

RE36-19

IECC: TABLE R402.1.2 (IRC N1102.1.2), TABLE R402.1.4 (IRC N1102.1.4), R402.2.1 (IRC N1102.2.1)

Proponent: William Fay, Energy-Efficient Codes Coalition, representing Energy-Efficient Codes Coalition (bfay@ase.org); Daniel Bresette, Alliance to Save Energy, representing Alliance to Save Energy (dbresette@ase.org); Maureen Guttman, BCAP-IBTS, representing BCAP-IBTS (mguttman@bcapcodes.org); Harry Misuriello, American Council for an Energy-Efficient Economy, representing American Council for an Energy-Efficient Economy (misuriello@verizon.net)

2018 International Energy Conservation Code

Revise as follows:

**TABLE R402.1.2 (IRC N1102.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT***

CLIMATEZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZEDFENESTRATION SHGC ^{b, e}	CEILINGR-VALUE	WOODFRAME WALL R-VALUE	MASSWALL R-VALUE ⁱ	FLOORR-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWLSPACE ^e WALLR-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.32	0.55	0.25	38	20 or 13+5 ^h	8/13	19	5/13 ^f	0	5/13
4 except Marine	0.32	0.55	0.40	49 60	20 or 13+5 ^h	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.30	0.55	NR	49 60	20 or 13+5 ^h	13/17	30 ^g	15/19	10, 2 ft	15/19
6	0.30	0.55	NR	49 60	20+5 ^h or 13+10 ^h	15/20	30 ^g	15/19	10, 4 ft	15/19
7 and 8	0.30	0.55	NR	49 60	20+5 ^h or 13+10 ^h	19/21	38 ^g	15/19	10, 4 ft	15/19

NR = Not Required. For SI: 1 foot = 304.8 mm.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.

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

Exception: In Climate Zones 1 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

c. "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation on the interior of the basement wall. "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. Alternatively, compliance with "15/19" shall be R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home.

d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs, as indicated in the table. The slab edge insulation for heated slabs shall not be required to extend below the slab.

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 R301.1 and Table R301.1.

g. Alternatively, insulation sufficient to fill the framing cavity and providing not less than an *R*-value of R-19.

h. The first value is cavity insulation, the second value is continuous insulation. Therefore, as an example, "13+5" means R-13 cavity insulation plus R-5 continuous insulation.

i. Mass walls shall be in accordance with Section R402.2.5. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.

**TABLE R402.1.4 (IRC N1102.1.4)
EQUIVALENT U-FACTORS^a**

CLIMATEZONE	FENESTRATIONU-FACTOR	SKYLIGHTU-FACTOR	CEILINGU-FACTOR	FRAMEWALL U-FACTOR	MASS WALL U-FACTOR ^b	FLOORU-FACTOR	BASEMENTWALL U-FACTOR	CRAWLSPACE WALL U-FACTOR
1	0.50	0.75	0.035	0.084	0.197	0.064	0.360	0.477
2	0.40	0.65	0.030	0.084	0.165	0.064	0.360	0.477
3	0.32	0.55	0.030	0.060	0.098	0.047	0.091 ^c	0.136
4 except Marine	0.32	0.55	0.026 0.024	0.060	0.098	0.047	0.059	0.065

5 and Marine 4	0.30	0.55	0.026 0.024	0.060	0.082	0.033	0.050	0.055
6	0.30	0.55	0.026 0.024	0.045	0.060	0.033	0.050	0.055
7 and 8	0.30	0.55	0.026 0.024	0.045	0.057	0.028	0.050	0.055

- a. Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source.
- b. Mass walls shall be in accordance with Section R402.2.5. Where more than half the insulation is on the interior, the mass wall *U*-factors shall not exceed 0.17 in Climate Zone 1, 0.14 in Climate Zone 2, 0.12 in Climate Zone 3, 0.087 in Climate Zone 4 except Marine, 0.065 in Climate Zone 5 and Marine 4, and 0.057 in Climate Zones 6 through 8.
- c. In warm-humid locations as defined by Figure R301.1 and Table R301.1, the basement wall *U*-factor shall not exceed 0.360.

R402.2.1 (IRC N1102.2.1) Ceilings with attic spaces. Where Section R402.1.2 requires R-38 insulation in the ceiling, installing R-30 over 100 percent of the ceiling area requiring insulation shall satisfy the requirement for R-38 wherever the full height of uncompressed R-30 insulation extends over the wall top plate at the eaves. Where Section R402.1.2 requires R-49 insulation in the ceiling, installing R-38 over 100 percent of the ceiling area requiring insulation shall satisfy the requirement for R-49 insulation wherever the full height of uncompressed R-38 insulation extends over the wall top plate at the eaves. Where Section R402.1.2 requires R-60 insulation in the ceiling, installing R-49 over 100 percent of the ceiling area requiring insulation shall satisfy the requirement for R-60 insulation wherever the full height of uncompressed R-49 insulation extends over the wall top plate at the eaves. This reduction shall not apply to the *U*-factor alternative approach in Section R402.1.4 and the Total UA alternative in Section R402.1.5.

Reason: The purpose of this code change proposal is to improve comfort and save energy for homeowners in climate zones 4 - 8 by upgrading and increasing ceiling insulation requirements from R-49 to R-60. Small improvements to the thermal envelope can have a significant beneficial impact, particularly in light of a home's long expected useful life. Insulation in particular may not be changed for many decades and may last for the full useful life of the building, providing consistent comfort and energy saving benefits over that period. Making long-lived, life cycle cost beneficial improvements is consistent with the intent of the IECC (R101.3), which is to "regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building." Using DOE's cost-effectiveness methodology, we found these R-value improvements would provide substantial life cycle cost benefits:

Climate Zone	Annual Energy Cost Savings
4	0.6%
5	0.7%
6	0.6%
7	0.5%
8	0.4%

These proposed changes are also within the range specified by the U.S. DOE's insulation guidelines for these climate zones. <https://www.energy.gov/energysaver/weatherize/insulation> A home with adequate insulation will maintain more consistent interior temperatures during both heating and cooling seasons and will be more resilient and livable in the event of extreme weather events and power outages.

Bibliography: *Insulation*, U.S. Dep't of Energy, <https://www.energy.gov/energysaver/weatherize/insulation> (last accessed Dec. 30, 2018). U.S. Dep't of Energy, *Methodology for Evaluating Cost-Effectiveness of Residential Energy Code Changes* (Aug. 2015), available at <https://www.enr.com/resources/documents/2015/08/04/methodology-for-evaluating-cost-effectiveness-of-residential-energy-code-changes>.

Cost Impact: The code change proposal will increase the cost of construction. Requiring more insulation will increase the cost of construction, but the resulting energy and cost savings will recoup the initial costs and will continue to benefit consumers over the useful life of the home.