

EC25–09/10

101.3, 202, 402.4.1, 402.4.2, 402.4.2.1, 402.4.2.2, 402.4.2.3 (New), 403.2.1, 403.2.2, 403.2.3, 403.4, 403.4.1 (New), 403.4.2 (New), 403.4.3 (New), 403.11 (New), Tables 402.1.1, 402.1.3, 402.2.5, 402.4.2, 405.5.2(1); IRC R202, N1102.4.1, N1102.4.2, N1102.4.2.1, N1102.4.2.2, N1102.4.2.3, N1103.2.1, N1103.2.2, N1103.2.3, N1103.4, N1103.4.1(New), N1103.4.2 (New), N1103.4.3 (New), N1103.10 (New), Table N1102.1, N1102.1.2, N1102.2.5, N1102.4.2

Proponent: Bill Fay, representing Energy Efficient Coalition

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC COMMITTEE. PART II WILL BE HEARD BY THE IRC BUILDING/ENERGY COMMITTEE. SEE THE TENTATIVE HEARING ORDERS FOR THESE COMMITTEES.

PART I – IECC

1. Revise as follows:

101.3 Intent. This code shall regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. ~~the effective use of energy~~. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

SECTION 202 GENERAL DEFINITIONS

ENERGY RECOVERY VENTILATION SYSTEM. Systems that employ air-to-air heat exchangers to recover energy from exhaust air for the purpose of preheating, precooling, humidifying or dehumidifying outdoor ventilation air prior to supplying the air to a space, either directly or as part of an HVAC system. Such systems include equipment referred to as an “energy recovery ventilator” (ERV) or as a “heat recovery ventilator” (HRV).

2. Add new text as follows:

**SECTION 202
GENERAL DEFINITIONS**

SPECIFIC LEAKAGE AREA (SLA). The air leakage area (L) per conditioned floor area (CFA) of a home (L/CFA), where leakage area (L) is defined in accordance with section 5.1 of ASHRAE 119 and where L and CFA are in the same units.

3. Revise as follows:

**TABLE 402.1.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a**

Climate Zone	Fenestration U-Factor	Glazed Fenestration SHGC ^{b,e}	Ceiling R-Value	Wood Frame Wall R-Value ^h	Mass Wall R-Value ⁱ	Basement ^c Wall R-Value	Crawl Space ^c Wall R-Value
1	NR 1-20	0-30 <u>0.25</u>	30	13	3/4	0	0
2	<u>0.40</u> 0-65 ^f	0-30 <u>0.25</u>	30 <u>38</u>	13	4/6	0	0
3	<u>0.35</u> 0-50 ^f	0-30 <u>0.25</u>	30 <u>38</u>	13-20 or <u>13+5</u>	5/8 <u>8/13</u>	5/13 ^f	5/13
4 except Marine	0.35	NR	38 <u>49</u>	13-20 or <u>13+5</u>	5/10 <u>8/13</u>	10/13	10/13
5 and Marine 4	<u>0.32</u> 0-35	NR	38 <u>49</u>	20 or 13+5 ^h	13/17	15/19 <u>10/13</u>	15/19 <u>10/13</u>
6	<u>0.32</u> 0-35	NR	49	20+5 or 13+10 ^h	15/19 20	15/19	15/19 <u>10/13</u>
7 and 8	<u>0.32</u> 0-35	NR	49	20+5 or <u>13+10-24</u>	19/21	15/19	15/19 <u>10/13</u>

j. For impact rated fenestration complying with Section 301.2.1.2 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.

(Portions of table and notes not shown remain unchanged)

**TABLE 402.1.3
EQUIVALENT U-FACTORS^a**

Climate Zone	Fenestration U-Factor	Ceiling U-Factor	Frame Wall U-Factor	Mass Wall U-Factor ^b	Basement Wall U-Factor ^d	Crawl Space Wall U-Factor ^c
1	0.50 <u>1-20</u>	0.035	0.082	0.197	0.360	0.477
2	<u>0.40</u> 0-65	0-035 <u>0.030</u>	0.082	0.165	0.360	0.477
3	<u>0.35</u> 0-50	0-035 <u>0.030</u>	0-082 <u>0.057</u>	0-144 <u>0.098</u>	0.091 ^c	0.136
4 except Marine	0.35	0-030 <u>0.026</u>	0-082 <u>0.057</u>	0-144 <u>0.098</u>	0.059	0.065
5 and Marine 4	<u>0.32</u> 0-35	0-030 <u>0.026</u>	0.057	0.082	0.050 <u>0-059</u>	0.055 <u>0-065</u>
6	<u>0.32</u> 0-35	0.026	0.04 0.57	0.060	0.050	0.055 <u>0-065</u>
7 and 8	<u>0.32</u> 0-35	0.026	0.04 0.57	0.057	0.050	0.055 <u>0-065</u>

(Portions of table and notes not shown remain unchanged)

**TABLE 402.2.5
STEEL-FRAME CEILING, WALL AND FLOOR INSULATION
(R-VALUE)**

Wood Frame R-Value Requirement	Cold-Formed Steel Equivalent R-Value^a
	Steel-Framed Wall
R-13	R-13+5 or R-15+4 or R-21+3 or R-0+10
R-19	R-13+9 or R-19+8 or R-25+7
<u>R-20</u>	<u>R-13+10 or R-19+8 or R-25+7</u>
R-21	R-13+10 or R-19+9 or R-25+8
<u>R-20+5</u>	<u>R-13+15 or R-19+14 or R-25+13</u>

(Portions of table and notes not shown remain unchanged)

402.4.1 Building thermal envelope. The *building thermal envelope* shall comply with Section 402.4.2 and be durably sealed to limit infiltration. The sealing methods between dissimilar materials shall allow for differential expansion and contraction. The following shall be caulked, gasketed, weatherstripped or otherwise sealed with an air barrier material, suitable film or solid material:

1. All joints, seams and penetrations.
2. Site-built windows, doors and skylights.
3. Openings between window and door assemblies and their respective jambs and framing.
4. Utility penetrations.
5. Dropped ceilings or chases adjacent to the thermal envelope.
6. Knee walls.
7. Walls and ceilings separating a garage from conditioned spaces.
8. Behind tubs and showers on exterior walls.
9. Common walls between dwelling units.
10. Attic access openings.
11. Rim joist junction.
12. Other sources of infiltration.

