THROUGHWALL FLASHINGS AND TRANSITION MEMBRANE TECHNOLOGIES

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Today's drive towards newer cavity wall designs, roof-to-wall connections, and wall air barriers-to-waterproofing tie-ins has caused a great deal of confusion in the design and construction industries. Code requirements, sustainability, and chemical compatibility are all in play as coatings are now more widely used than ever before in the building envelope. This article intends to remove the confusion and let you know what goes where and whether they can all play well together. Additionally, there are choices to be made on performance, warranty, and installed cost.

Throughwall flashing (**TWF**) is installed throughout the cladding of a masonry building, including over windows. Its sole purpose is to efficiently and rapidly evacuate water from a cavity wall. If the liquid water that enters the cavity wall is not evacuated rapidly, it can shorten the life of all the components, including insulation R-value, and it can cause the deterioration of coatings.

Transition membranes (**TM**) are installed at the roof-to-wall air barrier and the wall air barrier-to-waterproofing tie-ins to provide a chemically compatible surface to act as a continuous air barrier and waterproofing component as required by code.

MASS-PRODUCED PRODUCT TECHNOLOGIES

An article of this nature addresses the more commonly and readily available product technologies. Still, the reader does need to know that there are several unique and proprietarily formulated products available.

There are three main categories of TWF technology available in the U.S. market:

1. Thermoplastic TWF: These products are deformable by heat, i.e., polyvinyl chloride (PVC), self-adhering peel & stick asphalt;
2. Thermoset TWF: This is a "vulcanized" products, not deformable by heat, i.e., ethylene propylene diene monomer (EPDM) rubber or any other type of cured elastomer;
3. Flexible Metallics: This includes non-asphaltic copper, stainless steel, self-adhering stainless steel, all-in-one TWF, and drainage systems of copper and stainless steel. These are all readily available nationwide. These metallics appear to be the higher-cost materials, but on an installed cost basis, they are very competitive.

THROUGHWALL FLASHINGS COMPARISON CHART

Properties	Rubberized Asphalt (Peel & Stick)	PVC KEE Self-Adhering	Non-Asphaltic Copper Fabric 5 oz.	Flexible Stainless Steel	Drainage Plane Stainless Steel	Self-Adhering Stainless Steel
Base Material	Petroleum	Plastic	Copper	Stainless Steel	Stainless Steel	Stainless Steel
Base Material Recycled Content	1% - 3%	0%	90%	60% - 70%	60% - 70%	60% - 70%
Recyclable	No	No	Yes	Yes	Yes	Yes
Warranty (Maximum)	5 year	Out of Box	Lifetime	Lifetime	Lifetime	20 year
Lap Joints in 100'	17	17	1	1	2	17
Fire Resistant (ASTM E84)	Failed	Unknown	Class B	Class A	Class A	Class A
Mold Resistant (ASTM D3273)	Unknown	Unknown	Yes	Yes	Yes	Yes
Tensile Strength (ASTM D412)	1,200	825	32,000	100,000+	100,000+	100,000+
Puncture Resistance (ASTM D154)	80 psi	Unknown	784 psi	2,500+ psi	2,500+ psi	2,500+ psi
Chemically Compatible with All Wall Components	No	No	Yes	Yes	Yes	Yes
Gap Spanability	1/4" or less	1/4" or less	width of cavity	width of cavity	width of cavity	width of cavity
Primer Required	Yes	Yes	No	No	No	No
Drip Edge Required	Yes	Yes	No	No	No	No

* All information gathered from Manufacturer's literature 1/5/2021 ** BIA (Brick Industry Association) Tech Note #7

Figure 1

We have not mentioned the use of aluminum or galvanized in this section. Please go to the Brick Industry Association (BIA) and download their Tech Note7/7A on this subject for that clarification.

PHYSICAL PROPERTY CHART

The physical properties of the above materials vary greatly and are illustrated in Figure 1. Due to differences in ASTM testing methods, a direct number-to-number comparison is not valid. Still, the trends and indications hold a great deal of information for your decision-making.

What should you make of the numbers in Figure 1? TWF and TM must survive installation and job site abuse. To do this, you can decide to have a higher puncture-resistant design or a higher tensile strength to resist tearing, and the design choices are yours. Does your choice require physical support on gaps >1/4 inch (0.6 cm) wide? Does the TWF strongly suggest a drip edge to ensure cavity wall evacuation of water? Is a primer required for self-adhering TWF and TM? Does your TWF and TM meet and exceed the ASTM E2178 code, "Standard Test Method for Air Permeance of Building Materials," required for an air barrier material? It's just not as easy as it was in the past.

TRANSITION MEMBRANES

Roof-to-air barrier and waterproofing-to air barrier TMs are a constant source of discussion within the design community. Many TWF materials can and do serve as a TMs. A critical item in your selection should be based on chemical compatibility issues among the different chemical polymer systems, as shown in Figure 2.

There are several ways that the design community can develop the proper and chemically compatible TM system. These methods work for both roof-to-air barrier and waterproofing-to-air barrier transitions. First, you can develop proprietary specifications for a roof system, air barrier, and waterproofing to be supplied by a sole manufacturer (single source). This would ensure compatibility, but it is not a strong preference by designers to specify this way. Second, you can specify multiple manufacturers. Your specifications will then need to require letters of compatibility from each of the manufacturers attesting to the chemical compatibility of each system's recommended TM to the other manufacturers' systems.

