ILLINOIS ENERGY CONSERVATION CODE

AMENDMENT PROPOSALS

2021

Contents

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: C202 & C503.1

Name: Jeff Mang
Jurisdiction / Company: Jeff Mang Consulting
Submitted on Behalf of: Polyisocyanurate Insulation Manufacturers Association (PIMA)
Address: 3918 Kennedy Street, Hyattsville, Maryland
Phone: 202-365-6232
E-Mail: jeff@jcmangconsulting.com

Proposal No.: C01-01

Date of Submittal: 08/05/2021

Signature (for release of copyrights):

Related Sections Impacted by this Amendment:

Section C202, General Definitions
Section C503.1, exception 6

Revise as Follows (In strike-thru / underline format):

CHAPTER 2 [CE], DEFINITIONS
SECTION C202, GENERAL DEFINITIONS

Delete the following definition.

> ~~ROOF MEMBRANE PEEL AND REPLACE-MENT. Where an existing weather resisting roof membrane alone is removed, exposing insulation or sheathing and only a new weather resisting roof membrane is installed.~~

CHAPTER 5 [CE] EXISTING BUILDINGS
SECTION C503, ALTERATIONS
Section C503.1, General

Delete the following exception and renumber exceptions 7 and 8 as needed.

> **Exceptions:** The following alterations need not comply with the requirements for new construction, provided the energy use of the building is not increased:
>
> ~~6. Roof Membrane Peel and Replacement~~

Reason:

This code change proposal would remove a state-specific weakening amendment adopted by Illinois during its last code adoption cycle. Exception #6, which is not part of either the 2018 or 2021 International

Energy Conservation Code (IECC), defeats one of the most important and cost-effective opportunities to improve the energy efficiency of existing buildings through energy-efficient roof replacements.

Under the model building and energy codes and versions of the Illinois energy code that pre-date the current version, three (3) types of reroofing activity are recognized: repair, recover and replacement. Since 2000 when existing buildings were first included within the scope of the model energy code, the IECC has required that roof replacements comply with the requirements for the opaque envelope when the existing roof has no insulation or the insulation is located entirely above the roof deck. The intent of this policy is to leverage the natural cycle of building upgrades and component replacements to improve energy efficiency in existing buildings when it is most cost effective to do so.

The creation of a fourth category of reroofing – roof membrane peel and replacement – was proposed in Illinois' last update cycle for the exclusive purpose of creating a broad exception to the long-standing requirement that roof replacements must comply with the energy code. This intent of the "peel and replacement" amendment has been confirmed by subsequent publications issued by the concept's proponents in which they advance an interpretation so expansive it applies to almost every roof replacement project.

Importantly, the concept of "peel and replacement" has been rejected by committees and experts that participate in the development of the IECC. Their rejection has been based on the fact that there is no technical merit or justification for the creation of a fourth category of reroofing activity (other than to avoid compliance with the energy code). Furthermore, the original proposal to add "peel and replacement" to the Illinois energy code did not present any aspect of Illinois construction that is unique or otherwise requires special requirements not addressed by the model energy code (as is required under the Illinois *Energy Efficiency Building Act* as the basis for the adoption of state-specific amendments.)

Regardless of the meritless arguments that suggest some unique need for Illinois to recognize a fourth category of reroofing, the proponents offer no information on why "peel and replacement" should be listed as an exception to the energy code's requirements for roof replacements. All roof replacements, including "peel and replacements" (though we still object to its technical merit), offer the opportunity to improve the existing building's energy performance through the installation of additional above-deck insulation. Therefore, whether because the stricken language is unnecessary or to put the State back on track in terms of existing building energy efficiency, this code change proposal should be approved, and the "peel and replacement" provisions be deleted from the Illinois energy code.

Cost Impact:

There is no cost impact compared to the 2021 IECC because the stricken language does not appear in the model code. Replacing a roof on a typical existing building with a roof system that complies with the current model energy code reduces whole building energy use by an average of 5.7% and is life cycle cost effective (*i.e.,* the upfront incremental cost of adding insulation is paid back to the building owner/occupant over the life of the measure through lower energy costs). Additional benefits include a reduction in CO2 emissions and climate change impacts. (*see,* Jerry Phelan, George Pavlovich, and Eric Ma, Energy and Environmental Impact Reduction Opportunities for Existing Buildings with Low-Slope Roofs, Bayer Materials Science, April 2009. https://cdn.ymaws.com/www.polyiso.org/resource/resmgr/report/bayer_report.pdf.)

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: C403.4.1.6, C404.11, C405.2.

Office Use Only	
Proposal Number:	C02-01
Date Submittal Received:	August 13, 2021

Date: 8/13/2021
Name: Edith Makra
Jurisdiction/Company: Metropolitan Mayors Caucus
Submitted on Behalf of: Metropolitan Mayors Caucus
Address: 433 W. Van Buren St., Suite 450
Chicago, IL 60607
Phone: 630-327-4193
E-Mail: emakra@mayorscaucus.org

Related Sections Impacted by this Amendment:

New definition, add new Section C403.4.1.6, C404.11., and revise Section C405.2, New reference

Revise as Follow (in strike-thru / underline format):

Add new definition as follows:

DEMAND RESPONSIVE CONTROL. An automatic control that can receive and automatically respond to demand response requests from a utility, electrical system operator, or third-party demand response program provider.

Add new text as follows:

C403.4.1.6 Demand responsive controls. All thermostatic controls shall be provided with *demand responsive controls* capable of the following:

1. *Automatically increasing the zone operating cooling set points by a minimum of* 4°F (2.2°C)
2. *Automatically decreasing the zone operating heating set points by a minimum of* 4°F (2.2°C)
3. *Automatically decreasing the zone operating cooling set points by a minimum of* 2°F (1.1°C).
4. *Both ramp-up and ramp-down logic to prevent the building peak demand from exceeding that expected without the DR implementation.*

The thermostatic controls shall be capable of performing all other functions provided by the control when the *demand responsive controls* are not available. Systems with direct digital control of individual zones reporting to a central control panel shall be capable of remotely complying

Exception: Health care and assisted living facilities.

C404.11 Demand responsive water heating. All electric storage water heaters, or a group of water heaters, in a building with a total storage tank capacity greater than 37 gallons (140 L) shall be provided with *demand responsive controls* that comply with ANSI/CTA-2045-B or another *approved demand responsive control*.

Exception: Health care facilities.

C405.2 Lighting controls. Lighting systems shall be provided with controls that comply with one of the following.

2. Luminaire level lighting controls (LLLC) and lighting controls as specified in Sections C405.2.1, C405.2.4 and C405.2.5. The LLLC luminaire shall be independently capable of:
   2.4 Reducing lighting power in a uniform manner by no less than 10 percent when signaled by a *demand responsive control*.

Add new standard in Chapter 6 as follows:

CTA

Consumer Technology Association
1919 S. Eads Street
Arlington, VA 22202

Standard reference number	*Title*	*Referenced in code section number*
ANSI/CTA-2045-B	*Modular Communications Interface for Energy Management . .*	*C404.11*

Reason:

Building-grid integration techniques like demand response are critical to achieving achieve a potential goal in Illinois to be 100 percent renewable by 2050 as outlined in the Clean Energy Jobs Act. In 2020, 11% of Illinois's electricity is sourced from renewable energy, primarily wind, an intermittent source of energy.[1] As Illinois increases the amount of electricity generated from renewables, buildings must be prepared to aid in this transition by storing energy and reducing energy use to match grid demands. Demand response controls for lighting controls, thermostats, and water heaters are an inexpensive and proven technology that add this needed functionality to buildings.

In addition, demand responsive functionality will present a cost-saving opportunity for buildings in the future. More and more utilities are moving beyond voluntary programs and are expanding use of time-of-use rates for electricity as a tool for shaping demand. Installing demand-responsive lighting controls, thermostats, and water heaters now will allow building tenants and owners to better control their utility costs in the future.

This proposed amendment would require new thermostats, electric water heating systems, and commercial lighting controls to be capable of responding to signals from the grid.

Demand responsive controls for thermostats are added based on language from California Title 24 and ASHRAE Standard 189.1. Any thermostat listed as "Title 24 compliant" would meet this requirement. The controls allow for dialing back heating and cooling, as well as to accept additional cooling when renewable energy generation is high, and both ramp up and down requirements in relationship to the DR signal to prevent rebound issues on the grid after the signal is released.

[1] *Illinois - State Energy Profile Analysis*, U.S. Energy Information Administration (EIA), www.eia.gov/state/analysis.php?sid=IL.

In health care and assisted living facilities, thermostat setpoints can impact more than just thermal comfort, and temperature can be part of the health care being provided. To ensure that this requirement cannot have an adverse impact on those services, these facilities have been exempted from this requirement.

Demand response requirements for electric storage water heaters based on ANSI/CTA-2045-B will standardize the socket, and communications protocol, for heat pump water heaters so they can communicate with the grid, and with demand response signal providers. In addition, 2045-B adds control and communications requirements for mixing valves in heat pump water heaters to enable them to provide greater storage capacity to support increased load shifting. The requirement is limited to electric storage water heaters, excluding small, point-of-use water heaters; these water heaters also have very limited capacity for demand response. Additionally, it only applies to water heaters with storage over 20 gallons. Versions of this standard are included in codes or other requirements in California, Oregon, and Washington, and under consideration in several other states and national codes and standards. To ensure that this requirement does not have an adverse impact on critical services, health care facilities have been exempted from this requirement as well.

The approach to demand response control requirements for lighting limits are limited to LLLC lighting, which uses control technology that generally already includes demand response functionality or for which demand response functionality comes at a minimal additional cost. The threshold for lighting power reduction is drawn from California's Title 24 demand response requirements.

Cost Impact:

A basic demand response thermostat costs $60 compared to just under $30 for a basic 7-day programmable thermostat. Therefore, this code requirement would increase costs by $30 for each thermostat installed. Demand responsive thermostats were found to be extremely cost effective in 2011. For every dollar spent on a demand response thermostat yielded between $2 to $6 in operating cost savings over a 15-year period.[2] In the 10 years since, equipment prices have decreased thus increasing the cost effectiveness of this requirement.

Adding demand response controls to water heaters cost an additional $173 for each water heater installed.[5] These requirements become cost effective when enrolled in a demand response program.[5] Armada Power customers in Ohio who enrolled their water heaters in a demand response program saved $184 annually by enrolling in the program.[3] If Illinois utilities institute a similar program to shape demand, a customer would reap $12 in energy cost savings for every $1 spent on the additional controls.

Demand response lighting controls for commercial buildings with an existing lighting control system are estimated to cost an additional $825 to install.[4] Demand response controls for lighting was also found to be cost effective. For example, every dollar spent on demand response lighting controls for an office for example, yielded between $1.50 and $2 in operating cost savings over a 15-year period.[5]

---

[2] *Final CASE Report: Upgradeable Setback Thermostats*, California Statewide Codes and Standards Enhancement (CASE) Program, October 2011, https://title24stakeholders.com/wp-content/uploads/2020/01/2013_CASE-Report_Upgradeable-Setback-Thermostats.pdf

[3] *Capturing Value from Electric Water Heaters as a Non-Invasive Demand Response Resource*, Guidehouse Insights, 2020, plma.memberclicks.net/assets/resources/Guidehouse%20Insights_ArmadaPowerWhitePaper.pdf.

[4] *Final CASE Report: Nonresidential Grid Integration*, California Statewide Codes and Standards Enhancement (CASE) Program, August 2020, https://title24stakeholders.com/wp-content/uploads/2020/08/NR-Grid-Integration_Final-CASE-Report_Statewide-CASE-Team.pdf

[5] *Grid-Interactive Efficient Building Technology Cost, Performance, and Lifetime Characteristics*, Lawrence Berkeley National Labs, Dec. 2020, escholarship.org/uc/item/44t4c2v6#article_main.

Signature (for release of copyrights): _____

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: C402.2, C402.6

Office Use Only	
Proposal Number:	C03-01
Date Submittal Received:	August 13, 2021

Date: 8/13/2021
Name: Edith Makra
Jurisdiction/Company: Metropolitan Mayors Caucus
Submitted on Behalf of: Metropolitan Mayors Caucus
Address: 433 W. Van Buren St., Suite 450
Chicago, IL 60607
Phone: 630-327-4193
E-Mail: emakra@mayorscaucus.org

Related Sections Impacted by this Amendment:

New definitions in Chapter 2, revision to Section C402.2, and new Section C402.6

Revise as Follow (in strike-thru / underline format):

Add new definition in Chapter 2 [CE] Definitions

CHI-FACTOR (χ or Chi). Thermal transmittance of a *point thermal bridge* in units of Btu/(h*ft*°F) [W/(m*K)]

PSI-FACTOR (Ψ or Psi). Thermal transmittance per unit length of a linear thermal bridge in units of Btu/(h*ft*°F) [W/(m*K)]

THERMAL BRIDGE. An element that has a higher thermal conductivity than the surrounding materials, which creates a path of least resistance for heat transfer. For purposes of determining *building envelope* requirements, the classifications for thermal bridges are defined as follows:

CLEAR FIELD THERMAL BRIDGE. Elements of a *building envelop* assembly that are distributed over the area of the assembly and addressed in determining the thermal performance of the assembly in accordance with Normative Appendix A. . Examples of *clear field thermal bridges* include metal or wood studs, webs and face shells of masonry units, ties, tracks, plates, girts and purlins for metal building envelopes.

LINEAR THERMAL BRIDGE. A length-based element associated with horizontal, vertical, or diagonal elements that penetrates the insulation in the *building envelope* and with length measured along the exterior surface of the *building envelope*. Examples of *linear thermal bridges* include edges of *floors,* balconies, columns and beams in the plane of an assembly, parapets, *roof-wall-floor* intersections, *fenestration* interfaces, shelf angles and similar conditions no otherwise defined as a *clear field thermal bridge* or *point thermal bridge*. Linear thermal transmittance is heat flow divided by length and by the temperature difference between the interior and exterior sides of the assembly, represented by a Ψ-factor (Psi-factor) in units Btu/hr• ft• °F.

POINT THERMAL BRIDGE. A discrete elementt that penetrates the insulation in the *building envelope*. Examples of point *thermal bridges* include a beam penetrating a *wall*, a column penetrating a *roof* or

floor, and an anchor or connection used to attach an element to the *building* and not otherwise defined as a *clear field thermal bridge* or *linear thermal bridge*. The cross-sectional area of the point *thermal bridge* shall be measured at the outer surface of the outermost layer of insulation that is penetrated by the element , represented by a X-factor (Chi-factor) in units Btu/hr • ft• °F.

Add new language in Section 402.2

C402.2 Specific building thermal envelope insulation requirements.
Insulation in building thermal envelope opaque assemblies shall comply with Sections C402.2.1 through C402.2.~~7~~9 and Table C402.1.3

C402.2.8 Continuous insulation
In new *construction*, balconies and parapets that interrupt the *building* thermal envelope shall comply with one of the following:

1. Shall be insulated with *continuous insulation* having a minimum thermal resistance equivalent to the *continuous insulation* component required in the adjacent wall assembly as listed in Table C402.1.3. Where more than one *wall* assembly is interrupted by an adjacent balcony, the higher *thermal resistance* shall be followed.
2. Shall incorporate a minimum R-3 thermal break where the structural element penetrates the *building* thermal envelope.

C402.6 Thermal bridges (Mandatory)

Applications for construction document approval shall include the following documentation of *thermal bridges*:

C402.6.1 Clear field thermal bridges

Where otherwise not included in pre-calculated assembly *U-factors*, *C-factor*s, or F-*factors* outlined in Appendix A of ASHRAE 90.1-2019, *clear field thermal bridges* in a *wall*, roof, or *floor* assembly shall be noted as such in the drawings.

C402.6.2 Point thermal bridges

Point thermal bridges greater than or equal in area to 12in^2 and not associated with HVAC or electrical systems shall be noted as *thermal bridges* in the drawings.

C402.6.3 Linear thermal bridges

1. *Construction documents* shall include the following documentation in tabular format for linear thermal bridges listed in Table C402.6*Linear thermal bridge* type.
2. Aggregate length of each type of *linear thermal bridge*.
3. Relevant detail in the construction documents showing a cross-section through the *thermal bridge*.
4. Ψ-factor for each *thermal bridge* from Table C402.2.8.3.

Exception to C402.2.9.3
Where *linear thermal bridges* have been tested or modeled using methods approved by the department, alternate values may be used.

TABLE C402.6 THERMAL BRIDGE Ψ-FACTOR

Type of Thermal Bridge	Ψ-value[a] [Btu / hr ft °F]
Balcony	0.50
Floor Slab	0.44
Fenestration Perimeter Transition	0.32

Parapet	0.42
Shelf Angle	0.41

a. Psi-values are derived from the BC Hydro Building Envelope Thermal Bridging Guide Version 1.2 –September 2018 and are based on poor performing details.
b. Fenestration Perimeter Transition is the thermal bridge between any fenestration frame and the typical wall, roof or floor assembly it abuts or is mounted within.

Reason:

The requirements for overall assembly insulation have been well-addressed in 2021 IECC. However, the existing requirements do little to address the issue of thermal bridges. Thermal bridges are "short cuts" for heat to transfer through the thermal envelope, materials of higher thermal conductance that bypass insulation like studs, joists and structural connections. Thermal bridges can have an over-sized impact on the performance of the thermal envelope. The U-factor and R-value tables in the code assume that heat transfer in through a thermal envelope is parallel. However, heat also transfers laterally, so thermal bridges have a much larger impact on the performance of the envelope than is represented by the area of the envelope that they represent. For example, if 990 square feet of a 1,000 square foot ceiling has insulation with an R-value of R-40 and 10 square feet is uninsulated with an R-value of R-1, the overall R-value of that assembly is R-30 due to thermal bridging effects.

This proposal focuses on reducing thermal bridging through the thermal envelope by:

1. Requiring continuous insulation for balconies and parapets where relatively common and especially problematic thermal bridging issues occur. It is important to note that the proposal does not represent a requirement for additional insulation, but a different application of insulation to meet existing requirements.
2. Identifying and account for thermal bridges in final submittal documents.

This code change is similar to a requirement that is currently in New York City's 2020 Energy Conservation Code. This amendment is also under consideration in Wisconsin, Michigan, Massachusetts and Washington, DC.

Cost Impact:

This code proposal requires one to identify thermal bridges on construction documents which adds negligible additional costs. The proposal also requires builders provide a layer of continuous insulation or a thermal break where a balcony or parapet interrupts the building thermal envelope. A thermal break at a balcony is estimated to cost $83/linear foot. The additional cost for adding thermal breaks in buildings with balconies and parapets can reduce energy use by 2% and these energy savings pay for the additional cost within the lifetime of the building.[6]

Signature (for release of copyrights):

[6] *Building Envelope and Thermal Bridging Guide: Energy Savings and Cost Benefit Analysis*, BC Hydro, www.bchydro.com/content/dam/BCHydro/customer-portal/documents/power-smart/builders-developers/final-mh-bc-part-2-energy-and-cost-analysis.pdf.

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: C403.3.5

Office Use Only	
Proposal Number:	C04-01
Date Submittal Received:	August 13, 2021

Date: 8/13/2021
Name: Edith Makra
Jurisdiction/Company: Metropolitan Mayors Caucus
Submitted on Behalf of: Metropolitan Mayors Caucus
Address: 433 W. Van Buren St., Suite 450
Chicago, IL 60607
Phone: 630-327-4193
E-Mail: emakra@mayorscaucus.org

Related Sections Impacted by this Amendment:

New definitions in Chapter 2, and new Section C403.3.5

Revise as Follow (in strike-thru / underline format):

Add new definition as follows:

DX-DEDICATED OUTDOOR AIR SYSTEM UNITS (DX-DOAS UNITS). A type of air-cooled, water-cooled, or water-source factory assembled product that dehumidifies 100% outdoor air to a low dew point and includes reheat that is capable of controlling the supply dry-bulb temperature of the dehumidified air to the designed supply air temperature. This conditioned outdoor air is then delivered directly or indirectly via an independent ventilation system to the conditioned spaces. It may precondition *outdoor air* by containing an enthalpy wheel, sensible wheel, desiccant wheel, plate heat exchanger, heat pipes, or other heat or mass transfer apparatus.

Add new text as follows:

C403.3.5 Dedicated outdoor air systems (DOAS)
For buildings with occupancies as shown in Table C403.3.5, outdoor air shall be provided to each occupied space by a dedicated outdoor air system (DOAS) which delivers 100-percent outdoor air without requiring operation of the heating and cooling system fans for ventilation air delivery. The DOAS shall meet the requirements for total energy recovery in Section C403.3.5.2. Buildings subject to this requirement are not eligible for additional energy efficiency credit under Section C406.6.

Exceptions:

1. Occupied spaces that are not ventilated by a mechanical ventilation system and are only ventilated by a natural ventilation system in accordance with Section 402 of the International Mechanical Code.
2. Buildings where the primary heating equipment efficiency exceeds the minimum heating efficiency requirements in Section C403.3 by 10 percent. This exception shall not be used as a substitution for more efficient HVAC performance per Section C406.2.
3. Buildings where the primary cooling or heat rejection equipment exceeds the minimum cooling and heat rejection efficiency requirements in Section C403.3 by 10 percent. Where multiple cooling performance requirements are provided, the equipment shall exceed the annual energy requirement, including IEER,

SEER, and IPLV. This exception shall not be used as a substitution for more efficient HVAC performance per Section C406.2.

TABLE C403.3.5

OCCUPANCY CLASSIFICATIONS REQUIRING DOAS

IBC Occupancy Classification	Inclusions	Exempted
A-1	All occupancies not specifically exempted	Television and radio studios
A-2	Casinos (gaming area)	All other A-2 occupancies
A-3	Lecture halls, community halls, exhibition halls, gymnasiums, courtrooms, libraries, places of religious worship	All other A-3 occupancies
A-4, A-5		All occupancies excluded
B	All occupancies not specifically exempted	Food processing establishments including commercial kitchens, restaurants, cafeterias; laboratories for testing and research; data processing facilities and telephone exchanges; air traffic control towers; animal hospitals, kennels, pounds; ambulatory care facilities.
F, H, I, R, S, U		All occupancies excluded
E, M	All occupancies included	

C403.3.5.1 Controls. The HVAC system shall include supply-air temperature controls that automatically reset the supply-air temperature in response to representative building loads or to outdoor air temperatures. The controls shall reset the supply air temperature not less than 25 percent of the difference between the design supply-air temperature and the design room-air temperature.

C403.3.5.2 Energy recovery ventilation with DOAS. The DOAS shall include energy recovery ventilation. The energy recovery system shall have a 50 percent *enthalpy recovery ratio* in accordance with Section C403.7.4.1. For DOAS having a total fan system motor nameplate hp less than 5 hp, total combined fan power shall not exceed 1 W/cfm of outdoor air. For DOAS having a total fan system motor hp greater than 5 hp, refer to fan power limitations of Section C403.8.1. The airflow rate thresholds for energy recovery requirements in Tables C403.7.4.2-1 and C403.7.4.2-2 do not apply.

Exceptions:

1. Occupied spaces with all of the following characteristics: complying with Section C403.7.4, served by less than 5000 cfm, with an average occupant load greater than 25 people per 1000 square feet (93 m^2) of floor area (as established in Table 403.3.1.1 of the International Mechanical Code) that include demand control ventilation configured to reduce outdoor air by at least 50% below design minimum ventilation rates when the actual occupancy of the space served by the system is less than the design occupancy.

2. Systems installed for the sole purpose of providing makeup air for systems exhausting toxic, flammable, paint, or corrosive fumes or dust, dryer exhaust, or commercial kitchen hoods used for collecting and removing grease vapors and smoke.

C403.3.5.3 Heating/cooling system fan controls. Heating and cooling equipment fans, heating and cooling circulation pumps, and terminal unit fans shall cycle off and terminal unit primary cooling air shall be shut off when there is no call for heating or cooling in the zone.

Exception: Fans used for heating and cooling using less than 0.12 watts per cfm may operate when space temperatures are within the set point dead band (Section C403.4.1.2) to provide destratification and air mixing in the space.

C403.3.5.4 Decoupled DOAS supply air. The DOAS supply air shall be delivered directly to occupied space or downstream of the terminal heating and/or cooling units.

Exceptions:

1. Active chilled beam systems.
2. Sensible only cooling terminal units with pressure independent variable airflow regulating devices limiting the DOAS supply air to the greater of latent load or minimum ventilation requirements.
3. Terminal heating and/or cooling units that comply with the low fan power allowance requirements in the exception of Section C403.3.5.2.

Reason:

The majority of commercial HVAC systems are based around a central air handling delivery system. This system typically provides heating, cooling and ventilation air from a single source. Since cooling is typically the largest instantaneous load, the fans must be sized large enough to deliver enough air to meet the peak cooling requirements. When the ventilation is integrated, these large fans must operate during all occupied hours to deliver ventilation effectively to the space. This leads to very high fan energy use.

With ventilation separated from the heating and cooling delivery, the large heating/cooling fans can be shut off unless there is a call for heating or cooling and the much smaller ventilation-only fans can operate to deliver fresh air to the space. Furthermore, when the ventilation air is delivered using either Energy Recovery Ventilation (ERV) the heating energy requirements associated with tempering the ventilation air are significantly reduced or eliminated. Buildings with DOAS systems not only save energy but also exhibit improved indoor air quality which is especially important in businesses and schools.

Designs based around a DOAS are not new and it has long been established that this design direction leads to more energy efficient buildings. The General Services Administration required DOAS as the baseline design for all new GSA buildings unless otherwise directed by design programming in 1998.[7] The specifications require perimeter and interior systems have 100 percent outside air ventilation systems which are completely independent of any other air distribution system. Enthalpy heat recovery must be included if the outside air required or equipment capacity exceeds a stated amount.[8]

This proposed code change is similar to the requirements currently adopted in the Washington State Energy Code which requires buildings of only certain occupancy types to have a DOAS system. These requirements are currently under consideration in Washington, DC, and Michigan.

Compliance with this proposed code amendments requires the following in buildings where the cooling or heating system is not 10 percent more efficient than code requirements:

A. 100% ventilation air delivered directly to each zone separate from the heating/cooling system.
B. Ventilation air delivered using an ERV
C. Run heating and cooling equipment (fans and pumps) only when there is a call for conditioning in the zone.

[7] Mumma, Stanley A. "Designing Dedicated Outdoor Air Systems." *ASHRAE Journal* (May 2001) 28-31.
[8] General Services Administration. GSA 2003 Facilities Standards (P100), 5.5 HVAC Baseline Systems. Accessed March 25, 2021. https://www.gsa.gov/node/81728

A DOAS would be required in buildings whose occupancy is intended for Mercantile (Group M), and Educational (Group E). A DOAS would also be required in most Business's (Group B) except those exempted, certain Assembly occupancies (Group A) for performing arts or motion pictures (except for television and radio studios), casinos, and lecture halls, community halls, exhibition halls, gymnasiums, courtrooms, libraries, and places of religious worship.

A DOAS would not be required in buildings where the cooling or heating system is 10 percent more efficient than code requirements. A DOAS would also not be required in the building for occupancies for Residential (Group R), Factory and Industrial (Group F), High Hazard (Group H), Institutional (Group I), Storage (Group S), and Utility and Miscellaneous (Group U).

Buildings that install a DOAS or higher efficiency equipment because of this amendment are not allowed to claim energy efficiency credits for this change in Section C406.

Cost Impact:

The proposed code change will increase costs. On average the incremental cost of adding a DOAS for several building prototypes (small, medium and large office, retail, and schools) was found to be $0.88 per square foot. The increased cost of requiring DOAS systems is more than offset by operating cost savings. When compared to a code-minimum multi-zone VAV system, very high efficiency DOAS can reduce HVAC energy by an average of 7% to 16% depending on the type of DOAS system installed in Climate Zone 5A.[9] Installing a DOAS was found to save on average $2.00-$2.66 in operating costs for every additional dollar spent to install a DOAS in a building.[10]

I hereby grant and assign to the State of Illinois all rights in copyright I may have in any authorship contributions I make to the State of Illinois in connection with any proposed amendments or public comment, in its original form submitted or revised form, including written and verbal modifications. I understand that I have no rights in any State of Illinois publications that use such contributions in the form submitted by me or another similar form and certify that such contributions are not protected by the copyright of any other person or entity.

