

Integrated Moisture Management & Airtightness Solutions

For SFS
Construction

Air leakage



Airtightness and Moisture Management

Achieving high performing buildings that are energy efficient is ever higher on the construction agenda.

Approved Document L of the Building Regulations now ensures that the fabric of the building conforms to minimum standards (FEES) and that minimum energy performance is achieved by ensuring compliance with targeted emission rates (TER).

We will surely see the minimum targets set in Part L go up steeply on our way to 2020, as a result of governments setting CO₂ target reductions of 34%* and 80% by 2050.

On this timeline we will have Zero Carbon Homes by 2016 and Zero Carbon Buildings (non-dwelling) by 2019.

Clients seeking to achieve optimum performance in buildings – and thereby meet the above requirements – often currently look to standards such as BREEAM and Passiv Haus, as these currently set the benchmark for sustainable construction and energy performance.

Part L identifies unnecessary heat loss through air leakage as a key culprit in the area of thermal efficiency and stipulates mandatory air leakage testing. Well designed moisture management and high levels of airtightness are accepted as essential design parameters and performance requirements in modern buildings. The correct balance will help building functionality, longevity and sustainability in a range of ways.

* compared to 1990 baseline

Airtightness



Where heat escapes through poor airtightness, moisture laden air can escape too. When this meets cold elements of the building structure or cold air spaces, the moisture condenses, gathers and begins its potentially destructive work. This can be in the form of reducing the efficiency of insulation (exacerbating heat loss), rust, mould, the degradation of finishes and even of structural elements.

Ultimately, the proper functioning of the building is compromised, structural problems can occur and building longevity and therefore sustainability is affected.

High airtightness gives the following benefits:

- Lower heating bills due to less heat loss, with potentially reduced requirements for heating and cooling
- Reduction in entry and/or formation of moisture
- Fewer draughts and therefore increased thermal comfort

Moisture and Vapour



Detailing that promotes efficient and appropriate airtightness should, by default, also provide effective moisture and vapour management.

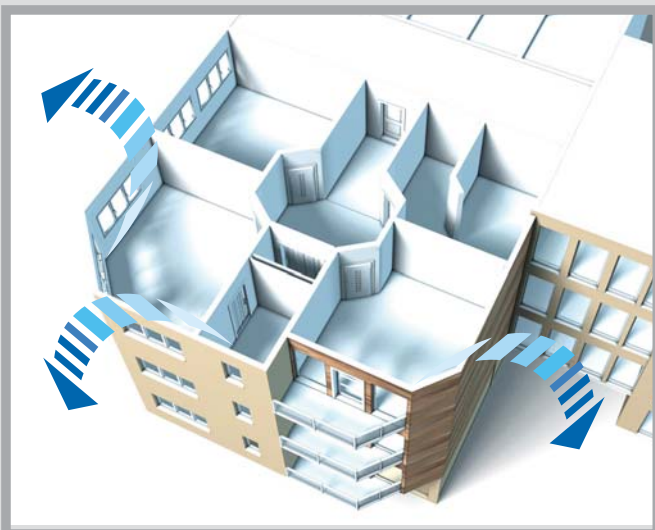
In a typical UK built environment, we have heated buildings and a positive vapour pressure gradient from the inside to the outside.



We can control the flow of water vapour in a building by specifying and using products that ensure the principles of 'inside tighter than outside' are maintained. This means that products used in the warm zone (internal) should be vapour tight (high sd) and those in the cold zone of the construction should be vapour open (low sd).

By maintaining the following principles, the risk of condensation can be reduced and associated problems avoided:

- Inside tighter than outside
- Sd ratio of minimum 10:1 inside to outside



Moisture management

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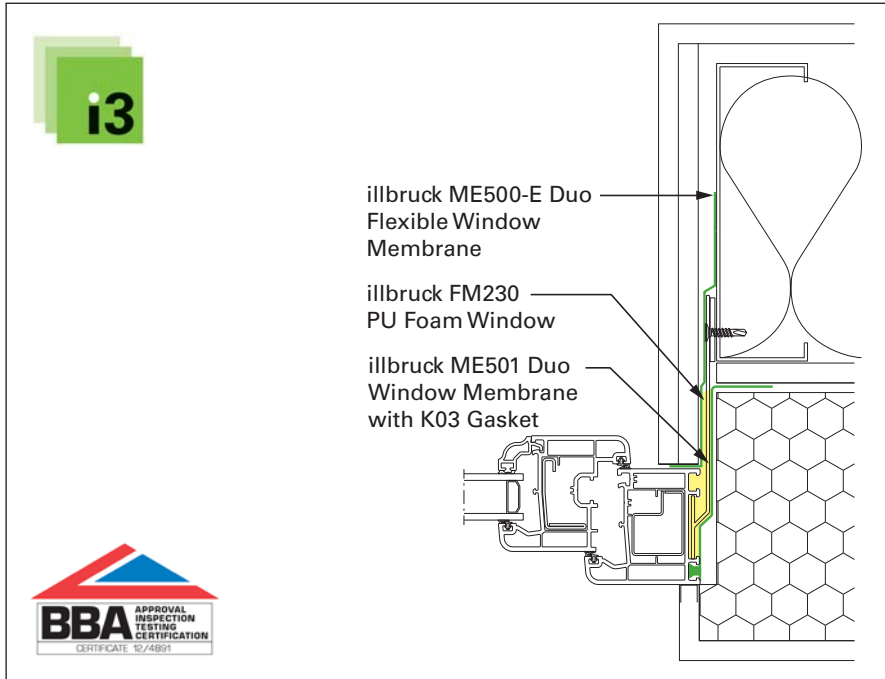
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Micro to Macro Solutions

illbruck building protection products work on both the micro level – around an individual window aperture such as the established illbruck i3 system – as well as the macro, providing total weatherproofing, as well as airtightness and vapour control across entire building elevations.



