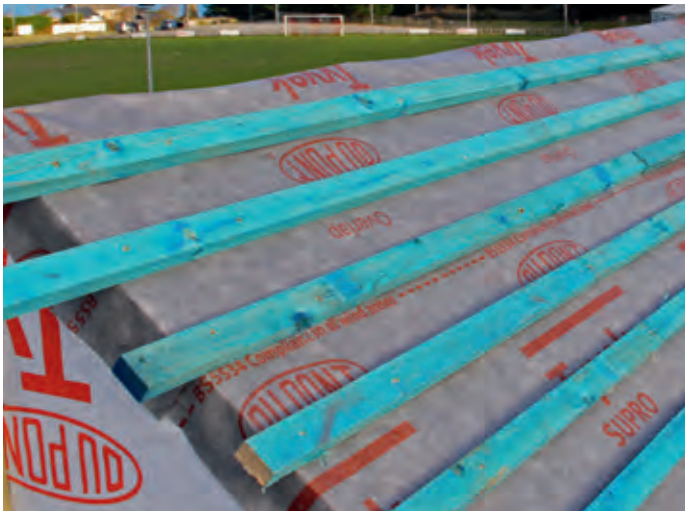










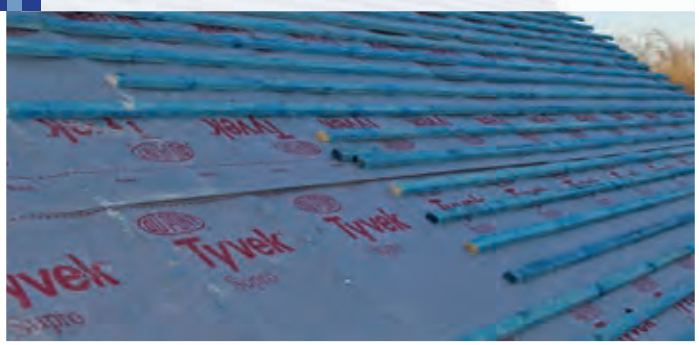


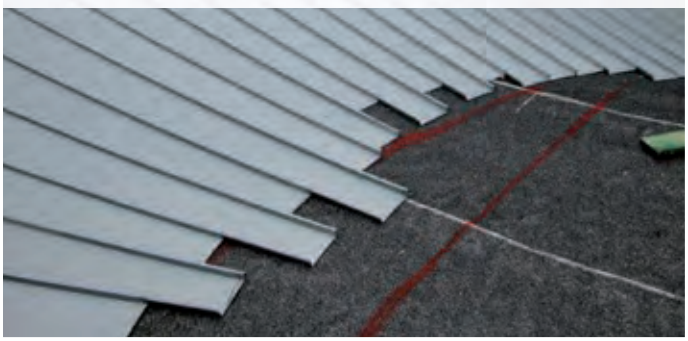
DUPONT Tyvek. FOR GREATER GOOD™

PROVIDING PROTECTION IN CONSTRUCTION

Technical guide: roofs

www.construction.tyvek.co.uk





Contents

Page

Introduction 1

Roofing products and accessories 2

Wall and roof products 3

Product selector 3

Building Regulations - DuPont™ Tyvek® solution 4

BBA approvals 5

Non-ventilated or sealed? 6

Benefits of DuPont™ Tyvek® sealed roof system 7

Agrément certificate coverage ..... 8 - 9

Supported applications 10

Unsupported applications 11

Wind resistance ..... 12 - 13

Eaves 14

DETAILING: Eaves ..... 14 - 20
Parapet 21
Valley 22
Ridge 23
Verge 24
Abutment 24
Soil vent pipe 25
Chimney stack 25
Roof window 26
Dormer 27

Adjoining existing constructions 28

Below pitch applications 28

Metal roof systems 29

Fully supported rigid sheet ..... 30 - 31

Profiled metal sheet ..... 30 - 31

Internal lining : DuPont™ AirGuard® Control / DuPont™ AirGuard® Reflective ..... 34 - 35
DuPont™ AirGuard® Smart ..... 36 - 37

Specification notes ..... 38 - 40

FAQ 41

Technical data ..... 42 - 44

General notes 45

Technical support 46

Condensation risk analysis 46

British/European Standards 47

About DuPont 49

Contact information ..... back cover

DuPont™ Tyvek® membranes Providing protection in construction

Introduction

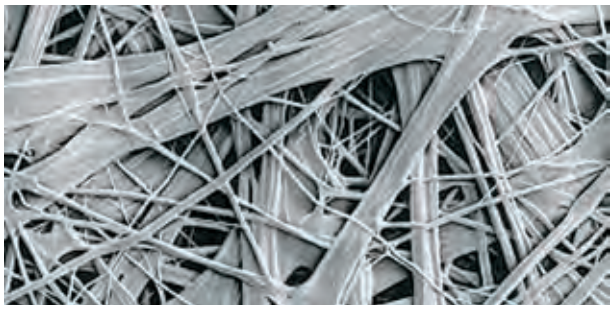
The DuPont™ Tyvek® family of membranes has been developed by DuPont to provide protection against the hazards associated with the construction and use of buildings; the principle hazards are:

- **climatic conditions**
  rain, snow, hail, wind, ground moisture
- **condensation**
  occurring on and within the building fabric

Protection in construction

Tyvek® membranes are engineered for the purposes of providing protection to buildings and their occupants from external climatic conditions and from the effects of condensation. This technical manual contains detailed information specifically on the use of Tyvek® membranes in **pitched roof construction**. By controlling the movements of heat, air and moisture through the building envelope Tyvek® membranes can make a major contribution to protecting the environment by improving the energy efficiency of buildings.

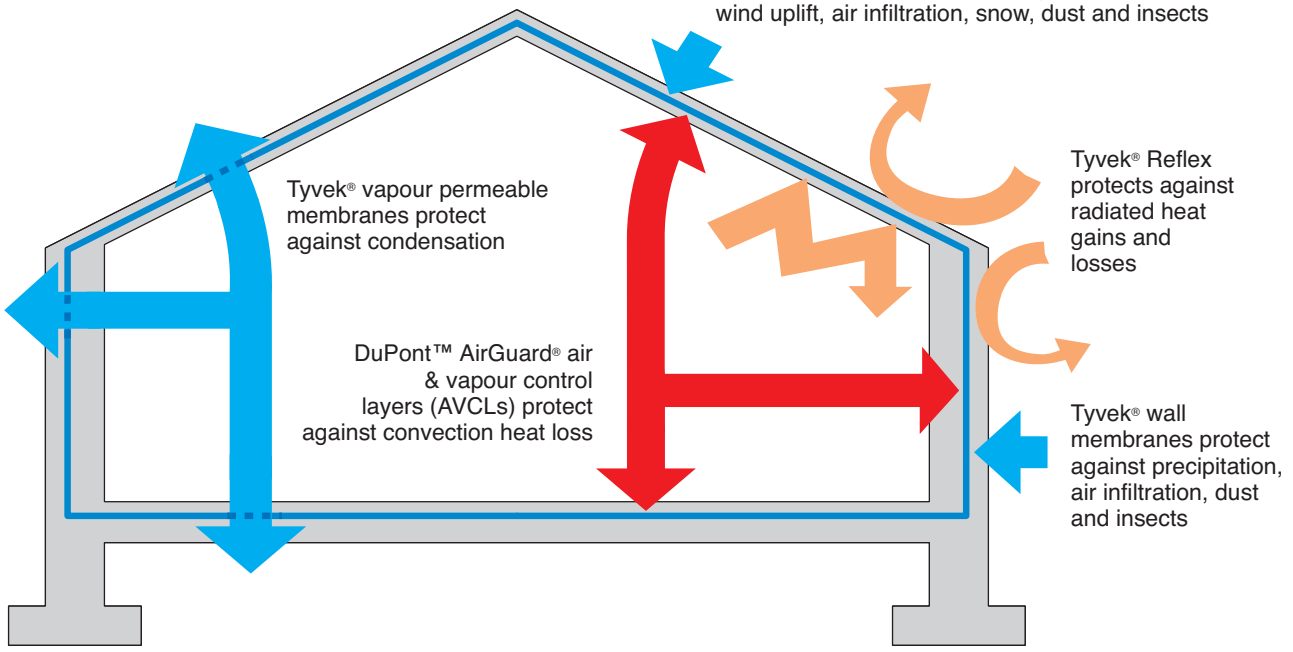
To achieve the required internal conditions with optimum efficiency it is essential to consider air flow and moisture movement together with all aspects of heat transfer, not



only by conduction, but also by convection and radiation. The reduction of air leakage, the avoidance of damaging condensation and the provision of thermal insulation must all be considered together to ensure the protection and wellbeing of the occupants and the long term protection of the building fabric.



Tyvek® roof underlays protect against precipitation, wind uplift, air infiltration, snow, dust and insects



For information on Tyvek® membranes for protection against external moisture and condensation please contact:
01275 337667 (Option 1)

DuPont™ Tyvek® product range and applications

Roofing products: BBA certificates n° 08/4548 and 90/2548

DuPont™ Tyvek® Supro/Supro Plus

Multi-purpose, heavyweight, reinforced Tyvek® grade for use in all supported and unsupported pitched roof applications, including warm, hybrid and cold roofs. Also suitable for Scottish sarking board systems, low pitched metal roofs as well as wall and floor applications.

Roll sizes:
1 m x 50 m and 1.5 m x 50 m.
Horizontal lap: 150 mm.

DuPont™ Tyvek® Metal

Metal roof breather membrane incorporating a supportive polypropylene drainage mesh for use beneath all rigid sheet metal roof systems. Allows condensate which can form beneath stainless steel, aluminium, copper and zinc roofs to drain away. Integral lap tape provided.

Roll size: 1.5 m x 25 m.
Horizontal lap: 100 mm (sealed).

DuPont™ AirGuard® Control

A dedicated air barrier with 100% airtightness and low vapour resistance. Primary function is to reduce convective heat losses through a roof, wall or floor element, but will also provide highly engineered vapour control to maintain a 'breathing' system.

Roll sizes: 1.5 m x 50 m.
Lap: 100 mm.

DuPont™ AirGuard® Smart

A 100% airtight vapour control layer with variable vapour resistance which adapts to changes in humidity. Particularly suitable for damp wall elements where inbuilt moisture needs to escape. Allows a structure to dry out into the building during the summer, but behaves like a traditional VCL during winter. Suitable for roof, wall and floor systems in projects of low to medium moisture classification.

Roll size: 1.5m x 50 m.
Lap: 100 mm.

DuPont™ AirGuard® Reflective

A 100% airtight vapour control layer (AVCL) with very high vapour resistance and low emissivity reflective surface. Significantly boosts thermal insulation in a building when used with a services void/batten space. Suitable for warm and cold pitched roofs, flat roofs, timber and metal frame walls and rainscreen cladding systems. Chlorine resistant.

Roll size: 1.5m x 50 m.
Lap: 100 mm.

DuPont™ AirGuard® Reflective E

A polypropylene reinforced air & vapour control layer (AVCL) with a low emissivity surface. The membrane is 100% airtight, has very high vapour resistance and when used with a batten space will provide an extra thermal benefit.

Roll size: 1.5m x 50 m.
Lap: 100 mm.

Tyvek® Acrylic Tape - Split liner

Same as standard Tyvek® Acrylic Tape but with split release backing liner for ease of application into corners and around window and door details.

Roll sizes: 60mm x 25m,
100mm x 25m.

Tyvek® Acrylic Tape

Single-sided tape for sealing overlaps and making good around penetrations, pipes and windows. Recommended for DuPont™ AirGuard® AVCLs, and suitable for all Tyvek® membranes. Made of Tyvek® and acrylic adhesive for durable and long lasting bonding.

Roll sizes: 75mm x 25m.

Tyvek® Butyl Tape

Double sided butyl based sealant, used to form a moisture and airtight seal between a Tyvek® membrane or a DuPont™ AirGuard® AVCL and most commonly used building materials. The product is compatible with brickwork, blockwork, masonry, timber, metalwork and most plastic products. Tyvek® Butyl Tape is most effective when used under compression, eg. under a timber batten and is recommended for use at perimeters, chimneys, abutments and for sealing nail penetrations and around electrical sockets.

Roll sizes: 20mm x 30m and 50mm x 30m.

Tyvek® Metallised Tape

Single-sided reflective tape for sealing laps in Tyvek® Reflex and DuPont™ AirGuard® Reflective. Ideal for making good around penetrations, pipework, windows and doors. Made of metallised Tyvek® and acrylic adhesive. Provides durable and long-lasting bond once cured.

Roll sizes: 75mm x 25m.

Tyvek® Double-sided Tape

Double-sided acrylic tape ideal for sealing overlaps and bonding Tyvek® membranes to smooth surfaces. Excellent adhesion properties under extreme humidity conditions. Strong initial tack. Recommended for Tyvek® UV Facade, but suitable for all Tyvek® membranes.

Roll sizes: 50mm x 25m.

Tyvek® FlexWrap NF

A heavy duty stretchable & flexible sealing tape made up of crimped Tyvek® and a butyl adhesive.
It provides excellent airtight & watertight adhesion to all Tyvek® and Airguard® membranes around complicated junctions, penetrations & corner details.

Roll size: 150mm x 22.9m

Tyvek® FlexWrap EZ

This is a narrow width version of Tyvek® Flexwrap NF - a high performance, heavy duty adhesive tape. Its great flexibility, allows effective and durable membrane sealing at wall/floor junctions and around many small and complicated penetration details - quick and easily.

Roll size: 60mm x 10 m

Wall and floor products: BBA certificate: N° 90/2548

DuPont™ Tyvek® Housewrap
Standard Tyvek® breather membrane for use in most timber/metal frame wall systems. Lightweight, but strong and very water resistant.

Roll sizes:
1.4m x 100m and 2.8m x 100m.
Horizontal lap: 100mm.

DuPont™ Tyvek® Firecurb™ Housewrap
As Tyvek® Housewrap, but with improved fire performance: Class B to EN 13501-1.

Roll size: 1.5 x 50m, 3.0 x 50m.
Horizontal lap: 100mm.

DuPont™ Tyvek® StructureGuard™
Single layer Tyvek membrane with high water resistance and exceptional airtightness. Suitable for all wall systems, particularly commercial rainscreen systems.

Roll sizes:
1.4 m x 100 m and 2.7 m x 100 m.
Horizontal lap: 100 mm.

DuPont™ Tyvek® Reflex
A vapour open wall membrane with a metallised low emissivity surface, which reflects radiant heat in summer and reduces radiated heat loss in winter.

Roll size: 2.8 x 50m.
Horizontal lap: 100mm.

DuPont™ Tyvek® UV Facade/ Facade Plus
Plain black (no logo), UV resistant breather membrane for use behind open-jointed wall cladding. Superior strength, water resistance, durability and airtightness. Tyvek® UV Facade Plus has an integral adhesive lap tape to improve sealing characteristics.

Roll size: 1.5 x 50m, 3.0 x 50m.
Horizontal lap: 100mm.

DuPont™ Tyvek® UV Facade Tape
Black single-sided acrylic tape for sealing laps and penetrations in Tyvek UV Facade.

Roll size: 75mm x 25m.

Product selector membrane applications

DuPont™ Tyvek® Grade	Warm Pitched Roofs	Cold Pitched Roofs	Metal Clad Industrial Roofs	Scottish boarded Roofs	Walls	Suspended timber floors
DuPont™ Tyvek® Supro	●	●	●	●	●	●
DuPont™ Tyvek® Supro Plus	●	●	●	●	●	●
DuPont™ Tyvek® Metal			●			
DuPont™ Tyvek® Housewrap					●	
DuPont™ Tyvek® StructureGuard™					●	
DuPont™ Tyvek® Reflex					●	
DuPont™ Tyvek® UV Facade					●	
DuPont™ Tyvek® UV Facade Plus					●	
DuPont™ AirGuard® Control	●	●	●	●	●	●
DuPont™ AirGuard® Smart	●	●	●	●	●	●
DuPont™ AirGuard® Reflective	●	●	●	●	●	●
DuPont™ AirGuard® Reflective E	●	●	●	●	●	●

Please note: DuPont™ AirGuard® Control, Smart and DuPont™ AirGuard® Reflective are for internal use only

DuPont™ Tyvek® membranes - Wall and floor applications
All Tyvek® membranes and ancillary products for use in roof and wall applications available in the Tyvek® construction membrane range are listed here. However, Tyvek® membranes used in wall and floor applications are covered in a separate technical manual.

DuPont™ Tyvek® membranes: Pitched roof applica

Roofing underlay

Tyvek® Supro and Tyvek® Supro Plus are extremely durable flexible sheet materials for use as roofing underlays in pitched roof construction. They can be incorporated into all tiled or slated pitched roofs, whether they be new-build or refurbishment projects. As a secondary water shedding layer a Tyvek® membrane will provide a barrier to minimize the wind load acting on the slates and tiles and will adequately resist wind blown snow and dust from entering the roof construction.

Tyvek® membranes are suitable for use as roofing underlays as defined in BS5534:2014 and ICP2:2002.

Tyvek® membranes are also suitable for use in metal clad industrial roofs.

Insulation - Condensation

Tyvek® membranes offer benefits over traditional impermeable roofing underlays by minimising the risk of interstitial condensation occurring within roof constructions:

Over the last 30 years or so, as we have become more aware of the need to conserve energy, the required levels of insulation within roofs have become greater. This has had the effect of increasing the likelihood of condensation forming on the underside of the roofing felt. Prior to the introduction of modern vapour permeable membranes, the only way of reducing this risk was to introduce ventilation openings in the roof to effectively "change the air". In order to ensure that a sufficient amount of ventilation was provided to prevent condensation, Building Regulations and Standards were amended.

Satisfying the Building Regulations

Approved Documents contain practical guidance on how to meet the requirements of the Building Regulations. Part C covers Resistance to moisture under C2.

The requirement is as follows:

Resistance to moisture

C2. The floors, walls and roof of the building shall be designed and constructed as to prevent the passage of moisture to the inside of the building or damage to the fabric of the building.

b) precipitation and wind driven spray.

c) interstitial and surface condensation; and,

d) spillage of water from or associated with sanitary fittings or fixed appliances.

Protection from external moisture and condensation will ensure the structural performance of a roof construction and thermal performance of the insulation will not be compromised.

DuPont™ Tyvek® Solution

Tyvek® is a vapour permeable material which, as a Type LR roofing underlay (BS5250), will offer a low resistance to the passage of vapour. During the winter, when a bulding is heated and the internal vapour pressure is high, a Tyvek® underlay will, by diffusion, allow water vapour within the roof space to permeate through to the batten space. Natural air movement through the joints of the roof covering will subsequently allow any moisture-laden air to escape to atmosphere.

The ability of a Tyvek® underlay to provide this function of condensation control eliminates the need to ventilate any roof voids between the underlay and the insulation.

In every case during the design stage it is important to consider the entire roof element, from the interior dry-lining to the outer roof covering, to assess the capacity of the system to control condensation.
This is dependant on a number of factors, but from a fabric point of view efficient external vapour release and internal vapour control must be established. In accordance with Section 6 of Approved Document C, moisture transfer through penetrations and gaps in the internal lining should be avoided.
This requirement encourages us to address the airtightness of the ceiling and it's ability to reduce convective vapour and heat transfer. Methods for which are described in BS 9250:2007 (Code of practice for design of the airtightness of ceilings in pitched roofs).

Using a Tyvek® underlay in conjunction with a suitable air & vapour control layer (AVCL) will fulfil all the requirements for weather protection, condensation control and convective heat loss (airtightness), as well as meeting the requirement of Approved Document C2.

Further information on internal air & vapour control can be found on page 8.

Please refer to page 34 for the DuPont™ AirGuard® range of AVCL's.



BBA Approvals

In order to determine the risk of condensation in non-ventilated pitched roof constructions using Tyvek® as the roofing underlay, the British Board of Agrément (BBA) conducted a long term research programme. The exhaustive research covered a wide range of pitched roofs, typical to the UK, varying in pitch from 12.5° to 70°, in different locations throughout the country, using various roof coverings. The tests were conducted over two winter periods and data collated and assessed using sophisticated computer modelling. More than 100 cases were analysed using readings taken from sites in Wiltshire and Glasgow, which were selected to reflect the prevailing weather patterns in these regions.

The results from the research were very successful, with insignificant amounts of condensation recorded, especially in the sealed roof systems. The results were further verified by additional measured data that had been gathered from other previous site monitoring.

Not surprisingly, the BBA granted approval in the form of certificate 08/4548 for the use of Tyvek® membranes in **non - ventilated** and **sealed** cold pitched roofs.

Together with the warm roof approvals granted originally in 1991 and most significantly in 1994 and 2004, DuPont now have universal approval for the use of Tyvek® membranes in pitched roof constructions.

Non-ventilated vs ventilated

BBA certificate 08/4548 states that with Tyvek®, "the risk of condensation is equivalent to, or less than, that attending current conventionally ventilated cold roof systems. "The certificate also states that Tyvek® membranes may be used in "dwellings of any conventional plan and of any size." This documentation is sufficient to satisfy current legislative requirements: Building Regulations Approved Document C2.

The solution of ventilating roof constructions in order to prevent excessive condensation beneath impermeable underlays is often regarded as "the traditional way" of meeting the regulations. However, traditional methods of construction and practices are often superceded by more efficient and effective solutions. From an energy conservation perspective, introducing cold external air into roofs can be to the detriment of the construction by:

- reducing the effectiveness of fibrous insulation.
- promoting warm air leakage from the building into the roof space.
- Increasing air infiltration into the heated building.
- Introducing dirt, dust and insects into the roof construction.
- Introducing external moisture laden air into the construction.

A non-ventilated Tyvek® system will not only prevent excessive condensation, as required, but will also offer substantial gains in energy efficiency by reducing these factors.

Non-ventilated or Sealed roofs?

DuPont currently promote two methods of application for Tyvek® membranes in pitched roof construction. This reflects the in-depth research that DuPont has undertaken to ascertain the most effective ways of not only controlling condensation, but also improving energy efficiency in roof construction. Extensive monitoring of test houses incorporating Tyvek® membranes at the BRE's test facilities also confirm the benefits of using Tyvek® non-ventilated and sealed roof systems.

