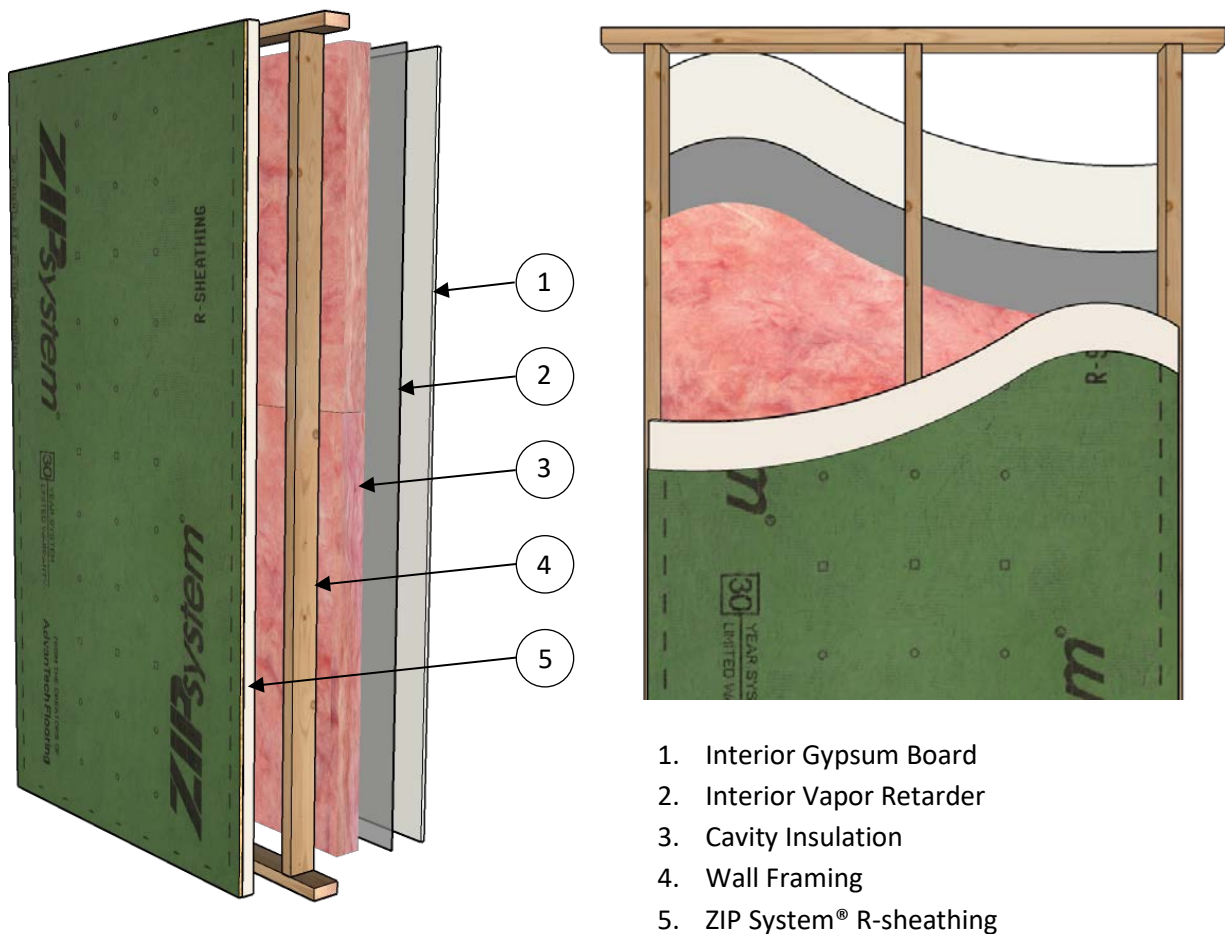


## Interior Vapor Retarder Requirements with ZIP System® R-sheathing

ZIP System® R-sheathing and other continuous insulation products provide a thermal break between the framing of the structure and the exterior environment. Continuous insulation products often carry low vapor permeance ratings which limit moisture transfer through the substrate. As a result, the International Residential Code (IRC) and International Building Code (IBC) have included guidelines on selecting the appropriate interior vapor retarder when using continuous insulation. This technical tip will address these vapor retarder requirements, explore considerations when selecting the proper vapor retarder, and explain the updates to this section in the 2021 IRC and IBC.

The models below illustrate the common sequencing of materials in a wall assembly that utilizes ZIP System R-sheathing. Reference these models when considering the proper placement of a vapor retarder (if required).



1. Interior Gypsum Board
2. Interior Vapor Retarder
3. Cavity Insulation
4. Wall Framing
5. ZIP System® R-sheathing

## Climate Zones

This map illustrates the different climate zones in the continental United States. This map can be found in Chapter 3 of the International Energy Conservation Code (IECC). This map is necessary to determine the climate zone for specific projects.