Micro: The i3 Window Sealing System



How it works: keeping 'inside tighter than outside'.

The micro zone focuses on the small, localised areas around the perimeter of windows and the interfaces between the window and structural openings.

Proper sealing is an effective interaction of the outer, middle, and inner sealing zones on the principle of 'inside tighter than outside.' By selecting the appropriate products from our range of components, various combinations can be created to suit the installation criteria. The resulting system will meet all the requirements of modern sealing technology. The result is an externally weatherproof but vapour permeable system that prevents warm, internal air penetrating joints and forming condensation.

Macro: The Holistic Approach – the Whole Façade

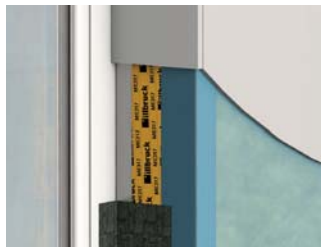


On-site air-leakage testing

How it works: optimisation of airtightness with correct vapour permeability

Macro is the main fabric of the building and the design of the built-up wall. The illbruck Building Protection Range consists of products for sealing of the internal airtight envelope of the building and the protection of the materials within the building fabric. Vapour barrier, breather membranes and high performing tapes and adhesives ensure long term building health, and performance of the entire construction, again working within the principles of 'inside tighter than outside'.

Compatibility



tremco illbruck is well-known for its site support and service levels. Through our on-going on-site 'toolbox talks' to customers and site visit reports, along with adhesion and chemical compatibility testing – it is clear that incompatibility between products from multiple sources can be a problem.

The illbruck Building Protection Range solves the problem. A range of products that are fully compatible with one another from inside to outside (see page 18 for full compatibility table). The inter-compatibility stretches from the adhesives bonding to the membranes and tapes, membranes bonding to membranes and also includes adhesion to common construction materials. illbruck products are endorsed by many market leading material suppliers.

Common problems we solve:

- Window membrane to breather membrane compatibility
- Window membrane to vapour barrier compatibility
- Vapour barrier tape to window membrane
- Breather membrane tape to window membrane
- Vapour barrier to floor, ceiling and walls
- Bonding to sheathing board tapes
- Tape compatibility to sheathing board, vapour barrier and breather membrane
- Adhesive to adhesive compatibility
- Bonding to damp sheathing board

