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## 2021 ILLINOIS ENERGY CONSERVATION CODE

The State of Illinois recently adopted the 2021 International Energy Conservation Code (IECC)

Illinois has made a few amendments and created what is now known as the **2021 ILLINOIS ENERGY CONSERVATION CODE**. Both are state-mandated codes.

Please review the 2021 IECC and the 2021 Illinois Energy Conservation Code and familiarize yourself with the requirements. The following is a list of notable changes (in green) related to residential construction within the Village of Huntley:

**R401.2.6 Additional energy efficiency.** This Section establishes additional requirements applicable to all compliance approaches to achieve additional energy efficiency.

1. For buildings complying with Section R401.2.1 (*the Prescriptive Compliance Option*), one of the additional efficiency package options shall be installed according to Section R408.2. Options include:
  - A. **R408.2.1 Enhanced envelope performance option.** The total building thermal envelope UA, the sum of U-factor times assembly area, shall be less than or equal to 95 percent of the total UA resulting from multiplying the U-factors in Table R402.1.2 by the same assembly area as in the proposed building. The UA calculation shall be performed in accordance with Section R402.1.5. The area-weighted average SHGC of all glazed fenestration shall be less than or equal to 95 percent of the maximum glazed fenestration SHGC in Table R402.1.2.
  - B. **R408.2.2 More efficient HVAC equipment performance option.** Heating and cooling equipment shall meet one of the following efficiencies:
    - a. **Greater than or equal to 95 AFUE (Annual Fuel Utilization Efficiency) natural gas furnace and 16 SEER (Seasonal Energy Efficiency Ratio) air conditioner.**
    - b. Greater than or equal to 10 HSPF/16 SEER air source heat pump.
    - c. Greater than or equal to 3.5 COP ground source heat pump.

For multiple cooling systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the cooling design load. For multiple heating systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the heating design load.
  - C. **R408.2.3 Reduced energy use in service water-heating.** The hot water system shall meet one of the following efficiencies:
    - a. Greater than or equal to 0.82 EF (Energy Factor) fossil fuel service water-heating system.
    - b. Greater than or equal to 2.0 EF (Energy Factor) electric service water-heating system.
    - c. Greater than or equal to 0.4 solar fraction solar water-heating system.



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- D. **R408.2.4 More efficient duct thermal distribution system.** The thermal distribution system shall meet one of the following efficiencies:
- 100 percent of ducts and air handlers located entirely within the building thermal envelope.
  - 100 percent of ductless thermal distribution system or hydronic thermal distribution system located completely inside the building thermal envelope.
  - 100 percent of duct thermal distribution system located in conditioned space as defined by Section R403.3.2.
- E. **R408.2.5 Improved air sealing and efficient ventilation.** The measured air leakage rate shall be less than or equal to 3.0 ACH50, with either an Energy Recovery Ventilator (ERV) or Heat Recovery Ventilator (HRV) installed. Minimum HRV and ERV requirements, measured at the lowest tested net supply airflow, shall be greater than or equal to 75 percent Sensible Recovery Efficiency (SRE), less than or equal to 1.1 cubic feet per minute per watt (0.03 m<sup>3</sup>/min/watt) and shall not use recirculation as a defrost strategy. In addition, the ERV shall be greater than or equal to 50 percent Latent Recovery/Moisture Transfer (LRMT).
2. For buildings complying with Section R401.2.2 (**Total Building Performance option, such as ResCheck or similar compliance software**), the building shall meet one of the following:
- 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
  - 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.

**Explanation:** This is new to the 2021 IECC and 2021 Illinois Energy Conservation Code.

- If you are using the Prescriptive Compliance option, you must utilize one of the five options outlined in Section 408.2.
- If you are using the Total Building Performance option, you must utilize one of the five options outlined in Section 408.2 **BUT** it cannot be included in the standard reference design **OR** show that the proposed design has an annual energy cost less than or equal to 95% of the standard reference design.
- If you are using the Energy Rating Index option, you must demonstrate that the proposed design score is 5% less than required in Table R406.5.



