



Proposed Code Change
State Form 41186R

RETURN TO:
INDIANA DEPARTMENT OF HOMELAND SECURITY
CODE SERVICES SECTION
302 W. Washington Street Room W246
Indianapolis, IN 46204

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(KEY - Dashed line through material to be deleted, underline material to be added)
Use second sheet for any material requiring more space.

Code Title Indiana Administrative Code, One and Two Family Dwelling Code		Edition 2005
Section number and title 675 IAC 14-4.3-139 Chapter 11; energy efficiency		Page 91
Proponent Bowden Quinn for the Hoosier Energy Code Coalition*	Title Conservation Program Coordinator, Sierra Club Hoosier Chapter	
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PROPOSED CODE CHANGE (Check One)

Change to read as follows Add to read as follows Delete and substitute as follows Delete without substitution

Sec. 139. Delete the text of Chapter 11 in its entirety and replace with Chapter 11 of the 2009 International Residential Code, with the following revisions to maintain consistency with the 2009 *IECC*. (Portions of 2009 *IRC* Chapter 11 that are not specifically referenced below shall remain as printed in the 2009 *IRC*.)

Chapter 2 Definitions – Conditioned Space. For energy purposes, space within a building that is provided with heating and/or cooling equipment or systems capable of maintaining, through design or heat loss/gain, 50°F (10°C) during the heating season and 85°F (29°C) during the cooling season, or communicates directly with a *conditioned space*. For mechanical purposes, an area, room or space being heated or cooled by any equipment or appliance. An area or room within a building being heated or cooled, containing uninsulated ducts, or with a fixed opening directly into an adjacent *conditioned space*.

N1101.1 Scope. This chapter regulates the energy efficiency for the design and construction of buildings regulated by this code.
Exception: Portions of the building envelope that do not enclose *conditioned space* are exempt from building thermal envelope provisions of this chapter.

TABLE N1102.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT ^a

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKY-LIGHT U-FACTOR ^b	GLAZED FENESTRATION SHGC ^{b,c}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ^k	FLOOR R-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^e WALL R-VALUE
1	1.20	0.75	0.35 0.30 ^f	30	13	3/4	13	0	0	0
2	0.65 ^b	0.75	0.35 0.30 ^f	30	13	4/6	13	0	0	0
3	0.50 ^b	0.65	0.35 0.30 ^f	30	13	5/8	19	5 / 13 ^f	0	5 / 13
4 except Marine	0.35	0.60	NR	38	13	5/10	19	10 / 13	10, 2ft	10 / 13
5 and Marine 4	0.35	0.60	NR	38	20 or 13+5 ^h	13/17	30 ^g	10 / 13	10, 2ft	10 / 13

6	0.35	0.60	NR	49	20 or 13+5 ^h	15/19	30 ^a	10/13 15/19	10, 4ft	10 / 13
7 and 8	0.35	0.60	NR	49	21	19/21	30 38 ^a	10/13 15/19	10, 4ft	10 / 13

- a. *R*-values are minimums. *U*-factors and Solar Heat Gain Coefficient (SHGC) are maximums. R-19 batts compressed into nominal 2 x 6 framing cavity such that the *R*-value is reduced by R-1 or more shall be marked with the compressed batt *R*-value in addition to the full thickness *R*-value.
- b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.
- c. The first *R*-value applies to continuous insulation, the second to framing cavity insulation; either insulation meets the requirement.
- d. R-5 shall be added to the required slab edge *R*-values for heated slabs. Insulation depth shall be the depth of the footing or 2 feet, whichever is less in Zones 1 through 3 for heated slabs.
- 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 N1101.2 and Table N1101.2.
- g. Or insulation sufficient to fill the framing cavity, R-19 minimum.
- h. "13+5" means R-13 cavity insulation plus R-5 insulated sheathing. If structural sheathing covers 25% or less of the exterior, R-5 sheathing is not required where structural sheathing is used. If structural sheathing covers more than 25% of exterior, structural sheathing shall be supplemented with insulated sheathing of at least R-2
- ki. The second *R*-value applies when more than half the insulation is on the interior.
- i. ~~For impact-rated fenestration complying with Section R301.2.1.2, the maximum *U* factor shall be 0.75 in zone 2 and 0.65 in zone 3.~~
- j. ~~For impact resistant fenestration complying with Section R301.2.1.2 of the International Residential Code, the maximum SHGC shall be 0.40.~~
- j. For impact rated fenestration complying with Section R301.2.1.2 of the *International Residential Code* or Section 1608.1.2 of the *International Building Code*, the maximum *U*-factor shall be 0.75 in Zone 2 and 0.65 in Zone 3.

