# TECHNICAL BULLETIN

## Reliability of Semi-Permeable SIGA Wigluv® in Rough Opening Preparation

Updated on: 31 July 2018


***SIGA Wigluv® is an acrylic, fully-adhered flashing tape designed for use in window and door rough-opening preparation and counterflashing. The SIGA Wigluv® semi-permeable polyolefin (PO) carrier material and solvent-free adhesive present a forward-thinking approach aimed at addressing the complex moisture management factors associated with the modern air-tight building enclosure.***

***This bulletin will explain the practical performance benefits of semi-permeable SIGA Wigluv® when used in rough opening protection, as tested beyond established norms by a third-party building science engineering firm.***

### What Is "Semi-Permeable"?

Permeance, a material's ability to allow or disallow the transfer of molecules through itself, plays a significant part in specifying building enclosure products. A materials water vapor permeance is important in building durability, and often times requires striking a vital balance of preventing moisture intrusion and allowing contained moisture to escape.

As it relates to moisture, permeance is framed in terms of the smallest and most difficult molecule size to obstruct: vapor. In North America, vapor permeance is measured with US Perms (US) or Ng/s-m2-Pa (CAN), which quantify the amount of water vapor that may diffuse through a material over a fixed time-frame. Table 1 shows commonly accepted classifications for building material's water vapor permeance.

SIGA Wigluv® is designed with a permeance of 1.72 US Perms. Being on the lower end of the 'semi-permeable' spectrum allows SIGA Wigluv® to meet the desired balance of both drying and protection, as the following studies will show.

**Table 1: Common Vapor Permeance Classifications**

| | US Perms | Ng/s-m$^2$-Pa |
|---|---|---|
| Impermeable | < 0.1 | < 5.7 |
| Semi-Impermeable | >0.1 to 1.0 | >5.7 to 57.2 |
| Semi-Permeable | >1.0 to 10 | >57.2 to 572.1 |
| Permeable | >10 | >572.1 |

**SIGA Wigluv® 1.72 Perms**

## Standards as a Starting Point

As a flashing tape, SIGA Wigluv® meets or exceeds the baseline established by AAMA 711 "Voluntary Specification for Self-Adhering Flashing Used for Installation of Exterior Wall Fenestration Products", the North American standard for evaluating self-adhered flashing membranes (see Table 2). This standard is referenced in the 2009, 2012 and 2015 International Residential Code (IRC).

**Table 2: AAMA 711 – Voluntary Specification for Self-Adhered Flashing Used for Installation of Exterior Wall Fenestration Products**

| Property Tested | Method | Requirement | SIGA Wigluv® Result |
|---|---|---|---|
| Tensile Strength | ASTM D5034 | >0.5 N/mm | 1.72 N/mm |
| Water Penetration around Nails | ASTM D1970 section 7.9 Mod. | No leakage at 31mm water head | Pass |
| Peel Adhesion | ASTM D3330--90º Peel | >0.26 N/mm | 0.99 N/mm (OSB) |
| Adhesion after UV Aging | ASTM G154 + ASTM D3330 | >0.26 N/mm | 0.95 N/mm |
| Adhesion after High Temp. Exposure | 90°C for 7 Days + ASTM D3330 | >0.26 N/mm | 0.99 N/mm |
| Adhesion after Thermal Cycling | 50°C & -40°C cycles + ASTM D3330 | >0.26 N/mm | 0.92 N/mm |
| Cold Temperature Pliability | ASTM C765 @ - 18° | No visible cracking | Pass |
| Adhesion after Water Immersion | Submersion 7 days + ASTM D3330 | >0.26 N/mm | 0.71 N/mm |
| Resistance from Peeling to Itself | AAMA 711 Annex 2 | Min. edge curl and min. corner curl | Pass – Level 3 |

While testing to AAMA 711 is considered by U.S. and Canadian building codes to demonstrate adequate functional properties for self-adhered fenestration flashing membranes, it does not yet address several important properties that have implications on building durability. These include direct water transmission through the membrane and the drying rate of wet substrates under flashing membranes. To account for these additional requirements, a series of practical and relevant third-party tests were performed in which SIGA Wigluv® was tested against some common flashing materials.

## Practical Problems of Moisture Management

Moisture management refers to techniques used to maintain safe levels of moisture within building materials to prevent moisture damage. This includes reducing wetting and allowing for drying to ensure no water accumulation occurs. Moisture damage, including mold, rot, and corrosion (see Figure 1), can occur when moisture levels remain high for an extended period. Flashing is primarily used to prevent direct water absorption. However, water may sometimes bypass flashings (leak) or alternatively enter framing systems from condensation or construction moisture causing damage if unable to escape.