402.4.2 Air sealing and insulation. The components of the *building thermal envelope* as listed in Table 402.4.2 shall be installed in accordance with the manufacturer's instructions and the criteria listed in Table 402.4.2, as applicable to the method of construction. Building envelope air tightness and insulation installation shall be demonstrated to comply with ~~one of the following options given~~ requirements established by Section 402.4.2.1 or and 402.4.2.2:

402.4.2.1 Performance testing requirement option. The building shall meet the air leakage standard set forth below as demonstrated by an air leakage test conducted as specified below:

1. ~~Building envelope tightness and insulation installation shall be considered acceptable when tested by a party approved by the code official. Where required by the code official, the approved party shall be independent from both the builder and any other entity responsible for installing the insulation and air barrier and otherwise sealing the building. A written report specifying the results of the test and attesting to the accuracy of the results shall be signed by the party conducting the testing and provided to the builder and code official.~~
2. The building shall be required to have an air leakage is less than 0.00030 *specific leakage area (SLA)* seven air changes per hour (ACH) when tested with a blower door at a pressure of 33.5 psf (50 Pa). Testing shall occur any time after rough in and after (i) installation of all penetrations of the building envelope, including penetrations for utilities, plumbing, electrical, ventilation, and combustion appliances, and (ii) completion of sealing of the *building thermal envelope* as required in section 402.4.1.
3. During testing:
 1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed beyond the weather-stripping, caulking and other intended permanent air infiltration control measures;
 2. Dampers shall be closed, but not sealed, including exhaust, intake, makeup air, backdraft, fireplace and flue dampers beyond intended permanent air infiltration control measures;
 3. Interior doors connecting conditioned spaces shall be open, doors connecting to unconditioned spaces closed but not sealed;
 4. Exterior openings for continuous ventilation systems and heat recovery ventilators shall be closed and sealed;

5. Heating and cooling system(s) shall be turned off;
6. HVAC ducts systems shall not be sealed; and
7. Supply and return registers shall be fully open at the time of the test not be sealed.

Exception: Multi-family residential buildings, with more than four dwelling units per building, may be individually exempted from the testing requirement only when meeting all of the following requirements:

1. The exemption is approved by the code official after inspection of the sealing of thermal envelope in accordance with Section 402.4.1 and Table 402.4.2;
2. At least 15% of the units are tested to have an air leakage less than 0.00036 specific leakage area (SLA) when tested with a blower door at a pressure of 33.5 psf (50 Pa), with the units to be tested specified by the code official; and
3. The tests demonstrate compliance for such units.

When any tested dwelling unit subject to this exception fails to meet the maximum air leakage requirement stated in Section 402.4.2.1, then the builder must resolve any leakage problems so that such unit passes the test and then must continue to test each additional dwelling unit in such building until a minimum of three consecutive dwelling units pass the test before the builder can return to testing as specified in Item 2 of this exception.

402.4.2.2 Visual insulation inspection option (Mandatory). Building envelope tightness and insulation installation shall be considered acceptable when the items listed in Table 402.4.2, applicable to the method of construction, are field verified to meet the Insulation Installation Criteria in Table 402.4.2. Where required by the code official, an approved party independent from the builder and the installer of the insulation, shall inspect the air barrier and insulation; in such case, a written inspection report, including a checklist demonstrating compliance shall be provided to the code official and builder before interior finish materials are applied.

402.4.2.3 Visual air barrier inspection. For any building or dwelling unit not required to be tested under section 402.4.2.1, building envelope tightness shall be field verified to meet the Air Barrier Criteria in Table 402.4.2. Where required by the code official, an approved party independent from the builder and the installer of any air barrier materials, shall inspect the air barrier; in such case, a written inspection report, including a checklist demonstrating compliance shall be provided to the code official and builder before interior finish materials are applied. In cases where the building or dwelling unit satisfies the testing requirement of section 402.4.2.1, the code official may also require field verification to show that the building meets the Air Barrier Criteria if deemed necessary.

4. Delete Table 402.4.2 and replace with the following table:

TABLE 402.4.2
AIR BARRIER AND INSULATION INSPECTION COMPONENT CRITERIA
TABLE 402.4.2
VISUAL AIR BARRIER AND INSULATION INSPECTION