Signature (for release of copyrights):

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

[9] *Energy Benefits of Different Dedicated Outdoor Air System Configurations in Various Climates*, Shihan Deng, University of Nebraska- Lincoln, May 2014, https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1030&context=archengdiss

[10] Benefits from this study were adjusted to account for difference in electricity rates between the two states.
Nonresidential HVAC Controls, Codes and Standards Enhancement (CASE) Initiative 2022 California Energy Code, Sept. 2020, title24stakeholders.com/wp-content/uploads/2020/10/2022-T24-Final-CASE-Report-HVAC-Controls.pdf.

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: C103.2, C401.2.2, C405.14

Office Use Only	
Proposal Number:	C05-01
Date Submittal Received:	August 13, 2021

Date: 8/13/2021
Name: Edith Makra
Jurisdiction/Company: Metropolitan Mayors Caucus
Submitted on Behalf of: Metropolitan Mayors Caucus
Address: 433 W. Van Buren St., Suite 450
Chicago, IL 60607
Phone: 630-327-4193
E-Mail: emakra@mayorscaucus.org

Related Sections Impacted by this Amendment:

New definitions in Chapter 2, Revise Section C103.2, C401.2.2, Table C405.12.2
Add new Section C405.14

Revise as Follow (in strike-thru / underline format):

Revise as follows:

C103.2 Information on construction documents. Construction documents shall be drawn to scale upon suitable material. Electronic media documented are permitted to be submitted when *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 herein governed. Details shall include the following as applicable:

14. Location of designated *EVSE spaces*, *EV-Ready spaces*, and *EV-Capable spaces* in parking facilities.

Add new definitions as follows:

AUTOMATIC LOAD MANAGEMENT SYSTEMS (ALMS). A control system that allows multiple connected *EVSE* to share a circuit or panel and automatically reduce power at each charger, reducing the total connected electrical capacity of all *EVSE*.

ELECTRIC VEHICLE (EV). An automotive-type vehicle for on-road use, such as passenger automobiles, buses, trucks, vans, neighborhood electric vehicles, electric motorcycles, and the like, primarily powered by an electric motor that draws current from a rechargeable storage battery, a fuel cell, a photovoltaic array, or another source of electric current. Plug-in hybrid electric vehicles are electric vehicles having a second source of motive power. Off-road, self-propelled electric mobile equipment, such as industrial trucks, hoists, lifts, transports, golf carts, airline ground support equipment, tractors, boats and the like, are not considered electric vehicles.

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE). The conductors, including the ungrounded, grounded, and equipment grounding conductors and the electric vehicle connectors, attachment plugs, 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.

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE) SPACE. An automotive parking space that is provided with a dedicated *EVSE.*

EV-CAPABLE SPACE. An automotive parking space that is provided with infrastructure for the future installation of an EVSE.

EV-READY SPACE. An automotive parking space that is provided with an electrical circuit capable of supporting an installed EVSE.

Revise text as follows:

C401.2.2 ASHRAE 90.1
Commercial buildings shall comply with the requirements of ANSI/ASHRAE/IESNA 90.1 and Section C405.14.

Revise table as follows:

TABLE C405.12.2 ENERGY USE CATEGORIES

LOAD CATEGORY	DESCRIPTION OF ENERGY CUSE
Total HVAC system	Heating, cooling and ventilation, including but not limited to fans, pumps, boilers, chillers, and water heating. Energy used by 120-volt equipment, or by 208/120-volt equipment that is located in a building where the main service is 480/277-volt power, is permitted to be excluded from total HVAC system energy use.
Interior lighting	Lighting systems located within the building.
Exterior lighting	Lighting systems located on the building site but not within the building.
Plug loads	Devices, appliances and equipment connected to convenience receptacle outlets.
Process load	Any single load that is not included in HVAC, lighting or plug load category and that exceeds 5 percent of the peak connected load of the whole building, including but not limited to data centers, manufacturing equipment, and commercial kitchens.
Electric vehicle charging	*Electric vehicle* charging loads.
Building operations and other miscellaneous	The remaining loads not included in this table, including but not limited to vertical transportation systems, automatic doors, motorized shading systems, ornamental fountains, ornamental fireplaces, swimming pools, in-ground spas and snow-melt systems.

Add new sections as follows:

Add new text as follows:

C405.14 Electric vehicle charging infrastructure. Parking facilities shall be provided with electric vehicle charging infrastructure in accordance with this section and Table C405.14 based on the total number of parking spaces and rounded

up to the nearest whole number. EVSE, EV ready spaces and EV capable spaces may be counted toward meeting minimum parking requirements. *EVSE spaces* may be used to meet requirements for EV ready spaces and EV capable spaces. EV ready spaces may be used to meet requirements for EV capable spaces. Where more than one parking facility is provided on a building site, the number of parking spaces required shall be calculated separately for each parking facility. EV spaces shall be uniformly distributed in the parking facility.

Exception: In parking garages, the conduit required for *EV capable spaces* may be omitted provided the parking garage electrical service has no less than 1.8 kVA of additional reserved capacity per *EV capable space.*

TABLE C405.14
ELECTRIC VEHICLE CHARGING INFRASTRUCTURE REQUIREMENTS

OCCUPANCY	***EVSE SPACES***	***EV READY SPACES***	***EV CAPABLE SPACES***
Group B Occupancies	15%	NA	40%
Group M Occupancies	25%	NA	40%
R-2 Occupancy	NA	100%[a]	NA
All other Occupancies	10%	NA	40%

a. Or one *EV ready space* per *dwelling unit.*

a. Or one *EV ready space* per *dwelling unit.*

C405.14.1 EV Capable Spaces. *EV Capable* Spaces shall be provided with electrical infrastructure that meets the following requirements:

1. Conduit that is continuous between a junction box or outlet located within 3 feet (914 mm) of the parking space and an electrical panel serving the area of the parking space.
2. The electrical panel to which the conduit connects shall have sufficient dedicated physical space for a dedicated dual-pole, 40-amp breaker.
3. The conduit shall be sized and rated to accommodate a 40-amp, 208/240-volt branch circuit and have a minimum nominal trade size of 1 inch.
4. The electrical junction box and the electrical panel directory entry for the dedicated space in the electrical panel shall have labels stating "For future *electric vehicle* charging".

C405.14.2 EV Ready Spaces. The branch circuit serving *EV Ready Spaces* shall meet the following requirements:

1. Wiring capable of supporting a 40-amp, 208/240-volt circuit.
2. Terminates at an outlet or junction box located within 3 feet (914 mm) of the parking space.
3. A minimum capacity of 1.8 kVA.
4. The electrical panel directory shall designate the branch circuit as "For electric vehicle charging" and the junction box or receptacle shall be labelled "For electric vehicle charging."

C405.14.2 EVSE Spaces. The *EVSE* serving *EVSE spaces* shall meet the following requirements:

1. Capable of supplying not less than 6.2 kW to an electric vehicle.

Exception: An *ALMS* may be used to reduce the total electrical capacity required by *EVSE spaces* provided that all *EVSE spaces* are capable of simultaneously charging at a minimum rate of 1.4 kW.

2. Located within 3 feet (914 mm) of the *EVSE space*.

Reason:

The widescale adoption of electric vehicles (EVs) is a key climate strategy to reduce GHG emissions from Illinois's. transportation sector and is critical to achieving Illinois's goal to achieve at least a 26% reduction in GHG emissions by 2025. The transportation sector of Illinois's greenhouse gas emissions, representing 33 percent of total emissions.[11] As Illinois is considering 100% renewable electricity by 2030 as proposed in the Clean Energy Jobs Act (CEJA) and is otherwise moving towards a cleaner electricity grid, the opportunity is now on the table to reduce vehicle emissions through electrification, and to minimize the impact of the transportation sector on the state's carbon footprint. But this will occur only if policies are put in place to support widespread electric vehicle infrastructure, including in Illinois homes and businesses.

Encouraging EVs will not only reduce carbon emissions in the state substantially, but will also reduce other pollutants. Vehicle emissions are the largest source of carbon monoxide and nitrogen oxides, $PM_{2.5}$ and smog-causing air pollution in cities. In 2015, 22,000 Americans died from transportation emissions. Neighborhoods with people of color also experience on average 66% more air pollution from cars and trucks than white residents.[12] Residents of Cook County, including Chicago, for example have an average exposure to PM2.5 that is more than double the nations average and people of color in Illinois are exposed to 20-30% more PM2.5 than the average Illinois resident.[13]

Fortunately, the transition to electric vehicles (EVs) is already underway and auto manufacturers in the Midwest are embracing this change, especially General Motors who recently announced it would only manufacture electric vehicles by 2035.[14] In the United States, EV sales increased by 80 percent from 2017 to 2018. The number of EVs on U.S. roads is projected to grow from 1 million vehicles at the end of 2018, to 18.7 million by 2030. To recharge these new EVs, the U.S. will need 9.6 million charge ports, a substantial portion of which will be installed in single and multi-family residential buildings.[15]

A major barrier to the transition to EVs is the lack of charging infrastructure at homes and businesses and the potential need for extensive electrical upgrades often requiring the installation of conduit through existing concrete to connect the electric vehicle supply equipment (EVSE) to electrical service. It is much more cost-effective to ensure a building is "EV ready" when it is being built or undergoing major renovations than trying to add electrical infrastructure after the building is complete. A recent study estimated that: "an estimated $8,000 per parking space can be avoided [in retrofit costs] when an individual Level 2 charging station is installed."[16] To reduce expensive retrofit costs, it is therefore critical that Illinios's building codes require parking spaces to be EV-ready, EV-capable or have EVSE.

---

[11] "U.S. Energy Information Administration - EIA - Independent Statistics and Analysis." *State-Level Energy-Related Carbon Dioxide Emissions, 2005-2016*, www.eia.gov/environment/emissions/state/analysis/./

[12] "Cost to Maintain an Electric Car." *GreenCars*, GreenCars, 2 Apr. 2021, www.greencars.com/post/what-does-it-cost-to-maintain-an-electric-car.

[13] Reichmuth, David. *Exposure to Air Pollution from Vehicles in Illinois IS Inequitable - It Doesn't Have to Be.* Union of Concerned Scientists Blog, 9 Feb. 2020, blog.ucsusa.org/dave-reichmuth/exposure-to-air-pollution-from-vehicles-in-illinois-is-inequitable-it-doesnt-have-to-be/.

[14] Eisenstein, Paul A. "GM to Go All-Electric by 2035, Phase out Gas and Diesel Engines." *NBCNews.com*, NBCUniversal News Group, 29 Jan. 2021, www.nbcnews.com/business/autos/gm-go-all-electric-2035-phase-out-gas-diesel-engines-n1256055.

[15] EEI Celebrates 1 Million Electric Vehicles on U.S. Roads, Edison Electric Institute, 3 Nov. 2018, www.eei.org/resourcesandmedia/newsroom/Pages/Press%20Releases/EEI%20Celebrates%201%20Million%20Electric%20Vehicles%20on%20U-S-%20Roads.aspx.

[16] *EV Charging Infrastructure: Nonresidential Building Standards*, California Air Resources Board, 15 Nov. 2019, ww2.arb.ca.gov/sites/default/files/2020-08/CARB_Technical_Analysis_EV_Charging_Nonresidential_CALGreen_2019_2020_Intervening_Code.pdf.

This proposed code language is currently being considered in Denver, Colorado, Michigan and Wisconsin. It captures recent developments in the national conversation about the best way to bring electric vehicle charging infrastructure (EVCI) requirements to code in a way that is consistent, understandable, feasible and ensures the societal benefit of the widest penetration of EV charging possible.

Definitions:
The definitions for Electric Vehicle and Electric Vehicle Supply Equipment are mirrored from NEC-2020 to be useful in defining requirements for electric vehicle infrastructure. The proposal establishes a balance between consistency and flexibility so that the same EVCI framework can be utilized to address parking/charging with different usage patterns and as Illinois steadily increases EVCI requirements over time. As a result, unlike the 2019 EVCI code language, terms are defined in a way that allows specific technical requirements to vary while the definitions remain consistent.

The proposal includes definitions for EV, EVSE, EV Ready Space, and Automatic Load Management System. EV Ready and EV Capable definitions do not include requirements for minimum capacity for the panels of branch circuit. Different levels of capacity are appropriate for different EV charging scenarios (charging at different building types, parking types, residential types, business types, times of day, etc.) as well as different levels of penetration of EV charging spaces in a parking lot. Therefore, capacity requirements are set in the code text itself to allow for consistent use of the definitions while the capacity requirements change to match the specific EVCI requirements of the parking/charging application and level of penetration of EV spaces over time.

Requirements:
The EV charging infrastructure requirements have been tailored to different charging scenarios. The requirements focus on utilizing EV Ready spaces for residential parking and utilizing EV Capable and EVSE spaces for commercial parking lots.

EV Capable Spaces
The definition of EV Capable is focused on future-proofing parking lots against high retrofit costs in the future. One of the largest costs of retrofitting parking lots for EVCI is retrenching existing parking lots to run wiring for EVSEs. EV Capable spaces are provided with conduit in order to substantially lower the cost of future EVCI retrofits. EV capable spaces must also have a dedicated space on the electrical panel.

EV Ready Spaces
EV Ready spaces are utilized in residential occupancies where EV owners are more likely to choose specific EVSEs with features that meet their personal, long-term needs. The minimum capacity of those EV Ready spaces has been set at Level 1 charging (1.8 kVA) in order to maximize access to EV charging: Level 1 charging was chosen for the following reasons:

- 208/240V NEMA receptacles are not intended for daily plug/unplug cycles, but NEMA 120V receptacles are.
- Nearly all EVs come with at least a Level 1 charger, so Level 1 EV Ready spaces provide immediate access to charging.
- Residential park times are generally much longer which makes Level 1 charging more feasible.
- Lower capacity charging minimizes the cost of EVCI per space, allowing for the maximization of the number of EV spaces, which maximizes access to charging. This is an important equity consideration.

Even though Level 1 charging is required for EV-ready spaces, the proposal includes a requirement for EV Ready spaces to have wiring and panel bus bars that support higher capacity charging to enable a cost-effective upgrade to load managed higher-capacity charging in the future.

EVSE Spaces
EVSE spaces are required for commercial parking lots where shorter parking times are typical and Level 2 or 3 charging is more appropriate. EVSE spaces are required in commercial parking lots to provide immediate access to charging. The charging rate for an EVSE space is set at 6.2 kW. This is equivalent to a 30A/208V EVSE. 30 and 32A chargers are the most common Level 2 chargers and the highest capacity chargers that

can be installed on a 40A branch circuit. kW is used as the metric to indicate total power delivered rather than the specific combination of Volts and Amps.

EV Ready spaces are not required in commercial parking lots for several reasons:

- An EV Ready space does not provide actual charging, particularly when no receptacle is included.
- While the car connection side of Level 2 EVSE are standard, the grid connection side is not. There are up to 8 plugs that could be utilized for portable level 2 chargers, making it less likely that users will have the proper plug. Many chargers come with adapter cables, but few of these are UL listed.
- The NEMA plugs used for 208/240V receptacles are not designed for repeated daily plug/unplug cycles (like 120V receptacles). NEMA has raised concerns about these receptacles being utilized in parking lots.
- Many NEMA 208/240V plugs lack a ground, creating a hazard if they were to be utilized in locations exposed to weather.
- Both 40A and 50A 208/240V circuits utilize the same receptacle plug, creating the chance for circuit overloading and tripped circuit breakers.

Monitoring

The 2021 IECC added requirements for sub-metering of building loads. The proposal adds an additional load category to those requirements. Electric Vehicle charging is a transportation load, not a building load, but is often provided through a building electrical service connection. Adding a category for monitoring EV charging separately allows the building load to be measured independently from this non-building load.

Alternate compliance for parking garages

The exception is added to allow capacity to be substituted for conduit in parking garages. EVCI retrofits have different cost considerations in parking garages compared to surface parking lots. Parking garage retrofits do not require retrenching, so the conduit in EV capable spaces does not come with the same future avoided costs.

The percentages in Table C405.14 can be adjusted to tailor the requirements for the specific market needs of Illinois. However, the EV Capable space requirements included for all commercial lots recognizes that future needs for EV charging will be much greater than they are now. EV capable spaces avoid the significant cost of parking lot re-trenching, which is one of the largest single costs of EVCI retrofits but only a minor investment in new construction.

Cost Impact:

As stated above, the proposed code change will increase costs marginally. Recent analysis by NBI and partners using cost data from RSMeans and a mid-range charger from a reputable manufacturer estimates that installing EVSE will increase construction costs by $10,500 per parking space. Making a space EV capable will increase construction costs by $7,319 per parking space.

The benefit of installing this infrastructure will reduce expensive future retrofit costs. A recent study estimated that: "$8,000 [in retrofit costs] per parking space can be avoided when an individual Level 2 charging station is installed."[17] These EV chargers will also yield substantial economic benefits to Illinois residents by allowing them to purchase EVs which cost much less to fuel and maintain than gas-powered vehicles. According to AAA, an electric vehicle (EV) will save roughly $1,039 per year in total fuel and maintenance costs compared to a comparable gasoline vehicle.[18] Although Electric Vehicles are often more expensive than gasoline

[17] *EV Charging Infrastructure: Nonresidential Building Standards*, California Air Resources Board, 15 Nov. 2019, ww2.arb.ca.gov/sites/default/files/2020-08/CARB_Technical_Analysis_EV_Charging_Nonresidential_CALGreen_2019_2020_Intervening_Code.pdf.

[18] "Electric Cars Only Cost Slightly More to Own than Gas-Powered Ones, AAA FINDS." *True Cost of EV Ownership*, www.ace.aaa.com/automotive/advocacy/true-cost-of-electric-vehicle-ownership.html.

powered vehicles, Bloomberg New Energy Finance on battery costs suggests EVs could reach upfront cost parity with gasoline vehicles by the early-to-mid 2020s [19].

I hereby grant and assign to the State of Illinois all rights in copyright I may have in any authorship contributions I make to the State of Illinois in connection with any proposed amendments or public comment, in its original form submitted or revised form, including written and verbal modifications. I understand that I have no rights in any State of Illinois publications that use such contributions in the form submitted by me or another similar form and certify that such contributions are not protected by the copyright of any other person or entity.

Signature (for release of copyrights): _____

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

[19] Baldwin, Roberto. *Evs Could Soon Cost Same as Gas Cars Thanks to Lower Battery Costs*. Car and Driver, 19 Feb. 2021, www.caranddriver.com/news/a34992832/battery-price-drop-2023/.

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: C405.13, C406.5

Office Use Only	
Proposal Number:	C06-01
Date Submittal Received:	August 13, 2021

Date: 8/13/2021
Name: Edith Makra
Jurisdiction/Company: Metropolitan Mayors Caucus
Submitted on Behalf of: Metropolitan Mayors Caucus
Address: 433 W. Van Buren St., Suite 450
Chicago, IL 60607
Phone: 630-327-4193
E-Mail: emakra@mayorscaucus.org

Related Sections Impacted by this Amendment:

New definitions in Chapter 2, Add new Section C405.13, Revise Section C406.5

Revise as Follow (in strike-thru / underline format):

Add new definition as follows:

RENEWABLE ENERGY CERTIFICATE (REC). A market-based instrument that represents and conveys the environmental, social, and other non-power attributes of one megawatt-hour of renewable electricity generation and could be sold separately from the underlying physical electricity associated with renewable energy resources.

Add new text as follows:

C405.13 On site renewable energy. Each building site shall have equipment for on-site renewable energy with a rated capacity of not less than 0.25 W/ft² (2.7 W/m²) multiplied by the sum of the gross conditioned floor area of the three largest floors.

Exceptions:

1. Any building located where an unshaded flat plate collector oriented towards the equator and tilted at an angle from horizontal equal to the latitude receives an annual daily average incident solar radiation less than 3.5 kWh/m²·day (1.1 kBtu/ft²·day).
2. Any building where more than 80 percent of the roof area is covered by any combination of equipment other than for on-site renewable energy systems, planters, vegetated space, skylights, or occupied roof deck.
3. Any building where more than 50 percent of roof area is shaded from direct-beam sunlight by natural objects or by structures that are not part of the building for more than 2,500 annual hours between 8:00 AM and 4:00 PM.

C405.13.1 Renewable energy certificate documentation. Documentation shall be provided to the code official that indicates that renewable energy certificates (RECs) associated with the on-site renewable energy will be retained and retired by or on behalf of the owner or tenant.

Revise text as follows:

C406.5 Onsite renewable energy. The total minimum ratings of on-site renewable energy systems, not including onsite renewable energy system capacity used for compliance with Section C405.13, shall be one of the following:

Reason:

In 2020, only 11% of Illinois's electricity is sourced from renewable energy.[20] In order to cost-effectively achieve a potential goal to be 100 percent renewable by 2050 as outlined in the Clean Energy Jobs Act, Illinois must begin installing a nominal amount of renewable energy on-site in all new buildings now. According to a recent study entitled "A New Roadmap for the Lowest Cost Grid",[21] the least expensive grid involves a large amount of centralized renewables and a large amount of distributed renewables located on the building site. More renewables placed on site enable more clean utility-scale renewables to be deployed efficiently.[21] It is therefore crucial for new commercial buildings to install renewable energy on-site during new construction so that Illinois can reach its 100% renewable electricity goal in the most cost-effective manner. Installing renewables on site will also allow building owners to economically benefit from Illinois's transition towards a low-carbon economy and benefit from additional resiliency during disruptions in centrally supplied power.

In addition, a solar requirement would help grow jobs in Illinois. According to the Clean Jobs Midwest report, in 2019, "clean energy jobs grew more than twice as fast as overall employment across the Midwest," with Illinois in particular leading the Midwest region in the number of clean energy jobs.[22]

This code proposal change is based on approved ASHRAE addenda by, ck, and cp to Standard 90.1-2019[23] which will be published in ASHRAE 90.1-2022 and the definition for renewable energy credits from ASHRAE 228p. The addenda was also recently recommended by the Minnesota Technical Advisory Group for inclusion in the next version of Minnesota's next commercial energy code (based on ASHRAE 90.1-2019). The addenda establishes a prescriptive requirement for onsite renewable energy of 0.25W/s.f. of the three largest floors of all commercial buildings. The size of the required on-site renewable energy is small (on average 4.5% of building energy use) and therefore is a cost-effective way to require all new commercial buildings following the prescriptive path to be solar-ready. The three exceptions to the requirement are written to ensure that the requirement is not applied to buildings without adequate space on the roof, to buildings that are in areas of the country areas where unblocked insolation levels do not provide enough energy to make the equipment cost-effective (according to ASHRAE cost-effective criteria), and to buildings where solar access is wholly or partially blocked. by permanent objects. The proposal also revises section C406.5 to allow only additional renewable energy to be counted toward compliance with the additional efficiency requirements. The proposal also requires building owners to retain any renewable energy credits (RECS) associated with the renewable energy so that no other individual or organization can take credit for the production from the system (again preventing double-counting).

Cost Impact:

This proposed code change will increase cost of construction modestly for commercial buildings following the prescriptive pathway of the 2021 IECC. The following table lists the required amount of photovoltaics under this proposed code amendment for a set of typical commercial buildings following the prescriptive pathway, the

[20] *Illinois - State Energy Profile Analysis*, U.S. Energy Information Administration (EIA), www.eia.gov/state/analysis.php?sid=IL.

[21] *Why Local Solar For All Costs Less: A New Roadmap for the Lowest Cost Grid,* Vibrant Clean Energy, Dec. 2020, www.vibrantcleanenergy.com/wp-content/uploads/2020/12/WhyDERs_ES_Final.pdf.

[22] CleanEnergyTrst. *Clean Jobs Midwest*, https://www.cleanjobsmidwest.com/state/illinois.

[23] *ANSI/ASHRAE/IES Addendum by, ck, and cp to ANSI/ASHRAE/IES Standards 90.1-2019*, ASHRAE Standards Committee, 31 July 2020, https://www.ashrae.org/file%20library/technical%20resources/standards%20and%20guidelines/standards%20addenda/90_1_2019_by_ck_cp_20200731.pdf

approximate installed costs for these photovoltaic systems assuming only the business energy investment tax credits (ITC), the annual energy cost savings in the first year of production and the simple payback period (before state tax credits, depreciation or other incentives and tax treatments).

	PV (kW)	**PV Cost**	**Annual Energy Cost Savings**	**Simple Payback Period**
Small Business (10,000 s.f., 3 floors)	2.5	$ 5,070	$ 315	16.1
Multi-family High Rise (80,000 s.f., 10 floors)	6.0	$ 12,168	$ 1,104	11.0
Office (50,000 s.f., 4 floors)	9.4	$ 19,013	$ 1,183	16.1

I hereby grant and assign to the State of Illinois all rights in copyright I may have in any authorship contributions I make to the State of Illinois in connection with any proposed amendments or public comment, in its original form submitted or revised form, including written and verbal modifications. I understand that I have no rights in any State of Illinois publications that use such contributions in the form submitted by me or another similar form and certify that such contributions are not protected by the copyright of any other person or entity.

Signature (for release of copyrights): _____

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: C405.4

Office Use Only	
Proposal Number:	C07-01
Date Submittal Received:	August 13, 2021

Date: 8/13/2021
Name: Edith Makra
Jurisdiction/Company: Metropolitan Mayors Caucus
Submitted on Behalf of: Metropolitan Mayors Caucus
Address: 433 W. Van Buren St., Suite 450
Chicago, IL 60607
Phone: 630-327-4193
E-Mail: emakra@mayorscaucus.org

Related Sections Impacted by this Amendment:

New definition and revision to section C405.4

Revise as Follow (in strike-thru / underline format):

Add new definition in Chapter 2 as follows:

PHOTOSYNTHETIC PHOTON EFFICACY (PPE). 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.

Modify section as follows:

C405.4 Lighting for plant growth and maintenance. ~~Not less than 95 percent of the~~ All permanently installed luminaires used for plant growth and maintenance shall have a ~~photon efficiency~~ *photosynthetic photon efficacy* as defined in accordance with ANSI/ASABE S640 of not less than 1.7 µmol/J for *greenhouses* and not less than ~~1.6~~ 2.2 µmol/J for all other indoor growing spaces. ~~as defined in accordance with ANSI/ASABE S640.~~

Exception:

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

Reason:

Indoor agriculture energy usage is projected to grow substantially nationwide over the next several years. A total of 46 million square feet of grow area in the U.S. is lit by electric horticultural lighting, 58% of which was in supplemental greenhouses, 41% in non-stacked indoor farms, and 1% in vertical farms. The majority of luminaires in indoor farms and greenhouses are inefficient high-pressure sodium and metal halide high

intensity discharge lamps. Lighting in greenhouses operate on average 2,120 hours per year or 6 hours per day and lighting in non-stacked indoor operations were on 5,475 hours per year or 15 hours per day.[24] Because of these long operating hours, lighting can account for 50 to 80% of a facilities energy use in indoor operations and 30% of energy use in greenhouses.[25]

Recognizing the impact of lighting in these facilities, Illinois passed House Bill 1438 to require lighting in cannabis facilities to either achieve an efficacy of 2.2 µmol/J or a maximum LPD of 36 watts per square foot of canopy. These standards require highly efficient LED luminaires for cannabis operations in Illinois. After Illinois passed HB 1438, the 2021 IECC adopted requirements for lighting in all horticultural lighting applications. However, the requirement (1.6 µmol/J) allows slightly less efficient double-ended High Pressure Sodium fixtures to be installed and does not align with the efficacy requirements for cannabis facilities in Illinois.

