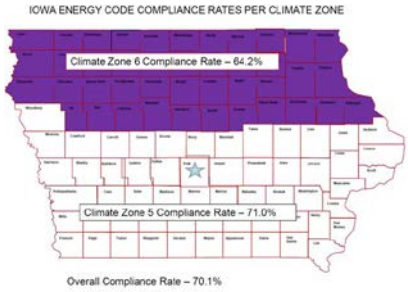
Residential Buildings Energy Code Summary



Overview

Iowa 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 houses in Iowa must meet the minimum requirements of the 2012 International Energy Conservation Code (2012 IECC). This publication is a summary overview of the 2012 IECC for residential construction with Iowa specific amendments. This statewide energy code becomes effective on April 1, 2014 with a grace period until June 1, 2014.

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.

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 for insulation, window, and heating system efficiencies and other energy features required in a new house. A sample is shown in Figure 6. The label also ensures that the information about these features is not lost over time. The label will be permanently affixed to the house's electrical breaker box, so subsequent owners will have the same information available to them.
Since the Energy Code is a state wide code, cities, towns, and counties with building code jurisdictions are required to enforce the state energy code in their jurisdictions.

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http://www.dps.state.ia.us/fm/building/energy/index.shtml

This booklet is an energy code summary.
A copy of the 2012 IECC can be ordered from the
International Code Council at **www.iccsafe.org** or call 800-786-4452

Continued

Outside of these building code jurisdictions, builders are required to meet the requirements of the energy code and show energy code compliance through a self-certification process. This means that the builder is required to provide a written statement to the homeowner that the house meets the state energy code requirements. The home builder or agent provides this certification by signing and dating the energy efficient components label.

Not only do home builders and home buyers benefit from this code, but Iowa wins too. Energy-efficient homes consume less energy than homes not built to these standards. This means less energy has to be produced to heat and cool these homes which helps conserve our fossil fuel resources and protects Iowa's environment.

What Buildings Are Covered Under The Statewide Energy Code?

The energy code applies to all new residential buildings, and additions, in Iowa (with exceptions noted below) regardless of fuel type (gas, electricity or other). Renovations and unaltered portions of existing buildings do not need to comply with this code. One- and two-family dwelling efficiency levels may vary slightly from multi- family dwellings. Residential buildings (R-2 and R-4) with more than three floors above ground must comply with the commercial energy code portions of the 2012 IECC code, excluding lighting provisions.

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.

Ways to Show Energy Code Compliance

There are three primary ways to demonstrate that one- and two-family dwellings meet the requirements of the Iowa Energy Code - 2012 International Energy Conservation Code.

1. Follow the **prescriptive path** listed in Table R402.1.1 of the IECC 2012.

2. Use REScheck™ a computer analysis, a free download at **www.energycodes.gov,** to show compliance, or other approved method. (**Trade off Path**)
   REScheck requires inputs of the areas and efficiency levels for ceilings, walls, and windows, etc.

3. "HERS Rating" by a certified Rater. (**Performance Path**)

Simplified - TABLE R402.1.1 Insulation and Window Requirements by Component

Component Insulation or Efficiency Level

Zone 5		Zone 6	
Component	Insulation or Efficiency Level	Component	Insulation or Efficiency Level
Ceiling	R49/38 [A]	Ceiling	R49/38 [A]
Exterior Wall	R20 or R13+R5ci [B]	Exterior Wall	R20 or R13+R5ci [B]
Mass Wall	R13/17 [C]	Mass Wall	R15/20 [C]
Floor	R30 [D]	Floor	R30 [D]
Basement Wall	R15/19ci [E]	Basement Wall	R15/19ci
Slab Perimeter	R10, [F] from top edge for 2ft. R15 heated	Slab Perimeter	R10, [F] from top edge for 4ft. R15
Crawlspace Wall	R15/19 [G]	Crawlspace Wall	R15/19 [G]
Window/Door	U.32 [H]	Window/Door	U.32 [H]

Continued

Footnotes to Table

The R-value requirement listings are for insulation material only, not for structural components such as drywall or siding. All materials, systems, and equipment must be installed in accordance with the manufacturers installation instructions.

A) Where R-49 is required in zones 5 & 6, R-38 is acceptable if the full height of uncompressed R-38 insulation extends over the wall top plate at the eaves. See Figure 4. IE, energy truss.

