VAPROSHIELD®

Breathable Membrane Systems for Roofs & Walls

MOISTURE CONTROL STRATEGIES FOR LOW-SLOPE COMMERCIAL ROOFING

SLOPESHIELD® PLUS SELF-ADHERED

Air Barrier and Permeable Vapor Retarder Membrane

Overview

Effective moisture management is vital for the resilience and long-term performance of low-slope commercial roofing assemblies. Selecting the right approach for moisture control is essential to address challenges, optimize energy efficiency, and protect the integrity of the roofing assembly throughout its service life.

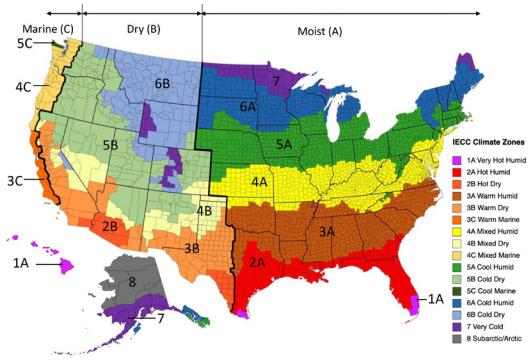
Key Considerations:

To achieve an effective moisture control strategy for low-slope commercial roofing, several critical factors must be considered and put into practice in the construction of the roof assembly:

- Climate
- Building occupancy
- Assembly design
- Cool roof hidden effects

Climate

The local climate significantly influences moisture control strategies, affecting the choice of materials, design approaches, and overall performance expectations for the roofing assembly.



Different climates pose unique challenges, from managing condensation and ice in colder regions to preventing moisture buildup in humid-mixed climates. Understanding climate specific needs is key to developing strategies that prevent condensation and moisture accumulation within the roofing assembly.

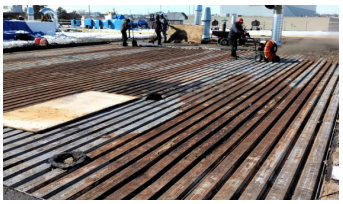
Building Occupancy and Use

The intended use of the building and the way a building is occupied plays a crucial role in understanding moisture control requirements and has significant code implications.

Buildings with planned high internal humidity levels, such as some manufacturing facilities, gyms, and indoor pools, generate significant moisture that can migrate into the roofing assembly if not properly controlled. These situations require complete restrictive moisture control measures to prevent moisture vapor migration, condensation, and potential structural damage, as well as degradation of the roofing system. Conversely, buildings with planned standard or low internal moisture levels may not need as aggressive measures, such as complete air and vapor restriction, but still require effective moisture control to mitigate intrusion and accumulation. **You must assess the building's use and the resulting internal moisture loads to design a moisture control system that will provide the needed roof performance, protect the building structure, and attain performance longevity.**

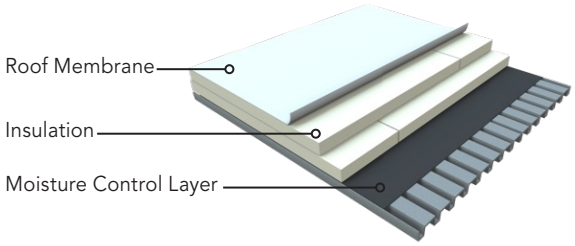
Assembly Design

The configuration and design of the roofing assembly determine what moisture control measures are needed, and how they are included within the roof assembly. Proper placement of moisture control layers relative to insulation and other assembly components supports effective moisture management.



Poor integration or misplacement can trap moisture, leading to condensation, mold growth, material degradation, consequential damage, and reduced energy efficiency.

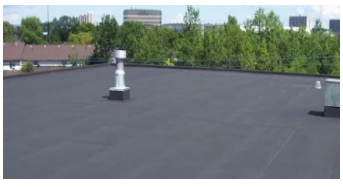
A well-designed assembly strategically positions these layers to control moisture movement, prevent accumulation, and help maintain the designed thermal performance of the roof assembly.



Cohesive integration of assembly components in the assembly is essential to create a moisture-resistant, resilient, and efficient roofing solution.

