

# Do it once do it right!



DUPONT®

Tyvek.

DUPONT™ BUILDING INNOVATIONS: AVCL INSTALLATION GUIDES

**THE MOST EFFICIENT WAY TO GUARANTEE OPTIMAL  
MOISTURE CONTROL IN ALL YOUR CONSTRUCTIONS**

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## Why airtightness is important

**BECAUSE:** Air tightness promotes greater energy efficiency, enhanced interior comfort, durability, health and longevity of buildings. The performance of the insulation material is largely determined by its protection against air movement and humidity pass through the actual insulant.

A properly installed AVCL will help to prevent water vapour from driving through the building envelope from the building interior. In addition, the AVCL will form an effective airtight barrier against warm air convection (draughts and heat loss). These functions will not only help to reduce condensation risk within the insulation and structure, but will also conserve energy and reduce CO<sub>2</sub> emissions.



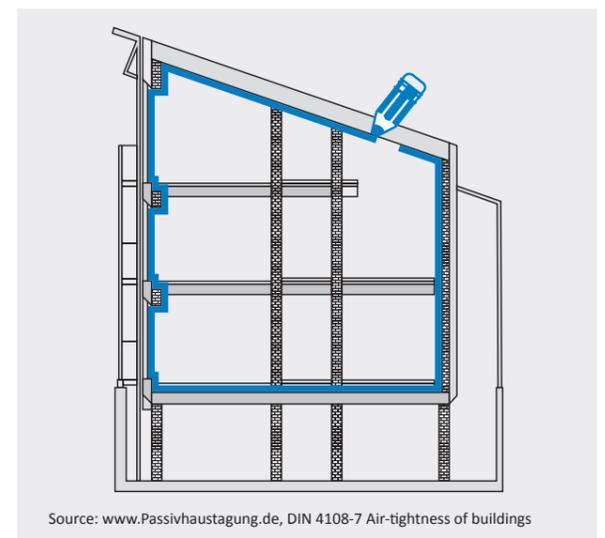
Healthy construction

Mould damage because of trapped moisture

## Why air tightness is in the detail

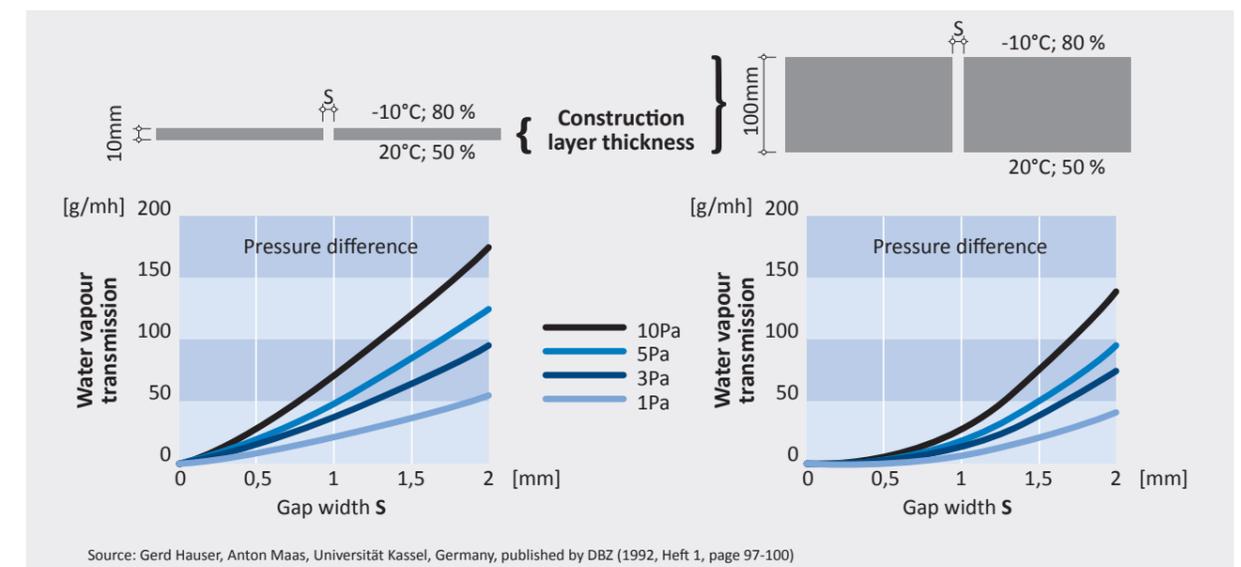
**BECAUSE:** A building envelope can be airtight only if it consists of one undisturbed airtight layer encapsulating the entire volume.