*Figure 1 – Damage to wood rough opening, resulting from moisture accumulation*

Vapor impermeable membranes (<0.1 US Perm) restrict the ability of water vapor to dry to the exterior and when used in excess may cause widespread issues. On the contrary, vapor permeable membranes (>10 US Perm) allow for some drying to the exterior and reduced the risk of trapping moisture within the enclosure. Although vapor permeable membranes promote drying, they are considered unacceptable for horizontal sill flashing applications. Horizontal flashing may experience ponding water and recent research shows that permeable membranes do not provide adequate water transmission resistance when subjected to ponding water for extended periods of time.

As previously mentioned, the key to effective moisture management is to prevent water penetration while allowing some drying to occur. Semi-permeable membranes that are resistant to extended water ponding can be used to both limit water transmission to sensitive substrates and allow drying, *thereby increasing building durability*.

**TEST 1: Ponding Water Transmission**

The first portion of the 3rd party evaluation established a comparative long-term water ponding test. This consisted of constructing physical mock-ups of a window rough opening and directly monitoring the impact of ponding water on sensitive substrates. This is the fastest and most direct way to evaluate the potential for ponding water to penetrate through horizontal flashing membranes. Water ponding may occur due to failure the water-shedding trim or in window itself (see Figure 2).

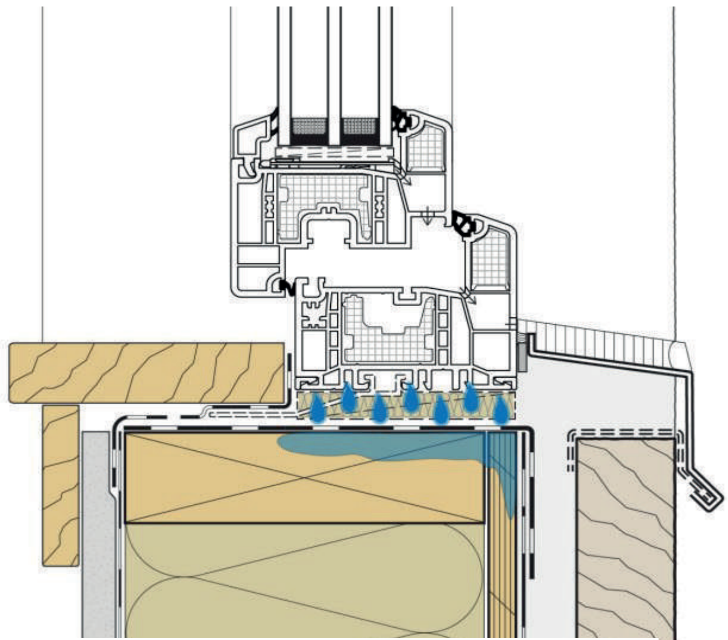

*Figure 2 – Wetting risk at window sill*

The evaluation involved the application of an impermeable membrane, a vapor permeable membrane, and SIGA Wigluv® to individual mock up window frames. Mock up frames (see Figure 3) were comprised of two 'sheathing' layers (OSB and plywood on either side) and 2x6 dimensional lumber as the sill and jamb frame. Water was placed in the "tub" portion of the mock up to a depth of 2 inches (51 mm) and the moisture content of the OSB, plywood, and sill were monitored for 90 days. The results from this test show that on average the water uptake of the substrate behind SIGA Wigluv® was minimal and significantly less than that of the control vapor permeable membrane.

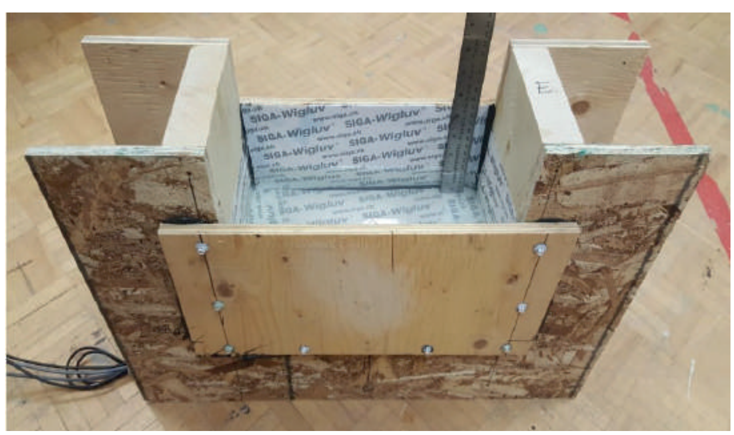


*Figure 3 - Typical rough opening frame mock-up lined with Wigluv®*

The sample average results (see Figure 4), which represent an average moisture content of all the wooden components, reveal that the impermeable membrane showed little to no water transmission, while the SIGA

