Rating Index (ERI) shall be determined in accordance with ANSI/RESNET/ICC 301 ~~The mechanical ventilation rates used for the purpose of determining the ERI shall not be construed to establish minimum ventilation requirements for compliance with this code except for buildings covered by the International Residential Code, the ERI reference design ventilation rate shall be in accordance with Equation 4-2.~~

~~Ventilation rate, CFM = (0.01 × total square foot area of house) + [7.5 × (number of bedrooms + 1)]~~

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

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

**TABLE R406.5  
MAXIMUM ENERGY RATING INDEX**

Climate Zone	Energy Rating Index Without Combustion Equipment <sup>a</sup>	Energy Rating Index With Combustion Equipment <sup>b</sup>
4	54	51
5	55	50

- a. Any building that contains no combustion equipment.
- b. Any building that contains combustion equipment.

**SECTION R408**  
**ADDITIONAL EFFICIENCY**  
**REQUIREMENTS ~~PACKAGE OPTIONS~~**

**R408.1 Scope.** This section establishes additional efficiency requirements ~~package options~~ to achieve additional energy efficiency in accordance with Section R401.2.15. *Buildings* shall comply with either Section R408.2 or Section R408.3

**R408.2. Heat pump equipment and air tightness option.** Buildings shall comply with all of the following:

1. Heating and cooling equipment shall be electric heat pump equipment. In Climate Zone 5A, air-source heat pumps shall meet the following requirements for cold climate heat pumps:
  - 1.1. COP at 5°F (-15°C)  $\geq$  1.75
  - 1.2. Percent of heating capacity at 5°F (-15°C)  $\geq$  70% of that at 47°F (8.34°C)
2. Water heating equipment shall be a heat pump water heater.
3. The measured air leakage shall be less than or equal to 2.0 ACH50 with either an Energy Recovery Ventilator (ERV) or Heat Recovery Ventilator (HRV) with a sensible heat recovery efficiency (SRE) no less than 70 percent at 32°F (0°C) at an airflow greater than or equal to design airflow. The SRE shall be determined from a listed value or from interpolation of listed values. Construction documents shall include documentation of the SRE.

**R408.32 Additional energy efficiency credit requirements ~~package options~~.** Additional efficiency ~~package options for compliance with Section R401.2.1 are set forth in Sections R408.2.1 through R408.2.5.~~ measures shall be selected from Table R408.3 that meet or exceed a total of 30 credits. Five additional credits shall be selected for dwelling units with greater than 5,000 square feet (465 m<sup>2</sup>) of living space floor area located above grade plane. Each measure selected shall meet the relevant subsections of Section R408 and receive credit as specified in Table R408.3 for the specific Climate Zone. Interpolation of credits between measures shall not be permitted.

**TABLE R408.3  
CREDITS FOR ADDITIONAL ENERGY EFFICIENCY**

Measure Number	Measure Description	Credit Value	
		CZ 4	CZ 5
R408.3.1.1 (1)	≥ 2.5% reduction in total UA	1	1
R408.2.1.1 (2)	≥ 5% reduction in total UA	2	3
R408.3.1.1 (3)	> 7.5% reduction in total UA	2	3
R408.3.1.2	0.22 U-factor windows	3	4
R408.3.2 (1)	High performance cooling system option 1	3	3
R408.3.2 (2)	High performance cooling system option 2	3	2
R408.3.2 (3)	High performance gas furnace option 1	5	7
R408.3.2(4)	High performance gas furnace option 2	4	5
R408.3.2(5)	High performance electric heat pump system option 1	21	31
R408.3.2 (6)	High performance electric heat pump system option 2	22	32
R408.3.2 (7)	Ground source heat pump	23	33
R408.3.2 (8)	High performance gas heat pump space heating system option 1	8	11
R408.3.2 (9)	High performance gas heat pump space heating system option 2	11	16
R408.3.3 (1)	Fossil fuel service water heating system	3	2
R408.3.3 (2)	High performance heat pump water heating system	8	6
R408.3.3 (3)	Solar hot water heating system	6	6
R408.3.3 (4)	Compact hot water distribution	2	2
R408.3.4 (1)	More efficient distribution system	10	12
R408.3.4 (2)	100% of ducts in conditioned space	12	15
R408.3.4 (3)	Reduced total duct leakage	1	1
R408.3.5 (1)	2 ACH50 air leakage rate with ERV or HRV installed	10	13
R408.3.5 (2)	2 ACH50 air leakage rate with balanced ventilation	4	5
R408.3.5 (3)	1.5 ACH50 air leakage rate with ERV or HRV installed	12	15
R408.3.5 (4)	1 ACH50 air leakage rate with ERV or HRV installed	14	17
R408.3.6	Energy Efficient Appliances	1	1