- ➔ For each construction element (walls, floors, ceilings, etc.), it must be specified which plane will form the airtight layer.
- ➔ In a second step it has to be determined, how the airtight layers of the components will be connected to guarantee effective and continuous airtightness.



Source: www.Passivhaustagung.de, DIN 4108-7 Air-tightness of buildings

## Risk of air tightness interruption



Source: Gerd Hauser, Anton Maas, Universität Kassel, Germany, published by DBZ (1992, Heft 1, page 97-100)



## AVCL Selection

### Why the vapour resistance of an AVCL is important

**BECAUSE:** High vapour tightness = high vapour resistance, which reduces the capacity in allowing any moisture which may be trapped within the construction to dry out more easily.

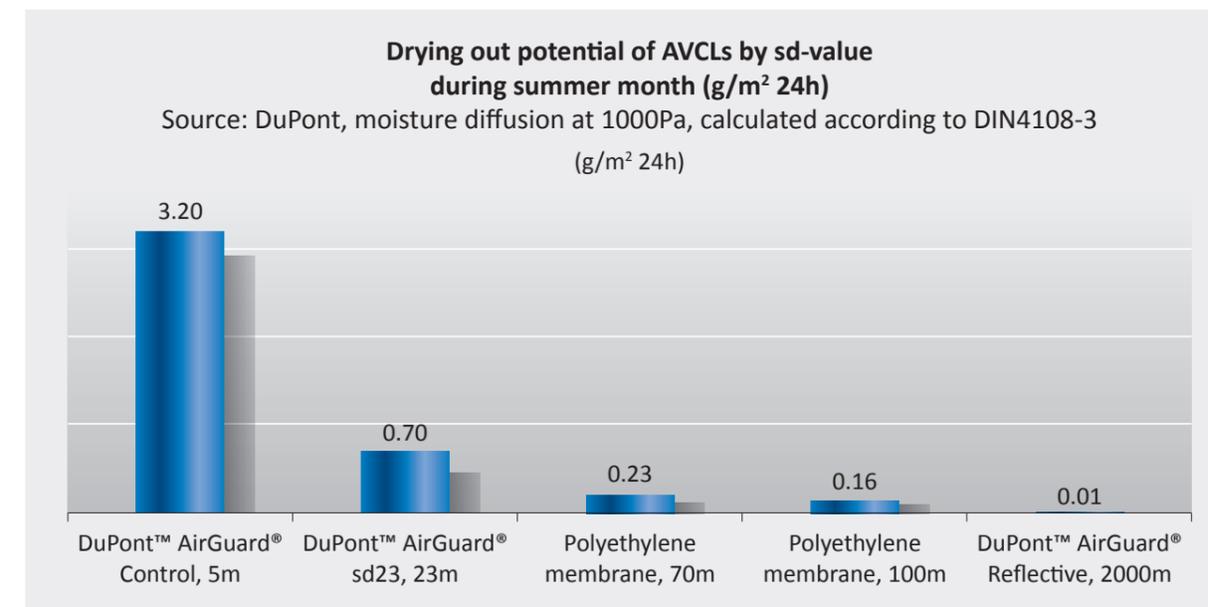
Under normal room humidity levels (30-70%), the water vapour resistance of an AVCL would ideally not only block moisture transmission during the winter months, but also enable drying out of unwanted humidity during the summer months. The higher the vapour resistance, the higher the moisture resistance during winter, but conversely, the lower the drying out potential during summer months.