Last, you can specify the use of a flexible, self-adhered metallic TM of Type 304 stainless steel. This material is chemically compatible with all known roof systems, air barriers, and waterproofing. The specification of this product is fairly easy. Include in your specification that the adhesive in the self-adhered TM is butyl based to ensure chemical compatibility. Additionally, specify that the stainless steel product has been tested to ASTM E2178 and passed as an air barrier material. Finally, require that the self-adhered stainless steel TM has been

CHEMICAL COMPATIBILITY

Flashing	Acrylic Liquid Air Barrier	Asphalt Liquid Air Barrier	Polyether Liquid Air Barrier	Silicone Liquid Air Barrier	Peel & Stick Asphalt Membrane	Peel & Stick Butyl Membrane	Spray Polyurethane Foam	Polystyrene Insulation	Polyiso Insulation
Copper Asphalt	Not Compatible	Not Compatible	Not Compatible	Not Compatible	Not Compatible	Not Compatible	Not Compatible	Not Compatible	Not Compatible
Copper Drainage	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible
Copper Fabric (Asphalt)	Not Compatible	Not Compatible	Not Compatible	Not Compatible	Not Compatible	Not Compatible	Not Compatible	Not Compatible	Not Compatible
Copper Fabric (Non-Asphaltic)	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible
Copper Sheet Metal	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible
EPDM	Compatible	Not Compatible	Compatible	Compatible	Not Compatible	Compatible	Caution	Caution	Compatible
EPDM Self-Adhered (Asphalt)	Compatible	Not Compatible	Compatible	Not Compatible	Not Compatible	Compatible	Caution	Caution	Compatible
PVC	Caution	Not Compatible	Caution	Caution	Not Compatible	Not Compatible	Not Compatible	Not Compatible	Compatible
PVC Thermoplastic Vinyl	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Caution	Compatible	Compatible
PVC Thermoplastic Asphalt SA	Not Compatible	Caution	Compatible	Not Compatible	Caution	Caution	Caution	Caution	Compatible
Rubberized Asphalt (Peel & Stick)	Not Compatible	Not Compatible	Compatible	Not Compatible	Caution	Caution	Caution	Caution	Compatible
Stainless Steel Drainage	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible
Stainless Steel Fabric	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible
Stainless Steel Self-Adhered	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible
Stainless Steel Sheet Metal	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible

Not Compatible
Caution
Compatible

FROM ABAA'S FLASHINGS & TERMINATIONS COMMITTEE

Figure 2

tested to and passed the ASTM D1970, "Standard Specification for Self-Adhereding Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection" (aka fastener sealability), or the American Architectural Manufacturers Association (AAMA) 711-20, "Specification for Self-Adhering Flashing Used for Installation of Exterior Wall Fenestration Products" (aka) water penetration). Use a 6-inch (15.2 cm)-wide piece of the material and bring the materials to be transitioned up and onto the stainless steel and adhere them 2-2.5 inches(5.1-6.4 cm) onto the sheet. Do not butt lap them together or bring them in to contact with each other, but leave a 1-to 1.5-inch (2.5-3.8 cm) gap between them, and make sure to seal the edges of any laps or seams.

INSTALLATION CHECKLIST

The majority of flashing failures are due to improper installation. We have compiled a list of best installation practices below:

- Self-adhered membranes should be rolled into place. Rolling the product is critical to achieving full adhesion, and means that the installer uses a hard-surfaced roller, such as a rubber or stainless steel roller, to press the self-adhering membrane to the wall firmly. The substrate surfaces are not perfectly smooth, so by rolling, we aggressively push the adhesive into complete contact with the substrate.
- Self-adhering membranes need full adhesion to the substrate, and the substrate must provide a good surface for adhesion. No dust, dirt, or oils can be on the substrate.
- Rubberized asphalt self-adhering products require a primer on the substrate before installation, which significantly affects its ability to stay adhered to the substrate. Most of the butyl and acrylic adhesive membranes do not require a primer unless there is an adhesion issue with the substrate, thereby saving labor and material costs.
- Transition membranes should have their edges sealed to ensure a monolithic surface and to prevent reverse laps.
- TWFs must go up the backer wall a minimum of 8 inches (20.3 cm BIA Tech Note 7/7A), but if the mortar deflection netting is directly against the backer wall, the TWF must be extended 6 inches above the top of the netting.
- If you choose to use one of the all-in-one (flexible metal and active drainage flashing systems) draining and flashing metallics, then the additional material and installation cost of including a mortar deflection device is not required.
- The TWF must extend beyond the head of the fenestration opening by either 6 inches or the first vertical mortar joint.
- Weep vents are located at a minimum of every 24 inches (61.0 cm), and rope wicks or weep tubes need to be placed every 16 inches (40.6 cm). Weep vents are the preferred option due to better performance in airflow and are less likely to clog. As an added benefit, weep vents can assist in keeping insects out of a wall.
- TWFs that are ultraviolet sensitive (cannot be exposed to the sun due to damage) must use a copper or stainless steel drip edge. TWFs must always go through the wall to the masonry's outer edge (See BIA Tech Note 7/7A).
- The TWFs should use a termination bar if they are not tucked into the backer wall. The termination bar mechanically attaches the top of the flashing to the backer wall, which helps the TWF stay in place for the wall's life. The top of the termination bar should receive a bead of sealant to assist in shedding water rundown.

CONCLUSIONS

There have been a great many changes in cavity wall design that are code mandated. All of these changes have occurred outside of your control. The caveat here is that what you designed for TWF and TM just five years ago may no longer be applicable to today's cavity wall design, coatings, and components. Air barriers, continuous insulation, roof-to-wall transitions, and water-proofing-to-wall transitions must now be designed with components that are chemically compatible, are durable for the life of the wall, and have the physical properties to survive both installation and job site conditions.

As the authors of this article, we have more than 65 years of experience in roofing, cavity wall, and waterproofing design and components, and our sole intent here is to make you aware of today's choices and changing design environments. Remember, what was your standard 5 or 10 years ago may need to be looked at for its applicability to modern cavity wall design.