This proposal is intended to apply the same lighting efficacy standard for cannabis facilities in Illinois to all other indoor grow facilities. The amendment however allows lighting in greenhouses not used to grow cannabis to meet a slightly lower efficacy requirement of 1.7 µmol/J. This lower requirement is intended to account for the lower operating hours and thus longer payback periods in these applications. Buildings that have lighting loads less than 40kW are also proposed to be exempt from these requirements to limit additional financial burden on small grow operations. The efficacy requirement for greenhouses and exemption for small grow operations is consistent with a proposed addenda to ASHRAE 90.1. Buildings subject to the Cannabis Regulation and Tax Act (under statute 410 ILCS 705/10-45) are also proposed to be exempt from these requirements because they are covered under statute.

Cost Impact:

This proposal will result in no additional cost for growers using greenhouses because there is little to no cost difference between luminaires meeting the current 2021 IECC requirement of 1.6 µmol/J and the proposed requirement of 1.7 µmol/J. For indoor grow operations, the cost of purchasing a luminaire that meets a 2.2 µmol/J requirement compared to a facility facing no efficacy requirement would result in increased costs of approximately $72.61/ square foot of canopy.[26]

These requirements are extremely cost effective. A recent analysis found that every dollar spent in additional installation costs yields $6 in operating and maintenance cost savings over a 15-year period for luminaires in indoor grow facilities meeting the 2.2 µmol/J requirement. Every dollar spent in additional fixture costs yields $2 in operating and maintenance cost savings over 15-years for luminaires in greenhouses meeting the 1.7 µmol/J requirement compared with business as usual practice.[27]

---

[24] *Energy Savings Potential of SSL in Agricultural Applications*, U.S. Department of Energy: Office of Energy Efficiency and Renewable Energy, June 2020, www.energy.gov/sites/prod/files/2020/07/f76/ssl-agriculture-jun2020.pdf.

[25] Schimelpfenig, Gretchen. Energy Efficiency for Massachusetts Marijuana Cultivators, Resource Innovation Institute, Sept. 2020, resourceinnovationinstitute.wildapricot.org/RII-REPORTS/.

[26] Morlino, Lauren, Emerging Technologies & Services Manager at Vermont Energy Investment Corporation . *Re: Cost Information for VT Luminaires*, 21 June 2021.

[27] *Final CASE Report: Controlled Environment Horticulture*, California Statewide Codes and Standards Enhancement (CASE) Program, March 2021, https://title24stakeholders.com/wp-content/uploads/2021/03/2022-T24-NR-CEH-Final-CASE-Report_w-Addendum.pdf

Signature (for release of copyrights): _____

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: C405.16

Office Use Only	
Proposal Number:	C08-01
Date Submittal Received:	August 13, 2021

Date: 8/13/2021
Name: Edith Makra
Jurisdiction/Company: Metropolitan Mayors Caucus
Submitted on Behalf of: Metropolitan Mayors Caucus
Address: 433 W. Van Buren St., Suite 450
Chicago, IL 60607
Phone: 630-327-4193
E-Mail: emakra@mayorscaucus.org

Related Sections Impacted by this Amendment:

Revisions to Section C103.2, C401.2.2; New definitions, Addition of new Section C405.16

Revise as Follow (in strike-thru / underline format):

Revise text as follows:

C103.2 Information on construction documents. Construction documents shall be drawn to scale upon suitable material. Electronic media documented are permitted to be submitted when *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 herein governed. Details shall include the following as applicable:

6. Mechanical and service water heating systems and equipment types, sizes, fuel source and efficiencies.

C103.2.2 Electrification system. The construction documents shall provide details for additional electric infrastructure, including branch circuits, conduit, or pre-wiring, and panel capacity in compliance with the provisions of this code.

C105.2.5 Electrical system. Inspection shall verify lighting system controls, components, ~~and~~ meters, and additional electric infrastructure as required by the code, approved plans and specifications.

Add new definitions as follows:

ALL-ELECTRIC BUILDING. A *building* that contains no *combustion equipment*, or plumbing for *combustion equipment,* installed within the *building* or *building site.*

APPLIANCE. A device or apparatus that is manufactured and designed to utilize energy and for which this code provides specific requirements.

COMBUSTION EQUIPMENT. Any *equipment* or *appliance* used for space heating, *service water heating*, cooking, clothes drying and/or lighting that uses *fuel gas* or *fuel oil*.

COMMERCIAL COOKING APPLIANCES. Appliances used in a commercial food service establishment for heating or cooking food and which produce grease vapors, steam, fumes, smoke or odors that are required to be removed through a local exhaust ventilation system. Such appliances include deep fat fryers, upright broilers, griddles, broilers, steam-jacketed kettles, hot-top ranges, under-fired broilers (charbroilers), ovens, barbecues, rotisseries, and similar appliances. For the purpose of this definition, a food service establishment shall include any building or a portion thereof used for the preparation and serving of food.

EQUIPMENT. Piping, ducts, vents, control devices and other components of systems other than appliances that are permanently installed and integrated to provide control of environmental conditions for buildings. This definition shall also include other systems specifically regulated in this code.

FUEL GAS. A natural gas, manufactured gas, liquified petroleum gas or a mixture of these.

FUEL OIL. Kerosene or any hydrocarbon oil having a flash point not less than 100°F (38°C).

MIXED-FUEL BUILDING. A *building* that contains *combustion equipment* or includes piping for such *equipment*.

Revise text as follows:

C401.2.2 ASHRAE 90.1
Commercial buildings shall comply with the requirements of ANSI/ASHRAE/IESNA 90.1 and Section C405.16.

C405.16 Additional electric infrastructure. Buildings that contain *combustion equipment* and end-uses shall be required to install electric infrastructure in accordance with this section.

C405.16.1 Electric infrastructure for dwelling and sleeping units. *Combustion equipment* and end-uses serving individual *dwelling units* or *sleeping units* shall comply with Section R404.6.

C405.16.2 Combustion space heating. Space heating *equipment* that uses *fossil fuels* shall comply with either C405.16.2.1 or C405.16.2.2

C405.16.2.1 Low-capacity heating. Warm-air furnaces with a capacity less than 225,000 Btu/h and gas- and oil-fired boilers with a capacity less than 400,000 Btu/h shall be provided with a designated exterior location(s) in accordance with the following:

a. Natural drainage for condensate from cooling equipment operation or a condensate drain located within 3 feet (914 mm) of the location of the space heating equipment.

b. A dedicated branch circuit in compliance with NFPA70 Section 424.4 based on heat pump space heating equipment sized in accordance with the requirements of C403.1.1 and terminating within 3 feet (914 mm) of the location of the space heating equipment with no obstructions. Both ends of the branch circuit shall be labeled "For Future Heat Pump Space Heater."

Exception: Where an electrical circuit in compliance with NFPA70 Sections 440.4(B) and 440.35 exists for space cooling equipment.

C405.16.2.2 High-capacity heating. All other space heating *equipment* shall be provided with conduit that is continuous between a junction box located within 3 feet (914 mm) of the *equipment* and an electrical panel. The junction box, conduit and bus bar in the electrical panel shall be rated and sized to accommodate a branch circuit with sufficient capacity for an equivalent electric *equipment* with an equivalent equipment capacity. The electrical junction box and electrical panel shall have labels stating, "For Future Electric Space Heating Equipment".

C405.16.3 Combustion water heating. Water heating *equipment* that uses *fossil fuels* shall comply with either C405.16.3.1 or C405.16.3.2

C405.16.3.1 Low-capacity water heating. Water heaters with a capacity less than 300,000 Btu/h (88 kW) shall be installed in accordance with the following:

1. A dedicated 208/240-volt branch circuit with a minimum capacity of 30 amps shall terminate within 3 feet (914 mm) from the water heater and be accessible to the water heater with no obstructions. Both ends of the branch circuit shall be labeled with the words "For Future Heat Pump Water Heater" and be electrically isolated.

2. A condensate drain that is no more than 2 inches (51 mm) higher than the base of the installed water heater and allows natural draining without pump assistance shall be installed within 3 feet (914 mm) of the water heater.

3. The water heater shall be installed in a space with minimum dimensions of 3 feet (914 mm) by 3 feet (914 mm) by 7 feet (2134 mm) high.

4. The water heater shall be installed in a space with a minimum volume of 700 cubic feet (20,000 L) or the equivalent of one 16-inch (406 mm) by 24-inch (610 mm) grill to a heated space and one 8-inch (203 mm) duct of no more than 10 feet (3048 mm) in length for cool exhaust air.

C405.16.3.2 High-capacity water heating. Water heaters with a capacity greater than or equal to 300,000 Btu/h (88 kW) shall be provided with the following:

1. Conduit that is continuous between a junction box located within 3 feet (914 mm) of the *equipment* and an electrical panel. The junction box, conduit and bus bar in the electrical panel shall be rated and sized to accommodate a branch circuit with sufficient capacity for an equivalent electric *equipment* with an equivalent equipment capacity. The electrical junction box and electrical panel shall have labels stating, “For Future Electric Water Heating Equipment”.

2. A condensate drain that is no more than 2 inches (51 mm) higher than the base of the installed water heater and allows natural draining without pump assistance shall be installed within 3 feet (914 mm) of the water heater.

C405.16.4 Combustion cooking. Cooking *equipment* that use *fossil fuel* shall comply with either C405.16.4.1 or C405.16.4.2.

C405.16.4.1 Commercial cooking. *Commercial cooking appliances* shall be provided with a dedicated branch circuit with a minimum capacity of 12 kVA per 1 kBtu of appliance input capacity. The branch circuit shall terminate within 3 feet (914 mm) of the appliance with no obstructions. Both ends of the branch circuit shall be labeled with the words “For Future Electric Cooking Equipment” and be electrically isolated.

C405.16.4.2 Light and medium duty cooking. Light- and medium duty cooking *equipment* not designated as *commercial cooking appliances* shall be provided with a dedicated branch circuit in compliance with NFPA 70 Section 422.10. The branch circuit shall terminate within 6 feet (1829 mm) of *fossil fuel* ranges, cooktops and ovens and be accessible with no obstructions. Both ends of the branch circuit shall be labeled with the words “For Future Electric Cooking Equipment” and be electrically isolated.

C405.16.5 Combustion clothes drying. Clothes drying *equipment* that use *fossil fuels* shall comply with either C405.16.5.1 or C405.16.5.2

C405.16.5.1 Commercial drying. Clothes drying *equipment,* and end-uses for commercial laundry applications shall be provided with conduit that is continuous between a junction box located within 3 feet (914 mm) of the *equipment* and an electrical panel. The junction box, conduit and bus bar in the electrical panel shall be rated and sized to accommodate a branch circuit with sufficient capacity for an

equivalent electric *equipment* with an equivalent equipment capacity. The electrical junction box and electrical panel shall have labels stating, "For Future Electric Clothes Drying Equipment".

C405.16.5.2 Residential drying. Clothes drying *equipment, appliances,* and end-uses serving multiple *dwelling units* or sleeping areas with a capacity less than or equal to 9.2 cubic feet shall be provided with a dedicated 240-volt branch circuit with a minimum capacity of 30 amps shall terminate within 6 feet (1829 mm) of *fossil fuel* clothes dryers and shall be accessible with no obstructions. Both ends of the branch circuit shall be labeled with the words "For Future Electric Clothes Drying Equipment" and be electrically isolated.

C405.16.6 Other combustion equipment. *Combustion equipment* not covered by Sections C405.16.2-3 shall be provided with conduit that is continuous between a junction box located within 3 feet (914 mm) of the *appliance* or *equipment* and an electrical panel. The junction box, conduit and bus bar in the electrical panel shall be rated and sized to accommodate a branch circuit with sufficient capacity for an equivalent electric appliance, equipment or end use with an equivalent equipment capacity. The electrical junction box and electrical panel shall have labels stating, "For future electric equipment".

Reason:

In order for Illinois to reach net zero carbon emissions, the state must not only reduce energy use through energy efficiency and move to utility scale and on-site renewable energy, but also begin to transition away from using combustion equipment in buildings that runs on fossil fuels to electric equipment. In 2016, combustion equipment in commercial and residential buildings accounted for 17% of Illinois's greenhouse gas emissions.[28] Because of Illinois's cold climate and reliance on natural gas, a recent study found that Illinois ranked in the top 10 of US states for potential emission reductions through building electrification.[29] Therefore it is crucial that new buildings today can be cost-effectively retrofitted in the future with electric equipment so that emissions are not "locked-in" by gas-dependent building infrastructure.

Fortunately, heat pump technology has dramatically improved over the last few decades, giving contractors and building owners access to highly efficient electric heating and cooling, and water heating technologies. Even accounting for reduced efficiency in extreme cold weather, modern air source heat pumps are more than twice as efficient as gas furnaces and in Illinois's climate zone can save families up to 9 percent on their utility bills. All-electric new construction is also less expensive to build than a home with gas appliances.[30]

All-electric homes are also healthier homes. Gas appliances release harmful pollutants like nitrogen dioxide (NO2) and carbon monoxide (CO) either indoors because of gas stoves or outdoors because of space-heating and water heating equipment. A recent study from the Harvard Chang School of Public Health and RMI shows that in Illinois in 2017, air pollution from burning fuels in buildings led to an estimated 1,123 early deaths and $12.574 billion in health impact costs.[31] These emissions can particularly affect children. In a meta-analysis analyzing the connections between gas stoves and childhood asthma, children in homes with gas stoves were 42% more likely to experience asthma symptoms, and 32% more likely to being diagnosed with asthma.[32] Therefore, ensuring all-electric appliances can be installed in our buildings in the future is critical to reducing air pollution, protect public health, reducing utility and construction costs, and meeting climate goals.

One of the biggest expenses of electrification retrofits – and therefore barriers to electrification in existing buildings - is running electrical infrastructure through a completed and enclosed building that has combustion equipment. This significant future cost can be greatly reduced through making simple, low-cost modifications to

[28] "U.S. Energy Information Administration - EIA - Independent Statistics and Analysis." *State-Level Energy-Related Carbon Dioxide Emissions, 2005-2016*, www.eia.gov/environment/emissions/state/analysis/.
[29] Electric Buildings: Repowering Homes and Businesses for Our Health and Environment, *Environment America, U.S PIRG, Frontier Grou*p, Apr. 2021, environmentamerica.org/sites/environment/files/reports/Electric-Buildings-2021/National-Electric-Buildings-Web.pdf.
[30] *The New Economics of Electrifying Buildings*. RMI, 12 Feb. 2021, rmi.org/insight/the-new-economics-of-electrifying-buildings.
[31] *Health Air Quality Impacts of Buildings Emissions*. RMI, 5 May 2021, rmi.org/health-air-quality-impacts-of-buildings-emissions#MI.
[32] *Gas Stoves: Health and Air Quality Impacts and Solutions.* RMI, 1 Feb. 2021, rmi.org/insight/gas-stoves-pollution-health/.

buildings during construction that enable easier electrification in the future. The requirements in this proposed amendment ensure that the electrical infrastructure is in place so that building owners can convert to an all-electric building in the future and ensures that unitized gas water heaters can be replaced with high-performance heat pump water heaters (HPWHs).

Changes with similar intent, electric-ready and electric-preference, with goals of moving toward zero carbon new construction, are being explored in other jurisdictions including Wisconsin, Michigan, Washington State, Denver, CO, Washington, DC, New York State, Massachusetts, Connecticut and California.[33] NBI is submitting this amendment along with amendments that address electric-preference, on-site renewables, electric vehicles, and grid integration techniques. These proposed changes to Illinois's code, working together, will put Illinois on the path to a decarbonized, resilient, and healthier future.

Electric Infrastructure:

The addition of C405.16 ensures the electrical plugs and physical space exists so that *a building owner can cost effectively replace their gas equipment and appliances with electric equipment in the future. This language is based on the approach adopted in the electrification reach codes adopted by various California cities.*

C405.16.1 indicates that electric infrastructure requirements for individual dwelling units should meet the requirements for electric infrastructure in a similar proposed code amendment for the residential energy code. If the Capital Development Board decides to adopt electric-readiness requirements for the commercial energy code but not the residential energy code, this section should be revised.

C405.16.2 ensures the electric infrastructure for combustion space heating is present so that a unitized heat pump or electric central heating system can be installed in the future. Electric requirements are based on sizing of electric heating systems that would be able to replace the unitized systems under C405.16.2.1, but since there is not an actual equipment size to reference and equipment size can vary depending on the size of the space and the climate, the section also references NFPA 70 Section 424.4 to establish the size of the heat pump equipment that would be required for the specific space. For central heating systems, the language presents "electric-capable" requirements, a step down from electric ready, ensuring that the primary infrastructure exists for central heating, but to allow for future advancements in central heating the systems are not considered to be "plug and play".

C405.16.3 is focused on ensuring that water heater locations are physically capable of incorporating a future unitized heat pump water heater (HPWH) or central electric water heating system. For unitized water heating systems, *requirement 1 ensures that there is a branch circuit ready to support the future installation of a HPWH. Requirement 2 ensures that the condensate generated by a HPWH compressor can be easily drained away. Requirement 3 ensures that the water heater location is physically large enough to accommodate HPWHs that are frequently wider and/or taller than code-minimum gas water heaters. Requirement 4 ensures that a future HPWH has access to sufficient air volume to effectively operate.* These requirements are based on the requirements adopted in several CA jurisdictions electrification reach codes. For central water heating systems, the language prepares the building for central HPWH by requiring condensate drainage. Central HPWH are currently undergoing extensive field testing and validation and are expected to be the primary replacement for central water heating systems.

The addition of C405.16.4 establishes a sizing equivalency based on the input of standard commercial range gas burners and electric hobs and light and medium duty cooking appliances.

C405.16.5 requires combustion clothes drying to have a circuit installed nearby so that a building owner can replace the combustion clothes dryer with electric equipment cost effectively in the future. The section is broken into two parts to clarify requirements for commercial clothes dryers and

[33] Golden, Sarah. *"Trend: Commercial Buildings Go All-Electric*." Greenbiz, 2 Mar. 2020, www.greenbiz.com/article/trend-commercial-buildings-go-all-electric.

residential clothes dryers. C405.16.6 address electric-readiness requirements for combustion equipment not covered by the pervious section.

This section and others rely on new definitions for appliance, equipment, fuel gas and fuel oil which are mirrored from 2021 IMC to be useful in defining combustion equipment.

Inspection, Construction Documents and Efficiency

C103.2.2 requires architects to note the electric infrastructure in place on construction documents to allow for easier enforcement of these provisions and C105.2.5 requires these systems to be inspected.

Cost Impact:

Illinois buildings that are all-electric would have no change in construction costs. Mixed fuel buildings would be slightly more expensive to build because they would have to be electric-ready. Electric-ready requirements are anticipated to be nominal. Recent analysis by NBI and partners using cost data from RSMeans for a medium office indicates that additional electrical infrastructure costs for water-heating and space-heating would cost a typical office building an additional $12,300.

However, if a building owner were to have to retrofit their building from using combustion equipment to natural gas equipment costs without these requirements in place, costs could be exorbitant.

I hereby grant and assign to the State of Illinois all rights in copyright I may have in any authorship contributions I make to the State of Illinois in connection with any proposed amendments or public comment, in its original form submitted or revised form, including written and verbal modifications. I understand that I have no rights in any State of Illinois publications that use such contributions in the form submitted by me or another similar form and certify that such contributions are not protected by the copyright of any other person or entity.

Signature (for release of copyrights): _____

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: C402.1.1, C402.1.2, C406.1

Office Use Only	
Proposal Number:	C09-01
Date Submittal Received:	August 13, 2021

Date: 8/13/2021
Name: Edith Makra
Jurisdiction/Company: Metropolitan Mayors Caucus
Submitted on Behalf of: Metropolitan Mayors Caucus
Address: 433 W. Van Buren St., Suite 450
Chicago, IL 60607
Phone: 630-327-4193
E-Mail: emakra@mayorscaucus.org

Related Sections Impacted by this Amendment:

Revisions to Section C402.1.1, C402.1.2, and C406.1; and new definitions

Revise as Follow (in strike-thru / underline format):

Add new definitions as follows:

ALL-ELECTRIC BUILDING. A *building* that contains no *combustion equipment*, or plumbing for *combustion equipment,* installed within the *building* or *building site.*

APPLIANCE. A device or apparatus that is manufactured and designed to utilize energy and for which this code provides specific requirements.

COMBUSTION EQUIPMENT. Any *equipment* or *appliance* used for space heating, *service water heating*, cooking, clothes drying and/or lighting that uses *fuel gas* or *fuel oil*.

EQUIPMENT. Piping, ducts, vents, control devices and other components of systems other than appliances that are permanently installed and integrated to provide control of environmental conditions for buildings. This definition shall also include other systems specifically regulated in this code.

FUEL GAS. A natural gas, manufactured gas, liquified petroleum gas or a mixture of these.

FUEL OIL. Kerosene or any hydrocarbon oil having a flash point not less than 100°F (38°C).

MIXED-FUEL BUILDING. A *building* that contains *combustion equipment* or includes piping for such *equipment*.

Revise text as follows:

C402.1.1 Low energy buildings and greenhouses. The following low-energy buildings, or portions thereof separated from the remainder of the *building*-by-*building thermal envelope assemblies* complying with this section shall be exempt from the building thermal envelope provisions of Section C402.

1. Those containing no *combustion equipment* with a peak design rate of energy usage less than 3.4 Btu/h·ft2 (10.7 W/m2) or 1.0 watt/ft2 of floor area for space conditioning purposes.

C402.1.1.1 Greenhouses. Greenhouse structures or areas containing no *combustion equipment* that are mechanically heated or cooled and that comply with all of the following shall be exempt from the building envelope requirements of this code:

C402.1.2 Equipment buildings. Buildings that comply with the following shall be exempt from the *building thermal envelope* provisions of this code:

6. Contain no *combustion equipment*.

Revise text as follows:

C406.1 Additional energy efficiency credit requirements. New *all-electric buildings* shall achieve a total of 10 credits and new *mixed-fuel buildings* shall achieve a total of 15 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 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:

Reason:

In order for Illinois to reach net zero carbon emissions, the state must not only reduce energy use through energy efficiency and move to utility scale and on-site renewable energy, but also begin to transition away from using combustion equipment in buildings that runs on fossil fuels to electric equipment. In 2016, combustion equipment in commercial and residential buildings accounted for 17% of Illinois's greenhouse gas emissions.[34] Because of Illinois's cold climate and reliance on natural gas, a recent study found that Illinois ranked in the top 10 of US states for potential emission reductions through building electrification.[35] Therefore it is crucial that new buildings today are incentivized to install electric equipment now so that emissions are not "locked-in" by gas-dependent building infrastructure. The incentive proposed is would require buildings that are mixed fuel to be slightly more efficient than all-electric buildings.

Fortunately, heat pump technology has dramatically improved over the last few decades, giving contractors and building owners access to highly efficient electric heating and cooling, and water heating technologies. Even accounting for reduced efficiency in extreme cold weather, modern air source heat pumps are more than twice as efficient as gas furnaces and in Illinois's climate zone can save families up to 9 percent on their utility bills. All-electric new construction is also less expensive to build than a home with gas appliances.[36]

All-electric homes are also healthier homes. Gas appliances release harmful pollutants like nitrogen dioxide (NO2) and carbon monoxide (CO) either indoors because of gas stoves or outdoors because of space-heating and water heating equipment. A recent study from the Harvard Chang School of Public Health and RMI shows that in Illinois in 2017, air pollution from burning fuels in buildings led to an estimated 1,123 early deaths and $12.574 billion in health impact costs.[37] These emissions can particularly affect children. In a meta-analysis analyzing the connections between gas stoves and childhood asthma, children in homes with gas stoves were 42% more likely to experience asthma symptoms, and 32% more likely to being diagnosed with asthma.[38] Therefore, incentivizing all-electric appliances is critical to reducing air pollution, protecting public health, reducing utility and construction costs, and meeting climate goals.

[34] "U.S. Energy Information Administration - EIA - Independent Statistics and Analysis." *State-Level Energy-Related Carbon Dioxide Emissions, 2005-2016*, www.eia.gov/environment/emissions/state/analysis/.
[35] Electric Buildings: Repowering Homes and Businesses for Our Health and Environment, *Environment America, U.S PIRG, Frontier Grou*p, Apr. 2021, environmentamerica.org/sites/environment/files/reports/Electric-Buildings-2021/National-Electric-Buildings-Web.pdf.
[36] *The New Economics of Electrifying Buildings*. RMI, 12 Feb. 2021, rmi.org/insight/the-new-economics-of-electrifying-buildings.
[37] *Health Air Quality Impacts of Buildings Emissions*. RMI, 5 May 2021, rmi.org/health-air-quality-impacts-of-buildings-emissions#MI.
[38] *Gas Stoves: Health and Air Quality Impacts and Solutions.* RMI, 1 Feb. 2021, rmi.org/insight/gas-stoves-pollution-health/.

Changes with similar intent for electric-preference, with goals of moving toward zero carbon new construction, are being explored in other jurisdictions including Wisconsin, Michigan, Washington State, Denver, CO, Washington, DC, New York State, Massachusetts, Connecticut and California.[39] NBI is submitting this amendment along with amendments that address electrification-readiness, on-site renewables, electric vehicles, and grid integration techniques. These proposed changes to Illinois's code, working together, will put Illinois on the path to a decarbonized, resilient, and healthier future.

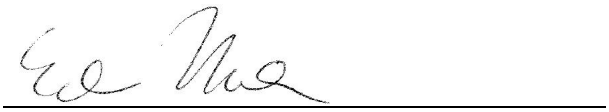
Revisions to C406.1 seeks to encourage electrification and decrease the carbon impact of mixed-fuel buildings by requiring mixed fuel buildings to achieve 5 more efficiency credits than all-electric buildings. These points can be easily gained by implementing a number of strategies detailed in Section C406 such as installing more efficient HVAC equipment, reducing lighting power, or installing on-site renewables.

Low energy buildings are currently exempt from thermal envelope requirements. The revision to C402.1.1 requires greenhouses and low-energy buildings that choose not to install insulation to be all-electric to reduce their greenhouse gas impact.

Cost Impact:

Illinois buildings that are all-electric would have no change in construction costs. Mixed fuel buildings would be slightly more expensive to build because they would have to meet additional efficiency requirements. Recent analysis by NBI and partners using cost data from RSMeans for a medium office indicates that additional efficiency credits for mixed fuel buildings would cost an additional $29,000 assuming those credits were gained by adding renewables. As shown in the proposed solar amendment, renewables in Illinois, assuming one receives only the federal tax credit, will pay for themselves in operating cost savings within 11 to 16 years of operation.

I hereby grant and assign to the State of Illinois all rights in copyright I may have in any authorship contributions I make to the State of Illinois in connection with any proposed amendments or public comment, in its original form submitted or revised form, including written and verbal modifications. I understand that I have no rights in any State of Illinois publications that use such contributions in the form submitted by me or another similar form and certify that such contributions are not protected by the copyright of any other person or entity.

Signature (for release of copyrights): 

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

[39] Golden, Sarah. *"Trend: Commercial Buildings Go All-Electric*." Greenbiz, 2 Mar. 2020, www.greenbiz.com/article/trend-commercial-buildings-go-all-electric.

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: C103.2, C405.15

Office Use Only	
Proposal Number:	C10-01
Date Submittal Received:	August 13, 2021

Date: 8/13/2021
Name: Edith Makra
Jurisdiction/Company: Metropolitan Mayors Caucus
Submitted on Behalf of: Metropolitan Mayors Caucus
Address: 433 W. Van Buren St., Suite 450
Chicago, IL 60607
Phone: 630-327-4193
E-Mail: emakra@mayorscaucus.org

Related Sections Impacted by this Amendment:

Section C103.2, and new Section C405.15

Revise as Follow (in strike-thru / underline format):

C103.2 Information on construction documents. Construction documents shall be drawn to scale upon suitable material. Electronic media documented are permitted to be submitted when *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 herein governed. Details shall include the following as applicable:

14. Location of pathways for routing of raceways or cable from the renewable energy system to the electrical service panel and electrical energy storage system area.