	POLYETHYLENE MEMBRANE	STANDARD AVCL MEMBRANES	VARIABLE AVCL MEMBRANES	REFLECTIVE AVCL MEMBRANES
<b>Vapour resistance (MNs/g)</b>	>=100MNs/g up to 500-750MNs/g and above	10MNs/g up to 125MNs/g	1.5 to 25MNs/g 1.25 to 50MNs/g 0.25 to >150MNs/g	>500MNs/g for composites with metallised surface  >2500MNs/g for composites with aluminum foil
<b>Sd-value (m) Vapour resistance expressed as equivalent air layer thickness</b>	>= 20m up to 100-150m and above	From 2m up to 25m	0.3to 5m 0.25to 10m 0.05 to >30m The lower the bottom value and the higher the upper value, the better the performance.	>100m for composites with metallised surface  >500m for composites with aluminum foil

### Why polyethylene (polythene) sheets or foil backed gypsum boards can quickly become a moisture trap

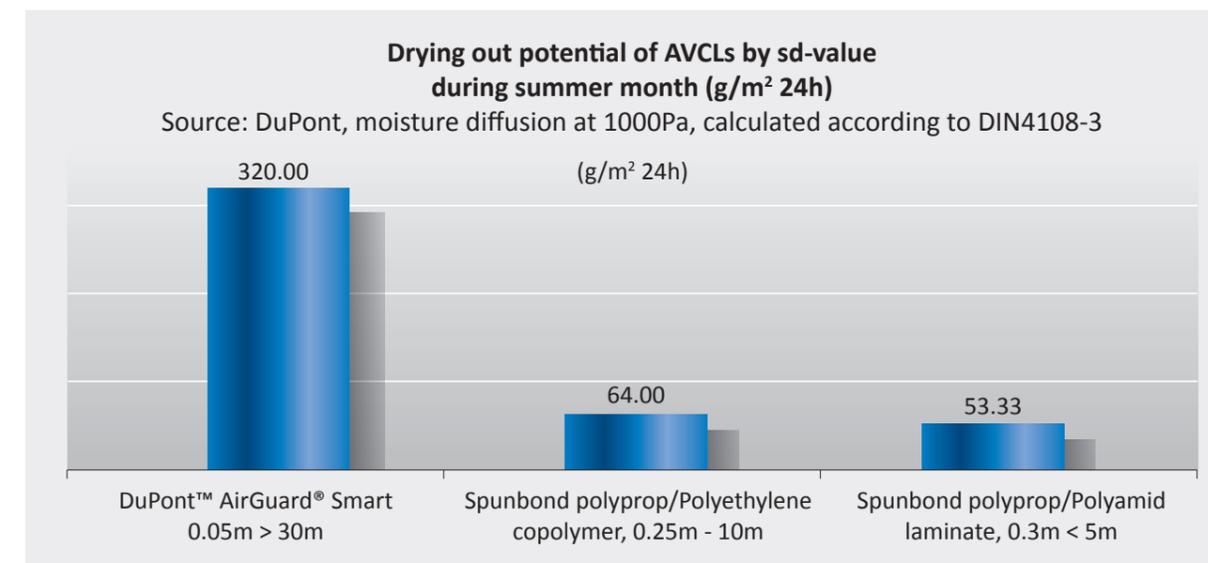
**BECAUSE:** The drying out of the construction toward the interior is rarely possible.

Polyethylene membranes are typically offered with sd-values ranging from >=20m up to 100-150m (>=100MNs/g up to 500-750 MNs/g and above). Due to their high vapour resistance, in the wrong environment they can quickly become a moisture trap.



