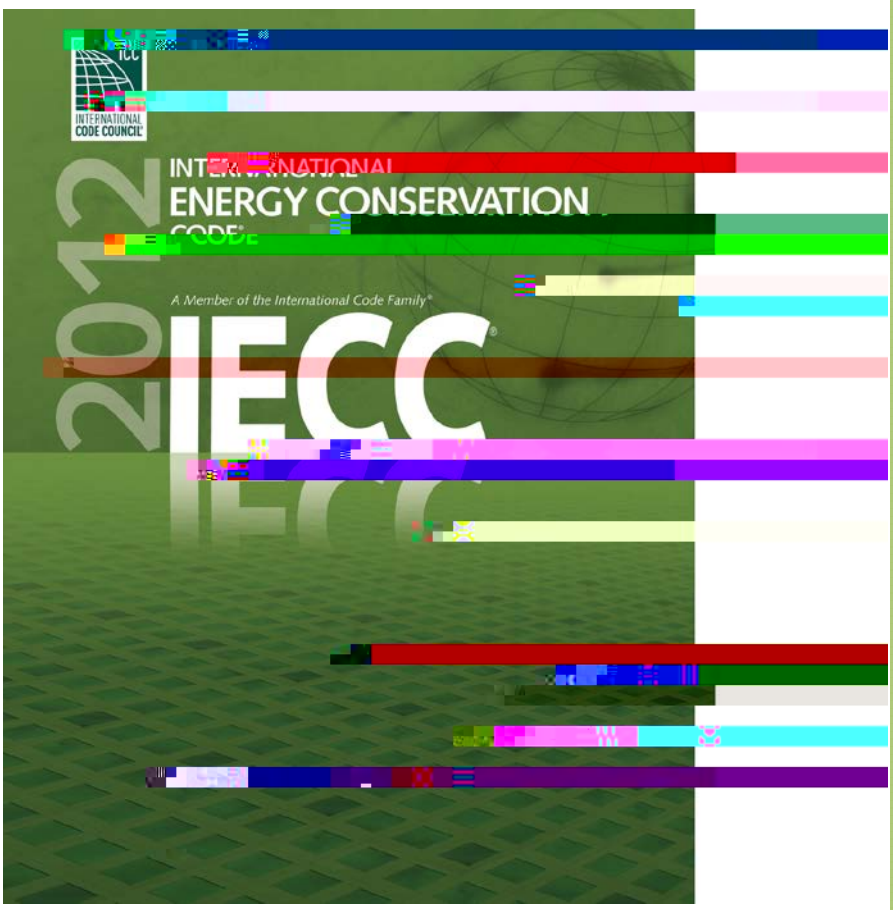
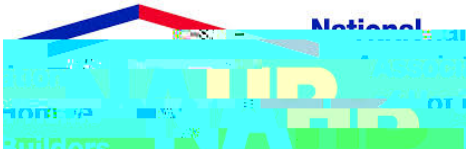
2012

IECC - Energy Code Action Kit





The NAHB-developed amendments provided below offer more cost-effective and affordable energy

energy costs – or a payback of 99 years.

(11) WALL VALUES FOR CLIMATE ZONE 3

Walls R Value/U Factor Correction Climate Zone 3. This proposal reinstates the appropriate minimum wall assembly R-Values/U-Factors in Climate Zone 3 published in the 2009 IECC. The 2012 IECC values increased the upfront construction costs an average of $1,199 per home yet only save $50 year in energy costs, or an average payback of 24 years.

(12) WALL VALUES FOR CLIMATE ZONES 6-8

Walls R Value/U Factor Corrections, Climate Zones 6, 7 & 8. This proposal reinstates the appropriate minimum wall assembly R-Values/U-Factors in climate zones 6, 7 & 8 published in the 2009 IEC

(1) Comprehensive Amendment

This is a comprehensive amendment that provides flexibility for meeting the energy code requirements while maintaining energy performance. It provides a “true” unrestricted performance path that will allow for cost-optimized construction of an energy-equivalent house. (Includes Amendments E6, E7, 14, 15)

Revise as follows:

R402.4 Air leakage ~~(Mandatory)~~. The building thermal envelope shall be constructed to limit air leakage in accordance with the requirements of Sections N1102.4.1 through N1102.4.4.