15. Location and layout of a designated area for electrical energy storage system.

Add new text as follows:

C405.15 Energy storage infrastructure. Each building site shall have equipment for on-site energy storage not less than 2 feet (610 mm) in one dimension and 4 feet (1219 mm) in another dimension and located in accordance with Section 1206.2.8 of the International Fire Code and Section110.26 of the NFPA 70.

Exception: Where an onsite electrical energy system storage system is installed.

C405.15.1 Electrical service reserved space. The main electrical service panel shall have a reserved space to allow installation of a two-pole circuit breaker for future electrical energy storage system installation This space shall be labeled "For Future Electric Storage." The reserved spaces shall be positioned at the end of the panel that is opposite from the panel supply conductor connection.

Reason:

Energy storage is critical to achieving the goal outlined in the Clean Energy Jobs Act to utilize 100% renewable energy by 2050. These systems will also improve Illinois's economy, present a cost savings opportunity for

Illinois homeowners in the future and increase Illinois's resilience to power outages. In 2020, 11% of Illinois's electricity is sourced from renewable energy, primarily wind, an intermittent source of energy.[40] According to ComEd, as Illinois increases the amount of electricity generated from renewables in order to meet clean energy goals, buildings must be prepared to aid in this transition by storing energy to match grid demands.[41]

Policies to encourage energy storage will improve Illinois's economy. Energy storage is expected to grow by over 40% each year until 2025[42] and the Midwest, because of its manufacturing background and experience in batter-storage technology for cars is becoming a clear leader in this market.[43]

Energy storage will also present a cost-saving opportunity for Illinois businesses. Battery prices have and will likely continue to fall in the United States,[44] meaning that behind-the-meter storage will likely become more accessible and affordable in the short-term. More and more utilities are moving beyond voluntary programs and are expanding use of time-of-use rates for electricity as a tool for shaping demand. Ensuring businesses are energy-storage ready now will allow them to cost effectively install storage systems in the future and take advantage of these voluntary programs.

Finally, energy storage will improve Illinois's resilience to power outages. Requiring homes to be storage-ready will ensure Illinois communities are more resilient by allowing buildings to cost effectively install storage which can operate for a short-period of time without relying on the electricity grid.

This code proposal requires commercial buildings to have the physical space, panel space and equipment for a future energy storage system. This requirement has been migrated up from Appendix CB Solar-Ready Zone into the main body of the code. This language includes revisions from the 2019 Group B Public Comment that were not incorporated into the final text of the 2021 IECC but modifies the language to ensure needed correlation with the IFC and NFPA. The reference to the IFC was also updated to the latest version. For ease of enforcement, information for both renewable energy and electrical energy storage have been included as part of construction documents.

Cost Impact:

Incremental costs of ensuring buildings are energy storage ready will increase costs but those costs are minor compared to retrofit costs for buildings who chose to add storage later when a building is not storage-ready. These incremental cost impacts include additional design professional fees, markings on the panels, and additional construction costs only if there were not spare square footage available in the equipment or storage rooms where panels are generally located.

---

[40] *Illinois - State Energy Profile Analysis*, U.S. Energy Information Administration (EIA), www.eia.gov/state/analysis.php?sid=IL.

[41] *In Illinois, Storage Is among the next Hurdles for Renewables Expansion*, Energy News Network, 3 May 2019, energynews.us/2019/05/03/in-illinois-storage-is-among-the-next-hurdles-for-renewables-expansion/.

[42] "Battery Storage Paves Way for a Renewable-Powered Future." *International Renewable Energy Agency*, www.irena.org/newsroom/articles/2020/Mar/Battery-storage-paves-way-for-a-renewable-powered-future.

[43] Balaskovitz, Andy, and Energy News Network August 13 Andy Balaskovitz. "Michigan Emerges as a Leader in Battery Storage Industry, Research." *Energy News Network*, 12 Aug. 2015, energynews.us/2015/08/13/michigan-emerges-as-a-leader-in-battery-storage-industry-research/.

[44] Lee, Timothy. *Battery Prices Have Fallen 88 Percent over the Last Decade*. Ars Technica, 18 Dec. 2020, arstechnica.com/science/2020/12/battery-prices-have-fallen-88-percent-over-the-last-decade/#:~:text=The%20average%20cost%20of%20a,of%2013%20percent%20since%202019.

Signature (for release of copyrights): _____

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: C202

Office Use Only	
Proposal Number:	C11-01
Date Submittal Received:	August 13, 2021

Date: August 14, 2021
Name: Bill McHugh
Jurisdiction/Company: Chicago Roofing Contractors Association
Submitted on Behalf of:
Address: 4415 W. Harrison St., #540
Hillside, IL 60162
Phone: 708-449-3340
E-Mail: bill@crca.org

Related Sections Impacted by this Amendment:
Revise as Follow (in strike-thru / underline format):

C202

ROOF MEMBRANE PEEL AND REPLACEMENT. Where an existing weather resisting roof membrane alone is removed, exposing insulation, an existing roof membrane or sheathing and only a new weather resisting roof membrane or recover board and insulation is installed.

Reason:

This modification to the existing language is to cover another situation that occurs on rooftops – the bottom roof is in good shape, but aged and can be reused as a base for the new roof. In this case, an existing roof has had a recover board added, and then a roof membrane applied, totally two roofs on the building.

That new top roof membrane and recover board needs replacing. In this case, if the bottom membrane is still suitable for roof recover, a new recover board and new membrane is installed on top of the old, original roof membrane. This edit would codify this method, a viable option for many roofs in the cities and suburbs in IL.

Cost Impact:

This modification will not increase the cost of construction if it is deemed to be a roof membrane peel and replacement, which is already allowed by current code.

Signature (for release of copyrights): WJM…

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: C202, C402.2

Office Use Only	
Proposal Number:	C12-01
Date Submittal Received:	August 13, 2021

Date: August 13 2021
Name: Leonard Sciarra
Jurisdiction/Company: Sciarra Architecture and Planning, LLC
Submitted on Behalf of: Sciarra Architecture and Planning, LLC
Address: 3003 Park Place
Evanston, IL 60201
Phone: 847.345.5619
E-Mail: leonard.sciarra@gmail.com

Related Sections Impacted by this Amendment: C402.2.2 – New Section

Revise as Follow (in strike-thru / underline format):

add new definitions to Chapter 2 as follows:

thermal bridge: An element that has higher thermal conductivity than the surrounding materials, which creates a path of least resistance for heat transfer. For the purposes of determining *building envelope* requirements, the classifications for thermal bridges are defined as follows:

clear field thermal bridge: elements of a *building envelope* assembly that are distributed over the area of the assembly and addressed in determining the thermal performance of the assembly in accordance with Normative Appendix A. Examples of *clear field thermal bridges* include studs, webs and face shells of masonry units, ties, tracks, plates, girts and purlins for metal building envelopes, and fasteners. Fasteners used to construct assemblies in accordance with normative Appendix A are not considered nor separately defined as *point thermal bridges.*

linear thermal bridge: a length-based element associated with horizontal, vertical, or diagonal elements that penetrate the insulation in the *building envelope* and with length measured along the exterior surface of the *building envelope*. Examples of *linear thermal bridges* include edges of floors, balconies, columns and beams in the plane of an assembly, parapets, roof-wall-floor intersections, *fenestration* interfaces, shelf angles and similar conditions not otherwise defined as a *clear field thermal bridge* or *point thermal bridge*.

point thermal bridge: A discrete element that penetrates the insulation in the *building envelope*. Examples of *point thermal bridges* include a beam penetrating a wall, a column penetrating a *roof* or *floor*, and an anchor or

connection used to attach an element to the *building* and not otherwise defined as a *clear field thermal bridge* or *linear thermal bridge*. The cross-sectional area of the point thermal bridge is measured at the outer surface of the outermost layer of insulation that is penetrated by the element.

insert new section in 402 as follows:

C402.2.2 Above-Grade Wall Thermal Bridges

Individual *point thermal bridges* and *linear thermal bridges* shall comply with equation C402.2.2

Exceptions:

1. Service penetrations, including mechanical, electrical, plumbing, telecommunications, and fire services that pass thru the *opaque building envelope*.
2. Insulated roof curbs and blocking.
3. *Clear field thermal bridges*
4. Individual *Point thermal bridges* that are less than the allowances in table C402.2.2.

Table C402.2.2 Allowable *point thermal bridge* cross sectional area	
Allowable Area per *point thermal bridge* In^2 (mm^2)	Common material name
3 (1935)	Carbon Steel
9 (5800)	Stainless Steel
65 (41935)	Concrete and Masonry

Equation C402.2.2.

347 Btu • in./(ft^2•hr·°F) × 0.003% · *above grade* area of the *building envelope* ≥ $(k_1 \times A_1) + (k_2 \times A_2) + (k_3 \times A_3)$…

(C402.2.2) I-P

50 W/(m·K) × 0.003% · *above grade* area of the *building envelope* ≥ $(k_1 \times A_1) + (k_2 \times A_2) + (k_3 \times A_3)$…

(C402.2.2) S-I

Where

k_1, k_2, k_3 … = the thermal conductivity of material 1, material 2, material 3, etc… expressed in Btu • in./(ft^2•hr·°F) (W/(m·K)) for point thermal bridge material 1, material 2, material 3, etc…(e.g. concrete, carbon steel, stainless steel, wood)

A_1, A_2, A_3,… = the total cross sectional area of *point thermal bridges* and *linear thermal bridges* of material 1, material 2, material 3, etc….expressed in ft^2 (m^2)

Modify section 407 as follows:

Table C407.2 REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE	
SECTION	TITLE
Envelope	
C402.5	Air Leakage-thermal envelope
C402.2.2	Thermal Bridging
Rest of table unchanged	

Reason:

This proposal closes a loophole in the IECC 2021 by limiting large thermal bridges and brings the IECC 2021 into alignment with an ongoing addendum to ASHRAE 90.1-2019. The IECC currently does not make a distinction between small clear field thermal bridges and somewhat larger point thermal or linear thermal bridges. The IECC addresses clear field thermal bridges with the current definition of continuous insulation. This addendum address the two other types of thermal bridges, point and linear. These allowances are based on:

1) items that are large enough to be on a set of construction drawings.
2) based on a survey of approximately 65 buildings across Iowa and Nebraska, 70% of buildings could meet the 0.003% threshold.

Cost Impact:

These proposed changes do not have a cost effectiveness threshold in that they do not impose any alternative construction requirements, but apply a limit to existing design (much like the limit on fenestration, its just a limit), which based on our survey over 70% of buildings would already comply. So this is really limiting the worst offenders. Buildings that exceed this limit would have to pursue a modeling approach, which seems reasonable, as buildings with large thermal bridges most likely are more complex with sophisticated A/E teams and Owners.

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

C13

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: C402.5

Office Use Only	
Proposal Number:	C13-01
Date Submittal Received:	August 13, 2021

Date: August 13 2021
Name: Leonard Sciarra
Jurisdiction/Company: Sciarra Architecture and Planning, LLC
Submitted on Behalf of: Sciarra Architecture and Planning, LLC
Address: 3003 Park Place
Evanston, IL 60201
Phone: 847.345.5619
E-Mail: leonard.sciarra@gmail.com

Related Sections Impacted by this Amendment: C402.5 – Air Leakage

Revise as Follow (in strike-thru / underline format):

C402.5 Air Leakage—Thermal Envelope (Mandatory)

The *thermal envelope* of all buildings less than 25,000 ft^2 (2300 m^2) shall shall be tested in accordance with Section C402.5.2 or C402.5.3 and shall also comply with Sections C402.5.7, C402.5.8 and C402.5.9. The *thermal envelope* of all other buildings shall comply with Sections C402.5.1 through C402.5.11.1, or the building *thermal envelope* shall be tested in accordance with Section C402.5.2 or C402.5.3. Where compliance is based on such testing, the building shall also comply with Sections C402.5.7, C402.5.8 and C402.5.9.

C402.5.2 Dwelling and sleeping unit enclosure testing

The *building thermal envelope* shall be tested in accordance with ASTM E779, ANSI/RESNET/ICC380, ASTM E3158 or ASTM E1827 or and equivalent method approved by the code official. The measured air leakage shall not exceed 0.30 cfm/ft2 (1.5L/s m2) of the testing unit enclosure area at a pressure differential of 0.3 ~~0.2~~ inch water gauge (75 ~~50~~ Pa). Where multiple dwelling units or sleeping units or other occupiable conditioned spaces are contained within one *building thermal envelope*, each unit shall be considered an individual testing unit, and the building air leakage shall be the weighted average of all testing unit results, weighted by eash testing unit's enclosure area. Units shall be tested separately with and unguarded blower door test as follows:

1. Where the buildings have fewer than eight testing units, each testing unit shall be tested.
2. For buildings with eight or more testing units, the greater of seven units or 20 percent of the texting units in the building shall be tested, including a top floor unit, a ground floor unit, and a unit with the largest testing unit enclosure area. For each tested unit that exceeds the maximum air leakage rate, an individual two units shall be tested, including a mixture of tesing unit types and locations

C402.5.3 Building thermal envelope testing

The *building thermal envelope* shall be tested in accordance with ASTM E779, ANSI/RESNET/ICC380, ASTM E3158 or ASTM E1827 or and equivalent method approved by the code official. The measured air leakage shall not exceed 0.30 ~~0.40~~ cfm/ft2 (1.5 ~~2.0~~L/s m2) of the testing unit enclosure area at a pressure differential of 0.3 inch water gauge (75 Pa).

Alternatively, portions of the building shall be tested and the measured air leakages shall be area weighted by the surface area of the building envelope in each portion. The weighted average test results shall not exceed the whole building leakage limit. In the alternative approach, the following portions of the building shall be tested:

1. The entire envelope area of all stories that have any spaces directly under a roof.
2. The entire envelope area of all stories that have a building entrance, exposed floor, or loading dock, or are below grade.
3. Representative above-grade sections of the building totaling at least 25 percent of the wall area enclosing the remaining conditioned area.

Exception: Where the measured air leakage rate exceeds 0.30 ~~0.40~~ cfm/ft2 (1.5 ~~2.0~~ L/s x m2) but does not exceed 0.40 ~~0.60~~ cfm/ft2 (2.0 ~~3.0~~ L/s x m2), a diagnostic evaluation using smoke tracer or infared imaging shall be conducted while the building is pressurized along with a visual inspection of the air barrier. Any leaks noted shall be sealed where such sealing can be made without destruction of existing building components. An additional report identifying the corrective actions taken to seal leaks shall be submitted to the code official and the building owner, and shall be deemed to comply with the requirements of this section.

Reason:

This proposal brings the IECC 2021 into alignment with an ongoing addendum to ASHRAE 90.1-2019. It does three things:

1. It updates the required pressure differential that is more typically used in commercial buildings (75 Pa).
2. It updates the target air leakage rate for commercial buildings to match what was proven to be cost effective in the 90.1 deliberations.
3. It adds a requirement for testing of all buildings less than 25,000 square feet.

Cost Impact:

These proposed changes were considered to be cost effective in the ASHRAE 90.1 committee which resulted in the public review draft - addendum t. The 90.1 process uses an approximately 40 year life to perform a life cycle cost assessment. Using a incremental increase in construction cost of $1,600 and national electric and gas rates ($0.1099/Kwh $0.98/Therm), there was a Net Present Value of $6,037 for Climate Zone 5 and $3,302 for Climate Zone 4.

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: C402.4.1.3

Office Use Only	
Proposal Number:	C14-01
Date Submittal Received:	August 13, 2021

Date: August 13 2021
Name: Leonard Sciarra
Jurisdiction/Company: Sciarra Architecture and Planning, LLC
Submitted on Behalf of: Sciarra Architecture and Planning, LLC
Address: 3003 Park Place
Evanston, IL 60201
Phone: 847.345.5619
E-Mail: leonard.sciarra@gmail.com

Related Sections Impacted by this Amendment: C402.4.1.3 – New Section

Revise as Follow (in strike-thru / underline format):

insert new section as follows

C402.4.1.3 Fenestration Orientation

The vertical fenestration shall comply with equation C402.4.1.3

$$A_w \times SHGC_w \leq (A_t \times SHGC_c)/4 \text{ and } A_e \times SHGC_e \leq (A_t \times SHGC_c)/4 \qquad \text{(equation C402.4.1.3)}$$

where:

A_w = west-oriented vertical fenestration area

A_e = east-oriented vertical fenestration area

A_t = total vertical fenestration area

$SHGC_c$ = SHGC criteria in Tables C402.4

$SHGC_e$ = SHGC for east-oriented fenestration

$SHGC_w$ = SHGC for west-oriented fenestration

Exceptions:

1. Buildings with shade on more than 75 percent 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 in the northern hemisphere).
2. 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.

Reason:
This proposal brings the IECC into alignment with some of the current provisions in ASHRAE standard 90.1 around fenestration and solar heat gain. It has been demonstrated that in Both Climate Zones 4 and 5, east and west fenestration have an outsized contribution to building cooling loads.

Cost Impact:
These proposed changes do not have a cost effectiveness test in that they do not impose any alternative construction, but apply a limit to existing design, which based on experience and modeling result in lower energy buildings.

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

Public Code Change Proposal Form **Code Section(s): C202, C503.1, C503.2**

To Amend the 2021 Illinois Energy Conservation Code

Mark S. Graham,
Vice President, Technical Services
National Roofing Contractors Association (NRCA)
10255 W. Higgins Road, Suite 600
Rosemont, IL 60018
(847) 493-7511 Direct
(847) 299-9070 Office main
mgraham@nrca.net
www.nrca.net

Proposal No. C15-01
Date of Submittal. August 14, 2021

Signature (for release of copyrights). MSG (electronic)

Sections Impacted by Amendment. C202, C503.1

Revise as Follows (In ~~strike-out~~/underline format):

SECTION C202
GENERAL DEFINITIONS

ROOF REPLACMENT. The process of removing ~~the~~ all existing layers of the roof ~~covering~~system down to the roof deck, repairing any damaged substrate and installing a new roof ~~covering~~system.

C503.1 General. *Alterations* to any *building* or structure shall comply with the requirements of Section C503 and the code for new construction. *Alterations* shall be such that the existing *building* or structure is not less conforming to the provisions of this code than the existing *building* or structure was prior to the *alteration*. *Alterations* to an existing *building*, *building* system or portion thereof shall conform to the provisions of this code as those provisions relate to new construction without requiring the unaltered portions of the existing *building* or *building* system to comply with this code.
Alterations shall not create an unsafe or hazardous condition or overload existing *building* systems.
Exception: The following *alterations* need not comply with the requirements for new construction, provided that the energy use of the building is not increased:
1. Storm windows installed over existing *fenestration*.
2. Surface-applied window film installed on existing single-pane *fenestration* assemblies reducing solar heat gain, provided that the code does not require the glazing or *fenestration* to be replaced.
3. Existing ceiling, wall or floor cavities exposed during construction, provided that these cavities are filled with insulation.
4. Construction where the existing roof, wall or floor cavity is not exposed.
5. *Roof recover*.
6. *Air barriers* shall not be required for *roof recover* and roof replacement where the *alterations* or renovations to the building do not include *alterations*, renovations or *repairs* to the remainder of the building envelope.

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.

Exceptions: In accordance with the following, provided that the energy use of the building is not increased:

Formatted: Normal, Left, Space After: 6 pt, Don't adjust space between Latin and Asian text, Don't adjust space between Asian text and numbers

Formatted: Font: Not Bold

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

Page | 1

1. Where the existing roof insulation is integral to or is located below the roof deck.
2. Where the new *roof assembly* above deck *R-Value* or *roof assembly U-factor*, is installed in accordance with the following;
   a. In compliance with the provisions of either C402.1.3, C402.1.4, C402.1.5 or C407; and,
   b. In maximum practicable compliance with Table C402.1.3 or Table C402.1.4 or C402.1.5, including any partial compliance in areas subject to limiting conditions identified in a survey of existing conditions conducted prior to the *alteration* and provided to the *code official*; and,
   c. 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*.

Formatted: Space After: 6 pt

Formatted: No underline

Formatted: No underline

Formatted: Space After: 6 pt, Numbered + Level: 2 + Numbering Style: a, b, c, … + Start at: 1 + Alignment: Left + Aligned at: 0.75" + Indent at: 1", Tab stops: 0.5", Left

Reason. The proposal addresses envelope requirements applicable to *roof replacements* to existing *buildings* by:

- Defining *roof replacement* consistently with the International Building Code (IBC) and consistent with contemporary roofing industry and code enforcement terminology;
- Confirming *roof replacement* as an *alteration* having its unique set of provisions by exception, and
  - Consistent with the intent of the framers of provisions of the Illinois Energy Conservation Code for *alterations* to existing buildings;
  - Consistent with the Chicago Memorandum (attached) as negotiated by the CRCA and the former IL DCEO, Office of Energy & Recycling in support of the Chicago Energy Conservation Code;
- Adding a provision for an "inspection report" of existing conditions conducted prior to the alteration and requiring its submission to those who enforce the Code; and
- Assuring advocates of efficiency measures that 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 *roof replacement* operations.

Cost Impact. The amendment will neither increase nor decrease the cost of construction.

Increases in model energy codes' building energy performance requirements have resulted in increased R-values being specific for many of the thermal envelope components of the building, including and particularly, roof systems. Where is the equivalency among a four-story brownstone in Chicago required to provide a low-slope, above-deck R-value of R-60, while a four-story multi-family building in Oak Park is permitted to provide a low-slope, above-deck R-value of R-30? Comparatively, where is the equivalency among a three-story, three-flat in Rockford is required to provide a low-slope, above-deck R-value of R-60, while a two-story Bass Pro Shop in Belleville is allowed to provide a low-slope, above-deck R-value of R-30?

Such R-value increases have been implemented into the code with little to no consideration of the added initial (construction) costs and long-term payback to building owners and local property managers who

(primarily) initiate their maintenance, repair and replacement by initiating such inquiries, not with an Architect or code enforcement but a roofing contractor.

Accordingly, NRCA conducted a 2014 energy-savings and payback analysis for roof assembly R-value increases[1] in sixteen (16) of Americas largest cities and representative of the Standard's (then) eight (8) U.S. climate zones. We believe that using contemporary pricing for materials and the relatively flat-costs of energy across the commercial building sector, will only increase the paybacks forecast.

[1] Graham M., "Analyzing R-value Requirements – Cost paybacks to increases in R-values may not be practical," NRCA Industry Issue Update, National Roofing Contractors Association, 2014.

Public Code Change Proposal Form

Code Section(s): C402.5.1

To Amend the 2021 Illinois Energy Conservation Code

Mark S. Graham,
Vice President, Technical Services
National Roofing Contractors Association (NRCA)
10255 W. Higgins Road, Suite 600
Rosemont, IL 60018
(847) 493-7511 Direct
(847) 299-9070 Office main
mgraham@nrca.net
www.nrca.net

Proposal No. C16-01
Date of Submittal. August 14, 2021

Signature (for release of copyrights). MSG (electronic)

Sections Impacted by Amendment. C402.5.1

Revise as Follows (In ~~strike-out~~/underline format):

[[Link to attached file w/ hand-marked edits.]]

Reason. The ICC does not know how to interpret the energy code that is sows; so much so that they've asked the Pacific Northwest National Laboratory (PNNL), the proponent of this change, to assist them through interpretation. In turn, PNNL (or the Staff contact in responsible charge for this proposal) is currently "on vacation" until after the due date for IL ECAC amendment proposals. (**see attached e-mails**)

The proposal intends to permit visual inspection, during normal course of conducting municipal inspections, to substitute for expensive testing alternatives on which neither the ICC, PNNL, nor proponents of air leakage proposals to IECC-COM, IECC-RES, or ASHRAE 90.1 ENV SC can agree. Illinois should "standby" until an unequivocal position is declared. Until such time, there is no consensus.

From: Kristopher Stenger <kstenger@iccsafe.org>
Sent: Tuesday, August 03, 2021 12:40 PM
To: dmeyers@ieccode.com
Subject: RE: 2021 IECC QUESTION - C402.5.1 Air barriers (2nd)

Darren-I am going to ask Reid if he would like to provide more clarity, also in hopes that he drafts a code change to clear this up.

From: dmeyers@ieccode.com <dmeyers@ieccode.com>
Sent: Tuesday, August 3, 2021 1:09 PM
To: Kristopher Stenger <kstenger@iccsafe.org>
Subject: RE: 2021 IECC QUESTION - C402.5.1 Air barriers (2nd)

Thanks for the swift reply, Kris.

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

a. Forgive me (not belaboring here), but … Could you respond to our Question #2 (below)?

b. Also, when commentary says, "Buildings and spaces not required to be tested undergo envelope performance verification;"

   - Does the ICC (or PNNL's Reid) provide any specifics with regard to which building-types, occupancy-types or "portions of building-types" that fit the Section C402.5.1.2, Item 3, descriptor? Put another way, "There aren't many buildings (if any) that are not captured by ICC IBC's "Building Use & Occupancy" Chapter 3. -AND- Presuming IBC Ch. 3 captures "any-and-all" building and space types with a characteristic occupancy type; thereby, there is "NO SUCH BUILDING or SPACE" conceivable that would suit Section C402.5.1.2, Item 3. Hence, Item 3 is "moot;" lending credence to our follow-on question 'c.', below.
   - Thereby, is "envelope performance verification," required for any building or space of any conceivable type at all?

c. Your (ICC's or PNNL's) reply to 'b.' (above), lends us to ask a similar question: Section C402.5.1.2 reads, "… shall comply with the following:" then provides three instruction lines, each a complete sentence without the benefit of being connected through the use of commas (,) semicolons (;) or the conjunctions "OR" or "AND." My question is are all three instruction lines requisite for compliance with the provisions of C402.5.1.2, or is this a pick one option?

Please feel free to take the time (requisite 5-biz days) to cross-check w/ PNNL's Reid … or respond as ICC, as necessary.

Appreciated, -Darren
(708) 790-4602

From: dmeyers@ieccode.com <dmeyers@ieccode.com>
Sent: Tuesday, August 3, 2021 12:18 PM
To: Kristopher Stenger <kstenger@iccsafe.org>
Subject: 2021 IECC QUESTION - C402.5.1 Air barriers

Greetings, Kristopher.

1. Would you please confirm our understanding with regard to the application of Sections C402.5.2 and C402.5.3:

   a. We see C402.5.2, regarding "air leakage testing of Group I and R Occupancies," being "launched" (if you will) by the language of C402.5.1.2, Item 1, which exempts buildings located in Climate Zones 2B, 3C and 5C … Correct?

   b. We see C402.5.3, regarding "air leakage testing of all other building Occupancies," being "launched" by the language of C402.5.1.2, Item 2, which exempts buildings of various sizes (s.f.) located in various Climate Zones … Correct?

   c. We note also that C402.5.1.2, Item 3, permits a third path to "Air barrier compliance," wholly separate and apart from Items 1 and 2 (above). This 3rd path, in turn, permits any building, of any occupancy type, to pursue "Air barrier compliance" in accordance with:

i. Section C402.5.1.3, Materials, and C402.5.1.5, Envelope performance verification, or

ii. Section C402.5.1.4, Assemblies, and C402.5.1.5, Envelope performance verification … Correct?

2. Section C402.5.1.5 reads, "… in accordance with the following:" then provides three instruction lines, each a complete sentence without the benefit of being connected through the use of commas (,) semicolons (;) or the conjunctions "OR" or "AND." My question is are all three instruction lines requisite for compliance with the provisions of C402.5.1.5, or is this a pick one option?

Regards, -Darren
ICC Member 8127099

Cost Impact. The amendment will decrease the cost of construction by way of clarification.

RE: NRCA 05 ILLINOIS CODE PROPOSAL
C402.5.1 AIR BARRIERS - INWARDLY

Daylight zones shall include *toplit daylight zones* and daylight sidelit zones.

C402.4.5 Doors. Opaque swinging doors shall comply with Table C402.1.4. Opaque nonswinging doors shall comply with Table C402.1.4. Opaque doors shall be considered as part of the gross area of above-grade walls that are part of the *building thermal envelope*. Opaque doors shall comply with Section C402.4.5.1 or C402.4.5.2. Other doors shall comply with the provisions of Section C402.4.3 for vertical fenestration.

