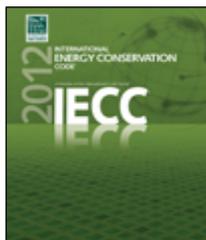


Residential Buildings Energy Code Summary



Overview

Cedar Rapids homebuyers appreciate the comfort and warmth of well-designed, energy-efficient houses. With the upgrade of Iowa's statewide energy code, home buyers now have peace of mind knowing that Iowa homes meet the latest standards for energy efficiency. All new residential construction and additions in Iowa must meet the minimum requirements of the 2012 International Energy Conservation Code (2012 IECC). This statewide energy code becomes effective on April 1, 2014 with a grace period until June 1, 2014.

What Buildings Are Covered Under The Statewide Energy Code?

The energy code applies to all **new residential buildings, and additions**, in Iowa regardless of fuel type (gas, electricity or other). Renovations and unaltered portions of existing buildings do not need to comply with this code.

The following buildings are exempt from this code:

- Buildings that are neither heated nor cooled or that have a peak design rate of energy use less than 3.4 Btu/h per square foot for space conditioning.
- Buildings that are classified or determined to be eligible for listing in the National Register of Historic Places.

Significant changes with the new Iowa energy code explained in more detail in this brochure:

- New houses are required to be sealed and tested by a third party to 4ACH50.
- **Basement walls** require insulation (finishing not required).
- **75% of the permanent light fixtures** must have high efficiency bulbs such as CFLS.
- **Heating system** ductwork located outside of the conditioned (heated) part of a house must be tested for tightness. Return ducts in building cavities must be tested as well.
- **Air barrier** material(s) such as spray in-place foam, sealed in-place sheathing, sealed in-place foam board or sealed poly are required in rim band joists, behind tub/shower enclosures on exterior walls and dropped ceilings adjacent to the thermal envelope.
- **Programmable/setback thermostats** are required in homes with furnaces.
- **Panel Certificate:** The statewide energy code also gives house buyers an additional tool to use in making their purchase decision—the “Energy Efficiency Components Label.” This label is required in all new houses and is a way for the builder to certify that the house at least meets the minimum code levels. The label will be permanently affixed to the house's electrical breaker box.

City Of Cedar Rapids Energy Code Compliance:

- Applicants are required to meet the requirements of the energy code and show energy code compliance through a Third Party process
- Applicant sign off at time of permit approval.
- All of the Mandatory provisions and either the Prescriptive or Performance based approached must be followed.
- Third party field inspections to verify compliance.

Mandatory Requirements

All mandatory provisions must be complied with regardless of the compliance path that is chosen.

- R401.3 Certificate
- R402.4 Air Leakage
- R402.5 Maximum fenestration U-factor and SHGC
- R403.1 HVAC Controls (Programmable Thermostat)
- R403.1.2 Heat Pump Supplementary Heat (Controls)
- R403.2.2 Duct Sealing
- R403.2.3 Building Cavities as ducts or plenums
- R403.3 Mechanical system piping insulation Section
- R403.4.1 Circulating hot water systems (Manual Switch)
- R403.5 Mechanical ventilation
- R403.6 Equipment sizing
- R403.7 Systems serving multiple dwelling units
- R403.8 Snow melt systems controls
- R403.9 Pools and in ground permanently installed spas
- R404.1 Lighting Equipment
- R404.1.1 Fuel Gas Lighting Equipment

<u>Prescriptive Option Requirements</u>	<u>Performance Option Requirements</u>
R402.1 General R402.2 Specific insulation requirements R402.3 Fenestration R403.2.1 Duct insulation R403.4.2 Hot Water Pipe Insulation	R405 Simulated performance alternative Must submit compliance documentation

Prescriptive Compliance Path

Prescriptive R- value

Table R402.1.1 Insulation and Fenestration Requirements by Component (2012 IECC)										
Climate Zone	Fenestration U-Factor	Skylight U-Factor	Glazed Fenestration SHGC	Ceiling R-value	Wood Frame Wall R-value	Mass Wall R-value	Floor R-value	Basement Wall R-value	Slab R-value & Depth	Crawl Space Wall R-value
5 And Marine 4	0.32	0.55	NR	49	20 or 13+5	13/17	30	15/19	10, 2ft	15/19

Prescriptive U- value

Table R402.1.3 Insulation and Fenestration Requirements by Component (2012 IECC)								
Climate Zone	Fenestration U-Factor	Skylight U-Factor	Ceiling U-Factor	Wood Frame Wall U-Factor	Mass Wall U-Factor	Floor U-Factor	Basement Wall U-Factor	Crawl Space Wall U-Factor
5 And Marine 4	0.32	0.55	0.026	0.057	0.082	0.033	0.050	0.055