<u>COMPONENT</u>	<u>INSULATION INSTALLATION CRITERIA</u>	<u>AIR BARRIER CRITERIA</u>
<u>General Requirements</u>	<u>Exterior thermal envelope insulation for framed walls is installed in substantial contact and continuous alignment with building envelope air barrier.</u>	<u>A continuous air barrier is installed in the thermal envelope.</u> <u>Breaks or joints in the air barrier are sealed.</u> <u>Air permeable insulation is not used as a sealing material.</u>
<u>Ceiling / attic</u>	<u>In any dropped ceiling/soffit, the insulation is substantially aligned with the air barrier.</u>	<u>Air barrier in any dropped ceiling / soffit is substantially aligned with insulation and any gaps are sealed.</u> <u>Attic access, knee wall door or drop down stair to unconditioned attic is sealed.</u>
<u>Walls</u>	<u>All corners and headers are insulated.</u> <u>Insulation is in substantial contact and continuous alignment with air barrier.</u>	<u>Junction of foundation and sill plate is sealed.</u> <u>Junction of exterior wall and top plate is sealed.</u> <u>Junction of the exterior wall and floor sheathing is sealed.</u> <u>Knee wall is sealed.</u>
<u>Fenestration</u>		<u>Space between fenestration jambs and framing is sealed.</u>
<u>Rim joists</u>	<u>Rim joists are insulated.</u>	<u>Air barrier is installed at the rim joist.</u>
<u>Floors (including above garage</u>	<u>Insulation is installed to maintain permanent contact</u>	<u>Air barrier is installed at any exposed edge of</u>

COMPONENT	INSULATION INSTALLATION CRITERIA	AIR BARRIER CRITERIA
<u>and cantilevered floors).</u>	<u>with underside of subfloor decking.</u>	<u>insulation.</u>
<u>Crawl space walls</u>	<u>Insulation is permanently attached to walls.</u>	<u>Exposed earth in unvented crawlspaces is covered with Class I vapor retarder with overlapping joints taped.</u>
<u>Shafts, penetrations</u>		<u>Duct shafts, utility penetrations, knee walls, and flue shafts opening to exterior or unconditioned space are sealed.</u>
<u>Narrow cavities</u>	<u>Batts in narrow cavities are cut to fit; narrow cavities are filled by sprayed/blown insulation.</u>	
<u>Garage separation</u>		<u>Air sealing is provided between the garage and conditioned spaces.</u>
<u>Recessed lighting</u>		<u>Recessed light fixtures installed in the building thermal envelope are airtight, IC rated, and sealed to drywall.</u>
<u>Plumbing and Wiring</u>	<u>Insulation is placed between the exterior of the wall assembly and pipes. Batt insulation is cut and fitted around wiring and plumbing, or sprayed/blown insulation extends between piping and wiring and to the exterior of the wall assembly.</u>	<u>All plumbing and wiring penetrations shall be sealed to the air barrier.</u>
<u>Shower / tub on exterior wall</u>	<u>Exterior walls adjacent to showers and tubs have insulation filling any gaps or voids between tub or shower walls and unconditioned space.</u>	<u>Exterior walls adjacent to showers and tubs have an air barrier separating the exterior wall from the shower and tubs.</u>
<u>Electrical / phone box on exterior walls</u>	<u>Insulation completely fills voids between the box and exterior sheathing.</u>	<u>Air barrier extends behind boxes or air sealed type boxes are installed.</u>
<u>Common wall</u>		<u>Air barrier is installed in common wall between dwelling units.</u>
<u>HVAC register boots</u>		<u>HVAC register boots that penetrate building envelope are sealed to subfloor or drywall.</u>
<u>Fireplace</u>		<u>Air barrier is installed on fireplace walls. Fireplace shall have gasketed doors.</u>

5. Revise as follows:

403.2.1 Insulation (Prescriptive). Supply ducts in attics shall be insulated to a minimum of R-8. All other ducts shall be insulated to a minimum of R-6.

Exception: ~~Where all ducts or portions thereof are located completely within conditioned space inside the building thermal envelope, supply ducts shall be insulated to a minimum of R-4.~~

403.2.2 Sealing (Mandatory). All ducts, air handlers, ~~and filter boxes, and building cavities used as ducts~~ shall be sealed. Joints and seams shall comply with Section M1601.4.1 of the *International Residential Code* or Section 603.9 of the *International Mechanical Code*, as applicable.

Duct tightness shall be verified by a test performed by a party approved by the code official after construction is completed. Where required by the code official, testing shall be conducted by an approved party independent from the builder and the installer of the ducts, either of the following: A written report specifying the results of the test and attesting to the accuracy of the results shall be signed by the party conducting the testing and provided to the builder and the code official.

- ~~1. Post construction test: L As tested, total duct leakage to outdoors shall be less than or equal to 8 cfm (226.5 L/min) per 100 ft² (9.29 m²) of conditioned floor area or a total leakage less than or equal to 6 1/2 cfm (226.5/2 L/min) per 100 ft² (9.29 m²) of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. All register boots shall be taped or otherwise sealed during the test.~~
- ~~2. Rough in test: Total leakage shall be less than or equal to 6 cfm (169.9 L/min) per 100 ft² (9.29 m²) of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pa) across the roughed in system, including the manufacturer's air handler enclosure. All register boots shall be taped or otherwise sealed during the test. If the air handler is not installed at the time of the test, total leakage shall be less than or equal to 4 cfm (113.3 L/min) per 100 ft² (9.29 m²) of conditioned floor area.~~

Exceptions: ~~Duct tightness test is not required if~~ Where the air handler and all ducts are located within conditioned space, total duct leakage shall not exceed 12 cfm per 100 ft² of conditioned floor area when tested as specified above.

403.2.3 Building cavities (Mandatory). Building framing cavities shall not be used as supply ducts.

403.4 Service water heating (Mandatory). Service hot water piping shall be installed in accordance with Sections 403.4.1 through 403.4.3.

403.4.1 Pipe length and Insulation. Service hot water piping shall be no more than a total of 60 linear feet of pipe length to all fixtures being served by one service water heating unit. All service hot water piping shall be insulated to at least R-3 for pipes sized 1" in diameter or less and R-4 for pipes larger than 1" in diameter for the distance between the service water heating equipment to within 5 feet of each fixture connected to the hot water pipe and the first 5 feet of hot and cold water pipes from the storage tank for non-recirculating service water heating systems.