**TABLE N1102.1.2
EQUIVALENT U-FACTORS ^a**

CLIMATE ZONE	FENESTRATION U-FACTOR	SKY-LIGHT U-FACTOR	CEILING U-FACTOR	FRAME WALL U-FACTOR	MASS WALL U-FACTOR ^b	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR ^d	CRAWL SPACE WALL U-FACTOR ^e
1	1.20	0.75	0.035	0.082	0.197	0.064	0.360	0.477
2	0.65	0.75	0.035	0.082	0.165	0.064	0.360	0.477
3	0.50	0.65	0.035	0.082	0.141	0.047	0.091 ^c	0.136
4 except Marine	0.35	0.60	0.030	0.082	0.141	0.047	0.059	0.065
5 and Marine 4	0.35	0.60	0.030	0.060 0.057	0.082	0.033	0.059	0.065
6	0.35	0.60	0.026	0.060 0.057	0.060	0.033	0.059 0.050	0.065
7 and 8	0.35	0.60	0.026	0.057	0.057	0.033 0.028	0.059 0.050	0.065

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

When more than half the insulation is on the interior, the mass wall U-factors shall be a maximum of 0.17 in Zone 1, 0.14 in Zone 2, 0.12 in Zone 3, 0.10 in Zone 4 except Marine, and the same as the frame wall U-factor in Marine Zone 4 and in Zones 5 through 8.

Basement wall U-factor of 0.360 in warm-humid locations as defined by Figure N1101.2 and Table N1101.2.

d. Foundation U-factor requirements shown in Table 402.1.3 include wall construction and interior air films but exclude soil conductivity and exterior air films. U-factors for determining code compliance in accordance with Section N1102.1.3 (total UA alternative) shall be modified to include soil conductivity and exterior air films.

N1102.2.2 Ceilings without attic spaces. Where Section N1102.1 would require insulation levels above R-30 and the design of the roof/ceiling assembly does not allow sufficient space for the required insulation, the minimum required insulation for such roof/ceiling assemblies shall be R-30. This reduction of insulation from the requirements of Section N1102.1 shall be limited to 500 ft² (46 m²) or 20 percent of the total insulated ceiling area, whichever is less.

**TABLE N1102.4.2
AIR BARRIER AND INSULATION INSPECTION**

COMPONENT	CRITERIA
Air barrier and thermal barrier	Exterior thermal envelope insulation for framed walls is installed in substantial contact and continuous alignment with building envelope air barrier Breaks or joints in the air barrier are filled or repaired Air-permeable insulation is not used as a sealing material Air-permeable insulation is inside of an air barrier

N1102.5 Maximum fenestration U-factor and SHGC. The area-weighted average maximum fenestration U-factor permitted using trade-offs from Section N1102.1.3 shall be 0.48 in zones 4 and 5 and 0.40 in zones 6 through 8 for vertical fenestration, and 0.75 in zones 4 through 8 for skylights. The area-weighted average maximum fenestration SHGC permitted using trade-offs from Section 405 in Zones 1 through 3 shall be 0.50.

REASON AND FISCAL IMPACT

Reason Statement

This proposal will bring about a significant increase in building energy efficiency statewide and will help Indiana meet its obligations under the American Recovery and Reinvestment Act (Recovery Act). In order to receive \$68.6 million in State Energy Program funds, Governor Daniels committed to the U.S. Department of Energy (DOE) that Indiana would meet the requirements of the Recovery Act, which includes the requirement to adopt the 2009 International Energy Conservation Code (*IECC*) or its equivalent. A copy of the March 12, 2009 letter to DOE is attached to this proposal, and it can also be found at <http://www.energy.gov/media/DanielsIndiana.pdf>.

On May 11, 2009 Governor Daniels also vetoed House Enrolled Act No. 1348, which would have updated building energy codes in Indiana. Governor Daniels determined that "the bill does constitute good policy," but that it was "completely superfluous" because the Indiana Fire Prevention and Building Safety Commission was already in the process of revising the state's energy code. A copy of the veto letter is also attached to this proposal.

