

## Moisture Vapor Transmission ("Perm" rating of Handi-Foam Two-Component PU Foam)

Water in its low energy state (liquid) does not permeate through polyurethane closed cell foam, and in its high energy state (vapor) its permeance is retarded significantly. Because of its very low moisture vapor transmission properties, polyurethane foam may be considered a 'vapor retarder', when applied in sufficient thickness, There is not a strict definition of what constitutes a vapor retarder vs. a vapor barrier. Furthermore, the outstanding insulating and air barrier properties of Handi-Foam Two-component Polyurethane Foam, when applied to form a seamless, monolithic coating make it an excellent solution to the problem of moisture condensation and humidity build-up in properly designed construction.

The most common method for evaluating the moisture vapor diffusion rate of a building material is ASTM E-96 (Standard Test Method for Water Vapor Transmission of Materials). E-96 determines the "water vapor permeance" for a given material at a given thickness. The permeance is often referred to as the "Perm rating"; the higher the Perm rating, the faster the diffusion rate of water vapor through the material.

Handi-Foam Two-Component Polyurethane Foam (UL94 Quick-Cure formulation) has been tested according to ASTM E-96 at varying thicknesses, and has a Perm rating of approximately 2.6 at a thickness of 1" (a Perm measures the number of grains of water vapor that pass through a square foot of material per hour at a differential vapor pressure equal to one inch of mercury. The metric equivalent unit of measure is 1 Perm= 57.45 ng/s.m<sup>2</sup>.Pa). As a point of comparison, open cell polyurethane foams typically have perm ratings between 10 and 50 at 1".

The 2000 IRC building code defines a vapor retarder as having a perm rating of 1.0, or less. Permeance is not a linear property. Therefore, rather than 2.23" giving a linearly-extrapolated perm rating of 1.0, in actuality it takes a thickness of approximately 3.5 " of Handi-Foam to achieve a Perm rating of less than 1.0.

Other Handi-Foam Two-Component products, such as E 84 Class 1, SR and high density formulations have also been tested, and will achieve similar results at these thicknesses, when applied properly under normal working conditions.

It is important to recognize that water vapor transmission (assuming air leakage has been eliminated) is affected by the following factors:

- The chemical composition of the building material
- The thickness of the building material
- The absolute humidity on each side of the building component (absolute humidity differential)

Although the science of preventing moisture condensation and the effects of water vapor diffusion can be vapor transmitting materials, designers and contractors can insure these problems will not occur. Additional information and reference resources may be found on the following web sites;

<http://www.sprayfoam.org/>

<http://www.buildingscience.com/>

<http://www.airbarrier.org/>

<http://www.cufca.ca/>