C402.4.5.1 Opaque swinging doors. Opaque swinging doors shall comply with Table C402.1.4.

C402.4.5.2 Nonswinging doors. Opaque nonswinging doors that are horizontally hinged sectional doors with a single row of fenestration shall have an assembly *U*-factor less than or equal to 0.440 in Climate Zones 0 through 6 and less than or equal to 0.360 in Climate Zones 7 and 8, provided that the fenestration area is not less than 14 percent and not more than 25 percent of the total door area.

Exception: Other doors shall comply with the provisions of Section C402.4.3 for vertical fenestration.

C402.5 Air leakage—thermal envelope. The *building thermal envelope* shall comply with Sections C402.5.1 through Section C402.5.11.1, or the building *thermal envelope* shall be tested in accordance with Section C402.5.2 or C402.5.3. Where compliance is based on such testing, the building shall also comply with Sections C402.5.7, C402.5.8 and C402.5.9.

C402.5.1 Air barriers. A continuous air barrier shall be provided throughout the *building thermal envelope*. The continuous air barriers shall be located on the inside or outside of the building thermal envelope, located within the assemblies composing the building thermal envelope, or any combination thereof. The air barrier shall comply with Sections C402.5.1.1, and C402.5.1.2.

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 in places and changes in 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. 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.

C402.5.1.2 Air barrier compliance. A continuous air barrier for the opaque building envelope shall comply with the following:

1. Buildings or portions of buildings, including Group R and I occupancies, shall meet the provisions of Section C402.5.2. x ;

   Exception: Buildings in Climate Zones 2B, 3C and 5C.

2. Buildings or portions of buildings other than Group R and I occupancies shall meet the provisions of Section C402.5.3. x ;

   Exceptions:

   1. Buildings in Climate Zones 2B, 3B, 3C and 5C.
   2. Buildings larger than 5,000 square feet (464.5 m^2) floor area in Climate Zones 0B, 1, 2A, 4B and 4C.
   3. Buildings between 5,000 square feet (464.5 m^2) and 50,000 square feet (4645 m^2) floor area in Climate Zones 0A, 3A and 5B.

ALL OTHER...

3. Buildings or portions of buildings that do not complete air barrier testing shall meet the provisions of Section C402.5.1.3 or C402.5.1.4 in addition to Section C402.5.1.5.

C402.5.1.3 Materials. Materials with an air permeability not greater than 0.004 cfm/ft^2 (0.02 L/s × m^2) under a pressure differential of 0.3 inch water gauge (75 Pa) when tested in accordance with ASTM E2178 shall comply with this section. Materials in Items 1 through 16 shall be deemed to comply with this section, provided that joints are sealed and materials

are installed as air barriers in accordance with the manufacturer's instructions.

1. Plywood with a thickness of not less than $^3/_8$ inch (10 mm).
2. Oriented strand board having a thickness of not less than $^3/_8$ inch (10 mm).
3. Extruded polystyrene insulation board having a thickness of not less than $^1/_2$ inch (12.7 mm).
4. Foil-back polyisocyanurate insulation board having a thickness of not less than $^1/_2$ inch (12.7 mm).
5. Closed-cell spray foam having a minimum density of 1.5 pcf (2.4 kg/m^3) and having a thickness of not less than $1^1/_2$ inches (38 mm).
6. Open-cell spray foam with a density between 0.4 and 1.5 pcf (0.6 and 2.4 kg/m^3) and having a thickness of not less than 4.5 inches (113 mm).
7. Exterior or interior gypsum board having a thickness of not less than $^1/_2$ inch (12.7 mm).
8. Cement board having a thickness of not less than $^1/_2$ inch (12.7 mm).
9. Built-up roofing membrane.
10. Modified bituminous roof membrane.
11. Single-ply roof membrane.
12. A Portland cement/sand parge, or gypsum plaster having a thickness of not less than $^5/_8$ inch (15.9 mm).
13. Cast-in-place and precast concrete.
14. Fully grouted concrete block masonry.
15. Sheet steel or aluminum.
16. Solid or hollow masonry constructed of clay or shale masonry units.

C402.5.1.4 Assemblies. Assemblies of materials and components with an average air leakage not greater than 0.04 cfm/ft^2 (0.2 L/s × m^2) under a pressure differential of 0.3 inch of water gauge (w.g.)(75 Pa) when tested in accordance with ASTM E2357, ASTM E1677, ASTM D8052 or ASTM E283 shall comply with this section. Assemblies listed in Items 1 through 3 shall be deemed to comply, provided that joints are sealed and the requirements of Section C402.5.1.1 are met.

1. Concrete masonry walls coated with either one application of block filler or two applications of a paint or sealer coating.
2. Masonry walls constructed of clay or shale masonry units with a nominal width of 4 inches (102 mm) or more.
3. A Portland cement/sand parge, stucco or plaster not less than $^1/_2$ inch (12.7 mm) in thickness.

C402.5.1.5 Building envelope performance verification. The installation of the continuous air barrier shall be verified by the *code official*, a *registered design professional* or *approved* agency in accordance with the following:

1. A review of the construction documents and other supporting data shall be conducted to assess compliance with the requirements in Section C402.5.1 x ; OR
2. Inspection of continuous air barrier components and assemblies shall be conducted during construction while the air barrier is still accessible for inspection and repair to verify compliance with the requirements of Sections C402.5.1.3 and C402.5.1.4 x ; OR
3. A final commissioning report shall be provided for inspections completed by the *registered design professional* or *approved* agency. The commissioning report shall be provided to the building owner or owner's authorized agent and the *code official*. The report shall identify deficiencies found during the review of the construction documents and inspection and details of corrective measures taken.

C402.5.2 Dwelling and sleeping unit enclosure testing. The *building thermal envelope* shall be tested in accordance with ASTM E779, ANSI/RESNET/ICC 380, ASTM E1827 or an equivalent method approved by the *code official*. The measured air leakage shall not exceed 0.30 cfm/ft^2 (1.5 L/s m^2) of the testing unit enclosure area at a pressure differential of 0.2 inch water gauge (50 Pa). Where multiple dwelling units or sleeping units or other occupiable conditioned spaces are contained within one *building thermal envelope*, each unit shall be considered an individual testing unit, and the building air leakage shall be the weighted average of all testing unit results, weighted by each testing unit's enclosure area. Units shall be tested separately with an unguarded blower door test as follows:

1. Where buildings have fewer than eight testing units, each testing unit shall be tested.
2. For buildings with eight or more testing units, the greater of seven units or 20 percent of the testing units in the building shall be tested, including a top floor unit, a ground floor unit and a unit with the largest testing unit enclosure area. For each tested unit that exceeds the maximum air leakage rate, an additional two units shall be tested, including a mixture of testing unit types and locations.

C402.5.3 Building thermal envelope testing. The *building thermal envelope* shall be tested in accordance with ASTM E779, ANSI/RESNET/ICC 380, ASTM E3158 or ASTM E1827 or an equivalent method approved by the

code official. The measured air leakage shall not exceed 0.40 cfm/ft^2 (2.0 L/s × m^2) of the *building thermal envelope* area at a pressure differential of 0.3 inch water gauge (75 Pa). Alternatively, portions of the building shall be tested and the measured air leakages shall be area weighted by the surface areas of the building envelope in each portion. The weighted average test results shall not exceed the whole building leakage limit. In the alternative approach, the following portions of the building shall be tested:

1. The entire envelope area of all stories that have any spaces directly under a roof.
2. The entire envelope area of all stories that have a building entrance, exposed floor, or loading dock, or are below grade.
3. Representative above-grade sections of the building totaling at least 25 percent of the wall area enclosing the remaining conditioned space.

Exception: Where the measured air leakage rate exceeds 0.40 cfm/ft^2 (2.0 L/s × m^2) but does not exceed 0.60 cfm/ft^2 (3.0 L/s × m^2), a diagnostic evaluation using smoke tracer or infrared imaging shall be conducted while the building is pressurized along with a visual inspection of the air barrier. Any leaks noted shall be sealed where such sealing can be made without destruction of existing building components. An additional report identifying the corrective actions taken to seal leaks shall be submitted to the code official and the building owner, and shall be deemed to comply with the requirements of this section.

C402.5.4 Air leakage of fenestration. The air leakage of fenestration assemblies shall meet the provisions of Table C402.5.4. Testing shall be in accordance with the applicable reference test standard in Table C402.5.4 by an accredited, independent testing laboratory and *labeled* by the manufacturer.

Exceptions:

1. Field-fabricated fenestration assemblies that are sealed in accordance with Section C402.5.1.
2. Fenestration in buildings that comply with the testing alternative of Section C402.5 are not required to meet the air leakage requirements in Table C402.5.4.

C402.5.5 Rooms containing fuel-burning appliances. In *Climate Zones* 3 through 8, where combustion air is supplied through openings in an exterior wall to a room or space containing a space-conditioning fuel-burning appliance, one of the following shall apply:

1. The room or space containing the appliance shall be located outside of the *building thermal envelope*.
2. The room or space containing the appliance shall be enclosed and isolated from conditioned spaces inside the *building thermal envelope*. Such rooms shall comply with all of the following:
   - 2.1. The walls, floors and ceilings that separate the enclosed room or space from conditioned spaces shall be insulated to be not less than equivalent to the insulation requirement of below-grade walls as specified in Table C402.1.3 or Table C402.1.4.
   - 2.2. The walls, floors and ceilings that separate the enclosed room or space from conditioned spaces shall be sealed in accordance with Section C402.5.1.1.

TABLE C402.5.4
MAXIMUM AIR LEAKAGE RATE FOR FENESTRATION ASSEMBLIES

FENESTRATION ASSEMBLY	MAXIMUM RATE (CFM/FT^2)	TEST PROCEDURE
Windows	0.20[a]	AAMA/WDMA/CSA101/I.S.2/A440 or NFRC 400
Sliding doors	0.20[a]	
Swinging doors	0.20[a]	
Skylights—with condensation weepage openings	0.30	
Skylights—all other	0.20[a]	
Curtain walls	0.06	NFRC 400 or ASTM E283 at 1.57 psf (75 Pa)
Storefront glazing	0.06	
Commercial glazed swinging entrance doors	1.00	
Power-operated sliding doors and power operated folding doors	1.00	
Revolving doors	1.00	
Garage doors	0.40	ANSI/DASMA 105, NFRC 400, or ASTM E283 at 1.57 psf (75 Pa)
Rolling doors	1.00	
High-speed doors	1.30	

For SI: 1 cubic foot per minute = 0.47 L/s, 1 square foot = 0.093 m^2.

a. The maximum rate for windows, sliding and swinging doors, and skylights is permitted to be 0.3 cfm per square foot of fenestration or door area when tested in accordance with AAMA/WDMA/CSA101/I.S.2/A440 at 6.24 psf (300 Pa).

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: Commercial Appendices

Office Use Only	
Proposal Number:	C17-01
Date Submittal Received:	August 14, 2021

Date: July 29, 2021
Name: Alison Lindburg
Jurisdiction/Company: Midwest Energy Efficiency Alliance
Submitted on Behalf of: MEEA and Slipstream
Address: 20 N Wacker Drive, Suite 1301
Chicago, IL 60606
Phone: 651-278-2529
E-Mail: alindburg@mwalliance.org

Related Sections Impacted by this Amendment: (New) Appendix CD – Commercial Energy Stretch Code Appendix

Revise as Follow (in strike-thru / underline format):

APPENDIX CD COMMERCIAL ENERGY STRETCH CODE APPENDIX

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

User note:

About this chapter: *Appendix CD provides minimum targets for exceeding the commercial state base energy code in a manner that allows jurisdictions to meet climate goals. Taking this step approach also allows the construction industry, such as code officials, designers, builders, subcontractors, and manufacturers, the ability to plan ahead for upcoming code changes, and also ensures technical assistance and support mechanisms can be created and properly disseminated.*

SECTION CD101

GENERAL

CD101.1 Purpose.

The purpose of this appendix is to supplement the Illinois Energy Conservation Code and provide targets of energy efficiency in newly constructed commercial buildings.

CD101.2 Scope.

This appendix applies to new buildings that are addressed by the Illinois Energy Conservation Code as adopted, including the Exceptions for Commercial buildings under that code.

SECTION CD102

DEFINITIONS

Energy Efficiency Performance Target – "Energy Efficiency Performance Target" means an established goal of overall building energy performance as specified in Table CD103.1. The building shall meet Energy Efficiency Performance Targets as outlined in Table CD103.1. The building's energy efficiency performance shall be projected during the design phase and verified prior to occupancy. energy performance targets are established in Buildings must achieve the specified Energy Efficiency Performance Target, to meet the requirements of this stretch code appendix.

Site Energy Index - "Site Energy Index" means a scalar published by the Pacific Northwest National Laboratory representing the ratio of the site energy performance of an evaluated code compared to the site energy performance of the 2006 IECC. A Site Energy Index includes only conservation measures and excludes net energy credit for any on-site or off-site energy production.

SECTION CD103

MINIMUM ENERGY EFFICIENCY TARGETS

CD 103.1 Energy Efficiency Performance Targets.

The overall energy efficiency of the building shall not exceed the number the Maximum Site Energy Index for the Stretch Code as according to Table CD103.1. The building's energy efficiency performance shall be projected during the design phase and verified prior to occupancy.

TABLE CD 103.1

MAXIMUM SITE ENERGY INDEX FOR STRETCH CODE

Stretch Code Step Number	State Code Update Cycle	Likely Enforcement Date	Maximum Site Energy Index[45]	Efficiency Over 2006 IECC
Step One	2021 IECC	July 2022	**0.50**	50%
Step Two	2024 IECC	July 2025	**0.40**[46]	60%
Step Three	2027 IECC	July 2028	**0.33**[47]	66%
Step Four	2030 IECC	July 2031	**0.25**	75%

CD 103.2 Calculation of Site Energy Index.

The calculation of Site Energy Index shall be determined during plan review prior to construction using a software approved by the code official.

CD 103.3 Verification of Site Energy Index.

The verification of the Site Energy Index shall be determined at final inspection using the observed construction methods that are entered into a software approved by the code official. The final Site Energy Index and supporting documentation shall be permanently posted near a heating and/or cooling unit prior to occupancy.

Reason:

The stretch code is generally inspired by the American Institute of Architects "2030 Commitment" campaign to achieve carbon neutral buildings by 2030. We must build efficient buildings by 2030 in order to meet 80% carbon reduction goals by 2050.

[45] Maximum Site Energy Index of the 2006 International Energy Conservation Code

[46] 0.40 unless the Board identifies unanticipated burdens associated with the stretch energy code adopted in 2022, in which case the Board may adopt a stretch energy code with a site energy index no greater than 0.42 of the 2006 International Energy Conservation Code, provided that the more relaxed standard has a site energy index that is at least 0.05 more restrictive than the 2024 International Energy Conservation Code

[47] 0.33 unless the Board identifies unanticipated burdens associated with the stretch energy code adopted in 2025, in which case the Board may adopt a stretch energy code with a site energy index no greater than 0.35 of the 2006 International Energy Conservation Code, but only if that more relaxed standard has a site energy index that is at least 0.05 more restrictive than the 2027 International Energy Conservation Code

According to **Error! Reference source not found.**[48] and Section 15 of the Energy Efficient Building Act[49], the Illinois Capital Development Board (CDB) is to officially adopt as a minimum requirement for State and commercial structures and as a minimum and maximum requirement for residential buildings, the most current IECC (potentially with amendments as determined by the CDB). The IECC and other I-codes sometimes have optional Appendices for adoption, and other statewide Illinois codes have optional Appendices available for adoption by local jurisdictions. By adopting an optional Appendix as part of the commercial energy code, the CDB would be fulfilling their role of setting minimum because the optional Appendix would become the minimum in the jurisdictions that choose to adopt it.

While jurisdictions currently have the ability to adopt their own version of an above-state commercial energy stretch code, a uniform stretch code option would allow for consistency of implementation and enforcement across jurisdictions by offering a state commercial energy code and a stretch commercial energy code. The commercial stretch code option would also have gone through a public process at the CDB, helping provide information and reference to jurisdictions that may choose to adopt it as their minimum energy code.

The language used in this proposal came from the Clean Energy Jobs Act (CEJA) and was approved through a stakeholder process by the Clean Energy Jobs Coalition.

Cost Impact:

The intent of the stretch code appendix is to allow flexibility to achieve maximized cost-effective efficiency improvements by 2032. It is important to consider the long-term operational cost to the occupants and not just one-time initial construction cost when discussing cost impacts.

Analyses done by PNNL, Vidaris Inc. and New Buildings Institute for the New York State Energy Research and Development Authority (NYSERDA)[50] for commercial buildings found that buildings built to the NYS Stretch Code:
-Use less energy by an average of 8% as compared to buildings built to the ASHRAE 90.1-2016
-Have an average payback of about 10 years based on energy savings alone; a short amount of time for a commercial building
-Buildings meeting the NYS Stretch Code, in Climate Zone 5 (the same as Chicago), would generate net savings of over $780,000 across a 10-year span

Signature (for release of copyrights):

X

Alison Lindburg

[48] https://www.ilga.gov/commission/jcar/admincode/071/071006000A01100R.html
[49] https://www.ilga.gov/legislation/ilcs/ilcs3.asp?ActID=2614&ChapterID=5
[50] 2020 NYStretch Energy Code Commercial Cost Effectiveness Analysis Final Report, July 2019. Prepared for: New York State Energy Research and Development Authority Albany, NY by Vidaris, Inc. New York, NY

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: R403.3.6 Duct testing

Office Use Only	
Proposal Number:	R01-01
Date Submittal Received:	08/03/2021

Date: 8/3/2021
Name: Sean Lintow Sr
Jurisdiction/Company: SLS Construction & Building Solutions LLC
Submitted on Behalf of: N/A
Address: 30W153 Argyll Ln
Naperville, IL 60563
Phone: (815) 200-3688
E-Mail: Sean@SLS-Construction.com

Related Sections Impacted by this Amendment:

403.3.6 Duct Leakage

Revise as Follow (in strike-thru / underline format):

R403.3.6 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 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.

Reason:

The first exception listed above was proposed & accepted in the general consensus process, but one of the 22 items overturned in the governmental voting. Unfortunately this causes problems when one has a small building or is trying to condition an addition which might only have 28 CFM of allowable leakage which many of us can attest can easily be chewed up by just the air-handler. I think the 60 CFM number is a good “floor value” similar to ENERGY STAR’s 40 or 60 (dependent on amount of returns) and achievable by most installers with

a little care taken on making their units substantially air-tight & sealed which has been required by the codes since at least 2000.

Cost Impact:

There is no cost increase and will potentially save some builders money.

I hereby grant and assign to the State of Illinois all rights in copyright I may have in any authorship contributions I make to the State of Illinois in connection with any proposed amendments or public comment, in its original form submitted or revised form, including written and verbal modifications. I understand that I have no rights in any State of Illinois publications that use such contributions in the form submitted by me or another similar form and certify that such contributions are not protected by the copyright of any other person or entity.

Signature (for release of copyrights): _____

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: (IL) 403.6.6 Mechanical ventilation rate

Office Use Only	
Proposal Number:	R02-01
Date Submittal Received:	August 3, 2021

Date:	8/3/2021
Name:	Sean Lintow Sr
Jurisdiction/Company:	SLS Construction & Building Solutions LLC
Submitted on Behalf of:	N/A
Address:	30W153 Argyll Ln
	Naperville, IL 60563
Phone:	(815) 200-3688
E-Mail:	Sean@SLS-Construction.com

Related Sections Impacted by this Amendment:

(IL) 403.6.6 Mechanical ventilation rate

Revise as Follow (in strike-thru / underline format):

Add to R403.6.6 Exceptions:

3. Demand Control Ventilation is permitted for balanced, or HVAC tied systems where the system has controls that enable monitoring and automatic activation of the unit when high levels of Carbon Dioxide (above 800 ppm) and VOC levels (500 ng/L (µg/m3)) are detected. The system must be capable of being manually turned on and activation levels being adjusted. The minimum ventilation rate must be the greater of 100 CFM or what is prescribed in (M1505.4.3 2021) multiplied by a factor of 2.

Reason:

One big issue with this code and ASHRAE 62.2 is their blanket you must have X ventilation running 24x7. It doesn't matter if no one is home, what the outside conditions are, or if the rate is too high for most people even when they are home. ASHRAE members have admitted that there is no scientific backing to ventilation rates, that they are essentially just a WAG, & wrong 99.9% of the time. (https://thehtrc.com/aci-great-ventilation-debate) This addition allows for some commonsense energy & health saving actions to be utilized like what is currently allowed for commercial buildings. This also has stymied many manufacturers that have those options but can't utilize them and stopping research & development which this will hopefully help change

Cost Impact:

Technically it is 0 as it is just an option with no requirement to use. With that said it varies from 0 to thousands up front. The backend potential of savings is large but completely dependent on usage, but as typical code-built ventilation requirements run approx. 4 to 8 points on the HERS score that equates to 5% or more of the energy used.

Up front – 0 is for builders already utilizing "smart" HVAC or other ventilation systems that already have these features built in. Into the thousands would be for a builder that jumps from the bare minimum exhaust fan running in a bath / laundry room to upgrading to a better HVAC system or separate ERV/HRV.

I hereby grant and assign to the State of Illinois all rights in copyright I may have in any authorship contributions I make to the State of Illinois in connection with any proposed amendments or public comment, in its original form submitted or revised form, including written and verbal modifications. I understand that I have no rights in any State of Illinois publications that use such contributions in the form submitted by me or another similar form and certify that such contributions are not protected by the copyright of any other person or entity.

Signature (for release of copyrights): _____

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: R404.5, R406.2

Office Use Only	
Proposal Number:	R03-01
Date Submittal Received:	August 13, 2021

Date: 8/13/2021
Name: Diana Burk
Jurisdiction/Company: New Buildings Institute
Submitted on Behalf of: New Buildings Institute
Address: 623 SW Oak Street
Portland, Oregon
Phone: 404-290-5442
E-Mail: diana@newbuildings.org

Related Sections Impacted by this Amendment:

Definitions, Add New Section R404.5, Revision to Table R405.2 and R406.2

Revise as Follow (in strike-thru / underline format):

Add new definitions as follows in Section R202 General Definitions:

ELECTRIC VEHICLE (EV). An automotive-type vehicle for on-road use, such as passenger automobiles, buses, trucks, vans, neighborhood electric vehicles, electric motorcycles, and the like, primarily powered by an electric motor that draws current from a rechargeable storage battery, a fuel cell, a photovoltaic array, or another source of electric current. Plug-in hybrid electric vehicles are electric vehicles having a second source of motive power. Off-road, self-propelled electric mobile equipment, such as industrial trucks, hoists, lifts, transports, golf carts, airline ground support equipment, tractors, boats and the like, are not considered electric vehicles.

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE). The conductors, including the ungrounded, grounded, and equipment grounding conductors and the *electric vehicle* connectors, attachment plugs, 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*.

EV-READY SPACE. A parking space that is provided with an electrical circuit capable of supporting an installed *EVSE*.

Add new text as follows:

R404.5 Electric vehicle charging infrastructure. Electric infrastructure for the current and future charging of *electric vehicles* shall be installed in accordance with this section. *EV ready spaces* are permitted to be counted toward meeting minimum parking requirements.

R404.5.1 One- and two- family dwellings and townhouses. One- and two-family dwellings and townhouses with a dedicated attached or detached garage or on-site parking spaces and new detached

garages shall be provided with one *EV-ready space* per *dwelling unit.* The branch circuit shall meet the following requirements:

1. A minimum capacity of 9.6 kVA
2. Terminates at a junction box or receptacle located within 3 feet (914 mm) of the parking space and labelled "For electric vehicle charging", and
3. The electrical panel directory shall designate the branch circuit as "For electric vehicle charging".

R404.5.2 Group R occupancies. Parking facilities serving Group R-2, R-3 and R-4 occupancies shall comply with Section C405.14.

Revise table as follows:

TABLE R405.2

REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE

SECTION [a]	TITLE
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls
R404.5	Electric vehicle charging infrastructure

Revise table as follows:

TABLE R406.2

REQUIREMENTS FOR ENERGY RATING INDEX

SECTION [a]	TITLE
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls
R404.5	Electric vehicle charging infrastructure
R406.3	Building thermal envelope

Reason:

The widescale adoption of electric vehicles (EVs) is a key climate strategy to reduce GHG emissions from Illinois's. transportation sector and is critical to achieving Illinois's goal to achieve at least a 26% reduction in GHG emissions by 2025. The transportation sector of Illinois's greenhouse gas emissions, representing 33 percent of total emissions.[51] As Illinois is considering 100% renewable electricity by 2030 as proposed in the Clean Energy Jobs Act (CEJA) and is otherwise moving towards a cleaner electricity grid, the opportunity is now on the table to reduce vehicle emissions through electrification, and to minimize the impact of the transportation sector on the state's carbon footprint. But this will occur only if policies are put in place to support widespread electric vehicle infrastructure, including in Illinois homes.

[51] "U.S. Energy Information Administration - EIA - Independent Statistics and Analysis." *State-Level Energy-Related Carbon Dioxide Emissions, 2005-2016*, www.eia.gov/environment/emissions/state/analysis/./

Encouraging EVs will not only reduce carbon emissions in the state substantially, but will also reduce other pollutants. Vehicle emissions are the largest source of carbon monoxide and nitrogen oxides, $PM_{2.5}$ and smog-causing air pollution in cities. In 2015, 22,000 Americans died from transportation emissions. Neighborhoods with people of color also experience on average 66% more air pollution from cars and trucks than white residents.[52] Residents of Cook County, including Chicago, for example have an average exposure to PM2.5 that is more than double the nations average and people of color in Illinois are exposed to 20-30% more PM2.5 than the average Illinois resident.[53]

Fortunately, the transition to electric vehicles (EVs) is already underway and has received a substantial boost from the Biden administration. Auto manufacturers in the Midwest are embracing this change, especially General Motors who recently announced it would only manufacture electric vehicles by 2035.[54] In the United States, EV sales increased by 80 percent from 2017 to 2018. The number of EVs on U.S. roads is projected to grow from 1 million vehicles at the end of 2018, to 18.7 million by 2030. To recharge these new EVs, the U.S. will need 9.6 million charge ports, a substantial portion of which will be installed in single and multi-family residential buildings.[55]

A major barrier to the transition to EVs is the lack of charging infrastructure at homes and businesses and the potential need for extensive electrical upgrades often requiring the installation of conduit through existing concrete to connect the electric vehicle supply equipment (EVSE) to electrical service. It is more cost-effective to ensure a building is "EV ready" when it is being built or undergoing major renovations than trying to add equipment after the building is constructed. Many of the nations top builders are already considering requiring homes to be EV-Ready. In a recent blog by the National Association of Home Builders, a builder stated that, "We are now including EV charging as part of figuring the loads required for the home and are seriously considering making at least the pre-wire part of our standard electrical package." [56] To reduce expensive retrofit costs, it is therefore critical that all builders follow suit and make parking spaces in homes be EV-ready.

The proposal requires that new single-family homes with parking include an EV Ready space, that is, a parking space that is provided with a branch circuit that can support a Level 2 EV charger. The proposal complements similar requirements proposed in CEJA to incentivize electric vehicle charging, focused on medium- and heavy-duty vehicles, and the creation of an "EV Access for All" program, to ensure all Illinois residents can benefit from electric vehicles.

Definitions:

The definition for "Electric Vehicle" is mirrored from NEC-2020 to be useful in defining requirements for electric vehicle infrastructure.

The definition for EV Ready does not include requirements for minimum capacity for the branch circuit. Different levels of capacity are appropriate for different EV charging scenarios (charging at different building types, parking types, residential types, business types, times of day, etc.) as well as different levels of penetration of EV charging spaces in a parking lot. Therefore, capacity requirements are set in the code text itself to allow for consistent use of the definition between residential and commercial requirements.