Section 410 of the Recovery Act requires the adoption of the 2009 *IECC* or equivalent for residential construction. We believe that the adoption of the 2009 *IECC* would bring substantial energy savings and other benefits to Indiana's citizens, and that even the 2009 International Residential Code (*IRC*), with a few amendments, can achieve similar results. The DOE has determined that for the purposes of meeting the Recovery Act requirements, the 2009 *IRC* is not equivalent to the 2009 *IECC*. We have attached a copy of that report to this proposal, but it can also be found at http://www.enrgycodes.gov/news/irc_iecc_arra.stm. For states that are obligated by statute to adopt the *IRC* for residential construction, the DOE has provided a list of strengthening amendments that would bring the 2009 *IRC* closer to equivalence with the 2009 *IECC*. **The proposal outlined above has incorporated the DOE recommended amendments to the 2009 *IRC* as closely as possible into the Indiana Residential Code.**

Indiana stands to benefit significantly from the adoption of the 2009 *IECC* or its equivalent for the statewide residential energy code.

- The 2009 *IECC* has been found to be a substantial improvement over the 2006 *IECC* and previous versions of the

code. A study by the widely recognized international energy consulting firm, ICF International, concluded that the residential provisions of the 2009 *IECC* would result in 11.6% energy cost savings over the 2006 *IECC* in climate zone 4 and 10% in climate zone 5. We estimate that the savings would be even greater for jurisdictions like Indiana that have even earlier versions of the *IECC* or *IRC*.

- By adopting the 2009 *IECC* or its equivalent, Indiana will stay on track with statewide energy efficiency goals and will guarantee homeowner benefits for many years. New construction is the most cost-effective time to install good insulation, quality windows and doors, and efficient heating and cooling equipment. Construction costs will be reduced through economies of scale, as suppliers and retailers may reduce inventories and streamline production to meet more consistent energy targets.
- The adoption of the 2009 *IECC* or its equivalent will facilitate compliance and enforcement of the code, and will allow builders to take advantage of free Department of Energy trainings, free compliance software like *REScheck*, and other programs. These programs do not apply to the 2009 *IRC* (without the DOE amendments) or any state-created energy codes.
- Implementing and enforcing the 2009 *IECC* or its equivalent will ensure that every buyer of a new home gets one that is sensibly efficient. A home built to the 2009 *IECC* will have an efficient duct system, a well-sealed thermal envelope, a programmable thermostat, and a properly-sized heating and cooling system. Builders using the prescriptive path will no longer be able to “trade-off” standard practice HVAC systems for a less-insulated thermal envelope.
- Customers are demanding energy efficient or “green” building, and are willing to pay more for these homes, even in a slumping housing market. Builders gain credibility by following the latest national energy standards.

Fiscal Impact

The largest fiscal impact on Indiana will be the infusion of \$68.6 million in State Energy Program funds from the Recovery Act. Because these funds are conditioned, in large part, upon Governor Daniels’ commitment to DOE that Indiana would adopt and effectively enforce the 2009 *IECC* or its equivalent, we believe that the \$68.6 should be included in the State’s calculation of overall fiscal impact.

The U.S. Department of Energy’s Pacific Northwest National Laboratory has just released an analysis comparing Indiana’s current residential energy code to the 2009 *IECC*. That analysis shows an energy savings of 13-14% statewide, which translates into an estimated \$226-250 annual savings. A copy of the PNNL report is attached to this proposal.

From the perspective of Indiana citizens who occupy homes built to Indiana’s building energy code standards, the proposed update to the 2009 *IECC* or 2009 *IRC* with amendments will bring significant energy savings (and lower energy bills) for the lifetime of the buildings. Well-built energy efficient homes will provide homeowners the benefits of more comfort and lower energy bills, and will cause less of a burden on Indiana to meet growing energy demands.

