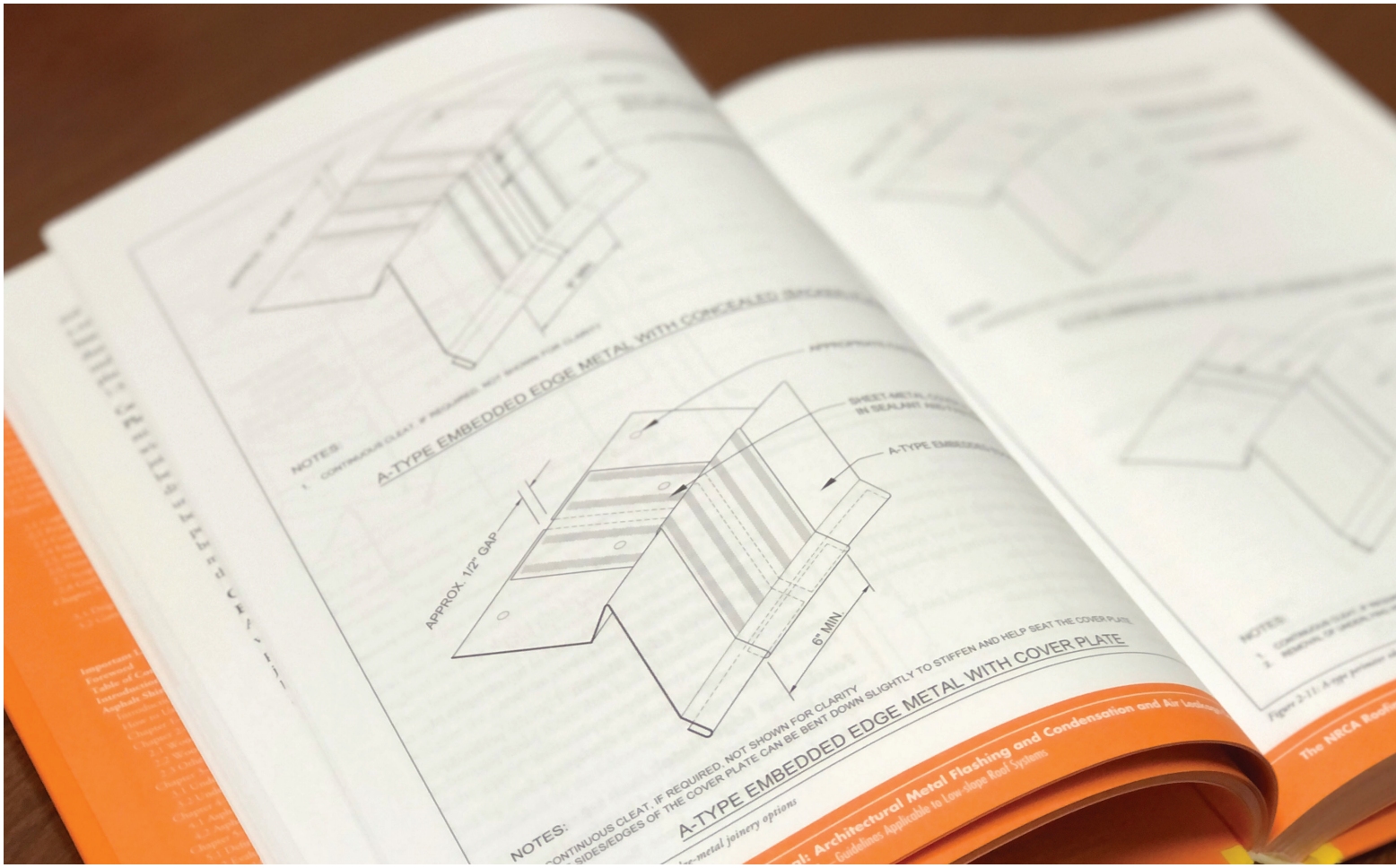


Positioning is everything

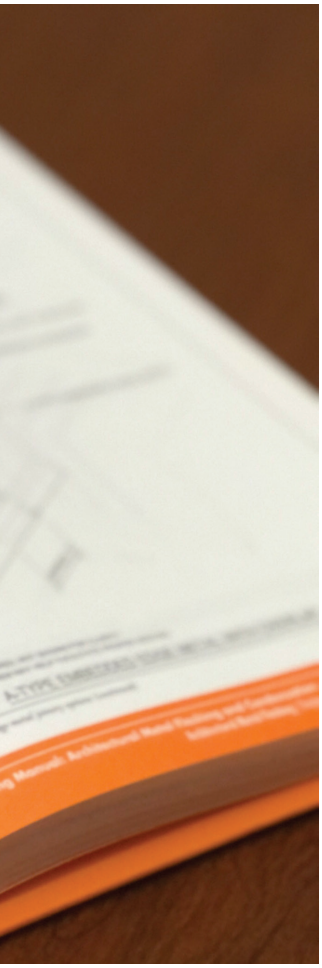
Proper vapor retarder layer placement is essential to prevent condensation

by Mark S. Graham

A vapor retarder layer sometimes is specified as an additional component in low-slope roof systems to minimize the potential for condensation to occur. When used, a vapor retarder layer can reduce water vapor diffusion from a building's interior into roof system components. For a vapor retarder layer to function as it should, it must be placed in a proper location within a low-slope roof system's cross-section. The following are some guidelines for proper vapor retarder layer placement.

Design considerations

For new construction situations, the designer of a building's mechanical system typically is best-suited for determining whether a vapor retarder layer is necessary. When sizing and designing a building's HVAC equipment, the mechanical system designer needs to consider outside conditions specific to the building's geographic location, climate conditions and desired interior design conditions. These same considerations form the basis for determining whether a vapor retarder layer is necessary for the building's exterior envelope, which includes the roof system. If a vapor retarder layer is deemed necessary for a building's exterior



wall assembly, the building's designer also should consider a vapor retarder layer as a roof system component.

Because a building's mechanical system designer typically has little to no knowledge of the building's specific roof system design, the roof system designer, whether that be a building designer or roof consultant, usually determines where any vapor retarder layer will be positioned within a low-slope roof system's cross-section.

Vapor retarder layer placement

For most buildings, the need for a vapor retarder layer is most pronounced during winter design conditions, which are characterized by relatively warm interior conditions compared with cool or cold exterior conditions. In these conditions, the predominate direction of vapor drive is from a building's interior to its exterior. Warm interior air will cool as it passes through a roof system's cross-section toward the outside. The rate at which this air cools depends on the materials it passes through and these materials' R-values.