Airtight Solutions for the Building

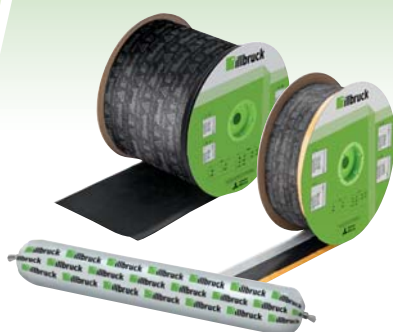
Inside

Vapour Barrier
Vapour Barrier Tapes
Adhesives



Window

Membranes
Adhesives



Outside

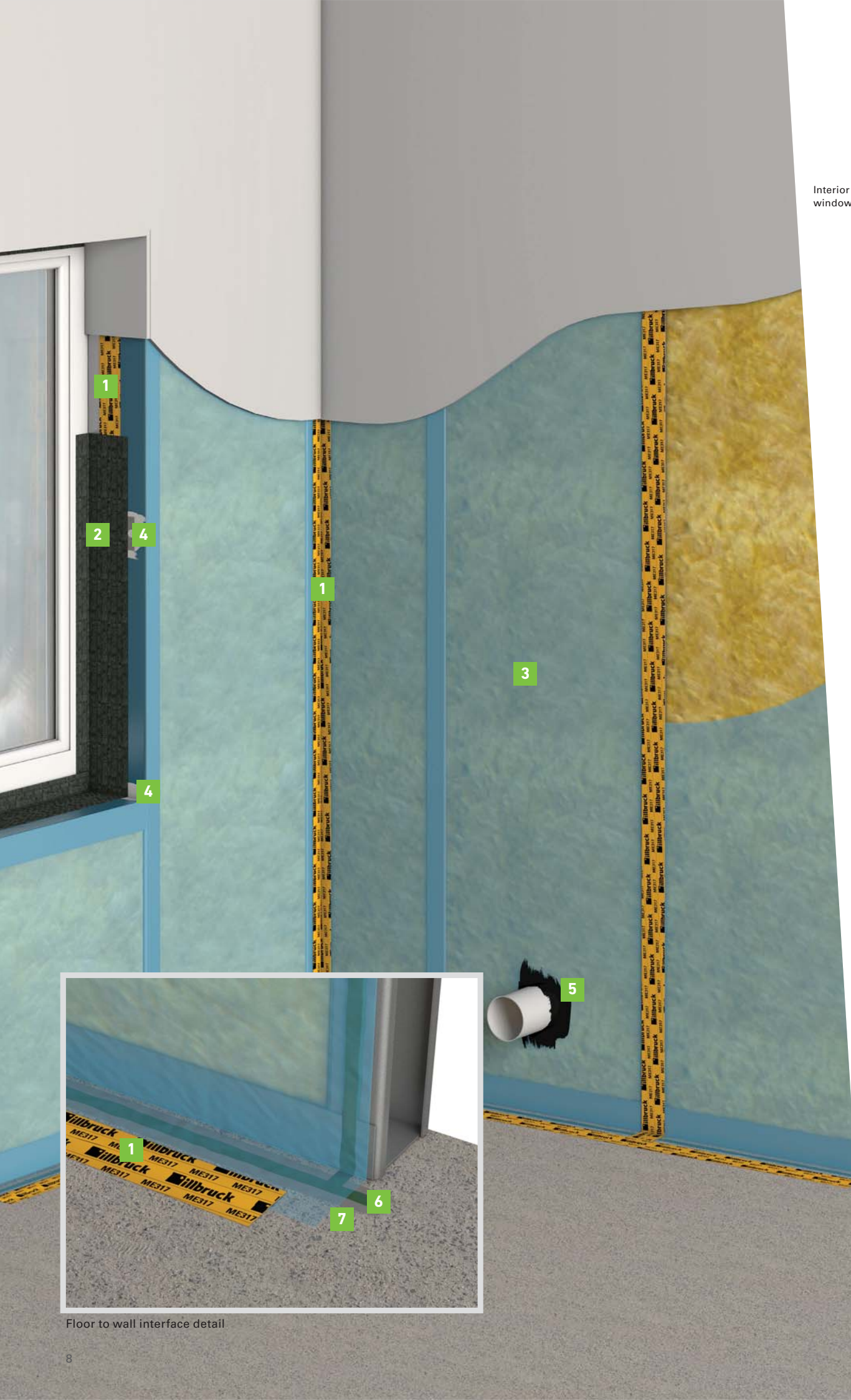
Sheathing Tapes
Breather Membranes
BM Tapes
Adhesives



Complete Protection for the Building



Interior with
window interface



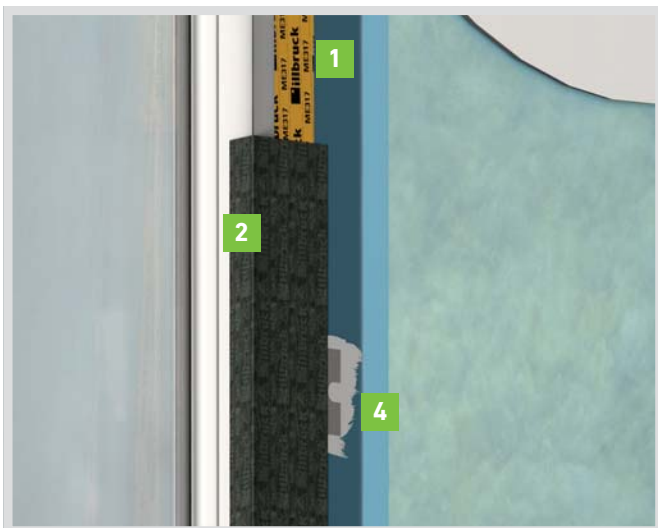
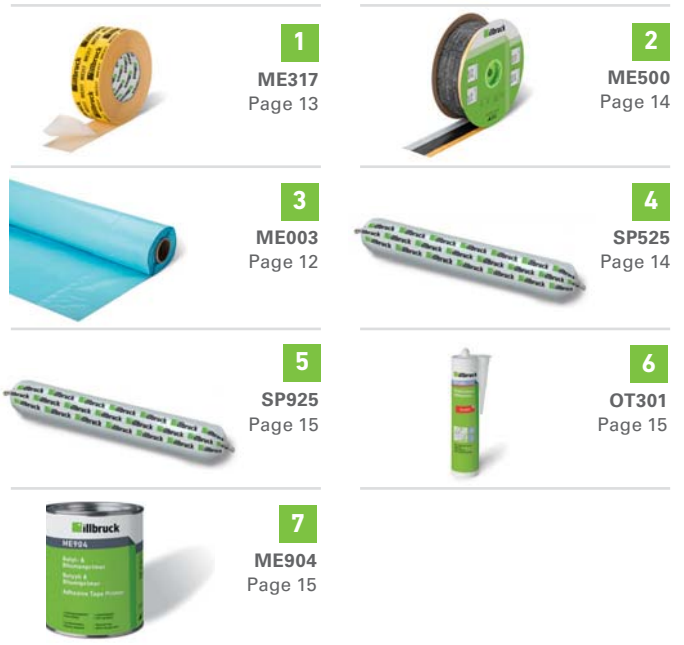
Floor to wall interface detail

Internal Applications

Our highly vapour tight, lightweight and cost effective vapour barrier is sealed using a high performance adhesive and tape. The range is complemented with all of the necessary adhesives and primers to properly seal the vapour barrier to the structure. In addition to this, our window membranes and i3 system ensure the micro areas around the window are properly sealed. Special consideration has to be made for these high risk interfaces. Finally, any penetrations are sealed using our unique brushable SP925 sealant.