R402.4.1 Building thermal envelope. The *building thermal envelope* shall comply with Sections N1102.4.1.1 and N1102.4.1.2. The sealing methods between dissimilar materials shall allow for differential expansion and contraction.

R402.4.1.1 Installation (Mandatory). The components of the *building thermal envelope* as listed in Table R402.4.1.1 shall be installed in accordance with the manufacturer’s instructions and the criteria listed in Table R402.4.1.1, as applicable to the method of construction. Where required by the *code official*, an *approved* third party shall inspect all components and verify compliance.

R402.4.1.2 Testing (Mandatory). The building or dwelling unit shall be tested ~~and verified as having an air leakage rate of not exceeding 5 air changes per hour in Climate Zones 1 and 2, and 3 air changes per hour in Climate Zones 3 through 8~~ for air leakage. Testing shall be conducted with a blower door at a pressure of 0.2 inches w.g. (50 Pascals). Where required by the *code 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 0 Td12 Tmb ( )T(.1

TABLE R405.5.2(1)

SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

Footnotes remain unchanged

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Vertical fenestration other than opaque doors	Total area[b] = ~~(a) The proposed glazing area; where proposed glazing area is less than 15% of the conditioned floor area.~~ ~~(b)~~ 15% of the conditioned floor area~~; where the proposed glazing area is 15% or more of the conditioned floor area.~~ Orientation: equally distributed to four cardinal compass orientations (N, E, S, & W) U-factor: from Table R402.1.3 SHGC: From Table R402.1.1 except that for climates with no requirement (NR) SHGC = 0.40 shall be used. Interior shade fraction: 0.92-(0.21 × SHGC for the standard reference design) External shading: none	~~As proposed~~ o 0 TdT2 1 Tf 0.002 Tw 9 1.49 Tw 0.24

Reason:

This is a comprehensive amendment that provides flexibility for meeting the energy code requirements while maintaining energy performance. It provides a “true” unrestricted performance path that will allow for cost-optimized construction of an energy-equivalent house. The proposed changes provide alternatives that encourage innovation and the use of materials and equipment to result in a home which is at least equivalent to that prescribed in the energy code.

The modifications will reinstate many of the changes made since the 2006 IRC Chapter 11 that restricted the flexibility of the builder/designer to construct an energy efficient code compliant home while still meeting the energy performance levels of the current code.

Items included in this amendment:
Energy-neutral building tightness tradeoffs
Credit for more energy-efficient buildings which incorporate reduced window area
Energy-neutral heating, cooling and water heating equipment efficiency tradeoffs

Currently all homes have a “mandatory” requirement to be equal to or tighter than 3ACH50 or 5ACH50, depending on climate zone. Proposed changes will allow for homes to be less tight provided other efficiency changes are made to the house to offset energy lost due to the change in air infiltration.

Currently, when conducting a performance analysis, a building glazing area greater than 15% of the conditioned floor area (CFA) is penalized for using more energy. However, a building with less than 15% window to CFA does not get credit for saving energy. This amendment allows the builder/designer to optimize window area that is both energy efficient and pleasing to the consumer.

(2) Remove Mandatory Requirements for Above Code Program

This proposal eliminates the need to meet all “Mandatory” requirements identified by the IRC/IECC as long as the program exceeds the energy-efficiency levels required.

Revise as follows:

R102.1.1 Above code programs.
The *code official* or other

(4) MULTI-FAMILY AIR-LEAKAGE TESTING ALTERNATIVE

This amendment adds an exception to allow compliance to the air barrier requirements as and allow builders to test the entire building as a whole, as is permitted for commercial buildings.

Revise as follows:

R402.4 Air leakage (Mandatory). The building thermal envelope shall be constructed to limit air leakage in accordance with the requirements of Section R402.4.1 through R402.4.4.