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**Table R402.1.3 Minimum Insulation Values**

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT U-FACTOR	GLAZED FENESTRATION SHGC	ROOF / CEILING R-VALUE	WOOD WALL R-VALUE	THERMAL MASS WALL R-VALUE	FLOOR R-VALUE	BASEMENT WALL R-VALUE	SLAB R-VALUE & DEPTH	CRAWL SPACE WALL R-VALUE
5	.30 MAX.	0.55 MAX.	.40 MAX. (1)	R-49 MIN (2)	20 MIN OR 13+5 MIN R-30 OR R-20 + R-5ci OR R-13 + 10ci OR 0 + R-20ci (3)	R-13/R-17 MIN	R-30 MIN	10/13 R-15ci or R-19 OR R-13 + R-5ci (4)	10 MIN, 2' DEEP R-10ci, 4 ft. (5)	15/19 MIN R-15 ci OR R-19 OR R-13 + R-5ci (6)

**Explanation:**

- R-values are minimums, U-factors and SHGC are maximums.
  - The first value is batt insulation; the second value is continuous insulation (ci).
- (1) None was required per the former 2018 IECC.
  - (2) The Illinois Energy Conservation Code reduced the 2021 IECC requirement from R-60 to R-49.
    - **R-38 can be used for a ceiling with a raised energy heel. A raised energy heel allows the ceiling insulation to be installed at its full thickness and uncompressed over the exterior top plate to the outside of the exterior wall. This installation will require an insulation dam that prevents the insulation from falling into the soffit.**
    - **For ceilings without attic space (vaulted ceilings), the minimum R-value shall be R-30, PROVIDED area is limited to 500 square feet or 20% of the total insulated ceiling area, whichever is less.**
  - (3) R-30 batt insulation on the interior surface of the wall **OR** R-20 batt insulation on the interior surface of the wall and R-5 continuous insulation on the exterior surface of the wall **OR** R-10 batt insulation on the interior surface of the wall and R-10 continuous insulation on the exterior surface of the wall **OR** R-20 continuous insulation on the exterior surface of the wall.
  - (4) R-15 continuous insulation on the interior or exterior surface of the basement wall **OR** R-19 batt or blanket insulation on the interior surface of the basement wall **OR** R-13 batt insulation on the interior surface of the wall and R-5 continuous insulation on the exterior surface of the basement wall.
    - **Per the 2021 Illinois Energy Conservation Code amendment, the insulation must be installed from the top of the basement wall down to 10 feet below grade or to within 6 inches of the basement floor, whichever is less. See R402.8.1 on the next page.**
  - (5) R-10 continuous insulation on the interior or exterior of the slab.
    - This requirement applies to slab-on-grade floors with a floor surface less than 12 inches below grade **only**.
    - The downward and horizontal dimensions were increased from 2 feet to 4 feet per the 2021 IECC.
    - **The insulation must extend downward 4 feet from the top of the slab OR downward to the bottom of the slab, then horizontally in either direction until 4 feet is achieved.**



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- Insulation installed between the interior edge of the slab and the interior surface of the foundation wall can be cut at a 45-degree angle.
- (6) R-15 continuous insulation on the interior or exterior surface of the crawlspace wall **OR** R-19 batt or blanket insulation on the interior surface of the crawlspace wall **OR** R-13 batt insulation on the interior surface of the crawlspace wall and R5 continuous insulation on the exterior surface of the wall.
- **Per the 2021 Illinois Energy Conservation Code amendment, the insulation must be installed from the top of the crawlspace wall down to 10 feet below grade or to within 6 inches of the crawlspace floor, whichever is less. See R402.8.1 below.**

**R402.8.1 Basement wall insulation installation.** Where basement walls are insulated, the insulation shall be installed from the top of the basement wall down to 10 feet below grade or to within 6 inches of the basement floor, whichever is less.

**Explanation:** The previous 2018 Illinois Energy Conservation Code permitted conditioned basements to be insulated from the top of the basement wall down to 4 feet below grade when R-15 continuous insulation was installed on the interior or exterior surface of the basement wall **OR** R-19 batt insulation was installed on the interior surface of the basement wall. **This is no longer permissible.**

**402.2.12 Sunroom and heated garage insulation.** Sunrooms enclosing conditioned space and heated garages shall meet the insulation requirements of this code.

**Exception:** For sunrooms and heated garages provided with thermal isolation (i.e. an exterior wall that is insulated in accordance with this code) and enclosed conditioned space, the following exceptions to the insulation requirements of this code shall apply:

1. The minimum ceiling insulation R-value shall be R-24.
2. The minimum wall insulation R-value shall be R-13 in all climate zones. Walls separating a sunroom or heated garage with thermal isolation from conditioned space shall comply with the building thermal envelope requirements of this code.