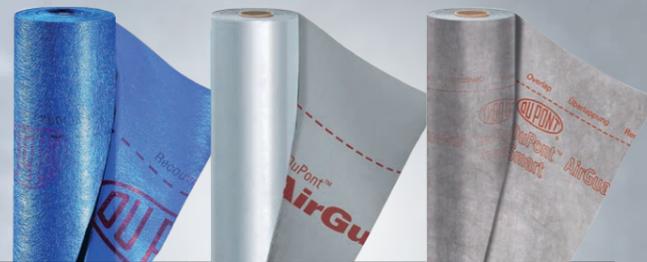
### Variable AVCLs offer excellent protection and high drying out potential

AVCLs with a variable sd-value offer excellent protection to the construction against condensation risk and potential damage due to the adaptation of their water vapour resistance by humidity concentration. The principle is simple: In an environment where humidity levels are moderate, as in a standard domestic dwelling, the membrane has a high vapour resistance. In this case the AVCL provides protection against moisture infiltration in the same way as a conventional AVCL. However, where humidity is high (eg. trapped moisture within the insulation layer) the vapour resistance of the membrane drops, thus allowing the structure to dry out into the building interior.



## AVCL application/product selector

Different systems require different types of membrane. Installations should be carefully analysed prior to product selection. Below is a rule of thumb table:



		DuPont™ AirGuard® Control	DuPont™ AirGuard® Reflective	DuPont™ AirGuard® Smart
Style reference		8327AD	5814X	8407A
Normal room humidity, ~40%-70%		●	●	●
High room humidity, >70%		●	●	●
Roof type	Flat	●	●	●
	Pitched, > 10°	●	●	●
Roof covering	Metal	●	●	●
	Tiles	●	●	●
	Single ply/ bitumen	●	●	●
Wall		●	●	●
Floor		●	●	●
Underlay sd-value	Low	●	●	●
	High	●	●	●
Insulation	Diffusion open ( $\mu \leq 10$ ) as for example: Stone wool, glass wool, wood fibre, cellulose fibre, etc.	●	●	●
	Diffusion closed ( $\mu > 10$ ) as for example: EPS, XPS, PUR/PIR, phenolic foam, foam glass	●	●	●

Legend: ● Usually recommended ● Usually not recommended ● Case specific

## Select the right tape for all sealing tasks

DuPont™ Tyvek® accessories are designed to work as a system with AirGuard® membranes. If other tapes are used, compatibility should be assessed by the installer case by case when in doubt.



	Tyvek® Acrylic Tape	Tyvek® Acrylic Tape with split release liner	Tyvek® Metallised Tape	Tyvek® Double Sided Tape	Tyvek® Butyl Tape	Tyvek® UV Façade Tape	DuPont™ FlexWrap® NF
Style reference							
<b>Product</b>	Single-sided tape.	Single-sided acrylic tape with split release liner.	Single-sided reflective tape. Made of metallised Tyvek® and acrylic adhesive.	Double sided acrylic tape. Excellent adhesion properties.	Double sided butyl based sealant, used to form a moisture and airtight seal.	Single-sided acrylic tape with high UV resistance.	High performance stretchable and flexible self-adhesive flashing tape.
<b>Colour</b>	White & printed	White & printed	Silver	Colorless	Black	Black	White/Black
<b>Product dimensions</b>	60mm x 25m 75mm x 25m 100mm x 25m	60 mm (12 x 48 split) x 25 m 100 mm (50 x 50 split) x 25 m	75mm x 25m	50mm x 25m	20mm x 30m 50mm x 30m	75mm x 25m	150mm x 22.9m

### Building material fit

Masonry/concrete/ render (smooth)	●	●	●	●	●	●	●
Brick/block/ concrete (rough)					●		Use primer
Plasterboard	●	●	●	●	●	●	
Eaves Carrier				●	●		●
Window/door frames	●	●	●	●	●	●	●
Metal surface	●	●	●	●	●	●	●
Timber (rough sawn)					●		Use primer
Timber (planed)	●	●	●	●	●	●	●