*Members of the Hoosier Energy Code Coalition are: Citizens Action Coalition of Indiana, Firestone Building Products Co., Hoosier Environmental Council, Midwest Energy Efficiency Alliance, Natural Resources Defense Council, Polyisocyanurate Insulation Manufacturers Association, Responsible Energy Codes Alliance, Sierra Club Hoosier Chapter

REVIEW RECOMMENDATION

Approve

Disapprove

Approve as amended

Further Study



STATE OF INDIANA
OFFICE OF THE GOVERNOR
State House, Second Floor
Indianapolis, Indiana 46204

Mitchell E. Daniels, Jr.
Governor

March 12, 2009

The Honorable Steven Chu
Secretary
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585

Re: State Energy Program Assurances

Dear Secretary Chu:

As a condition of receiving our State's share of the \$3.1 billion funding for the State Energy Program (SEP) under the American Recovery and Renewal Act of 2009 (H.R. 1)(ARRA), I am providing the following assurances. I have requested our public utility commission (the Indiana Utility Regulatory Commission) to consider additional actions to promote energy efficiency, consistent with the federal statutory language contained in H.R. 1 and their obligations to maintain fair and reasonable rates, while protecting the public. I have also requested the Fire Prevention and Building Safety Commission to consider actions to improve building energy codes consistent with State law and State Constitutional requirements, and to consider the statutory language contained in ARRA.

We are prioritizing our energy investments to take advantage of existing programs and expand programs where appropriate.

Indiana is committed to a robust improvement in energy efficiency and renewable energy, as well as a balanced State energy policy. I want to assure you that, within the limits of my authority, we will move forward in these critical areas.

We look forward to immediate distribution of the federal SEP funds to permit Indiana in progressing towards energy efficiency and renewable energy.

Respectfully Submitted,

cc: Gil Sperling, Director, Office of Weatherization and Intergovernmental Programs,
U.S. Department of Energy
David Lott Hardy, Chairman, Indiana Utility Regulatory Commission
Brandon Seitz, Director, Indiana Office of Energy Development
David P. Hannum, P.E., Chairman, Fire Prevention & Building Safety Commission

The 2009 International Residential Code and the American Recovery and Reinvestment Act of 2009

Updated September 23, 2009

Background

Recovery Act. The American Recovery and Reinvestment Act of 2009 requires that the Secretary shall make grants under Section 410 in excess of the base allocation established for a State under regulations issued pursuant to the authorization provided in section 365(f) of such Act. But this is only to be done if the governor of the recipient State notifies the Secretary of Energy in writing that the governor has obtained necessary assurances including that the State, or the applicable units of local government that have authority to adopt building codes, will implement a building energy code (or codes) for residential buildings that meets or exceeds the [2009] International Energy Conservation Code, or achieves equivalent or greater energy savings.

State Applications. The March 21, 2009, Financial Assistance Funding Opportunity Announcement requires a two step process: an initial application and a comprehensive application. The initial application, due March 23, 2009, requires the inclusion of the Governor's assurances required by Section 410 of the Recovery Act. In the second step of the process a State must provide a discussion of the progress it has made in meeting the Governor's assurances.

The 2009 IRC is Not Equivalent to the 2009 IECC. At the International Code Council's Final Action Hearings that produced the 2009 edition of the International Residential Code, a number of significant proposals which won approval for inclusion in the 2009 International Energy Conservation Code, did not win approval for or were not proposed for inclusion in the International Residential Code. Additionally, there are several other differences between the two codes. All differences are listed below.

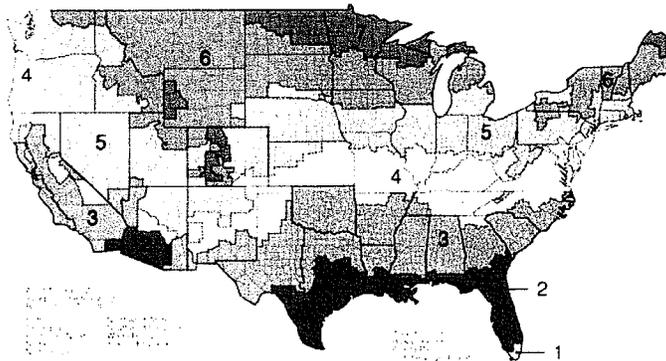


Figure 1. 2009 IECC climate zones

1. The IECC requires an SHGC of 0.30 or lower (Table 402.1.1) whereas the IRC requires an SHGC of 0.35 or lower (Table N1102.1), in climate zones 1, 2, and 3. Impact

resistant fenestration in zones 2 and 3 is allowed to have an SHGC of 0.40 or lower in the IRC only.

2. For basement walls, the IECC requires either R-15 continuous insulation or R-19 cavity insulation in zones 6-8, whereas the IRC requires R-10 continuous or R-15 cavity insulation in these same zones.
3. The IECC requires R-38 floors in zones 7 and 8; the IRC requires only R-30.
4. The IECC limits the allowance for R-30 insulation in ceilings without attics to 500 ft² or 20% of the total insulated ceiling area, whichever is less. The IRC limits the allowance to 500 ft² without regard to the total ceiling area.

