## 14. Vapor Retarders

Both vapor retarders and air barriers reduce the penetration of water vapor into the walls. The code provisions related to vapor retarders are found in the International Residential Code (IRC). The code provisions related to the air barrier are found in the International Energy Conservation Code (IECC). Materials may function as both an air barrier and a vapor retarder.

Vapor retarders are materials used to slow or reduce the movement of water vapor through a material or building assembly by diffusion. Water vapor diffusion is the movement of water vapor through vapor-permeable materials. Vapor diffusion happens through a solid material even when the material has no air leaks.

IRC Section R702.7 requires that a Class I or II vapor retarder be installed in the Montana climate on the interior side of exterior walls. Exceptions for the vapor retarder requirement include a basement wall or any portion of wall below grade and walls not affected by freezing moisture. The vapor retarder class is based on the manufacturer's certified testing or a tested assembly. The following are some materials that meet the class specifications:

| Class | Definition | Examples | Description |
|---|---|---|---|
| I | 0.1 perm or less | Sheet polyethyl-ene, sheet metal, non-perforated aluminum foil | Impermeable |
| II | Greater than 0.1 perm to less than 1.0 perm | Kraft-faced fiberglass batts or low-perm paint | Semi-Impermeable |
| III | Greater than 1.0 perm to less than 10 perm | Latex or enamel paint | Semi-permeable |

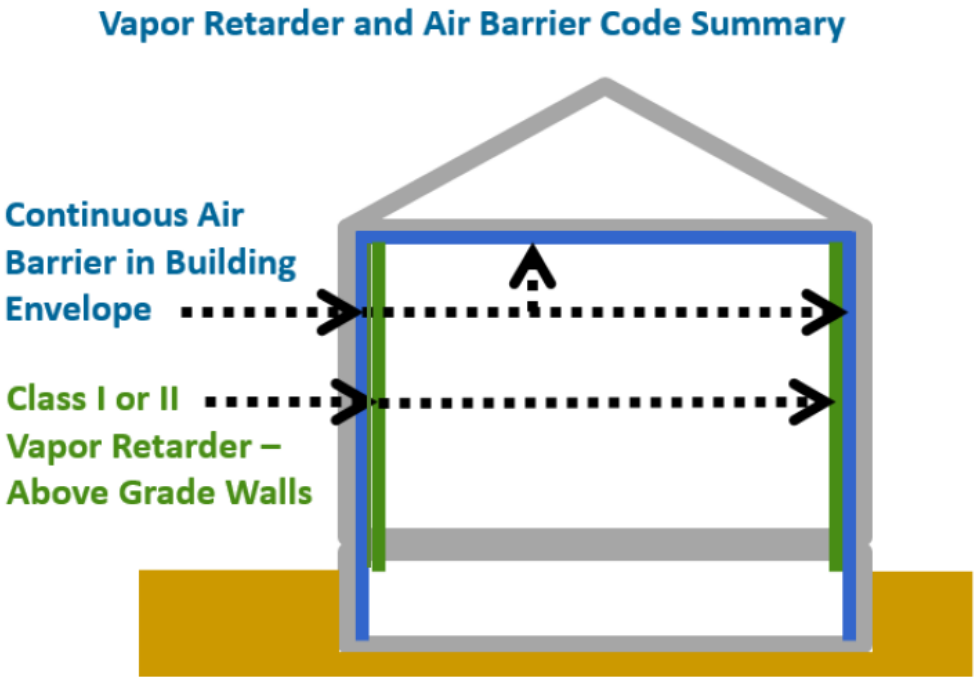
**Building Code Vapor Retarder Class Definitions**

Class III vapor retarders are allowed with vented cladding (i.e., vinyl siding) over fiberboard or gypsum wall sheathing. A Class III vapor retarder is also allowed on a 2 X 6 frame wall that is constructed with at least R-11.25 continuous exterior insulation sheathing.

IRC Section R806.5 includes provisions addressing vapor retarders in unvented attic assemblies. In general, it requires that assemblies with air impermeable insulation may not have a Class I vapor retarder and must have a Class II or Class III vapor retarder in direct contact with the underside of the insulation.

From a building science perspective the vapor retarder is less critical than the air barrier at minimizing water vapor movement into the exterior wall assembly. However, the IRC vapor retarder remains a code requirement and is especially important if the building interior experiences higher relative humidity levels.

**Vapor Retarders and Insulated Basements.** Below-grade basement walls differ from above-grade walls in that they are vulnerable to moisture wicking into the wall from the ground. Drying does not occur through a foundation wall that is below grade. It is important to maintain the drying potential of the wall to the inside.




**Plan Review**

1. Indentify the vapor retarder material. Verify that the material meets the vapor retarder classification of IRC R702.7.
2. If gypsum board in acting as the vapor retarder required in the Montana Climate Zone, verify that the paint meets the permeability characteristics of a Class II vapor retarder.
3. Verify that the vapor retarder is specified in all above grade exterior walls and is to be intalled on the interior side of framed walls.

**Inspection**

1. Verify that the vapor retarder material specified in the permit documents is installed per manufacturer's instructions.
2. Verify that the vapor retarder is installed in all above grade exterior walls on the interior side of framed walls.

**Code Reference**

**IRC Section 702.7 Vapor Retarders.** Class I and II capor retarders are required on the interior side of frame walls in Climate Zones 5, 6, 7, 8 and Marine 4.

Exceptions:

1. Basement walls.
2. Below grade portion of any wall.
3. Consrtuction where moisture or it freezing willnot damage the materials.

**R702.7.1 Class III Vapor Retarders.** Class III vapor retarders shall be permitted where any one of the conditions in Table R702.7.1.1 is met.

**Excerpt from Table R702.7.1.1**

| | |
|---|---|
| Climate Zone 6 | Vented cladding over fiberboard. |
| | Vented cladding over gypsum. |
| | Insulated sheathing with R-value ≥7.5 over 2 x 4 wall. |
| | Insulated sheathing with R-value ≥11.25 over 2 x 6 wall. |

**R702.7.1Material Vapor Barrier Class.** The vapor barrier class shall be based on the manufacturers's certified testing or tested assembly.

The following shall be deemed to meet the class specified:

Class I: Sheet polyethylene, unperforated aluminum foil.

Class II: Kraft-faced fiberglass batts.

Class III: Latex or enamel paint

**R702.7.3 Minimum clear air spaces and vented opeings for vented cladding.** For the purposes of this section, veneted cladding shall include the following minimum clear air spaces. Other openings with the equivalent vent area shall be permitted.

1. Vinyl lap or horizontal aluminum siding applied over a weather resistive barrier as specified in Table R703.7.4.
2. Brick veneer with a clear airspace as specified in Table R703.7.4.
3. Other approved vented claddings.

**The Importance of Mechanical Ventilation**

Air sealing and the resulting tighter house can lead to air-quality concerns due to lack of fresh air entering the house. Contaminants from household chemicals and elevated moisture levels can build up, creating health concerns. Tighter buildings also increase the risk of backdrafting unsealed combustion appliances such as conventional gas furnaces, gas water heaters, gas fireplaces, and wood stoves. Montana code requires a minimum level of mechanical ventilation, depending on the house size and number of bedrooms. Options range from an upgraded bath fan to heat-recovery ventilation systems.

### Resources

2012 International Energy Conservation Code, Copyright August 2011 by the International Energy Codes Council, Inc., Falls Church, Virginia.

2012 International Residential Code, Copyright August 2011 by the International Energy Codes Council, Inc., Falls Church, Virginia.

*Builder's Guide to Cold Climates*, by Joseph Lstiburek, Building Science Press, 2006