**Explanation:** Sunrooms enclosing conditioned space and heated garages must now meet the insulation requirements noted above.

**R402.4.1.2 Testing.** The building or dwelling unit shall be tested for air leakage. The maximum air leakage rate for any building or dwelling unit under any compliance path shall not exceed 5.0 air changes per hour or 0.28 cubic feet per minute (CFM) per square foot [ $0.0079 \text{ m}^3/(\text{s} \times \text{m}^2)$ ] 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). A written report of the results of the test shall be signed by the party conducting the test and made available to the building official.

Testing shall be performed at any time after all penetrations of the building thermal envelope have been sealed. (See 402.4.1.3 below.)



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**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 3.0 air changes per hour, when tested in accordance with Section R402.4.1.2.

**Explanation:** As noted in Section R402.4.1.2 above, the maximum allowable air leakage rate is 5.0 air changes per hour per the 2021 IECC. However, R402.4.1.3 reduces the maximum to 3.0 air changes per hour when utilizing the **PRESCRIPTIVE COMPLIANCE METHOD** noted in Table R402.1.3. The previous 2018 Illinois Energy Conservation Code required a maximum of 4.0 air changes, therefore the allowable 3.0 air changes, if utilizing the Prescriptive Compliance Method, is more stringent than the previous 2018 IECC requirement.

**R402.4.6 Electrical and communication outlet boxes (air-sealed boxes).** Where air-sealed boxes are required by Table R402.4.1.1, electrical and communication outlet boxes shall comply with all of the following:

1. Be tested in accordance with NEMA OS 4.
2. Have an air leakage rate of not greater than 2.0 cubic feet per minute (0.944 Us) at a pressure differential of 1.57 psf (75 Pa).
3. Be marked "NEMA OS 4" or "OS 4" in accordance with NEMA OS 4.
4. Be installed per the manufacturer's instructions and with any supplied components required to achieve compliance with NEMA OS 4.

**Explanation:** Electrical boxes located on exterior walls must be sealed in accordance with the information noted above. Electrical boxes within the building thermal envelope (interior walls) do not need to be sealed.

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

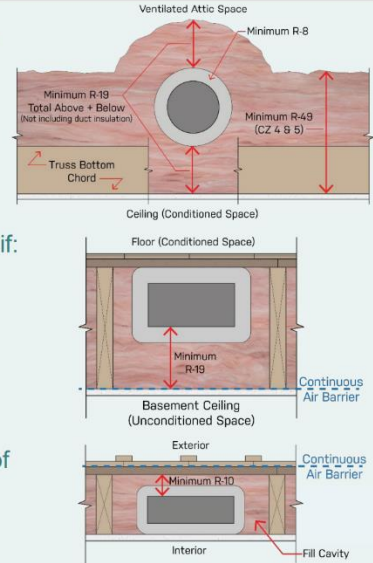
**Note:** The 2021 IECC requires duct testing for all ducts.

**R403.3.2 Ducts located in conditioned space.** All ducts located within conditioned spaces must be sealed and insulated as follows:

**R403.3.2**

**Ducts in Conditioned Space**

- Clarifies definitions of conditioned space for ducts
  - Entirely within thermal envelope
  - Ductless or hydronic system within thermal envelope
  - Ducting qualifies as within **conditioned space** if:
    - Buried in attic insulation and sealed to 1.5cfm/100sf floor area
    - Ducts in floor cavities must have R-19 between duct and unconditioned space
    - Ducts in exterior walls must have R-10 between duct and exterior sheathing; rest of cavity filled with insulation



Picture compliments of SEDAC

**Explanation:** These requirements are new to the 2021 IECC:

- Ducts in ventilated, unconditioned attics must be in the attic insulation.
- Ducts in floor cavities above unconditioned spaces must have a minimum of R-19 insulation between the duct and the ceiling of the unconditioned space below.
- Ducts in exterior walls must have a minimum of R-10 insulation between the duct and the exterior sheathing.

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

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

**Exception:** If the HVAC duct system is serving less than or equal to 750 square feet of conditioned floor area, the allowable duct leakage with the air-handler installed shall be 60 cubic feet per minute or less. R403.6 Mechanical ventilation.