Non-ventilated roofs

Roofs with no provision for airflow beneath the underlay will be more energy efficient than conventional, ventilated roofs.

Sealed roofs

Roofs with no airflow beneath the underlay and with all air leakage paths sealed will be more energy-efficient than non-ventilated roofs and will provide a higher degree of comfort.

Results from tests carried out on the non-ventilated systems showed this to be an efficient form of construction. However, further improvements were indicated in tests carried out on the sealed roofs.

Non-ventilated systems

This is where a Tyvek® membrane is laid over the roof, parallel to the eaves, as in traditional practice. A horizontal lap of 150mm minimum is maintained between each consecutive Tyvek® run. No ventilation is incorporated at eaves or ridge.

Sealed roof systems

A Tyvek® membrane is laid over the roof in a taut condition, parallel to the eaves and counter battened. A horizontal lap of 150mm minimum is maintained between each consecutive Tyvek® run. All membrane laps, junctions, pipe penetrations, rooflights and perimeters are sealed with an appropriate sealing tape. No ventilation is incorporated at eaves or ridge.

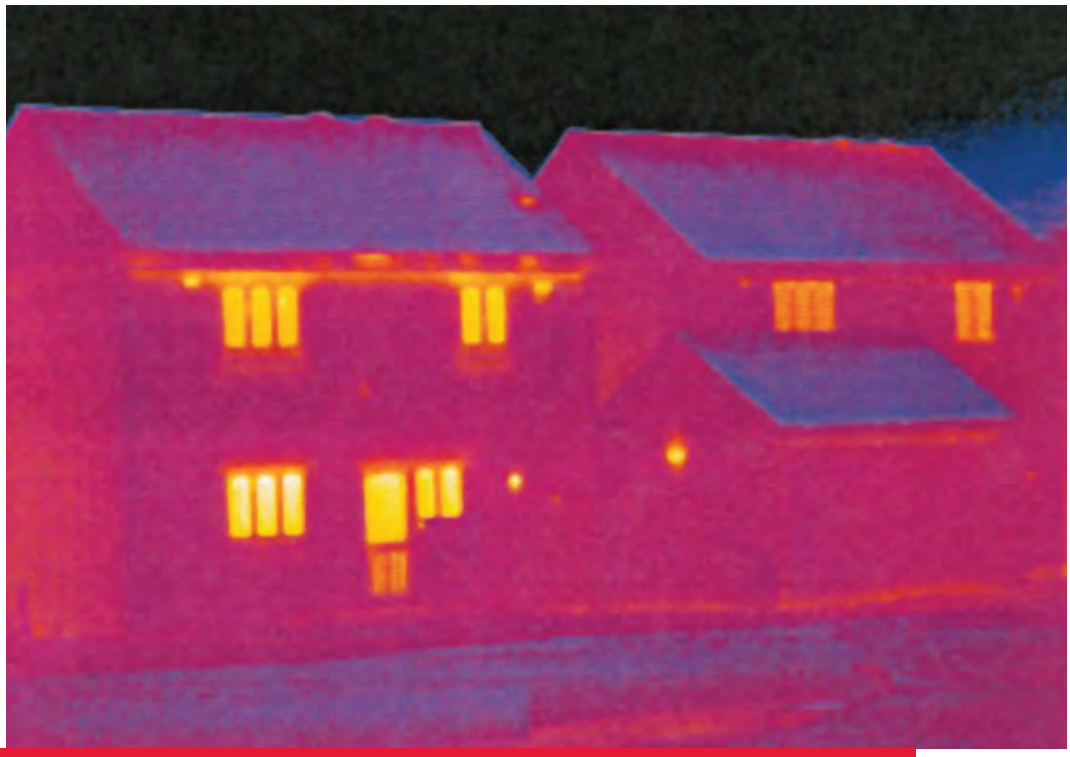
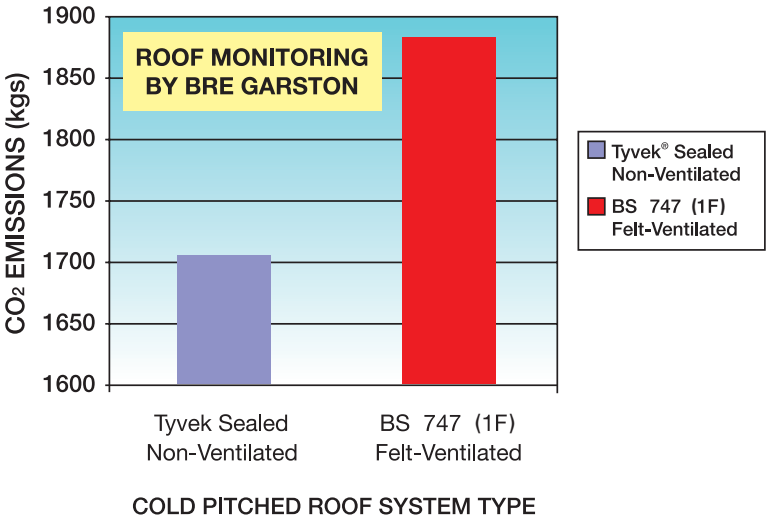


Fig. 3 - An infrared thermography was carried out on two UK matched pair houses at BRE Watford to corroborate the test findings.

Benefits of DuPont™ Tyvek® sealed roof system

Tyvek® non-ventilated roofs will significantly reduce the likelihood of condensation, have less air leakage and are more energy efficient than conventionally ventilated roofs. However, they are still subject to air infiltration at laps, perimeters and penetrations. Air movement through those gaps can result in significant heat losses. Adopting the Tyvek® sealed roof system will not only reduce the risk of condensation, but will also minimise the heat losses caused by air infiltration.

ANNUAL CO_2 EMISSIONS OF A TYPICAL UK HOUSE **Fig. 4**



Eliminating air movement substantially improves energy efficiency

DuPont™ Tyvek® Sealed Roof System was extensively researched during early studies by the BRE and VTT. Further tests were carried out by the BBA for the purposes of independent accreditation. The following results and conclusions were achieved:

- a signifi cant reduction in air leakage
- a 7.1% reduction in overall energy consumption
- 25% saving in heat lost through the roof when compared to a typical ventilated system
- an air leakage rate as low as 2ach.

These test results are indicative of the following energy savings:

- a 3.2kWh saving in energy consumption per day
- a 700kWh saving in energy consumption over a full heating season
- a 135kg reduction in CO2 emissions over a full heating season If correct and thorough sealing work is carried out to the roof construction further improvements in energy savings can be made:
- 4.2kWh saving in energy consumption per day*
- 927kWh saving in energy consumption over a full heating season*
- 179kg reduction in CO_2 emissions over a full heating season*
- Air leakage rate as low as 1.7ach*.

* Data obtained from additional tests after extensive sealing work was carried out.

Please note: It is of benefi t to recognise the importance of making internal linings convection tight when considering the need to reduce uncontrolled air leakage. This is particularly relevant for the purposes of complying with the air permeability requirements of Approved Document L.

The conditions of BBA certificate 08/4548 should be referred to when sealing work is to be carried out.

With a lower risk of condensation in comparison with a standard roof using a traditional felt underlay and a ventilated loft space.

In addition to this the BBA have concluded: *"In conventionally ventilated roof constructions energy loss by ventilation can account for up to 25% of the total heat lost through the roof. The Tyvek® non-ventilated roof system will substantially reduce this mechanism of heat loss."*

To gain maximum benefit an air & vapour control layer (AVCL) should be installed above the ceiling. DuPont™ AirGuard® Control, Reflective and Smart are available for this purpose.

Agrément certificate coverage

BBA certificate 08/4548 state that Tyvek® underlays are suitable for use in dwellings. Due to the wide range of conditions that they offer, dwellings are used by the BBA for the purposes of assessing product performance. The test environments include appropriate temperature and humidity levels which prevail within bathrooms and kitchens. It is generally accepted that the majority of commercial and industrial buildings will present safer conditions within which the membrane is to perform. An office for instance will generally have lower temperature and humidity levels than a domestic dwelling. Tyvek® membranes can therefore be incorporated into domestic, industrial and commercial specifications. Previous certification was restricted, in that the BBA approved the use of Tyvek® membranes only in roofs of simple plan rectangular shapes. Certification now allows for typical roof detailing such as lean-to roofs, valleys, dormers and Scottish boarded roofs. Certificate 08/4548 approves the use of Tyvek® membranes in both **warm and cold** pitched roof construction. These are categorised according to the positioning of the insulation:

Cold roofs (Fig. 5)

This is where the insulation is installed at joist level with a cold loft - space (attic) between the insulation and roofing underlay. In the main, quilt insulation is laid between and over ceiling joists.

Warm roofs (Fig. 6)

This is where the insulation is installed at rafter level using rigid and/or semi rigid insulation. The insulation would ideally be positioned in a continuous layer above the rafters so that the roof structure is situated in a "warm" environment. However, certain roof specifications can result in the insulation being installed over rafters, between rafters or under rafters. With increasing thermal requirements it is quite common for a combination of these options to be employed.

Room in the roof applications (Fig. 7)

The BBA have assessed room in the roof applications as included in Agrément certificate 08/4548. Tyvek® membranes may therefore be installed into this form of construction without ventilation at eaves or ridge. Room in the roof constructions very often incorporate a combination of both warm and cold roof constructions, employing varying types of insulation. Cold roof areas usually include "vapour open" fibrous insulation such as mineral wool quilt, whereas the sloping ceiling areas include closed cell or foil backed rigid board insulants, of which the majority are highly vapour resistant. This variation in vapour resistance can result in an imbalance in vapour drive. To equalise the internal vapour resistances throughout the construction it is recommended that a AVCL such as DuPont™ AirGuard® Control, Smart or DuPont™ AirGuard® Reflective be installed beneath the "vapour open" quilt insulation.

Air & Vapour Control Layers (AVCL's).

As the requirements of Approved Document L tighten and fabric thermal performance levels increase, heat transmission into a cold roof space by conduction will be reduced. In a cold pitched roof this will result in a lower operating temperature within the loft space, which could potentially increase the probability of interstitial condensation occurring. However, in a normal domestic environment of 20°C at 60% RH the expected quantity of vapour should egress the building safely and efficiently via trickle vents and other internal ventilation measures. The Tyvek® underlay can be relied upon to diffuse any normal levels of vapour that migrates into the roof construction to outside atmosphere.

There may however be circumstances where the internal air will contain a higher level of moisture than the system can efficiently manage. Excessive humidity levels can be generated by swimming pools for example or when a new building is undergoing a period of drying-out during a winter season. As heat will displace air in an upwards trend, the majority of vapour will migrate into the roof void. Cold vapour resistant surfaces such as structural steelwork and vapour impermeable (Type HR) underlays are at great risk from a build-up of condensate even when properly ventilated. Similarly, vapour can also potentially condense on vapour permeable (Type LR) underlays (such as Tyvek® Supro) if moisture in the air is excessive. This is most likely to happen whilst the building is drying out.

Once the moisture levels within the building have decreased, so too will the risk of condensation. The relative humidity will balance out and the building will operate within the expected comfort levels. In some cases, the drying out phase may need some assistance with apparatus such as de-humidifiers. This would be particular to buildings which have extreme levels of trapped moisture due to construction processes as described above, or from exposure to precipitation during construction. Specifying an air & vapour control layer (AVCL) such as DuPont™ Airguard will in every case help to safeguard against large volumes of moisture laden air infiltrating the roof construction, resulting in a reduced condensation risk. Coupled with the layer's airtight function and obvious energy saving benefits, it is generally accepted as good practice for an AVCL to be installed into roof systems, regardless of whether they are ventilated or not (Please see following note on Ventilated systems).

Ventilated systems

Due to the detrimental effects that cold air infiltration can have on the thermal performance of insulated systems,

windwashing, convective heat loss, etc. an AVCL is of particular importance where the roof system is to be ventilated. Please refer to page 34 for the DuPont™ Airguard range of AVCL's.

Refurbishment work to existing buildings

In addition to new build projects, a non-ventilated roof system using Tyvek Supro can also be adopted in refurbishment/re-roofing work. Before such work is undertaken however, it is important to consider the notes below to ensure efficient performance in terms of heat, air and moisture management.

Existing ceiling

At the design stage of a new build domestic construction the recommendations of BS 9250:2007 to establish airtightness at the ceiling line can be followed and an AVCL can be specified. As a continuous airtight and vapour-tight layer this important component can greatly reduce condensation within the loft space which can sometimes occur when the building is undergoing a drying-out phase. This is not normally possible in a refurbishment project as there will typically be an existing ceiling already in place. However, where no wet trades have been employed within the building the internal humidity levels should be reasonably stable. The existing ceiling will very often provide a sufficient level of vapour control as they invariably include layers of paint or textured finishes which will help to diffuse internally generated vapour. In this case the system should perform satisfactorily and ventilation to the loft space will not be necessary. When considering airtightness, the integrity of the existing ceiling, whether plasterboard or lathe & plaster is a factor, as any breach in these layers will allow water vapour to infiltrate the construction. Existing loft access hatches should be checked to ensure they are up to current standards and if in doubt, should be replaced with a modern insulated unit that incorporates compressible draught seals. If new light fitments are to be installed within the ceiling line any penetrations made should be formed so as to present minimal disruption to the ceiling's airtightness and vapour controlling abilities. The holes created by light fittings can be made good by sealing the wiring penetration with a suitable sealing tape. The retrospective installation of downlights can present noticeable disruptions in the ceiling, which will allow high levels of internal heat and vapour to flow freely into the roof space. Special care and attention should be paid to fitments of this kind to reduce the detrimental effect that they can have on condensation control and energy efficiency. Where possible, low energy, fire rated and sealed units that are IP65 rated should be considered as best practice.

Insulation

During refurbishment projects, particularly with cold pitched roofs, it is common for the existing insulation to be upgraded or added to with extra thermal layers. The benefits in terms of energy consumption and subsequent lowered heating costs are well known, but a negative effect of this will be lower loft space temperatures. High humidity within the building and/or insufficient air/vapour control at ceiling level could potentially increase the condensation risk within the roof construction. Other updating measures, such as installing double glazing will further improve the building's thermal performance, but will also alter the internal air quality. As it is important to maintain sufficient indoor ventilation, it is crucial that trickle vents within the window units are used.

Note: A Tyvek non-ventilated pitched roof system will efficiently deal with the humidity/moisture levels associated with normal domestic building use.

BBA BRITISH BOARD OF AGRÉMENT

BBA certificate 08/4548

Insulation
Tyvek® underlay
DuPont™AirGuard® AVCL

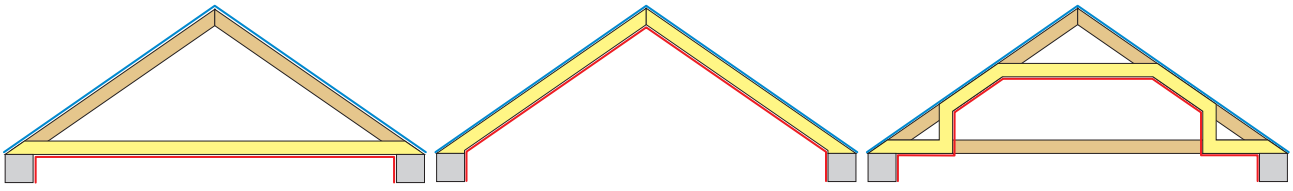


Fig. 5 - Cold roof

Fig. 6 - Warm roof

Fig. 7 - Room in the roof

Tyvek® roofing applications can be broken down into two main categories:

1. SUPPORTED APPLICATIONS
2. UNSUPPORTED APPLICATIONS

The application category will determine which membrane is suitable and how it is to be installed.

1. SUPPORTED APPLICATIONS

DuPont™ Tyvek® Supro - DuPont™ Tyvek® Supro Plus

This is where the Tyvek® membrane is laid directly over a supporting layer such as timber boarding or flexible/rigid insulation. In this condition counter battens over the membrane will be required to lift the tiling battens off the membrane and create an effective drainage path to the eaves.

Fig. 8

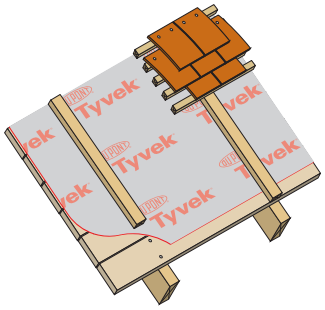


Fig. 9

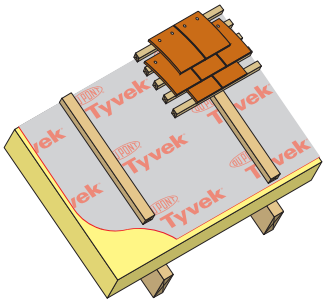
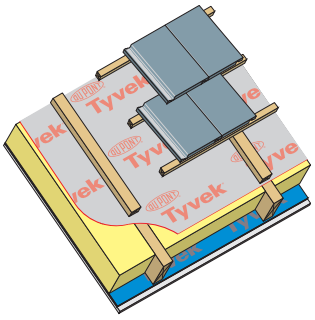


Fig. 10



Scottish boarded roofs are also categorized as supported applications but battens are normally omitted and the slates are nailed directly through the membrane and into the boarding. Recommended grade: Tyvek® Supro.

Fig. 11

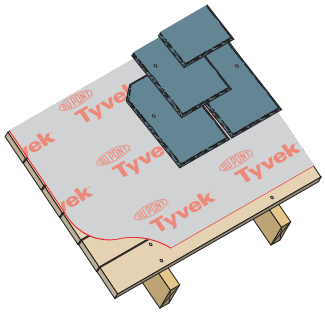
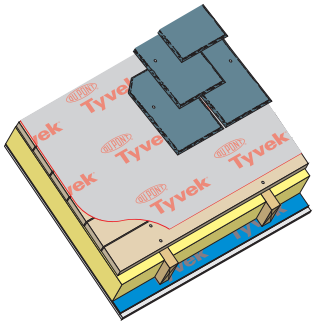


Fig. 12



Sealed Roof System - The supported application gives the end-user the option to upgrade the system to a sealed roof by taping all laps and penetrations in the membrane. Tyvek® Supro Plus is most suitable for this purpose as an integral sealing tape is provided.

Fig. 13

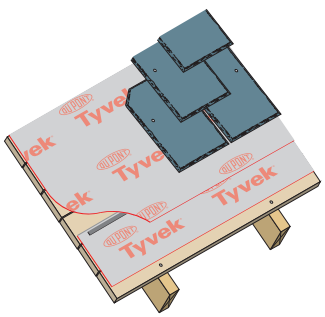


Fig. 14

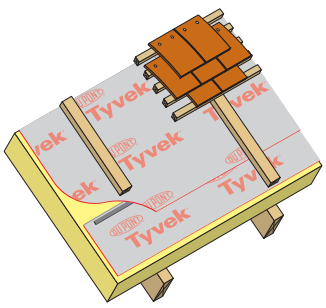
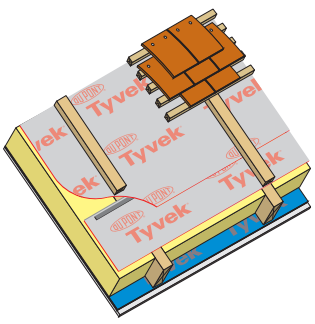


Fig. 15



2. UNSUPPORTED APPLICATIONS

DuPont™ Tyvek® Supro - DuPont™ Tyvek® Supro Plus

Over rafters (the traditional method) - The Tyvek® membrane is laid over rafters and allowed to drape slightly for drainage beneath tiling battens. To accommodate the drape an airspace of approx 10mm beneath the membrane will be required. In order to prevent the risk of wind uplift a maximum drape of 10mm in the membrane is recommended. No counter battens will be required over the membrane in this application. Recommended grade: Tyvek® Supro.

Fig. 16

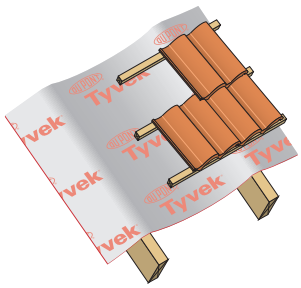


Fig. 17

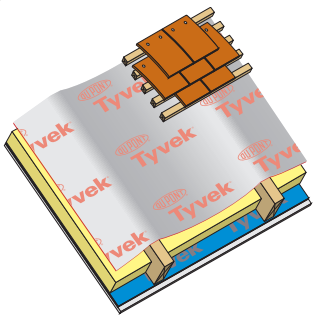
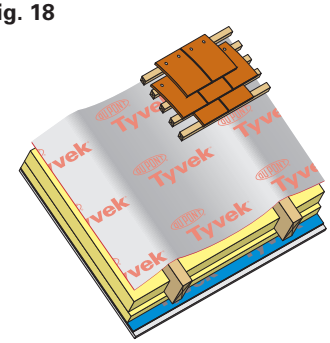


Fig. 18



Over counter battens - Tyvek® can also be draped over counter battens that are installed over timber boarding or rigid insulation. This represents the most practicable approach to on-site membrane installation and corresponds with the majority of rigid insulation manufacturers recommendations. Recommended grade: Tyvek® Supro.

Fig. 19

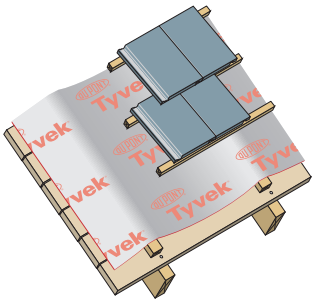


Fig. 20

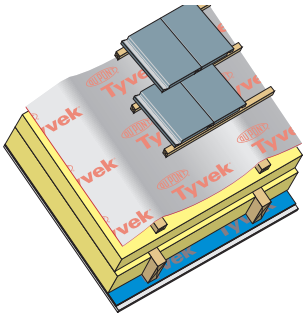
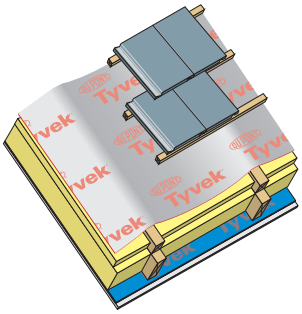


Fig. 21



Sealed Roof System - Tyvek® can also be installed over rafters in a taut condition with counter battens fixed over. This method is normally adopted when a sealed system is specified. Tyvek® Supro Plus is most suitable for this purpose as an integral sealing tape is provided.