The 2009 IECC and IRC also have a number of other differences that may not directly alter energy efficiency requirements but for which the IECC text should be preferred so that there is no doubt that equivalency with the IECC is attained.

1. The IECC has an SHGC trade-off cap of 0.50 in climate zones 1, 2, and 3 (402.5.) and a U-factor cap of U-0.48 in zones 4 and 5 and U-0.40 in zones 6, 7, and 8. These caps are not present in the 2009 IRC. As these caps do not increase stringency of the code (but rather restrict trade-off options), there is no direct impact on annual energy costs. There may, however, be some impacts on occupant comfort and/or resistance to moisture condensation.
2. The air barrier and insulation inspection tables (IECC 402.4.2 and IRC N1102.4.2) differ slightly. The IECC requires checking that "Air-permeable insulation is inside of an air barrier" (right column in the first row). The IRC is missing this.
3. The definitions of "conditioned space" are different between the two codes.
4. The three labels "*mandatory*," "*prescriptive*," and "*performance*" are used to label many sections in IECC, but are not used at all in the IRC. The provisions that are "mandatory" are always required while "prescriptive" provisions can be traded off as long as the overall energy efficiency is not decreased.
5. The scope section of the IRC (N1101.1) states that Chapter 11 (Energy Efficiency) does not apply to portions of the building that do not enclose conditioned space. Section 101.5.2 of the IECC is more specific, exempting only building thermal envelope provisions that do not contain conditioned space.

Compliance with the Recovery Act

Amendments to the 2009 IRC. States wishing to adopt the International Residential Code while maintaining compliance with the requirements of the Recovery Act, should adopt the following amendments:

1. Substitute IECC Tables 402.1.1 and 402.1.3 into the following tables for those in the IRC as follows:

Table N1102.1.1 Insulation and Fenestration Requirements by Component^a

Climate Zone	Fenestration U-Factor ^b	Skylight ^b U-Factor	Glazed Fenestration SHGC ^{b,e}	Ceiling R-Value	Wood Frame Wall R-Value	Mass Wall R-Value ⁱ	Floor R-Value	Basement ^c Wall R-Value	Slab ^d R-Value & Depth	Crawl Space ^c Wall R-Value
1	1.20	0.75	0.30	30	13	3/4	13	0	0	0
2	0.65 ^j	0.75	0.30	30	13	4/6	13	0	0	0
3	0.50 ^j	0.65	0.30 ^(e)	30	13	5/8	19	5/13 ^f	0	5/13
4 except Marine	0.35	0.60	NR	38	13	5/10	19	10 / 13	10, 2 ft	10 / 13
5 and Marine 4	0.35	0.60	NR	38	20 or 13+5 ^h	13/17	30 ^g	10 / 13	10, 2 ft	10 / 13
6	0.35	0.60	NR	49	20 or 13+5 ^h	15/19	30 ^g	15 / 19	10, 4 ft	10 / 13
7 and 8	0.35	0.60	NR	49	21	19/21	38 ^g	15 / 19	10, 4 ft	10 / 13

For SI: 1 foot = 304.8 mm.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. *R*-19 batts compressed into a nominal 2 × 6 framing cavity such that the *R*-value is reduced by *R*-1 or more shall be marked with the compressed batt *R*-value in addition to the full thickness *R*-value.

b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

c. "15/19" means *R*-15 continuous insulated sheathing on the interior or exterior of the home or *R*-19 cavity insulation at the interior of the basement wall. "15/19"

shall be permitted to be met with *R*-13 cavity insulation on the interior of the basement wall plus *R*-5 continuous insulated sheathing on the interior or exterior of the

home. "10/13" means *R*-10 continuous insulated sheathing on the interior or exterior of the home or *R*-13 cavity insulation at the interior of the basement wall.

d. *R*-5 shall be added to the required slab edge *R*-values for heated slabs. Insulation depth shall be the depth of the footing or 2 feet, whichever is less in Zones 1 through 3 for heated slabs.