Insulation markers with at least one-inch sized numbers are required at least every 300 sq. ft. of attic space and must face the access opening.
Attic access hatches and doors must be weather-stripped or sealed and baffled to prevent loose insulation from spilling into the living space and insulated to its surrounding area's requirement.

B) The second number is a listing for continuous Insulation (CI), which is insulation that runs continuously over structural members and is free of thermal bridging. Foam sheathing over exterior wall framing is an example of continuous insulation.

Steel framed wall requirements, where code requires wood framed walls to be insulated to R-20 or R13+5: Either 16 or 24-inch on center framing; R-20 high density insulation or R-13 batt with R-5 continuous insulation foam sheathing.

Structural Insulated Panels (SIP) with at least 5.5 inches of foam, and insulated concrete foam systems (ICF) with at least 2 inches of foam on each side, surpass the R-20 wall requirements because of their lack of thermal bridging.
Log walls use mass wall requirements. Usually 14-inch and larger log walls will meet the R-15 requirement or REScheck can be used to show compliance.

C) Mass walls are considered to be above grade walls of concrete, concrete block, insulated concrete form (ICF), brick, (other than brick veneer), earth and solid timber/logs. R-19 applies when more than half the insulation is on the interior of the mass wall. REScheck can be used to show compliance.

D) Floor insulation must be in contact with the underside of the floor sheathing.

E) Basement walls, whether or not the space is finished, require R-19 cavity or R-15 continuous insulation level. A REScheck analysis will usually allow lower levels of insulation with less than a 12 percent window-to-wall ratio. R-15 continuous insulation should meet the basement insulation requirement. A REScheck analysis must be completed.

F) R-15 is required for heated slab-on-grade floors. Heated slab includes floors with heating elements, hydronic tubing and ductwork within and under the slab. Slab-on-grade floors with a floor surface less than 12 inches below grade require R-10 insulation, adding R-5 for heated slabs. Slab-on-grade insulation should extend downward from the top of the slab on the outside or inside of the foundation wall. The insulation should extend 4 feet by any combination of vertical and horizontal placement that extends out from the slab or under the slab (see the Insulated Slab Options, Figure 1). Insulation extending away from the building should be protected by pavement or at least 10 inches of soil. The top edge of the insulation installed between the exterior wall and the edge of the interior slab may be cut at a 45 degree angle. Exposed insulation shall have a weather-resistant protective covering extending at least 6 inches below grade level.

G) Conditioned crawlspace walls require a minimum of R-19 with fiberglass or R-15 with foam. Insulation should cover the entire foundation wall.

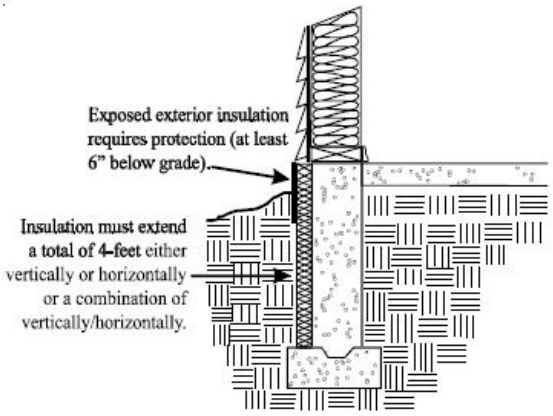
H) Because the U-value is the inverse of the R-value, a lower U-value indicates a window that has better thermal capabilities than a window with a higher U-value. Example: a U-.30 rated window is more efficient than a U-.33 rated window. Up to 15 sq. ft. of glazing is exempt for the U-value requirement. Skylights must have a U-value of at least .55.

Insulated Slab Options

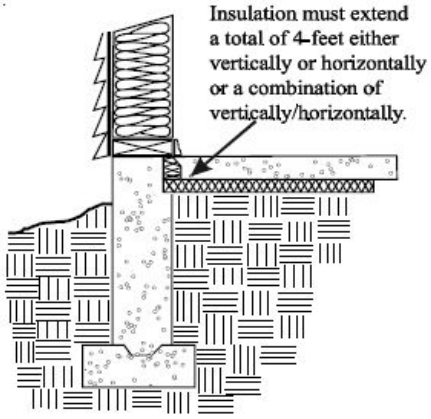
Slab perimeter insulation of at least R-10
(R-15 for in-floor heat) from top edge for at least 4 feet.

