

Vapor Barriers or Vapor Diffusion Retarders

In most U.S. climates, vapor barriers or vapor diffusion is part of a moisture control strategy for a home.

How They Work

A vapor barrier or vapor diffusion retarder (VDR) is a material that reduces the rate at which water vapor can move through a material. The older term "vapor barrier" is still used even though it may inaccurately imply that the material stops all of the moisture transfer. Since everything allows some water vapor to diffuse through it to some degree, the term "vapor diffusion retarder" is more accurate.

The ability of a material to retard the diffusion of water vapor is measured by units known as "perms" or permeability. A perm at 73.4°F (23°C) is a measure of the number of grains of water vapor passing through a square foot of material per hour at a differential vapor pressure equal to one inch of mercury (1" W.C.) Any material with a perm rating of less than 1.0 is considered a vapor retarder. Vapor diffusion retarders can help control moisture to reduce mold growth in these areas:

- Basements
- Ceilings
- Crawl spaces
- Floors
- Slab-on-grade foundations
- Walls

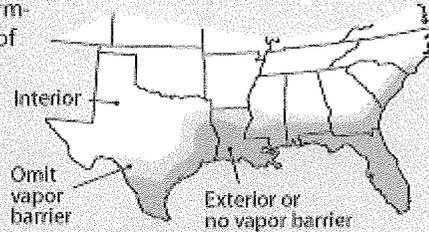
Effective moisture control in these areas and throughout a home includes air sealing gaps in the structure, not just the use of a vapor diffusion retarder. How, where, and whether a vapor diffusion retarder should be used depends on the climate. Typically, the number of Heating Degree Days in an area is used to help make these determinations. A Heating Degree Day is a unit that measures how often outdoor daily dry-bulb temperatures fall below an assumed base, normally 65°F (18°C).

Except for extensive remodeling projects, it's difficult to add materials like sheet plastic as a vapor diffusion retarder to an existing home. However, many existing homes don't really need a more effective vapor diffusion retarder than the numerous layers of paint usually on their walls and ceilings. These multiple layers are quite effective as a vapor diffusion retarder in all but the most extreme northern climates. Follow your local building code for the best application of vapor retarders in new construction. When remodeling or when insulating an older home in northern climates, vapor retarder paints may be the only feasible way of reducing moisture in walls.

"Vapor barrier" paints are also an effective option for colder climates. If the perm rating of the paint is not indicated on the label, find the paint formula. The paint formula usually indicates the percent of pigment. To be a good vapor diffusion retarder, it should consist of a relatively high percent of solids and thickness in application. Glossy paints are generally more effective vapor diffusion retarders than flat paints, and acrylic paints are generally better than latex paints. Alkyd based paints have a perm rating less than one making one coat adequate to meet the rating in older homes. When in doubt, apply more coats of paint. It's best to use paint labeled as a vapor diffusion retarder and follow the directions for applying it.

Vapor Barrier Placement By Geographical Location

In most cold climates, vapor barriers should be placed on the interior (warm-in-winter) side of walls. However, the map shows that in some southern climates, the vapor barrier should



be omitted, while in hot and humid climates, such as along the Gulf coast and in Florida, the vapor barrier should be placed on the exterior of the wall.

Perm Ratings of Different Materials

(Rating of 1 or less qualifies as a vapor barrier)

Asphalt-coated paper backing on insulation	0.40
Polyethylene plastic (6 mil)	0.06
Plywood with exterior glue	0.70
Plastic-coated insulated foam sheathing	0.4 to 1.2
Aluminum foil (.35 mil)	0.05
Vapor barrier paint or primer	0.45
Drywall (unpainted)	5.0
Drywall (painted - latex paint)	2-3

Remember, vapor barriers only slow down the rate of moisture permeability due to diffusion, while most moisture enters walls either through fluid capillary action or as water vapor through air leaks. Air leaks around outlets, switches, light fixtures, plumbing, and the space between the floor and sheetrock is important for controlling moisture in walls for your home. All climates require these moisture control steps:

- Install a polyethylene ground cover on the earth floor of houses with crawl spaces and slope the ground away from the foundations of all houses.
- Install a continuous vapor barrier, if your climate needs one (see map on this page) that has a perm rating of less than one.
- Place a termite shield, sill gaskets, or other vapor-impermeable membrane on the top of the foundation wall. This action will prevent moisture from wicking into the framed wall from the concrete foundation wall by capillary action.

Wind-driven rain can also penetrate the exterior finish. To enhance protection against rain penetration, create a drainage plane within the wall system of the home. Causes of rain leaks, and eventually mold is from improper installation of the following:

- Siding materials
- No flashing, improperly applied flashing, or poor-quality flashing
- House wrap, weather-stripping or caulking around joints in the building exterior (such as windows, doors, and bottom plates).

*See the manufacturers and local building code requirements for installing these materials.