

## Issued Errata

The following is errata for the published 2021 Oregon Residential Specialty Code (ORSC), which is based on the 2018 International Residential Code (IRC).

The division issues errata for an adopted specialty code when there was a mistake in the printing of the integrated codebook, or a referenced section needs to be corrected in alignment with another section or code.

Notes for the reader are annotated in *italics and blue text*.

## Chapter 2 Definitions

*The definition of “Building Code” and “Story above grade plane” were mistakenly left out of the published codebook.*

*(added April 2022)*

**BUILDING CODE.** *Shall mean the Oregon Structural Specialty Code as adopted by OAR 918-460-0010.*

*(added May 2022)*

**STORY ABOVE GRADE PLANE.** *Any story having its finished floor surface entirely above grade plane, or in which the finished surface of the floor next above is either of the following:*

- 1. More than 6 feet (1829 mm) above grade plane.*
- 2. More than 12 feet (3658 mm) above the finished ground level at any point.*

## Chapter 3 Building Planning

**TABLE R301.2(1)  
CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA**

*The footnote for the basic design wind speed of Umatilla is replaced with “i” and the footnote, “j” for the special wind region basic design wind speed of Wasco is moved to the basic design wind speed column.*

Umatilla	Note a	102 <sup>i</sup>	-	Note c	Severe	24	Slight	≤ 1,500
Wasco	Note a	99 <sup>j</sup>	110 <sup>f</sup>	Note c	Severe	24	Slight	≤ 1,500

- i. The basic design wind speed, V, for buildings and structures in this region with full exposure (wind Exposure Category D) to Columbia River Gorge winds shall be 135 mph.
- j. The basic design *wind speed*, V, for buildings and structures in this region with full exposure (wind Exposure Category D) to Columbia River Gorge winds shall be 120 mph.

**TABLE R301.2(1)  
EXTERIOR WALLS**

*The struck language below was mistakenly left in the codebook and should have been deleted.*

EXTERIOR WALL ELEMENT		MINIMUM FIRE-RESISTANCE RATING	FIRE SEPARATION DISTANCE PROVIDED
Walls	Fire-resistance rated	1 hour—tested in accordance with ASTM E119 or UL 263 with exposure from both sides	< 3 feet
	Not fire-resistance rated	0 hours	≥ 3 feet
Projections <sup>c</sup>	Not allowed	N/A	< 2 feet
	Fire-resistance rated	1 hour on the underside <sup>a, b</sup>	≥ 2 feet to < 3 feet
	Not fire-resistance rated	0 hours	≥ 3 feet
Openings in walls	Not allowed	N/A	< 3 feet
	<del>25% maximum of wall area</del>	<del>0 hours</del>	<del>3 feet</del>
	Unlimited	0 hours	≥ 3 feet
Penetrations	All	Comply with Section R302.4	< 3 feet
		None required	≥ 3 feet

## Chapter 4 Foundations

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*In Section R408.1, the language annotated in blue/underline text was mistakenly omitted from the codebook. For new construction in Baker, Clackamas, Hood River, Multnomah, Polk, Washington and Yamhill counties where radon-mitigating construction is required, the minimum net area of ventilation openings is not permitted to be reduced for naturally ventilated crawl spaces.*

**R408.1 Ventilation.** The under-floor space between the bottom of the floor joists and the earth under any building (except space occupied by a *basement*) shall have ventilation openings through foundation walls or exterior walls. The ground surface of the under-floor space shall be covered by a Class I vapor retarder, or other *approved* material, lapped not less than 12 inches (305 mm) at the joints and extended not less than 12 inches (305 mm) up perimeter foundation walls.

The minimum net area of ventilation openings shall be not less than 1 square foot (0.0929 m<sup>2</sup>) for each 150 square feet (14 m<sup>2</sup>) of under-floor space area.

The minimum net area of ventilation openings may be reduced to 1 square foot (0.0929 m<sup>2</sup>) for each 1,500 square feet (140 m<sup>2</sup>) of under-floor space area where the ground surface is covered by the required Class I vapor retarder.

The minimum net area of ventilation openings is not permitted to be reduced for naturally ventilated crawl spaces in new construction in Baker, Clackamas, Hood River,

Multnomah, Polk, Washington and Yamhill counties where radon-mitigating construction is required.

The required ventilation openings shall be placed to provide cross ventilation of the space. One such ventilation opening shall be within 3 feet (914 mm) of each corner of the building.