FIGURE 1

Option 1

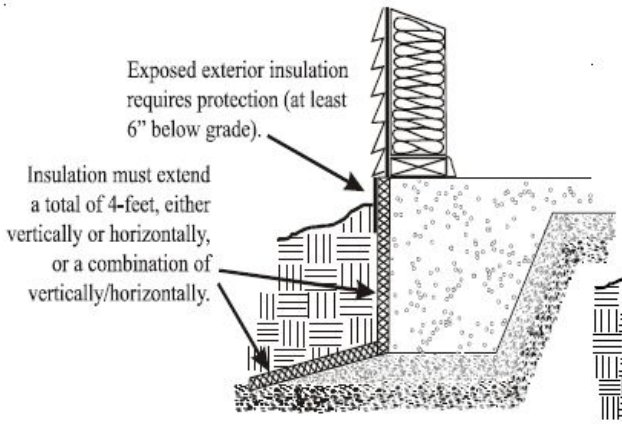


Option 2

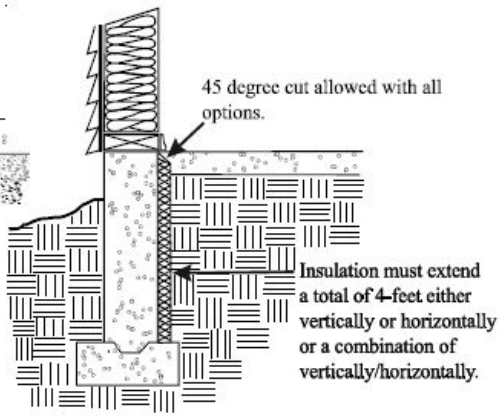


Option 3

2006 IRC Section 403.3 allows frost protected shallow foundation footing depth of 2 feet.



Option 4



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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.

These locations are shown on Figure 4. (Note: *fiberglass and cellulose do not stop airflow, and do not qualify as air barriers. Generally, the facing materials used on fiberglass batt insulation cannot be adequately sealed to be considered an air barrier.*)

Sealing air leaks significantly reduces energy loss. A well sealed home should have a mechanical ventilation system, although not required by code, to ensure good indoor air quality. Mechanical ventilation options range from a quiet 80 to 100 cubic feet per minute (cfm) bathroom fan rated at 1.5 sone sound rating or less, 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.

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.

1) 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.

List of Table R402.4.1.1 – Air barrier and insulation inspection component criteria (see Figure 3).

Insulation Inspection Criteria

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. (See Figure 4.)