**R408.32.1 Enhanced envelope performance option.** ~~The total building thermal envelope UA, the sum of U-factor times assembly area, shall be less than or equal to 95 percent of the total UA resulting from multiplying the U-factors in Table R402.1.2 by the same assembly area as in the proposed building. The UA calculation shall be performed in accordance with Section R402.1.5. The area-weighted average SHGC of all glazed fenestration shall be less than or equal to 95 percent of the maximum glazed fenestration SHGC in Table R402.1.2.~~ The building thermal envelope shall meet the requirements of Section R408.3.1.1 or R408.3.1.2.

**R408.3.1.1 Enhanced envelope performance UA.**

The proposed total building thermal envelope UA shall be calculated in accordance with Section R402.1.5 and shall meet one of the following:

1. Not less than 2.5 percent of the total UA of the building thermal envelope.
2. Not less than 5 percent of the total UA of the building thermal envelope.
3. Not less than 7.5 percent of the total UA of the building thermal envelope.

**R408.3.1.2 Improved fenestration.** Vertical fenestration shall meet a U-factor equal to or less than 0.22.

**R408.32.2 More efficient HVAC equipment performance option.** Heating and cooling equipment shall meet one of the following efficiencies:

**Options:**

- ~~1. Greater than or equal to 95 AFUE natural gas furnace and 16 SEER air conditioner.~~
- ~~2. Greater than or equal to 10 HSPF/16 SEER air source heat pump.~~
- ~~3. Greater than or equal to 3.5 COP ground source heat pump.~~
1. Greater than or equal to 6.9 SEER2 and 13.4 EER2 air conditioner.
2. Greater than or equal to 15.2 SEER2 and 10 EER2 air conditioner.
3. Greater than or equal to 96 AFUE natural gas furnace.
4. Greater than or equal to 92 AFUE natural gas furnace.
5. Greater than or equal to 8.1 HSPF2/16 SEER2 electric air source heat pump.
6. Greater than or equal to 8.5 HSPF2/16.9 SEER2 electric air source heat pump.
7. Greater than or equal to 3.5 COP ground source heat pump.
8. Greater than or equal to 120 AFUE gas heat pump space heating system. The gas heat pump space heating system shall not be configured to provide cooling.
9. Greater than or equal to 140 AFUE gas heat pump space heating system. The gas heat pump space

heating system shall not be configured to provide cooling.

For multiple cooling systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the cooling design load. For multiple heating systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the heating design load. In Climate Zone 5A, air-source heat pumps shall meet the following requirements for cold climate heat pumps:

1. COP at 5°F (-15°C)  $\geq$  1.75
2. Percent of heating capacity at 5°F (-15°C)  $\geq$  70% of that at 47°F (8.34°C)

**R408.32.3 Reduced energy use in service water-heating option.** The hot water system shall meet one of the following efficiencies:

1. Greater than or equal to 0.82 EF fossil fuel service water-heating system.
2. Greater than or equal to 2.90 UEF electric service water-heating system.
3. Greater than or equal to 0.4 solar fraction solar water-heating system.
4. Compact hot water distribution. For Compact Hot Water Distribution system credit, the volume shall store not more than 16 ounces of water in the nearest source of heated water and the termination of the fixture supply pipe when calculated using section R408.3.3.1 and documented in compliance with Section R408.3.3.2.

**R408.3.3.1 Water volume determination.** The water volume in the piping shall be calculated in accordance with this section. Water heaters, circulating water systems and heat trace temperature maintenance systems shall be considered to be sources of heated water. The volume shall be the sum of the internal volumes of pipe, fittings, valves, meters and manifolds between the nearest source of heated water and the termination of the fixture supply pipe. The volume in the piping shall be determined from Table R408.3.3.1. The volume contained within fixture shutoff valves, within flexible water supply connectors to a fixture fitting and within a fixture fitting shall not be included in the water volume determination. Where heated water is supplied by a recirculating system or heat-traced piping, the volume shall include the portion of the fitting on the branch pipe that supplies water to the fixture.