Exception: Hot water distribution systems that are not located below ground or in a mass floor or mass wall in contact with the ground and that supply hot water from one of the following sources:

1. Condensing gas service water heating equipment.
2. Solar thermal water heating equipment that is designed to provide more than 50% of annual hot water requirements from solar heated water.
3. Heat pump electric service water heating equipment.
4. Tankless demand service gas water heating equipment, or
5. Tankless demand service electric heating equipment, where either: (a) heated water is provided through piping that is insulated to R-3 or (b) there is no more than a total of 15 linear feet of pipe length to all fixtures being served by each unit.

403.4.2 Circulating hot water systems (Mandatory). All circulating service hot water piping shall be insulated to at least R-~~32~~ for pipes sized 1" in diameter or less and R-4 for pipes larger than 1" in diameter. Circulating hot water systems shall include an automatic or readily accessible manual switch that can turn off the hot water circulating pump when the system is not in use.

403.4.3 Heat Traps. Water heating equipment not supplied with integral heat traps and serving non-circulating systems shall be provided with heat traps on the supply and discharge piping associated with the equipment.

6. Add new text as follows:

403.11 Energy Recovery Ventilation System and Air leakage supplemental requirements. The building shall meet the following the requirements:

1. An energy recovery ventilation system shall be installed. For warm humid counties as identified in table 301.1, a dehumidifier with a built in humidistat shall be installed in addition to the energy recovery ventilation system.
2. Building air leakage shall be tested in accordance with the procedure prescribed in Section 402.4.2.1, except that the air leakage shall not exceed 0.00015 specific leakage area (SLA) for all buildings except multifamily, which shall not exceed 0.00018 specific leakage area (SLA), when tested with a blower door at a pressure of 33.5 psf (50 Pa) by an approved party independent of the builder and any contractors involved in any aspect of sealing the building.

Exceptions:

1. Buildings located in climate zones 1 or 2 with installed cooling equipment with an efficiency that exceeds prevailing federal minimum standards by at least 20% and meets or exceeds 12.5 EER.
2. Buildings located in climate zones 3, 4 or 5 with installed heating and cooling equipment with an efficiency that exceeds prevailing federal minimum standards by at least 15% and cooling equipment that meets or exceeds 12.5 EER.
3. Buildings located in climate zones 6, 7 or 8 with installed heating equipment with an efficiency that exceeds prevailing federal minimum standards by at least 20%.
4. In the event the heating or cooling equipment specified in the exception applicable to a particular climate zone above is not available in the market, the equipment with the highest rated efficiency commercially available can be substituted, when approved by the code official.

5. As an alternative to the heating equipment specified in Exceptions 2 and 3 above, a ground source heat pump with an efficiency of greater than or equal to 2.8 COP and 13 EER may be installed.

6. Revise as follows:

**TABLE 405.5.2(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Air Exchange Rate	<p><i>Specific leakage area (SLA) = 0.0001536 assuming no energy recovery, with a 70% efficient energy recovery ventilation system.</i></p> <p><u>Exceptions:</u></p> <p>1. For multifamily buildings, the specific leakage area shall be 0.00018 with a 70% efficient energy recovery ventilation system.</p> <p>2. For buildings subject to the exceptions in section 403.11, SLA = 0.00030, assuming no energy recovery.</p>	<p>For residences that are not tested, the same as the standard reference design.</p> <p><u>Specific Leakage Area (SLA) = the tested value for the proposed home and the tested value shall be in determined accordance with the methodology set out in section 402.4.2.1 and the ASHRAE 119, Section 5.1 and the SLA shall be:</u></p> <p>1. For residences without mechanical ventilation that are tested in accordance with ASHRAE 119, Section 5.1, the measured air exchange rate^e but not less than 0.35 ACH.</p> <p>2. For residences with mechanical ventilation that is not an energy recovery ventilation system that are tested in accordance with ASHRAE 119, Section 5.1, the measured air exchange rate^e combined with the mechanical ventilation rate, <i>f</i> which shall not be less than $0.01 \times CFA + 7.5 \times (N_{br} + 1)$ where: CFA = conditioned floor area <i>N_{br}</i> = number of bedrooms</p> <p>3. For residences with energy recovery ventilation systems, the efficiency of the energy or heat recovery ventilation system shall be as proposed.</p>

(Portions of table and notes not shown remain unchanged)

d. ~~Where leakage area (L) is defined in accordance with Section 5.1 of ASHRAE 119 and where:~~
SLA = L/CFA

where L and CFA are in the same units.

PART II – IRC BUILDING/ENERGY

1. Add new text as follows:

SECTION R202 GENERAL DEFINITIONS

ENERGY RECOVERY VENTILATION SYSTEM. Systems that employ air-to-air heat exchangers to recover energy from exhaust air for the purpose of preheating, precooling, humidifying or dehumidifying outdoor ventilation air prior to supplying the air to a space, either directly or as part of an HVAC system. Such systems include equipment referred to as an “energy recovery ventilator” (ERV) or as a “heat recovery ventilator” (HRV).

SPECIFIC LEAKAGE AREA (SLA). The air leakage area (L) per conditioned floor area (CFA) of a home (L/CFA), where leakage area (L) is defined in accordance with Section 5.1 of ASHRAE 119 and where L and CFA are in the same units.

