



Increase thermal comfort by following the Illinois Energy Conservation Code

Why should designers and building professionals make the extra effort to comply with the Illinois Energy Conservation Code? Following the Code is required by Illinois law and will not only lead to energy cost savings, but will make the building more comfortable for occupants. Thermal comfort in the workplace is correlated with increased productivity and satisfaction.¹ People who may be reluctant to comply with energy code requirements are likely to appreciate the increased comfort of an energy efficient design.

¹ See Smart Building Center. 2015. "Keeping Employees Productive through Thermal Comfort."

RESIDENTIAL REQUIREMENTS TO INCREASE COMFORT

Insulation R402.1. Meeting or exceeding insulation requirements will increase comfort by preventing warm or cool conditioned air from leaking out, and stopping hot or cold air from coming in. The Code specifies insulation requirements for the ceiling, wall, fenestration, floor, basement wall, slab, and crawl space components of the envelope. Window and skylight requirements (shown right) are particularly important for comfort. U-factor measures how well a product prevents heat from escaping, and SHGC measures how well a product blocks heat caused by sunlight.

Table R402.1.2, abridged

Climate zone	Fenestration U-factor	Skylight U-factor	Glazed fenestration SHGC
5	0.30	0.55	NR
4	0.32	0.55	0.40

Air leakage R402.4. Code requirements limit air leakage, which improves comfort. A continuous air barrier in the building envelope is required, and breaks and joints must be sealed. This includes sealing the space between windows and framing. Air leakage testing is required. Recessed lighting can be a big culprit for air leakage. When purchasing fixtures, make sure they are IC-rated, with low air leakage rate, as required by the Code. The fixtures must be caulked (as shown on the right) to provide a seal between the ceiling and cover.



Controls R403.1. Programmable thermostats are required, with the ability to control the heating and cooling system on a daily schedule to maintain different temperature setpoints at different times of the day. Programmable thermostats can be used to ensure that the home stays comfortable when occupants are there, while saving energy when they are not.



Equipment sizing R403.7. Equipment sizing requirements prevent oversizing of heating and cooling equipment. Oversized cooling equipment can make an environment less comfortable because it does not properly dehumidify the air.

Lighting R404.1. A well-lit environment with efficient lighting is a more comfortable environment. The Code requires that not less than 90% of the lamps in permanently installed lighting fixtures be "high efficacy lamps." Replacing incandescent lighting with compact fluorescent lights (CFLs) or LEDs, which use about 80-90% less energy, will reduce energy consumption and increase comfort.



COMMERCIAL REQUIREMENTS TO INCREASE COMFORT

Insulation C402.1. Meeting or exceeding insulation requirements will improve building comfort by reducing infiltration and keeping interior surfaces warmer. The code specifies minimum insulation requirements for fenestration, ceiling, wall, floor, basement wall, slab-edge and crawl space wall components of the building envelope. Fenestration requirements specify U-factor and Solar Heat Gain Coefficient values for all window products. U-factor measures how well a product prevents heat from escaping, and SHGC measures how well a product blocks heat caused by sunlight.

Insulation must be *continuous* in many locations, meaning that it extends across all structural members without thermal bridges other than fasteners and service openings. Building designers are encouraged to *exceed* the minimum insulation requirements to further reduce heating and cooling loads and further increase comfort.

Air leakage C402.5.

The Code has extensive mandatory requirements to control air leakage in buildings.



These include:

- Continuous air barrier for envelope assemblies
- Joints and seams must be sealed
- Penetrations must be caulked and gasketed and allow for expansion, contraction, and mechanical vibration
- Fenestration must not exceed maximum air leakage rates
- Air barrier materials must have low air-leakage rates

Equipment sizing C403.2. Oversized systems decrease occupant comfort, cost more to install and operate, cycle on and off too quickly (causing extra wear and tear), and provide poor dehumidification. The Code requires that engineers use accurate heating and cooling load calculations to size HVAC Equipment.

Heating and cooling system controls C403.4. Properly commissioned HVAC controls schedule heating and cooling systems for comfort and energy savings. Scheduling setbacks for unoccupied periods can save substantial energy costs. The Code has extensive control requirements including:

- Individual thermostatic controls for each zone which can be controlled separately.
- Deadband requirement of 5 degrees to prevent simultaneous heating and cooling.
- Vestibule and air curtain heating system controls
- Off-hour controls to provide each zone with setback
- Automatic setback and shutdown controls capable of seven different daily schedules per week

Lighting power requirements C405.3.1-2

Lighting directly affects the comfort, mood, and productivity of a building's occupants. Lighting requirements limit maximum power for interior and exterior applications to save energy and reduce cooling loads. These requirements can be met by using fluorescents or LEDs, which are 6-10 times more energy efficient than conventional incandescent lights and can last more than 25 times longer. Some can last for 100,000 hours or more.



Lighting controls C405.2

Lighting control requirements reduce lighting when occupants are not present, are not expected to be present, or when there is adequate daylight to reduce artificial lighting.

Note: The current Illinois Energy Code is based on the 2015 IECC, although the code will be updated to the 2018 IECC in March of 2019. The requirements discussed in this Energy Smart Tip are based on the 2018 IECC and are subject to change, based on Illinois Amendments.

ENERGY CODE TRAINING & SUPPORT sedac.org/energy-code

SEDAC provides energy code training and support for professionals throughout Illinois. We offer:

- Workshops
- Webinars
- Online courses and resources
- Technical support

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WHO WE ARE

The Smart Energy Design Assistance Center assists buildings and communities in achieving energy efficiency, saving money, and becoming more sustainable. SEDAC is an applied research program at the University of Illinois at Urbana-Champaign working in collaboration with 360 Energy Group. SEDAC services include

- Quick Advice
- Energy Assessments
- New Construction Design Assistance
- Long-term energy planning
- Retro-commissioning