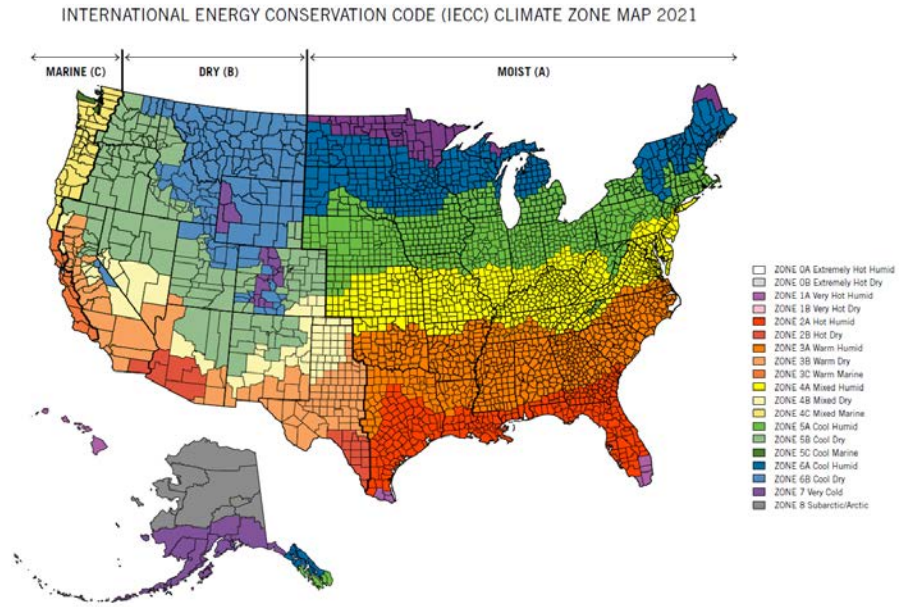


Image source: Figure R301.1 Climate Zones 2021 International Energy Conservation Code

## Vapor Retarder Overview

Vapor retarder classes are defined in Table R702.7(1) in the 2021 IRC and Table 1404.3(1) of the 2021 IBC. Vapor retarders are categorized into three classes. The perm rating range for each class and some examples of each class are shown in the table below. Class I vapor retarders have the lowest perm rating, while Class III vapor retarders have the highest perm rating.

**TABLE R702.7(1) Vapor Retarder Materials and Classes**

Class	Acceptable Materials
I	Sheet polyethylene, nonperforated aluminum foil or other approved materials with a perm rating less than or equal to 0.1.
II	Kraft-faced fiberglass batts, vapor retarder paint or other approved materials applied in accordance with the manufacturer's installation instructions for a perm rating greater than 0.1 and less than or equal to 1.0.
III	Latex paint, enamel paint or other approved materials applied in accordance with the manufacturer's installation instructions for a perm rating greater than 1.0 and less than or equal to 10.0.

Data source: Table R702.7(1) of the 2021 International Residential Code

## Exception for Class III Vapor Retarder Use

A Class I or Class II vapor retarder is typically required on the interior side of the wall assembly in climate zones Marine 4, 5, 6, 7, and 8. The use of a low permeance vapor retarder in these predominantly colder climate zones is intended to reduce the risk of moisture accumulation in the wall assembly. Continuous insulation offers little to no vapor permeance, and using a Class I vapor retarder on the interior side of the wall assembly may present the risk of allowing moisture to accumulate in the wall cavity. For that reason, reference tables are available in the IRC and IBC that permit the use of a Class III (semi-permeable) vapor retarder, assuming certain requirements are satisfied. A Class III vapor retarder is permeable enough to offer drying potential on the interior side of the wall assembly. The requirements are specific to each climate zone and are listed in *Table 702.7(3) Class III Vapor Retarders* from the 2021 International Residential Code (below). This table slightly differs from the 2018 IRC and IBC such that it now includes a higher continuous insulation R-value requirement in climate zone 8.

**TABLE R702.7(3) Class III Vapor Retarders**

Climate Zone	Class III Vapor Retarder Permitted For: <sup>a, b</sup>
Marine 4	Continuous Insulation with R-value $\geq 2.5$ over 2x4 wall
	Continuous Insulation with R-value $\geq 3.75$ over 2x6 wall
5	Continuous Insulation with R-value $\geq 5$ over 2x4 wall
	Continuous Insulation with R-value $\geq 7.5$ over 2x6 wall
6	Continuous Insulation with R-value $\geq 7.5$ over 2x4 wall
	Continuous Insulation with R-value $\geq 11.25$ over 2x6 wall
7	Continuous Insulation with R-value $\geq 10$ over 2x4 wall
	Continuous Insulation with R-value $\geq 15$ over 2x6 wall
8	Continuous Insulation with R-value $\geq 12.5$ over 2x4 wall
	Continuous Insulation with R-value $\geq 20$ over 2x6 wall

a. The requirements in this table apply only to insulation used to control moisture in order to permit the use of Class III vapor retarders. The insulation materials used to satisfy this option also contribute to but do not supersede the thermal envelope requirements of Chapter 11.

b. Spray foam insulation with a maximum permeance of 1.5 perms at the installed thickness applied to the interior side of wood structural panels, fiber board, insulated sheathing or gypsum shall be deemed to meet the continuous insulation moisture control requirement in accordance with the following conditions: 1) The spray foam R-value is equal to or greater than the specified continuous insulation R-value, 2) the combined value of the spray foam insulation and continuous insulation is equal to or greater than the specified continuous insulation R-value.