**TABLE R408.3.3.1  
INTERNAL VOLUME OF VARIOUS WATER DISTRIBUTION TUBING  
OUNCES OF WATER PER FOOT OF TUBE**

NOMINAL SIZE (inches)	COPPER TYPE M	COPPER TYPE L	COPPER TYPE K	CPVC CTS SDR 11	CPVC SCH 40	CPVC SCH 80	PE- RT SDR 9	COMPOSITE ASTM F1281	PEX CTS SDR 9
3/8	1.06	0.97	0.84	N/A	1.17	-	0.64	0.63	0.64
1/2	1.69	1.55	1.45	1.25	1.89	1.46	1.18	1.31	1.18
3/4	3.43	3.22	2.90	2.67	3.38	2.74	2.35	3.39	2.35
1	5.81	5.49	5.19	4.43	5.53	4.57	3.91	5.56	3.91
1 1/4	8.70	8.36	8.09	6.61	9.66	8.24	5.81	8.49	5.81
1 1/2	12.18	11.83	11.45	9.22	13.20	11.38	8.09	13.88	8.09
2	21.08	20.58	20.04	15.79	21.88	19.11	13.86	21.48	13.86

For SI: 1 foot = 304.8 mm, 1 inch = 25.4 mm, 1 liquid ounce = 0.030L, 1 oz/ft<sup>2</sup> = 305.15 g/m<sup>2</sup>.  
N/A = Not available

(9.29 m ) of conditioned floor area.

**R408.3.3.2 Water volume documentation.** Where compliance with Section R408.3.3(5) is required, construction documentation or final field inspection shall verify that the compact hot water distribution system meets the prescribed limit in Section R408.3.3(5) with one of the following:

1. Referencing ounces of water per foot of tube on plans as per Table R408.3.3.1.
2. Referencing ounces of water per foot of tube installed as per Table R408.3.3.1.
3. In accordance with Department of Energy's Zero Energy Ready Home National Specification (Rev. 07 or higher) footnote on Hot water delivery systems.

**R408.3.3.4 More efficient duct thermal distribution system option.** The thermal distribution system shall meet one of the following efficiencies:

- ~~1. 100 percent of ducts and air handlers located entirely within the building thermal envelope.~~
1. 100 percent of ductless thermal distribution system or hydronic thermal distribution system located completely inside the *building thermal envelope*.
2. 100 percent of duct thermal distribution system located in conditioned space as defined by Section R403.3.2.
3. When ducts are located outside conditioned space, the total leakage of the ducts, measured in accordance with R403.3.5, shall be in accordance with one of the following:
  - 3.1. Where the air handler is installed at the time of testing, 2.0 cubic feet per minute (0.94 L/s) per 100 square feet (9.29 m ) of conditioned floor area.
  - 3.2. Where the air handler is not installed at the time of testing, 1.75 cubic feet per minute (0.83 L/s) per 100 square feet

**R408.3.3.5 Improved air sealing and efficient ventilation system option.** ~~The measured air leakage rate shall be less than or equal to 3.0 ACH50, with either an Energy Recovery Ventilator (ERV) or Heat Recovery Ventilator (HRV) installed. Minimum HRV and ERV requirements, measured at the lowest tested net supply airflow, shall be greater than or equal to 75 percent Sensible Recovery Efficiency (SRE), less than or equal to 1.1 cubic feet per minute per watt (0.03 m<sup>3</sup>/min/watt) and shall not use recirculation as a defrost strategy. In addition, the ERV shall be greater than or equal to 50 percent Latent Recovery/Moisture Transfer (LRMT).~~ The measured air leakage rate shall be one of the following:

1. Less than or equal to 2.0 ACH50, with either an Energy Recovery Ventilator (ERV) or Heat Recovery Ventilator (HRV) installed.
2. Less than or equal to 2.0 ACH50, with balanced ventilation as defined in Section 202 of the 2021 *International Mechanical Code*.
3. Less than or equal to 1.5 ACH50, with either an ERV or HRV installed.
4. Less than or equal to 1.0 ACH50, with either an ERV or HRV installed.

Minimum HRV and ERV requirements, measured at the lowest tested net supply airflow, shall be greater than or equal to 75 percent Sensible Recovery Efficiency (SRE), greater than or equal to 1.2 cubic feet per minute per watt (0.03 m<sup>3</sup>/min/watt) and shall not use recirculation as a defrost strategy. In addition, the ERV shall be

greater than or equal to 50 percent Latent Recovery/ Moisture Transfer (LRMT).

**R408.3.6 Energy efficient appliances.** Appliances installed in a dwelling unit shall meet the product energy efficiency specifications listed in Table R408.3.6, or equivalent energy efficiency specifications. The three appliance types from Table R408.3.6 shall be installed for compliance with this section.

