1322.0402 SECTION R402, BUILDING THERMAL ENVELOPE.

Subpart 1. **Table R402.1.1.** IECC Table R402.1.1 is amended to read as follows:

Table R402.1.1 Insulation and fenestration requirements by component.[a]

Climate Zone	Fenestration U-Factor[b]	Skylight[b] U-Factor	Glazed Fenestration SHGC[b,e]	Ceiling[j] R-Value	Wood Frame Wall R-Value[f]
6	0.32	0.55	NR	49	20, 13+5
7	0.32	0.55	NR	49	21

Table R402.1.1 Insulation and fenestration requirements by component.

Mass Wall R-Value[i,g,h]	Floor R-Value	Basement Wall R-Value[c,i]	Slab R-Value and Depth[d]	Crawl Space Wall R-Value[c,i]
15/20	30[e]	15	10, 3.5 ft	15
19/21	38[e]	15	10, 5 ft	15

For SI: 1 foot = 304.8 mm.

a. R-values are minimums. U-factors and SHGC are maximums. When 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 not be 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.

c. See section R402.2.8.

d. Insulation R-values for heated slabs shall be installed to the depth indicated or to the top of the footing, whichever is less.

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

f. First value is cavity insulation, second is continuous insulation or insulated siding, so "13+5" means R-13 cavity insulation plus R-5 continuous insulation or insulated siding. If structural sheathing covers 40 percent or less of the exterior, the continuous insulation R-value is permitted to be reduced by no more than R-3 in the locations where structural sheathing is used to maintain a consistent total sheathing thickness.

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

h. When using log-type construction for thermal mass walls the following applies:

(1) a minimum of a 7-inch diameter log shall be used; and

(2) the U-value of fenestration products shall be 0.29 overall on average or better.

i. See section 402.2.8. A minimum R-19 cavity insulation is required in wood foundation walls.

j. Roof/ceiling assemblies shall have a minimum 6-inch energy heel.

Subp. 2. **Section R402.1.1 Insulation and fenestration criteria.** IECC section R402.1.1 is amended to read as follows:

R402.1.1 Insulation, waterproofing, and fenestration criteria. The building thermal envelope shall meet the requirements of Table R402.1.1 based on the climate zone specified in chapter 3, and the requirements contained in section R402.2. Cast-in-place concrete and masonry block foundation walls shall be waterproofed according to IRC section R406 and the following requirements:

1. The waterproofing shall extend from the top interior wall edge, across the top of the wall, and down the exterior wall face to the top of the footing. If a full width, closed-cell material is installed to create a seal between the sill plate and the top of the foundation wall, the installation is deemed to meet the requirements for the top of the wall waterproofing.

2. If the walls are exposed to the exterior environment, the waterproofing system shall have a rigid, opaque, and weather-resistant protective covering to prevent degradation of the waterproofing system. The protective covering shall cover the exposed waterproofing and extend a minimum of 6 inches (152 mm) below grade. The protective covering system shall be flashed in accordance with IRC section R703.8.

R402.1.1.1 Integral foundation insulation requirements. Any insulation assembly installed integral to the foundation walls shall be manufactured for that intended use and installed according to the manufacturer's installation instructions.

R402.1.1.2 Exterior draining foundation insulation requirements. Any insulation assembly installed on the exterior of the foundation walls and on the perimeter of slabs-on-grade that permits water drainage shall:

1. be made of water-resistant materials manufactured for that intended use;

2. be installed according to the manufacturer's installation instructions;

3. comply with either ASTM C578, C612, or C1029, as applicable; and

4. have a rigid, opaque, and weather-resistant protective covering to prevent the degradation of the insulation's thermal performance. The protective covering shall cover the exposed exterior insulation and extend a minimum of 6 inches (152 mm) below grade. The insulation and protective covering system shall be flashed in accordance with IRC section R703.8.

R402.1.1.3 Exterior nondraining foundation insulation requirements. Any insulation assembly installed on the exterior of the foundation walls or on the perimeter of slabs-on-grade that does not permit bulk water drainage shall:

1. be made of water-resistant materials manufactured for that intended use;

2. be installed according to the manufacturer's installation instructions;

3. comply with either ASTM C578 or C1029, as applicable;

4. be covered with a 6-mil polyethylene slip sheet over the entire exterior surface; and

5. have a rigid, opaque, and weather-resistant protective covering to prevent degradation of the insulation's thermal performance. The protective covering shall cover the exposed exterior insulation and extend a minimum of 6 inches (152 mm) below grade. The insulation and protective covering system shall be flashed in accordance with IRC section R703.8.

R402.1.1.4 Interior foundation insulation requirements. Any insulation assembly installed on the interior of foundation walls shall meet the following requirements:

1. Masonry foundation walls shall be drained through each masonry block core to an approved interior drainage system.

2. If a frame wall is installed, it shall not be in direct contact with the foundation wall.

3. The insulation assembly shall comply with the interior air barrier requirements of section R402.4.

4. The insulation assembly shall comply with section R402.1.1.5, R402.1.1.6, or R402.1.1.7, as applicable.

R402.1.1.5 Rigid interior insulation. Rigid interior insulation shall comply with ASTM C578 or ASTM C1289 and the following requirements:

1. For installation:

   a. the insulation shall be in contact with the foundation wall surface;

   b. vertical edges shall be sealed with acoustic sealant;

   c. all interior joints, edges, and penetrations shall be sealed against air and water vapor penetration;

   d. continuous acoustic sealant shall be applied horizontally between the foundation wall and the insulation at the top of the foundation wall; and

   e. continuous acoustic sealant shall be applied horizontally between the basement floor and the bottom insulation edge.