Data source: Table R702.7(3) of the 2021 International Residential Code

### Updates in the 2021 IRC and IBC

In the 2021 IRC and IBC, the section that addresses vapor retarders has been expanded to include additional restrictions and considerations regarding the appropriate vapor retarder for different climate zones. In addition to the *Table R702.7(3)* above, the updates to the 2021 IRC and IBC include information regarding the use of Class II vapor retarders and when they are acceptable. As seen in *Table R702.7(4)* below, requirements must be satisfied pertaining to continuous insulation and framing depth, in each climate zone, to permit the use of a Class II vapor retarder.

For example, a 2x4 framed wall in climate zone 6 would require the R3 (R-value 3.6) ZIP System® R-sheathing panel to permit the use of a Class II vapor retarder. Where a Class II vapor retarder is used in combination with continuous insulation, the Class II vapor retarder must have a vapor permeance greater than 1.0 when tested to the ASTM E96 standard using Procedure B (wet cup method). Vapor retarders tested to this method are often called ‘Smart Vapor Retarders’.

**TABLE R702.7(4) Continuous Insulation with Class II Vapor Retarder**

Climate Zone	Class II Vapor Retarder Permitted For: <sup>a, b, c</sup>
3	Continuous Insulation with R-value $\geq 2$
4, 5, and 6	Continuous Insulation with R-value $\geq 3$ over 2x4 wall Continuous Insulation with R-value $\geq 5$ over 2x6 wall
7	Continuous Insulation with R-value $\geq 5$ over 2x4 wall Continuous Insulation with R-value $\geq 7.5$ over 2x6 wall
8	Continuous Insulation with R-value $\geq 7.5$ over 2x4 wall Continuous Insulation with R-value $\geq 10$ over 2x6 wall

Data source: Table R702.7(4) of the 2021 International Residential Code

- a. The requirements in this table apply only to insulation used to control moisture in order to permit the use of Class II vapor retarders. The insulation materials used to satisfy this option also contribute to but do not supersede the thermal envelope requirements of Chapter 11.
- b. Where a Class II vapor retarder is used in combination with foam plastic insulating sheathing installed as continuous insulation on the exterior side of frame walls, the continuous insulation shall comply with Table R702.7(4) and the Class II vapor retarder shall have a vapor permeance greater than 1 perm when measured by ASTM E96 water method (Procedure B).
- c. Spray foam insulation with a maximum permeance of 1.5 perms at the installed thickness applied to the interior side of wood structural panels, fiber board, insulated sheathing or gypsum shall be deemed to meet the continuous insulation moisture control requirement in accordance with the following conditions: 1) The spray foam R-value is equal to or greater than the specified continuous insulation R-value, 2) the combined value of the spray foam insulation and continuous insulation is equal to or greater than the specified continuous insulation R-value.

## **Smart Vapor Retarders**

Vapor retarders are categorized using the ASTM E96 Standard Test Method for Water Vapor Transmission of Materials. “Smart” vapor retarders are materials designed to increase in vapor permeability with increased relative humidity. Because smart vapor retarders become more permeable with increased vapor pressure (represented by having a permeance greater than 1 perm when measured by ASTM E96 water method, Procedure B), they can be used on the interior side of wall assemblies in all climate zones, except climate zones 1 and 2. Smart vapor retarders are designed to maintain low vapor permeance in low humidity settings but become more vapor permeable in settings with high humidity. These are ideal in settings that include cold winters with hot and humid summers. In these climates, the vapor retarder maintains low vapor permeance in the winter, to prevent the risk of condensation in the wall assembly, but become more vapor-open in the humid, summer months to promote drying potential.

Following the reference tables within the IRC and IBC may help reduce the risk of moisture accumulation within the wall assembly. Remember, proper moisture control is an imperative part of a high-performance wall assembly. This is especially important when using continuous insulation, such as ZIP System® R-sheathing, due to the low perm rating of rigid insulation. Contact a local architect, designer, or moisture/energy consultant for more information regarding vapor control layers in the wall assembly.

Please visit [Huberwood.com](http://Huberwood.com) or contact our technical department at 800-933-9220 Ext 2716 or at [techquestions@huber.com](mailto:techquestions@huber.com) with any questions or comments.