### Sealing the details

Pipe penetrations	●	●	●				●
Wiring / cable penetrations	●	●	●				●
Chimneys					●	●	●
Electrical sockets	●	●		●	●	●	●
Laps sealing	●	●	●	●			
Nail penetrations					●	●	●
Damage repair & making good	●	●	●				●

<b>Storage</b>	Rolls are ideally stored palletized or on their sides on a smooth clean surface, under cover and protected from direct sunlight.
<b>Care</b>	Care should be taken when handling the membrane in order to prevent tears and punctures occurring. Any damage during the installation must be repaired or replaced.
<b>Membrane orientation and fixing</b>	DuPont™ AirGuard® products are installed with the printed side facing the room. Consider possible expansion and contraction of the membranes with temperature changes, therefore don't overstretch when installing, but rather keep a certain amount of slack and make pleats where appropriate.  Either pre-cut the correct length of product needed for the wall/ceiling or unwind the roll as you go and cut when appropriate.
<b>Continuous sealing</b>	DuPont™ AirGuard® must be sealed at all laps, junctions and penetrations.
<b>Fixing to timber</b>	Initial/temporary fixing of the membrane is normally achieved with stainless steel staples. These may be positioned at the overlap where the membrane is to be later sealed with tape. For best practice fix the membrane using DuPont™ Tyvek® double sided tape, as this will help to minimise penetrations.  Where shrinkage or movement within the structure is likely a flexible seal, such as DuPont™ Tyvek® butyl tape will be of benefit. The membrane should be permanently fixed with timber battens, metal channels/brackets or the internal lining.
<b>Fixing to concrete</b>	When the sheet is fixed to a concrete surface, ensure the surface is clean and dry. A flexible seal, such as butyl tape is recommended, as it can accommodate small gaps and imperfections.
<b>Fixing to steelwork</b>	Use DuPont™ Tyvek® double sided or butyl tape for temporary fixing. The membrane shall be permanently fixed with timber batten, metal channels/brackets or the internal lining.
<b>Penetrations</b>	Penetrations should be kept to a minimum and any that are made should be sealed to ensure full functionality of the membrane as an airtightness layer.
<b>Membrane damages</b>	Any membrane damage should be immediately made good to avoid air leakage after installation. First cover the damaged area with tape, and then add an extra piece of AirGuard® membrane over the damage. The overlap shall be at least 100mm in all directions.

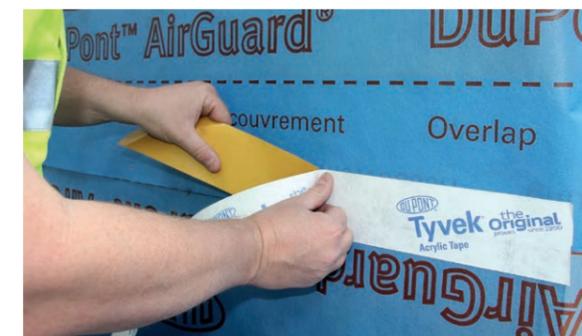
## 100mm laps

Maintain a minimum 100mm lap between sheets. The sheets should be sealed with double sided tape.



As an alternative to double sided tape, joints can be sealed with single sided DuPont™ Tyvek® tape or alternative. Do not apply the tape under stress. Make sure the tape covers the overlap of the two membranes with 50/50 coverage.

For best practice, vertical membrane overlaps should be placed in line with studs



## After taping

Permanently fix the membrane with a timber batten or the internal lining.