Fig. 22

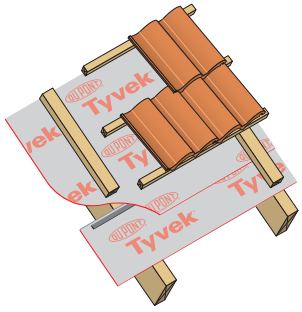


Fig. 23

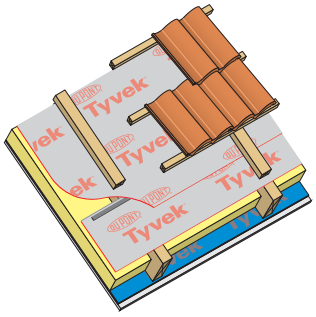
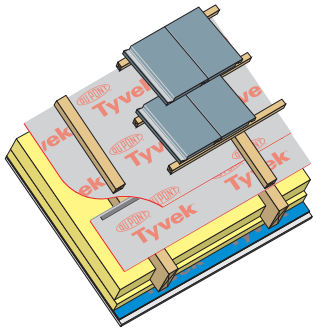


Fig. 24



Agrément certificate 08/4548 covers the use of Tyvek® membranes in non-ventilated and sealed pitched roofs.

Note:
Please refer to the wind uplift information on pages 12 & 13 for further guidance on unsupported applications.

DuPont™ Tyvek® roofing underlays - Wind uplift

BS5534: 2014

In the UK, most homeowners at some time will have experienced some sort of damage resulting from extreme weather conditions. In addition to the odd garden fence blowing over, the roof is particularly susceptible to wind damage - the hazards associated with dislodged tiles being very real. Limiting this risk and thus making our roofs safer is the responsibility of BS5534.

For nearly 40 years, anyone engaged in the construction of a pitched roof in the UK has been able to draw upon the recommendations within BS5534. Whilst this document forms the Code of Practice for slating and tiling, its guidance covers many other aspects of pitched roofing, the materials used and the methods employed. The standard does not take the form of a legal document, but for many it could be regarded as 'the roofers bible.'

The latest revision to BS5534, introduced in March 2015 was a radical update to the standard with a realistic and future- proof emphasis on roof security and overall safety. The document addresses in detail the specification of mortar bedding, battens, flashings, structural sheathing and underlays as well as a specific focus on fixings.

BS5534: 2014 also includes guidance associated with UK meteorological data, such as exposure to driving rain and a noticeable concentration on the effect of wind pressures on roofing components. Roofing underlays have not been left out and now after many years of debate specific limits on wind uplift resistance have been imposed. By following the guidance and advice given in the standard we can now realistically design and build our homes in a way to better prepare them for high winds and stormy conditions. This is very relevant as the majority of damage reports come from domestic dwellings, where the average cost of damage is at least £300 million per year.

Extreme wind conditions have in the past resulted in entire roofs being lifted off a building. New building codes will have reduced the risk, but these roof failures demonstrate the strong lifting forces that can be exerted upon a roof when wind passes overhead. The suction effect of negative wind pressure, such as on the leeward side of a building can result in tiles or slates being dislodged. BS5534: 2014 has gone some way to safeguard against this risk with its recommendations, not just with more stringent fixing requirements for slates and tiles, but also for the underlay.

The emphasis on underlays

The benefits of a roof underlay positioned beneath a primary water shedding layer have been realised for many years. Even before a pitched roof is completed, a quickly installed underlay will keep the construction dry before the outer layers are in place. Once the roof is completed, the underlay will act as a back-up to the tile or slate covering by providing a secondary water shedding function. The underlay is also expected to resist a significant proportion of wind load imposed on the outer covering and it is this function that is now being addressed.

The potential effect of an underlay subjected to excessive wind loading is for it to balloon upwards, toward the tile or slate covering. If the wind resistance of the underlay is inadequately low or it has been installed with excessive drape, it could balloon to such an extent that it impacts upon the tiles or slates, causing them to dislodge. The tiling batten will help to restrain the underlay to an extent, but in the case of large format tiles where the batten gauge is sizeable the underlay deflection would be more significant.

A greater responsibility has therefore been placed on the underlay to cope with these wind forces and it is appropriate for BS5534: 2014 to set the parameters. The Code of Practice now also includes a new annex which describes the procedure for assessing an underlays' wind uplift resistance to a more stringent level than was previously required. When tested to the new standard the recorded values will determine the product's suitability for use in certain areas of the country. The document consequently includes a UK wind zone map, derived from a map of wind velocities, which correlates with EN 1991-1, the relevant Eurocode concerning Wind Actions.

Wind zones according to Annex A

These minimum wind resistance requirements are applicable for building projects where positive wind pressure from beneath is limited by a continuous internal lining. The ceiling in this case will consequently be considered 'well sealed' which for today's energy efficient modern buildings should be regarded as standard practice. The figures are for an underlay laid with a drape of 10mm and a batten gauge of 345mm.

Zone 1: 820Pa

Zone 2: 975Pa

Zone 3: 1150Pa

Zone 4: 1330Pa

Zone 5: 1600Pa

The following conditions apply:

- ridge height not greater than 15 m;
- roof pitch between 12.5° and 75°;
- site altitude not greater than 100 m;
- no significant site topography;

resistance

Additional values according to specification of internal linings and fenestration:

- 1 600 N/m² when a well-sealed ceiling is present;
- 1 900 N/m² when no ceiling or no wellsealed ceiling is present;
- 2 350 N/m² when no ceiling or no wellsealed ceiling is present and a permanent dominant opening is present on an external face of the building.

Minimum underlay requirements:

There will undoubtedly be many building projects in the UK where the conditions above do not apply. In these instances additional calculations will need to be undertaken to determine the values that are required. The values conveyed in the document are indeed minimum standards and careful selection of the underlay will be needed to ensure that the recorded wind resistance values are suitable for the job. Ideally the underlay would be capable of tolerating all the conditions that would be encountered in all 5 wind zones.

The Tyvek® solution

As set out within BS5534: 2014 underlay manufacturers are required to clearly indicate the suitability of their product in accordance with the standard. The tables below indicate zonal suitability for the Tyvek roof underlays currently available in the UK.

Tyvek® Supro			
BATTEN GAUGE	WIND UPLIFT RESISTANCE (Pa)		ZONE SUITABILITY
	Battened lap	Taped lap*	
≤ 345 mm	1643Pa	3371Pa	1 to 5
≤ 250 mm	3272Pa	3371Pa	1 to 5
≤ 100 mm	3272Pa	3371Pa	1 to 5

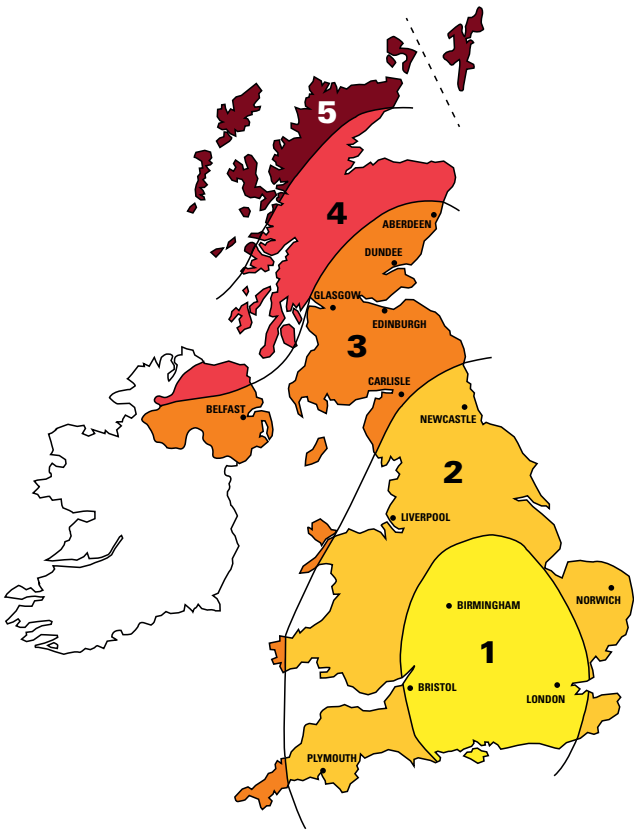
Tyvek® Supro Plus			
BATTEN GAUGE	WIND UPLIFT RESISTANCE (Pa)		ZONE SUITABILITY
	Battened lap	Taped lap*	
≤ 345 mm	1750Pa	3204Pa	1 to 5
≤ 250 mm	1750Pa	3204Pa	1 to 5
≤ 100 mm	1750Pa	3204Pa	1 to 5

Zone Suitability:

The wind uplift resistance figures for the Tyvek® underlays in the tables apply to applications where a well-sealed ceiling is present, ridge height is not greater than 15 m, roof pitch is between 12.5° and 75°, site altitude is not greater than 100 m, and no significant site topography is present. Projects outside of these parameters may require a greater wind uplift resistance. If in doubt please contact DuPont™ Tyvek® 01275 337667 - Option 1 where a project specific wind uplift calculation can be carried out.

Tyvek® - unrestricted use:

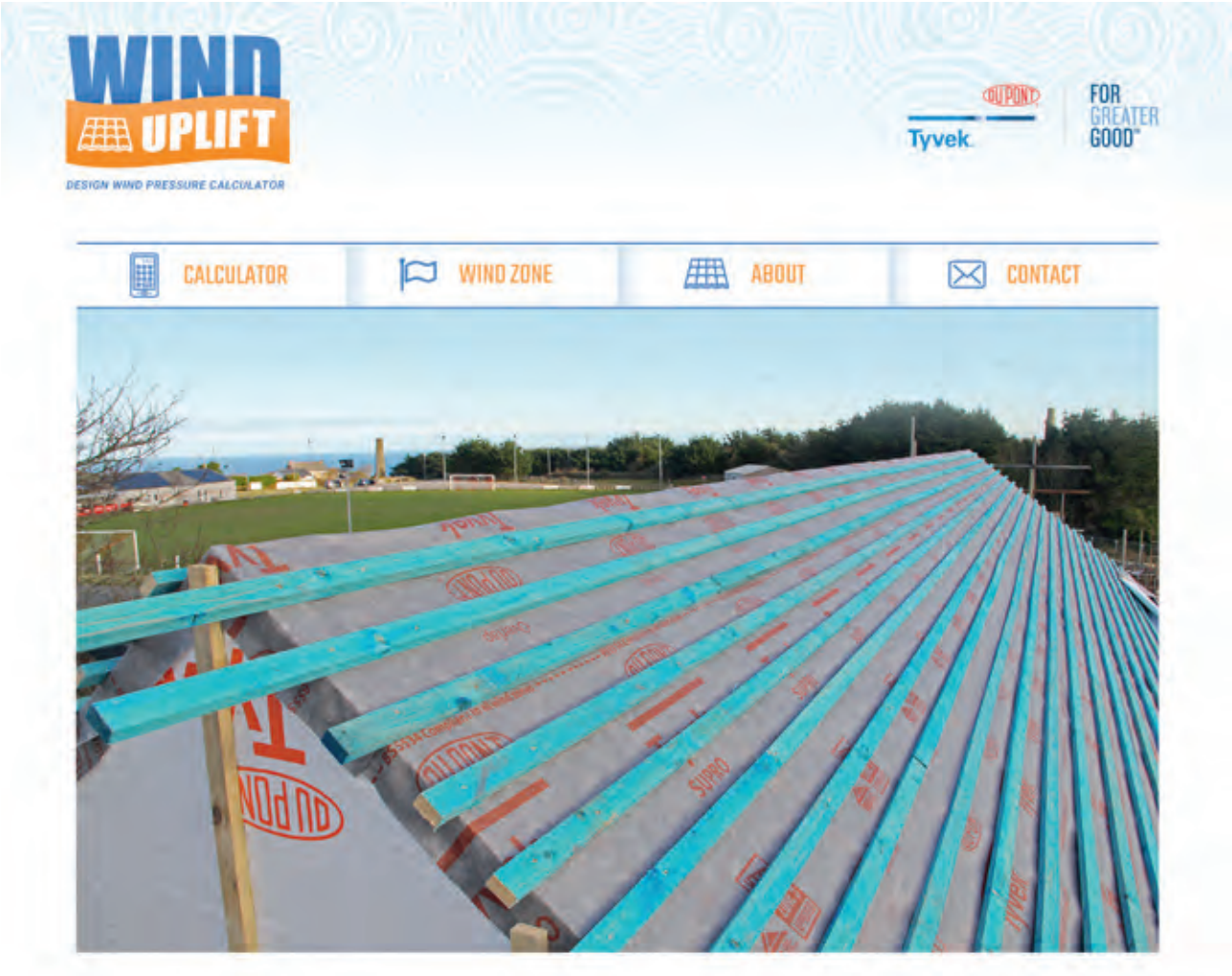
A Tyvek® underlay with a taped lap will satisfy all geographical locations, all site conditions and all building characteristics.



The designated wind zones range from Zone 1 with moderate conditions to Zone 5 that typically encounter higher wind speeds.

Discover our new design wind pressure calculator

www.windpressure-calculator.tyvek.co.uk



The suitability of underlays in respect to wind uplift is defined by BS5534 (The code of Practice for slating and tiling,) using the zonal method as described previously. Annexe A of the standard describes five geographical wind zones within the United Kingdom with ascending design wind pressures allocated to each zone.

However, these design wind pressures for each zone are only applicable if the site of the construction falls within the following parameters:

- ridge height not greater than 15 m;
- roof pitch between 12.5° and 75°;
- site altitude not greater than 100 m;
- no significant site topography;

Where a construction site falls outside of these parameters the standard suggest that a further calculation be undertaken (as defined by Annexe H of BS5534,) to give a revised Design wind pressure.

To ensure full compliance with the standard the Tyvek® Building Knowledge Centre have created a use friendly calculation tool to quickly ensure the suitability of Tyvek® roofing products in all locations across the United Kingdom. This tool is free to use at the following link:

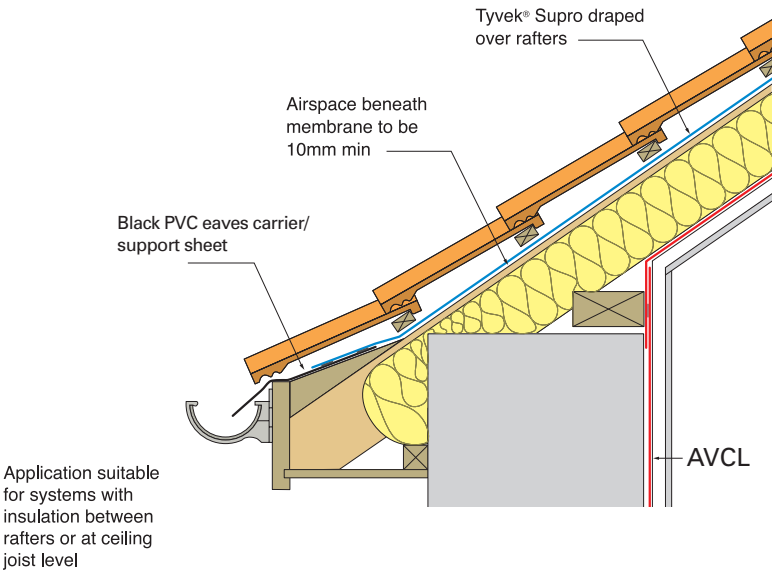
www.windpressure-calculator.tyvek.co.uk

Alternatively, our Building Knowledge Centre can be contacted on 08444 068722

Eaves Detailing

The following pages contain information on how best to install Tyvek® membranes in pitched roof constructions. No provision for ventilation at eaves or ridge is included in these recommendations. BBA references are included where appropriate.

Fig. 25 - Membrane unsupported over rafters



Tyvek® Enercor® Roof also suitable for this method of applications with minimum 23mm airspace beneath

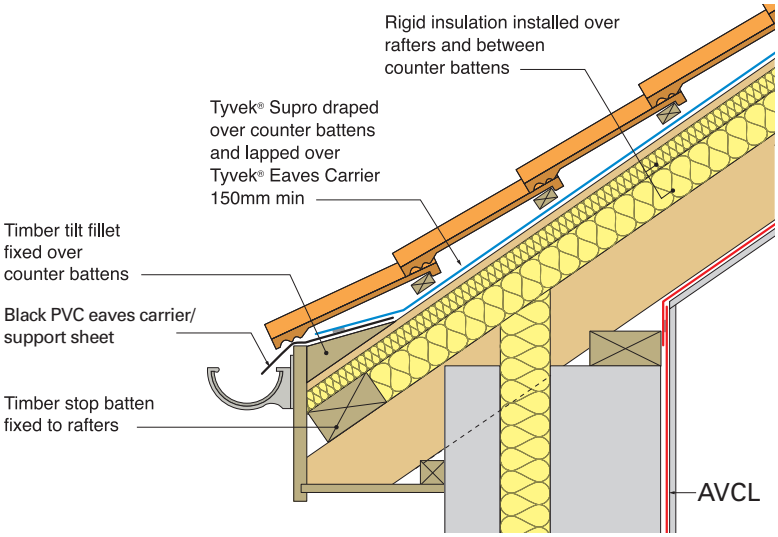
In both of these details, **Tyvek® Supro** is installed in a draped condition over rafters or counter battens.

A recommended drape in the membrane of maximum 10mm is recommended to allow sufficient drainage beneath tiling/ slating battens.

The membrane may come into contact with the insulation with no risk of tenting (capillary action).

Air infiltration beneath the membrane should be prevented by ensuring air-tightness at the fascia and soffit locations. Insulation pushed up to the underside of the membrane will also be effective, but may obstruct the drainage of moisture over the membrane.

Fig. 26 - Membrane unsupported over counter battens



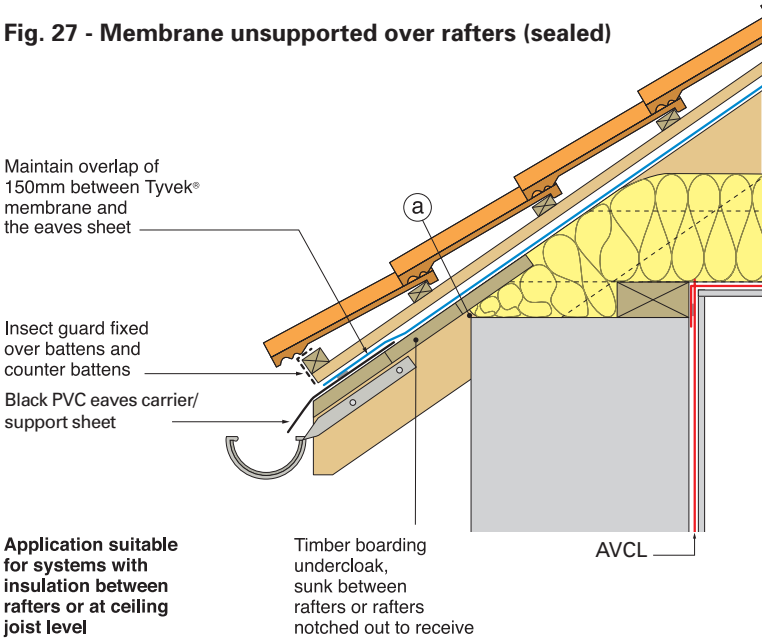
Tyvek® Enercor® Roof also suitable for this method of applications with minimum 23mm airspace beneath

Note:
Please refer to the wind uplift information on pages 12 & 13 for further guidance on unsupported applications.

Fixing
For guidance on fixing procedure please refer to the specification notes on pages 38 to 40.

Eaves Detailing

Fig. 27 - Membrane unsupported over rafters (sealed)



Application suitable for systems with insulation between rafters or at ceiling joist level

Both of these details show **Tyvek® Supro** or **Tyvek® Supro Plus** installed unsupported over rafters. The membrane is laid in a taut condition with counter battens fixed over. Sealing the system is easily achieved by taping the laps.

An insect mesh should be fixed at the eaves to prevent intrusion into the batten zone.

Both details include no fascia board or soffit:

Fig. 27 includes a timber undercloak at the overhang with the membrane unsupported over rafters (sealed) membrane dressed onto **an eaves sheet.**

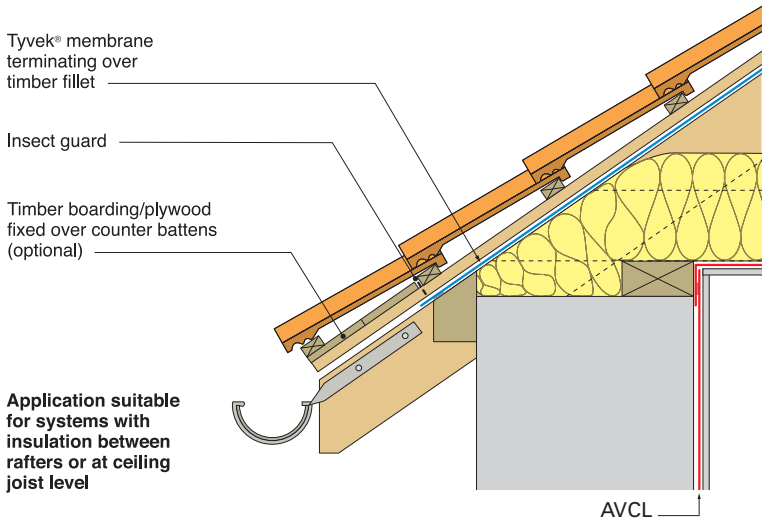
Fig. 28 is an alternative arrangement showing the Tyvek® membrane terminating before the gutter.

Air infiltration beneath the membrane should be prevented by ensuring air-tightness at ⓐ.