2. Revise as follows:

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

Climate Zone	Fenestration U-Factor	Glazed Fenestration SHGC ^{b,e}	Ceiling R-Value	Wood Frame Wall R-Value ^b	Mass Wall R-Value ⁱ	Basement ^c Wall R-Value	Crawl Space ^c Wall R-Value
1	NR <u>1-20</u>	0-30 <u>0.25^f</u>	30	13	3/4	0	0
2	<u>0.40</u> 0.65^j	0-30 <u>0.25^f</u>	30 <u>38</u>	13	4/6	0	0
3	<u>0.35</u> 0.50^j	0-30 <u>0.25^{g†}</u>	30 <u>38</u>	13-20 <u>or 13+5</u>	5/8 <u>8/13</u>	5/13 ^f	5/13
4 except Marine	0.35	NR	38 <u>49</u>	13-20 <u>or 13+5</u>	5/10 <u>8/13</u>	10/13	10/13
5 and Marine 4	<u>0.32</u> 0.35	NR	38 <u>49</u>	20 or 13+5 ^h	13/17	15/19 <u>10/13</u>	15/19 <u>10/13</u>
6	<u>0.32</u> 0.35	NR	49	20±5 or 13+10 ^h	15/19±20	15/19 <u>10/13</u>	15/19 <u>10/13</u>
7 and 8	<u>0.32</u> 0.35	NR	49	20±5 or 13+10 <u>21</u>	19/21	15/19 <u>10/13</u>	15/19 <u>10/13</u>

- 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.

(Portions of table and notes not shown remain unchanged)

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

Climate Zone	Fenestration U-Factor	Ceiling U-Factor	Frame Wall U-Factor	Mass Wall U-Factor ^b	Basement Wall U-Factor ^d	Crawl Space Wall U-Factor ^c
1	0.50 <u>1-20</u>	0.035	0.082	0.197	0.360	0.477
2	<u>0.40</u> 0.65ⁱ	0.035 <u>0.030</u>	0.082	0.165	0.360	0.477
3	<u>0.35</u> 0.50ⁱ	0.035 <u>0.030</u>	0.082	0.144 <u>0.098</u>	0.091 ^c	0.136
4 except Marine	0.35	0.030 <u>0.026</u>	0.082	0.144 <u>0.098</u>	0.059	0.065
5 and Marine 4	<u>0.32</u> 0.35	0.030 <u>0.026</u>	0.060	0.082	0.050 <u>0.059</u>	0.055 <u>0.065</u>
6	<u>0.32</u> 0.35	0.026	0.048 <u>0.060</u>	0.060	0.050 <u>0.059</u>	0.055 <u>0.065</u>
7 and 8	<u>0.32</u> 0.35	0.026	0.048 <u>0.057</u>	0.057	0.050 <u>0.059</u>	0.055 <u>0.065</u>

(Portions of table and notes not shown remain unchanged)

**TABLE N1102.2.5
STEEL-FRAME CEILING, WALL AND FLOOR INSULATION (R-VALUE)**

Wood Frame R-Value Requirement	Cold-Formed Steel Equivalent R-Value ^a
	Steel-Framed Wall
R-13	R-13+5 or R-15+4 or R-21+3 or R-0+10
R-19	R-13+9 or R-19+8 or R-25+7
<u>R-20</u>	<u>R-13+10 or R-19+8 or R-25+7</u>
R-21	R-13+10 or R-19+9 or R-25+8
<u>R-20+5</u>	<u>R-13+15 or R-19+14 or R-25+13</u>

(Portions of table and notes not shown remain unchanged)

N1102.4.1 Building thermal envelope. The *building thermal envelope* shall comply with Section N1102.4.2 and be durably sealed to limit infiltration. The sealing methods between dissimilar materials shall allow for differential expansion and contraction. The following shall be caulked, gasketed, weatherstripped or otherwise sealed with an air barrier material, suitable film or solid material.

1. All joints, seams and penetrations.
2. Site-built windows, doors and skylights.
3. Openings between window and door assemblies and their respective jambs and framing.
4. Utility penetrations.
5. Dropped ceilings or chases adjacent to the thermal envelope.
6. Knee walls.
7. Walls and ceilings separating the garage from conditioned spaces.
8. Behind tubs and showers on exterior walls.
9. Common walls between dwelling units.
10. Attic access openings.
11. Rim joist junction.
12. Other sources of infiltration.

N1102.4.2 Air sealing and insulation. The components of the *building thermal envelope* as listed in Table N1102.4.2 shall be installed in accordance with the manufacturer's instructions and the criteria listed in Table N1102.4.2, as applicable to the method of construction. Building envelope air tightness and insulation installation shall be demonstrated to comply with ~~one of the following options given~~ requirements established by Section N1102.4.2.1 ~~or~~ and N1102.4.2.2.

N1102.4.2.1 Performance testing requirement ~~option~~. The building shall meet the air leakage standard set forth below as demonstrated by an air leakage test conducted as specified below:

1. Building envelope tightness shall be tested by a party *approved* by the code official. Where required by the code official, the *approved* party shall be independent from both the builder and any other entity responsible for installing the insulation and air barrier and otherwise sealing the building. A written report specifying the results of the test and attesting to the accuracy of the results shall be signed by the party conducting the testing and provided to the builder and code official.
2. ~~Tested~~ The building shall be required to have an air leakage is less than 0.00030 *specific leakage area (SLA)* 7-ACH when tested with a blower door at a pressure of 33.5 psf (50 Pa) ~~pascals (0.007 psi)~~. Testing shall occur any time after rough in and after (i) installation of all penetrations of the building envelope, including penetrations for utilities, plumbing, electrical, ventilation, and combustion appliances, and (ii) completion of sealing of the *building thermal envelope* as required in section N1102.4.1.
3. During testing:
 1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed beyond the weather-stripping, caulking and other intended permanent air infiltration control measures;
 2. Dampers shall be closed, but not sealed, including exhaust, intake, makeup air, backdraft, fireplace and flue dampers beyond intended permanent air infiltration control measures;
 3. Interior doors connecting conditioned spaces shall be open, doors connecting to unconditioned spaces closed but not sealed;
 4. Exterior openings for continuous ventilation systems and heat recovery ventilators shall be closed and sealed;
 5. Heating and cooling system(s) shall be turned off;
 6. ~~HVAC ducts systems shall not be sealed;~~ and
 7. Supply and return registers shall be fully open at the time of the test ~~not be sealed.~~