2. The insulation shall not be penetrated by the placement of utilities, fasteners, or connectors used to install a frame wall, with the exception of through penetrations.

3. Through penetrations shall be sealed around the penetrating products.

R402.1.1.6 Spray-applied interior foam insulation. Spray-applied interior foam insulation shall comply with the following:

1. Closed-cell foam:

   a. The foam shall comply with ASTM C1029 and have a permeance not greater than 0.8, in accordance with ASTM E96 procedure A, and a permeance of not less than 0.3, in accordance with ASTM E96 procedure B.

   b. The foam shall be sprayed directly onto the foundation wall surface. There shall be a 1-inch minimum gap between the foundation wall surface and any framing.

   c. The insulation surface shall not be penetrated by the placement of utilities, fasteners, or connectors used to install a frame wall, with the exception of through penetrations.

   d. Through penetrations shall be sealed around the penetrating products.

2. Open-cell foam:

   a. The foam shall be sprayed directly onto the foundation wall surface. There shall be a 1-inch minimum gap between the foundation wall surface and any framing.

b. The insulation surface shall not be penetrated by the placement of utilities, fasteners, or connectors used to install a frame wall, with the exception of through penetrations.

c. Through penetrations shall be sealed around the penetrating product.

d. A vapor retarder and air barrier shall be applied to the warm-in-winter side of the assembly with a permeance not greater than 1.0, in accordance with ASTM E96 procedure A, and a permeance not less than 0.3, in accordance with ASTM E96 procedure B.

R402.1.1.7 Fiberglass batt interior insulation. Fiberglass batt insulation shall comply with the following:

1. The above-grade exposed foundation wall height shall not exceed 1.5 ft.

2. The top and bottom plates shall be air sealed to the foundation wall surface and the basement floor.

3. A vapor retarder and air barrier shall be applied to the warm in winter side of the wall with a permeance not greater than 1.0 in accordance with ASTM E96 procedure A and a permeance not less than 0.3 in accordance with ASTM E96 procedure B meeting the following requirements:

a. the vapor and air barrier shall be sealed to the framing with construction adhesive or equivalent at the top and bottom plates and where the adjacent wall is insulated;

b. the vapor and air barrier shall be sealed around utility boxes and other penetrations; and

c. all seams in the vapor and air barrier shall be overlapped at least 6 inches and sealed with compatible sealing tape or equivalent.

R402.1.1.8 Foundation wall insulation performance option. Insulated foundation systems designed and installed under the performance option shall meet the requirements of this section and the foundation, basement, or crawl space wall equivalent U-factor from Table 402.1.3.

1. **Water separation plane.** The foundation shall be designed and built to have a continuous water separation plane between the interior and exterior. The interior side of the water separation plane shall:

a. have a stable annual wetting and drying cycle whereby foundation wall system water (solid, liquid, and vapor) transport processes produce no net accumulation of ice or water over a full calendar year and the foundation wall system is free of absorbed water for at least 4 months over a full calendar year;

b. prevent conditions of moisture and temperature to prevail for a time period favorable to mold growth for the material used; and

c. prevent liquid water from the foundation wall system from reaching the foundation floor system at any time during a full calendar year.

2. **Documentation.** The foundation insulation system designer shall provide documentation certified by a professional engineer licensed in Minnesota demonstrating how the requirements of this section are fulfilled. The foundation insulation system designer shall also specify the design conditions for the wall and the design conditions for the interior space for which the water separation plane will meet the requirements of this section. The foundation insulation system designer shall provide a label disclosing these design conditions. The label shall be posted according to section R401.3.

3. **Installation.** The water separation plane shall be designed and installed to prevent external liquid or capillary water flow across it after the foundation is backfilled.

4. **Foundation air barrier.** The foundation insulation system shall be designed and installed to have a foundation air barrier system between the interior and the exterior. The foundation air barrier system shall be a material or combination of materials that is continuous with all joints sealed and is durable for the intended application. Material used for the foundation air barrier system shall have an air permeability not to exceed 0.004 $ft^3/min.ft^2$ under a pressure differential of 0.3 inches water (1.57 psf) (0.02 $L/s.m^2$ at 75Pa) as determined by either commonly accepted engineering tables or by being labeled by the manufacturer as having these values when tested according to ASTM E2178.

Subp 3. **Section R402.2.8, Basement walls.** IECC section R402.2.8, Basement walls, is amended to read as follows:

R402.2.8 Basement walls. Walls associated with conditioned basements shall be insulated from the top of the basement wall down to 10 feet (3048 mm) below grade or to the top of the footing, whichever is less. Foundation insulation shall be

installed according to the manufacturer's installation instructions. Walls associated with unconditioned basements shall meet the requirements of this section unless the floor overhead is insulated in accordance with sections R402.1.1 and R402.2.7 and the following requirements:

a. R-15 insulation for concrete and masonry foundations shall be installed according to R402.1.1.1 to R402.1.1.8 and a minimum of a R-10 shall be installed on the exterior of the wall. Interior insulation, other than closed cell spray foam, shall not exceed R-11. Foundations shall be waterproofed in accordance with the applicable provisions of the International Residential Code (IRC).

Exception: R-10 continuous insulation on the exterior of each foundation wall shall be permitted to comply with this code if the tested air leakage rate required in section R402.4.1.2 does not exceed 2.6 air changes per hour and the total square feet between the finished grade and the top of each foundation wall does not exceed 1.5 multiplied by the total lineal feet of each foundation wall that encloses conditioned space. Interior insulation, other than closed cell spray foam, shall not exceed R-11. See footnote c to Table R402.2.1.

b. Minimum R-19 cavity insulation is required in wood foundation walls. See footnote 1 to Table R402.2.1.

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