Counter battens

Please refer to note on counter battens on page 40.

Fig. 28 - Membrane unsupported over rafters (sealed)



Application suitable for systems with insulation between rafters or at ceiling joist level

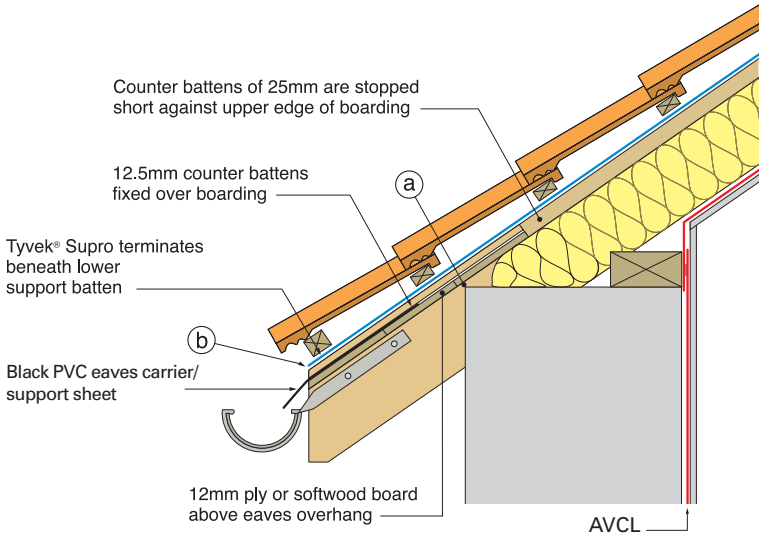
Note:
Please refer to the wind uplift information on pages 12 & 13 for further guidance on unsupported applications.

Fixing

For guidance on fixing procedure please refer to the specification notes on pages 38 to 40.

Eaves Detailing

Fig. 29 - Membrane unsupported over counter battens



These details illustrate **Tyvek® Supro** installed in a draped condition and are suggested in order to overcome detailing of the timber undercloak. Once again, both details include no fascia board or soffit:

Fig. 29 includes a timber undercloak fixed over rafters.

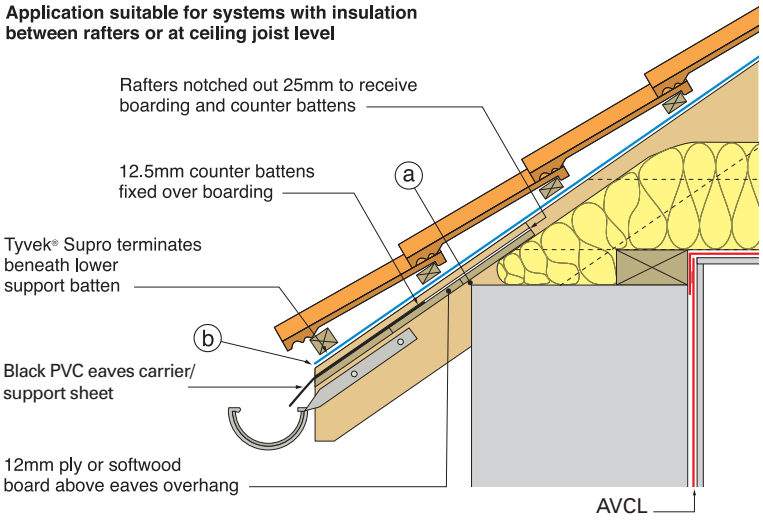
Fig. 30 shows the timber undercloak notched into the rafter.

In both instances a small counter batten or lathe is fixed over the boarding to ensure continuous drainage to the eaves is maintained.

Air infiltration beneath the membrane should be prevented by ensuring air-tightness at (a).

Preventing air infiltration beneath the membrane at (b) may be difficult to achieve. Attention at these locations should therefore be paid to minimise air ingress.

Fig. 30 - Membrane unsupported over rafters



Note:
Please refer to the wind uplift information on pages 12 & 13 for further guidance on unsupported applications.

Fixing
For guidance on fixing procedure please refer to the specification notes on pages 38 to 40.

Eaves Detailing

Fig. 31 - Membrane supported over timber sarking

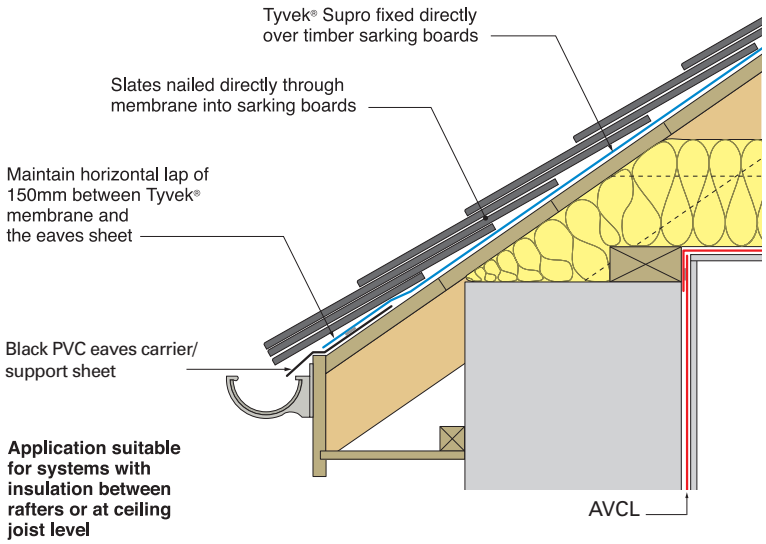
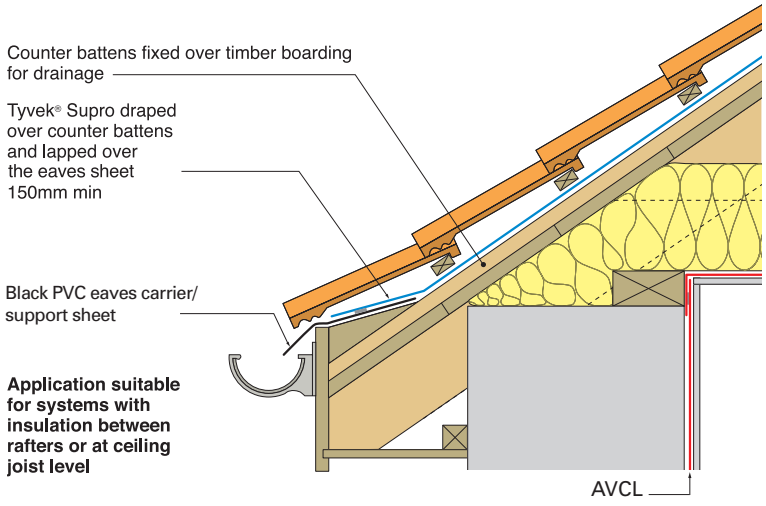


Fig. 32 - Membrane unsupported over timber sarking



Boarded roofs are common to geographical locations that experience high exposure to driving rain, typically Scotland.

Tyvek® Supro should be laid directly onto the boarding or draped over a counter batten.

Fig. 31 illustrates typical Scottish practice where the roofing underlay is laid over the sarking board. Slates are then secured directly over the membrane with no battens or counter battens included.

Fig. 32 incorporates battens and counter battens and is applicable to systems with slates or tiles.

A sealed roof system can be achieved with both methods of application by specifying **Tyvek® Supro Plus** and taping all laps in the membrane. This is feasible only when the membrane is laid in direct contact with the boarding.

Air infiltration beneath the membrane should be prevented by ensuring air-tightness at the fascia and soffit locations. Insulation pushed up to the underside of the sarking board will also be effective.

Fixing

For guidance on fixing procedure please refer to the specification notes on pages 38 to 40.

Eaves Detailing

Fig. 33 - Membrane unsupported over rafters (sealed)

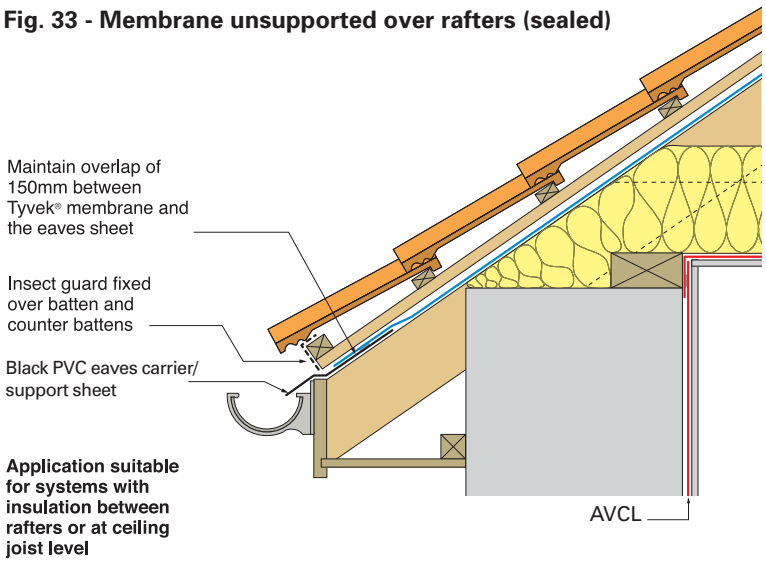
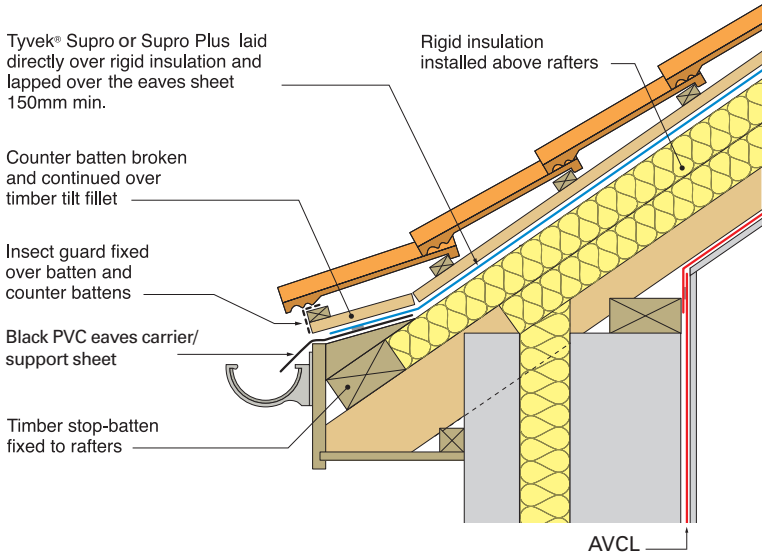


Fig. 34 - Membrane supported over insulation (sealed)



Both of these details are suitable if a sealed system is required, as the membrane is laid in a taut condition with counter battens fixed over. Sealing the system is achieved by taping all horizontal laps.

An insect mesh should be fixed at the eaves to prevent intrusion into the batten zone.

Fig. 33 illustrates **Tyvek® Supro** or **Tyvek® Supro Plus** laid taut over rafters with counter battens fixed over. The membrane runs down the full length of the rafter and is dressed onto a Tyvek® membrane supported over insulation (sealed) eaves carrier.

Air infiltration beneath the membrane should be prevented by ensuring air-tightness at the fascia and soffit locations. Insulation pushed up to the underside of the membrane will also be effective, but may obstruct the drainage of moisture over the membrane.

Fig. 34 is an alternative arrangement showing **Tyvek® Supro or Supro Plus** dressed over a timber tilt fillet. In this case a warm roof with insulation over the rafters is shown.

Counter battens

Please refer to note on counter battens on page 40.

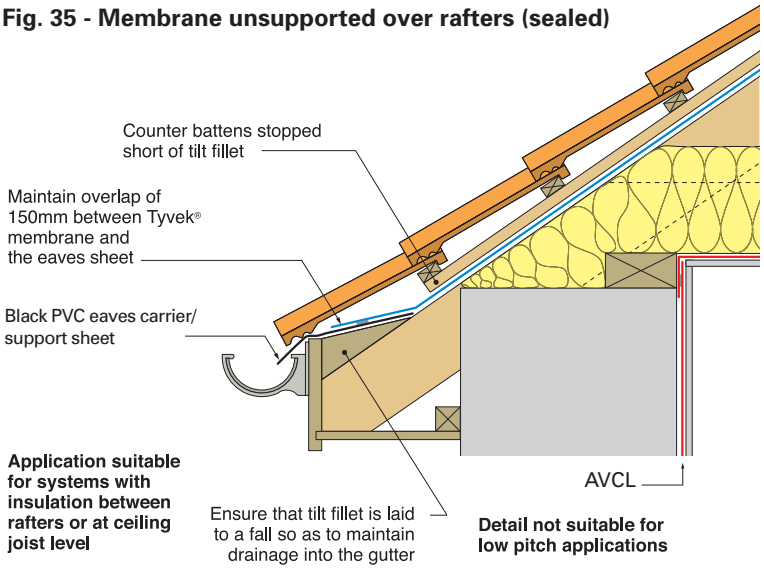
Note:
Please refer to the wind uplift information on pages 12 & 13 for further guidance on unsupported applications.

Fixing

For guidance on fixing procedure please refer to the specification notes on pages 38 to 40.

Detailing

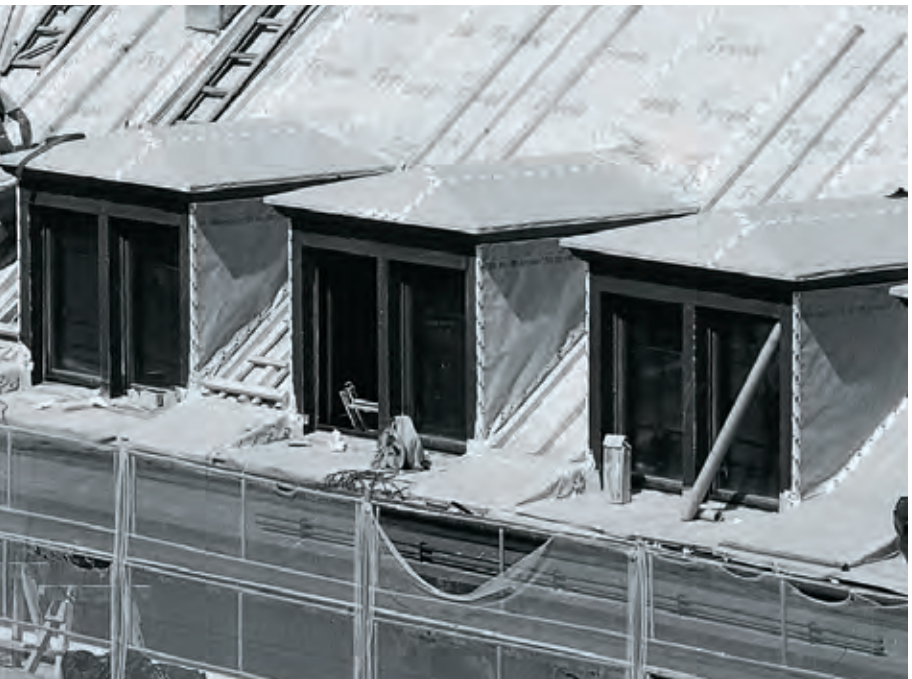
Fig. 35 - Membrane unsupported over rafters (sealed)



EAVES DETAILING - GENERAL COMMENTS

We have tried to be thorough with the eaves details illustrated in this technical guide in an attempt to match a variety of individual roof specifications. However, it will not always be possible to achieve complete coverage of all roof designs. Care should therefore be taken if adapting a detail to suit certain design parameters. It is most important to ensure that the Tyvek® membrane can adequately shed any water to the eaves efficiently and without risk of penetration into the structure.

Ponding of water on the membrane and back-falls on timber tilt fillets should be avoided.



This is a slight variation on the sealed roof details illustrated on page 17 Again **Tyvek® Supro** or **Supro Plus** is laid in a taut condition with counter battens fixed over. The laps can then be sealed using adhesive tape.

In this detail the counter batten is stopped short of an enlarged tilt fillet which supports the tiles/slates.

Air infiltration beneath the membrane should be prevented by ensuring airtightness at the fascia and soffit locations. Insulation pushed up to the underside of the membrane will also be effective, but may obstruct the drainage of moisture over the membrane.

Counter battens

Please refer to note on counter battens on page 40.

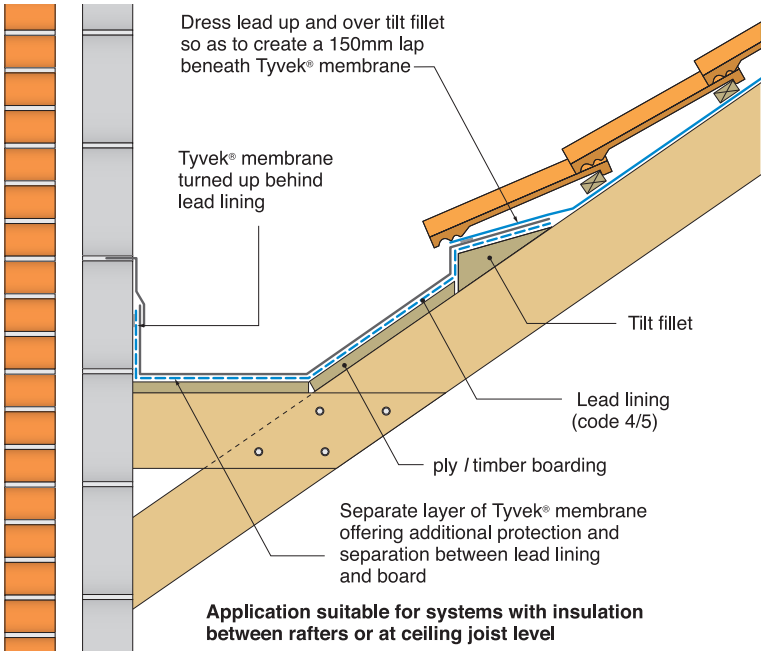
Note:
Please refer to the wind uplift information on pages 12 & 13 for further guidance on unsupported applications.

Fixing

For guidance on fixing procedure please refer to the specification notes on pages 38 to 40.

Detailing

Fig. 36 - Membrane unsupported over rafters



Lead lined gutters

A separate layer of Tyvek® beneath a lead lined gutter will provide additional protection against water ingress. As a separation layer the membrane will allow movement to occur between the lead and the supporting board as a result of thermal expansion.

Parapet (Fig. 36)

Lay a strip of Tyvek® over the timber/ply board extending up and over the timber tilt fillet/edge batten. Dress the Tyvek® membrane up the face of the parapet wall to terminate behind the lead flashing.

The roofing underlay should be dressed over the gutter lining with a 150mm min overlap.

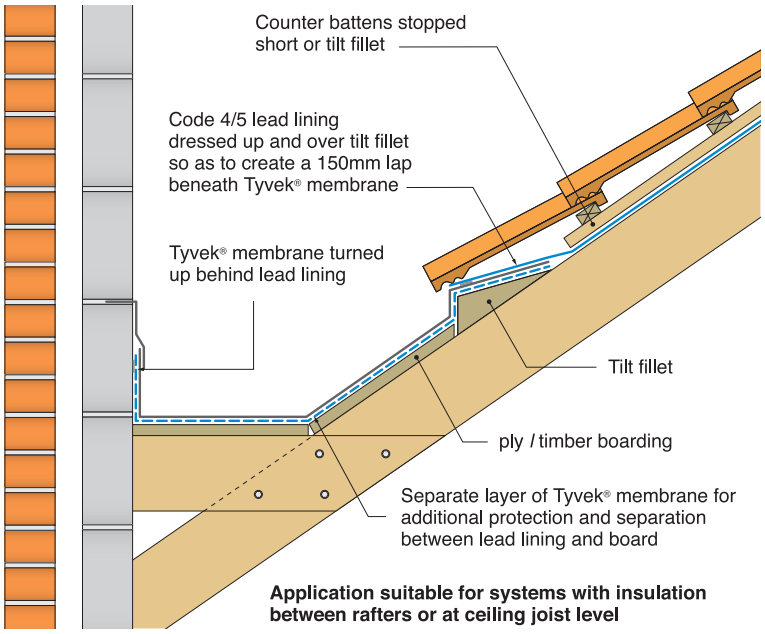
Parapet (Fig. 37)

Similar detail includes a counter batten over the underlay.

Counter battens

Please refer to note on counter battens on page 40.

Fig. 37 - Membrane unsupported over rafters (sealed)



Note:
Please refer to the wind uplift information on pages 12 & 13 for further guidance on unsupported applications.

Fixing

For guidance on fixing procedure please refer to the specification notes on pages 38 to 40.

Detailing

Fig. 38 - Membrane unsupported over rafters

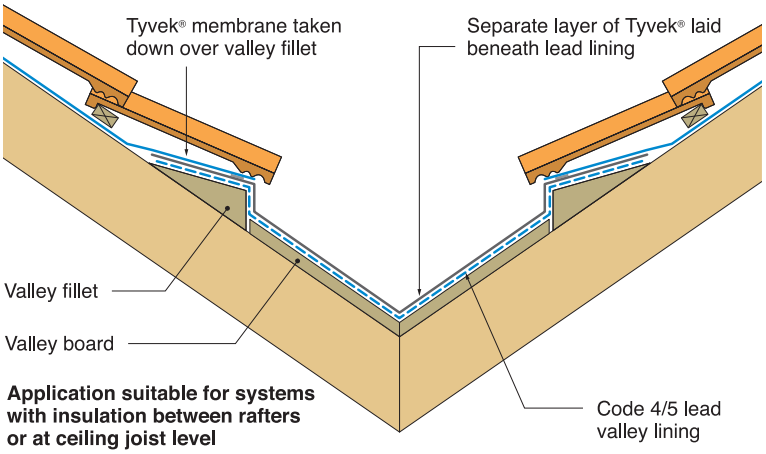
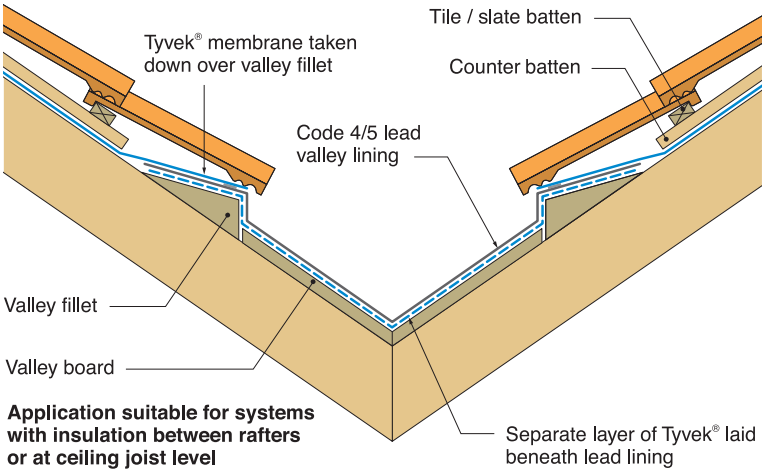


Fig. 39 - Membrane unsupported over rafters (sealed)



Valley (Fig. 38)

Lay a strip of Tyvek® over the timber/ply board extending up and over the timber valley fillets on each side, prior to the application of the lead or GRP lining.