Transition to Cool Roofs and Hidden Effects

A significant factor in low-slope roof assembly design is the shift from traditional black roofs to light-colored and highly reflective "cool" roofs. While these roofs offer benefits such as reduced heat absorption and can improve energy efficiency, they also present new challenges to moisture management and potential unintended consequences must be carefully evaluated and mitigated.



Cool roofs disrupt the natural wetting and drying cycles within a roof assembly by reflecting more heat and limiting heat retention.

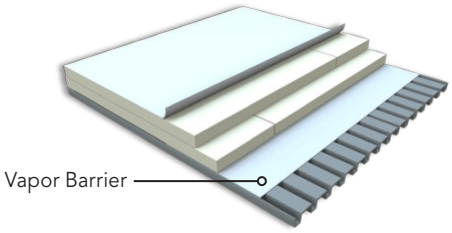
This can impede the drying process—particularly in warm-humid, mixed-humid, and cool-humid climate zones, which experience significant temperature fluctuations in both wet and dry seasons.

This shift requires a reevaluation of moisture control strategies, as the potential for condensation and moisture buildup increases in roof assemblies that were not previously affected. This aspect is often not sufficiently considered during the design phase, leading to unexpected moisture-related challenges and reduced roof performance over time.

The NRCA highlights that moisture trapped within a roof assembly can reduce the thermal resistance of insulation by up to 40%, significantly affecting energy performance. This trapped moisture can degrade insulation, lower energy efficiency, and promote mold growth, posing risks to structural integrity and indoor air quality. Additionally, trapped moisture can compromise the roof assembly's capacity for wind uplift resistance, weaken seams, and corrode fasteners and other components. These degradations not only threaten the roof's performance but also increase the potential for structural failure and costly repairs, emphasizing the importance of effective moisture control strategies.

Moisture Control Strategies

A variety of strategies are available to address moisture control, from vapor barriers and air barriers to drainage systems and material choices. Selecting and applying these methods based on the specific needs of the project is critical for success.

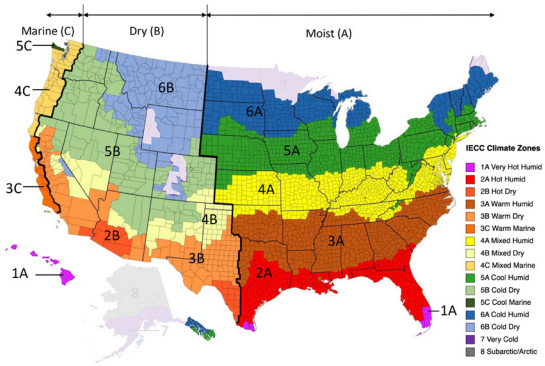


When discussing moisture control, air/vapor barriers are the traditional solution offering complete vapor restriction, effectively blocking both air and moisture transmission when detailed and installed properly.

An air and vapor barrier is most effective in cold-dry climates (ASHRAE Climate Zones 7 and 8) or in buildings with high internal humidity, where preventing moisture intrusion from the internal space into the roof assembly, moisture exfiltration, is critical to maintaining assembly integrity. In climates where both heating and cooling cycles occur frequently, or in designs that require balanced moisture control, **new material solutions offer more technically precise and effective approaches.**

Advanced Moisture Management: Addressing Condensation and Air Movement

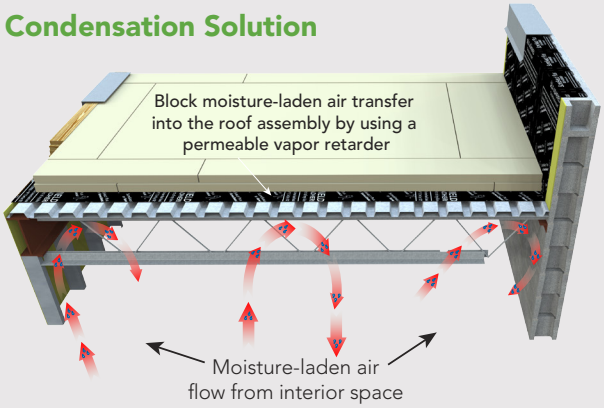
Air barrier and permeable vapor retarder technologies, also known as permeable air barriers or smart barriers, are innovative technologies designed to address condensation and moisture-related challenges in low-slope roof assemblies.



