

The build up of moisture in insulated building envelopes resulting from condensation continues to demonstrate that the standard practice of including a vapor retarder is not a fail safe means of preventing moisture problems. The elimination of the vapor retarder in air conditioned buildings can allow for drying to the interior during the cooling season. With the removal of the vapor retarder, moisture can diffuse through the interior cladding into the interior air space where it can be removed by the air conditioning system. The benefit of vapor retarder removal has been recognized in the 2006 IRC which now allows for vapor retarders to be optional in climate zones one through four.

Although, The Icynene Insulation System® is not a vapor retarder, it can be used as the primary resistance to airborne moisture transport. The air seal capability of Icynene® controls convective moisture flow which can be the primary moisture transfer mechanism through the building envelope. In many applications, where the rate of diffusion is low, Icynene® provides the opportunity to eliminate vapor retarders from the assembly and thereby improve the drying capability of the building envelope. In applications where vapor protection is required, standard polyethylene vapor retarder can be replaced through the use of a vapor retarder paint.

Although the use of The Icynene Insulation System® can qualify a project for the elimination of the vapor retarder, a number of other conditions must also be met:

1. Climate must not exceed 7200 Heating Degree Days (HDD) on a 65 °F basis
2. Interior relative humidity must not exceed 35% RH for a significant period of time during the heating season
3. Subject to approval by the design authority and the local code office

Climate Zones

Historically, our standard recommendation with Icynene® has been that a vapor retarder is not necessary in the average home except in areas colder than 7500 Heating Degree Days on a 65 °F basis (such as Madison, Wisconsin) or in high humidity applications (indoor swimming pools, etc). Since then, The International Code Council (ICC) has defined new Climate Zones; maps and definitions of these zones

can be found in both the International Residential Code (IRC) and the International Energy Conservation Code (IECC). Under the new zoning system, 7500 Heating Degree Days (HDD) roughly corresponds to Climate Zones 6 (7200 HDD) and above. For construction projects in Climate Zones 6 and higher, polyethylene can be replaced by the use of a vapor retarder paint. Projects in Climate Zones 4 or 5 can further eliminate the need for vapor retarder paint by controlling interior humidity.

Interior Relative Humidity

In Climate Zones 4 and 5, the reversal of vapor drives between the summer and winter seasons is best served by assemblies that are breathable (vapor permeable) and allow for drying to the interior in the summer and the exterior during the winter. The prevalence of air conditioned buildings makes it even more important to be able to eliminate vapor retardant materials in assemblies. In these climate zones, the need for vapor protection can be made unnecessary by controlling interior relative humidity levels.

In terms of building durability, maintaining humidities lower than 35% RH are preferred, but low humidity levels are generally not comfortable to occupants. For example, static shocks on door handles, nose bleeds, etc begin to occur below 20% RH. Maintaining interior humidity levels at around 35% RH provides both comfort and a reasonable assurance of building durability.

Maintaining the interior relative humidity at no more than 35% RH will require the use of an appropriately sized mechanical ventilation system. All houses insulated and air-sealed with The Icynene Insulation System® should have a mechanical ventilation system to supply fresh air. The building code sets a minimum standard for supplying fresh air to a building, and, in an airtight house, this can only be supplied through mechanical ventilation.

Vapor Retarder Recommendations

In some buildings, vapor protection is absolutely necessary. Fortunately, these are also applications where the vapor drive is consistently from one side of the wall to the other, making it less likely that the

vapor retarder would ever act as a condensation plane; for example:

1. extremely cold climate
2. extended high humidity levels
3. special applications such as coolers or freezers

In the event of a pipe or roof leak, vapor retarders can impede the drying of the assembly. The vapor protection should therefore be selected so as not to impede the drainage of liquid water in the event of this type of water intrusion. In these applications, it is therefore highly recommended that vapor protection be supplied through the use of a vapor retarder paint, as opposed to polyethylene. This paint can be applied directly to the insulation, prior to the installation of gypsum drywall.

Extreme Cold Climates

In extreme cold climates, climate zones 7 and 8, winter conditions consistently drive indoor moisture into the insulation. Additionally, a limited warm season provides very little opportunity for the wall system to dry to the interior. As a result, it is highly recommended that vapor protection be included on the inside face of the insulation.

In these climates, the use of air conditioning is also significantly reduced, or even excluded from many projects. This results in a reduced opportunity for condensation due to the use of an interior vapor retarder.

Elevated Interior Humidity

There are many applications where the demands of the living space require interior humidity levels to be above 35% RH. This can include areas around swimming pools, saunas, greenhouses, showers, etc. For most of the year the indoor humidity levels will be higher than those outdoors, and moisture drive will be consistently from the interior of the building into the insulation. In these cases, a vapor retarder should not be removed from the assembly, and should be installed on the interior face of the insulation.

Coolers & Freezers

Like indoor pools, coolers and freezers present a special situation whereby moisture is always traveling in one direction. However, unlike pool rooms, moisture is typically traveling *into* a cooler or freezer

from the outside. This situation presents both special advantages, and special design considerations.

One of the special advantages with these specialized structures arises from the fact that many coolers / freezers are entirely located within a conditioned building. As well, moisture that enters the freezer is often managed by the mechanical system that handles cooling. In this situation, it is important to ensure that no major obstructions to moisture flow exist on the interior finish of the cooler. If the cooler is insulated from the inside, moisture that penetrates the Icynene® is conveyed into the cooler/freezer, where it is removed from the interior air by the cooling system.

Many coolers are framed with cold-formed steel cladding. If the Icynene® is installed by spraying the outer face of the steel cladding, the cladding acts as a cold-side vapor barrier. In this case, moisture that enters the insulation can accumulate on the outside of the steel skin. In this case, vapor protection should be applied to the outer face of the insulation.

Where any wall of the cooler is also an exterior wall, the wall can be exposed to reversals in vapor drive. In this case, the inclusion of a vapor retarder and its location is at the discretion of the designer, depending on local climate.

The Icynene Insulation System®

The Icynene Insulation System® is also an air barrier material that will prevent the flow of airborne moisture into the building envelope. With Icynene® there is no need for a sealed poly vapor retarder to act as an air barrier to prevent convective moisture flow into the building envelope. As a result, the requirement for a vapor retarder with Icynene® occurs where substantial vapor drive exists, a large temperature difference across the building envelope or high humidity levels. By preventing air leakage, The Icynene Insulation System® is able to eliminate the need for a vapor retarder in many climate zones and living conditions. This will allow for drying of the building envelope to the interior of the building, thereby improving the overall quality and durability of the structure.

At the same time, vapor retarders remain a necessary part of many projects. Although initially the removal of the vapor retarder may reduce the cost of the project, improperly eliminating the vapor retarder can end up costing a lot more to fix down the road.

The Icynene Insulation System® is a low-density soft foam insulation, which is sprayed into/onto walls, crawlspaces, underside of roofs, attics and ceilings by Icynene Licensed Dealers. Sprayed as a liquid, it expands to 100 times its volume in seconds to create a superior insulation and air barrier. Every crevice, crack, electrical box, duct and exterior penetration is effortlessly sealed to reduce energy-robbing random air leakage. The Icynene Insulation System® adheres to the construction material and remains flexible so that the integrity of the building envelope seal remains intact over time. Icynene® is ideal for residential, commercial, industrial and institutional indoor applications. **Information about The Icynene Insulation System® can be obtained by visiting Icynene.com or contacting your local Icynene Licensed Dealer.**