

# Construction Without A Vapor Barrier

Moisture problems in walls and ceilings are caused by air leakage, which delivers a large quantity of vapor through gaps in air barriers and through insulation to condense on a cold surface. Abundant literature has documented that condensation due to vapor diffusion is the source of only 1% of moisture transfer, while airborne transfer usually accounts for 99% of moisture migration – and moisture problems.

## Airborne moisture movement

Icynene® has low air permeance, low enough to be classed as an air barrier. Therefore, there is no moisture movement through polyisocyanurate foam by air transfer.

## Moisture movement by diffusion

Moisture conveyed by diffusion is usually not a problem as it is so small that it is measured in nanograms (billionths of a gram), and is typically overcome by normal storage/drying cycles of building materials.

Five inches of Icynene® foam has a vapor permeance of 10 perms. This property allows extremely low rates of moisture diffusion to occur, just enough to allow breathing of adjacent building materials, preventing moisture entrapment. Its permeance was conservatively extrapolated from tests made with 2-inch (50 mm) foam core, without either of the two skins. More foam and the inclusion of skins would lower its permeance further.

Such diffusion as does occur through Icynene® will pass through the insulation without condensing, provided that the substrate to which it is attached is equally, or more vapor permeable.

## What happens to the moisture?

Eyre and Jennings (Saskatchewan Research Council) explain what happens to moisture. “Water vapor will usually pass beyond the dewpoint location without causing condensation or frosting, and will continue

to move outward through the cavity until it encounters the right condition (a cold surface) to condense and build up.”

## Practical performance

Practical experience has been gained using Icynene® without a vapor barrier, where it has been injected into renovated cavity walls. In this situation no opportunity exists for the inclusion of a vapor barrier. Experience has also been gained where Icynene® is applied to the underside of steel-deck roofing without a vapor barrier.

This experience demonstrates that no moisture buildup occurs where Icynene® is used without a vapor barrier. In fact, only in the following conditions require vapor barriers:-

1. Extreme conditions of humidity (i.e. indoor swimming pools, ice hockey arenas, greenhouses, coolers etc.)
2. In extreme northern climates. The National Association of Homebuilders recommends those climates with greater than 8,000 degree days F (4,500 degree days C) of winter heating.