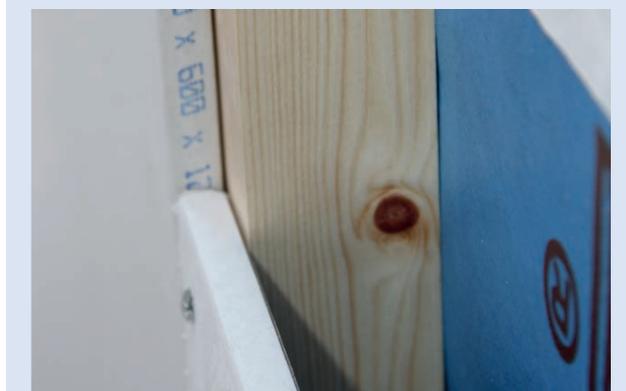


## Minimise membrane penetrations

The internal lining (plasterboard, etc.) can be spaced off DuPont™ AirGuard® to create a services void.

This can help minimise penetrations through the membrane created by electrical sockets, light fittings, etc.

Timber battens, minimum 25mm, may be used for this.



# Round penetrations

Whether you have to seal a tube or a cable: It only takes 8 small steps from cutting to finishing with DuPont™ Flexwrap™ tape.

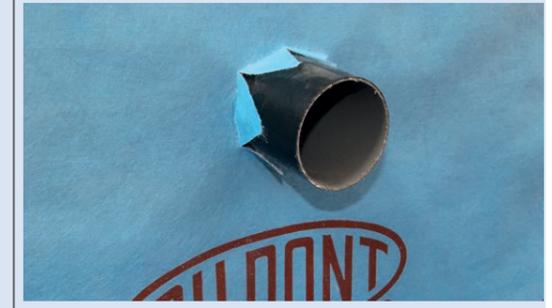
<b>Step 1</b>	Calculate or measure perimeter and add 2cm.	
<b>Step 2</b>	Cut the appropriate length of DuPont™ Flexwrap™.	
<b>Step 3</b>	Fold DuPont™ Flexwrap™ and remove first half of the release paper backing.	
<b>Step 4</b>	Attach DuPont™ Flexwrap™ to the penetration detail and wrap it around, pressing firmly to ensure a good bond.	
<b>Step 5</b>	Remove the remaining release paper backing.	
<b>Step 6</b>	Attach DuPont™ Flexwrap™ onto the membrane surface (adjacent to the pipe) on the opposite side to the tape joint.	
<b>Step 7</b>	Stretch and press DuPont™ Flexwrap™ with both hands, from the initial point outwards, pressing firmly into place.	
<b>Step 8</b>	Stretch to finish, checking that the tape adhesion and contact is thorough..	

## TIP

DuPont™ Flexwrap™ tape is also an easy way to install solution for small tubes or cables as an alternative to sleeves.



As an alternative to the DuPont™ Flexwrap™ tape, sleeves or Tyvek® acrylic tape can be used to seal round penetrations.

<b>Step 1</b>	Cut the membrane to accommodate the penetration, usually an asterisk is appropriate.	
<b>Step 2</b>	Cut DuPont™ Tyvek® tape strips and place them the long way down the penetration over the AVCL.	
<b>Step 3</b>	Tape the strips around the penetration, pressing firmly into place until completely sealed.	
<b>Step 4</b>	Check the work for gaps and imperfections.	

# Square penetrations

For squared penetrations you can follow the same principle as for round penetrations. DuPont™ Flexwrap™ tape is an easy to seal alternative to the DuPont™ Tyvek® single sided tape shown in the following pictures.

<p><b>Step 1</b></p>	<p>Offer the membrane into position and cut around any penetrations (in this example we are using a rafter to wall detail).</p> <p>Cut around the penetration as neatly as possible.</p> <p>Trim off any excess.</p> <p>Staples may be used to secure the edges if necessary.</p>	
<p><b>Step 2</b></p>	<p>Seal around the penetration by using DuPont™ Tyvek® tape strips, placing them vertically over the cuts in the membrane.</p>	
<p><b>Step 3</b></p>	<p>Apply the tape strips around the penetration until completely sealed.</p>	
<p><b>Step 4</b></p>	<p>Check the work for gaps and imperfections where air leakage could occur.</p> <p>Complete the sealing process where necessary, attending particularly to any unsealed laps.</p>	

# Wall window / Door

For the sealing of walls the flexible DuPont™ Flexwrap™ tape is recommended: it is easy and fast to install, thanks to its flexibility it limits the risk of gaps in the finished sealing.