### Exceptions:

1. Ventilation openings are not required on one side.
2. Ventilation openings are not required where a continuously operated mechanical ventilation system is installed. The system shall be designed to have the capacity to exhaust a minimum of 1.0 CFM (0.5 L/s) for each 50 square feet (4.6 L/s) of under-floor area. The ground surface shall be covered with a Class I vapor retarder, or other approved material.
3. Ventilation openings in *townhouses* are not required on two sides when adjoining adjacent *townhouses*.

## Chapter 6 Wall Construction

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*Section R602.10.4.4 is revised as follows:*

**R602.10.4.4 Panel joints.** Vertical joints of panel sheathing shall occur over and be fastened to common studs. Horizontal joints of panel sheathing in *braced wall panels* shall occur over and be fastened to common blocking of a thickness of 1½ inches (38 mm) or greater.

### Exceptions:

1. For methods WSP and CS-WSP, blocking of horizontal joints is permitted to be omitted when adjustment factor No. 8 of Table R602.10.3(2) or No. 10 ~~9~~ of Table R602.10.3(4) is applied.
2. Vertical joints of panel sheathing shall be permitted to occur over double studs, where adjoining panel edges are attached to separate studs with the required panel edge fastening schedule, and the adjacent studs are attached together with two rows of 10d box nails [3 inches by 0.128 inch (76.2 mm by 3.25 mm)] at 10 inches o.c. (254 mm).
3. Blocking at horizontal joints shall not be required in wall segments that are not counted as *braced wall panels*.
4. Where Method GB panels are installed horizontally, blocking of horizontal joints is not required.

## Chapter 8 Roof-Ceiling Construction

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*In Section R806.5, item no. 6.3. is revised by removing the incorrect reference to Table R806.5 for condensation control.*

**R806.5 Unvented attic and unvented enclosed rafter assemblies.** Unvented *attics* and unvented enclosed roof framing assemblies created by ceilings that are applied directly to the underside of the roof framing members and structural roof sheathing applied directly to the top of the roof framing members/rafters, shall be permitted where all the following conditions are met:

...

- 6.3. Where both *air-impermeable* and *air-permeable insulation* are provided, the *air-impermeable insulation* shall be applied in direct contact with the underside of the structural roof sheathing to an insulation level not less than R-20 ~~and shall be in accordance with the R values in Table R806.5 for condensation control.~~ The *air-permeable insulation* shall be installed directly under the *air-impermeable insulation*.

## Chapter 11 Energy Efficiency

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*Table N1101.1(1), Footnote "j" is revised as follows:*

- j. Sliding glass doors shall comply with window performance requirements. Windows exempt from testing in accordance with Section [NF1114.2, Item 1](#) ~~NF1114.2, Item 3~~ shall comply with window performance requirements if constructed with thermal break aluminum or wood, or vinyl, or fiberglass frames and double-pane glazing with low-emissivity coatings of 0.10 or less. Buildings designed to incorporate passive solar elements may include glazing with a *U*-factor greater than 0.35 by using Table N1104.1(1) to demonstrate equivalence to building envelope requirements.

*Sections N1105.3 is revised as follows:*

**N1105.3 Installation of ducts.** All new duct systems and air handling equipment and appliances shall be located fully within the building thermal envelope.

**Exceptions:**

1. Ventilation intake ductwork and exhaust ductwork.
2. Up to 5 percent of the length of an HVAC system ~~ductwork~~ shall be permitted to be located outside of the thermal envelope.
3. Ducts deeply buried in insulation in accordance all of the following:
  - 3.1. Insulation shall be installed to fill gaps and voids between the duct and the ceiling, and a minimum of R-19 insulation shall be installed above the duct between the duct and unconditioned attic.
  - 3.2. Insulation depth marker flags shall be installed on the ducts every 10 feet (3048 mm) or as *approved* by the *building official*.

*Section N1105.4.3 is revised as follows:*

**N1105.4.3 Temperature zoning.** Each separate heating, ventilating and air-conditioning system shall be provided [with](#) at least one thermostat for regulation of space temperature. In addition, a readily accessible manual or automatic means shall be provided to partially restrict or shut off the heating or cooling input to each zone or floor, excluding unheated or noncooled basements and garages.