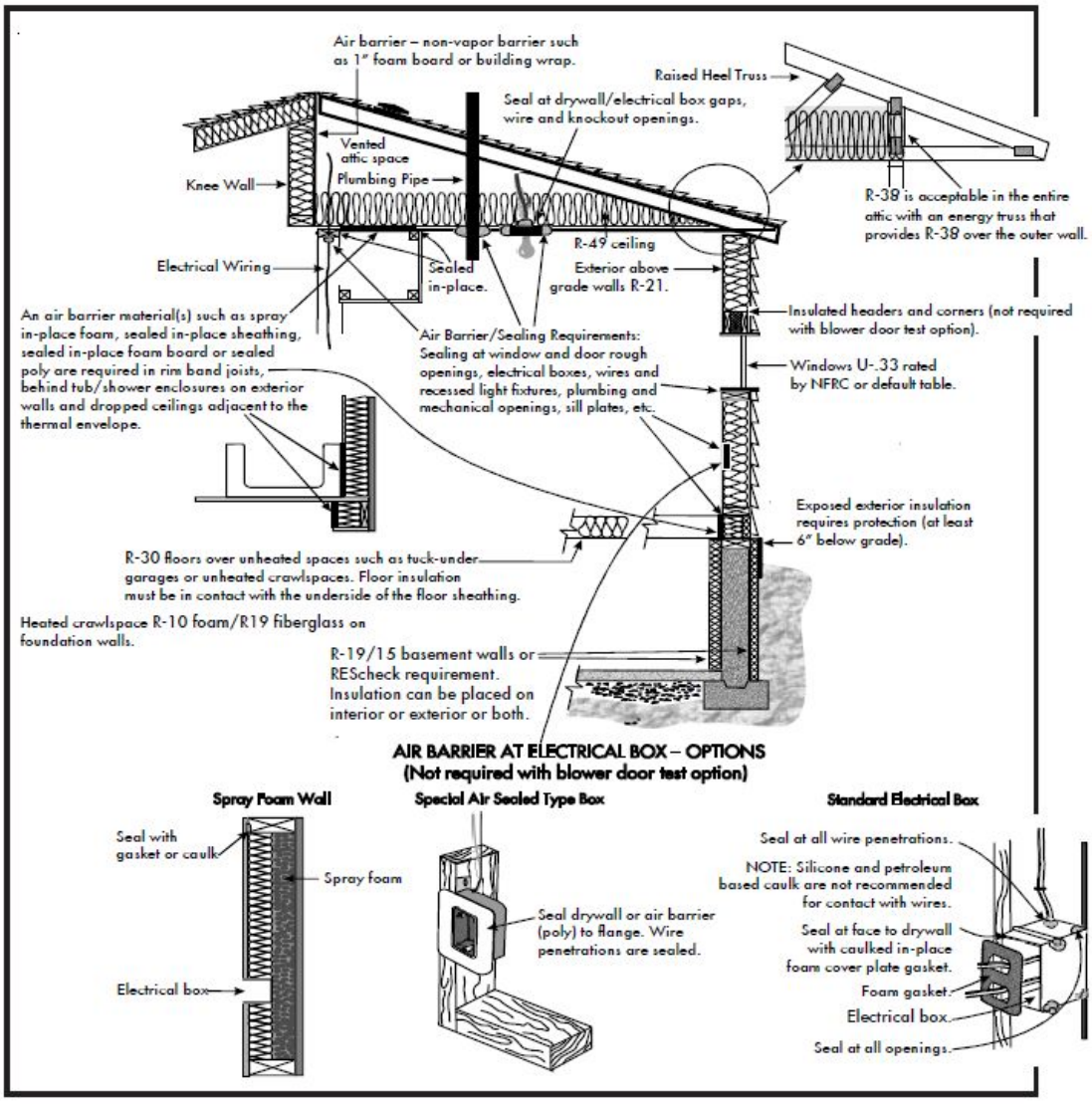
(Figure 3.)

TABLE R402.4.1.1
AIR BARRIER AND INSULATION INSTALLATION

COMPONENT	CRITERIA[a]
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 unvented 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 402.4.4

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.

Heating Systems Section R403

Programmable Thermostats – Section R403.1.1(Mandatory)
Programmable thermostats are required on forced air heating systems (furnaces) and have to be capable to set back or temporarily operate the system to maintain temperatures down to 55 degrees or up to 85 degrees. It should be initially programmed with a heating temperature no higher than 70 degrees and a cooling temperature no lower than 78 degrees.

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 conditioned boundary 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 conditioned boundary, 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.

Testing is not required if all ductwork and the air handler (cabinet) are located within conditioned space and a building cavity is not used as a return.

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 roughed-in 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 should 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 manufacturer's air handler enclosure. All register boots shall be sealed during the test.

Pipe Insulation – Section R403.3 (Mandatory)
Mechanical system piping such as boiler or cooling (AC) 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 requirements for most piping running to kitchen and bath fixtures as well as if the pipes are run outside the thermal envelope. 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.