All of this is achieved with a suite of compatible products from one source.

- Airtightness
- Controlled vapour permeability
- Elimination of cold bridging



Window to wall interface detail



Pipe penetration



With insulated
render

External Applications

On the cold side of the building envelope, our products are designed to stop the weather (cold air and moisture) coming in, but allow water vapour to escape from inside the building, thus reducing condensation risk.

- Full weather proofing
- Airtightness
- Controlled vapour permeability
- Elimination of cold bridging

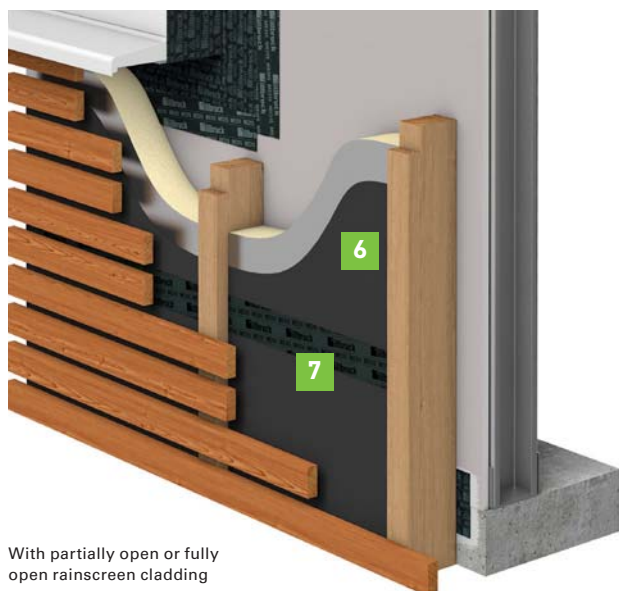
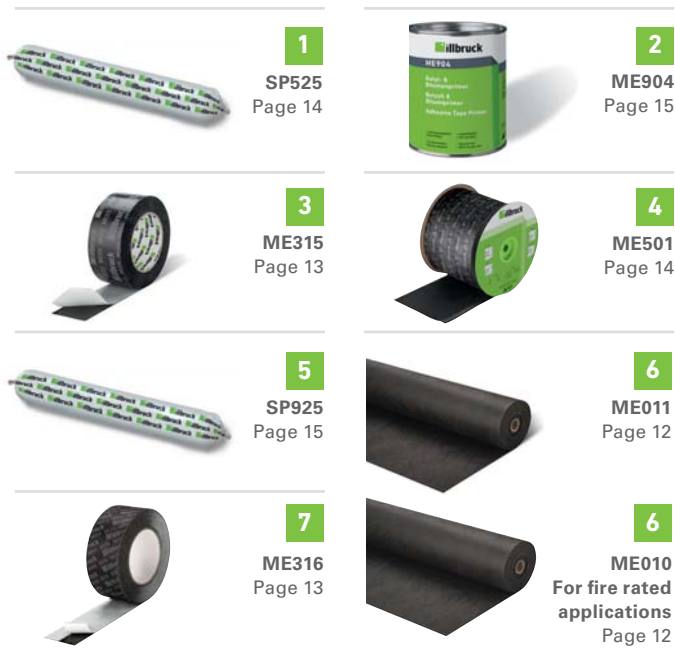
The main image, left, shows how each element is sealed to create an airtight and vapour-open construction.

The high performance breather membrane is fully air tight unlike many on the market. This allows flexibility and peace of mind with the window membrane interfaces. Market-leading sealing tapes are used to seal joints in the sheathing board, seal the membrane and interface with window membranes – all with just one product, ME315.

Adhesives, tapes and membranes are all fully compatible throughout the illbruck Building Protection Range.

Even complex small joints and penetrations from brackets and fixings can be sealed using our unique, brushable sealant SP925 to provide the complete airtight and moisture management solution.

Other typical cladding options are shown below but illbruck products work behind almost any facade system.



With partially open or fully open rainscreen cladding



With brick facing

Product Range

ME003

Vapour Barrier

- Rolls 50 m x 1.5 m wide
- Blue: semi transparent



Usage:
internal
walls



ME003 is an innovative, 3-ply co-extruded PE vapour barrier membrane that meets virtually all the demands of professional practice and protects the construction and insulation by providing a vapour and air-tight seal.

The high-grade granulates that are used as its main constituent, do not lower the sd-value (vapour diffusion-equivalent air layer thickness) and therefore this high-grade product offers comparable diffusion resistance properties to typical 160 µm PE vapour barriers, despite being thinner.

Product benefits

- sd >107 m
- Straightforward application due to low weight
- Flexible and tear-resistant
- Highly vapour retardant
- Compatible with illbruck intelligent window membranes and adhesive

ME010

Breather Membrane UV + Fire

- Rolls 50 m x 1.5 m wide
- Black



Usage:
External
walls



ME010 is a highly vapour open, hydrophobic polyester-based breather membrane. It has a Euroclass B fire rating, so can also be used where a fire rating is required.

It can be directly laid to sheathing board or thermal insulation behind partially or fully open rain screen façades or curtain walling.