**Explanation:** If the duct is located within the thermal envelope, the leakage rate must be less than or equal to 8.0 cubic feet per minute. If the duct is located outside the thermal envelope, the leakage rate must be less than or equal to 4.0 cubic feet per minute.

**R403.6 Mechanical Ventilation.**

**Note:** This section in the 2021 IECC involves whole house mechanical ventilation. The 2021 Illinois Energy Conservation Code amended this section to include information regarding equipment, design, system controls, ventilation rate, different occupancy densities, airflow measurement and exhaust rates. Consult Section R403.6 of the Illinois Energy Conservation Code for additional information.

**R403.6.3 Testing.** Mechanical ventilation systems shall be tested and verified to provide the minimum ventilation flow rates required by Section R403.6. Testing shall be performed according to the ventilation equipment manufacturer's instructions, or by using a flow hood or box, flow grid, or other airflow measuring device at the mechanical ventilation fan's inlet terminals or grilles, outlet terminals or grilles, or in the connected ventilation ducts. Where required by the building 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 made available to the building official.


**Exception:** Kitchen range hoods that are ducted to the outside with 6-inch (152 mm) or larger duct and not more than one 90-degree (1.57 rad) elbow or equivalent in the duct run.

R403.6.3
Ventilation Testing

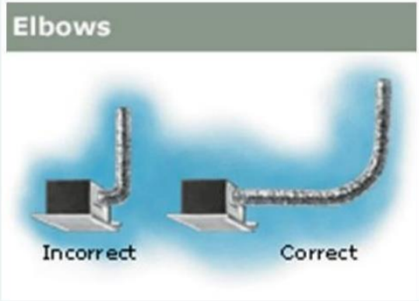
NEW!

Installed fans must now be **TESTED** to verify airflow performance. Avoids issue of installing rated fan, but duct length and bends reduce flow rate.


- Exception for kitchen range hoods w/ 6" duct & at most 1 bend



<https://energyconservatory.com/applications/air-flow-devices/>



<https://basc.pnnl.gov/resource-guides/bathroom-exhaust-fans#edit-group-description>



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**R404.1 Lighting Equipment.** All permanently installed lighting fixtures, excluding kitchen appliance lighting fixtures, shall contain only high-efficacy light sources.

**Explanation:** The 2018 IECC required only 90% of permanent lighting fixtures to be high- efficacy light sources.

Revised: 01/24

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**R404.1.2 Fuel gas lighting equipment.** Fuel gas lighting systems shall not have continuously burning pilot lights.

**Explanation:** Interior and exterior continuously burning gas lighting systems are no longer permitted.

**R404.2 Interior lighting controls.** Permanently installed lighting fixtures shall be controlled with either a dimmer, an occupant sensor control or other control that is installed or built into the fixture.

**Exception:** Lighting controls shall not be required for the following:

1. Bathrooms.
2. Hallways.
3. Exterior lighting fixtures.
4. Lighting designed for safety or security.

**Explanation:** These requirements are new to the 2021 IECC.

**R404.3 Exterior lighting controls.** Where the total permanently installed exterior lighting power is greater than 30 watts, the permanently installed exterior lighting shall comply with the following:

1. Lighting shall be controlled by a manual on and off switch, which allows automatic shut-off actions.

**Exception:** Lighting serving multiple dwelling units.

2. Lighting shall be automatically shut off when daylight is present and satisfies the lighting needs.
3. Controls that override automatic shut-off actions shall not be allowed unless the override automatically returns automatic control to its normal operation within 24 hours.

**Explanation:** These requirements are new to the 2021 IECC.

#### **R409 Phius alternative compliance option.**

The 2021 Illinois Energy Conservation Code added this section, which establishes criteria for compliance via the Phius 2021 Standard. Consult Section R403.6 of the Illinois Energy Conservation Code for additional information.

**The 2021 IECC and the 2021 Illinois Energy Conservation Code will apply to all permit submittals that are received after JUNE 1, 2024.**

The 2021 IECC and commentary can be purchased from the International Code Council (ICC) at <http://www.iccsafe.org/>.

The 2021 Illinois Energy Conservation Code can also be viewed at: <https://cdb.illinois.gov/business/codes/illinois-energy-codes/illinois-energy-conservation-code.html>