Third Party in-field inspections to verify compliance
Supporting Documents to be supplied before C.O
 (Compliance Report, Inspection Checklist and Panel Certificate)

Panel Certificate (R401.3)

ENERGY EFFICIENCY CERTIFICATE

Address: _____

City: _____ State: MD Zip Code: _____

RESIDENTIAL COMPLIANCE PATH
(Only One Shall Apply)

Prescriptive R Prescriptive U
 Prescriptive UA Performance

COMPONENT VALUES

Ceiling R or U-value: _____

Wood Frame Wall R or U-value: _____

Mass Wall R or U-value: _____

Floor R or U-value: _____

Basement Wall R-value: _____

Slab R-value: _____ Depth: _____

Crawl Space R-value: _____

Fenestration U-factor: _____ SHGC: _____

Skylight U-factor: _____

Ducts Outside of

Thermal Envelope R-value: Supply R-8 Other R-6

Building Envelope Air Leakage: _____ Air Changes per hour

Duct System Air Leakage: _____ cfm per 100sf

Rough In Testing: Post Construction Testing:

Heating System Efficiency: _____

Cooling System Efficiency: _____

Water Heating Efficiency: _____

Gas Fired Unvented

Room Heater:

Electric Furnace:

Baseboard Electric Heat:

This Certificate is based upon 2009/2012 International Energy Conservation Code and the 2009/2012 International Residential Code. The Certificate shall be posted on or in the electrical distribution panel.

HB/MHIC License #: _____
 Date: _____
 Signature: _____
 Contractor: _____

R401.3 Certificate (Mandatory). A permanent certificate shall be completed and posted on or in the electrical distribution panel by the builder or registered design professional. The certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels. The certificate shall list the predominant R-values of insulation installed in or on ceiling/roof, walls, foundation (slab, basement wall, crawlspace wall and/or floor) and ducts outside conditioned spaces; U-factors for fenestration and the solar heat gain coefficient (SHGC) of fenestration, and the results from any required duct system and building envelope air leakage testing done on the building. Where there is more than one value for each component, the certificate shall list the value covering the largest area. The certificate shall list the types 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 list "gas-fired unvented room heater," "electric furnace" or "baseboard electric heater," as appropriate. An efficiency shall not be listed for gas-fired unvented room heaters, electric furnaces or electric baseboard heaters.

Air Sealing Requirements

Section R402.4 Air Leakage (Mandatory)

Uncontrolled air leakage can significantly increase heating bills and cause uncomfortable drafts. Therefore, the energy code requires an **air barrier** for control of air leakage. An air barrier is a material that blocks air flow **through or into** the building envelope.

Some of the major air leakage areas that must be sealed with an air barrier material, durable caulk, or foam sealant are:

1. Openings between the building structure and exterior windows and door frames;
2. Openings around electrical wire, boxes, recessed light fixtures, and plumbing piping through the attic, exterior walls and other unheated spaces;
3. Dropped ceilings or chases adjacent to the thermal boundary;
4. Behind tub, showers and fireplaces on exterior walls;
5. Common walls between dwelling units;
6. Attic access openings;
7. Rim/band joist junctions;
8. Other sources of infiltration.

Air Sealing and Insulation

Section R402.4.1.2 Testing (Mandatory)

Certain sealing and insulation installation requirements of the code can be demonstrated with a blower door test.

Blower Door Test - Section R402.4.1.2

This allows compliance when a blower door test measurement of building air tightness results show four air changes per hour or less when tested at 50 Pascal – 4ACH50. A blower door test is performed using a large fan assembly placed in an exterior door opening. The fan draws air out of the building while measuring the air flow required to hold a slight vacuum in the building.

Batt insulation is cut to fit around wiring and plumbing, narrow cavities or spray/blown insulation extend behind piping and wiring and narrow cavities.

Wall corners and headers must be insulated.

Air Barrier Criteria

Air permeable insulation such as fiberglass and cellulose must be inside of an air barrier.

Insulation placed in the conditioned boundary of the building; walls, ceilings, dropped ceilings/soffit, rim joists, fireplace walls, shower/tub must be in substantial contact and continuous alignment with the buildings' envelope air barrier.