**TABLE R408.3.6 MINIMUM EFFICIENCY REQUIREMENTS: APPLIANCES**

Appliance	Efficiency Improvement	Test Procedure
Refrigerator	Maximum Annual Energy Consumption (AEC) No greater than 620 kWh/yr	10 CFR 430, Subpart B, Appendix A
Dishwasher	Maximum Annual Energy Consumption (AEC) No greater than 270 kWh/yr	10 CFR 430, Subpart B, Appendix C1
Clothes Washer and Clothes Dryer	Maximum Annual Energy Consumption (AEC) for Clothes Washer <sup>a</sup> No greater than 130 kWh/yr Integrated Modified Energy Factor (IMEF) > 1.84 cu.ft/kWh/cycle	10 CFR 430 Subpart B, Appendix J2 and 10 CFR 430, Subpart B, Appendices D1 and D2

a. Credit for Clothes Washer and Clothes Dryer pair is based on Clothes Washer efficiency.

**CHAPTER 6[RE]  
REFERENCED STANDARDS**

<i>ASME</i>	American Society of Mechanical Engineers Two Park Avenue New York, NY 10016-5990
<i>BPVC</i>	<i>Boiler and Pressure Vessel Code</i>
<i>CTA</i>	Consumer Technology Association Technology & Standards Department 1919 S Eads Street Arlington VA 22202
ANSI/CTA-2045-B – 2018	Modular Communications Interface for Energy Management
ANSI/CTA-2045-A – 2018	Modular Communications Interface for Energy Management
<i>IEC</i>	IEC Regional Centre for North America 446 Main Street 16th Floor Worcester MA 01608
IECIEC Regional Centre for North America.	IEC 62746-10-1 - 2018: Systems interface between customer energy management system and the power management system - Part 10-1: Open automated demand response



<i>OpenADR</i>	OpenADR Alliance 111 Deerwood Road, Suite 200 San Ramon CA 94583
OpenADR OpenADR Alliance.	OpenADR 2.0a and 2.0b – 2019: Profile Specification Distributed Energy Resources
<i>AHRI</i>	Air-Conditioning, Heating, & Refrigeration Institute 2111 Wilson Blvd, Suite 500 Arlington VA 22201
AHRI 1380-2019  AHRI 1430-2022 (I-P)	Demand Response through Variable Capacity HVAC Systems in Residential and Small Commercial Applications Demand Flexible Electric Storage Water Heaters

4. Where the addition alone or the existing building and addition together comply with Section R405 or R406.

## SECTION R502 ADDITIONS

**R502.3 Prescriptive compliance.** *Additions* shall comply with Sections R502.3.1 through R502.3.5.

**R502.3.1 Building envelope.** New *building* envelope assemblies that are part of the *addition* shall comply with Sections R402.1, R402.2, R402.3.1 through R402.3.5, and R402.4.

**Exception:** New envelope assemblies are exempt from the requirements of Section R402.4.1.2.

**R502.3.2 Heating and cooling systems.** HVAC ducts newly installed as part of an *addition* shall comply with Section R403.

**Exception:** Where ducts from an existing heating and cooling system are extended to an *addition*.

**R502.3.3 Service hot water systems.** New service hot water systems that are part of the *addition* shall comply with Section R403.5.

**R502.3.4 Lighting.** New lighting systems that are part of the *addition* shall comply with Section R404.1.

**R502.3.5 Additional Efficiency Requirements.** *Additions* shall comply with sufficient measures from Table R408.3 to achieve not less than 10 credits. *Alterations* to the existing building that are not part of the *addition*, but permitted with the *addition*, shall be permitted to be used to achieve this requirement.

**Exceptions:**

1. Additions that increase the building's total conditioned floor area by less than 25 percent.
2. Additions that do not include the addition or replacement of equipment covered in Sections R403.5 or R403.7.
3. Additions that do not contain conditioned space.

## 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.

**R503.1.2 Heating and cooling systems.** New heating and cooling and duct systems that are part of the alteration shall comply with Section R403 and this section. HVAC ducts newly installed as part of an *alteration* shall comply with **Section R403**. Alterations to heating, cooling and duct systems shall comply with this section.

~~**Exception:** Where ducts from an existing heating and cooling system are extended to an *addition*.~~

**R503.1.2.1 Ducts.** HVAC ducts newly installed as part of an alteration shall comply with Section R403.

**Exception:** Where ducts from an existing heating and cooling system are extended to an *addition*.

**R503.1.2.2 System sizing.** New heating and cooling equipment that is part of an *alteration* shall be sized in accordance with Section R403.7 based on the existing building features as modified by the *alteration*.

**Exception:** Where it has been demonstrated to the *code official* that compliance with this section would result in heating or cooling equipment that is incompatible with the remaining portions of the existing heating or cooling system.