Terminate the main roofing layer of Tyvek® over the valley fillet, maintaining a 150mm lap over the valley lining.

Valley (Fig. 39)

Similar detail includes a counter batten over the underlay.

Sealed Systems

The Tyvek® underlay can be sealed to the lead lining by using **Tyvek® Butyl Tape** (double sided).

Tiled valley

As an alternative to using a separate Tyvek® strip, the main roofing layers may be taken into the valley from both sides, beyond the centre-line and up the opposite slope by a minimum of 300mm. A double layer of Tyvek® at the valley will then be achieved.

Counter battens

Please refer to note on counter battens on page 40.

Note:
Please refer to the wind uplift information on pages 12 & 13 for further guidance on unsupported applications.

Fixing

For guidance on fixing procedure please refer to the specification notes on pages 38 to 40.

Detailing Non-ventilated and sealed systems

Fig. 40 - Duo-pitch ridge

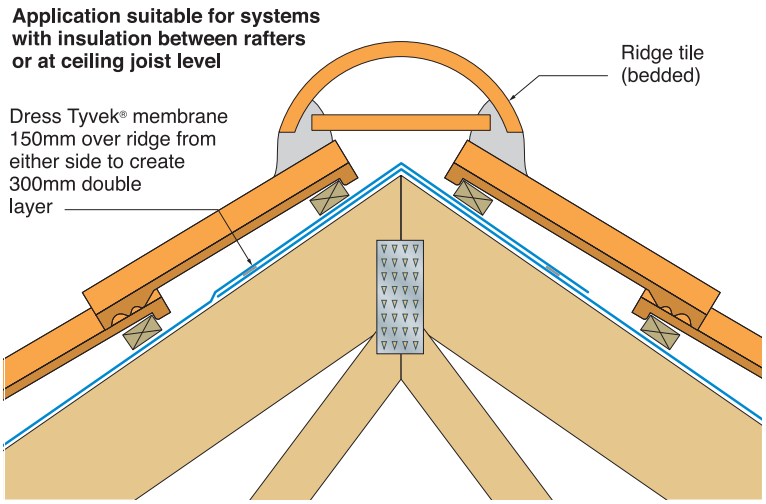
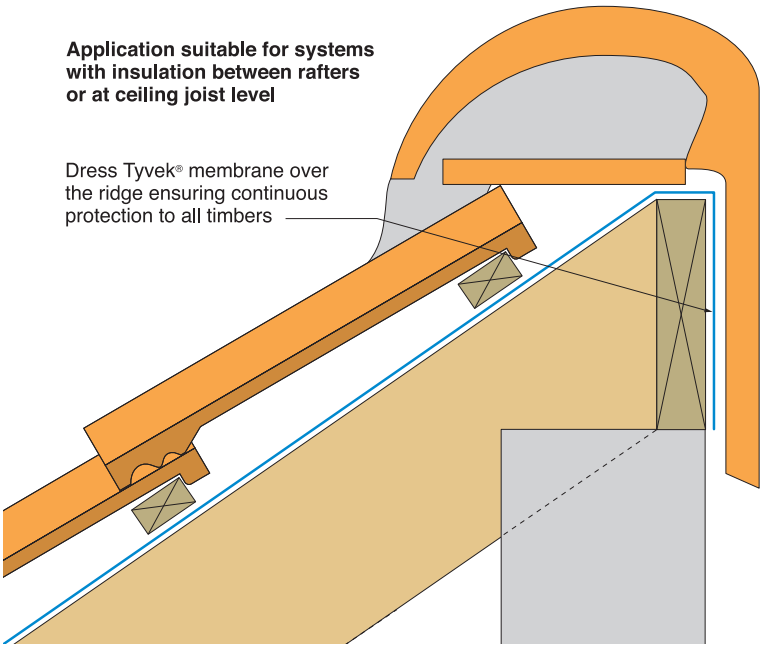


Fig. 41 - Mono-pitch ridge



Ridges

As roof ventilation is not required when using a Tyvek® vapour permeable underlay, it will not be necessary to form a "break" at the ridge. The underlay should therefore continue past the detail helping to maintain a continous secondary water shedding layer across the entire roof area.

Duo-pitch (Fig. 40)

Extend the Tyvek® membrane over the ridge by 150mm either side. A "double felted" layer of min. 300mm will then be achieved.

Mono-pitch (Fig. 41)

Dress the Tyvek® membrane over the ridge batten, offering maximum protection to the roof structure, by extending the Tyvek® underlay behind the monoridge tile.

Sealed Systems

The Tyvek® underlay can be sealed at laps and perimeters by using **Tyvek® Tape 2060B** (single sided) or **Tyvek® Double-sided Tape** (acrylic).

Note 1:
Ridge tiles may need to be mechanically fixed to comply with the wind uplift requirements of BS5534 Annex A.

Note 2:
Please refer to separate Technical Guidance where housing projects are covered by specialist insurance schemes such as NHBC Buildmark. This may affect the ridge detail and the provision for ventilation.

Note 3:
Please refer to the wind uplift information on pages 12 & 13 for further guidance on unsupported applications.

Fixing

For guidance on fixing procedure please refer to the specification notes on pages 38 to 40.

Detailing Non-ventilated and sealed systems

Fig. 42 - Verge

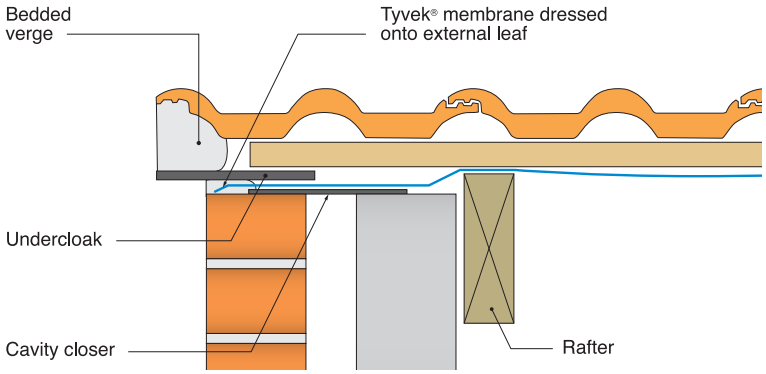


Fig. 43 - Abutment

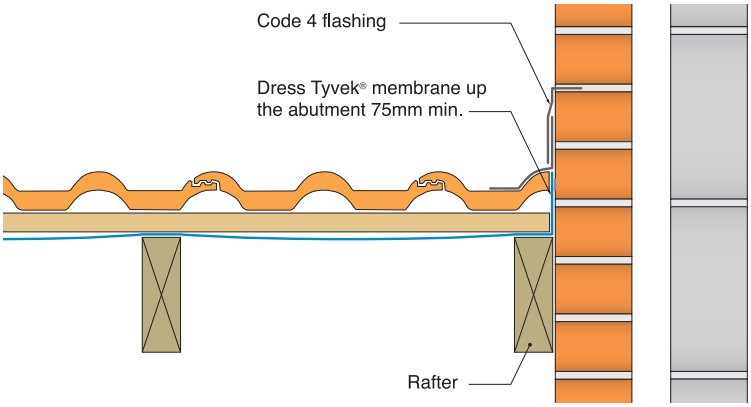
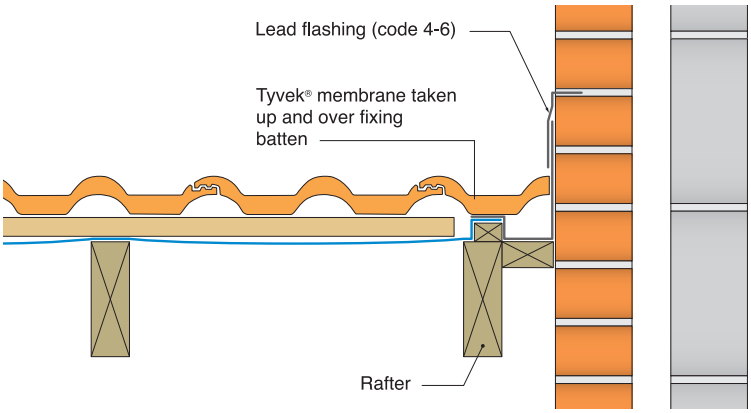


Fig. 44 - Abutment (secret gutter)



Verge (Fig. 42)

It is important to ensure that the Tyvek® membrane is dressed so as to prevent moisture ingress into the roof system. The membrane should be extended to the external face of the wall and secured with a timber batten or dressed into mortar. If a fascia or barge board is being used, terminate the membrane against the rear face.

Abutment (Fig. 43)

The Tyvek® underlay should be taken up the wall by at least 75mm or ideally behind the lead flashing.

Abutment (Fig. 44)

If a secret gutter is used terminate the membrane over the fixing batten.

Sealed Systems

To further improve the thermal efficiency of the construction the Tyvek® underlay can be sealed at the perimeters by using **Tyvek® Butyl Tape** (double sided) or **Tyvek® Double-sided Tape.**

Note:
Please refer to the wind uplift information on pages 12 & 13 for further guidance on unsupported applications.

Fixing

For guidance on fixing procedure please refer to the specification notes on pages 38 to 40.

Detailing Non-ventilated and sealed systems

Fig. 45 - Soil vent pipe

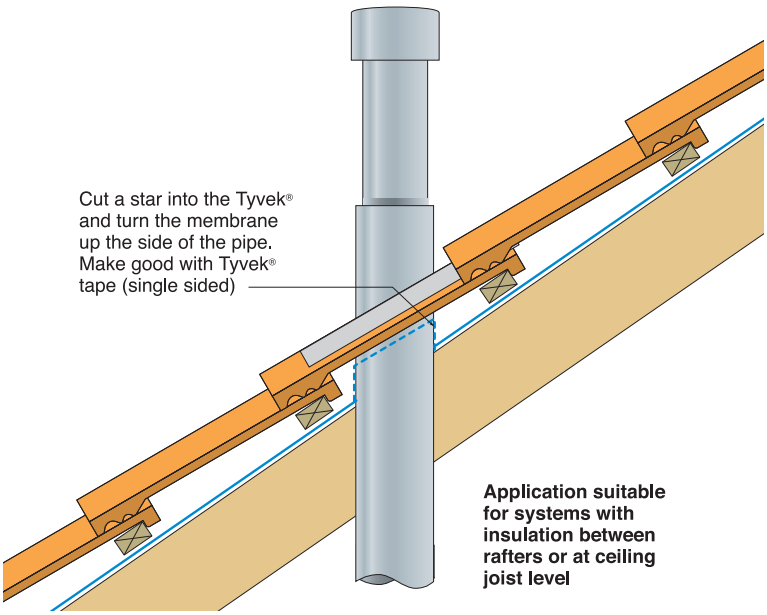
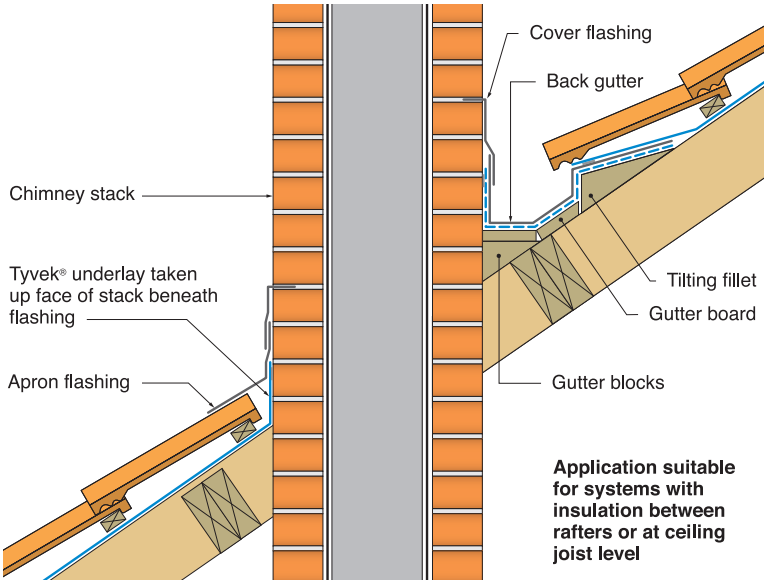


Fig. 46 - Chimney stack



Penetrations

As with all roofing underlays, any surface water should be directed around all penetrations that occur.

Soil vent pipe (Fig. 45)

An "asterisk" or "star" shaped cut should be formed in the membrane and triangular flaps folded upwards. The underlay should then be made good with **Tyvek® Tape 2060B** (single sided).

Chimney (Fig. 46)

For all intents and purposes the chimney detail incorporates an abutment detail and a parapet gutter, the recommendations for which can be used here.

The main layer of Tyvek® should be taken over the tilt fillet to achieve a 150mm lap over the gutter lining. A separate strip of Tyvek® should be included beneath the gutter lining for thermal movement.

Dress the membrane up the sides of the stack a minimum of 75mm.

At the apron, extend the membrane up the stack and finish behind the flashing.

Note:
Please refer to the wind uplift information on pages 12 & 13 for further guidance on unsupported applications.

Fixing

For guidance on fixing procedure please refer to the specification notes on page 40.

Detailing Non-ventilated and sealed systems

Fig. 47

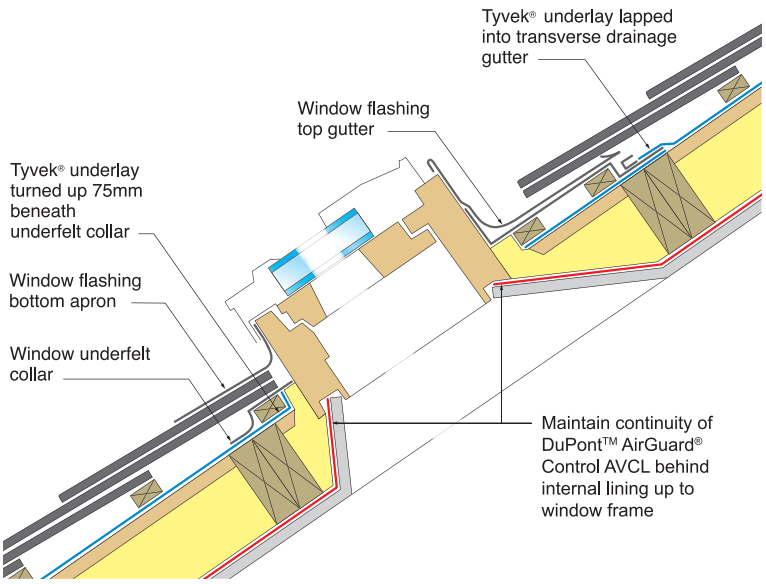
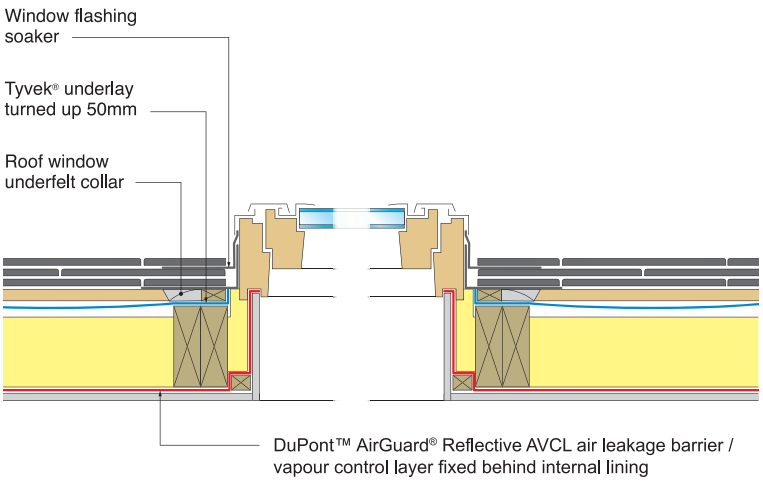


Fig. 48



Roof windows

The criterion when laying an underlay in conjunction with roof windows is the same as for other penetration details, ie. surface water should be directed around the detail.

Top

The Tyvek® underlay should be lapped into transverse drainage gutter above the roof window.

Sides

Turn the membrane up the sides of the window by a minimum of 75mm beneath the underfelt collar. Secure a fixing batten over.

Bottom

Dress the membrane so that it finishes beneath the window's underfelt collar, turning 75mm up a fixing batten if practicable.

Tyvek® Tape 2060B (single sided) may be used for making good to corners and junctions and / or when a sealed system is required.

The recommendations given here represent general advice for laying the Tyvek® underlay around a typical roof window.

Example roof detail is based on Velux GGL centre pivoted roof window by kind permission Velux Company Ltd. For guidance regarding installation of the roof window, the window manufacturer's instructions should be sought.

Vapour control layer

DuPont™ AirGuard® Control or AirGuard® Smart may be installed as the internal AVCL in these details.

Recommendation: Spacing the internal lining off the AVCL with a batten will help maintain the membrane's integrity, as well as to provide a services void for wiring. Please see pages 34 - 37 for details.

Fixing

For guidance on fixing procedure please refer to the specification notes on pages 38 to 40.

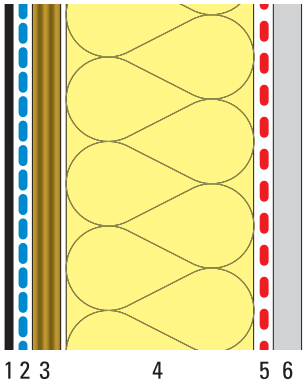
Restricted details

It is accepted that certain roofing elements will not permit the free passage of moisture laden air to outside atmosphere. Such details will include vapour resistant outer surfaces such as dormer cheeks and valleys clad with lead, and flat roofs with built-up roofing systems.

Whilst these details cannot be regarded as breathable, it is acceptable for them to be incorporated into a non-ventilated Tyvek® system, provided that they represent a relatively small proportion of the roof area.

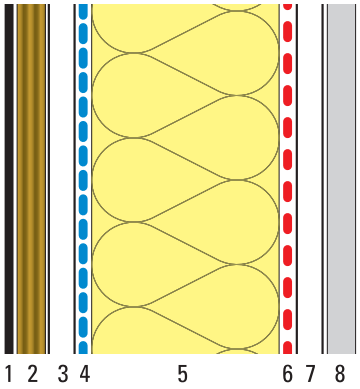
Fig. 49

OPTION 1
VAPOUR CLOSED



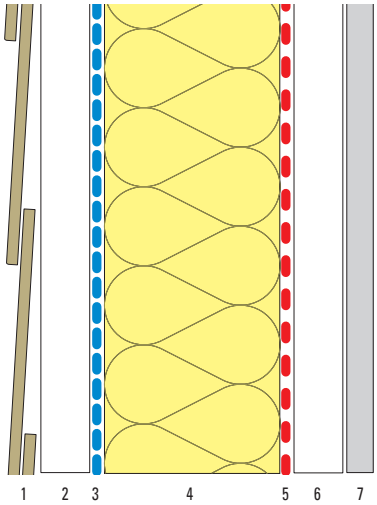
1. External lead cladding
2. Tyvek® Supro
3. Sheathing (ply/OSB)
4. Insulation between frame
5. DuPont™ AirGuard® Reflective AVCL (high vapour resistance)
8. Internal lining

OPTION 2
VAPOUR OPEN (BEST PRACTICE)



1. External lead cladding
2. Sheathing (ply/OSB)
3. Vertical batten (drainage path)
4. Tyvek® Supro
5. Insulation between frame
6. DuPont™ AirGuard® Reflective AVCL (high vapour resistance)
7. Vertical batten (service void)
8. Internal lining

Fig. 50



1- External weatherboarding
2- Vertical batten (drainage path)
3- Tyvek® Supro
4- Insulation between frame
5- DuPont™ AirGuard® Reflective / AirGuard® Control AVCL
6- Vertical batten (service void)
7- Internal lining

Dormer walls (cheeks)

Vapour-closed wall system (Fig. 49)

A Tyvek® membrane can also be used to provide secondary protection to the side walls (cheeks) of dormers.

Option 1 to the left shows the most simplistic arrangement where a Tyvek® membrane is acting as a separation layer, directly behind the lead outer cladding. To avoid condensation, this 'vapour-closed' wall element is hugely dependant on a well installed internal AVCL of high vapour resistance.

Option 2 shows the same type of system, but with additional battening. The external battens (vented top & bottom) produce an airspace to assist with vapour permeability and drainage. The internal battens provide a void for electrical wiring and help minimise penetrations through the AVCL. A great improvement in terms of both condensation control and energy efficiency.

In both options the AVCL is providing vapour control and airtightness. Therefore, sealing laps and any penetrations through this membrane is paramount.

Note: Dormer cheeks clad with a rigid metal sheet finish such as copper, zinc, aluminium or stainless steel may be detailed with Tyvek Metal. This breather membrane incorporates a drainage mesh and sits directly behind the outer sheet.

Breathing wall system (Fig. 50)

Dormers can also be finished externally with a discontinuous covering such as tile-hanging or cladding/weatherboarding. If no external ply/OSB sheathing is installed the vapour permeability of these systems will be much improved and the risk of condensation greatly reduced. A true 'breathing wall' system.