*Section N1105.6 is renumbered:*

**[N1105.7](#) ~~N1105.6~~ Furnace fan efficiency.** New central furnaces shall have electronically commutated fan motors with a fan efficiency rating meeting 10 CFR 430.32(y).

The following sections are added to Chapter 11.

### PART III FENESTRATION STANDARD

#### SECTION NF1110 SCOPE

**NF1110.1 General.** All windows installed in Oregon shall meet the requirements of this section.

#### SECTION NF1111 ALTERATIONS

**NF1111.1 Windows.** Windows shall be tested and labeled in accordance with Section N1104.4.

The following information is reprinted for the reader's convenience:

**N1104.4 Windows.** All windows installed in Oregon shall meet the requirements of Part III, Fenestration Standard.

1. Decorative or unique architectural feature glazing not exceeding 1 percent of the heated space floor area is exempt from thermal performance requirements and does not need to be included in Table N1104.1(1) thermal performance calculations.
2. Glass block assemblies may use a U-factor of 0.51.

The U-factor for windows may be a weighted average of total window area when all other building envelope measures comply with the performance requirements specified in this code. This calculation shall be provided to the *building official* and the windows that are less than required for prescriptive compliance shall be identified on the plans.

#### SECTION NF1112 DEFINITIONS

**NF1112.1 General.** For purposes of this section the following definitions are provided:

**WINDOWS PRODUCED IN LOW VOLUME** are a manufacturer's product installed in Oregon during a calendar year that does not exceed: 750 windows, 500 glazed doors, 1,000 skylights covered in Section NF1114.2 and 25 complete sun-rooms/solariums.

**MANUFACTURER** produces windows, assembles window components or does both. A "manufacturer" includes its subsidiaries, divisions and all other companies under common control or ownership.

**SUNROOM/SOLARIUM.** A one-story structure attached to a dwelling with a glazing area in excess of 40 percent of the gross area of that structure's exterior walls and roof.

**ALUMINUM WITH VINYL.** Fenestration framing material consisting of a composite of both aluminum and vinyl framing constructed in a manner where the aluminum framing is provided a complete thermal break by the vinyl framing.

#### SECTION NF1113 INSULATED GLASS CERTIFICATION

**NF1113.1 General.** Sealed insulated glass units shall conform to, or be in test for, ASTM E774-97 *Standard Practice for Evaluating Solar Absorptive Materials for Thermal Applications*, as Class A under a Sealed Insulated Glass Manufacturers Association (SIGMA) approved certification program and installed in accordance with the SIGMA glazing specifications.

#### SECTION NF1114 WINDOW THERMAL PERFORMANCE DESIGNATION FOR NEW BUILDINGS AND ADDITIONS

*The requirements of this section are not intended to waive or supersede any window thermal performance requirements under state or federal laws.*

**NF1114.1 Manufactured windows.** U-factors for manufactured fenestration products (windows, skylights and doors) shall be determined in accordance with the National Fenestration Rating Council (NFRC) 100 2001 Procedure for Determining Fenestration Product U-Factors. The U-factors shall be labeled and certified in accordance with the NFRC Product Certification.

**NF1114.2 Windows products exempt from testing.** The following products are exempt from thermal performance testing as specified in Section NF1114.1.

1. Windows produced in low volume.
2. Glazing not exceeding 1 percent of the heated space floor area.
3. Solariums and sunrooms.
4. Skylights constituting no more than 10 percent of total glazing in a residential building.
5. Skylights constructed with wood, thermal break aluminum or aluminum with vinyl frames with a glazing configuration of either: a minimum 0.5-inch (12.7 mm) space between the panes and low-e glass; or triple layered acrylic.

**NF1114.2.1 Thermal performance of exempted products.** The thermal performance of window products exempted from testing shall be determined by the following procedures:

1. Windows produced in low volume are assigned default U-factors as specified in Section NF1114.3, Item 1.
2. Glazed doors produced in low volume are assigned default U-factors as specified in Section NF1114.3, Item 2.
3. Skylights produced in low volume are assigned default U-factors as specified in Section NF1114.3, Item 3.
4. Skylights constituting no more than 10 percent of total glazing in a residential building that are exempt from testing are assigned default U-factors as specified in Section NF1114.3, Item 3.
5. Vertical and overhead glazing contained in sunrooms/solariums are assigned default U-factors as specified in Section NF1114.3, Items 1, 2 and 4.
6. Skylights specified in Section NF1114.2, Item 5 shall be assigned a default U-factor of 0.50.