<p><b>Step 1</b></p>	<p>Cut the hole (diagonal) for the penetration. <b>Alternative cut shapes</b></p>	
<p><b>Step 2</b></p>	<p>Calculate or measure the required tape length for the window frame.</p> <p>Fold the tape at the release paper split.</p>	
<p><b>Step 3</b></p>	<p>Tape the membrane around the window opening.</p>	
<p><b>Step 4</b></p>	<p>Tape the membrane edges and corners with DuPont™ Tyvek® single sided tape or alternative.</p>	
<p><b>Step 5</b></p>	<p>Fix the plasterboard into place.</p>	

For the door penetration the same principle as for the window penetration applies.



# Wall connection

## Method 1: First wall then ceiling membrane

<p><b>Step 1</b></p>	<p>A proper connection of the ceiling and wall membrane can be achieved by using DuPont™ Tyvek® double-sided tape.</p>	
<p><b>Step 2</b></p>	<p>Maintain a minimum 100mm lap between the sheets</p>	
<p><b>Step 3</b></p>	<p>As an alternative to the double-sided tape, the lap may also be sealed with DuPont™ Tyvek® single sided tape.</p>	
<p><b>Step 4</b></p>	<p>Permanently fix the membrane with timber battens or the internal lining. Timber battens offer the advantage of providing a service void.</p>	

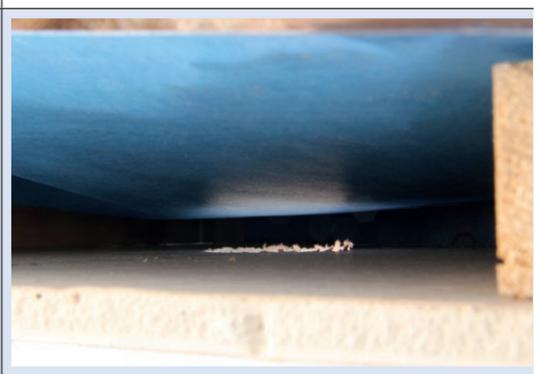
## Method 2: First ceiling then wall membrane

<p><b>Step 1</b></p>	<p>At the ceiling/wall junction, apply DuPont™ Tyvek® double sided tape to the ceiling corners.</p>	 <p>Ceiling</p>
<p><b>Step 2</b></p>	<p>Place the membrane against the ceiling, allowing a 100mm lap onto/down the adjacent walls.</p> <p>Remove the release liner from the tape and press the membrane firmly into place.</p> <p>Fold the membrane in the corner, do not cut off the fold.</p>	 <p>Ceiling</p>
<p><b>Step 3</b></p>	<p>Apply DuPont™ Tyvek® double sided tape to the walls so that it covers the edges of the ceiling membrane.</p>	 <p>Ceiling</p>
<p><b>Step 4</b></p>	<p>Position the wall membrane into the corners. Remove the tape release paper and press the wall membrane firmly into place.</p> <p>Ensure that airtightness is achieved and there are no weaknesses in the join.</p>	 <p>Ceiling</p> <p>first wall layer</p>