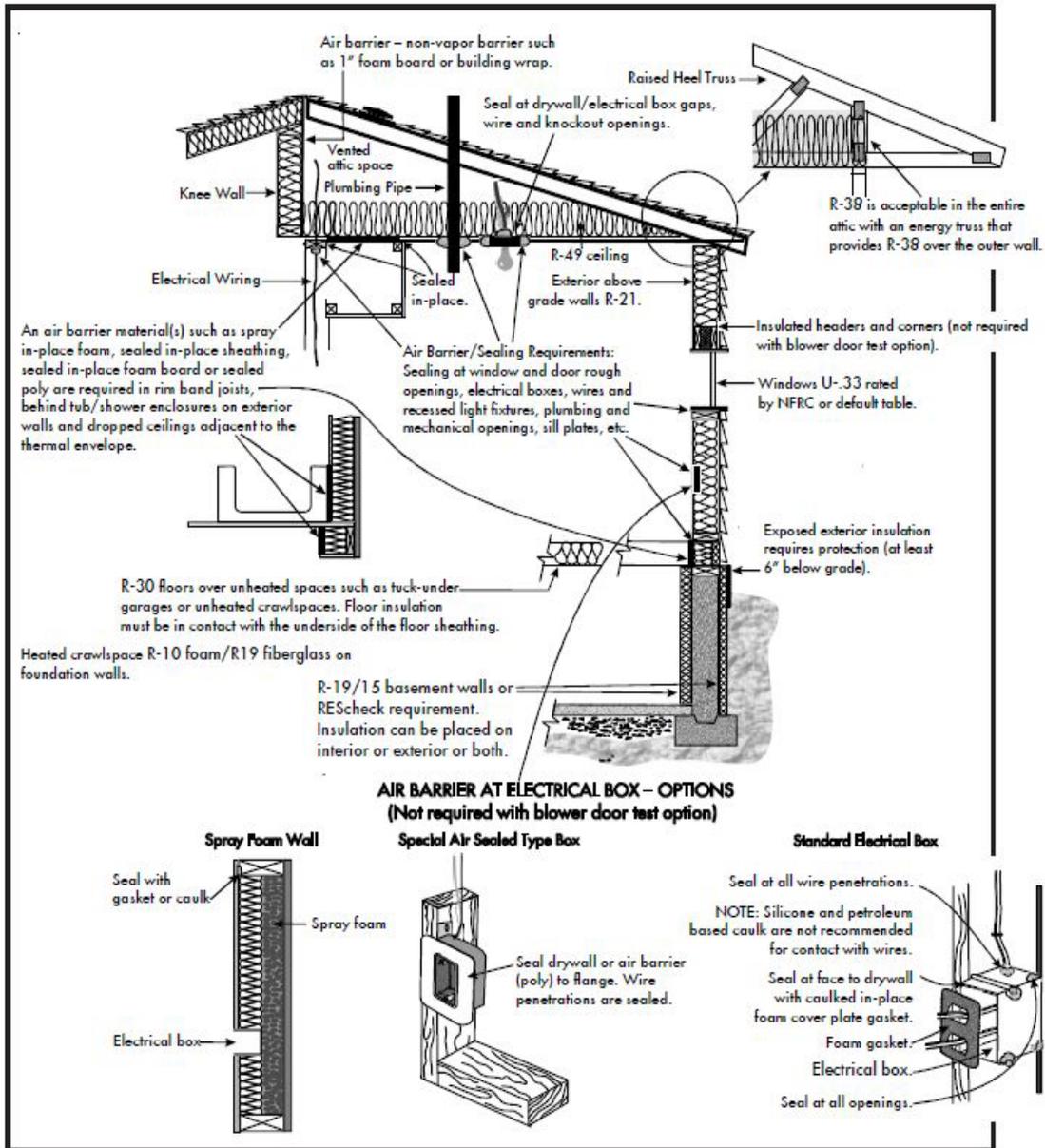
Air barrier extends behind electrical and phone boxes on exterior walls, or air sealed type boxes are installed.