**NF1114.3 Thermal performance validation for windows produced in low volume or site-built.** Windows, glazed doors, skylights and sunroom/solariums produced in low volume and meeting the requirements of this subsection may validate default U-factors:

1. By using Table NF1114.3(1) for windows,
2. By using Table NF1114.3(2) for glazed doors,
3. By using Table NF1114.3(1) for skylights based on an overall *U*-factor of U-0.50.
4. By using Table NF1114.3(1) for overhead glazing installed in sunrooms/solariums based on an overall *U*-factor of U-0.35.

## SECTION NF1115 THERMAL PERFORMANCE LABELING

*The requirements of this section are not intended to waive or supersede any window label or disclosure requirements under state or federal laws.*

**NF1115.1 Labels.** Labels shall be either:

1. National Fenestration Rating Council (NFRC) certified product; or
2. State-approved labels.

Labeling is not required for glazing not exceeding one percent of the heated space floor area and is exempt from Table N1104.1(1) thermal performance calculations.

**NF1115.2 Label description.** All windows shall have state-approved labeling except as provided in Section NF1115.1, Item 1.

### Exceptions:

1. Labeling is not required for glazing not exceeding 1 percent of the heated space floor area.
2. Portions of labels for windows produced in low volume may be handwritten.

**NF1115.2.1 Windows produced in low volume labels.** Labels for windows produced in low volume under NF1112(1), due to its frame and glazing configuration shall:

1. Specify window components;
2. Show the allowed *U*-factor in the appropriate location;
3. Show a production count number that does not exceed the maximums established in NF1112(1);
4. Imprint “(Manufacturer’s name) certifies the attached window is constructed in a manner to obtain the specified *U*-factor” or “(Manufacturer’s name) certifies the attached skylight complies with the criteria specified in the Oregon building codes”;
5. Be imprinted, not handwritten;
6. Face the interior of the room; and
7. Remain attached to the window until the building inspector inspects and verifies the labeling.

**NF1115.3 Labels for skylights exempted from thermal performance standards.** Labels for skylights exempt from thermal performance standards under Section NF1114.2, Item 5, because of its frame and glazing configuration shall:

1. Specify skylight components;
2. State “U-0.50 Default *U*-factor”;
3. State “Limited Production Skylight Compliance *U*-factor Label” and “Maximum Allowable Skylight Area Shall Not Exceed Two Percent of the Heated Space Floor Area”;
4. Show a production count number that does not exceed the maximums established in Section NF1112.1.

5. Imprint “(Manufacturer’s name) certifies the attached skylight complies with the criteria specified in the Oregon building codes;”
6. Contain the statement, “This skylight is not required to be tested or evaluated for thermal performance”;
7. State “EXEMPT” in 0.75-inch (20 mm) high letters;
8. Specify “Issued (Date of issue)”;
9. Contain the statement, “Under ORS 455.525(4) this skylight is deemed to comply with Oregon’s thermal performance standards regardless of *U*-factor.”

**NF1115.4 Labels for sunrooms/solariums produced in low volume or exempted from testing.** Labels for solariums and sunrooms produced in low volume or with 0.5-inch (12.7 mm) airspace between the glazing shall:

1. Specify the components for each of the glazed surfaces, such as the front, overhead, and each side;
2. Show a production count number that does not exceed the maximums established in Section NF1112;
3. Show the *U*-factor determined by Section NF1114.2.1, Item 5 or NF1114.3, Item 4 for each of the glazed surfaces;
4. Imprint “(Manufacturer’s name) certifies the components of this sunroom or solarium are constructed in a manner to obtain the specified *U*-factor”; and
5. Have one label providing a description of each of the glazed surfaces.

**NF1115.5 Labels for skylights exempt from testing.** Labels for skylights that are exempt from testing in accordance with Section NF1114.2(4) shall:

1. Specify skylight components;
2. State “Calculated *U*-factor Skylight Compliance Label”;
3. State *U*-factor determined by Section NF1114.2.1, Item 4; and
4. Show a production count number that does not exceed the maximums established in Section NF1112.

**NF1115.6 Combined products.** When different window types are combined, mulled together by the manufacturer or manufactured to fit a framed rough opening, a single label may be used.

**Exception:** A skylight/solarium shall have one label providing a description of each of the glazed surfaces, such as the front, overhead, and each side.