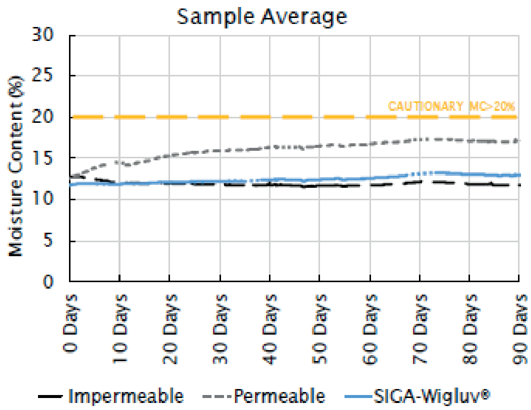


*Figure 4 - Average moisture content of all sensors in samples*

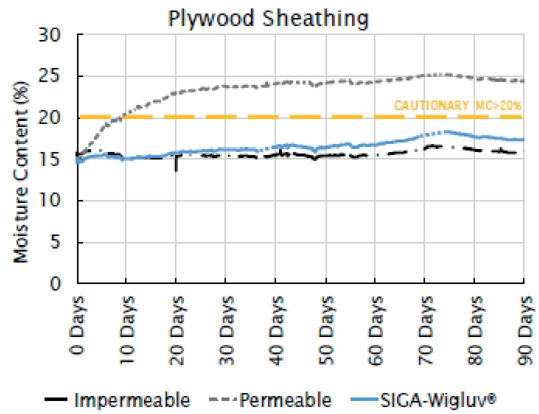


*Figure 5 - Measured moisture content in plywood sheathing*

Wigluv® samples tracked closely with only marginal differences in percentage after 90 days. The plywood sheathing component (see Figure 5) showed the largest uptake of water of all monitored components. The permeable membrane quickly allowed water to enter the plywood to unacceptable levels after less than 10 days. ***The SIGA Wigluv® samples never exceeded the 20% moisture content (MC) threshold during the 90-day period***. The semi-permeable SIGA Wigluv® shows a similar level of protection to an impermeable membrane, yet has a higher drying capacity than a standard impermeable membrane as can be seen in the following drying experiment.

**TEST 2: Drying Rates**

The second phase of testing evaluated the drying potential of severely wet substrates underneath installed flashing (see Figure 6). Several simulated fenestration framing samples were constructed and covered with an impermeable membrane or with SIGA-Fentrim® tape, a product with an equal vapor permeance as SIGA Wigluv® (1.72 US perms).

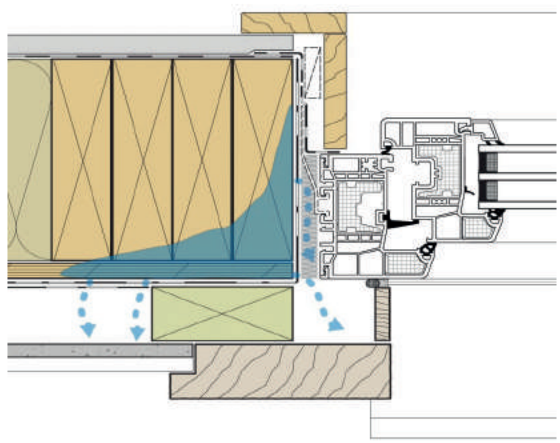

*Figure 6: Jamb section example, showing paths for drying in built-up condition*

The samples represent several conditions (Figure 7) commonly found at rough openings, including a single member (e.g. a sill or simply framed jamb), a built-up member (e.g. reinforced jamb) and a steel track with wooden liner (e.g. steel frame sill). Figure 7 also shows the sensor layout for each. The wood portions of the


*Figure 7 - Graphical representation of drying rate samples and sensor locations (Left to Right: single member, built-up, steel sill)*

samples were soaked to saturation, representing severe construction wetting, prior to application of SIGA's tape and the impermeable membrane. The moisture content of the wood was monitored for several months to determine differences in drying rates between SIGA's tape and impermeable membranes.

Results from the single member sample showed that drying occurred towards the back or underside of the sample and that little difference was noted between the impermeable membrane and the SIGA tape. The most prevalent difference in results occurred in the built-up and steel track samples (Figures 8 & 9). This was due to internal water being trapped by the wet framing members or impermeable steel sill, thus causing a larger portion of drying to occur through the flashing membrane. The semi-permeable membrane had an ***average drying rate 2.6x faster***[1] than the impermeable membrane in the built-up sample (Figure 10), while the steel sample was approximately 1.9x faster[1].