Product benefits

- sd 0.04 m
- Highest range of in-service temperature resistance
- Euroclass B according to EN 13501-1
- Permanently UV-resistant
- Highly vapour open
- For partially open or fully open façades
- Non-branded, plain black finish – suitable for visible applications
- Airtight and weathertight

ME011

Breather Membrane UV

- 50 m rolls x 1.5 m wide
- Black



Usage:
External
walls



ME011 is made of a special, monolithic functional membrane covered with two layers of non-woven water-repellent polyester

It can be directly laid on sheathing board or thermal insulation behind partially open rain screen façades or curtain walling with up to 30 mm wide open joints.

The open joints should represent a maximum of 40% of the overall façade area i.e. for a 30 mm gap width, the panels/slats should be a minimum width of 45 mm each.

Product benefits

- sd 0.15 m
- UV resistant – 6 months UV stable
- Can be used within partially open façades
- Non-branded, plain black finish – suitable for visible applications
- Wide range of in-service temperature resistance
- Highly vapour open
- Airtight and weathertight

ME315

Total Protection Tape

- 25 m rolls x 60 mm wide, 100 mm & 150 mm widths also available
- Black with white branding



Usage:
Internal
and
external
walls



ME315 is single-sided adhesive tape on special membrane with solvent free modified acrylic dispersion adhesive, for interior and exterior use providing a high performing air and weather-tight seal.

Suitable for a wide variety of applications, including sealing of sheathing boards and the permanent bonding of illbruck vapour barrier and breather membranes.

A durable bond is achieved on all tremco illbruck indoor and outdoor building protection membranes.

Product benefits

- Interior and exterior use
- Quick and easy application
- 12 months UV resistant
- Can be used within partially open façades
- Weather resistant
- Highly moisture resistant adhesive
- Excellent adhesive bond strength to most common substrates
- Fully compatible with all illbruck building protection products

ME316

Endurance Tape

- 25 m rolls x 60 mm wide
- Black with grey branding



Usage:
Internal
and
external
walls



ME316 is a single-sided adhesive tape on PP fleece with waterproof adhesive for interior and exterior use providing a high performing air and weathertight seal.

Suitable for a wide variety of applications, including sealing of sheathing boards and for the durable bonding of illbruck commercial vapour barrier, and breather membranes.

Particularly suited for sealing of joints between timber panels to maintain long-term performance. A permanent bond is achieved on all illbruck building protection membranes and PE, PA, PP, aluminium foils, concrete, brick and block, aerated concrete and wood used to create an airtight seal.

Product benefits

- Interior and exterior use
- 6 month UV stability and outdoor exposure
- Can be used in partially open façades – low visibility branding when installed
- Quick and easy application
- Soft fleece backing
- Dual release liner
- Excellent permanent adhesive bond strength to most common substrates
- Suitable for rough and undulating surfaces
- Compatible with all illbruck building protection membranes

ME317

Internal Membrane Tape

- 40 m rolls x 60 mm wide
- Yellow with black branding



Usage:
internal
walls



ME317 is a single-sided adhesive reinforced kraft paper with modified acrylate dispersion, solvent-free adhesive.

For the airtight bonding of overlaps in illbruck vapour barrier and membranes for interior use. Also for joints in OSB boards and as an air-seal tape for penetrations.

Product benefits

- Strong kraft paper
- Easy to tear by hand
- Quick and easy application
- Fully compatible with all internal illbruck building protection products

Product Range

ME500

Duo Flexible Window Membrane

- Rolls 50 m x various widths
- Black



Usage:
window
installation



ME500 is a tearproof non-woven fleece fabric with a polyethylene copolymer film, including an integrated movement pleat for variable joint sizes and absorption of movement, and acrylic and butyl self adhesive strips for quick and easy installation.

Provides a perimeter window seal for airtight internal and weathertight external joints.

The product is BBA accredited.

Product benefits

- The variable sd value 0.21-15 m ensures that the joint dries out quickly, thus protecting against mould and moisture damage
- Complies with principle of 'inside tighter than outside' in order to facilitate efficient vapour management
- Excellent drying potential (due to the membrane's permeability) avoiding mould growth and physical damage
- UV – will tolerate up to 2 months direct exposure prior to covering



ME501

Duo Window Membrane HD

- Rolls 25 m x up to 1500 mm wide
- Black



Usage:
window
installation



ME501 is a high strength, tear resistant membrane made from polyethylene copolymer film with non-woven fabric. It can be applied before or after window installation to suit on-site details and programming. It is also available with gasket options for fixing to profile.

ME501 provides a high performance seal to the perimeter joint between the window/curtain wall and the construction reveal. Due to the variable sd-value, the membrane is suitable for interior and exterior use and can provide an airtight and weathertight (but vapour permeable) seal.

The product is BBA accredited.

Product benefits

- The variable sd value 0.21-15 m ensures that the joint dries out quickly, thus protecting against mould and moisture damage
- Easy fixing to frame and wall
- UV – will tolerate up to 9 months direct exposure prior to covering
- Lightweight
- Proven weathertightness



SP525

Frame and Façade Sealant

- 600 ml sausage
- White, light grey, mid-grey, concrete grey, anthracite, black, Portland (light sandstone and sandstone).



Usage:
window
installation



SP525 is a low modulus hybrid sealant formulated using advanced SP polymer technology with high movement capability, excellent primerless adhesion to most substrates and long-term performance.

