



Vapor Barriers, Retarders, and Air Barriers

Air and moisture can enter a home in many ways. Convective transfer involves moving air, such as a draft around a window or door, electrical boxes, or other wall penetrations. Diffusion involves to moisture moving through a material from an area of high concentration to an area of lower concentration. This is similar to a dry sponge soaking up water.

Cavity wall are typically constructed with fiberglass batts placed into the cavities between studs allowing air to pass through. This requires an additional, separate vapor barrier, typically polyethylene sheet (Visqueen) or kraft paper facing on the fiberglass batts to reduce moisture penetrating the wall. Vapor barriers, or more properly worded, retarders, must be sealed properly to prevent air infiltration and vapor transmission.

Due to their nature, continuous insulation (EPS foam or XPS foam) can also be used as a vapor barrier.

Insulating Concrete Forms (ICFs) do not require a separate vapor barrier or retarder. ICF walls are mass walls, characterized by a solid structure from interior to exterior, with no voids or cavities. The EPS and the concrete are bonded together at the inner face of the form, eliminating airflow through the wall.

VAPOR BARRIER (RETARDER CLASSIFICATION SYSTEM)	PERMEABILITY RATING
Class I Vapor Retarder	0.1 perm or less
Class II Vapor Retarder	1.0 perm or less and greater than 0.1 perm
Class III Vapor Retarder	10 perm or less and greater than 1.0 perm

Test Procedure for vapor retarders: ASTM E96-00 Test Methods for Water Vapor Transmission of Materials

The EPS foam of a BuildBlock ICF form at 2.5" of thickness per side (5" total), provides a perm rating of .408, and classifies the ICF form as a class II vapor retarder.

The monolithic concrete core also serves as an air barrier, and has it's own perm rating. At a thickness of 6-inches the perm rating is of the concrete core is .533. (Estimated according to the average perm rating of 3.2 per inch of concrete; per ASHRAE).

Permeability ratings for BuildBlock ICFs are calculated in the following manner based on product testing:

$$\text{Permeability Rating for Desired Thickness} = \frac{\text{Permeability for 1 Inch}}{\text{Inches of Thickness}}$$

$$.408 = \frac{2.04 \text{ (EPS Perm Per 1-inch)}}{5 \text{ (inches of EPS Foam)}}$$

EFFECT OF MATERIAL THICKNESS

The perm ratings given are for stated thicknesses of materials. Generally, doubling material thickness halves water vapor transmission: if 1 inch of a material has a perm rating of 2.0, then for 2 inches, the perm rating would be 1.0. With paints, however, adding a second coat more than halves the water vapor transmission.

The concrete core of a BuildBlock ICF wall effectively seals the wall from air infiltration. Being a poured product, it will fill any openings or gaps completely, eliminating air movement. The EPS foam will bond to the concrete, creating a seal, and breaking the path for moisture to penetrate the wall.

Additionally the insulating effects of the EPS foam serve to maintain a more stable inner wall temperature, lessening condensation usually seen in cavity walls. Any condensation that does occur, has no effect on the EPS or the concrete.

Concrete and EPS are both inorganic, and do not serve as a food source for mold or mildew, and the highly alkaline environment of the concrete further reduces the incidence of mold and mildew growth.

Applying additional vapor barriers can potentially trap moisture, and allow it to run down or evaporate up into more moisture sensitive areas of the structure. A properly sized HVAC unit will ensure that any moisture present will be quickly reduced to a level below 50% humidity, thus stopping mold and mildew growth.

Below is additional information from the IRC 2012 regarding Vapor Barriers.

R702.7 Vapor Retarders.

Class I or II vapor 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. Construction where moisture or its freezing will not damage the materials.

Note: BuildBlock ICFs act as a Class II Vapor Retarder thus meeting the code requirements above.