Requirements:

Single-family homes, where the occupants will choose the specific EVSE that meets their EV charging needs, are required to have one parking space with an EV Ready space that is sized to accommodate the most common EVSE on the market. The requirements for EV charging infrastructure for Group R buildings are referenced to the commercial requirements as those are more appropriate for EV charging in parking lots. If LARA choses not to adopt the accompanying commercial amendment, this section should be revised. The required capacity for the branch circuit

---

[52] "Cost to Maintain an Electric Car." *GreenCars*, GreenCars, 2 Apr. 2021, www.greencars.com/post/what-does-it-cost-to-maintain-an-electric-car.

[53] Reichmuth, David. *Exposure to Air Pollution from Vehicles in Illinois IS Inequitable - It Doesn't Have to Be.* Union of Concerned Scientists Blog, 9 Feb. 2020, blog.ucsusa.org/dave-reichmuth/exposure-to-air-pollution-from-vehicles-in-illinois-is-inequitable-it-doesnt-have-to-be/.

[54] Eisenstein, Paul A. "GM to Go All-Electric by 2035, Phase out Gas and Diesel Engines." *NBCNews.com*, NBCUniversal News Group, 29 Jan. 2021, www.nbcnews.com/business/autos/gm-go-all-electric-2035-phase-out-gas-diesel-engines-n1256055.

[55] EEI Celebrates 1 Million Electric Vehicles on U.S. Roads, Edison Electric Institute, 3 Nov. 2018, www.eei.org/resourcesandmedia/newsroom/Pages/Press%20Releases/EEI%20Celebrates%201%20Million%20Electric%20Vehicles%20on%20U-S-%20Roads.aspx.

[56] https://nahbnow.com/2021/04/pre-wiring-for-electric-vehicle-charging-prepping-your-homes-for-future-demand/

for the EV-Ready space is the equivalent of a 240V, 40A circuit and is expressed in kVA as that is the standard metric for capacity or “apparent power” in electrical infrastructure.

R405 and R406

The proposal also includes a modification to the mandatory table in R405 and R406 to ensure that projects using the performance or ERI method will also comply with this requirement.

Cost Impact:

Research currently undertaken by NBI and partners indicate that the cost of the added infrastructure to make a home EV-ready is estimated to be $162 at the time of construction. If a home was not made EV ready but chose to add an EV charger at a later date with an insufficient supply infrastructure in place, the cost of the retrofit (if the retrofit is feasible) was found to be approximately $1,500 to $3,000. [57] Therefore, adding the infrastructure to make a home EV-ready saves $1,338 to $2,838 for the average homeowner who must add an EV charger at a later date.

This change will also allow Illinois residents to purchase an Electric Vehicle which will save them money. According to AAA, an electric vehicle (EV) will save roughly $1,039 per year in total fuel and maintenance costs compared to a comparable gasoline vehicle.[58] Although Electric Vehicles are often more expensive than gasoline powered vehicles, Bloomberg New Energy Finance on battery costs suggests EVs could reach upfront cost parity with gasoline vehicles by the early-to-mid 2020s [59].

I hereby grant and assign to the State of Illinois all rights in copyright I may have in any authorship contributions I make to the State of Illinois in connection with any proposed amendments or public comment, in its original form submitted or revised form, including written and verbal modifications. I understand that I have no rights in any State of Illinois publications that use such contributions in the form submitted by me or another similar form and certify that such contributions are not protected by the copyright of any other person or entity.

Signature (for release of copyrights): Diana Burk

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

[57] *City of Carlsbad Electric Vehicle Ordinance Cost Analysis* , Center for Sustainability, 17 Dec. 2018, www.carlsbadca.gov/civicax/filebank/blobdload.aspx?BlobID=37502.
[58] “Electric Cars Only Cost Slightly More to Own than Gas-Powered Ones, AAA FINDS.” *True Cost of EV Ownership*, www.ace.aaa.com/automotive/advocacy/true-cost-of-electric-vehicle-ownership.html.

[59] Baldwin, Roberto. *Evs Could Soon Cost Same as Gas Cars Thanks to Lower Battery Costs*. Car and Driver, 19 Feb. 2021, www.caranddriver.com/news/a34992832/battery-price-drop-2023/.

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: R103.2.3, R105.2.5, R404.4

Office Use Only	
Proposal Number:	C04-01
Date Submittal Received:	August 13, 2021

Date: 8/13/2021
Name: Edith Makra
Jurisdiction/Company: Metropolitan Mayors Caucus
Submitted on Behalf of: Metropolitan Mayors Caucus
Address: 433 W. Van Buren St., Suite 450
Chicago, IL 60607
Phone: 630-327-4193
E-Mail: emakra@mayorscaucus.org

Related Sections Impacted by this Amendment:

Add sections R103.2.3, R105.2.5, R404.4; Revise sections R105.2.3, R401.3, Table R405.2 and Table R406.2; Renumber Section R105.2.6; and add new definition.

Revise as Follow (in strike-thru / underline format):

Add new text as follows:

> **R103.2.3 Solar-ready system**. The construction documents shall provide details for dedicated roof area, structural design for roof dead and live 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.

Revise text as follows:

> **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.

Add new text as follows:

> **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. Where the energy storage system area is not in the same space as the electrical panel, inspections shall verify conduit or pre-wiring from the energy storage ready zone to the electrical panel.

Revise numbering as follows:

> ~~**R105.2.5**~~ **R105.2.6 Final inspection.**

Add new definitions as follows:

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.

Revise text as follows:

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 certification shall indicate the following:

8. Where a *solar-ready zone* is provided, the certificate shall indicate the location, dimensions, and capacity reserved on the electrical service panel.

Add new text as follows:

R404.4 Renewable energy infrastructure. The building shall comply with the requirements of R404.4.1 or R404.4.2

R404.4.1 One- and two- family dwellings and townhouses. One- and two-family dwellings and townhouses shall comply with Sections R404.4.1.1 through R404.4.1.4.

Exceptions:

1. A *building* with a permanently installed on-site renewable energy system.

2. A *building* with less than 600 square feet (55 m^2) of roof area oriented between 110 degrees and 270 degrees of true north.

3. A *building* where all areas of the roof that would otherwise meet the requirements for a *solar-ready zone* are in full or partial shade for more than 70 percent of daylight hours annually.

R404.4.1.1 Solar-ready zone area. The total area of the *solar-ready zone* shall not be less than 300 square feet (28 m^2) and shall be composed of areas not less than 5.5 feet (1676 mm) in width and not less than 80 square feet (7.4 m^2) exclusive of access or set back areas as required by the International Fire Code.

Exception: 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^2) per dwelling shall be permitted to have a solar-ready zone area of not less than 150 square feet (14 m^2).

R404.4.1.2 Obstructions. Solar-ready zones shall be free from obstructions, including but not limited to vents, chimneys, and roof-mounted equipment.

R404.4.1.3 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.

R404.4.1.4 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 one of the following:

1. Minimum ¾-inch nonflexible conduit

2. Minimum #10 Metal copper 3-wire

Where the interconnection terminates in the attic, location shall be no less than 12" (35 mm) above ceiling insulation. Both ends of the interconnection shall be labeled "For Future Solar Electric".

R404.4.2 Group R occupancies. Buildings in Group R-2, R-3 and R-4 shall comply with Section C405.13.

Revise table as follows:

TABLE R405.2 REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE

SECTION	TITLE
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls
R404.4	Renewable energy infrastructure

Revise table as follows:

TABLE R406.2 REQUIREMENTS FOR ENERGY RATING INDEX

SECTION	TITLE
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls
R404.4	Renewable energy infrastructure
R406.3	Building thermal envelope

Reason:

In 2020, only 11% of Illinois's electricity is sourced from renewable energy.[60] In order to cost-effectively achieve a potential goal to be 100 percent renewable by 2050 as outlined in the Clean Energy Jobs Act, Illinois must remove cost barriers to installing renewable energy on-site in the future if it is not being installed at the time of new construction. According to a recent study entitled "A New Roadmap for the Lowest Cost Grid",[61] the least expensive grid involves a large amount of centralized renewables and a large amount of distributed renewables located on the building site. More renewables placed on site enable more clean utility-scale renewables to be deployed efficiently.[21] If a building is not built to be "solar ready," it can be technically infeasible or economically prohibitive to install solar at a later date. Therefore, it is crucial to remove this barrier in new residential building so that homeowners can install renewable energy on-site to enable a low-cost carbon free grid. Solar-ready code requirements will also allow homeowners to economically benefit from Illinois's transition towards a low-carbon economy and benefit from additional resiliency during disruptions of centrally supplied power.

In addition, a solar-ready code amendment would help grow jobs in Illinois. According to the Clean Jobs Midwest report, in 2019, "clean energy jobs grew more than twice as fast as overall employment across the Midwest," with Illinois in particular leading the Midwest region in the number of clean energy jobs.[62] The proposed amendment would help to support Illinois's this growing industry by making it easier for homeowners to install solar on their homes.

The proposed revisions and additions to the code have been moved from the 2021 IECC Appendix RB Solar-Ready Provisions to the most appropriate place in the base code. The amendments would require all new homes in Illinois to be solar ready by requiring a designated 300 square foot minimum "solar ready zone" on the roof. Conduit and wire from this zone must be installed and space in the electrical panel must be reserved for a future solar array. Homes where solar is not feasible due to shading or not enough solar exposure due to orientation are exempt. Information on compliance with this requirement must be placed on the construction documents to improve compliance and so that future homeowners know their home is solar-ready. Revisions to Table R405.2 and R406.2 make this a mandatory requirement in the energy code. This amendment points multifamily buildings (Group R-2 and R-3 occupancies) to a

[60] *Illinois - State Energy Profile Analysis*, U.S. Energy Information Administration (EIA), www.eia.gov/state/analysis.php?sid=IL.

[61] *Why Local Solar For All Costs Less: A New Roadmap for the Lowest Cost Grid,* Vibrant Clean Energy, Dec. 2020, www.vibrantcleanenergy.com/wp-content/uploads/2020/12/WhyDERs_ES_Final.pdf.

[62] CleanEnergyTrst. *Clean Jobs Midwest*, https://www.cleanjobsmidwest.com/state/illinois.

similar amendment in the commercial energy code. If the Capital Development Board chooses to accept this amendment but not the commercial solar amendment. This amendment should be revised accordingly.

Cost Impact:

Recent analysis by NBI and partners using cost data from RSMeans indicates that adding the infrastructure to make a home solar ready would cost $435 or $0.17 per square foot for a typical home at the time of construction. According to an NREL report, if a home is not made solar ready but chooses to add solar at a later date, the cost of the retrofit (if the retrofit is feasible) is $4,373 or $1.75 per square foot. [63] Therefore, adding the infrastructure to make a home solar ready saves $3,938 or $1.58 per square foot for homeowners who choose to add solar at a later date.

I hereby grant and assign to the State of Illinois all rights in copyright I may have in any authorship contributions I make to the State of Illinois in connection with any proposed amendments or public comment, in its original form submitted or revised form, including written and verbal modifications. I understand that I have no rights in any State of Illinois publications that use such contributions in the form submitted by me or another similar form and certify that such contributions are not protected by the copyright of any other person or entity.

Signature (for release of copyrights): _____

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

[63] Assumes the single family home is 2,500 square feet, the average size of a single family home built in the U.S..
Solar Ready: An Overview of Implementation Practices, National Renewable Energy Laboratory, Jan. 2012, www.nrel.gov/docs/fy12osti/51296.pdf.

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: R403.1.1, R403.5.4

Office Use Only	
Proposal Number:	C05-01
Date Submittal Received:	August 13, 2021

Date: 8/13/2021
Name: Edith Makra
Jurisdiction/Company: Metropolitan Mayors Caucus
Submitted on Behalf of: Metropolitan Mayors Caucus
Address: 433 W. Van Buren St., Suite 450
Chicago, IL 60607
Phone: 630-327-4193
E-Mail: emakra@mayorscaucus.org

Related Sections Impacted by this Amendment:

Add new definition and new standard; revise Section R403.1.1 and Table R405.2 and Table R406.2; add Section R403.5.4.

Revise as Follow (in strike-thru / underline format):

Add new definition as follows:

DEMAND RESPONSIVE CONTROL. An automatic control that can receive and automatically respond to demand response requests from a utility, electrical system operator, or third-party demand response program provider.

Revise text as follows:

R403.1.1 Thermostat ~~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 setpoints at different times of the day. 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). The thermostat shall be provided with a d*emand responsive control* capable of increasing the cooling setpoint by no less than 4°F (2.2°C) and decreasing the heating setpoint by no less than 4°F (2.2°C) in response to a demand response request.

Add new text as follows:

R403.5.4 Demand responsive water heating. All electric storage water heaters with a storage tank capacity greater than 20 gallons (76 L) shall be provided with *demand responsive controls* that comply with ANSI/CTA-2045-B or another *approved demand responsive control*.

Revise table as follows:

TABLE R405.2 REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE

SECTION	TITLE
Mechanical	
R403.5 except Section R403.5.2	Service hot water systems
~~R403.5.1~~	~~Heated water circulation and temperature maintenance systems~~
~~R403.5.3~~	~~Drain water heat recovery units~~

Revise table as follows:

TABLE R406.2 REQUIREMENTS FOR ENERGY RATING INDEX

SECTION	TITLE
Mechanical	
R403.5 except Section R403.5.2	Service hot water systems
~~R403.5.1~~	~~Heated water circulation and temperature maintenance systems~~
~~R403.5.3~~	~~Drain water heat recovery units~~

Add new standard as follows:

CTA

Consumer Technology Association
1919 S. Eads Street
Arlington, VA 22202

Standard reference number	*Title*	*Referenced in code section number*
ANSI/CTA-2045-B	*Modular Communications Interface for Energy Management . . . . . .*	*. R403.5.4*

Reason:

Building-grid integration techniques like demand response are critical to achieving Illinois's potential goal to utilize 100% renewable energy by 2050 as outlined in the Clean Energy Jobs Act. In 2020, 11% of Illinois's electricity is sourced from renewable energy, primarily wind, an intermittent source of energy.[64] As Illinois increases the amount of electricity generated from renewables, buildings must be prepared to aid in this transition by storing energy and reducing energy use to match grid demands. In 2016, 32.5% of Illinois's carbon emissions came from the electric power industry.[65] Increasing the number of buildings with demand response controls will reduce emissions from this industry by allowing buildings to shift their load off times of peak demand when peaking fossil fuel plants are more likely to operate.

Demand response controls for water heating and space conditioning are an inexpensive and proven technology that add this needed functionality to buildings. In addition, demand responsive functionality will present a cost-saving opportunity for buildings in the future. More and more utilities are moving beyond voluntary programs and are expanding use of time-of-use rates for electricity as a tool for shaping demand. Installing demand-responsive thermostats, and water heaters now will allow homeowners and renters to better control their utility costs in the future.

[64] *Illinois - State Energy Profile Analysis*, U.S. Energy Information Administration (EIA), www.eia.gov/state/analysis.php?sid=IL.
[65] "U.S. Energy Information Administration - EIA - Independent Statistics and Analysis." *State-Level Energy-Related Carbon Dioxide Emissions, 2005-2016*, www.eia.gov/environment/emissions/state/analysis/.

This proposed amendment would require new thermostats and water heaters to be capable of responding to signals from the grid. Demand responsive controls for thermostats are based on language from California Title 24. Demand response requirements for electric storage water heaters based on ANSI/CTA-2045-B will standardize the socket, and communications protocol, for heat pump water heaters so they can communicate with the grid, and with demand response signal providers. In addition, 2045-B adds control and communications requirements for mixing valves in heat pump water heaters to enable them to provide greater storage capacity to support increased load shifting. Versions of this standard are included in codes or other requirements in California, Oregon, and Washington, and under consideration in several other states including Michigan and Wisconsin.

Cost Impact:

Demand responsive thermostats were found to be extremely cost effective in 2011.[66] For every dollar spent on a demand response thermostat yielded between $2 to $6 in operating cost savings over a 15-year period.[66] In the 10 years since, equipment prices have decreased (less than $60 for a basic DR thermostat[67] compared to just under $30 for a basic 7-day programmable thermostat.[68]) Demand response controls for water heaters which costs between $173 become cost effective when enrolled in a demand response program.[69] Armada Power customers in Ohio who enrolled their water heaters in a demand response program saved $184 annually by enrolling in the program.[70] If Illinois utilities institute a similar program to shape demand, a customer would reap $12 in energy cost savings for every $1 spent on the additional controls. By installing thermostats today that are ready for this type of signal and utility program, Illinois is future proofing the construction of new homes to take advantage of these savings.

I hereby grant and assign to the State of Illinois all rights in copyright I may have in any authorship contributions I make to the State of Illinois in connection with any proposed amendments or public comment, in its original form submitted or revised form, including written and verbal modifications. I understand that I have no rights in any State of Illinois publications that use such contributions in the form submitted by me or another similar form and certify that such contributions are not protected by the copyright of any other person or entity.

Signature (for release of copyrights): _____

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

---

[66] *Final CASE Report: Upgradeable Setback Thermostats*, California Statewide Codes and Standards Enhancement (CASE) Program, October 2011, https://title24stakeholders.com/wp-content/uploads/2020/01/2013_CASE-Report_Upgradeable-Setback-Thermostats.pdf

[67] SupplyHouse. "T3700 - Venstar T3700 - Explorer T3700 Residential Digital Thermostat (2 Heat, 1 Cool)." *SupplyHouse.com*, www.supplyhouse.com/Venstar-T3700-Explorer-T3700-Residential-Digital-Thermostat-2-Heat-1-Cool.

[68] SupplyHouse. "P711-010 - Lux P711-010 - 7 Day, 5/2-Day Programming or Non-Programmable Thermostat, Horizontal Mount (1 Heat - 1 Cool)." SupplyHouse.com, www.supplyhouse.com/Lux-P711-010-7-Day-5-2-day-Programming-or-Non-Programmable-Thermostat-Horizontal-Mount-1-Heat-1-Cool.

[69] *Grid-Interactive Efficient Building Technology Cost, Performance, and Lifetime Characteristics*, Lawrence Berkeley National Labs, Dec. 2020, escholarship.org/uc/item/44t4c2v6#article_main.

[70] https://plma.memberclicks.net/assets/resources/Guidehouse%20Insights_ArmadaPowerWhitePaper.pdf

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: R105.2.5, R404.6

Office Use Only	
Proposal Number:	R06-01
Date Submittal Received:	August 13, 2021

Date: 8/13/2021
Name: Diana Burk
Jurisdiction/Company: New Buildings Institute
Submitted on Behalf of: New Buildings Institute
Address: 623 SW Oak Street
Portland, Oregon
Phone: 404-290-5442
E-Mail: diana@newbuildings.org

Related Sections Impacted by this Amendment:

Add new definitions
Revise Section R103.2, R401.3, R402.1, Table R405.2, Table R406.2,
Add Section R105.2.5, R404.6

Revise as Follow (in strike-thru / underline format):

Revise text as follows:

R103.2 Information on construction documents. Construction documents shall be drawn to scale upon suitable material. Electronic media documented are permitted to be submitted when 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 herein governed. Details shall include the following as applicable:

6. Mechanical and service water heating systems and equipment types, sizes, fuel sources and efficiencies.

Add new text as follows:

R103.2.4 Electrification system. The construction documents shall provide details for additional electric infrastructure, including branch circuits, conduit, or pre-wiring, and panel capacity in compliance with the provisions of this code.

Add new text as follows:

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.

Revise numbering as follows:

~~**R105.2.5**~~ **R105.2.6 Final inspection.**

Add new definitions as follows:

ALL-ELECTRIC BUILDING. A *building* that contains no *combustion equipment*, or plumbing for *combustion equipment,* installed within the *building,* or *building site.*

APPLIANCE. A device or apparatus that is manufactured and designed to utilize energy and for which this code provides specific requirements.

COMBUSTION EQUIPMENT. Any *equipment* or *appliance* used for space heating, *service water heating*, cooking, clothes drying, or lighting that uses *fuel gas* or *fuel oil*.

EQUIPMENT. Piping, ducts, vents, control devices and other components of systems other than appliances that are permanently installed and integrated to provide control of environmental conditions for buildings. This definition shall also include other systems specifically regulated in this code.

FUEL GAS. A natural gas, manufactured gas, liquified petroleum gas or a mixture of these.

FUEL OIL. Kerosene or any hydrocarbon oil having a flash point not less than 100°F (38°C).

MIXED-FUEL BUILDING. A *building* that contains *combustion equipment* or includes piping for *combustion equipment*.

Revise text as follows:

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 certification shall indicate the following:

4. The types, sizes, fuel sources, and efficiencies of heating, cooling and service water heating equipment. Where a gas-fired 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.

8. The fuel sources for cooking and clothes drying equipment.

9. Where combustion equipment is installed, the certificate shall indicate information on the installation of additional electric infrastructure including which *equipment* and/or *appliances* include additional electric infrastructure, capacity reserved on the electrical service panel for replacement of each piece of combustion *equipment* and/or *appliance*

Add new text as follows:

R404.6 Additional electric infrastructure. *Combustion equipment* shall be installed in accordance with this section.

R404.6.1 Equipment serving multiple units. *Combustion equipment* that serves multiple *dwelling units* shall comply with Section C405.13.

R404.6.2 Combustion water heating. Water heaters shall be installed in accordance with the following:

1. A dedicated 240-volt branch circuit with a minimum capacity of 30 amps shall terminate within 3 feet (914 mm) from the water heater and be accessible to the water heater with no obstructions. Both ends of the branch circuit shall be labeled with the words "For Future Heat Pump Water Heater" and be electrically isolated.
2. A condensate drain that is no more than 2 inches (51 mm) higher than the base of the installed water heater and allows natural draining without pump assistance shall be installed within 3 feet (914 mm) of the water heater.
3. The water heater shall be installed in a space with minimum dimensions of 3 feet (914 mm) by 3 feet (914 mm) by 7 feet (2134 mm) high.

4. The water heater shall be installed in a space with a minimum volume of 700 cubic feet (20,000 L) or the equivalent of one 16-inch (406 mm) by 24-inch (610 mm) grill to a heated space and one 8-inch (203 mm) duct of no more than 10 feet (3048 mm) in length for cool exhaust air.

R404.6.3 Combustion space heating. Where a building has combustion equipment for space heating, the building shall be provided with a designated exterior location(s) in accordance with the following:

1. Natural drainage for condensate from cooling equipment 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."

   Exception: Where an electrical circuit in compliance with IRC Section E3702.11 exists for space cooling equipment.

R404.6.4 Combustion clothes drying. A dedicated 240-volt branch circuit with a minimum capacity of 30 amps shall terminate within 6 feet (1829 mm) of natural gas clothes dryers and shall be accessible with no obstructions. Both ends of the branch circuit shall be labeled with the words "For Future Electric Clothes Drying" and be electrically isolated.

R404.6.5 Combustion cooking. A dedicated 240-Volt, 40A branch circuit shall terminate within 6 feet (1829 mm) of natural gas ranges, cooktops and ovens and be accessible with no obstructions. Both ends of the branch circuit shall be labeled with the words "For Future Electric Range" and be electrically isolated.

R404.6.6 Other combustion equipment. *Combustion equipment* and end-uses not covered by Sections R404.6.2-5 shall be provided with a branch circuit sized for an electric *appliance*, *equipment* or end use with an equivalent capacity that terminates within 6 feet (1829 mm) of the *appliance* or *equipment*.

Revise table as follows:

TABLE R405.2 REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE

SECTION [a]	TITLE
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls
R404.6	Additional electric infrastructure

Revise table as follows:

TABLE R406.2 REQUIREMENTS FOR ENERGY RATING INDEX

SECTION [a]	TITLE
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls
R404.6	Additional electric infrastructure
R406.3	Building thermal envelope

Reason:

In order for Illinois to reach net zero carbon emissions, the state must not only reduce energy use through energy efficiency and move to utility scale and on-site renewable energy, but also begin to transition away from using combustion equipment in buildings that runs on fossil fuels to electric equipment. In 2016, combustion

equipment in commercial and residential buildings accounted for 17% of Illinois's greenhouse gas emissions.[71] Because of Illinois's cold climate and reliance on natural gas, a recent study found that Illinois ranked in the top 10 of US states for potential emission reductions through building electrification.[72] Therefore it is crucial that new buildings today can be cost-effectively retrofitted in the future with electric equipment so that emissions are not "locked-in" by gas-dependent building infrastructure.

Fortunately, heat pump technology has dramatically improved over the last few decades, giving contractors and building owners access to highly efficient electric heating and cooling, and water heating technologies. Even accounting for reduced efficiency in extreme cold weather, modern air source heat pumps are more than twice as efficient as gas furnaces and in Illinois's climate zone can save families up to 9 percent on their utility bills. All-electric new construction is also less expensive to build than a home with gas appliances.[73]

All-electric homes are also healthier homes. Gas appliances release harmful pollutants like nitrogen dioxide (NO2) and carbon monoxide (CO) either indoors because of gas stoves or outdoors because of space-heating and water heating equipment. A recent study from the Harvard Chang School of Public Health and RMI shows that in Illinois in 2017, air pollution from burning fuels in buildings led to an estimated 1,123 early deaths and $12.574 billion in health impact costs.[74] These emissions can particularly affect children. In a meta-analysis analyzing the connections between gas stoves and childhood asthma, children in homes with gas stoves were 42% more likely to experience asthma symptoms, and 32% more likely to being diagnosed with asthma.[75] Therefore, ensuring all-electric appliances can be installed in our buildings in the future is critical to reducing air pollution, protect public health, reducing utility and construction costs, and meeting climate goals.

One of the biggest expenses of electrification retrofits – and therefore barriers to electrification in existing buildings - is running electrical infrastructure through a completed and enclosed building that has combustion equipment. This significant future cost can be greatly reduced through making simple, low-cost modifications to buildings during construction that enable easier electrification in the future. The requirements in this proposed amendment ensure that the electrical infrastructure is in place so that homeowners can convert to an all-electric building in the future and ensures that gas water heaters can be replaced with high-performance heat pump water heaters (HPWHs).

Changes with similar intent, electric-ready and electric-preference, with goals of moving toward zero carbon new construction, are being explored in other jurisdictions including Wisconsin, Michigan, Washington State, Denver, CO, Washington, DC, New York State, Massachusetts, Connecticut and California.[76] NBI is submitting this amendment along with amendments that address electrification incentives, on-site renewables, electric vehicles, and grid integration techniques. These proposed changes to Illinois's code, working together, will put Illinois on the path to a decarbonized, resilient, and healthier future.

Electric Infrastructure:

The addition of R404.6 ensures the electrical plugs and physical space exists so that *a building owner can cost effectively replace their gas equipment and appliances with electric equipment in the future. This language is based on the approach adopted in the electrification reach codes adopted by various California cities.*

As described in R404.6.1, this proposal is limited to gas equipment that serves individual dwelling units. Equipment that serves multiple dwelling units is directed to a similar proposed code amendment in the commercial section. If the Capitol Development Board choses to adopt this amendment and not the electric-readiness amendment for commercial, this amendment should be revised accordingly.

[71] "U.S. Energy Information Administration - EIA - Independent Statistics and Analysis." *State-Level Energy-Related Carbon Dioxide Emissions, 2005-2016*, www.eia.gov/environment/emissions/state/analysis/.
[72] Electric Buildings: Repowering Homes and Businesses for Our Health and Environment, *Environment America, U.S PIRG, Frontier Grou*p, Apr. 2021, environmentamerica.org/sites/environment/files/reports/Electric-Buildings-2021/National-Electric-Buildings-Web.pdf.
[73] *The New Economics of Electrifying Buildings*. RMI, 12 Feb. 2021, rmi.org/insight/the-new-economics-of-electrifying-buildings.
[74] *Health Air Quality Impacts of Buildings Emissions*. RMI, 5 May 2021, rmi.org/health-air-quality-impacts-of-buildings-emissions#MI.
[75] *Gas Stoves: Health and Air Quality Impacts and Solutions.* RMI, 1 Feb. 2021, rmi.org/insight/gas-stoves-pollution-health/.
[76] Golden, Sarah. *"Trend: Commercial Buildings Go All-Electric*." Greenbiz, 2 Mar. 2020, www.greenbiz.com/article/trend-commercial-buildings-go-all-electric.