SP525 is ideal for the bonding of ME500/ME501 and for sealing joints in façades, rain screens and curtain walls, and perimeter joints around windows, doors and rooflights.

Product benefits

- Meets the requirements of EN ISO 11600 F 25LM
- Isocyanate free, VOC free, non-hazardous, non-toxic
- Paintable
- High movement, rapid curing and non-staining formulation
- Excellent long-term resistance to weathering, ageing and UV
- Low modulus formulation ensures minimum strain at joint faces

OT301

Endurance Adhesive

- 310 ml cartridge
- Green



Usage: Internal and external walls



OT301 is used for creating airtight joints between illbruck vapour barrier and structural elements, airtightness membranes, wall lining membranes of all kinds and for bonding wind-tight joints between sub-roof and roof-lining membranes.

A permanent bond is achieved on all illbruck membranes, PE, PA, PP and aluminium foil used to create an airtight seal.

Product benefits

- Very high, permanent adhesion
- Quick drying.
- No pressure lath is required on loadbearing substrates
- Very elastic, permanently flexible
- Can be applied in low temperatures and suitable for permanent use in very wide temperature range
- Can be stored in very low temperatures

ME904

Adhesive Tape Primer

- 1 litre tin
- White on application, transparent when dry



Usage: Internal and external walls



ME904 is used for the pre-treatment of building substrates, e.g. cement particle board, masonry, timber, etc, when using illbruck building protection tapes: particularly for bonding to damp substrates.

Product benefits

- Optimises adhesion
- Stabilisation of the surface
- Short drying time
- Solvent free
- Allows use of illbruck building protection tapes in damp conditions

SP925

Airseal

- 600 ml sausage
- Graphite grey



Usage: window installation



SP925 is a sealant specifically developed to provide weather and airtightness in areas difficult to seal with conventional sealants such as pipe and cable penetrations and around brackets and fixings.

By being brushable and sprayable, complex small joints can be successfully sealed. Easy to apply, SP925 does not drop out of vertical unbacked joints up to 6mm wide. For larger gaps backing is required.

Product benefits

- Airtight and weathertight
- Very easy to handle
- Permanently elastic
- Fast curing
- Solvent, isocyanate, VOC and silicone free
- Applicable on damp substrates
- Brushable and sprayable
- Easy sealing of complex small joints

Technical Appendix

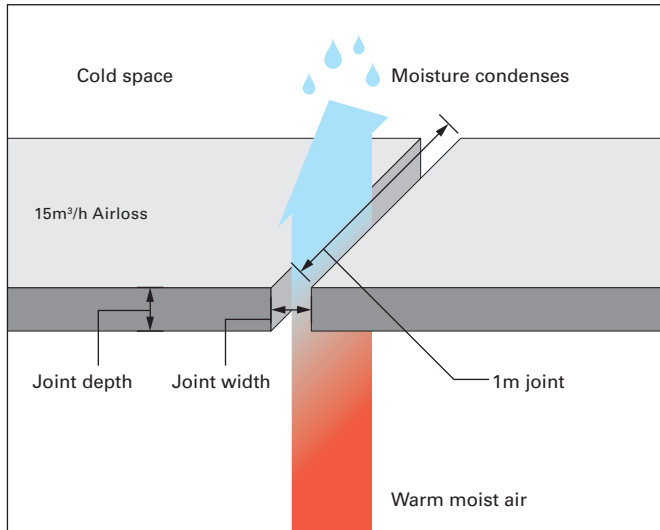


Figure 1

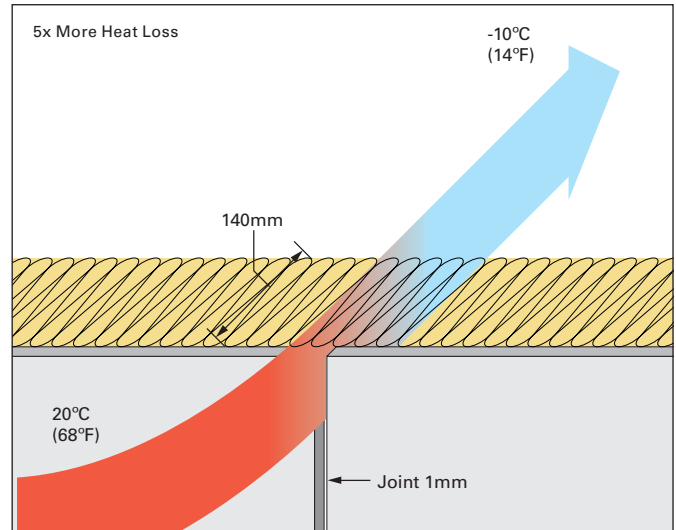


Figure 2 (1 m x 1 m structure)

Airtightness

When we are looking at heat loss in buildings, we need to consider the three forms heat loss takes:

- convection
- conduction
- radiation

Today's buildings have better insulation than ever before and are able to slow the rate of conduction through the main building fabric - walls and roofs.

Conduction is pretty slow and an indirect form of heat loss. However, the large surface area of your building means it still contributes 30-40% overall.

Convection actually accounts for the majority of the heat loss, at between 50-60%, and allows warm air in your building to pass through gaps in the fabric and be lost. This also means cold air can come in through the same holes, meaning more energy is required to maintain the required internal temperature. Studies have shown that air loss also has a detrimental effect on the thermal performance of the entire wall.