> **Exception:** Dwelling units of R-2 Occupancies and attached multiple single family dwellings shall be permitted to comply with IECC Section C402.4

Reason:

Air tightness testing for single-family detached homes is very straightforward; however, it is much more difficult to accurately test attached dwelling units, including multi-family buildings and townhomes. Currently the IECC treats low-rise 605.28 473.76 **0.7(ul)6(t)2(i)]TJor1**Td [(f)W6(n)4(h)o

(5) AIR LEAKAGE RATE CORRECTION CLIMATE ZONE 3-8

Building Tightness Leakage Rate Correction. The 2012 IECC requires homes to have a leakage rate of no more than three air changes per hour (3 ACH) in climate zones 3-8. The ASHRAE Handbook of Fundamentals shows that less than 10% of homes achieve 3 ACH or less. This proposal modifies the requirement from 3 ACH to 4 ACH, an aggressive tightness level that will provide a tight, comfortable, energy-efficient home for the consumer

Revise as follows:

R402.4.1.2 Testing. The building or dwelling unit shall be tested and verified as having an air leakage rate of not exceeding 5 air changes per hour in Climate Zones 1 and 2, and ~~3~~ 4 air changes per hour in Climate Zones 3 through 8. Testing shall be conducted with a blower door at a pressure of 0.2 inches w.g. (50 Pascals). Where required by the *code 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 provided to the *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope*.

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(6) BUILDING TIGHTNESS TRADE-OFF

Building Tightness Trade-off. This proposal allows builders to trade improvements in other building energy components for less stringent building envelope pressure test results. This performance option provides flexibility in meeting the air tightness requirements and provides options for recovering from an unexpected air tightness test failure at C/O with the resident waiting to move in. Without this option what can be done? ***(Part of Amendment #1)***

Revise as follows:

R402.4 Air leakage ~~(Mandatory)~~. The building thermal envelope shall be constructed to limit air leakage in accordance with the requirements of Sections R402.4.1 through R402.4.4.

R402.4.1 Building thermal envelope. The *building thermal envelope* shall comply with Sections R402.4.1.1 and R402.4.1.2. The sealing methods between dissimilar materials shall allow for differential expansion and contraction.

R402.4.1.1 Installation (Mandatory). The components of the *building thermal envelope* as listed in Table R402.4.1.1 shall be i-0 0 9.9dhe

(7) DUCT LEAKAGE TRADEOFF

Duct Leakage Tradeoff. This proposal allows an energy neutral duct-tightness trade-off. The proposal keeps the mandatory testing; however, it permits duct leakage to exceed the prescriptive requirement provided the performance of the building still meets the target efficiency in the performance path.

Revise as follows:

R403.3.2 Sealing ~~(Mandatory).~~ ~~Ducts, air handlers, and filter boxes shall be sealed. Joints and seams~~ ~~shall~~

A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*.

R403.2.2.3 Duct leakage (Prescriptive). Total leakage of the ducts, when measured in accordance with Section R403.2.2.2, shall be as follows:

1.Postconstruction test: Total leakage shall be less than or equal to 4 cfm (113.3 L/min) per 100 square feet (9.29 m2) of conditioned floor area.
2.Rough-in test: Total leakage shall be less than or equal to 4 cfm (113.3 L/min) per 100 square feet (9.29 m2) of conditioned floor area if the air handler is present at the time of the test, or 3 cfm (85 L/min) per 100 square feet (9.29 m2) of conditioned floor area if the air handler is not present at the time of the test.

Exception: No maximum duct leakage rate is required when ducts and air handlers are located entirely within the building thermal envelope.

Reason:

These modifications remove the mandatory maximum duct leakage requirement and provide designers and builders the flexibility to trade-off duct tightness with other performance path measures when using the performance path. Currently the duct tightness requirements are mandatory and even under ideal circumstances, difficult to achieve. This will provide energy neutral trade-offs for expensive and sometimes unattainable requirements with other building improvements. This proposal does not change the stringency of the code it only increases the flexibility.

(8) HOT WATER PIPING INSULATION

Research has been performed by a two

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]	[illegible] *R*-VALUE R

Reason:

The prescriptive basement wall requirement increased from R-10 to R-15 in the 2012 IECC. Calculations used to justify the change were based on energy models, which had less sophisticated algorithms than Energy Plus which is now the preferred modeling software of the Department of Energy. When using Energy Plus, the energy savings in a 700 square foot basement totaled $7/yr in Chicago (CliaWc[z2(y)on

Climate Zone	Representative City	Change	Energy Savings	Incremental Cost	Simple

The energy modeling was done using the Energy Plus simulation engine and BEopt version 1.4, Cost figures came from ASHRAE RP-1481. Vaulted or cathedralized ceiling are very problematic when trying to achieve R- 49, which is about 16 inches thick. This would require a rafter at least 17” tall (which does not exist) or an insulated panel, which represents a very small portion of the market.

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CLIMATE

Reason:

Frame wall requirements in climate zone 3 changed from R-13 to R-20, which was, is not cost effective for the consumer.