R404.6.2 is focused on ensuring that water heater locations are physically capable of incorporating a future heat pump water heater (HPWH). *Requirement 1 ensures that there is a branch circuit ready to support the future installation of a HPWH. Requirement 2 ensures that the condensate generated by a HPWH compressor can be easily drained away. Requirement 3 ensures that the water heater location is physically large enough to accommodate HPWHs that are frequently wider and/or taller than code-minimum gas water heaters. Requirement 4 ensures that a future HPWH has access to sufficient air volume to effectively operate.* These requirements are based on the requirements adopted in several CA jurisdictions electrification reach codes.

R404.6.3 ensures the electric infrastructure for combustion space heating is present so that a heat pump can be installed in the future. The section references IRC Section E3702.11 which sets the requirement for sizing a branch circuit serving a heat pump and relies on the size of the actual equipment to be installed. Since there is not an actual equipment size to reference and equipment size can vary depending on the size of the home and the climate, the section also references Section R403.7 to establish the size of the heat pump equipment that would be required for the specific home.

R404.6.4 and R404.6.5 requires combustion clothes drying and cooking to have plugs nearby so that a homeowners can replace them with electric equipment cost effectively in the future. IRC Section E3702.9.1 requires a 240V/40A branch circuit for a standard 8.75 kVA or larger electric residential range and has been used as the basis for the sizing of the branch circuit. Six feet is cited per requirements from IRC Section E3901.5 requiring appliance receptacles to be within 6 feet of the intended appliance. R404.6.6 addresses electric infrastructure requirements for all other combustion equipment.

This section and others rely on new definitions for appliance, equipment, fuel gas and fuel oil which are mirrored from 2021 IMC to be useful in defining combustion equipment.

Inspection and Construction Documents

R103.2 and R401.3 requires builders to note the electric infrastructure in place on the construction documents and compliance certificate to both allow for easier enforcement of these provisions and to ensure current or future homeowners are aware that they can easily replace combustion equipment and appliances with electric equipment and appliances. R105.2.5 requires code officials to perform an electrical inspection at the rough-in stage to ensure electric-ready requirements are met.

Cost Impact:

Illinois buildings that are all-electric would have no change in construction costs. Mixed fuel buildings would be slightly more expensive to build because they have to be electric-ready. Recent analysis by NBI and partners using cost data from RSMeans indicates that additional electrical infrastructure costs for water-heating, space-heating, and cooking cost $440.

However if a homeowner were to have to retrofit their home from using combustion equipment to natural gas equipment costs without these requirements in place, costs could be exorbitant. For example, upgrading the electrical panel could cost upwards of $6,000 if it is not sized appropriately.[77]

[77] Woody, Todd. *Climate-Proofing Your Home: How to Electrify*. Bloomberg, 5 Jan. 2021, www.bloomberg.com/news/articles/2021-01-05/switching-to-electric-home-appliances-for-environmental-and-economic-benefits.

Illinois publications that use such contributions in the form submitted by me or another similar form and certify that such contributions are not protected by the copyright of any other person or entity.

Signature (for release of copyrights): Diana Burk

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: R401.2.5, R402.1, R406.5

Office Use Only	
Proposal Number:	R07-01
Date Submittal Received:	August 13, 2021

Date: 8/13/2021
Name: Edith Makra
Jurisdiction/Company: Metropolitan Mayors Caucus
Submitted on Behalf of: Metropolitan Mayors Caucus
Address: 433 W. Van Buren St., Suite 450
Chicago, IL 60607
Phone: 630-327-4193
E-Mail: emakra@mayorscaucus.org

Related Sections Impacted by this Amendment:

Revise Section R401.2.5, R402.1 and R406.5, add new definitions

Revise as Follow (in strike-thru / underline format):

Add new definitions as follows:

ALL-ELECTRIC BUILDING. A *building* that contains no *combustion equipment*, or plumbing for *combustion equipment,* installed within the *building,* or *building site.*

APPLIANCE. A device or apparatus that is manufactured and designed to utilize energy and for which this code provides specific requirements.

COMBUSTION EQUIPMENT. Any *equipment* or *appliance* used for space heating, *service water heating*, cooking, clothes drying, or lighting that uses *fuel gas* or *fuel oil*.

EQUIPMENT. Piping, ducts, vents, control devices and other components of systems other than appliances that are permanently installed and integrated to provide control of environmental conditions for buildings. This definition shall also include other systems specifically regulated in this code.

FUEL GAS. A natural gas, manufactured gas, liquified petroleum gas or a mixture of these.

FUEL OIL. Kerosene or any hydrocarbon oil having a flash point not less than 100°F (38°C).

MIXED-FUEL BUILDING. A *building* that contains *combustion equipment* or includes piping for *combustion equipment*.

Revise text as follows:

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

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

2. For mixed-fuel buildings complying with Section R401.2.1, the building shall be required to install either R408.2.1 or R408.2.5 of the additional efficiency package options, and any two of R408.2.2, R408.2.3, or R408.2.4 of the additional efficiency package options.

~~2~~3. For buildings complying with Section R401.2.2, the building shall meet one of the following:

~~2~~3.1. *All-electric buildings* shall have ~~O~~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~~3.2. The proposed design of the *all-electric building* ~~building~~ under Section R405.3 shall have an annual energy cost that is less than or equal to the 95 percent of the annual energy cost of the standard reference design~~.~~; or

3.3 Mixed-fuel buildings shall have either R408.2.1 or R408.2.5 of the additional efficiency package options, and any two of R408.2.2, R408.2.3, or R408.2.4 of the additional efficiency package options installed without including such measures in the proposed design under Section R405; or

3.4 The proposed design of the mixed-fuel building under Section R405.3 shall have an annual energy cost that is less than or equal to 85 percent of the annual energy cost of the standard reference design.

~~3~~4. 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 options selected for compliance shall be identified in the certificate required by Section R401.3.

R402.1 General. The building thermal envelope shall comply with the requirements of Sections R402.1.1 through R402.1.5.

Exceptions:

1. The following low-energy buildings, or portions thereof, separated from the remainder of the *building* by *building thermal envelope assemblies* complying with this section shall be exempt from the building thermal envelope provisions of Section R402.
   1.1 Those containing no *combustion equipment* with a peak design rate of energy usage less than 3.4 Btu/h·ft2 (10.7 W/m2) or 1.0 watt/ft2 of floor area for space conditioning purposes.
   1.2 Those containing no *combustion equipment* that do not contain *conditioned space*.

Revise text as follows:

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 for the proposed *mixed-fuel building* or the proposed *all-electric building* as indicated in Table R406.4 when compared to the *ERI reference design*.

TABLE R406.4 MAXIMUM ENERGY RATING INDEX

Climate Zone	~~Energy Rating Index~~ All-Electric Building	Mixed Fuel Building
4	54	47
5	55	47

Add new text as follows:

R408.2.3 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 82 EF fossil fuel service water-heating system.
2. Greater than or equal to 2.0 EF electric service water-heating system.
3. Greater than or equal to 0.4 solar fraction solar water-heating system.
4. Greater than or equal to 82 EF instantaneous fossil fuel service water-heating system and drain water heat recovery unit meeting the requirements of Section R403.5.3 installed on at least one shower.

Reason:

In order for Illinois to reach net zero carbon emissions, the state must not only reduce energy use through energy efficiency and move to utility scale and on-site renewable energy, but also begin to transition away from using combustion equipment in buildings that runs on fossil fuels to electric equipment. In 2016, combustion equipment in commercial and residential buildings accounted for 17% of Illinois's greenhouse gas emissions.[78] Because of Illinois's cold climate and reliance on natural gas, a recent study found that Illinois ranked in the top 10 of US states for potential emission reductions through building electrification.[79] Therefore it is crucial that new buildings today be incentivized to install electric equipment now.

Fortunately, heat pump technology has dramatically improved over the last few decades, giving contractors and building owners access to highly efficient electric heating and cooling, and water heating technologies. Even accounting for reduced efficiency in extreme cold weather, modern air source heat pumps are more than twice as efficient as gas furnaces and in Illinois's climate zone can save families up to 9 percent on their utility bills. All-electric new construction is also less expensive to build than a home with gas appliances.[80]

All-electric homes are also healthier homes. Gas appliances release harmful pollutants like nitrogen dioxide (NO2) and carbon monoxide (CO) either indoors because of gas stoves or outdoors because of space-heating and water heating equipment. A recent study from the Harvard Chang School of Public Health and RMI shows that in Illinois in 2017, air pollution from burning fuels in buildings led to an estimated 1,123 early deaths and $12.574 billion in health impact costs.[81] These emissions can particularly affect children. In a meta-analysis analyzing the connections between gas stoves and childhood asthma, children in homes with gas stoves were 42% more likely to experience asthma symptoms, and 32% more likely to being diagnosed with asthma.[82] Therefore, incentivizing all-electric construction is critical to reducing air pollution, protect public health, reducing utility and construction costs, and meeting climate goals.

This code amendment requires buildings with combustion equipment to be as or more efficient than all-electric buildings because all-electric buildings are more efficient than mixed-fuel buildings. Changes with similar intent, electric-ready and electric-preference, with goals of moving toward zero carbon new construction, are being explored in other jurisdictions including Wisconsin, Michigan, Washington State, Denver, CO, Washington, DC, New York State, Massachusetts, Connecticut and California.[83] NBI is submitting this amendment along with amendments that address electric-readiness, on-site renewables, electric vehicles, and grid integration techniques. These proposed changes to Illinois's code, working together, will put Illinois on the path to a decarbonized, resilient, and healthier future.

Efficiency

All-electric newly constructed homes typically use less energy when compared to newly constructed mixed-fuel homes. Revisions to R401.2.5 seek to encourage electrification and more evenly weigh the impact of the additional efficiency credits by requiring the mixed-fuel home to select a total of three packages from the options while the all-electric home is required to select one package. Of the three packages required for the

[78] "U.S. Energy Information Administration - EIA - Independent Statistics and Analysis." *State-Level Energy-Related Carbon Dioxide Emissions, 2005-2016*, www.eia.gov/environment/emissions/state/analysis/.
[79] Electric Buildings: Repowering Homes and Businesses for Our Health and Environment, *Environment America, U.S PIRG, Frontier Grou*p, Apr. 2021, environmentamerica.org/sites/environment/files/reports/Electric-Buildings-2021/National-Electric-Buildings-Web.pdf.
[80] *The New Economics of Electrifying Buildings*. RMI, 12 Feb. 2021, rmi.org/insight/the-new-economics-of-electrifying-buildings.
[81] *Health Air Quality Impacts of Buildings Emissions*. RMI, 5 May 2021, rmi.org/health-air-quality-impacts-of-buildings-emissions#MI.
[82] *Gas Stoves: Health and Air Quality Impacts and Solutions.* RMI, 1 Feb. 2021, rmi.org/insight/gas-stoves-pollution-health/.
[83] Golden, Sarah. *"Trend: Commercial Buildings Go All-Electric*." Greenbiz, 2 Mar. 2020, www.greenbiz.com/article/trend-commercial-buildings-go-all-electric.

mixed-fuel home, one must address the envelope (improved envelope or reduced infiltration plus better ventilation) while the remaining two impact HVAC (better equipment or more efficient ducts) and water-heating (better equipment) requirements). Since mixed fuel buildings will be required to select more package options, the amendment also adds a fourth service hot water package that combines the efficiency benefits of an instantaneous gas water heater with a drain water heat recovery unit. This package is based on analysis conducted by the Northwest Energy Efficiency Alliance[84] (NEEA). Modifications to requirement 3 under R401.2.4 applies this same concept to the performance path.

Low-energy buildings

Low energy buildings are currently exempt from thermal envelope requirements. The revision to R402.1 requires low-energy buildings that choose not to install insulation to be all-electric to reduce their greenhouse gas impact.

ERI

The proposal also includes a modification to R406 which encourages homes following the ERI performance path to be all-electric by setting more stringent ERI values for mixed-fuel homes. This is needed as Standard 301, which sets the calculation methodology for calculating ERI, claims to be fuel agnostic. The ERI values for mixed-fuel homes match those from ASHRAE 90.2 and Appendix RC Zero Energy Residential Building Provisions as published in the 2021 IECC. The ERI values for all-electric homes are the same as the values published in Table R406.5 of the 2021 IECC.

Cost Impact:

Illinois buildings that are all-electric would have no change in construction costs. Mixed fuel buildings would be slightly more expensive to build because they would have to be more efficient. Recent analysis by NBI and partners using cost data from RSMeans indicates that additional energy efficiency measures required by mixed-fuel buildings would raise construction costs by $1,350. This additional expense would pay itself back because of reduced energy costs in these homes.

Signature (for release of copyrights):

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

[84] Heny Odum; Paul Kinter; *Oregon Residential Specialty Code: Energy Efficiency Analysis,* NEEA (March 2020)

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: R103.2.4, R105.2.5, R404.6

Office Use Only	
Proposal Number:	R08-01
Date Submittal Received:	August 13, 2021

Date: 8/13/2021
Name: Edith Makra
Jurisdiction/Company: Metropolitan Mayors Caucus
Submitted on Behalf of: Metropolitan Mayors Caucus
Address: 433 W. Van Buren St., Suite 450
Chicago, IL 60607
Phone: 630-327-4193
E-Mail: emakra@mayorscaucus.org

Related Sections Impacted by this Amendment:

Add new Section R103.2.4, R105.2.5, R404.6

Revise as Follow (in strike-thru / underline format):

Add new text as follows:

R103.2.4 Energy storage-ready system. The construction documents shall provide the location of pathways for routing of raceways or cable from the electrical service panel and energy storage system area and the location and layout of a designated area for electrical energy storage system.

Add new text as follows:

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 energy storage system area is not in the same space as the electrical panel, inspections shall verify conduit or pre-wiring from the energy storage ready zone to the electrical panel.

Add new text as follows:

R404.6 Energy storage infrastructure. Each *building site* shall have a dedicated location for the installation of future on-site energy storage in accordance with this section.

Exception: Where an onsite electrical energy system storage system is installed.

R404.6.1 One- and two- family dwellings and townhouses. One- and two-family dwellings and townhouses shall be provided with an energy storage ready area in accordance with the following:

1. Floor area not less than 2 feet (610 mm) in one dimension and 4 feet (1219 mm) in another dimension and located in accordance with Section 1207 of the International Fire Code and Section 110.26 of the NFPA 70.

2. The main electrical service panel shall have a reserved space to allow installation of a two-pole circuit breaker for future electrical energy storage system installation. This space shall be labeled "For Future Electric Storage." The reserved spaces shall be positioned at the end of the panel that is opposite from the panel supply conductor connection.

R404.6.2 Group R occupancies. Buildings with Group R-2, R-3 and R-4 occupancies shall comply with Section C405.15.

Revise table as follows:

TABLE R405.2 REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE

SECTION [a]	TITLE
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls
R404.6	Energy storage infrastructure

Revise table as follows:

TABLE R406.2 REQUIREMENTS FOR ENERGY RATING INDEX

SECTION [a]	TITLE
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls
R404.6	Energy storage infrastructure
R406.3	Building thermal envelope

Reason:

Energy storage is critical to achieving the goal outlined in the Clean Energy Jobs Act to utilize 100% renewable energy by 2050. These systems will also improve Illinois's economy, present a cost savings opportunity for Illinois homeowners in the future and increase Illinois's resilience to power outages. In 2020, 11% of Illinois's electricity is sourced from renewable energy, primarily wind, an intermittent source of energy.[85] According to ComEd, as Illinois increases the amount of electricity generated from renewables in order to meet clean energy goals, buildings must be prepared to aid in this transition by storing energy to match grid demands.[86]

Policies to encourage energy storage will improve Illinois's economy. Energy storage is expected to grow by over 40% each year until 2025[87] and the Midwest, because of its manufacturing background and experience in batter-storage technology for cars is becoming a clear leader in this market.[88]

Energy storage will also present a cost-saving opportunity for Illinois homeowners. Battery prices have and will likely continue to fall in the United States,[89] meaning that behind-the-meter storage will likely become more accessible and affordable in the short-term. More and more utilities are moving beyond voluntary programs

[85] *Illinois - State Energy Profile Analysis*, U.S. Energy Information Administration (EIA), www.eia.gov/state/analysis.php?sid=IL.

[86] *In Illinois, Storage Is among the next Hurdles for Renewables Expansion*, Energy News Network, 3 May 2019, energynews.us/2019/05/03/in-illinois-storage-is-among-the-next-hurdles-for-renewables-expansion/.

[87] "Battery Storage Paves Way for a Renewable-Powered Future." *International Renewable Energy Agency*, www.irena.org/newsroom/articles/2020/Mar/Battery-storage-paves-way-for-a-renewable-powered-future.

[88] Balaskovitz, Andy, and Energy News Network August 13 Andy Balaskovitz. "Michigan Emerges as a Leader in Battery Storage Industry, Research." *Energy News Network*, 12 Aug. 2015, energynews.us/2015/08/13/michigan-emerges-as-a-leader-in-battery-storage-industry-research/.

[89] Lee, Timothy. *Battery Prices Have Fallen 88 Percent over the Last Decade*. Ars Technica, 18 Dec. 2020, arstechnica.com/science/2020/12/battery-prices-have-fallen-88-percent-over-the-last-decade/#:~:text=The%20average%20cost%20of%20a,of%2013%20percent%20since%202019.

and are expanding use of time-of-use rates for electricity as a tool for shaping demand. Ensuring homes are energy-storage ready now will allow them to cost effectively install storage systems in the future and take advantage of these voluntary programs.

Finally, energy storage will improve Illinois's resilience to power outages. Requiring homes to be storage-ready will ensure Illinois communities are more resilient by allowing buildings to cost effectively install storage which can operate for a short-period of time without relying on the electricity grid.

This code proposal requires residential buildings to have the physical space, panel space and equipment for a future energy storage system. This requirement has been migrated up from Appendix CB Solar-Ready Zone into the main body of the residential code. This language includes revisions from the 2019 Group B Public Comment that were not incorporated into the final text of the 2021 IECC but modifies the language to ensure needed correlation with the IFC and NFPA. The reference to the IFC was also updated to the latest version. For ease of enforcement, information for electrical energy storage have been included as part of construction documents. The ERI and total building performance mandatory requirements table has also been modified to include the new requirements for energy storage as mandatory elements of the code amendments.

Cost Impact:

Incremental costs of ensuring buildings are energy storage ready will increase costs but those costs are minor compared to retrofit costs for buildings who chose to add storage later when a building is not storage-ready. These incremental cost impacts include additional design professional fees, markings on the panels, and additional construction costs only if there were not spare square footage available in the equipment or storage rooms where panels are generally located. In that case, it would be equal to the construction costs for an additional 8 square feet of storage space.

Signature (for release of copyrights): _____

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: R202

Office Use Only	
Proposal Number:	R09-01
Date Submittal Received:	August 13, 2021

Date: August 14, 2021
Name: Bill McHugh
Jurisdiction/Company: Chicago Roofing Contractors Association
Submitted on Behalf of:
Address: 4415 W. Harrison St., #540
Hillside, IL 60162
Phone: 708-449-3340
E-Mail: bill@crca.org

Related Sections Impacted by this Amendment:
Revise as Follow (in strike-thru / underline format):

R202
ROOF MEMBRANE PEEL AND REPLACEMENT. Where an existing weather resisting roof membrane alone is removed, exposing insulation, an existing roof membrane or sheathing and only a new weather resisting roof membrane or recover board and insulation is installed.

Reason:

This modification to the existing language is to cover another situation that occurs on rooftops – the bottom roof is in good shape, but aged and can be reused as a base for the new roof. In this case, an existing roof has had a recover board added, and then a roof membrane applied, totally two roofs on the building.

That new top roof membrane and recover board needs replacing. In this case, if the bottom membrane is still suitable for roof recover, a new recover board and new membrane is installed on top of the old, original roof membrane. This edit would codify this method, a viable option for many roofs in the cities and suburbs in IL.

Cost Impact:

This modification will not increase the cost of construction if it is deemed to be a roof membrane peel and replacement, which is already allowed by current code.

Signature (for release of copyrights): WJM

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section(s): R202, R503.1.1

Mark S. Graham,
Vice President, Technical Services
National Roofing Contractors Association (NRCA)
10255 W. Higgins Road, Suite 600
Rosemont, IL 60018
(847) 493-7511 Direct
(847) 299-9070 Office main
mgraham@nrca.net
www.nrca.net

Proposal No. R10-01
Date of Submittal. August 14, 2021

Signature (for release of copyrights). MSG (electronic)

Sections Impacted by Amendment. R202, R503.1.1

Revise as Follows (In ~~strike-out~~/underline format):

SECTION R202
GENERAL DEFINITIONS

ROOF REPLACMENT. The process of removing ~~the~~ all existing layers of the roof ~~coverings~~system down to the roof deck, repairing any damaged substrate and installing a new roof ~~coverings~~system.

R503.1.1 Building envelope. *Building* envelope assemblies that are part of the *alteration* shall comply with Section R402.1.2 or R402.1.4, Sections R402.2.1 through R402.2.12, R402.3.1, R402.3.2, R402.4.3 and R402.4.5.

Exception: The following *alterations* need not comply with the requirements for new construction, provided that the energy use of the building is not increased: 1. Storm windows installed over existing *fenestration.*

2. Existing ceiling, wall or floor cavities exposed during construction, provided that these cavities are filled with insulation.

3. Construction where the existing roof, wall or floor cavity is not exposed.
4. *Roof recover.*

5. *Roof replacement*: ~~Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or belowthe sheathing.~~

a. Where the existing roof insulation is integral to or is located below the roof deck.

b. Where the new *roof assembly* above deck *R-Value* or *roof assembly U-factor*, is installed in accordance with the following:

i. In compliance with the provisions of either C402.1.3, C402.1.4, C402.1.5 or C407; and,

ii. In maximum practicable compliance with Table C402.1.3 or Table C402.1.4 or C402.1.5, including any partial compliance in areas subject to limiting conditions identified in a survey of existing conditions conducted prior to the *alteration* and provided to the *code official*; and.

iii. 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.*

Formatted: Font: Italic

Formatted: Space After: 6 pt

Formatted: No underline

Formatted: No underline

Formatted: Font: (Default) Times New Roman, 10 pt

Formatted: Default, Justified, Space After: 6 pt, Numbered + Level: 2 + Numbering Style: i, ii, iii, … + Start at: 1 + Alignment: Right + Aligned at: 0.75" + Indent at: 1", Adjust space between Latin and Asian text, Adjust space between Asian text and numbers, Tab stops: 0.5", Left

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

6. Surface-applied window film installed on existing single-pane *fenestration* assemblies reducing solar heat gain, provided that the code does not require the glazing or *fenestration* to be replaced.

Reason. The proposal addresses envelope requirements applicable to *roof replacements* to existing *buildings* by:

- Defining *roof replacement* consistently with the International Building Code (IBC) and consistent with contemporary roofing industry and code enforcement terminology;
- Confirming *roof replacement* as an *alteration* having its unique set of provisions by exception, and
  - Consistent with the intent of the framers of provisions of the Illinois Energy Conservation Code for *alterations* to existing buildings;
  - Consistent with the Chicago Memorandum (attached) as negotiated by the CRCA and the former IL DCEO, Office of Energy & Recycling in support of the Chicago Energy Conservation Code;
- Adding a provision for an "inspection report" of existing conditions conducted prior to the alteration and requiring its submission to those who enforce the Code; and
- Assuring advocates of efficiency measures that 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 *roof replacement* operations.

Cost Impact. The amendment will neither increase nor decrease the cost of construction.

Increases in model energy codes' building energy performance requirements have resulted in increased R-values being specific for many of the thermal envelope components of the building, including and particularly, roof systems. Where is the equivalency among a four-story brownstone in Chicago required to provide a low-slope, above-deck R-value of R-60, while a four-story multi-family building in Oak Park is permitted to provide a low-slope, above-deck R-value of R-30? Comparatively, where is the equivalency among a three-story, three-flat in Rockford is required to provide a low-slope, above-deck R-value of R-60, while a two-story Bass Pro Shop in Belleville is allowed to provide a low-slope, above-deck R-value of R-30?

Such R-value increases have been implemented into the code with little to no consideration of the added initial (construction) costs and long-term payback to building owners and local property managers who (primarily) initiate their maintenance, repair and replacement by initiating such inquiries, not with an Architect or code enforcement but a roofing contractor.

Accordingly, NRCA conducted a 2014 energy-savings and payback analysis for roof assembly R-value increases[1] in sixteen (16) of Americas largest cities and representative of the Standard's (then) eight (8) U.S. climate zones. We believe that using contemporary pricing for materials and the relatively flat-costs of energy across the commercial building sector, will only increase the paybacks forecast.

[1] Graham M., "Analyzing R-value Requirements – Cost paybacks to increases in R-values may not be practical," NRCA Industry Issue Update, National Roofing Contractors Association, 2014.

Public Code Change Proposal Form **Code Section(s): R202, R03.1.1**

To Amend the 2021 Illinois Energy Conservation Code

Mark S. Graham,
Vice President, Technical Services
National Roofing Contractors Association (NRCA)
10255 W. Higgins Road, Suite 600
Rosemont, IL 60018
(847) 493-7511 Direct
(847) 299-9070 Office main
mgraham@nrca.net
www.nrca.net

Proposal No. R11-01
Date of Submittal. August 14, 2021

Signature (for release of copyrights). MSG (electronic)

Sections Impacted by Amendment. R202, R503.1.1

Revise as Follows (In ~~strike out~~/underline format):

SECTION R202
GENERAL DEFINITIONS

ROOF REPLACMENT. The process of removing ~~the~~ all existing layers of the roof ~~covering~~system down to the roof deck, repairing any damaged substrate and installing a new roof ~~covering~~system.

R503.1.1 Building envelope. *Building* envelope assemblies that are part of the *alteration* shall comply with Section R402.1.2 or R402.1.4, Sections R402.2.1 through R402.2.12, R402.3.1, R402.3.2, R402.4.3 and R402.4.5.

Exception: The following *alterations* need not comply with the requirements for new construction, provided that the energy use of the building is not increased: 1. Storm windows installed over existing *fenestration*.

2. Existing ceiling, wall or floor cavities exposed during construction, provided that these cavities are filled with insulation.
3. Construction where the existing roof, wall or floor cavity is not exposed.
4. *Roof recover*.

5. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below
the sheathing.

6. Surface-applied window film installed on existing single-pane *fenestration* assemblies reducing solar heat gain, provided that the code does not require the glazing or *fenestration* to be replaced.
7. *Air barriers* shall not be required for *roof recover* and roof replacement where the *alterations* or renovations to the building do not include *alterations*, renovations or *repairs* to the remainder of the building envelope.

Formatted: Space After: 0 pt

Reason. The proposal addresses envelope requirements applicable to *reroofing* operations (i.e., *roof recover* and *roof replacements*) to existing *buildings* by:

- Defining *roof replacement* consistently with the International Building Code (IBC) and consistent with contemporary roofing industry and code enforcement terminology;

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

- Confirming the ineffectuality of systemic air sealing or leakage testing as a result of reroofing *alterations*. For instance, consider the analogy where the existing building shell (built 10-, 20-, 50-years ago) as if it were a food colander:
  - Holes in the food colander constitute existing leakage pathways through doors, windows, chimneys, walls and floors over outdoor air or crawlspaces;
  - Consider a piece of saranwrap/cellophane wrapped over the top of the colander the existing low-sloped, roof system or roof covering;
  - When conducting a roof recover, a new piece of saranwrap/cellophane is wrapped over the existing low-sloped, roof covering/membrane. Should such operation require retroactive air sealing of the roof, much more the building?
  - When conducting a roof replacement, the existing saranwrap/cellophane is removed and a new piece of saranwrap/cellophane is wrapped over the colander. Should such operation require retroactive air sealing of the roof, much more the building?

Cost Impact. The amendment will decrease the cost of (reroofing) construction.