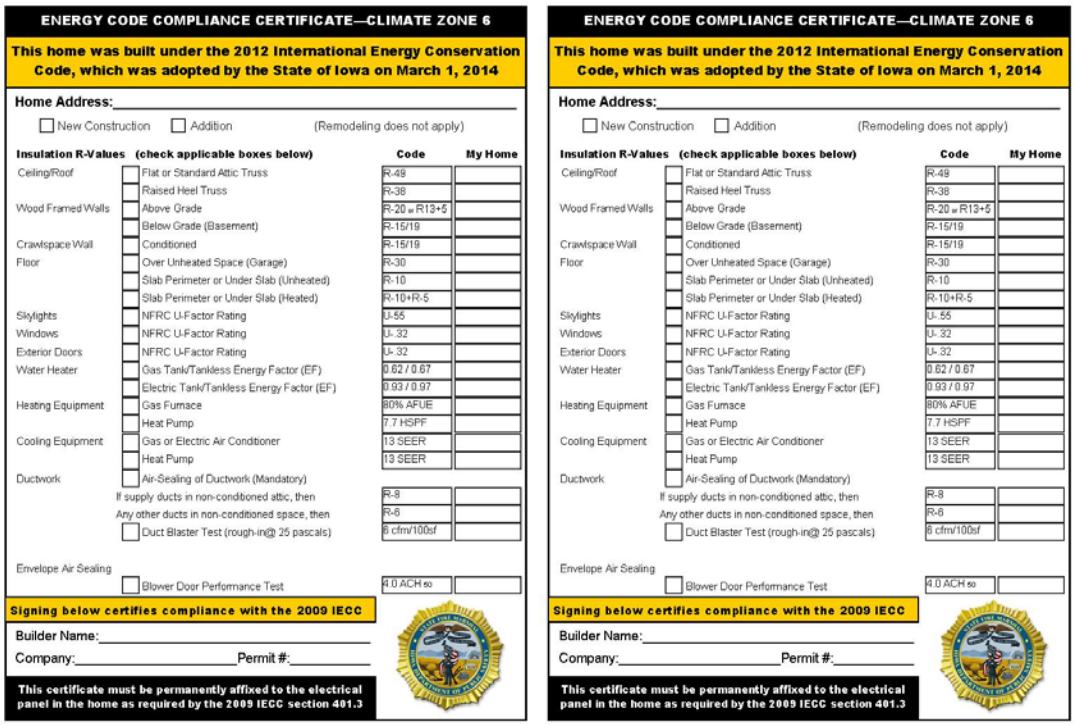
Proper Sizing of Heating and Cooling Equipment – Section R403.6 (Mandatory)
Heating and cooling equipment shall be sized in accordance with ACCA manual S based on the building loads calculated in accordance with ACCA Manual J or other approved heating and cooling calculation method.

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.

Energy Efficiency Components Label

R401.3 Certificate (Mandatory) The certificate of the homes performance shall be adhered to the electrical panel.

Energy Efficiency Components ZONE 6
Label with Prescriptive Path Listing



ENERGY CODE COMPLIANCE CERTIFICATE—CLIMATE ZONE 6

This home was built under the 2012 International Energy Conservation Code, which was adopted by the State of Iowa on March 1, 2014

Home Address:_____

☐ New Construction ☐ Addition (Remodeling does not apply)

Insulation R-Values (check applicable boxes below)			Code	My Home
Ceiling/Roof	☐	Flat or Standard Attic Truss	R-49	
	☐	Raised Heel Truss	R-38	
Wood Framed Walls	☐	Above Grade	R-20 or R13+5	
	☐	Below Grade (Basement)	R-15/19	
Crawlspace Wall	☐	Conditioned	R-15/19	
Floor	☐	Over Unheated Space (Garage)	R-30	
	☐	Slab Perimeter or Under Slab (Unheated)	R-10	
	☐	Slab Perimeter or Under Slab (Heated)	R-10+R-5	
Skylights	☐	NFRC U-Factor Rating	U-.55	
Windows	☐	NFRC U-Factor Rating	U-.32	
Exterior Doors	☐	NFRC U-Factor Rating	U-.32	
Water Heater	☐	Gas Tank/Tankless Energy Factor (EF)	0.62 / 0.67	
	☐	Electric Tank/Tankless Energy Factor (EF)	0.93 / 0.97	
Heating Equipment	☐	Gas Furnace	80% AFUE	
	☐	Heat Pump	7.7 HSPF	
Cooling Equipment	☐	Gas or Electric Air Conditioner	13 SEER	
	☐	Heat Pump	13 SEER	
Ductwork	☐	Air-Sealing of Ductwork (Mandatory)		
	If supply ducts in non-conditioned attic, then		R-8	
	Any other ducts in non-conditioned space, then		R-6	
	☐	Duct Blaster Test (rough-in@ 25 pascals)	6 cfm/100sf	
Envelope Air Sealing				
	☐	Blower Door Performance Test	4.0 ACH 50	

Signing below certifies compliance with the 2009 IECC

Builder Name:_____

Company:_____ **Permit #:**_____

This certificate must be permanently affixed to the electrical panel in the home as required by the 2009 IECC section 401.3