Climate Zone	Representative City	Wall R-Value Change	Energy Savings	Incremental Cost	Simple Payback
3	Atlanta, GA	R-13->R-20	$50/yr	$1,199	24 years

The energy modeling was done using the Energy Plus simulation engine and BEopt version 1.4, Cost figures came from ASHRAE RP-1481. Not only is the payback 24 years, but for a consumer, there would be a negative cash flow based on the incremental cost and energy savings. The increase in the monthly mortgage would be $6.43 (@ 5%) and the average monthly energy savings would be $4.17.

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CLIMATE ZONE	FENESTRATION *U*-FACTOR[b]	SKYLIGHT[b]

TABLE R402.1.3
EQUIVALENT U-FACTORS[a]

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
1	0.50	0.75	0.035	0.082	0.197	0.064	0.360	0.477
2	0.40	0.65	0.030	0.082	0.165	0.064	0.360	0.477
3	0.35	0.55	0.030	0.057	0.098	0.047	0.091[c]	0.136
4 except Marine	0.35	0.55	0.026	0.057	0.098	0.047	0.059	0.065
5 and Marine 4	0.32	0.55	0.026	0.057	0.082	0.033	0.050	0.055
6	0.32	0.55	0.026	~~0.048~~ 0.057	0.060	0.033	0.050	0.055
					0.057	0.028	0.050	0.055

(13) U-FACTOR TABLE CORRECTION

Adjustment of U-

Climate Zone 1 and 2 Wall U-Factor Calculation Spreadsheet

Wall Thermal Resistance by Component	2x4 Wall R-13 Batt		
	R-Value Studs	R-Value Cavity	Assembly Value
Wall - Outside Winter Air Film[A]	0.17		
Siding - Vinyl[A]	0.62		
Continuous Insulation	0		
OSB - 7/16"[A]	0.62		
SPF Stud/Cavity Insulation	4.375	13	
1/2" Drywall[A]	0.45		
Inside Air Film[A]	0.68		
Studs at 16" o.c.[A]	25%	75%	

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14. Trade-Off for 2X6 Wall

This amendment provides an option for a thermally equivalent tradeoff for 2x6 wall

This amendment provides an option for a thermally equivalent tradeoff for 2x6 wall assemblies which have reduced framing factors and R-18 insulation. Here are the calculations showing equal U-Factors for both assemblies (0.060).

Wall Thermal Resistance by Component	2x6 Wall R-20

Enermodal, 2001. Characterization of Framing Factors for Low-Rise Residential Building Envelopes (904-RP). Final Report prepared for ASHRAE.

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(15) MECHANICAL EQUIPMENT TRADE-OFF CREDIT

Mechanical Equipment Credit. This proposal reinstates the performance option in the International Energy Conservation Code (IECC) to reduce prescriptive requirements by installing HVAC equipment with higher energy-efficiency performance ratings than required by the code. ***(Part of Amendment #1)***

Revise as follows:

TABLE R405.5.2(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Heating systems [f, g]	~~As proposed for other than electric heating without a heat pump, Where the proposed design utilizes electric heating without a heat pump the standard reference design shall be an air source heat pump meeting the requirements of Section R403 of the IECC-Commercial Provisions.~~ Fuel type: same as proposed design Efficiencies: Electric: air-source heat pump with prevailing federal minimum standards Nonelectric furnaces: natural gas furnace with prevailing federal minimum standards Nonelectric boilers: natural gas boiler with prevailing federal minimum standards Capacity: sized in accordance with Section R403.6	~~As proposed~~ As proposed As proposed As proposed As proposed
Cooling systems [f,h]	~~As proposed~~ Fuel type: Electric Efficiency: in accordance with prevailing federal minimum standards Capacity: sized in accordance with Section R403,6	~~As proposed~~ As proposed As proposed
Service Water Heating [f,g,h,i]	~~As proposed~~ Fuel type: same as proposed design Efficiency: in accordance with prevailing federal minimum standards Use: gal/day = 30 + 10 × *Nbr*	

builders to often use less efficient equipment while increasing the cost of construction.