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 301.1 and Table 301.1.

g. Or insulation sufficient to fill the framing cavity, *R*-19 minimum.

h. "13+5" means *R*-13 cavity insulation plus *R*-5 insulated sheathing. If structural sheathing covers 25 percent or less of the exterior, insulating sheathing is not

required where structural sheathing is used. If structural sheathing covers more than 25 percent of exterior, structural sheathing shall be supplemented with insulated sheathing of at least *R*-2.

i. The second *R*-value applies when more than half the insulation is on the interior of the mass wall.

j. For impact rated fenestration complying with Section R301.2.1.2 of the *International Residential Code* or Section 1608.1.2 of the *International Building Code*, the maximum *U*-factor shall be 0.75 in Zone 2 and 0.65 in Zone 3.

**TABLE N1102.1.2
EQUIVALENT *U*-FACTORS^a**

CLIMATE ZONE	FENESTRATION <i>U</i> -FACTOR	SKYLIGHT <i>U</i> -FACTOR	CEILING <i>U</i> -FACTOR	FRAME WALL <i>U</i> -FACTOR	MASS WALL <i>U</i> -FACTOR ^b	FLOOR <i>U</i> -FACTOR	BASEMENT WALL <i>U</i> -FACTOR	CRAWL SPACE WALL <i>U</i> -FACTOR
1	1.20	0.75	0.035	0.082	0.197	0.064	0.360	0.477
2	0.65	0.75	0.035	0.082	0.165	0.064	0.360	0.477
3	0.50	0.65	0.035	0.082	0.141	0.047	0.091 ^c	0.136
4 except Marine	0.35	0.60	0.030	0.082	0.141	0.047	0.059	0.065
5 and Marine 4	0.35	0.60	0.030	0.057	0.082	0.033	0.059	0.065
6	0.35	0.60	0.026	0.057	0.060	0.033	0.050	0.065

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT U-FACTOR	CEILING U-FACTOR	FRAME WALL U-FACTOR	MASS WALL U-FACTOR ^b	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR	CRAWL SPACE WALL U-FACTOR
7 and 8	0.35	0.60	0.026	0.057	0.057	0.028	0.050	0.065

- a. Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source.
- b. When more than half the insulation is on the interior, the mass wall *U*-factors shall be a maximum of 0.17 in zone 1, 0.14 in zone 2, 0.12 in zone 3, 0.10 in zone 4 except Marine, and the same as the frame wall *U*-factor in Marine zone 4 and zones 5 through 8.
- c. Basement wall *U*-factor of 0.360 in warm-humid locations as defined by Figure 301.1 and Table 301.2.

2. Modify Section N1102.2.2 by adding the underlined text:

N1102.2.2 Ceilings without attic spaces. Where Section N1102.1 would require insulation levels above R-30 and the design of the roof/ceiling assembly does not allow sufficient space for the required insulation, the minimum required insulation for such roof/ceiling assemblies shall be R-30. This reduction of insulation from the requirements of Section N1102.1 shall be limited to 500 ft² (46 m²) or 20 percent of the total insulated ceiling area, whichever is less.

3. Add the following section:

N1102.5 Maximum fenestration *U*-factor and SHGC.

The area-weighted average maximum fenestration *U*-factor permitted using trade-offs from Section N1102.1.3 shall be 0.48 in Zones 4 and 5 and 0.40 in Zones 6 through 8 for vertical fenestration, and 0.75 in Zones 4 through 8 for skylights. The area-weighted average maximum fenestration SHGC permitted using trade-offs from Section 405 in Zones 1 through 3 shall be 0.50.

4. Add "Air-permeable insulation is inside of an air barrier" in the right column in the first row of Table N1102.4.2.
5. Change the definition of "conditioned space" to "An area or room within a building being heated or cooled, containing uninsulated ducts, or with a fixed opening directly into an adjacent *conditioned space*."
6. Change the scope of the IRC (section N1101.1) by adding the underlined text:

N1101.1 Scope. This chapter regulates the energy efficiency for the design and construction of buildings regulated by this code.

Exception: Portions of the building envelope that do not enclose *conditioned space* are exempt from building thermal envelope provisions of this chapter.

Impact of Amending the SHGC Provisions of the 2009 IRC

The Department of Energy has had its Pacific Northwest National Laboratory perform a limited analysis of potential impact of these amendments in representative locations using the EnergyGauge (DOE-2) simulation tool on a typical house:

- 2400 ft² floor area, two-story
- natural gas furnace heating at \$1.20/therm, except Table 2, which is heat pump heating
- Central air conditioning electricity at 12 cents/kWh

- Equipment efficiencies at Federal minimum levels
- 360 ft² window area equally oriented in north, east, south, and west. No exterior shading.