The effect of gaps on air-tightness:

A test programme was undertaken at the German Fraunhofer Institute to measure the air losses through a series of gap sizes over a 1 m length joint. The results showed that, with a differential pressure of only 6 Pa, and with a 2 mm gap, the air loss was 15 m³ per hour (see Figure 1). The equivalent air loss for a 1 mm gap width was approximately 3.5 m³/hr, so still very significant

The effect of air-loss on U-Value

The prescribed BS EN ISO 6946 method of calculating U-values does not take into account air leakage (infiltration) through the structure. However, to consider how the air leakage may impact overall thermal performance, a 1 x 1 m sized structure with a thermal insulation thickness of 140 mm was studied. With a joint-free, airtight design, the previously calculated thermal performance of 0.30 W/m²K was confirmed. However, if the same structure features only a **1 mm wide gap** in the airproofing layer, the U-value deteriorates to 1.44 W/m² K (see Figure 2). This means almost 5 times more heat is lost than with an airtight construction.

It should also be noted that any air leakage will also increase the movement of water vapour through the fabric of the building and this must also be managed to avoid the detrimental effects caused by condensation.

Condensation Risk Analysis

Figures 3 and 4 show condensation risk analysis graphs for a built-up wall example. Both walls are of the same make-up, with insulation within the SFS frame, a sheathing board, breather membrane and external, solid insulation covered by a brickwork external facade. The only difference between these two walls is that figure 3 has no vapour barrier on the inside of the SFS. Figure 4 has illbruck ME003 in this location. On figure 4, the two lines - the allowable vapour content of the air based on the local temperature, and the calculated actual vapour content - are separated by a clear gap. This means that there is no calculated condensation risk, and generally, the wider the gap the lower the risk. On figure 3 however, the removal of the vapour barrier has resulted in an increased calculated vapour content in the

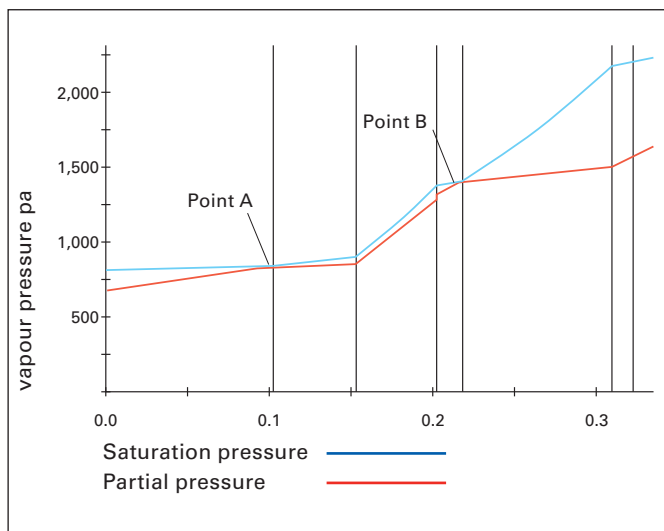


Figure 3

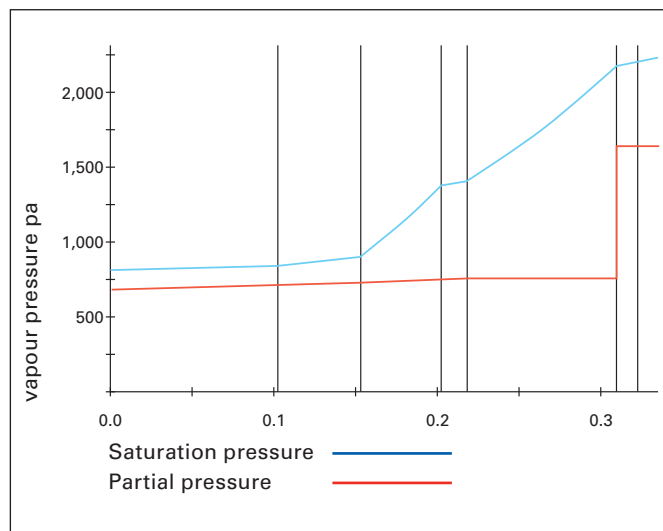


Figure 4

build⁷desk
Part of the Vabi group

external zones and the two lines intersect in two locations. At these locations, interstitial condensation will occur. Point A is the interface between the brickwork facade and the solid insulation. If condensation occurs here, the result could be damage to the brick through freeze-thaw action. Point B is the interface between the sheathing board and the insulated SFS frame. Here lies the greater concern. Condensation in this zone will lead to degradation of the sheathing board, possible corrosion of the metal frame and if it enters the insulation zone, could also cause black mould and a reduction in thermal performance which is clearly very serious. Over and above this, even where the lines on the graph do not meet, they are very close together. This means that any reduction in performance of the wall through, for example bracketry, cold bridges or poor installation, will likely result in condensation throughout the majority of the wall build-up.

Build Tight, Ventilate Right

Adequate controlled ventilation is key to both the living and working conditions of occupants of the building and for the health of the building itself.

It is widely accepted that damp and mould caused by excess humidity increases instances of asthma and other respiratory diseases, as well as causing damage to buildings.