**R503.1.2.3 Duct leakage.** Where an *alteration* includes any of the following, ducts shall be tested in accordance with Section R403.3.5 and shall have a total leakage less than or equal to 12.0 cubic feet per minute (339.9 L/min) per 100 square feet (9.29 m<sup>2</sup>) of conditioned floor area:

1. Where 25 percent or more of the registers that are part of the duct system are relocated.
2. Where 25 percent or more of the total length of all ducts in the system are relocated.
3. Where the total length of all ducts in the system is increased by 25 percent or more.

**Exception:** Duct systems located entirely inside a conditioned space in accordance with Section R403.3.2.

**R503.1.2.4 Controls** New heating and cooling equipment that are part of the *alteration* shall be provided with controls that comply with Sections R403.1 and R403.2.

## APPENDIX RB

# SOLAR-READY PROVISIONS—DETACHED ONE- AND TWO-FAMILY DWELLINGS AND TOWNHOUSES

*The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.*

### User note:

*About this appendix: Harnessing the heat or radiation from the sun's rays is a method to reduce the energy consumption of a building. Although Appendix RB does not require solar systems to be installed for a building, it does require the space(s) for installing such systems, providing pathways for connections and requiring adequate structural capacity of roof systems to support the systems.*

### SECTION RB101 SCOPE

**RB101.1 General.** These provisions shall be applicable for new construction where solar ready provisions are required.

### SECTION RB102 GENERAL DEFINITION

**SOLAR-READY ZONE.** A section or sections of the roof or building overhang designated and reserved for the future installation of a solar photovoltaic or solar thermal system.

### SECTION RB103 SOLAR-READY ZONE

**RB103.1 General.** New detached one and two family dwellings, and townhouses with not less than 600 square feet (55.74 m<sup>2</sup>) of roof area oriented between 110 degrees and 270 degrees of true north shall comply with Sections RB103.2 through RB103.8.

#### Exceptions:

1. New residential buildings with a permanently installed on site renewable energy system.
2. A building where all areas of the roof that would otherwise meet the requirements of Section RB103 are in full or partial shade for more than 70 percent of daylight hours annually.

**RB103.2 Construction document requirements for solar ready zone.** Construction documents shall indicate the solar ready zone.

**RB103.3 Solar ready zone area.** The total solar ready zone area shall be not less than 300 square feet (27.87 m<sup>2</sup>) exclusive of mandatory access or setback areas as required by the *International Fire Code*. New townhouses three stories or less in height above grade plane and with a total floor area less than or equal to 2,000 square feet (185.8 m<sup>2</sup>) per dwelling shall have a solar ready zone area of not less than 150 square feet (13.94 m<sup>2</sup>). The solar ready zone shall be composed of areas not less than 5 feet (1524 mm) in width and not less than 80 square feet (7.44 m<sup>2</sup>) exclusive of access or setback areas as required by the *International Fire Code*.

**RB103.4 Obstructions.** Solar ready zones shall be free from obstructions, including but not limited to vents, chimneys, and roof mounted equipment.

**RB103.5 Shading.** The solar ready zone shall be set back from any existing or new permanently affixed object on the building or site that is located south, east or west of the solar zone a distance not less than two times the object's height above the nearest point on the roof surface. Such objects include, but are not limited to, taller portions of the building itself, parapets, chimneys, antennas, signage, rooftop equipment, trees and roof plantings.

**RB103.6 Capped roof penetration sleeve.** A capped roof penetration sleeve shall be provided adjacent to a solar ready zone located on a roof slope of not greater than 1 unit vertical in 12 units horizontal (8 percent slope). The capped roof penetration sleeve shall be sized to accommodate the future photovoltaic system conduit, but shall have an inside diameter of not less than 1<sup>1</sup>/<sub>4</sub> inches (32 mm).

**RB103.7 Roof load documentation.** The structural design loads for roof dead load and roof live load shall be clearly indicated on the construction documents.

**RB103.8 Interconnection pathway.** Construction documents shall indicate pathways for routing of conduit or plumbing from the solar ready zone to the electrical service panel or service hot water system.

**RB103.9 Electrical service reserved space.** The main electrical service panel shall have a reserved space to allow installation of a dual pole circuit breaker for future solar electric installation and shall be labeled "For Future Solar Electric." The reserved space shall be positioned at the opposite (load) end from the input feeder location or main circuit location.

**RB103.10 Construction documentation certificate.** A permanent certificate, indicating the solar ready zone and other requirements of this section, shall be posted near the electrical distribution panel, water heater or other conspicuous location by the builder or registered design professional.

DRAFT