Exception: Multi-family residential buildings, with more than four dwelling units per building, may be individually exempted from the testing requirement only when meeting all of the following requirements:

1. The exemption is approved by the code official after inspection of the sealing of thermal envelope in accordance with section N1102.4.1 and Table N1102.4.2;
2. At least 15% of the units are tested to have an air leakage less than 0.00036 *specific leakage area (SLA)* when tested with a blower door at a pressure of 33.5 psf (50 Pa), with the units to be tested specified by the code official; and
3. The tests demonstrate compliance for such units.

When any tested dwelling unit subject to this exception fails to meet the maximum air leakage requirement stated in Section N1102.4.2.1, then the builder must resolve any leakage problems so that such unit passes the test and then must continue to test each additional dwelling unit in such building until a minimum of three consecutive dwelling units pass the test before the builder can return to testing as specified in Item 2 of this Exception.

N1102.4.2.2 Visual insulation inspection ~~option~~. The items listed in Table N1102.4.2, applicable to the method of

construction, are Building envelope insulation installation shall be field verified to meet the Insulation Installation Criteria in Table N1102.4.2. Where required by the code official, an *approved* party independent from the builder and the installer of the insulation, shall inspect the air barrier and insulation; in such case, a written inspection report, including a checklist demonstrating compliance shall be provided to the code official and builder before interior finish materials are applied.

N1102.4.2.3 Visual air barrier inspection. For any building or dwelling unit not required to be tested under section N1102.4.2.1, building envelope tightness shall be field verified to meet the Air Barrier Criteria in Table N1102.4.2. Where required by the code official, an approved party independent from the builder and the installer of any air barrier materials, shall inspect the air barrier; in such case, a written inspection report, including a checklist demonstrating compliance shall be provided to the code official and builder before interior finish materials are applied. In cases where the building or dwelling unit satisfies the testing requirement of section N1102.4.2.1, the code official may also require field verification to show that the building meets the Air Barrier Criteria if deemed necessary.

3. Delete Table N1102.4.2 and replace with the following table:

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

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

<u>COMPONENT</u>	<u>INSULATION INSTALLATION CRITERIA</u>	<u>AIR BARRIER CRITERIA</u>
<u>General Requirements</u>	<u>Exterior thermal envelope insulation for framed walls is installed in substantial contact and continuous alignment with building envelope air barrier.</u>	<u>A continuous air barrier is installed in the thermal envelope.</u> <u>Breaks or joints in the air barrier are sealed.</u> <u>Air permeable insulation is not used as a sealing material.</u>
<u>Ceiling / attic</u>	<u>In any dropped ceiling/soffit, the insulation is substantially aligned with the air barrier.</u>	<u>Air barrier in any dropped ceiling / soffit is substantially aligned with insulation and any gaps are sealed.</u> <u>Attic access, knee wall door or drop down stair to unconditioned attic is sealed.</u>
<u>Walls</u>	<u>All corners and headers are insulated. Insulation is in substantial contact and continuous alignment with air barrier.</u>	<u>Junction of foundation and sill plate is sealed.</u> <u>Junction of exterior wall and top plate is sealed.</u> <u>Junction of the exterior wall and floor sheathing is sealed.</u> <u>Knee wall is sealed.</u>
<u>Fenestration</u>		<u>Space between fenestration jambs and framing is sealed.</u>
<u>Rim joists</u>	<u>Rim joists are insulated.</u>	<u>Air barrier is installed at the rim joist.</u>
<u>Floors (including above garage and cantilevered floors)</u>	<u>Insulation is installed to maintain permanent contact with underside of subfloor decking.</u>	<u>Air barrier is installed at any exposed edge of insulation.</u>
<u>Crawl space walls</u>	<u>Insulation is permanently attached to walls.</u>	<u>Exposed earth in unvented crawlspaces is covered with Class I vapor retarder with overlapping joints taped.</u>
<u>Shafts, penetrations</u>		<u>Duct shafts, utility penetrations, knee walls, and flue shafts opening to exterior or unconditioned space are sealed.</u>
<u>Narrow cavities</u>	<u>Batts in narrow cavities are cut to fit; narrow cavities are filled by sprayed/blown insulation.</u>	