**NF1115.7 Label distribution.** Labels provided under Section NF1114.2 shall be designed by the division and sold by persons authorized by the agency and shall not be sold in lots exceeding the maximums for each window type per manufacturer during any calendar year.

## SECTION NF1116 AIR LEAKAGE REQUIREMENTS

**NF1116.1 General.** Windows shall comply with the air leakage requirements of Section N1104.8.

**Exception:** Site-built windows.

**TABLE NF1114.3(1)**  
**APPROVED WINDOW DEFAULT U-VALUES<sup>a, b</sup>**

DESCRIPTION <sup>c, d, e, f, g</sup> (inches)	FRAME TYPE <sup>h</sup>		
	ALUMINUM THERMAL BREAK <sup>i</sup>	WOOD/VINYL	ALUMINUM CLAD WOOD/REINFORCED VINYL <sup>j</sup>
Double, Clear 1/4	N/A	0.56	0.59
Double, Clear 1/4 + argon	0.63	0.53	0.56
Double, Low-e 4, 1/4	0.61	0.52	0.54
Double, Low-e 2, 1/4	0.58	0.49	0.51
Double, Low-e 1, 1/4	0.55	0.47	0.49
Double, Low-e 4, 1/4 + argon	0.55	0.47	0.49
Double, Low-e 2, 1/4 + argon	0.52	0.43	0.46
Double, Low-e 1, 1/4 + argon	0.50	0.41	0.43
Double, Clear 3/8	0.63	0.54	0.57
Double, Clear 3/8 + argon	0.60	0.51	0.54
Double, Low-e 4, 3/8	0.57	0.48	0.51
Double, Low-e 2, 3/8	0.54	0.45	0.48
Double, Low-e 1, 3/8	0.51	0.43	0.46
Double, Low-e 4, 3/8 + argon	0.53	0.44	0.47
Double, Low-e 2, 3/8 + argon	0.49	0.41	0.44
Double, Low-e 1, 3/8 + argon	0.47	0.39	0.41
Double, Clear 1/2	0.60	0.50	0.54
Double, Clear 1/2 + argon	0.58	0.48	0.51
Double, Low-e 4, 1/2	0.53	0.44	0.47
Double, Low-e 2, 1/2	0.50	0.41	0.44
Double, Low-e 1, 1/2	0.47	0.39	0.42
Double, Low-e 4, 1/2 + argon	0.50	0.42	0.44
Double, Low-e 2, 1/2 + argon	0.46	0.37	0.40
Double, Low-e 1, 1/2 + argon	0.43	0.35	0.38
Triple, Clear 1/4	0.52	0.42	0.44
Triple, Clear 1/4 + argon	0.49	0.39	0.42
Triple, Low-e 4, 1/4	0.50	0.40	0.40
Triple, Low-e 2, 1/4	0.48	0.39	0.41
Triple, Low-e 1, 1/4	0.47	0.38	0.40
Triple, Low-e 4, 1/4 + argon	0.46	0.37	0.39
Triple, Low-e 2, 1/4 + argon	0.43	0.34	0.37
Triple, Low-e 1, 1/4 + argon	0.42	0.34	0.36
Triple, Clear 1/2	0.46	0.37	0.40
Triple, Clear 1/2 + argon	0.45	0.36	0.38
Triple, Low-e 4, 1/2	0.43	0.35	0.37
Triple, Low-e 2, 1/2	0.41	0.32	0.35
Triple, Low-e 1, 1/2	0.39	0.31	0.33
Triple, Low-e 4, 1/2 + argon	0.41	0.32	0.35
Triple, Low-e 2, 1/2 + argon	0.38	0.30	0.32
Triple, Low-e 1, 1/2 + argon	0.37	0.29	0.31

For SI: 1 inch = 25.4 mm.