**TABLE R402.4.1.1
AIR BARRIER AND INSULATION INSTALLATION**

COMPONENT	CRITERIA*
Air barrier and thermal barrier	A continuous air barrier shall be installed in the building envelope. Exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed. Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling/soffit shall be aligned with the insulation and any gaps in the air barrier sealed. Access openings, drop down stair or knee wall doors to unconditioned attic spaces shall be sealed.
Walls	Corners and headers shall be insulated and the junction of the foundation and sill plate shall be sealed. The junction of the top plate and top of exterior walls shall be sealed. Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier. Knee walls shall be sealed.
Windows, skylights and doors	The space between window/door jambs and framing and skylights and framing shall be sealed.
Rim joists	Rim joists shall be insulated and include the air barrier.
Floors (including above-garage and cantilevered floors)	Insulation shall be installed to maintain permanent contact with underside of subfloor decking. The air barrier shall be installed at any exposed edge of insulation.
Crawl space walls	Where provided in lieu of floor insulation, insulation shall be permanently attached to the crawlspace walls. Exposed earth in invented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.
Narrow cavities	Batts in narrow cavities shall be cut to fit, or narrow cavities shall be filled by insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be air tight, IC rated, and sealed to the drywall.
Plumbing and wiring	Batt insulation shall be cut neatly to fit around wiring and plumbing in exterior walls, or insulation that on installation readily conforms to available space shall extend behind piping and wiring.
Shower/tub on exterior wall	Exterior walls adjacent to showers and tubs shall be insulated and the air barrier installed separating them from the showers and tubs.
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical or communication boxes or air sealed boxes shall be installed.
HVAC register boots	HVAC register boots that penetrate building thermal envelope shall be sealed to the sub-floor or drywall.
Fireplace	An air barrier shall be installed on fireplace walls. Fireplaces shall have gasketed doors.

a. In addition, inspection of log walls shall be in accordance with the provisions of ICC-400.

FIGURE 4. Air Sealing and Prescriptive Path Insulation Requirements



Recessed Light Requirements

Section 402.4.5

Recessed lights that are installed in the building thermal envelope (typically a ceiling with unheated space above) must be sealed to limit air leakage between conditioned and unconditioned spaces. All recessed lights must be IC rated and labeled as meeting ASTM E 283. All recessed lights shall be sealed with a gasket or caulk between the housing and interior ceiling or wall covering.

Fenestration Requirements

Prescriptive R– value

Table R402.1.1 Insulation and Fenestration Requirements by Component (2012 IECC)										
Climate Zone	Fenestration U-Factor	Skylight U-Factor	Glazed Fenestration SHGC	Ceiling R-value	Wood Frame Wall R-value	Mass Wall R-value	Floor R-value	Basement Wall R-value	Slab R-value & Depth	Crawl Space Wall R-value
5 And Marine 4	0.32	0.55	NR	49	20 or 13+5	13/17	30	15/19	10, 2ft	15/19

Prescriptive U– value

Table R402.1.3 Insulation and Fenestration Requirements by Component (2012 IECC)									
Climate Zone	Fenestration U-Factor	Skylight U-Factor	Ceiling U-Factor	Wood Frame Wall U-Factor	Mass Wall U-Factor	Floor U-Factor	Basement Wall U-Factor	Crawl Space Wall U-Factor	
5 And Marine 4	0.32	0.55	0.026	0.057	0.082	0.033	0.050	0.055	

Heating Systems Section R403

HVAC Controls

(Programmable Thermostat)R403.1

R403.1 Controls (Mandatory).

At least one thermostat shall be provided for each separate heating and cooling system.

R403.1.1 Programmable thermostat.

Where the primary heating system is a forced-air furnace, at least one thermostat per dwelling unit shall be capable of controlling the heating and cooling system on a daily schedule to maintain different temperature set points at different times of the day. This thermostat shall include the capability to set back or temporarily operate the system to maintain *zone* temperatures down to 55°F (13°C) or up to 85°F (29°C). The thermostat shall initially be programmed with a heating temperature set point no higher than 70°F (21°C) and a cooling temperature set point no lower than 78°F (26°C).

R403.1.2 Heat pump supplementary heat (Mandatory).

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

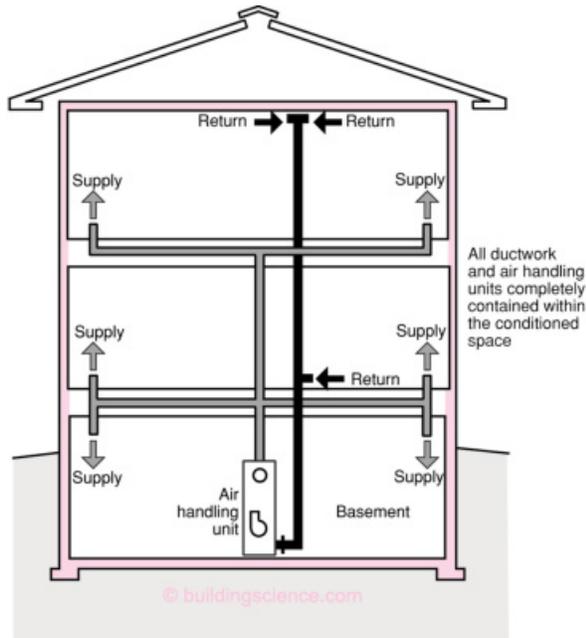
Ducts – Section R403.2

All ducts, both supply and return, air handlers, filter boxes, and building cavities used as returns, shall be sealed. Building cavities cannot be used for supply ducts. Supply ducts in

nonconditioned attics must be insulated to at least R-8. All other ducts, both supply and return, located outside the thermal envelope must be insulated to at least R-6.