Public Code Change Proposal Form

Code Section: R402.2.1, R402.2.2

To Amend the 2021 Illinois Energy Conservation Code

Mark S. Graham,
Vice President, Technical Services
National Roofing Contractors Association (NRCA)
10255 W. Higgins Road, Suite 600
Rosemont, IL 60018
(847) 493-7511 Direct
(847) 299-9070 Office main
mgraham@nrca.net
www.nrca.net

Proposal No. R12-01
Date of Submittal. August 14, 2021

Signature (for release of copyrights). MSG (electronic)

Related Sections Impacted by Amendment. R402.2.1, R402.2.2, Table R402.1.2, Table R402.1.3

Revise as Follows (In ~~strike-out~~/underline format).

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

CLIMATE ZONE	FENES-TRATION U-FACTOR b	SKYLIGHTb U-FACTOR	GLAZED FENES-TRATION SHGCb, e	ROOF/CEILING R -VALUE	WOOD FRAME WALL R -VALUE	MASS WALL R -VALUEi	FLOOR R -VALUE	BASEMENTc WALL R -VALUE	SLAB d R -VALUE & DEPTH	CRAWL SPACE c WALL R-VALUE

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

CLIMATE ZONE	FENES-TRATION *U*-FACTOR	SKYLIGHT *U*-FACTOR	ROOF/CEILING *U*-FACTOR	FRAME WALL *U*-FACTOR	MASS WALL *U*-FACTOR[b]	FLOOR *U*-FACTOR	BASEMENT WALL *U*-FACTOR	CRAWL SPACE WALL *U*-FACTOR

R402.2.1 Roof/Ceilings with attic spaces. 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, installing R-49 over 100 percent of the ceiling 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 attics. 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

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

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 R402.1.2 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 *U*-factor alternative approach in Section R402.1.4 and the Total UA alternative in Section R402.1.5.

Exception:

For roofs on existing buildings with slope less than 2 units vertical in 12 units horizontal (2:12), refer to Section R503.1.1.

Formatted: Font: (Default) Times New Roman, Bold

Formatted: Space After: 0 pt

Formatted: Font: (Default) Times New Roman

Reason. The genesis for this proposal came about during deliberations in April of 2019 at the ICC Group 'B' Code Hearings, Albuquerque, among roofing and insulation interests. Apparently, there was confusion regarding whether the provisions of Sections R402.2.1, R402.2.2 and associated Tables R402.1.2 and R402.1.3 were germane to low-sloped roofs on one- and two-family dwellings, townhouses, two-flat, three-flat, and low-rise, multifamily buildings within the scope of the IECC-R and IRC-R provisions. The allegation was simply, that due to the inadvertent omission of the word "ROOF" from affiliated headings and titles, the provisions therein did not apply to low-sloped roofing.

The proposed exception is retained from IL ECAC's legacy actions supporting Illinois' adoption and enforcement of the 2018 IECC.

Cost Impact. The amendment will neither increase nor decrease the cost of construction.

Public Code Change Proposal Form **Code Section(s): Table R402.1.2, Table R402.1.3**

To Amend the 2021 Illinois Energy Conservation Code

Mark S. Graham,
Vice President, Technical Services
National Roofing Contractors Association (NRCA)
10255 W. Higgins Road, Suite 600
Rosemont, IL 60018
(847) 493-7511 Direct
(847) 299-9070 Office main
mgraham@nrca.net
www.nrca.net

Proposal No. R13-01
Date of Submittal. August 14, 2021

Signature (for release of copyrights). MSG (electronic)

Sections Impacted by Amendment. Table R402.1.2, Table R402.1.3

Revise as Follows (In ~~strike-out~~/underline format):

[[Link to attached file w/ hand-marked edits.]]

Reason. The proposal equalizes the insulation implications "as applied" to low-sloped roofs of commercial buildings to low-sloped roofs of one- and two-family buildings, townhomes, two-flats, three-flats, and low-rise, multifamily buildings throughout Illinois. The Chicago Department of Buildings has normalized its low-sloped commercial and residential multifamily roofs in its most recent 2019 "N-Code" (f.k.a., 2018 Chicago Energy Conservation Code).

Increases in model energy codes' building energy performance requirements have resulted in increased R-values being specific for many of the thermal envelope components of the building, including and particularly, roof systems. Where is the equivalency among a four-story brownstone in Chicago required to provide a low-slope, above-deck R-value of R-60, while a four-story multi-family building in Oak Park is permitted to provide a low-slope, above-deck R-value of R-30? Comparatively, where is the equivalency among a three-story, three-flat in Rockford is required to provide a low-slope, above-deck R-value of R-60, while a two-story Bass Pro Shop in Belleville is allowed to provide a low-slope, above-deck R-value of R-30?

Cost Impact. The amendment will neither increase nor decrease the cost of construction.

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.

SECTION R402
BUILDING THERMAL ENVELOPE

R402.1 General. The *building thermal envelope* shall comply with the requirements of Sections R402.1.1 through R402.1.5.

Exceptions:

1. The following low-energy *buildings*, or portions thereof, separated from the remainder of the building by *building thermal envelope* assemblies complying with this section shall be exempt from the *building thermal envelope* provisions of Section R402.
   - 1.1. Those with a peak design rate of energy usage less than 3.4 Btu/h × ft^2 (10.7 W/m^2) or 1.0 watt/ft^2 of floor area for space-conditioning purposes.
   - 1.2. Those that do not contain *conditioned space*.
2. Log homes designed in accordance with ICC 400.

R402.1.1 Vapor retarder. Wall assemblies in the *building thermal envelope* shall comply with the vapor retarder requirements of Section R702.7 of the *International Residential Code* or Section 1404.3 of the *International Building Code*, as applicable.

R402.1.2 Insulation and fenestration criteria. The *building thermal envelope* shall meet the requirements of Table R402.1.2, based on the *climate zone* specified in Chapter 3. Assemblies shall have a *U*-factor equal to or less than that specified in Table R402.1.2. Fenestration shall have a *U*-factor and glazed fenestration SHGC equal to or less than that specified in Table R402.1.2.

R402.1.3 *R*-value alternative. Assemblies with *R*-value of insulation materials equal to or greater than that specified in Table R402.1.3 shall be an alternative to the *U*-factor in Table R402.1.2

R402.1.4 *R*-value computation. Cavity insulation alone shall be used to determine compliance with the cavity insulation *R*-value requirements in Table R402.1.3. Where cavity insulation is installed in multiple layers, the *R*-values of the cavity insulation layers shall be summed to determine compliance with the cavity insulation *R*-value requirements. The manufacturer's settled *R*-value shall be used for blown-in insulation. Continuous insulation (ci) alone shall be used to determine compliance with the continuous insulation *R*-value requirements in Table R402.1.3. Where continuous insulation is installed in multiple layers, the *R*-values of the continuous insulation layers shall be summed to determine compliance with the continuous insulation *R*-value requirements. Cavity insulation *R*-values shall not be used to determine compliance with the continuous insulation *R*-value requirements in Table R402.1.3. Computed *R*-values shall not include an

TABLE R402.1.2
MAXIMUM ASSEMBLY *U*-FACTORS[a] AND FENESTRATION REQUIREMENTS

CLIMATE ZONE	FENESTRATION *U*-FACTOR[f]	SKYLIGHT *U*-FACTOR	GLAZED FENESTRATION SHGC[d, e]	CEILING *U*-FACTOR	WOOD FRAME WALL *U*-FACTOR	MASS WALL *U*-FACTOR[b]	FLOOR *U*-FACTOR	BASEMENT WALL *U*-FACTOR	CRAWL SPACE WALL *U*-FACTOR
0	0.50	0.75	0.25	0.035	0.084	0.197	0.064	0.360	0.477
1	0.50	0.75	0.25	0.035	0.084	0.197	0.064	0.360	0.477
2	0.40	0.65	0.25	0.026	0.084	0.165	0.064	0.360	0.477
3	0.30	0.55	0.25	0.026	0.060	0.098	0.047	0.091[c]	0.136
4 except Marine	0.30	0.55	0.40	~~0.024~~ 0.032	0.045	0.098	0.047	0.059	0.065
5 and Marine 4	0.30	0.55	0.40	~~0.024~~ 0.032	0.045	0.082	0.033	0.050	0.055
6	0.30	0.55	NR	0.024	0.045	0.060	0.033	0.050	0.055
7 and 8	0.30	0.55	NR	0.024	0.045	0.057	0.028	0.050	0.055

Em RE37-19

For SI: 1 foot = 304.8 mm.

a. Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source.

b. Mass walls shall be in accordance with Section R402.2.5. Where more than half the insulation is on the interior, the mass wall *U*-factors shall not exceed 0.17 in Climate Zones 0 and 1, 0.14 in Climate Zone 2, 0.12 in Climate Zone 3, 0.087 in Climate Zone 4 except Marine, 0.065 in Climate Zone 5 and Marine 4, and 0.057 in Climate Zones 6 through 8.

c. In Warm Humid locations as defined by Figure R301.1 and Table R301.1, the basement wall *U*-factor shall not exceed 0.360.

d. The SHGC column applies to all glazed fenestration.

Exception: In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

e. There are no SHGC requirements in the Marine Zone.

f. A maximum *U*-factor of 0.32 shall apply in Marine Climate Zone 4 and Climate Zones 5 through 8 to vertical fenestration products installed in buildings located either:

1. Above 4,000 feet in elevation above sea level, or
2. In windborne debris regions where protection of openings is required by Section R301.2.1.2 of the *International Residential Code*.

"SLASH"

ROOF

TABLE ~~R402.1.3~~

INSULATION MINIMUM *R*-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	FENESTRATION *U*-FACTOR[b, i]	SKYLIGHT[b] *U*-FACTOR	GLAZED FENESTRATION SHGC[b, e]	CEILING *R*-VALUE	WOOD FRAME WALL *R*-VALUE[g]	MASS WALL *R*-VALUE[h]	FLOOR *R*-VALUE	BASEMENT[c, g] WALL *R*-VALUE	SLAB[d] *R*-VALUE & DEPTH	CRAWL SPACE[c, g] WALL *R*-VALUE
0	NR	0.75	0.25	30	13 or 0+~~&~~10ci	3/4	13	0	0	0
1	NR	0.75	0.25	30	13 or 0+~~&~~10ci	3/4	13	0	0	0
2	0.40	0.65	0.25	49	13 or 0+~~&~~10ci	4/6	13	0	0	0
3	.30	0.55	0.25	49	20 or 13+~~&~~10ci[h] or 0 & 15ci[h]	8/13	19	5ci or 13[f]	10ci, 2 ft	5ci or 13[f]
4 except Marine	.30	0.55	0.40	~~60~~ 49/30ci	30 or 20& 5ci[h] or 13 & 10ci[h] or 0 & 20ci[h]	8/13	19	10ci or 13	10ci, 4 ft	10ci or 13
5 and Marine 4	0.30[i]	0.55	0.40	~~60~~ 49/30ci	30 or 20& 5ci[h] or 13 & 10ci[h] or 0 & 20ci[h]	13/17	30	15ci or 19 or 13+~~&~~5ci	10ci, 4 ft	15ci or 19 or 13+~~&~~5ci
6	0.30[i]	0.55	NR	60	30 or 20& 5ci[h] or 13 & 10ci[h] or 0 & 20ci[h]	15/20	30	15ci or 19 or 13+~~&~~5ci	10ci, 4 ft	15ci or 19 or 13+~~&~~5ci
7 and 8	0.30[i]	0.55	NR	60	30 or 20+~~&~~5ci[h] or 13+~~&~~10ci[h] or 0 & 20ci[h]	19/21	38	15ci or 19 or 13+~~&~~5ci	10ci, 4 ft	15ci or 19 or 13+~~&~~5ci

For SI: 1 foot = 304.8 mm.

NR = Not Required.

ci = continuous insulation.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.

b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.
Exception: In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

c. "5ci or 13" means R-5 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "10ci or 13" means R-10 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "15ci or 19 or 13 + 5ci" means R-15 continuous insulation (ci) on the interior or exterior surface of the wall; or R-19 cavity insulation on the interior side of the wall; or R-13 cavity insulation on the interior of the wall in addition to R-5 continuous insulation on the interior or exterior surface of the wall.

d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs, as indicated in the table. The slab-edge insulation for heated slabs shall not be required to extend below the slab.

e. There are no SHGC requirements in the Marine Zone.

f. Basement wall insulation is not required in Warm Humid locations as defined by Figure R301.1 and Table R301.1.

g. The first value is cavity insulation; the second value is continuous insulation. Therefore, as an example, "13 + 5" means R-13 cavity insulation plus R-5 continuous insulation.

h. Mass walls shall be in accordance with Section R402.2.5. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.

i. A maximum *U*-factor of 0.32 shall apply in Climate Zones 3 through 8 to vertical fenestration products installed in buildings located either:

1. Above 4,000 feet in elevation, or
2. In windborne debris regions where protection of openings is required by Section R301.2.1.2 of the *International Residential Code*.

R-value for other building materials or air films. Where insulated siding is used for the purpose of complying with the continuous insulation requirements of Table R402.1.3, the manufacturer's labeled *R*-value for the insulated siding shall be reduced by R-0.6.

R402.1.5 Total UA alternative. Where the total *building thermal envelope* UA, the sum of *U*-factor times assembly area, is less than or equal to 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 *building* shall be considered to be in compliance with Table R402.1.2. The UA calculation shall be performed using a method consistent with the ASHRAE *Handbook of Fundamentals* and shall include the thermal bridging effects of framing materials. In addition to UA compliance, the SHGC requirements of Table R402.1.2 and the maximum fenestration *U*-factors of Section R402.5 shall be met.

R402.2 Specific insulation requirements. In addition to the requirements of Section R402.1, insulation shall meet the specific requirements of Sections R402.2.1 through R402.2.12.

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: Chapter 4, Residential Energy Efficiency

Office Use Only	
Proposal Number:	R14-01
Date Submittal Received:	August 14, 2021

Date: August 13, 2021
Name: Isaac Elnecave
Jurisdiction/Company: Phius
Submitted on Behalf of: Phius
Address: 53 W. Jackson St., Suite 1462
Chicago, IL 60604
Phone: 312-561-4588
E-Mail: ielnecave@phius.org

Related Sections Impacted by this Amendment: *Table R402.1.3*

Revise as Follow (in strike-thru / underline format):

Table R402.1.3

INSULATION AND FENESTRATION RQUIREMENTS BY COMPONENT

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT U-FACTOR	GLAZED FENESTRATON SHGC	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE	FLOOR R-VALUE	BASEMSENT WALL R-VALUE	SLAB R-VALUE & DEPTH	CRAWL SPACE WALL R-VALUE
0	NR	0.75	0.25	30	13 or 0+10	¾	13	0	0	0
1	NR	0.75	0.25	30	13 or 0+10	¾	13	0	0	0
2	0.40	0.65	0.25	49	13 or 0+10	4/6	13	0	0	0
3	0.30	0.55	0.25	49	20 or 13 + 5ci or 0+15	8/13	19	5ci or 13	10ci, 2ft	5ci or 13
4 except marine	0.30	0.55	0.40	60	20+5ci or 13+10ci or 0+15	8/13	19	10ci or 13	10ci, 4ft	10ci or 13
5 and Marine 4	0.30	0.55	0.40	60	20+~~5ci~~ 7ci or 13+10ci or 0+15	13/17	30	15ci or 19 or 13+5ci	10ci, 4ft	15ci or 19 or 13+5ci
6	0.30	0.55	NR	60	20+5ci or13+10ci or 0+15	15/20	30	15ci or 19 or 13+5ci	10ci, 4ft	15ci or 19 or 13+5ci
7 and 8	0.30	0.55	NR	60	20+5ci or 13+10ci or 0+15	19/21	38	15ci or 19 or 13+5ci	10ci, 4ft	15ci or 19 or 13+5ci

Reason:

In the Residential Chapter of the 2021 International Energy Conservation Code, the wall insulation requirement in Table R402.1.3 for Climate Zone 5 includes the option to use R20 +5 ci. R 20 + 5ci is an assembly that specifies R-20 for cavity insulation with R-5 for exterior continuous insulation. Unfortunately, this

insulation combination may pose moisture problems in Climate Zone 5. According to a paper by the Building Science Corporation, ***BSD-163: Controlling Cold-Weather Condensation Using Insulation*** by John Straube, the exterior insulation R-value should be, at a minimum, roughly 35% of the R-value of the cavity insulation. In the case of R20 + 5, the exterior insulation is 25% (5/20). There is insufficient exterior insulation to protect against moisture accumulation, causing condensation or mold in the walls during cold weather. [1]

To avoid the problem detailed above, the proposal is to amend the prescriptive R20 + 5ci requirement to R20 + 7ci for Climate Zone 5. The additional exterior insulation would protect against cold-weather condensation and potential moisture-related problems.

Besides protecting against moisture, this proposal has a positive environmental impact because it would reduce energy use beyond what Table 402.1.3 of the 2021 IECC currently requires.

Although builders would need to add a small amount of exterior insulation to the homes they are building, homeowners would receive the double bonus of additional energy savings and a lowered risk of moisture-related issues in walls. [2]

Cost Impact:
Adding additional exterior insulation will slightly raise the cost. The difference between 1" of exterior insulation (R-5) and 1.5" (R-7.5) is about $7 per board (which is equivalent to 32 square feet). For a typical home, with roughly 1,800 square feet of wall area, the additional cost is about $400 per home. This cost must be weighed against both the additional energy savings as well as the saved cost from avoiding moisture problems. The costs to rectify any moisture problems in walls would swamp the cost of preventing them up front.

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

---

[1] BSD-163: Controlling Cold-Weather Condensation Using Insulation
https://www.buildingscience.com/documents/digests/bsd-controlling-cold-weather-condensation-using-insulation

[2] Phius Certification Guidebook, v3.02: https://www.phius.org/PHIUS%2B2021/Phius%20Certification%20Guidebook%20v3.02.pdf

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: Chapter 4, Residential Energy Efficiency

Office Use Only	
Proposal Number:	R15-01
Date Submittal Received:	August 14, 2021

Date: August 13, 2021
Name: Isaac Elnecave
Jurisdiction/Company: Phius
Submitted on Behalf of: Phius
Address: 53 W. Jackson St., Suite 1462
Chicago, IL 60604
Phone: 312-561-4588
E-Mail: ielnecave@phius.org

Related Sections Impacted by this Amendment: ***R401.2, R401.2.5, R401.2.6 and New Section R409***

Revise as Follow (in strike-thru / underline format):

R401.2 Application

Residential buildings shall comply with Section R401.2.~~5~~6 and either Sections R401.2.1, R401.2.2, R401.2.3, ~~or~~ R401.2.4 or R401.2.5.

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.

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 (ER) Option requires compliance with R406

R401.2.4 Tropical Climate Region Option

The Tropical Climate Region Option requires compliance with Section R407

R401.2.5 Phius Alternative Compliance Option

The Phius Alternative Compliance Option requires compliance with Section R409

R401.2.~~5~~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 building complying with 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

R409 Phius Alternative Compliance Option

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

R409.2 Projects shall comply with Phius 2021 Standard, including 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 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 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

Reason:
By including this amendment, the state will provide an additional path to energy code compliance. Homes and low-rise multi-family buildings that meet this alternative compliance path will use significantly less energy than a building built to code without incurring any additional compliance costs.

A home or multi-family building to receive a certification by Phius, meets a rigorous and exhaustive two-part review process that will result in dwellings that are 40-60% more energy efficient than a dwelling built to code. On top of that, this amendment will simplify the code compliance process, as code officials will get extensive documentation of both the design review and multiple rounds of construction inspections; including documentation that the building meets the mandatory requirements of the code.

This amendment will allow construction professionals such as architects, engineers and builders who can and wish to build to a higher standard of energy efficiency to do so knowing there is a direct path to code compliance.

Currently, three states, Washington, New York, and Massachusetts, have added this amendment to their energy code. Following are links to the Washington and New York versions.

New York State Stretch Code (Section R408, Page 62):

https://www.nyserda.ny.gov/All-Programs/Programs/Energy-Code-Training/NYStretch-Energy-Code-2020

Washington State Code Section R407, Page 49):

https://sbcc.wa.gov/sites/default/files/2021-01/2018%20WSEC_R%20Final%20package2.pdf

Cost Impact:
None. There is no cost increase as it is not a requirement but merely an alternative path to compliance.

I hereby grant and assign to the State of Illinois all rights in copyright I may have in any authorship contributions I make to the State of Illinois in connection with any proposed amendments or public comment, in its original form submitted or revised form, including written and verbal modifications. I understand that I have no rights in any State of Illinois publications that use such contributions in the form submitted by me or another similar form and certify that such contributions are not protected by the copyright of any other person or entity.

Signature (for release of copyrights): _____

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: Chapter 4, Residential Energy Efficiency

Office Use Only	
Proposal Number:	R16-01
Date Submittal Received:	August 14, 2021

Date: August 13, 2021
Name: Isaac Elnecave
Jurisdiction/Company: Phius
Submitted on Behalf of: Phius
Address: 53 W. Jackson St., Suite 1462
Chicago, IL 60604
Phone: 312-561-4588
E-Mail: ielnecave@phius.org

Related Sections Impacted by this Amendment: *R402.4.1.2 Testing and R402.1.3 Leakage Rate*

Revise as Follow (in strike-thru / underline format):

R402.4.1.2 Testing

The building or dwelling unit shall be tested for air leakage. The maximum air leakage rate of any building or dwelling unit under any compliance path shall not exceed ~~5.0~~ 3.5 air changes per hour or ~~0.28~~ 0.2 cubic feet per minute per square foot (~~0.0079~~ 0.00055 m3/s x m2) of dwelling unit enclosure area. Testing shall be conducted in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2-inch w.g. (50 Pascals). Where required by the code official, 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. Testing shall be performed at any time after creation of all penetrations of the building thermal envelope have been sealed.

R402.4.1.3 Leakage Rate

When complying with Section R401.2.1, the building or dwelling unit shall have an air leakage rate not exceeding 5.0 air changes per hour in Climate zones 0,1, and 2 and ~~3.0~~ 2.0 air changes per hour in Climate Zones 3 through 8, when tested in accordance with Section R402.4.1.2.

Reason:

The Residential Chapter of the 2021 International Energy Conservation Code requires single family homes and low-rise multi-family buildings to meet an airtightness requirement of 3 ACH50, while the current Illinois energy code has a requirement of 4 ACH50. Blower door test data from homes constructed over the last few years, however, shows that the code requirement for airtightness can easily be met if it were set lower, at 2 ACH50, saving energy without raising the cost of construction.

RESNET, the organization that runs the HERS program across the country (including Illinois), requires all homes receiving a HERS rating to undergo a blower door test; the standard methodology to measure the airtightness of a home. RESNET collected the results of 5354 blower door tests conducted in Illinois between 2013 and 2016. The results show that 1/5 of the homes (over 1,000) achieved an airtightness level of 2 ACH50, even though the Illinois requirement is twice that amount[1] (a more recent data sample from the past few years would undoubtedly show a larger percentage of homes achieving 2 ACH50).

Airtight homes have been shown to not only save energy but also to deliver better indoor air quality and maintain a stable indoor temperature longer than a leaky home (less cold air in the winter and less hot air in the summer coming into the house) providing a more resilient, comfortable home.

No special technology is needed to air seal a home; it simply requires training and practice. The fact that so many homes exceed the code required air tightness indicates that builders can easily achieve that and there is no extra time or materials necessary to meet this value (if there was, it would not be exceeded so regularly).

Cost Impact:
As noted above, a significant number of builders are already meeting the proposed lower requirement. This implies that there is no cost increase involved as few builders would go beyond the code requirement if there was a cost increase in either time or materials.

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.

[1] *Data on HERS Rated Homes In Illinois*, Ryan Meres, Program Director, RESNET

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: Residential

Office Use Only	
Proposal Number:	*R17-01*
Date Submittal Received:	*August 15, 2021*

Date: 08/13/2021
Name: Bill Ward
Jurisdiction/Company: Home Builders Assoc. of Illinois
Submitted on Behalf of: Home Construction & Remodeling Industry
Address: 112 W. Edwards St
Springfield, Il 62704
Phone: 217-494-8143
E-Mail: Billward@hbai.org

Related Sections Impacted by this Amendment:
2021 Table R402.1.3 Insulation R-Values and Fenestration Requirements by Component

Revise as Follow (in strike-thru / underline format):

Remain with 2018 Table.

Reason:
Window and door jams will require additional material and labor. Walls will require more wood, 2x6 wood studs vs. 2x4 studs. R-60 ceiling insulation vs. current R-49 will raise costs significantly while cost savings is insignificant and will never be recouped.

Cost Impact:
Window and door jams will cost an average of $300 per jam. Average number of total jams is 25 which raises constructions by $7500.

Going from 2x4 studs to 2x6 studs @ 400 studs per home will raise costs $1836. Top and bottom plate cost increase will be about $500.

Continuous R-5 will require 1" foam sheathing vs. current ½" sheathing, a cost increase of $850.

Total cost increase on median-size home due to 2021 Table will be over $10,000.

Signature (for release of copyrights): Bill W

Public Code Change Proposal Form

To Amend the 2021 Illinois Energy Conservation Code

Code Section: C503.1.1

Office Use Only	
Proposal Number:	R18-01
Date Submittal Received:	August 15, 2021

Date: August 15, 2021
Name: Bill McHugh
Jurisdiction/Company: Chicago Roofing Contractors Association
Submitted on Behalf of:
Address: 4415 W. Harrison St., #540
Hillside, IL 60162
Phone: 708-449-3340
E-Mail: bill@crca.org

Related Sections Impacted by this Amendment:
Revise as Follow (in strike-thru / underline format):

R503.1.1 Building envelope. *Building* envelope assemblies that are part of the *alteration* shall comply with Section R402.1.2 or R402.1.4, Sections R402.2.1 through R402.2.12, R402.3.1, R402.3.2, R402.4.3 and R402.4.5.

Exception: The following *alterations* need not comply with the requirements for new construction, provided that the energy use of the building is not increased:

1. Storm windows installed over existing *fenestration*.

2. Existing ceiling, wall or floor cavities exposed during construction, provided that these cavities are filled with insulation.

3. Construction where the existing roof, wall or floor cavity is not exposed.

4. *Roof recover*.

5. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.

6. Surface-applied window film installed on existing single-pane *fenestration* assemblies reducing solar heat gain, provided that the code does not require the glazing or *fenestration* to be replaced.

7. *Air barriers* shall not be required for *roof recover* and *roof replacement* where the *alterations* or renovations to the building do not include *alterations,* renovations or *repairs* to the remainder of the building envelope.

Reason. The proposal addresses envelope requirements applicable to *reroofing* operations (i.e., *roof recover* and *roof replacements*) to existing *buildings,* and is focused at an air barrier on the rooftop at the time of the *alteration*: ;

In discussions with the US Department of Energy at CRCA Events, it was asked, 'What happens if an air barrier is added without the rest of the building envelope adding an air barrier?' The answer, 'Have you ever tried to blow a balloon up that has holes in its side?". In other words, without addressing the wall air barrier, it is worthless to require an air barrier on the rooftop. It is ineffective. Resources should be focused other items that bring better reductions in energy use since this brings no added value.

Cost Impact. The amendment will decrease the cost of (reroofing) construction.

I hereby grant and assign to the State of Illinois all rights in copyright I may have in any authorship contributions I make to the State of Illinois in connection with any proposed amendments or public comment, in its original form submitted or revised form, including written and verbal modifications. I understand that I have no rights in any State of Illinois publications that use such contributions in the form submitted by me or another similar form and certify that such contributions are not protected by the copyright of any other person or entity.

Signature (for release of copyrights): WJM…

A proponent shall not submit multiple amendments to the same code section. When a proponent submits multiple amendments to the same section, the proposals shall be considered as incomplete proposals. The proponent of the proposal shall be notified and the proposal shall be held until the deficiencies are corrected, with a final date set for receipt of a corrected submittal. If the corrected amendment is received after the final date, the proposal shall not be considered by the ILECAC. This restriction shall not apply to amendments that attempt to address differing subject matter within a code section.