Dormer roofs

Recommendations for dormer roofs clad with lead should follow those of lead clad dormer cheeks by using a suitable AVCL.In addition, the condensation risk in flat roofs can be further reduced by specifying a warm roof detail, ie. insulation installed over the joists or above the decking.Dormer cheeks and/or roofs clad with copper, stainless steel or zinc outer sheeting may be detailed with **Tyvek® Metal.**

Restricted details

Adjoining ventilated roof constructions

It is acceptable and quite common for Tyvek® membranes to be used in refurbishment or building extension projects in a non-ventilated situation. Invariably, the existing construction will incorporate traditional roofing materials with a ventilated roof space. Air movement from the adjoining roof space will introduce air and external humidity which will reduce the roof space temperature and reduce insulation performance. In these circumstances it is important to ensure that any adjoining ventilated roof spaces are isolated from the non-ventilated Tyvek® system.

In order for the membrane to perform its function as a vapour permeable layer, an airtight dividing partition will need to be constructed between the two types of system, so that no common roof space exists.

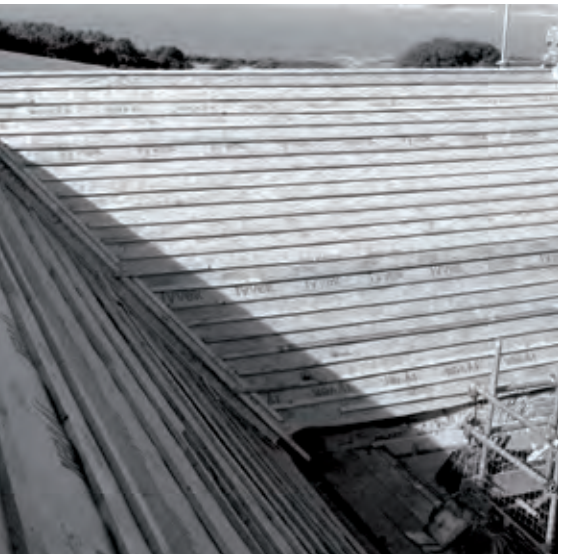
In a combined system the membrane will provide a similar function to that of a traditional felt, in which case full ventilation should be provided. Installing a Tyvek® underlay in a fully ventilated roof will not be detrimental to the function of the membrane. Its suitability as a secondary water shedding layer will be similar to that of other traditional roof tile underlays.

DuPont™ Tyvek® Supro - Low pitch roof applications

June 2013

It has been accepted for quite some time for Tyvek® to be installed in two layers with staggered laps to accommodate roof systems that are built below the minimum pitch for the tile or slate. This originated in the 90's as a solution for projects where a building or design constraint existed and has been widely accepted by local authorities throughout the UK. Understandably the 'double felt' method has been implemented widely within the industry to overcome low pitch problems.

The 'double felt' solution has proven to be particularly useful for roofs that commonly suffer from height restrictions such as on single storey lean-to extensions. It is quite common for these roofs to present a relatively small area and are therefore ideal for this method as they would be expected to discharge only a limited amount of rainfall. Whilst this method is very effective it's use is limited in main roofs, especially ones of two storey height. However, this method may be considered depending on the proposed pitch, location data and slate/tile selection.



Wherever possible, our standard pitched roof underlay Tyvek® Supro should be laid at a pitch suitable for the slate or tile that is being used. However, we will accept the 'double felt' method using the following rules as a general guide:

Tile/slate min pitch	Double felt allowance
12° - 19°	- 2°
20° - 29°	- 3°
30° - 39°	- 4°
40° +	please contact us

Following this system will ensure that the absolute minimum pitch allowed with two layers of Tyvek® Supro is 10° (for a tile which has a minimum pitch of 12°). A lower pitch may be acceptable for profiled metal clad industrial roofs or where a tile effect metal roof sheet is used eg. Metrotile, Britmet Tileform.

Rafter length should not exceed 9m for areas of normal exposure to driving rain and 6m for areas of high exposure.

Attention must be paid to details such as hips, valleys and large tilt fillets (eaves sprockets). These are considered 'weak points' in the system as they incorporate lower pitches than that of the main roof areas.

Consideration should also be given to details that penetrate the Tyvek® underlay such as soil vent pipes, chimneys & roof windows.
The underlay should turn up against the detail and be sealed with Tyvek® Flexwrap or dressed behind appropriate flashings. Any cuts and/or corners should be made good with Tyvek® Acrylic Tape (single-sided) to prevent water ingress.

These factors all govern the risk of water penetration onto the roof underlay. **In all cases the underlay must be laid to a fall with no ponding of water on the underlay under any circumstances.**

This policy is not entirely rigid and approval may be given for pitches lower than those stipulated above, according to specific data associated with the proposal. In these cases details such as roof area, height and location would need to be considered.

Our warranty for Tyvek® Supro is applicable to the double felting method, provided it is installed in accordance with these guidelines.

For further advice on the use of Tyvek® membranes please contact DuPont™ Tyvek® Technical Support on 01275 337667 (select option 1)

Nick Williams, DuPont Protection Solutions - Building Envelope Technical Manager UK & Ireland

Detailing Non-ventilated metal roof systems

The risks

A potential exists for condensation to form beneath metal clad roofs due to the high vapour resistance of the sheet materials employed in this type of construction.

Water vapour that migrates into the roof construction via the internal lining and insulation can condense on the underside of the outer sheets. If allowed to buildup, there is a risk that this condensation will drip back onto the insulation and affect the layer's thermal performance. Metal fixings, the internal lining and indeed the structure are then at risk of suffering from deterioration as a result.

The cycle of events that can occur as a result of night sky radiation can also present a potential risk for roof components and materials to degrade; the temperature drop that occurs during the night increases the risk of condensation forming on the underside of the outer metal sheeting. It is quite common for this moisture to freeze during very cold periods. When the temperature rises the following day, the trapped moisture thaws and saturates the construction once more. The moisture is trapped within the construction and goes through cycles of evaporation and saturation.

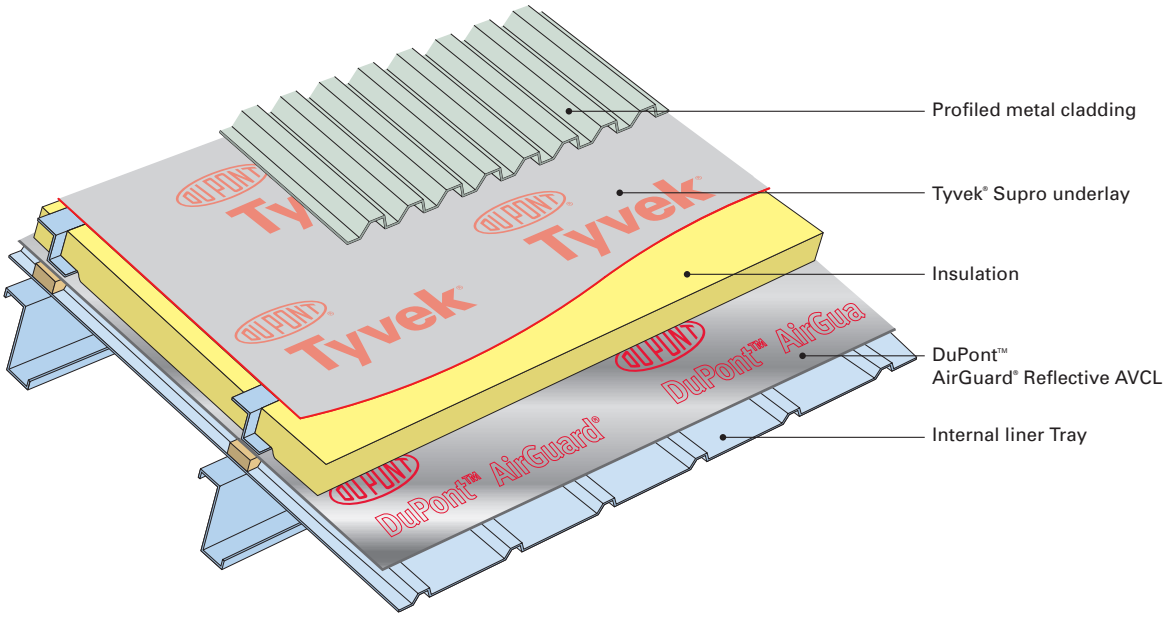
Over time, the weatherproof properties of profiled metal cladding can be compromised by natural weathering and/or the effects of thermally induced movement. This can displace waterproof seals between laps in the sheeting and enlarge penetration points where the sheets are fixed. The risk of moisture ingress, especially as a result of driving rain is increased.



DuPont™ Tyvek® Protection from condensation

The performance of a profiled metal roof can be significantly improved by installing a Tyvek® membrane over the structure and the insulation layer. The high vapour permeability of the Tyvek® membrane will permit the release of vapour through and away from the insulation. The high water resistance of the Tyvek® membrane will prevent any condensed moisture beneath the outer cladding to re-enter the construction, thus ensuring that the insulation operates in a dry environment.

Fig. 51



Detailing Non-ventilated metal roof systems

DuPont™ Tyvek® Protection from external moisture

As a secondary water shedding layer, a Tyvek® underlay can protect an insulation layer and the roofing structure from external precipitation. Any moisture that penetrates the primary roof covering will be safely channelled to the eaves by the Tyvek® underlay beneath. The long term durability of the construction is then assured.

Fully supported rigid metal sheet roofs

A Tyvek® underlay can also be of benefit in a standing seam metal roof system. Tyvek® Supro, when installed over a sheathing board or insulation will provide temporary protection during construction, prior to the installation of the external metal sheeting. In addition, when installed over the supporting sheathing Tyvek® Supro will act as a 'slip layer' to allow movement between the steel sheet and the timber boarding. The primary weathering material used in rigid standing seam metal roofing is commonly, copper, stainless steel, aluminium and zinc. These materials are quite capable at keeping the rain out, but similarly are effective at preventing internal water vapour from escaping, possibly leading to condensation beneath the outer sheet. Experience has shown that metals will corrode rapidly from the effects of wetting from condensate leading to white rust. It is therefore important to ensure that any condensation build-up beneath rigid metal sheeting is either eliminated or allowed to drain safely away and not be trapped within the construction layers. In many cases, organisations that specialise in the manufacture and development of standing seam systems have their own standard details that describe how such a system is designed and constructed. In the case of zinc roofing we can refer to the technical guidance offered by VM Zinc for instance and would recommend that such an organisation is consulted for any such roof system proposals.

Cold roof systems (fig.52a)

In most cases for cold roof construction, condensation control in a standing seam metal system can be achieved by ventilating beneath the supporting outer deck. This will ensure that any water vapour that permeates the insulation will disperse before it has the chance to settle. With an internal AVCL installed and a vapour permeable underlay such as Tyvek® Supro laid over the insulation, all bases, including temporary protection during construction are covered.

Warm roof systems

By far the most efficient type of system in every respect is where the roof structure is situated in a warm internal environment and the thermal insulation layer is installed continuously above. Risks associated with condensation and thermal bridging are greatly reduced. Tyvek® Supro may be specified here as the underlay between the standing seam metal sheet and the supporting board and is suitable for systems such as structural insulated panels (SiPs). Again, on the internal side of the construction is installed an AVCL to limit water vapour transfer and provide airtightness to the system.

DuPont™ Tyvek® Metal (fig.52b)

Also suitable as the underlay in a warm roof system is Tyvek® Metal.
This product can be termed a "metal roof drainage membrane" and consists of a Tyvek® breather membrane (Supro) bonded to an open mesh of polypropylene strands approximately 8mm deep. The open mesh will provide adequate support for the rigid sheeting, whilst maintaining an airspace to allow any condensate which forms beneath to drain away. The Tyvek® membrane that is bonded to the mesh is highly water resistant. Tyvek® Metal will allow movement between the steel sheet and the timber boarding and will offer a reduction in sound transmission normally generated by structure borne sounds such as rain-clatter.
See installation guidance on page 29.

Air & vapour control layer (AVCL)

A suitable AVCL for use in a standing seam metal roof system is DuPont™ Airguard® Reflective. Continuity of this layer can be maintained by installing a batten between the AVCL and the internal lining. The batten space will also serve as a service void for wiring.

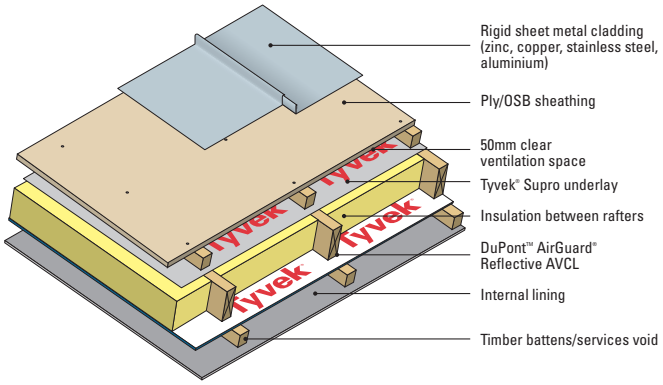


Fig. 52a Cold roof system with Tyvek® Supro

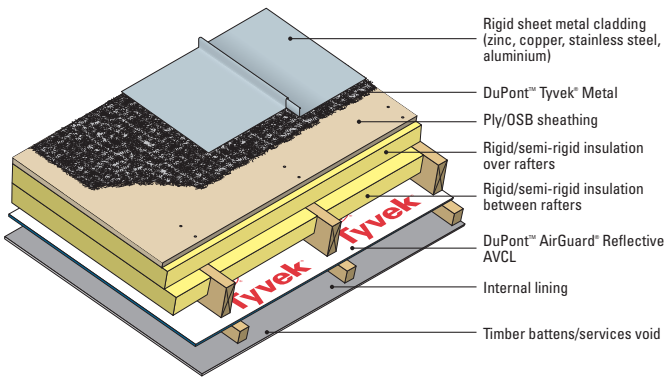
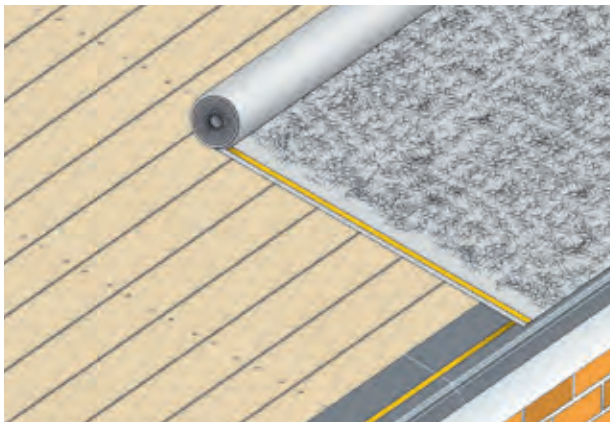


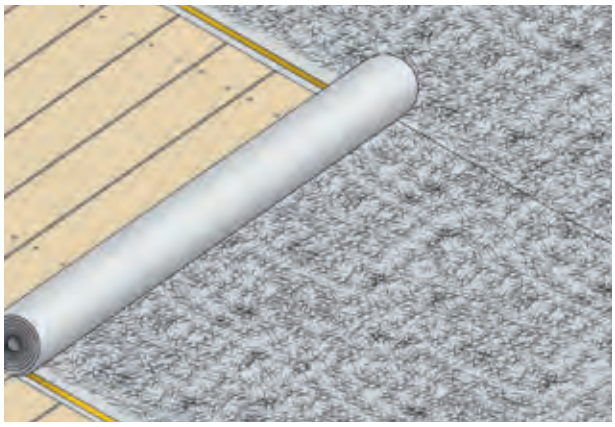
Fig. 52b Warm roof system with Tyvek® Metal

Detailing Non-ventilated metal roof systems

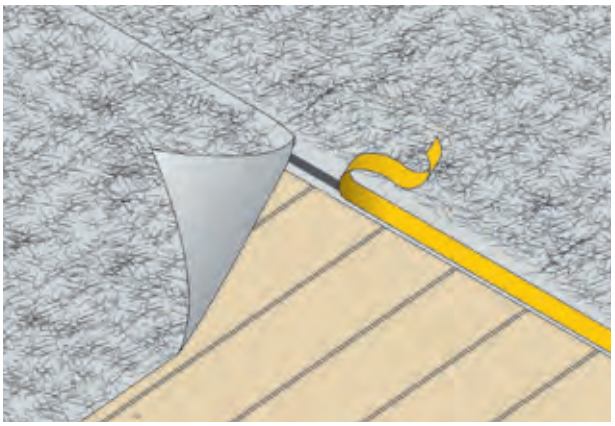
Tyvek® Metal: The installation procedure is as follows:



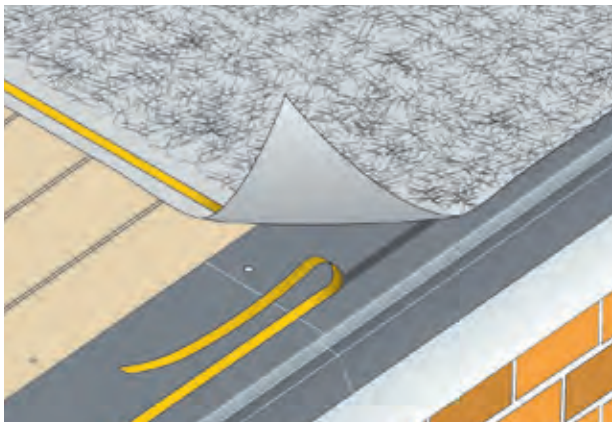
1. Install **the eaves sheet** as detailed on page 12. Lay the first run of **Tyvek® Metal** up-and-over the roof, with the bottom edge lapping on to the eaves sheet. Fix into the board with stainless steel staples or large headed galvanised steel clout nails.



2. Lay the next run of **Tyvek® Metal**, lapping it 100mm onto the mesh-free selvedge of the first run.



3. Peel the backing paper from the self adhesive tape and press the lap down firmly to form a good seal ; between each sheet…



4. …and over the **eaves sheet.**

Drainage of moisture from **Tyvek® Metal** may also be achieved by forming a drainage slot into a soffit.

Please note: Tyvek® Metal is suitable for use on 'vapour closed' sheathing boards of ply or OSB or on a 'vapour open' supporting layer such as timber boarding of nominal size 150mm wide with a 2mm gap (as illustrated above). This latter method should be employed only on warm roof systems such as that illustrated in Fig. 52b (Page 30).

Detailing Non-ventilated and sealed systems

Fig. 53

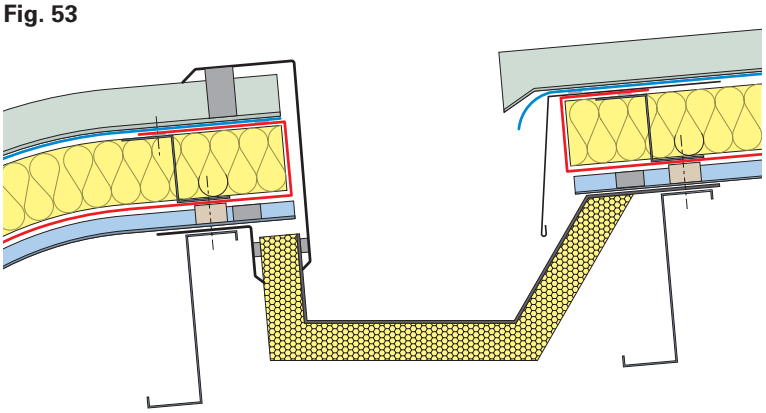


Fig. 54

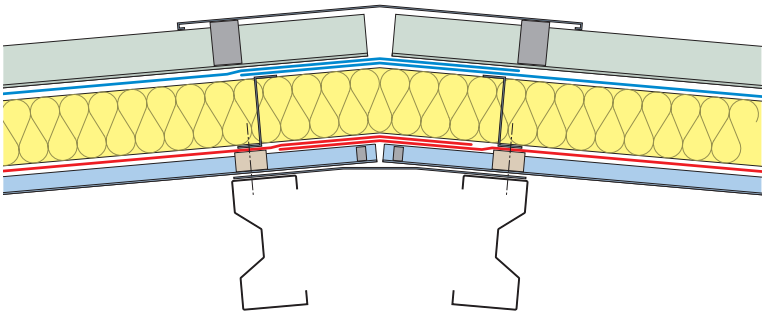
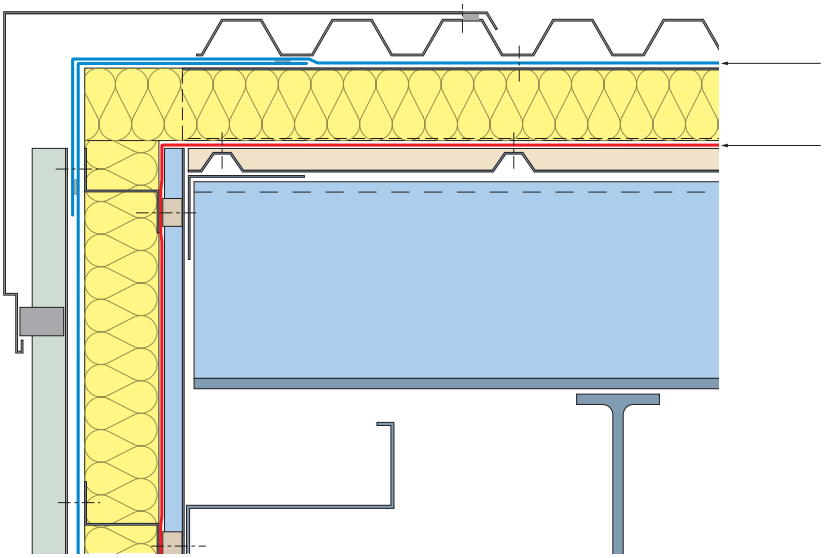


Fig. 55



Eaves (Fig. 53)

Where a Tyvek® membrane is used as the breather membrane in the wall it should be extended onto the roof slope by at least 300mm. The Tyvek® membrane on the roof should be lapped over it and dressed into the gutter. Ensure there is a clear drainage path at the end of the metal sheeting.