Duct Sealing – Section R403.2.2 (Mandatory)

Heating system ductwork and air handler (cabinet) that are located outside of the thermal barrier, such as in the attic or garage, must be tested for tightness. Building cavities used as returns, shall be sealed and tested by an approved certified third party.



Note: Colored shading depicts the building's thermal barrier and pressure boundary. The thermal barrier and pressure boundary enclose the conditioned space.



Duct leakage testing is not required if all ductwork and air handlers are located within the conditioned space and building cavities are not used as returns.

Duct tightness must be verified with either a test at rough-in or at completion. (Iowa Specific Amendment)

1. If tested before completion (rough-in), the total leakage must be equal to or less than 6 cubic feet per minute (cfm) per 100 sq. ft. of the conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pascal), across the entire system, including the manufacturer's air handler enclosure. If the air handler is not installed at the time of the test, total leakage must be equal to or less than 3 cfm per 100 sq.ft. of conditioned floor area. All register boots shall be sealed for the test.
2. If tested after completion (post construction), the leakage to the outdoors shall be equal to or less than 4 cfm per 100 sq.ft. of conditioned floor area, **or** a total leakage equal to or less than 6 cfm per 100 sq.ft. of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pascal) across the entire system, including the manufacturers air handler enclosure. All register boots shall be sealed during the test.

Mechanical System

Sealing air leaks significantly reduces energy loss. A newly constructed home is required to have a mechanical ventilation system to ensure good indoor air quality. Mechanical ventilation options range from an 80 to 100 cubic feet per minute (cfm) bathroom fan to heat recovery ventilation systems. Heat recovery systems bring fresh air into the house and reclaim or recover about 80 percent of the heat from the stale air that is being drawn out of the house.

- Because of minimal air leakage requirements, all dwelling units shall be provided with whole house mechanical ventilation. [IRC R303.4]
- Whole-house supply and exhaust air shall be provided. Air flow rates vary dependent with system type, dwelling unit size and number of bedrooms, and also must run either continuously or intermittently.
- Contact your HVAC designer for requirements. [IRC M1507.1]
- Outdoor air ducts connected to the return side of an air handler are considered to provide supply ventilation while local kitchen and bathroom exhaust fans may provide for exhaust air serving together as a whole-house ventilation system. [IRC M1507.3.1]
- Whole-house mechanical ventilation system fans must meet certain efficacy requirements, or if integral to HVAC equipment they shall have electronically commutated motors (ECM). [R403.5.1]
- Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating. [R403.5]

Pipe Insulation – Section R403.3 (Mandatory)

Mechanical system piping that is capable of carrying fluids above 105 degrees F or below 55 degrees F must be insulated to at least R-3. There are additional domestic hot water insulation (prescriptive) requirements R403.4.2.

Circulating Hot Water Systems - Section R403.4.1 (Mandatory)

Circulating hot water systems must also include an automatic or readily accessible manual switch that can turn off the hot water circulating pump when the system is not operating.

Proper Sizing of Heating and Cooling Equipment – Section R403.6 (Mandatory)

Heating and cooling equipment shall be sized in accordance with ACCA manual S based on the building loads calculated in accordance with ACCA Manual J or other approved heating and cooling calculation method. Load calculations shall be submitted before mechanical permit is issued.

Insulation of refrigerant piping – IRC Section M1411.5

Piping and fittings for refrigerant vapor (suction) lines shall be insulated with insulation having a thermal resistivity of at least R-4.

Lighting Requirement – Section R404.1 (Mandatory)

75% of the permanently installed lighting fixtures must have high-efficacy lamps or light bulbs, (need not be fixtures) which include compact fluorescent (CFL), T-8 or smaller linear fluorescent or LED or lamps with a minimum efficacy of 60 lumens per watt if over 40 watts, 50 lumens per watt if over 15 watts to 40 watts, and 40 lumens per watt if 15 watts or less