- a. Subtract 0.02 from the listed default *U*-factor for insulated spacers. Insulated spacer material includes fiberglass, wood and butyl or other material with an equivalent *K*-value.
- b. Sunrooms/solariums may subtract 0.03 from the default *U*-factor.
- c. 1/4" = a minimum dead air space of 0.25 inch (6.4 mm) between the panes of glass.  
3/8" = a minimum dead air space of 0.375 inch (9.5 mm) between the panes of glass.  
1/2" = a minimum dead air space of 0.5 inch (12.7 mm) between the panes of glass.  
Products with air spaces different than those listed above shall use the value for the next smaller air space; i.e. 3/4 inch = 1/2-inch *U*-factor, 7/16 inch = 3/8-inch *U*-factor, 5/16 inch = 1/4-inch *U*-factor.
- d. Low-*e* 4 (emissivity) shall be 0.4 or less.  
Low-*e* 2 (emissivity) shall be 0.2 or less.  
Low-*e* 1 (emissivity) shall be 0.1 or less.
- e. *U*-factors listed for argon shall consist of sealed, gas-filled, insulated units for argon, CO<sub>2</sub>, SF<sub>6</sub> and argon/SF<sub>6</sub> mixtures.  
The following conversion factor shall apply to Krypton gas-filled units: 1/4-inch (6.4 mm) or greater airspace with Krypton gas fill = 1/2-inch (12.7 mm) airspace with Argon gas-fill.
- f. Dividers placed between glazing: The *U*-factors listed shall be used where the divider has a minimum gap of 1/8 inch (3.2 mm) between the divider and lite of each inside glass surface. Add 0.03 to the listed *U*-factor for True Divided Lite windows.
- g. "Glass block" assemblies may use a *U*-factor of 0.51.
- h. Insulated fiberglass framed products shall use wood/vinyl *U*-factors.

*(continued)*

**TABLE NF1114.3(1)—continued**  
**APPROVED WINDOW DEFAULT U-VALUES<sup>a, b</sup>**

- i. Aluminum Thermal Break = An aluminum thermal break framed window shall incorporate the following minimum design characteristics:
  - 1. The thermal conductivity of the thermal break material shall be not more than 3.6 Btu-in/h • ft<sup>2</sup> • °F;
  - 2. The thermal break material shall not be less than 0.210 inch; and
  - 3. All metal framing members of the product to interior and exterior air must incorporate a thermal break meeting the criteria in 1 and 2 above.
- j. Aluminum clad wood windows shall use the *U*-factors listed for Aluminum Clad Wood/Reinforced Vinyl windows. Vinyl clad windows shall use the *U*- factors listed for Wood/Vinyl windows. Any vinyl frame window with metal reinforcement in more than one rail shall use the *U*-factors listed for Aluminum Clad Wood Reinforced Vinyl windows.

**TABLE NF1114.3(2)**  
**APPROVED GLAZED DOOR DEFAULT U-VALUES<sup>a</sup>**

DESCRIPTION <sup>b, c, d, e</sup> (inches)	DOOR MATERIAL			
	INSULATED <sup>f</sup>	WOOD <sup>g</sup>		
	Full-Lite <sup>h, i</sup>	Half-Lite <sup>j, k</sup>	Full-Lite <sup>h</sup>	Half-Lite <sup>j</sup>
Double, Clear 1/4	0.39	0.31	0.47	0.42
Double, Clear 1/4 + argon	0.37	0.30	0.45	0.41
Double, Low-e 4, 1/4	0.36	0.30	0.44	0.41
Double, Low-e 2, 1/4	0.35	0.29	0.43	0.40
Double, Low-e 1, 1/4	0.24	0.28	0.41	0.39
Double, Low-e 4, 1/4 + argon	0.33	0.28	0.41	0.39
Double, Low-e 2, 1/4 + argon	0.31	0.26	0.39	0.38
Double, Low-e 1, 1/4 + argon	0.31	0.26	0.38	0.37
Double, Clear 3/8	0.37	0.30	0.45	0.41
Double, Clear 3/8 + argon	0.36	0.29	0.44	0.41
Double, Low-e 4, 3/8	0.34	0.28	0.42	0.40
Double, Low-e 2, 3/8	0.33	0.28	0.41	0.39
Double, Low-e 1, 3/8	0.21	0.26	0.38	0.37
Double, Low-e 4, 3/8 + argon	0.32	0.27	0.40	0.38
Double, Low-e 2, 3/8 + argon	0.29	0.25	0.37	0.37
Double, Low-e 1, 3/8 + argon	0.29	0.25	0.36	0.36
Double, Clear 1/2	0.36	0.29	0.44	0.41
Double, Clear 1/2 + argon	0.34	0.28	0.42	0.40
Double, Low-e 4, 1/2	0.32	0.27	0.40	0.38
Double, Low-e 2, 1/2	0.30	0.26	0.38	0.37
Double, Low-e 1, 1/2	0.19	0.25	0.36	0.36
Double, Low-e 4, 1/2 + argon	0.30	0.26	0.38	0.37
Double, Low-e 2, 1/2 + argon	0.28	0.25	0.36	0.36
Double, Low-e 1, 1/2 + argon	0.28	0.24	0.34	0.35
Triple, Clear 1/4	0.31	0.26	0.39	0.38
Triple, Clear 1/4 + argon	0.29	0.25	0.37	0.37
Triple, Low-e 4, 1/4	0.30	0.26	0.38	0.37
Triple, Low-e 2, 1/4	0.29	0.25	0.37	0.36
Triple, Low-e 4, 1/4 + argon	0.27	0.24	0.35	0.35
Triple, Low-e 2, 1/4 + argon	0.26	0.24	0.34	0.35