Indoor air quality is also affected by a number of indoor pollutants including VOC's, Formaldehyde, indoor CO₂ and other irritants. These can be emitted by carpets, adhesives, cleaning products, and building products such as paints and varnishes. illbruck looks to mitigate the use of such products where possible and promote products such as our Hybrid adhesive range that are isocyanate free and low VOC.

Internal vapour control

Materials such as glass and aluminium are water vapour tight, but other common building materials are only resistant. The vapour resistance of a material is a measure of the material's reluctance to let water vapour pass through it. This reluctance is expressed as an 'equivalent air layer thickness', and is usually represented as 'sd value'. The equivalent air layer thickness is measured in metres. Like vapour resistance, it can only be quoted for a particular thickness of material or a given product. The higher the sd value, the more resistant to vapour transmittance.

In typical UK built environments we have heated buildings and a positive vapour pressure gradient from the inside to the outside.

We can control the flow of water vapour in a building by specifying and using products that ensure the principle of 'inside tighter than outside' is maintained.

Internal vapour control membranes not only provide the building with an airtight barrier, but also ensure warm moist air does not enter into the fabric of the building. The warmer the air, the greater its capacity for carrying water vapour. When warm, moist air comes into contact with a cooler surface, or cooler air, it drops in temperature, and loses some of its capacity for storing moisture, so some of it is released to form condensation in the air, or on a material surface. We usually observe condensation on surfaces that cannot absorb liquid, e.g. windows, ceramic tiles etc, but it can form on any surface, or in-between layers of construction materials (Interstitial Condensation) and therefore it may not be noticeable until mould appears, or the material starts to rot.

An internal vapour barrier can never be perfect. Even with high performance building membranes, some water vapour will pass through. In addition to this, poor workmanship, penetrations and follow-on trades can further reduce designed performance. The vapour that passes through will permeate out into the cold zone of the construction. If trapped in this location the quantity of vapour and condensation risk is increased, particularly if local cold bridges exist.

External breathability

The solution to this is to have the outer elements of the construction as vapour open as possible.

Breather membranes are located in the cold zone and provide a secondary weather seal, whilst allowing water vapour to escape. As construction dictates that the external façade is left open for a period of time, or even permanently, breather membranes should also be UV stable.

An additional factor sometimes overlooked, is the airtightness of the breather membrane. A highly airtight membrane allows formation of interface details without compromising overall performance. An example of this would be where a window is to be sealed to a breather membrane. Here, the airtight performance of the window seal can only be as good as the airtightness of the breather membrane itself.

In summary, when selecting a breather membrane, five material performance criteria should be considered.

- Vapour permeability: the lower the sd value, the better
- Weather tightness: ability to resist wind driven rain
- Airtightness: the greater the airtightness, the better.
- UV stability: to withstand UV exposure either semi-permanently or permanently.
- Additional consideration: fire resistance for products applied over 18 m high

Product Compatibility Matrix

Key ● Fully compatible ● Not compatible ● Primer required ● N/A

	ME003	ME010	ME011	ME500	ME501	ME315	ME316	ME317	SP525	SP925	OT008	OT015	OT301
Membranes													
ME003	●	●	●	●	●	●	●	●	●	●	●	●	●
ME010	●	●	●	●	●	●	●	●	●	●	●	●	●
ME011	●	●	●	●	●	●	●	●	●	●	●	●	●
ME500	●	●	●	●	●	●	●	●	●	●	●	●	●
ME501	●	●	●	●	●	●	●	●	●	●	●	●	●
ME315	●	●	●	●	●	●	●	●	●	●	●	●	●
ME316	●	●	●	●	●	●	●	●	●	●	●	●	●
ME317	●	●	●	●	●	●	●	●	●	●	●	●	●
Sealants													
SP525	●	●	●	●	●	●	●	●	●	●	●	●	●
SP925	●	●	●	●	●	●	●	●	●	●	●	●	●
Adhesives													
OT008	●	●	●	●	●	●	●	●	●	●	●	●	●
OT015	●	●	●	●	●	●	●	●	●	●	●	●	●
OT301	●	●	●	●	●	●	●	●	●	●	●	●	●

tremco illbruck and its strong brands



tremco illbruck is a European manufacturer and service provider of high-performance sealing, bonding, flooring, waterproofing, and passive fire protection for the construction and manufacturing industries. We ensure that your processes become faster, smarter, more efficient. And more enjoyable. Every time.



illbruck adds perfection – to all your sealing and bonding projects. Be it windows, façades, interiors and exteriors, a major construction scheme or a minor refurbishment job. We offer the right set of products, services and expertise to lessen your workload and improve the overall climate of buildings. Making it perfect.



Nullifire helps reducing the complexities of passive fire protection. Fire safety regulations are complicated and potentially involve the threat of liability. To cope with these challenges we deliver a focused range of rigorously tested products that cover a wide array of passive fire protection applications. Nullifire's expert advice, support and training make for smart and simple solutions in passive fire protection.



TREMCO delivers lasting results when it comes to flooring, waterproofing, insulating glass or structural glazing. The building envelope is faced with ever more exacting requirements – technologically, legally and in terms of sustainability. With more than 80 years of field experience TREMCO offers products that have been tested for decades and under extreme environmental conditions – for buildings that are made to last.



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