Unintended Consequences of Self-Adhered Flashing

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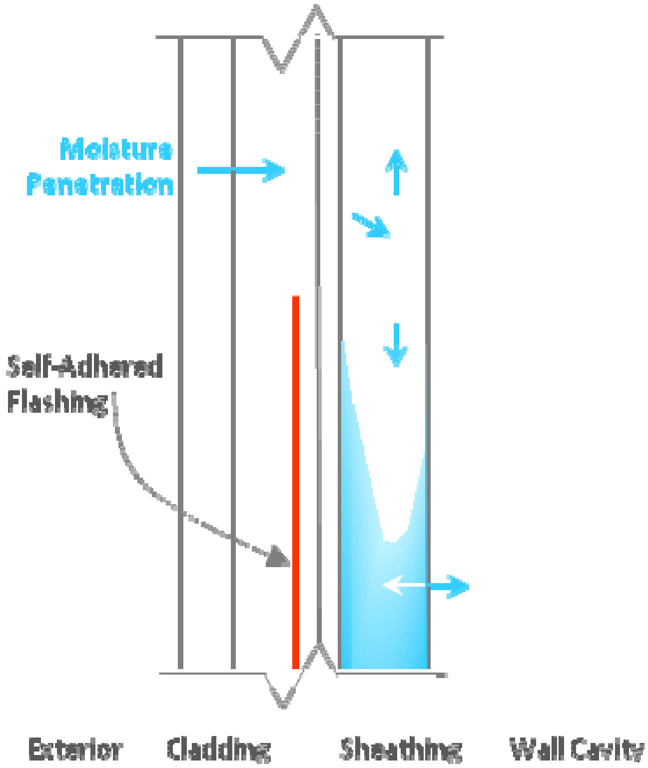
Self-adhered flashings (SAFs) and peel-and-stick membranes are used extensively in moisture control strategies for building enclosures. When properly integrated with the flashed elements and weather-resistive barriers, this approach is seen as a time-saving, cost-effective solution to moisture-related failures. However, an unintended problem occurs when moisture accumulates between the flashing and sheathing due to moisture leaks or as a result of exfiltration from poorly-sealed rough openings. The problem is worse in cold climate construction as a result of low-permeability interior vapor retarders that restricted inward drying.

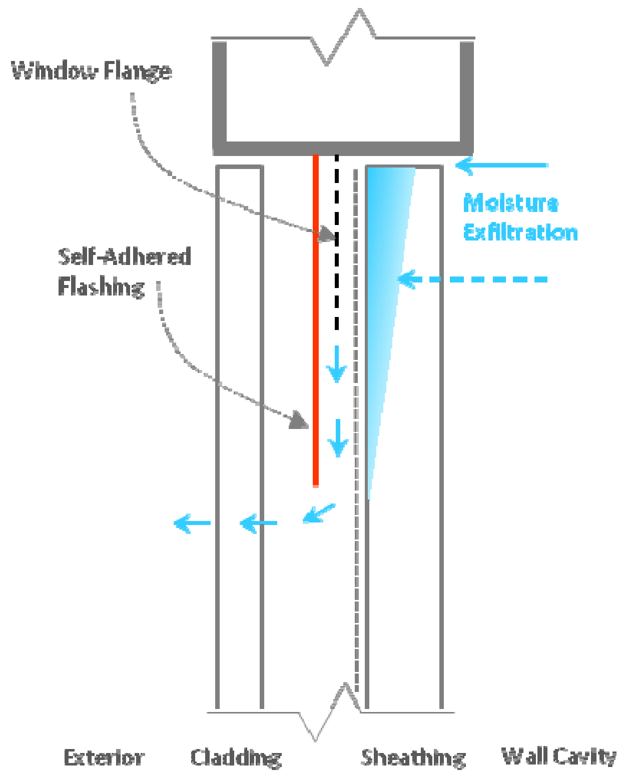
Moisture Penetration

The figure below illustrates what happens when moisture is introduced at surfaces adjacent to those covered by self-adhered flashing. Moisture migrates from the source by means of surface diffusion, vapor diffusion, and capillary conduction. In certain materials, such as OSB, we know that moisture diffusivity within the panel increases exponentially with increasing relative humidity but movement through the panel is less efficient. In other words, moisture moves more freely within the panel than it does through the panel. Some moisture will move inward into the cavity, but interior vapor retarders restrict inward drying. Likewise, the impermeable self-adhered flashing prevents outward drying. Moisture must now traverse the space that is contained by the self-adhered flashing on the corresponding exterior sheathing surface. The likelihood of moisture-induced failures increases as the rate of drying is diminished.



Moisture Exfiltration
A similar problem occurs when moisture is allowed to migrate from interior spaces into the assembly cavity. For example, the schematic below illustrates a window rough opening where self-adhered flashing is applied over the nailing flange as is typical for window installation in residential and light commercial construction. Exfiltration occurs through poorly sealed interfaces on the interior side of the window, wall framing, and interior finishes. Again, the impermeable self-adhered flashing restricts outward drying. In winter conditions, when prevailing vapor drive is from interior to exterior, moisture sorption often exceeds drying rates at interior and exterior faces of the affected sheathing. Like the prior example, this results in moisture accumulation and a higher likelihood of premature degradation. A cautionary note: In cold-climate construction, do not assume that sheathing temperatures are too cold for mold growth. The minimum threshold recommended by ASHRAE 160 is 41°F for a 30-day running average. Several fungal species grow well at 34-36°F.

Source: The Building Enclosure via Built Environments
https://builtenv.wordpress.com/



We see the issue worsening.

Reason #1: "*If some is good, then more is better*".
There is a growing reliance on SAFs in a wide range of flashing applications, from base of wall detailing and window flashing to below-grade waterproofing and roofs. Self-adhered flashing are also spanning larger areas. For example, in a 10'x10' a brick-clad wall containing a single window, we might see SAF at base of walls, sills, and windows. Using current practices, we could see as much as 26% of sheathed surfaces covered by impermeable self-adhered flashing. As these materials enjoy greater use, while also spanning greater surface areas, the risks of associated failures become more apparent.

Reason #2: Most assemblies do not accommodate normal moisture loading.
Moisture, whether in vapor or bulk form, will come in contact with sheathing materials. When it does, moisture moves in the x, y, and z planes at varying rates and efficiencies. Assumptions that self-adhered flashing serves as an impenetrable moisture barrier to moisture penetration must also account for its effects on moisture impedance and drying for the greater assembly.

> a) Reliance on air-sealing approaches such as batt insulation chinking doesn't prevent vapor transport to the cold sheathing. Surprisingly, we see this approach still used. Not surprisingly, we still see major problems.

b) Spray foam applications are imperfect. Some products, when used without a sealed interior air barrier, will enable unacceptable amounts of moisture transport to cold sheathing. This problem is compounded by wetted sheathing or highly permeable sheathing materials that allow moisture to move further outward to colder surfaces where the rate of drying will be much reduced.

c) Poorly applied interior sealants are readily exploited. Interior caulk joints are often viewed as an unnecessary precaution to an already 'sealed' and 'insulated' rough opening. If sealant is used, haphazard applications or poor joint sizing can seriously undermine the intended purpose.

Conclusions

The intended purpose and benefits of self-adhered flashing are duly noted. These materials provide effective workable solutions to many of the industry's pervasive problems. But the real potential for compromised performance warrants careful design considerations, especially in cold climates and interior environments subject to high humidity.

Resources

Ofori-Amanfo, C. and M.J. Spink. 2008. Condensation damage behind self-adhering membrane flashing and interior furnishings on exterior residential walls. Journal of ASTM International.