The use of semi-impermeable membranes allowed for quicker drying than impermeable membranes in the test condition. In applying this information, it is important to understand both general moisture management principles and demands of individual projects to ensure adequate protection against moisture damage. If your project is unable to dry to the interior, either from steel construction or from a vapor barrier polyethylene sheet, then a semi-permeable flashing membrane like ***SIGA Wigluv® will increase both the capacity for exterior drying and the overall moisture durability of the assembly.***

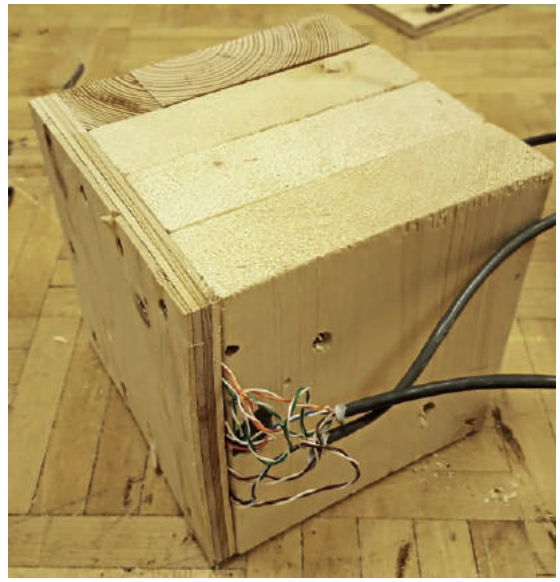

*Figure 8 – Actual built-up sample*

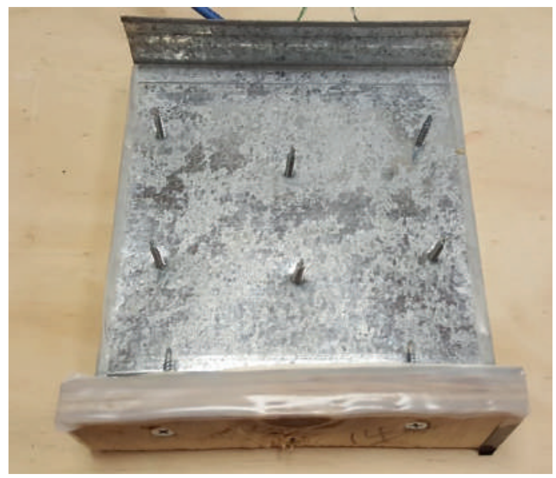

*Figure 9 – Actual steel sample*

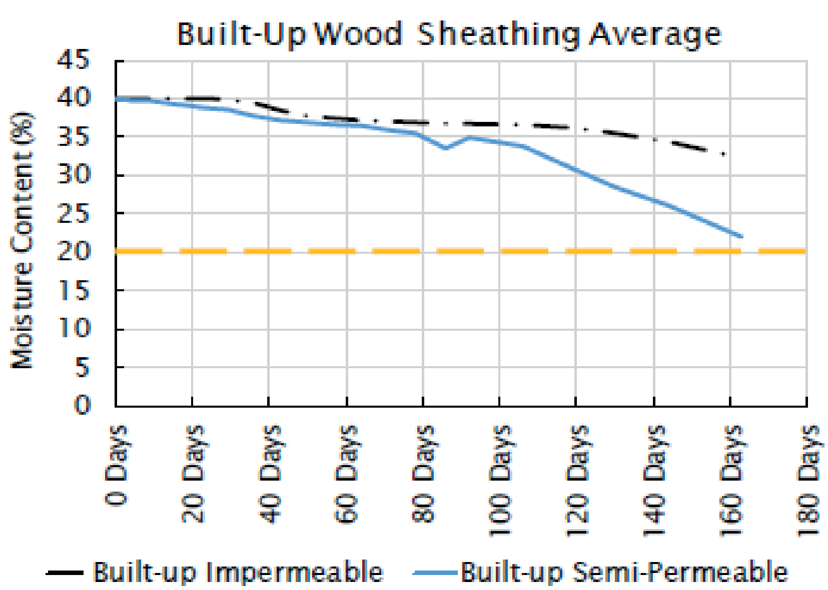


*Figure 10 - Built-up sample sheathing moisture content*

## CONCLUSIONS

SIGA Wigluv® tape provides numerous benefits when used as a self-adhered flashing tape, including increased malleability, strong adhesion to multiple substrates, protection against water penetration, and the additional benefit of allowing wet substrates to dry. SIGA Wigluv® has undergone and passed the rigorous AAMA 711 testing, which is the current industry standard for self-adhered flashing in North America. Additional experiments revealed that SIGA Wigluv® resisted ponding water to a degree similar to fully impermeable membranes, and, in comparison, also allowed for drying to occur when substrates were wet.

***Based on the stringent AAMA 711 testing and additional experimentation, SIGA Wigluv® is a suitable self-adhered flashing membrane for use in fenestration openings.***

This research was completed in partnership with RDH Building Science Inc.

1 - Rate of drying was measured by determining average reduction in moisture content per day until a 'safe' MC (20%) level was reached or until the last experimental observation point.