The results are shown in Tables 1 through 4.

The Recovery Act requires that a code other than the IECC achieve equivalent or greater energy savings to qualify for state energy grants. The 0.35 SHGC requirement in the IRC compared to the 0.30 SHGC requirement in the IECC results in energy cost increase some but not all climate zone 3 locations according to this simulation analysis. However, it is worth noting there are benefits to lower solar heat gains apart from total energy use impacts, such as reductions in peak loads, which benefits summer peaking utilities and the downsizing of air conditioners. The Department of Energy has and will continue to look at such factors when submitting proposals to upgrade the IECC.

Table 1. Energy Savings of Reducing SHGC from 0.35 to 0.30 in Climate Zones One Through Three – Natural Gas Heating

Climate Zone	Representative City	Cooling Savings	Heating Increase	Energy Savings
1	Miami	\$27	\$1	\$26
2	Houston	\$19	\$11	\$8
3	Atlanta	\$16	\$21	-\$5
3	Jackson MS	\$19	\$16	\$3
3	Memphis	\$14	\$15	-\$1
3	Dallas	\$16	\$17	-\$1
3	El Paso	\$19	\$22	-\$3
3	Las Vegas	\$15	\$18	-\$3

Table 2. Energy Savings of Reducing SHGC from 0.35 to 0.30 in Climate Zones One Through Three – Heat Pump Heating

Climate Zone	Representative City	Cooling Savings	Heating Increase	Energy Savings
1	Miami	\$26	\$0	\$26
2	Houston	\$18	\$8	\$10
3	Atlanta	\$16	\$17	-\$1
3	Jackson MS	\$18	\$14	\$4
3	Memphis	\$12	\$14	-\$2
3	Dallas	\$16	\$13	\$3
3	El Paso	\$18	\$18	0
3	Las Vegas	\$16	\$14	\$2

Table 3. Energy Savings of Increasing Basement Wall Insulation from R-13 to R-19 in Climate Zones Six through Eight

Climate Zone	Representative City	Energy Savings
6	Burlington	\$29
7	Duluth	\$34
8	Fairbanks	\$33

Table 4. Energy Savings of Increasing Floor Insulation from R-30 to R-38 in Climate Zones Seven and Eight (Floor over Unheated Basement)

Climate Zone	Representative City	Energy Savings
7	Duluth	\$13
8	Fairbanks	\$19

Analysis of 2009 International Energy Conservation Code Requirements for Residential Buildings in Indiana

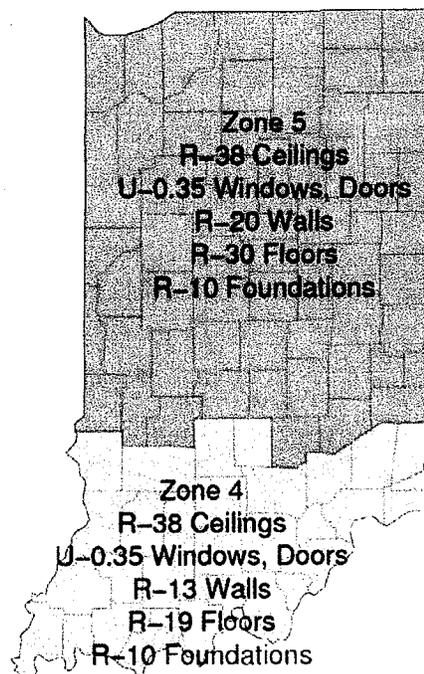
Summary

The 2009 International Energy Conservation Code (IECC) contains several major improvements in energy efficiency over the current state code, the 1992 Model Energy Code with amendments. The most notable changes are improved duct sealing and efficient lighting requirements. A limited analysis of these changes resulted in estimated savings of \$226 to \$250 a year for an average new house at recent fuel prices.

Overview of the 2009 IECC

The IECC scope includes residential single-family housing and multifamily housing three stories or less above-grade intended for permanent living (hotel/motel is not “residential”). The code applies to new buildings and additions/alterations/renovations/ repairs.

The map below shows the primary building envelope requirements for all residential buildings in the 2009 IECC.