Significant improvements in the efficiency of HVAC and water heating equipment have been made in the last 20 years. With the increased emphasis on new and improved technologies, this trend is expected to continue and will result in even higher energy savings in future years. If builders are forced to comply with the energy code by installing requirements which are not cost-effective, there will be a resistance to install higher efficiency equipment. This could end up hurting energy efficiency in the long term, consumers which have non-condensing furnaces will be less likely to install a higher efficiency condensing replacement furnace because of the additional cost to run an exhaust vent.

Industries such as log home manufacturers may no longer be able to construct to projected higher envelope requirements. The combination of increases in envelope thermal requirements, building tightness and duct tightness combined with the elimination of energy neutral trade-offs pose a serious threat to the viability of the log home industry. There are practical limitations to the thickness of log home walls, increases in the log diameter has a exponential increase in the cost of the logs making log walls with a U- factor of 0.082 or lower prohibitively expensive

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17. Exhaust Hood Makeup Air

This amendment reduces the amount of makeup air required for kitchen draft hoods in excess of 400 cfm and includes an exception that increases the threshold for requiring makeup air to draft hoods larger than 600 cfm.

Revise as follows:

M1503.4 Makeup air required. Exhaust hood systems capable of exhausting ~~in excess of~~ more than 400 cubic feet per minute (0.19 m^3/s) shall be mechanically or naturally provided with makeup air at a rate approximately equal to the exhaust air rate in excess of 400 cubic feet per minute. Such makeup air systems shall be equipped with not less than one damper. Each damper shall be a gravity damper or an electrically operated damper that automatically opens when the exhaust system operates. Dampers shall be accessible for inspection, service, repair and replacement without removing permanent construction or any other ducts not connected to the damper being inspected, serviced, repaired or replaced.

Exception: Makeup air openings are not required for kitchen exhaust systems capable of exhausting not greater than 600 cubic feet per minute (0.28 m^3/s) provided that one of the following conditions is met:

1. Where the floor area within the air barrier of a dwelling unit is at least 1500 square feet, and where natural draft or mechanical draft space- or water-heating appliances are not located within the air barrier.
2. Where the floor area within the air barrier of a dwelling unit is at least 3000 square feet, and where natural draft space- or water-heating appliances are not located within the air barrier.
3. Where all appliances in the house are sealed combustion, power-vent, unvented, or electric.

Reason:

As originally written, this section allows range hoods up to 400 cfm to be installed without makeup air. This amendment aims for consistency by requiring makeup air equaling the amount above and beyond 400 cfm for larger fans. Essentially there would be no difference between the effect a 400 cfm fan has on a house and a 600 cfm fan with 200 cfm of makeup air. This would also improve the feasibility and acceptance of this code section as well as cut down on the amount of wasted energy and potential occupant discomfort caused by needlessly introducing excessive amounts of unconditioned air.

The exception takes into consideration that in many homes there is no danger of backdrafting due to the natural infiltration of outdoor air (which is relative to the size of the home) or the lack of natural draft appliances. The 400 cfm threshold can be raised to 600 cfm in these cases with no added danger.

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18. Joints, Seams, and Connections

This amendment eliminates the need to seal longitudinal seams in residential ductwork that operate at pressures below a 2 inch water column.

Revise as follows:

M1601.4.1 Joints, seams and connections. Longitudinal and transverse joints, seams and connections in metallic and nonmetallic ducts shall be constructed as specified in SMACNA HVAC *Duct Construction Standards—Metal and Flexible* and NAIMA *Fibrous Glass Duct Construction Standards*. Joints, longitudinal and transverse seams, and connections in ductwork shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic- plus-embedded-fabric systems, liquid sealants or tapes. Tapes and mastics used to seal fibrous glass ductwork shall be *listed* and *labeled* in accordance with UL 181A and shall be marked "181A-P" for pressure-sensitive tape, "181 A-M" for mastic or "181 A-H" for heat-sensitive tape.

Tapes and mastics used to seal metallic and flexible air ducts and flexible air connectors shall comply with UL 181B and shall be marked "181 B-FX" for pressure-sensitive tape or "181 BM" for mastic. Duct connections to flanges of air distribution system equipment shall be sealed and mechanically fastened. Mechanical fasteners for use with flexible nonmetallic air ducts shall comply with UL 181B and shall be marked 181B-C. Crimp joints for round metallic ducts shall have a contact lap of not less than1-have a co94s(t)-9.2Tc 0 BM t9(n)8.1(e- 6.18w)13.2i--txibl[(l)6.9(l)6. and c an6( )-12.2n cg(