Ridge (Fig. 54)

Extend the Tyvek® membrane over the centre line of the ridge by 300mm from both sides, so a double strip of 600mm is formed.

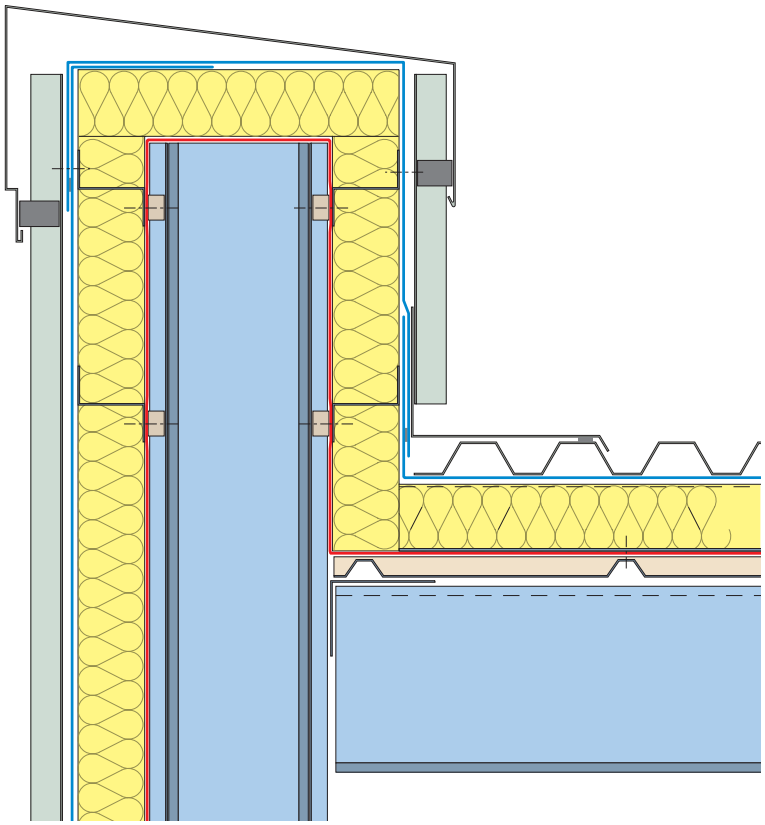
Verge (Fig. 55)

Extend the Tyvek® membrane from the walls 150mm onto the roof. Lap the Tyvek® membrane from the roof a minimum of 150mm over the wall membrane.

The recommended membranes for use in metal clad roof systems is: Tyvek® Supro

Detailing Non-ventilated and sealed systems

Fig. 56



Abutment / parapet (Fig. 56)

Dress the Tyvek® membrane up the face of the wall so as to finish 150mm above the surface of the roof. Lap with the Tyvek® membrane on the wall face.

Sealed Systems

To further improve the thermal efficiency of the construction, the laps in the Tyvek® membrane can be sealed by using **Tyvek® Tape 2060B** (single-sided) or **Tyvek® Double-sided Tape** (acrylic).

Penetrations through the membrane, roof windows and edge details can also be sealed using **Tyvek® Tape 2060B**, **Tyvek® Double-sided Tape** (acrylic) or DuPont™ FlexWrap NF.

Alternatively, **Tyvek® Supro Plus** which has an integral adhesive tape can be specified.

Specification

Specify the roof membrane as **Tyvek® Supro** or **Tyvek® Supro Plus** vapour permeable roof underlay as manufactured by DuPont.

Installation

The Tyvek® membrane should be laid as soon as possible after the insulation has been installed to ensure maximum protection from inclement weather.

On commercial buildings clad with metal sheeting, it is quite common for the membrane to be laid vertically from eaves to ridge, lapping successive runs by 150mm. The fully supported condition in which it is laid sometimes makes this a more practicable method of installation. **Tyvek® Supro Plus** is most appropriate for this application as the vertical laps in the membrane should be sealed.

The membrane can be taken over the ridge by 300mm or taken over the ridge and down the opposite slope in one run.

Internal Air & Vapour Control Layer

Install **DuPont™ AirGuard® Reflective** on the warm side of the thermal insulation. All laps in the membrane should be minimum 100mm. Seal all laps, penetrations and abutments with **Tyvek® Metallised Tape**

Internal Lining

DuPont™ AirGuard® Control

In today's modern world, a greater emphasis is being placed on environmental issues and the need to significantly reduce CO2 emissions. It has been reported that buildings in the UK contribute 43% of CO2 emissions - 27% from housing alone. For the prevention of global warming and the benefit of future generations it is **our** obligation to improve the energy efficiency of buildings.

The Building Regulations are already addressing these issues in the form of Approved Documents and in particular Part L, The conservation of fuel and power, now separated into L1 (dwellings) and L2 (buildings other than dwellings). For many years this document has addressed heat loss by **conduction** and includes various solutions and calculation methods on how to meet current u-value requirements. The theory works, but in practice total continuity of insulation layers can be very difficult to achieve. In reality **air infiltration** and heat loss by **convection** will occur through gaps between and around insulation and through hairline cracks in plasterboard linings. These invariably occur during the building drying out process, but are also caused by settlement and thermal movement over the life of the building.

Building Regulations Approved Document L raises the issue of heat loss by **convection** and air infiltration under the heading "Limiting air leakage." It states that: "Reasonable provision should be made to reduce unwanted air leakage."

DuPont™ AirGuard® Control air & vapour control layer

DuPont™ AirGuard® Control has been specifically developed for use as a barrier to air leakage. As the majority of vapour transfer through the building envelope will be via convection the membrane may be termed as an AVCL in this regard. However, the membrane's vapour resistance at 26 MNs/g is relatively low and does not fall within the category of an AVCL to BS5250:2011. DuPont™ AirGuard® Control will therefore be an ideal choice for vapour open constructions where a high resistance AVCL is not appropriate. The membrane can be specified as the airtight layer in the ceilings of cold pitched roof systems, helping to reduce convective heat and vapour transfer into the cold loft space in accordance with BS9250:2007.

Recommendation: Installing a timber batten over DuPont™ AirGuard® Control will help maintain the integrity of the membrane as well as to provide a suitable void for services.

Air & Vapour control layer

DuPont™ AirGuard® Reflective may also be installed where Dupont™ AirGuard® Control is indicated. However, in order to benefit from the extra thermal resistance provided by its low emissivity surface a batten space will need to be incorporated.



DuPont™ AirGuard® Reflective - Air & Vapour Control layer (AVCL)

DuPont™ AirGuard® Reflective is a metallised reinforced polypropylene based membrane designed for use as a continuous air and vapour control layer in walls and warm roof systems. As an internal component the membrane is installed behind a plasterboard lining/ceiling to provide effective control against interstitial condensation both by diffusion and by convection. The membrane will reduce convective heat loss through the roof construction as well as retaining heat by reflecting it back in. **DuPont™ AirGuard® Reflective** has been tested in accordance with CE marking and is classified as airtight. The membrane has a very high vapour resistance at 10,000 MNs/g, confirmed by the BBA in Agrement Certificate 08/4548 Product Sheet 4.

To benefit from the membrane's thermal attributes the reflective surface must face a minimum 15mm airspace - usually between the membrane and the plasterboard lining (values for smaller cavities can be established from BS6946). A standard 25mm batten would be ideal for this and will have the added benefit of providing a services void for electrical wiring and pipework. The batten space will also serve to minimise penetrations through the membrane from plasterboard fixings, light fittings, etc. Whilst this batten space is optional it is highly recommended, as the membrane's continuity is a principal factor in making the complete layer air and vapour tight. A high degree of workmanship is therefore key to a successful pressure test result.

Airtightness

DuPont™ AirGuard® Reflective is completely airtight and therefore will form an integral component in warm roof systems to reduce uncontrolled air leakage and subsequent heat loss. A correctly installed membrane will help to meet the requirements of Approved Document L by limiting the design air permeability well below the required **10m³/(h.m²) at 50 Pa**.

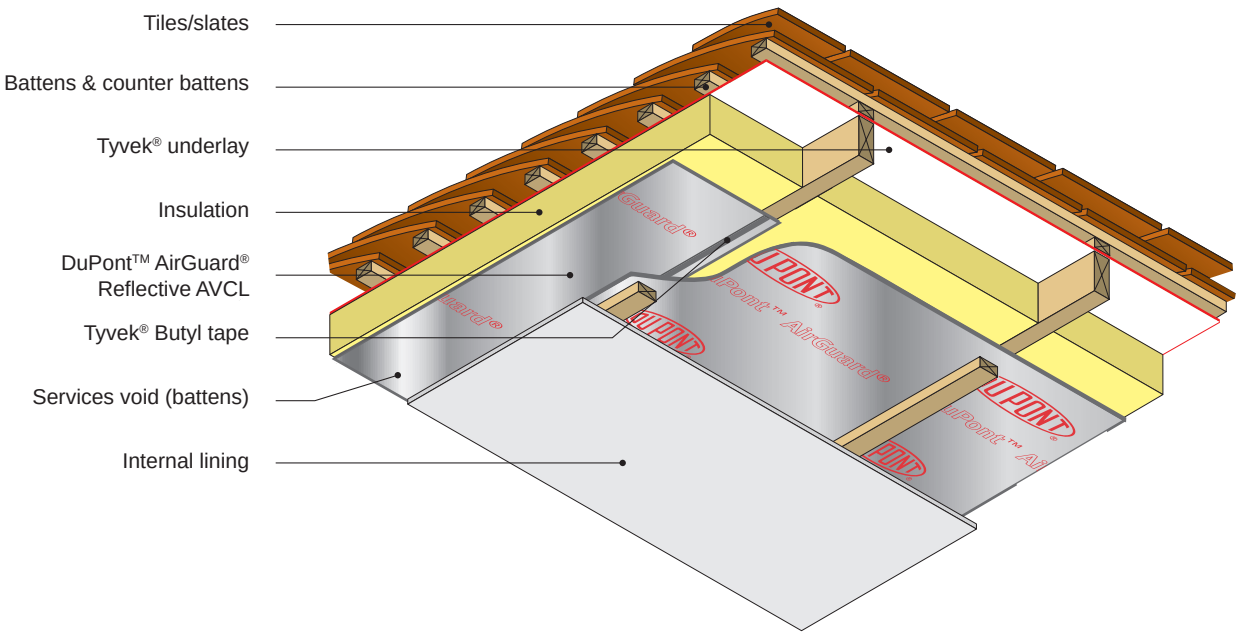
Vapour Control

DuPont™ AirGuard® Reflective provides high resistance to the passage of water vapour both by diffusion and convection. When installed continuously with all laps and penetrations sealed, the membrane will provide effective condensation control for warm roofs in all building types. This includes those of high humidity class, eg. swimming pools, textile factories, etc.

Thermal comfort

The metallised face of **DuPont™ AirGuard® Reflective** provides a low emissivity surface on the internal side of a warm roof construction. When used with a batten space the membrane will reflect internally generated heat back into the building providing a back-up to traditional insulation. This reduction in heat transmission allows the airspace resistance to be increased to **0.45 m²K/W**, which can be added to the overall U-value of the roof system.

Fig. 57



Please refer to page 37 for detailing

DuPont™ AirGuard® Smart

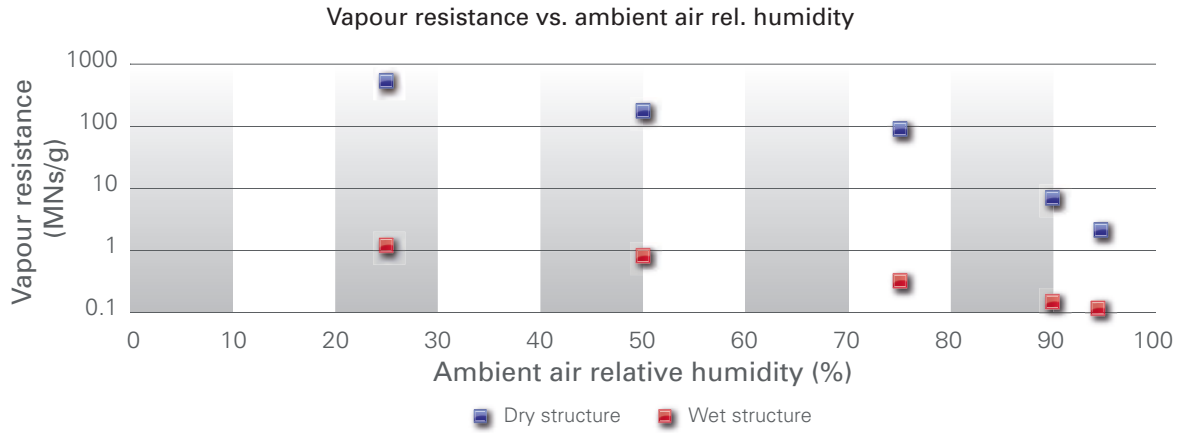
DuPont™ AirGuard® Smart is a strong and lightweight flexible membrane for use as an internally applied airtight vapour control layer (AVCL).

Outstanding properties:

- Extreme vapour resistance range from 0.26 MNs/g to more than 150 MNs/g, (Sd value 0.05 m - more than 30 m), therefore highly adaptable → one of the widest vapour resistance spans known in the market
- Combines drying-out and vapour control function in one layer
- High drying-out potential = maximum protection against structural damage
- High tensile strength offering superior insulation support/retention
- Very robust - offering versatility in site work
- Airtight
- Transparent allowing the timber members to be easily located for fixing
- Easy to install - suitable for use in roof or wall constructions

How DuPont™ AirGuard® Smart works

The graph shows 2 extreme examples:
1. Wet (100%) and 2. dry (0%) building envelope structure and corresponding vapour Rs (resistance) - depending on ambient air relative humidity. The actual vapour Rs is a combination of both the moisture content of the building envelope and relative humidity of the internal air. DuPont™ AirGuard® Smart provides traditional vapour control to the diffusion of vapour from the building interior, whilst offering a high drying-out potential of built-in moisture back into the building.



What happens just after a new build construction or after renovation?

New construction

Condition just after completion: Moisture is confined within the building envelope; damp timbers, insulation, etc, due mainly to wet building processes.

A new-build property will very often have a high relative humidity due to the rapid drying of the building fabric. Hence after completion, the owner has to adequately ventilate the building interior to expel the moisture rather than allow it to migrate through the construction where it can condense and cause harm. If needed the DuPont™ AirGuard® Smart allows moisture within the building fabric to migrate back into the building. Where the moisture content within the structure is high the vapour resistance of DuPont™ AirGuard® Smart will always be low This will allow the structural elements and the insulation to dry out towards the warm side of the building, in addition to the normal process of vapour diffusion through the external DuPont™ Tyvek® breather membrane.

Renovation

Condition just after completion: Building structure and insulation dry after brief humidity stabilisation.

In the case of a dry building structure, DuPont™ AirGuard® Smart acts as a traditional AVCL, providing effective condensation control and airtightness. Even in temporarily high air humidity zones water vapour diffusion is reduced*. The vapour resistance of DuPont™ AirGuard® Smart will be between 0.26 MNs/g and more than 150 MNs/g, (Sd value 0.5 m - more than 30 m). The migration of newly generated moisture through the construction will be significantly reduced.

*DuPont™ AirGuard® Smart is not suitable for places with permanent high ambient air humidity, such as saunas or swimming pools.

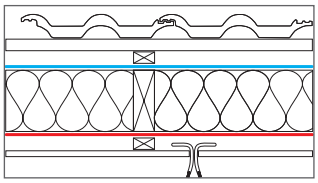
Installation: DuPont™ AirGuard® Control, AirGuard® Reflective, AirGuard® Smart

Product selection – roof applications

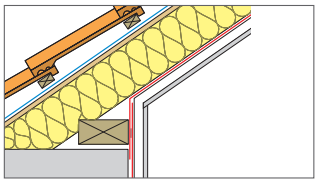
	DuPont™ AirGuard® Reflective	DuPont™ AirGuard® Reflective E	DuPont™ AirGuard® Smart	DuPont™ AirGuard® Control
Properties of high internal humidity	✔	✔		
Warm pitched roofs	✔	✔	✔	
Flat roofs	✔	✔	✔	
Enhancing thermal performance	✔	✔		
Existing properties with damp structure			✔	
New properties during drying out			✔	
Properties of low internal humidity			✔	✔
Cold pitched roofs				✔
Room-in-roof applications	✔	✔	✔	✔

Installation

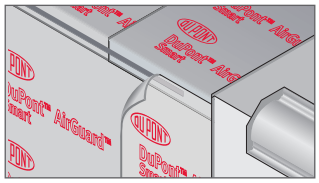
1 - Services void



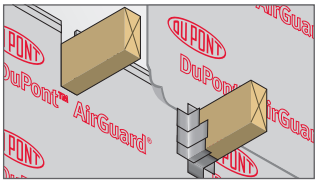
2 - Sloping ceiling/wall junction



3 - Flat ceiling/wall junction



4 – Making good around penetrations



Detailing

The integrity of a DuPont™ AirGuard® AVCL is essential for it to provide effective control to the passage of water vapour and convective heat loss. The internal lining (plasterboard, etc.) may be applied directly against the membrane if required, but for best practice fixing a batten over the membrane to create a services void is recommended. Please note: The reflective surface of DuPont™ AirGuard® Reflective must face a minimum 15mm airspace (1).

Continuity

Maximum coverage of a DuPont™ AirGuard® AVCL must be maintained at all junctions, including adjoining roofs and adjacent walls (2 & 3).

Penetrations and making good

Penetrations through the membrane should be kept to a minimum and any that are made should be sealed. Cuts in the membrane at details such as corners to roof windows and loft hatches should be made vapour and convection tight, as well as any penetrations for pipework, wiring and light fittings (4).

Product selection - roof applications

	Tyvek® Acrylic Tape	Tyvek® Metallised Tape	Tyvek® FlexWrap NF	Tyvek® FlexWrap EZ	Tyvek® Butyl Tape	Tyvek® Double-sided Tape
Membrane laps and making good to cuts and damage repair						
DuPont™ AirGuard® Control	✔					
DuPont™ AirGuard® Smart	✔					
DuPont™ AirGuard® Reflective		✔				
Making good around service pentrations and at corners of roof windows/loft hatches						
DuPont™ AirGuard® Control	✔					
DuPont™ AirGuard® Smart	✔		✔	✔		
DuPont™ AirGuard® Reflective		✔				
DuPont™ AirGuard® Reflective E		✔				
Bonding to planed timber & metal framing						
All DuPont™ AirGuard® AVCL Membranes					✔	✔
Bonding to rough sawn timber & masonry						
All DuPont™ AirGuard® AVCL Membranes					✔	
Sealing nail and screw penetrations						
All DuPont™ AirGuard® AVCL Membranes					✔	

For further information on tape selection please refer to page 44

Non-ventilated and sealed systems

Underlay

Shall be **Tyvek® Supro** or **Tyvek® Supro Plus** vapour permeable roof underlay as manufactured by DuPont de Nemours (Luxembourg) Sàrl and supplied by DuPont Protection Solution, Building Envelope, UK & Ireland. Tel. 01275 337667 (Option 1).

Storage

Rolls should be stored palletised or on their sides on a smooth clean surface, under cover and protected from direct sunlight.

Installation

General

Care should be taken when handling the membrane in order to prevent tears and punctures occurring. Any that do occur should be repaired with **Tyvek® Acrylic Tape (single-sided)**

Eaves

An eaves sheet should be secured over the fascia board and rafters with felt nails and extended into the gutter. Install the first run of Tyvek® underlay parallel to the eaves so that the leading edge is in line with the rear of the fascia board, (the "pinch point."). The membrane should lap onto the eaves sheet by a minimum of 150mm.

Fixing: Supported applications - Non-ventilated

Tyvek® Supro or Tyvek® Supro Plus should be laid horizontally across the roof slope in a taut condition over insulation and secured with stainless steel staples or galvanised nails at maximum 300mm centres. Counter battens of minimum depth 12mm should be installed over the membrane. Horizontal laps in the membrane should be 150mm.

Note ⓐ **Tyvek® Supro** may also be laid over timber boarding.

Note ⓑ If the membrane is supported by insulation that is positioned over rafters (warm roofs), larger counter battens should be used to provide the required bearing for batten fixing.

Re: BBA certificate 08/4548,

Fixing: Supported applications - Sealed

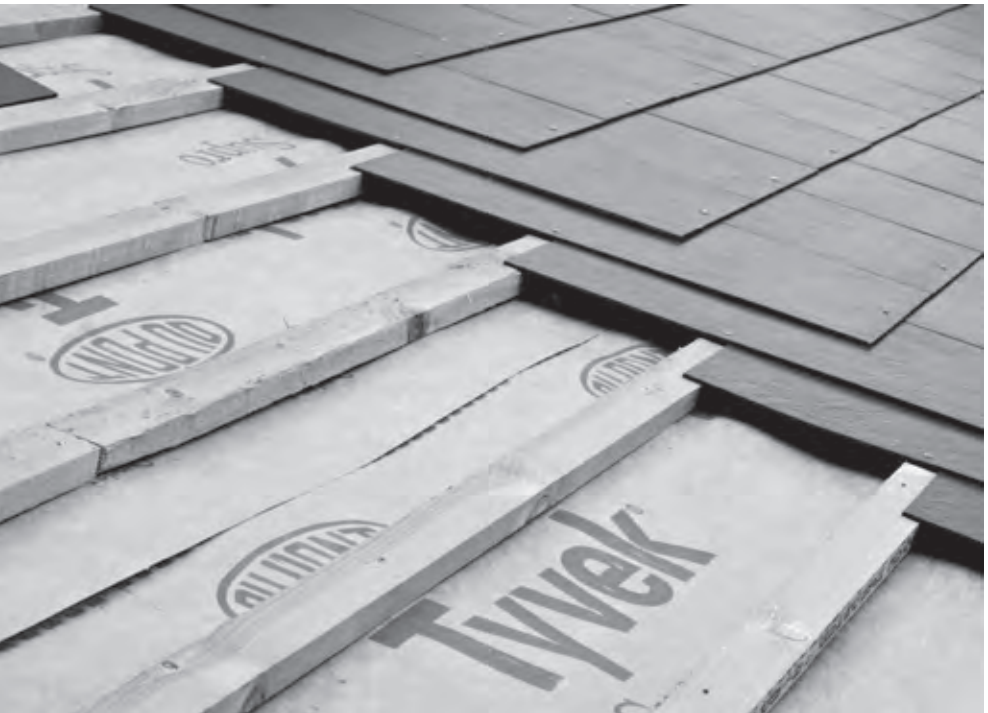
Tyvek® Supro or Tyvek® Supro Plus should be laid horizontally across the roof slope in a taut condition over insulation and secured with stainless steel staples or galvanised nails at maximum 300mm centres. Counter battens of size: 25mm x 50mm should be installed over the membrane. Horizontal laps in the membrane should be 150mm and be sealed with adhesive tape:

- Laps in **Tyvek® Supro** should be sealed with **Tyvek® Acrylic Tape (single-sided)** or **Tyvek® Double-sided Tape** (acrylic)
- Laps in **Tyvek® Supro Plus** should be sealed with the integral adhesive tape provided.