Notable requirements in the 2009 IECC:

- Building envelope must be caulked and sealed.
- Slab-on-grade insulation is R-10 to a depth of 2 feet.
- Supply ducts in attics must be insulated to R-8. Return ducts in attics and all ducts in crawlspaces, unheated basements, garages, or otherwise outside building envelope must be insulated to R-6.
- All ducts must be sealed and either:

- *verified by pressure testing* – the duct system has to be tested and the air leakage out of ducts must be kept to an acceptable maximum level.
- *installed entirely within the building thermal envelope* – testing is not required if all ducts are inside the building thermal envelope (for example in heated basements), though the ducts still have to be sealed.
- Piping for hydronic (boiler) heating systems must be insulated to R-3.
- Although vapor retarders are not required by the IECC, the I-codes do set wall vapor retarder requirements in Section R601.3 of the 2009 IRC, and vapor retarders are required in Zone 5.
- Less insulation is allowed for mass walls and more insulation is required for steel framing.
- 50% of the lighting “lamps” (bulbs, tubes, etc.) in a building must be high efficacy. Compact fluorescents qualify, standard incandescent bulbs do not.
- Standard I-code administrative requirements (inspections, documentation) apply.
- A certificate must be posted near the electrical panel listing insulation levels and other energy efficiency measures.

Exemptions/Allowances from prescriptive measures:

- One door and 15 ft² of window area are exempt
- Skylight U-factors are allowed to be U-0.60
- 500 ft² or 20% of ceiling area of cathedral ceiling, whichever is less, is allowed to have R-30 insulation

Mandatory Requirements:

Windows can never exceed an area-weighted U-factor of 0.48. The 2009 IECC also identifies a set of other requirements that are strictly “mandatory” that must be done in all buildings, such as building envelope and duct sealing.

Compliance Paths:

The IECC effectively contains three alternative compliance paths.

- 1) Prescriptive measures. This is considered the simplest path. These requirements do not vary by building size, shape, window area, or other features. The IECC has a single table of requirements for insulation R-values and window and door U-factors and SHGC. There is a corresponding U-factor table that permits compliance of less common component types (e.g., structural insulated panels), albeit without any cross-component trade-offs.
- 2) Total building envelope UA (U-factor multiplied by area). This is the path predominantly used by the REScheck™ software. Based on the prescriptive U-factor table, it allows trade-offs whereby some energy efficiency measures can fall below code requirements if balanced by other measures that exceed code requirements.
- 3) Simulated performance (requires software programs). This path allows compliance if the home has a calculated annual energy consumption (or energy cost) equal to or less than that of a standard reference design that just meets the code’s prescriptive requirements. This path allows for crediting energy efficiency measures not accounted for in the other paths, such as renewable energy measures. The 2009 performance path differs from previous editions of the IECC in that it allows no tradeoff credit for the use of high efficiency space heating, space cooling, or water heating equipment.

Main Difference between the Current Indiana Code and the 2009 IECC

The format of the Indiana code and 2009 IECC are substantially different. The Indiana code is based on an older code, the 1992 Model Energy Code (MEC), and sets U-factor requirements by component (walls, roof/ceilings, floors, slabs, crawl spaces, and basement walls) with similar values to those in the all versions of the MEC and IECC through the 2003 edition of the IECC. The Indiana code does not have any simplified R-value prescriptive requirements contained in more recent versions of the MEC and IECC. The 2009 IECC has new climate zones that cover larger geographic regions than the zones in the Indiana code. The envelope insulation and window requirements in the Indiana code vary by window-to-wall area percentage, but not in the 2009 IECC. This change in format makes a simple comparison of the envelope requirements in the two codes impossible.

Table 20 shows the estimated annual energy savings per house that result from meeting the improved requirements in the 2009 IECC. Total savings includes heating, cooling, and lighting and is shown as a percentage of the end-uses covered by the 2009 IECC (heating, cooling and water heating).

Table 20. Energy End Use and Percentage Savings

<i>Climate Zone</i>	<i>Annual Energy Cost (\$)</i>				<i>Savings 2009 IECC vs. Indiana Code</i>	
	<i>Indiana Code</i>		<i>2009 IECC</i>		<i>Savings (\$/yr)</i>	<i>Percent Savings</i>
	<i>Heating</i>	<i>Cooling</i>	<i>Heating</i>	<i>Cooling</i>		
Evansville (CZ 4A)	1201	247	1049	223	250	14
Indianapolis (CZ 5A)	1264	182	1131	163	226	13