To prevent condensation, it is the roof designer's goal to make sure the temperature at the vapor retarder layer is warmer than the dew-point temperature.

The dew-point temperature, sometimes referred to as dew point, is the temperature at which air becomes fully saturated with water vapor and when condensation begins to form.

> "If a vapor retarder layer is necessary for an exterior wall assembly, the building designer also should consider a vapor retarder layer as a roof system component"

This is the temperature at which air has a relative humidity of 100%.

It is important to realize dew-point temperature is not a singular, static value. Instead, it is constantly changing based on changing temperatures and relative humidities. For this reason, NRCA advises dew-point temperature calculations be based on a building's design conditions, such as those used for sizing and designing a building's HVAC equipment.

To ensure the temperature at the vapor retarder layer remains higher than the calculated design dew-point temperature, insulation of a sufficient R-value must be designed and installed above the vapor retarder layer to maintain a temperature warm enough to prevent condensation.

When low-slope insulation is above the roof deck in membrane roof system designs, NRCA recommends the vapor retarder layer be positioned directly above the roof deck or as closely above the roof deck as is feasible. For example, over a metal roof deck, designs that use a thin, low R-value thermal barrier layer of insulation mechanically attached to the roof deck with a vapor retarder layer applied directly to the thin insulation layer usually are appropriate.

Also, special consideration needs to be paid to the design of any roof drains, roof curbs and other roof penetrations, as well as parapets and other edge conditions. At these areas, the vapor retarder layer needs to be properly detailed and terminated, and these areas also must be adequately insulated to prevent condensation.

For buildings located in year-round, warm climates with interior cooling, the direction of vapor flow will occur predominantly from the building's exterior to its interior. In these situations, the vapor retarder layer should be designed on the exterior-side of above-deck insulation. In most instances, the roof membrane will function as the vapor retarder layer.