COMPONENT	INSULATION INSTALLATION CRITERIA	AIR BARRIER CRITERIA
<u>Garage separation</u>		<u>Air sealing is provided between the garage and conditioned spaces.</u>
<u>Recessed lighting</u>		<u>Recessed light fixtures installed in the building thermal envelope are airtight, IC rated, and sealed to drywall.</u>
<u>Plumbing and Wiring</u>	<u>Insulation is placed between the exterior of the wall assembly and pipes. Batt insulation is cut and fitted around wiring and plumbing, or sprayed/blown insulation extends between piping and wiring and to the exterior of the wall assembly.</u>	<u>All plumbing and wiring penetrations shall be sealed to the air barrier.</u>
<u>Shower / tub on exterior wall</u>	<u>Exterior walls adjacent to showers and tubs have insulation filling any gaps or voids between tub or shower walls and unconditioned space.</u>	<u>Exterior walls adjacent to showers and tubs have an air barrier separating the exterior wall from the shower and tubs.</u>
<u>Electrical / phone box on exterior walls</u>	<u>Insulation completely fills voids between the box and exterior sheathing</u>	<u>Air barrier extends behind boxes or air sealed type boxes are installed.</u>
<u>Common wall</u>		<u>Air barrier is installed in common wall between dwelling units.</u>
<u>HVAC register boots</u>		<u>HVAC register boots that penetrate building envelope are sealed to subfloor or drywall.</u>
<u>Fireplace</u>		<u>Air barrier is installed on fireplace walls. Fireplace shall have gasketed doors.</u>

4. Revise as follows:

N1103.2.1 Insulation. Supply ducts in attics shall be insulated to a minimum of R-8. All other ducts shall be insulated to a minimum of R-6.

Exception: Where all ducts or portions thereof are located completely within conditioned space inside the building thermal envelope, supply ducts shall be insulated to a minimum of R-4.

N1103.2.2 Sealing. All ducts, air handlers, ~~and filter boxes, and building cavities used as ducts~~ shall be sealed. Joints and seams shall comply with Section M1601.4 of the *International Residential Code*.

Duct tightness shall be verified by a test performed by a party approved by the code official after construction is completed. Where required by the code official, testing shall be conducted by an approved party independent from the builder and the installer of the ducts, either of the following: A written report specifying the results of the test and attesting to the accuracy of the results shall be signed by the party conducting the testing and provided to the builder and the code official.

1. ~~Post construction test: L~~ As tested, total duct leakage to outdoors shall be less than or equal to 8 cfm (3.78 L/S) per 100 ft² (9.29 m²) of conditioned floor area or a total leakage less than or equal to 6.12 cfm (226.5 L/min 5.66 L/S) per 100 ft² (9.29 m²) of conditioned floor area when tested at a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer's air handler end closure enclosure. All register boots shall be taped or otherwise sealed during the test.
2. ~~Rough-in test: Total leakage shall be less than or equal to 6 cfm (2.83 L/S) per 100 ft² (9.29 m²) of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pa) across the roughed-in system, including the manufacturer's air handler enclosure. All register boots shall be taped or otherwise sealed during the test. If the air handler is not installed at the time of the test, total leakage shall be less than or equal to 4 cfm (1.89 L/S) per 100 ft² (9.29 m²) of conditioned floor area.~~

Exceptions: Duct tightness test is not required if Where the air handler and all ducts are located within conditioned space, total duct leakage shall not exceed 12 cfm per 100 ft² of conditioned floor area when tested as specified above.

N1103.2.3 Building cavities. Building framing cavities shall not be used as supply ducts.

N1103.4 Service water heating. Service hot water piping shall be installed in accordance with Sections 403.4.1 through 403.4.3.

N1103.4.1 Pipe length and Insulation. Service hot water piping shall be no more than a total of 60 linear feet of pipe length to all fixtures being served by one service water heating unit. All service hot water piping shall be insulated to at least R-3 for pipes sized 1" in diameter or less and R-4 for pipes larger than 1" in diameter for the distance between the service water heating equipment to within 5 feet of each fixture connected to the hot water pipe. In addition, the first 5 feet of hot and cold water pipes from the storage tank for non-recirculating service water heating systems shall be insulated to at least R-3 for pipes sized 1" in diameter or less and R-4 for pipes larger than 1" in diameter.

Exception: Hot water distribution systems that supply hot water from one of the following sources (this exception does not apply to portions of hot water distribution systems located below ground or in a mass floor or mass wall in contact with the ground):

1. Condensing gas service water heating equipment.
2. Solar thermal water heating equipment that is designed to provide more than 50% of annual hot water requirements from solar heated water.
3. Heat pump electric service water heating equipment.
4. Tankless demand service gas water heating equipment, or
5. Tankless demand service electric heating equipment, where either: (a) heated water is provided through piping that is insulated to R-3 or (b) there is no more than a total of 15 linear feet of pipe length to all fixtures being served by each unit.

N1103.4.2 Circulating hot water systems. All circulating service hot water piping shall be insulated to at least R-3~~2~~ for pipes sized 1" in diameter or less and R-4 for pipes larger than 1" in diameter. Circulating hot water systems shall include an automatic or readily accessible manual switch that can turn off the hot water circulating pump when the system is not in use.

N1103.4.3 Heat Traps. Water heating equipment not supplied with integral heat traps and serving non-circulating systems shall be provided with heat traps on the supply and discharge piping associated with the equipment.

5. Add new text as follows:

N1103.10 Energy Recovery Ventilation System and air leakage supplemental requirements. The building shall meet the following the requirements:

1. An energy recovery ventilation system shall be installed. For warm humid counties as identified in table N1101.2, a dehumidifier with a built in humidistat shall be installed in addition to the energy recovery ventilation system.
2. Building air leakage shall be tested in accordance with the procedure prescribed in Section N1102.4.2.1, except that the air leakage shall not exceed 0.00015 specific leakage area (SLA) for all buildings except multifamily, which shall not exceed 0.00018 specific leakage area (SLA), when tested with a blower door at a pressure of 33.5 psf (50 Pa) by an approved party independent of the builder and any contractors involved in any aspect of sealing the building.