For SI: 1 inch = 25.4 mm.

- a. Subtract 0.02 from the listed default *U*-factor for insulated spacers. Insulated spacer material includes fiberglass, wood and butyl or other material with an equivalent *K*-value.
- b. 1/4" = a minimum dead air space of 0.25 inch (6.4 mm) between the panes of glass.  
 3/8" = a minimum dead air space of 0.375 inch (9.5 mm) between the panes of glass.  
 1/2" = a minimum dead air space of 0.5 inch (12.7 mm) between the panes of glass.  
 Products with air spaces different than those listed above shall use the value for the next smaller air space; i.e., 3/4 inch = 1/2-inch *U*-factor, 7/16 inch = 3/8-inch *U*-factor, 5/16 inch = 1/4-inch *U*-factor.
- c. Low-e 4 (emissivity) shall be 0.4 or less. Low-e 2 (emissivity) shall be 0.2 or less. Low-e 1 (emissivity) shall be 0.1 or less.
- d. *U*-factors listed for argon shall consist of sealed, gas-filled, insulated units for argon, CO<sub>2</sub>, SF<sub>6</sub> and argon/SF<sub>6</sub> mixtures. The following conversion factor shall apply to Krypton gas-filled units: 1/4-inch or greater airspace with Krypton gas fill = 1/2 -inch airspace with Argon gas-fill.
- e. Dividers placed between glazing: The *U*-factors listed shall be used where the divider has a minimum gap of 1/8 inch between the divider and lite of each inside glass surface. Add 0.03 to the listed *U*-factor for true divided lite windows.
- f. Insulated = Any urethane insulated foam core door with a thermal break. Thermal Break = A thermal break door shall incorporate the following minimum design characteristics:
  - 1. The thermal conductivity of the thermal break material shall be not more than 3.6 Btu-in/h/ft<sup>2</sup>•°F; and
  - 2. The thermal break material shall not be less than 0.210 inch.
- g. Wood = Any wood door.
- h. Full lite = A door that consists of more than 35-percent glazing.
- i. Add 0.05 to the listed *U*-factor for full-lite values if insulated door does not have a thermal break.
- j. Half lite = A door that consists of 35-percent or less glazing.
- k. Add 0.06 to the listed *U*-factor for half-lite values if the insulated door does not have a thermal break.

## Appendix F Radon Control Methods

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*The following replaces Section AF103.5.*

**AF103.5 Crawl space mitigation system.** In buildings with crawl space foundations, a system complying with Section AF103.5.1 or AF103.5.2 shall be installed during construction.

**Exception:** Buildings in which an approved mechanical crawl space ventilation system or other equivalent system is installed.

*The following sections are added to Section AF103.5.*

**AF103.5.2 Crawl space ventilation and building tightness.**

**AF103.5.2.1 Ventilation.** Crawl spaces shall be provided with vents to the exterior of the building that comply with Section R408.1 of this code. The minimum net area of ventilation openings shall not be less than 1 square foot (0.0929 m<sup>2</sup>) for each 150 square feet (14 m<sup>2</sup>) of underfloor space area.

**AF103.5.2.2 Ventilation openings.** Ventilation openings shall comply with Section R408.2. Operable louvers, dampers, or other means to temporarily stop the ventilation shall not be permitted.

**AF103.5.2.3 Building tightness.** Dwellings shall be tested with a blower door, depressurizing the dwelling to 50 Pascals from ambient conditions and found to exhibit no more than 4.0 air changes per hour. A mechanical exhaust, supply, or combination ventilation system providing whole-building ventilation rates specified in M1505.4.3 or ASHRAE 62.2 shall be installed within the *dwelling unit*.