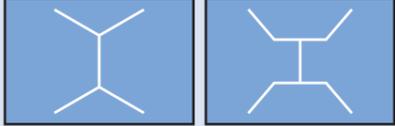
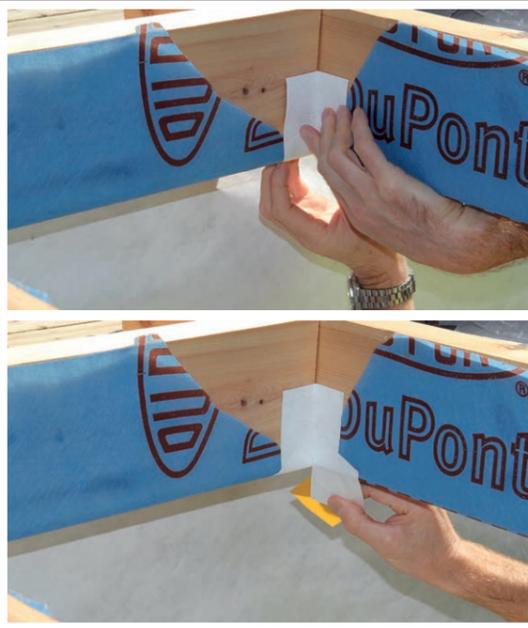
# Floor connection

<p><b>Step 1</b></p>	<p>Check the floor is clean and dry from construction site dirt to ensure good tape adhesion. A primer is recommended to promote tape adhesion on concrete.</p>	
<p><b>Step 2</b></p>	<p>Place double sided butyl tape along the wall floor connection line.  A flexible seal, such as butyl tape is recommended, as it can accommodate small gaps and imperfections.</p>	
<p><b>Step 3</b></p>	<p>Pull down the AVCL, remove tape's release paper backing and press the AVCL firmly against the tape.</p>	
<p><b>Step 4</b></p>	<p>Check the AVCL is well bonded along its full length.</p>	

# Downlights

<p><b>Step 1</b></p>	<p>Once the membrane is installed and sealed for airtightness, fix timber battens of minimum 25mm over to provide a services void.</p>	
<p><b>Step 2</b></p>	<p>Fix the internal lining into place (typically plasterboard) and cut a suitably sized hole to accommodate the downlight fitting. Take care not to damage the airtightness layer.</p>	
<p><b>Step 3</b></p>	<p>Before the downlight is fitted, double check the airtightness layer to ensure it has not been damaged during cutting.</p>	

# Ceiling hatch

<p><b>Step 1</b></p>	<p>Cut diagonal the opening for the ceiling hatch.</p> <p><b>Alternative cut shapes:</b></p> 	
<p><b>Step 2</b></p>	<p>Fold the cuts upwards and stable to the timber.</p>	
<p><b>Step 3</b></p>	<p>Neatly trim the membrane to size.</p>	
<p><b>Step 4</b></p>	<p>Seal the cut membrane to the corners of the opening using DuPont™ Tyvek® single side tape. Apply the first piece centrally in the corner.</p> <p>Apply additional tape strips, starting from the centre of the corner outwards.</p>	

<p><b>Step 5</b></p>	<p>Ensure the tape is sufficiently long enough so that it extends across the underside of the hatch frame.</p>	
<p><b>Step 6</b></p>	<p>Once the corner is sealed and airtight the internal lining can be installed.</p>	
<p><b>Step 7</b></p>	<p>Fix the hatch frame into place. Butyl tape between the hatch frame and AVCL can be beneficial to improve the sealing.</p>	
<p><b>Step 8</b></p>	<p>Fit the hatch, ensuring that all integrated draught seals are effective.</p>	



*Recommendations as to methods, use of materials and construction details are based on the experience and current knowledge of DuPont™ and are given in good faith as a general guide to designers, contractors and manufacturers. This information is not intended to substitute for any testings you may need to conduct to determine for yourself the suitability of our products for your particular purposes. This information may be subject to revision as new knowledge and experience becomes available. Since we cannot anticipate all variations in actual end-use conditions, DuPont™ makes no warranties and assumes no liability in connection with any use of this information. Nothing in this publication is to be considered as a licence to operate under a recommendation to infringe any patent right.*



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