Exceptions:

1. Buildings located in climate zones 1 or 2 with installed cooling equipment with an efficiency that exceeds prevailing federal minimum standards by at least 20% and meets or exceeds 12.5 EER.
2. Buildings located in climate zones 3, 4 or 5 with installed heating and cooling equipment with an efficiency that exceeds prevailing federal minimum standards by at least 15% and cooling equipment that meets or exceeds 12.5 EER.
3. Buildings located in climate zones 6, 7 or 8 with installed heating equipment with an efficiency that exceeds prevailing federal minimum standards by at least 20%.
4. In the event the heating or cooling equipment specified in the exception applicable to a particular climate zone above is not commercially available, the equipment with the highest rated efficiency commercially available can be substituted, when approved by the code official.
5. As an alternative to the heating equipment specified in Exceptions 2 and 3 above, a ground source heat pump with an efficiency of greater than or equal to 2.8 COP and 13 EER may be installed.

Reason: At the 2009 Final Action Hearings, a majority of voting code officials supported proposals to substantially boost energy efficiency of the 2009 IECC's energy efficiency over its 2006 counterpart (including over 60% who voted for the Energy Efficient Codes Coalition's EC14, also known as "The 30% Solution"). Even though some of those votes fell short of the 2/3 majority needed for adoption, the final version of IECC 2009 will boost efficiency by more than 10% (http://www.thirtypercentsolution.org/solution/EECC-Savings_Analysis-Jan-2009.pdf).

This comprehensive proposal builds on the momentum ICC's members set in Minneapolis last year, while simultaneously responding to profound events that are shining a national spotlight on energy codes, the role buildings play in national energy use and the impact both can have on national energy policy.

Specifically, this **Core Package Proposal** was developed by the Energy Efficient Codes Coalition (EECC) to support the ICC (and its I-Code process) in reaching the energy savings targets proposed by many (including DOE) and being considered by Congress in several pending bills. Our proposal incorporates currently available technologies that are being included in new home construction every day and is designed to make the code as simple and clear as possible (to avoid undue burdens on code officials) and to be consistent with current federal law regarding efficient equipment covered by federal standards. Some of the major energy-saving improvements captured in this comprehensive package include:

- (1) Improved envelope measures including better fenestration and insulation in most climate zones;
- (2) Comprehensive air sealing, testing, and insulation inspection;
- (3) Improved sealing and testing requirements for ducts;
- (4) Requirements for efficient hot water service distribution system or equipment; and
- (5) Requirements for reduced envelope infiltration along with energy recovery ventilation, or else more efficient HVAC equipment.

The elements of this and other individual EECC proposals have been reviewed by energy efficiency experts, building scientists and many others, and improved based on their comments. Individual EECC supporters are also submitting each element of this package, along with a number of other proposals, in the form of individual proposals to strengthen energy efficiency in both the *IECC* and *IRC*. The detailed reasons supporting the individual elements of this proposal can be found in these individual proposals, which are incorporated by reference into this reason statement.

We estimate that this Core Package Proposal will result in a 2012 IECC that is at least 20% more energy efficient than the 2009 IECC (and more than 30% more efficient than the 2006 IECC). Taken together with the efficiency gains in the 2009 IECC, adoption of this proposal by the full ICC will produce a 2012 IECC that comfortably exceeds Congress' initial 30% savings target (compared with IECC 2006) and puts the ICC on the path to the next target of 50% savings.

EECC is submitting this proposal to both the *IRC* and the *IECC*, in order to assure consistency between the two codes. However, EECC believes that America needs a single model energy code, the IECC (the only I-Code recognized in federal statutes). **For this reason**, EECC is also submitting a separate proposal that would incorporate the IECC by reference in the *IRC* Chapter 11 (as is currently done with the International Building Code IBC).

Since September of 2008, three events have occurred that could transform the ICC's residential model energy code:

The US Conference of Mayors and other elected officials charged with establishing and implementing national, state and local energy policies have begun to recognize the profound impact that the model energy codes can have on achieving local, regional, and national goals for sustainable economic growth, and have endorsed the concept of a 30% improvement in model energy codes. Several city and state governments have adopted their own policies to achieve at least 30% efficiency improvements in new buildings.

Congress has also jumped into the energy code arena with legislative carrots and sticks designed to speed the rate of energy efficiency improvements in the I-Code and their adoption by state and local jurisdictions. First, Congress linked billions of dollars in stimulus funds to each state's adoption of the 2009 IECC (or equivalent), followed by the introduction of legislation that sets targets of 30%, then 50% and beyond, for ICC to meet or exceed. The proposed legislation also authorizes hundreds of millions of federal dollars for code development bodies and state and local governments for adoption, implementation and compliance with codes that meet these goals.

Finally, the ICC's new schedule for I-Code development reduces the number of opportunities to meet these targets being considered in Congress to once in each three-year code cycle.

As the growing national interest in the ICC and its model energy code attests, our nation's energy policy is in a period of transition. As states scramble to meet increasing peak energy demands and to curb pollution and greenhouse gases, there has been an increased focus on energy efficiency at all levels of government and the private sector. Federal and state governments recognize that energy efficiency is the most cost-effective means of meeting increasing energy demand. The time has come to complete the transition to at least a 30% more efficient residential energy code before 2012, and this proposal will help to bring that about.

The Energy Efficient Codes Coalition (website: www.thirtypercentsolution.org) was established to boost the energy efficiency of the IECC, and its supporters include all forms of electric utilities, low-income homeowner groups, a wide-range of regional and national energy efficiency and environmental organizations, many levels of government, business and labor coalitions, and as well as many of the typical participants in the ICC process.

Cost Impact: This proposal will increase the cost of construction.

PART I – IECC

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

PART II – IRC BUILDING/ENERGY

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

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