Additional information

Additional information about vapor retarder layer design is provided in Chapter 2 of the Condensation and Air Leakage Control Section of *The NRCA Roofing Manual: Architectural Metal Flashing and Condensation and Air Leakage Control—2018*. Specific procedures and examples are provided for determining the design dew-point temperature, vapor retarder layer placement, amount of R-value necessary above a vapor retarder layer and the temperature gradient across a roof system's cross-section.

MARK S. GRAHAM is NRCA's vice president of technical services.
@MarkGrahamNRCA

Recent trends driving construction tech adoption

The construction industry traditionally has been slow to adopt new technology, but the industry's investment in technology has increased significantly during the past few years, according to forconstructionpros.com.

During a live simulcast March 16, Aaron Toppston, managing director for Walsh Investment Group, Chicago, offered the following four reasons why the construction industry is experiencing a more rapid rate of technology adoption:

1. The talent pool and technology are changing. New talent is entering the industry and bringing increased willingness and ability to use technology. Additionally, construction technology is being designed to be more accessible and familiar, which makes workers on job sites more comfortable using it.
2. Projects are becoming more complex. Toppston says: "Ten years ago, a $500 million project was enormous. Today, there are billion dollar and multibillion dollar procurements both in the private sector and the public sector." Because projects are larger, administrative reporting requirements grow exponentially.
3. Traditionally, builders and those in the trades were not always viewed as "professional services," but that is changing. Now, everyone on a job site is viewed as providing professional services. Project owners expect to be able to trust all stakeholders on the project to do good work, which has led to more collaboration between various project entities, such as builders, architects and engineers.
4. Technology costs have been reduced. Construction typically is a low-margin business, and more affordable technology has played a significant role in its adoption in the industry.

Want to learn more? To access a recording of the simulcast, go to professionalroofing.net.

New York City pilots remote video-inspection program

The New York City Department of Buildings recently piloted a remote video-inspection program using standard digital video technology, according to constructiondive.com. The city has continued to use in-person inspections during the COVID-19 pandemic.

The voluntary six-week program, which ended April 30, replaced in-person visits for some construction inspections in Staten Island and Brooklyn. Inspectors viewed job sites via phones or other mobile devices. The program has numerous requirements, including a strong, reliable internet connection on the entire property; a device with a camera that can easily move through the facility, such as a phone or tablet; adequate lighting for good picture quality; a separate light source, such as a flashlight, for darker areas; and an authorized attendee with a tape measure for measuring certain dimensions. If an inspector observed elements unsuitable for virtual inspection, the New York City DOB required a physical inspection.

New York City DOB personnel are working to identify operational challenges and address new processes for how virtual inspections in the city could work. If the program is deemed successful, it will expand to the rest of the city.

Remote inspections of construction projects have become much more common during the pandemic, and inspectors from various states have indicated the practice could continue in the future. The availability of tools such as Skype, Zoom and Microsoft Teams offer building inspectors an accessible way to view and inspect job sites from a safe distance.

However, the International Code Council® found about 60% of building departments surveyed said they did not yet have the capacity to perform remote inspections. The ICC published a series of guidelines and recommendations for agencies to follow and rapidly adopt the practice while maintaining COVID-19 guidelines.

ASTM International committee proposes air barriers standard

ASTM INTERNATIONAL

ASTM International Committee E06 on Performance of Buildings has proposed a standard to help engineers better understand how various climates affect water vapor transmission of water-resistive barriers and air barriers in building envelopes, according to astm.org.

WK51917, "New Guide for Specifying Water Vapor Transmission Material Properties of Water Resistive Barriers and Air Barriers," will explain how water-resistive barriers and air barriers function in various wall and roof assemblies.

"The proposed standard is focused on factors affecting water-resistive barrier and air barrier performance, best practices to test and ways to easily report water vapor transmission characteristics," says Danko Davidovic, senior building scientist for Huber Engineered Woods and an ASTM International member. "The standard will be easy to follow and reflect the current best building science practices regarding how water vapor transmission properties of water-resistive barriers and air barriers impact moisture transport through wall and roof assemblies."

Architects, designers and other professionals will be able to use the standard to better specify water-resistive barrier and air barrier transmission properties in design documents, and regulatory agencies will be able to improve water vapor transmission property requirements for water-resistive barrier and air barrier materials and systems in building codes.