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Crawlspace Wall	☐	Conditioned	R-15/19	
Floor	☐	Over Unheated Space (Garage)	R-30	
	☐	Slab Perimeter or Under Slab (Unheated)	R-10	
	☐	Slab Perimeter or Under Slab (Heated)	R-10+R-5	
Skylights	☐	NFRC U-Factor Rating	U-.55	
Windows	☐	NFRC U-Factor Rating	U-.32	
Exterior Doors	☐	NFRC U-Factor Rating	U-.32	
Water Heater	☐	Gas Tank/Tankless Energy Factor (EF)	0.62 / 0.67	
	☐	Electric Tank/Tankless Energy Factor (EF)	0.93 / 0.97	
Heating Equipment	☐	Gas Furnace	80% AFUE	
	☐	Heat Pump	7.7 HSPF	
Cooling Equipment	☐	Gas or Electric Air Conditioner	13 SEER	
	☐	Heat Pump	13 SEER	
Ductwork	☐	Air-Sealing of Ductwork (Mandatory)		
	If supply ducts in non-conditioned attic, then		R-8	
	Any other ducts in non-conditioned space, then		R-6	
	☐	Duct Blaster Test (rough-in@ 25 pascals)	6 cfm/100sf	
Envelope Air Sealing				
	☐	Blower Door Performance Test	4.0 ACH 50	

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Definitions of Some Energy Efficient Terms

A good comparison shopper needs to understand certain units of measurement, such as MPG (miles per gallon) when shopping for a new car. Shopping for energy efficiency also involves knowing a few units of measurement. Each Energy Efficiency Components Label may contain five or more different units of measurement. The following definitions will help you crack the code of energy efficiency.

R-VALUES – The units used to measure the insulating value of an object. The higher the R-value, the more insulating value an object has. A high density batt of fiberglass insulation for a 2” x 6” wall has an R-value of 21.

U-VALUES – Another unit of insulation measurement, U-values, measure heat loss through windows. The U-value of a window is the reciprocal of its R-Value (U = 1/R). For instance, a window with a U-value of 0.33 is equivalent to an R-value of 3 (0.33 = 1/3). Because the U-value is the inverse of the R-value, a lower U-value indicates a window that has better insulating capabilities than a window with a higher U-value.

NFRC UNIT RATING – The National Fenestration Rating Council (NFRC) determines the U-value for most windows. This rating is placed on a label attached to all new NFRC rated windows. If the NFRC rating is available, the home builder should use this number when filling in the U-value on the Energy Efficiency Components Label for a new home. Windows with a U-value of 0.4 or less usually have a low-e coating.

EF – Used to determine the energy efficiency of hot water tanks, EF is the abbreviation for "Energy Factor." This unit is a ratio of the heat energy contained in the water in a hot water tank over a certain period of time divided by the energy that the hot water heater consumes over the same time period. The most efficient electric water heaters have an EF rating of 0.93 to 0.96, while the most efficient gas-fired water heaters have energy factors ranging from 0.8 to 0.9.

AFUE – An abbreviation for "Annual Fuel Utilization Efficiency." AFUE is a measure of the effectiveness of gas and oil space heating systems. All furnaces and boilers in the United States are required to have an AFUE rating of at least 78 percent. The most efficient gas furnaces have an AFUE of 92 percent to over 96 percent, while the most efficient gas hot-water boilers have AFUE ratings of around 84 percent to 90 percent. Energy-efficient oil furnaces have similar AFUE ratings, in the mid-80s to 90 percent. The most efficient oil-fired hot water boilers have efficiencies that are slightly lower, with AFUE ratings up to around 85 percent. Gas or oil-fired steam boilers have somewhat lower ratings, with the most energy-efficient units having an AFUE around 80 percent.

HSPF – Heating Season Performance Factor is the measurement unit for determining the efficiency of heat pumps. It is calculated by dividing the estimated seasonal heating output (in Btu) by the seasonal power consumption (in watts). The most efficient electric heat pumps on the market have an HSPF of between 7.7 and 10.

SEER – **Seasonal Energy Efficiency Ratio**. The total cooling output of an air conditioner during its normal annual usage period for cooling, in Btu/hours, divided by the total electric energy input during the same period in watthours.

Following are some websites with additional energy conservation information:

Advanced Energy	Raleigh, NC	**www.crawlspaces.org**
Building Science Corporation	Westford, MA	**www.buildingscience.com**
Efficient Windows Collaborative	Washington, DC	**www.efficientwindows.org**
EPA Home Performance	Washington, DC	**www.energystar.gov**
Lawrence Berkeley Laboratory/,	Berkeley, CA	**www.lbl.gov**
U.S. Department of Energy	Washington, DC	**www.eere.energy.gov**
National Fenestration Rating Council		**www.nfrc.org**