The best application for a permeable vapor retarder technology is in climates ranging from very hot-humid to cold-humid (ASHRAE Climate Zones 1-6), where balanced moisture control is critical.

As a general rule of thumb, permeable vapor retarder technology is particularly suitable for buildings with **standard internal moisture levels under 45% relative humidity, where controlling moisture intrusion from the conditioned interior is essential for maintaining the roofing assembly's integrity and energy efficiency.**

Condensation Solution

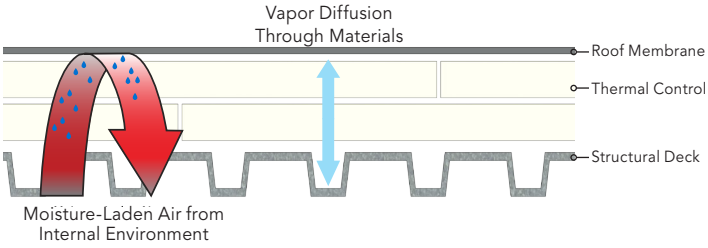


Permeable vapor retarder technology controls moisture through two primary mechanisms:

- **Controls** vapor diffusion limiting moisture intrusion and ingress while allowing moisture egress, preventing moisture accumulation within the roof assembly.
- **Restricts** air movement to block moisture-laden air from entering the assembly. This is particularly important because air movement accounts for over 98% of water vapor movement into building cavities.

Controlling Air Movement

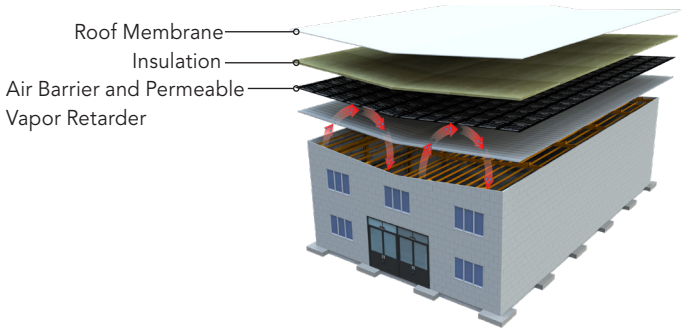
Controlling air movement into the roof assembly is critical.



Up to 200 times more water vapor is transported by air flow than vapor diffusion.

By restricting air movement (air barrier) and managing moisture ingress through controlled vapor diffusion, a permeable vapor retarder addresses the primary source of moisture issues in climates ranging from very hot-humid to cold-humid.

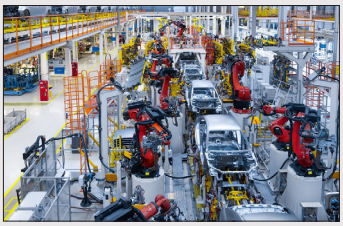
Through their dual functionality, air barrier and permeable vapor barrier materials mitigate condensation, enhance energy performance, and support the long-term stability of the roofing assembly.



Additionally, they allow trapped moisture within the assembly to be released, maintaining a balanced and moisture-regulated roof. This approach enables the roofing assembly to adapt seamlessly to natural seasonal cycles, promoting long-term stability and extending the lifespan of the roof.

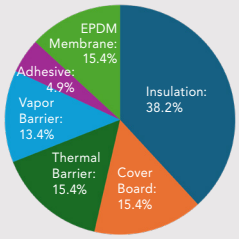
Why Use a Permeable Vapor Retarder?

Protect Your Internal Assets



Mitigate Moisture Related Damage

Reduce Risk Assembly Components



Conclusion

Understanding the need for tailored moisture control solutions in low-slope commercial roofing is crucial.

By aligning the selected moisture control strategy with the:

- Building's climate
- Occupancy
- Roof assembly design

architects, roofing consultants, facility managers, and roofing professionals can effectively prevent moisture accumulation, extend the roof's service life, and optimize energy efficiency.

This approach ensures a roof assembly capable of reliable performance under varying environmental conditions, safeguarding the structure and roof system while protecting the interior environment. It prevents damage to interior construction and assets, and reduces the risk of occupancy disruptions, maintaining the building's functionality and minimizing potential impacts on occupants and operations.

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