Note ⓐ **Tyvek® Supro or Tyvek® Supro Plus** may also be laid over timber boarding.

Note ⓑ If the membrane is supported by insulation that is positioned over rafters (warm roofs), larger counter battens should be used to provide the required bearing for batten fixing.

Re: BBA certificate 08/4548,



Non-ventilated and sealed systems

Fixing: Scottish sarking applications - Non-ventilated / Sealed

Tyvek® Supro should be laid horizontally across the roof slope over 150mm wide timber boarding with 2mm gaps and secured with galvanised clout nails at maximum 300mm centres. Lay the slates directly onto the membrane and fix into the timber sarking as in traditional practice. Horizontal laps in the membrane should be 150mm.

A sealed system can be achieved by sealing the laps with adhesive tape:

- Laps in **Tyvek® Supro** should be sealed with **Tyvek® Acrylic Tape (single-sided)** or **Tyvek® Double-sided Tape** (acrylic).
- Laps in **Tyvek® Supro Plus** should be sealed with the integral adhesive tape provided.

Re: BBA certificate 08/4548.

Fixing: Unsupported applications - Non-ventilated

Tyvek® Supro should be laid horizontally across the roof slope and draped approx 10mm over rafters or counter battens. Membrane should be secured with stainless steel staples or galvanised nails at maximum 300mm centres. Horizontal laps in the membrane should be 150mm.

Re: BBA certificate 08/4548.

Fixing: Unsupported applications - Sealed

Tyvek® Supro or Tyvek® Supro Plus should be laid horizontally across the roof slope in a taut condition over rafters and secured with stainless steel staples or galvanised nails at maximum 300mm centres. Counter battens of size 25mm x 50mm should be installed over the membrane. Horizontal laps in the membrane should be 150mm and be sealed with adhesive tape:

- Laps in **Tyvek® Supro** should be sealed with **Tyvek® Acrylic Tape (single-sided)** or **Tyvek® Double-sided Tape** (acrylic).
- Laps in **Tyvek® Supro Plus** should be sealed with the integral adhesive tape provided.

Re: BBA certificate 08/4548.

Valleys - Lead / GRP (also applicable for parapet details)

Cover entirely the timber or ply valley board with a separate strip of Tyvek® underlay as a separation layer and for continuous protection against external moisture. Once the lead or GRP lining is installed, bring the main Tyvek® layers into the valley terminating over the tilt fillet/edge batten so that the membrane is not visibly exposed to direct sunlight. The edges of the Tyvek® separation layer should lap under the roof underlay by a minimum of 150mm.

Valleys - Tiled

Dress the Tyvek® underlay into the valley, beyond the centre-line by a minimum of 300mm either side so as to create a double layer of 600mm. Continue to lay the tiles over in the normal way.



Non-ventilated and sealed systems

Ridges (duo-pitch)

The underlay should lap at least 150mm down each side of the slope so that a 300mm wide double layer is formed over the centre-line of the ridge.

Ridges (mono-pitch)

Extend the underlay over the ridge batten and terminate on the external face of the wall behind the ridge tile/ fascia board.

Hips

The underlay should lap at least 300mm down each side of the hip so that a 600mm wide double layer is formed over the centre-line of the hip.

Verges

Terminate the underlay at the external face of the wall and secure with a timber batten or dress into mortar. If a fascia board is specified turn the membrane a minimum of 50mm up the board.

Abutments

Turn the underlay up the face of the wall a minimum of 75mm or terminate behind the lead flashing. Where a secret gutter is specified terminate the underlay over the fixing batten.

Penetrations

The underlay should be dressed so as to direct water away from all penetrations in the membrane. An upstand of 75mm min. should be formed around the penetration to prevent water ingress. Any cuts in the membrane at corners, junctions, etc., should be made good with **Tyvek® Acrylic Tape (single-sided)**.

Sealing

A sealed system can be achieved by sealing all laps, penetrations, perimeters and abutments with **Tyvek® Acrylic Tape (single-sided)**, **Tyvek® Double-sided Tape**. The Tyvek® membrane should be laid in a taut condition in order for the sealing tape to be applied to the laps. As part of the sealed roof system a counter batten should be fixed over the membrane.

Re: BBA certificate 08/4548.

Counter Battens

Where counter battens are installed over the membrane it is important to ensure that they are tightly secured in order to avoid water penetration through the fixing points.

Internal Air & Vapour Control Layer

Shall be **DuPont™ AirGuard® Control, Smart** or **DuPont™ AirGuard® Reflective** as manufactured by DuPont de Nemours (Luxembourg) Sàrl and supplied by DuPont Protection Solutions; Building Envelope, Bristol & Bath Science Park, Dirac Crescent, Emersons Green Bristol BS16 7FR

Fixing

Install **DuPont™ AirGuard® Control, Smart** or **DuPont™ AirGuard® Reflective** on the warm side of the thermal insulation and fix to the underside of the rafters/ joists with stainless steel staples or galvanised nails at maximum 300mm centres. All laps in the membrane should be minimum 100mm. Seal all laps, penetrations and abutments with **Tyvek® Acrylic Tape (single-sided)** or **Tyvek® Double-sided Tape** (acrylic).

DuPont™ AirGuard® Reflective should be laid with the metallised surface facing inwards. A timber batten should be fixed over the membrane prior to the installation of the internal lining (plasterboad) to benefit from its thermal resistance value. Seal all laps of the membrane with **Tyvek® Metallised Tape.** **DuPont™ AirGuard® Reflective** is especially recommended for warm roof and **DuPont™ AirGuard® Control** is recommended for cold roofs.



Questions & Answers

Can DuPont™ Tyvek® membrane be installed as a roofing underlay without ventilation?

Yes. Tyvek® underlays are BBA certified for non-ventilated applications. No eaves or ridge ventilation is necessary.

Can DuPont™ Tyvek® membranes be used on new build and refurbishment work without ventilation?

Yes, but care must be taken to ensure that all internal linings (ceilings) are intact so that adequate vapour control is provided.

Should an air & vapour control layer (AVCL) be installed in the ceiling?

An AVCL should be considered in all projects whether the roof system is ventilated or not. In domestic applications an AVCL will limit the risk of condensation during a building's drying out phase and provide sufficient airtightness to meet the Design Air Permeability requirements of Part L. An AVCL should be installed over bathrooms and kitchens but particularly over swimming pools and saunas. Low risk environments, such as offices may not require a high level of vapour control, but an AVCL should be considered for airtightness purposes.

Do counter battens need to be installed when DuPont™ Tyvek® membrane is laid over rafters in an unsupported condition?

No, provided that the Tyvek® membrane can be draped sufficiently between the rafters. Tyvek® Supro should be used here.

When laying DuPont™ Tyvek® unsupported how much airspace beneath is required to allow the membrane to drape?

Approximately 10mm.

Do counter battens need to be installed when DuPont™ Tyvek® membrane is laid directly over insulation in a fully supported condition?

Yes. As with all roofing underlays a counter batten should be installed here.

Can DuPont™ Tyvek® be installed draped over counter battens?

Yes. Tyvek® Supro should be used for this method of application.

Can DuPont™ Tyvek® membrane be installed beneath counter battens?

Yes. The membrane will then be laid in a taut condition which allows the laps to be sealed if required.

Can water permeate through DuPont™ Tyvek® membrane when laid directly over insulation or timber boarding?

No. Tyvek® membranes do not "tent" water (capillary action). However, care should be taken to ensure that counter battens that are installed over the membrane are tightly secured.

What is the difference between a "nonventilated" system and a "sealed" system?

Both systems are non-ventilated, but the sealed system includes adhesive tape at all laps in the Tyvek® membrane, penetrations and edge details. A counter batten over the membrane is included in the Tyvek® sealed roof specification.

Does DuPont™ Tyvek® membrane need to be sealed?

No. Sealing the Tyvek® membrane is optional and is specified where maximum thermal efficiency is required.

Can DuPont™ Tyvek® be used on a roof that has been constructed below the recommended minimum pitch of the tile or slate?

Yes, but the Tyvek® membrane should be installed in two layers (double felted) with staggered laps. Please refer to page 26 for details.

Can DuPont™ Tyvek® be laid directly over timber sarking without battens or counter battens as in traditional Scottish practice?

Yes. The slates may be secured through the membrane and into the boarding in the normal way. The sarking board will need to be timber boarding of 150mm wide with 2mm gaps.

Is ventilation to the batten space required when using Tyvek® in a nonventilated or sealed roof system ?

No. Natural air movement between tiles and slates will be sufficient to remove any water vapour from the batten space.

Can DuPont™ Tyvek® be dressed into the gutter as in traditional practice?

No. It is generally accepted as good practice for all roofing underlays to be stopped short of the gutter, overlapping a "proprietary eaves protection device" (BS5534). This is a UV resistant eaves sheet that replaces the underlay as the "drip" into the gutter. The roofing underlay should not be left permanently exposed to direct sunlight.

Can DuPont™ Tyvek® be left exposed temporarily, before the tiles/slates are installed?

Yes. The ultra violet stability of Tyvek® membranes allows them to be left exposed for a period not exceeding 4 months. However, this will only apply when the membrane is adequately secured.

Are DuPont™ Tyvek® membranes suitable for installation into non-ventilated flat roof systems?

No. Tyvek® membranes are suitable for non-ventilated pitched roof applications only. In flat roofing a Tyvek® membrane may only be used as a protection layer over insulation or as a separation layer between metal sheeting and a supporting deck.

Before any final decision is made with below pitched applications please contact the DuPont™ Tyvek® Technical Support for clarification Tel.: 01275 337667 (Option 1)

Product Data

	DuPont™ Tyvek® Supro / Supro Plus BBA Certificate 08/4548	DuPont™ Tyvek® Metal
		
Composition	Spunbonded polyethylene and polypropylene / Tyvek® Supro Plus includes acrylic adhesive	Spunbonded polyethylene and polypropylene with polypropylene mesh
Thickness (mm)	0.45	7.4
Weight (g/m²)	145	350
Roll width (m)	1.0 1.5	1.5
Roll length (m)	50	25
Roll weight (kg)	8.5 12	11.5
Rolls per pallet / box	24	4

Performance characteristics		Test Method	DuPont™ Tyvek® Supro / Supro Plus (2507B)	DuPont™ Tyvek® Metal (2510B)
Water vapour resistance (MN.s/g)		BS 3177:1959	0.22	/
Water vapour permeability (g/m²/day)	measured by **BBA**	BS 3177:1959	935	/
Sd (m)*		EN ISO 12572	0.015	0.03
Resistance to water penetration	measured by **BBA**	MOAT 27:5.1.4.2:1983 1.0m head of water	pass	pass
Head of water sustained with no penetration (m)		BS EN 20811:1992 (1996) (speed 60cm/min)	2.0	>2.0
Resistance to penetration of air ($m^3/m^2/hr$ at 50Pa)		EN 12114	≤0,25	≤0,1
Tensile strength (N/5cm)		EN 12311-1 MD/XD	300/255	345/290
Elongation (%)		EN 12311-1	13/22	14/20
Nail tear resistance (N)		EN 12310-1 MD/XD	175/190	175/175
Fire classification		EN-11925-2	E	E
Emissivity			/	/
CE Certification CE		EN 13859-1	Yes	Yes

	DuPont™ AirGuard® Reflective BBA Certificates 90/2548 and 08/4548	DuPont™ AirGuard® Reflective E BBA Certificates 90/2548 and 08/4548	DuPont™ AirGuard® Control BBA Certificates 90/2548 and 08/4548	DuPont™ AirGuard® Smart
				
	Polyethylene, Polypropylene, Aluminum	DuPont™ Typar®, PE and aluminum composite	DuPont™ Typar® spunbond & Ethylen-Butylacrylate Copolymer	DuPont™ Typar® (PP), Film, spunbond PP
	0.43	0.43	0.3	0.4
	149	122	108	139
	1.5	1.5	1.5	1.5
	50	50	50	50
	12.0	9,5	8.5	11
	24	24	24	24
Test Method	**DuPont™ AirGuard® Reflective (5814X)**	**DuPont™ AirGuard® Reflective (5814X)**	**DuPont™ AirGuard® Control (8327AD)**	**DuPont™ AirGuard® Smart (8407A)**
	20520	20520	≥ 10.5	0.26 - 156
	/	/	≤ 20	0.05 - 30
EN 1931	2000	2400	2	13
MOAT 27:5.1.4.2:1983 1.0m head of water	pass	pass	pass	/
	/	/	/	/
ISO 5636/5 (Gurley)	>2000s	>2000s	>2000s	>2000s
EN 12311-2	440/210	180/160	200/170	360/300
EN 12311-2	25/22	25/22	38/38	30/20
EN 12310-1 MD/XD	230/250	230/250	240/240	310/330
EN-11925-2	E **	E **	E	E
	0,05	0,05	/	/
EN 13984	Yes	Yes	Yes	Yes

* tested acc.to EN ISO 12572 climat C (multilayer method).
**installed on mineralwool.

Product Data

	Tyvek® Acrylic Tape & Split Release Liner (2060B)	Tyvek® Butyl Tape (1310B)	Tyvek® Double Sided Acrylic Tape (1310D)	Tyvek® Metallised Tape (2060M)	Tyvek® UV Facade Tape (1310F)
					
Composition	Acrylic adhesive on Tyvek® carrier	100% butyl adhesive	Acrylic adhesive with polymer grid	Acrylic adhesive on metallised Tyvek® carrier	Acrylic adhesive on Tyvek® UV Façade carrier
Thickness (mm)	0.3	1.2	0.15	0.3	
Weight (g/m²)	320	1560	220	320	410
Roll width (mm)	75	50 20	50	75	75
Roll length (m)	25	30	25	25	20
Roll weight (kg)	0.7	2.5 1.0	0.3	0.7	0.7
Rolls per pallet/box	8	4/8	12	8	8

	Tyvek® FlexWrap NF (FLEXNF)	Tyvek® FlexWrap EZ (FLEXEZ)
		
Composition	Butyl adhesive on crimped Tyvek® carrier	Butyl adhesive on crimped Tyvek® carrier
Thickness (mm)	1.6	1.6
Weight (g/m²)	1200	1200
Roll width (mm)	152	60
Roll length (m)	23	10
Roll weight (kg)	4.5	4.5
Rolls per pallet/box	1	3

Applications	Tyvek® 2060B Tape	Tyvek® Metallised Tape	Tyvek® Double Sided Acrylic Tape	Tyvek® Butyl Tape	Tyvek® UV Facade Tape	Tyvek® Flexwrap NF	Tyvek® Flexwrap EZ
Roofing membranes							
DuPont™ Tyvek® Supro	✔		✔	✔		✔	✔
DuPont™ Tyvek® Metal			✔	✔			
Wall membranes							
DuPont™ Tyvek® Housewrap	✔		✔	✔		✔	✔
DuPont™ Tyvek® StructureGuard™	✔		✔	✔		✔	✔
DuPont™ Tyvek® UV Facade			✔	✔	✔		
DuPont™ Tyvek® Reflex		✔	✔	✔			
Internal AVCL's							
DuPont™ AirGuard® Control	✔		✔	✔		✔	✔
DuPont™ AirGuard® Reflective		✔	✔	✔			
DuPont™ AirGuard® Reflective E		✔	✔	✔			
DuPont™ AirGuard® Smart	✔		✔	✔		✔	✔
Materials							
Masonry/concrete/render (smooth)	✔	✔	✔	✔	✔	✔	✔
Brick/block/concrete (rough)				✔		✔	✔
Plasterboard	✔	✔	✔	✔	✔	✔	✔
Eaves Carrier			✔	✔			
Window/door frames	✔	✔	✔	✔	✔	✔	✔
Metal surface	✔	✔	✔	✔	✔	✔	✔
Timber (rough sawn)				✔		✔	✔
Timber (planed)	✔	✔	✔	✔	✔	✔	✔
Details							
Pipe penetrations (plastic)	✔	✔			✔	✔	✔
Pipe penetrations (metal)	✔	✔			✔	✔	✔
Wiring/cable penetrations	✔	✔			✔		
Chimneys				✔		✔	✔
Chimneys (making good corners)	✔	✔				✔	✔
Around electrical sockets	✔		✔	✔		✔	✔
Other							
Damage repair	✔	✔			✔		
Nail penetration*				✔			
Making good	✔	✔			✔		
Laps sealing	✔	✔	✔		✔	✔	✔

*Under batten

Note: It is important to ensure that site conditions are appropriate when applying DuPont adhesive tapes. The efficiency of the adhesive to provide a suitable tack may be affected by low temperatures (below 5oC), contamination to bonding surfaces and the presence of moisture. More product specific information can be found on our website: construction.tyvek.co.uk

DuPont™ Tyvek® product range and applications

General Notes

Ordering, supply and delivery

DuPont™ Tyvek® membranes and accessories are supplied and technically serviced in the UK & Ireland and are available through most local and national roofing and builders merchants.

Packaging and identification

Rolls of Tyvek® membranes are individually wrapped and contain a label bearing the Tyvek® grade (eg. Tyvek® Supro), the company name, address and telephone number, together with fixing instructions. A printed overlap line is indicated on the top surface of the material together with a continuous identification legend: DuPont™ Tyvek®.

Damage

Whilst Tyvek® membranes are extremely durable there may be occasions when the membrane is damaged as a result of careless Minor damage can be easily repaired with a suitable single sided tape referred to on page 44. Areas of the membrane that suffer extensive damage should be replaced, or covered with a Tyvek® patch. In this case the affected area should be covered entirely, taking care to lap the sheets correctly by a minimum 150mm.

Fire

The products have similar properties in relation to those of traditional roof tile underlay. Tyvek® membranes will melt and shrink away from heat, but will burn in the presence of an ignition source. They will not give off any harmful gases.

Insect attack

Whilst wasps may occasionally pose a threat to Tyvek® membranes and other similar materials, the threat of attack by insects, birds or vermin generally is very rare.

Compatibility

Tyvek® membranes are compatible with most materials associated with the construction process, including sand / cement and lime rendering, silicone and bitumen. Fibre contraction within the membrane can sometimes occur when in contact with water or solvent based timber treatments, temporarily resulting in a slight loss of water resistance. This may apply to wet treatments, freshly applied or soaked by rainfall, or where spray applied micro emulsion treatments are retrospectively applied. Sufficient time must be allowed for timber treatments to dry before the installation of the Tyvek® membrane.

Health and safety

In normal installation and usage Tyvek® membranes do not present a hazard under the COSHH regulations. Handling single rolls of Tyvek® does not present a risk of injury, provided recommended safe practices in lifting and handling are followed. As with paper, freshly cut edges can be sharp, but cutting the material does not produce hazardous dust. COSHH information in accordance with directive 93/112/EC is available on request. Tyvek® membranes are 100% recyclable.

Durability

Tyvek® membranes will retain their durability at temperatures down to -40°C and up to 100°C. Properly secured Tyvek® membranes may be left exposed to the elements for a period not exceeding 4 months. Weak points such as nail holes, membrane laps, penetrations and other detailing should be considered for potential water ingress during this temporary exposure period.

Technical Support

DuPont™ Tyvek® offer a high level of technical support to assist with detailed proposals or specifications that include Tyvek® membranes. Full technical back up includes:

Telephone helpline:

discuss details and solutions with one of our technical consultants.

Written confirmation:

for assistance with Building Regulations applications, warranties, acceptance of proposals and suitability of applications.

Technical literature:

Agrément certificates, technical brochures and COSHH information.

Site assistance:

On-site technical liaison with one of our Regional Managers.

Seminars:

guidance on Tyvek® applications, control of condensation, energy efficiency and legislative compliance.

Condensation Risk Analysis:

to demonstrate compliance with the Approved Documents of the Building Regulations, condensation risk assessments to BS EN ISO 13788 are available on request. (See following page).

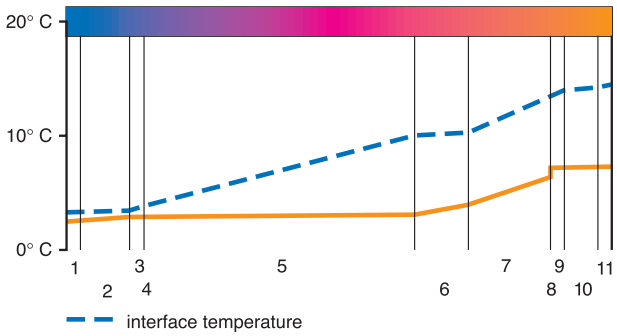
For information, please call our Technical Support Department: **01275 337667 (Option 1)**

General Notes

Condensation Risk Analysis

In order to assess the risk of interstitial condensation a free analysis can be carried out for proposed wall or floor constructions where a Tyvek® membrane is specified. The analysis uses the calculation method contained in BS EN ISO 13788, and as referred to within Annex D of BS5250:2011.

Condensation Risk Graph



To obtain the analysis please complete this form, scan and email to Tyvek Technical Support: tyvek.construction@dupont.com

Name & address: ..... **Tel:** .....

..... **Mob:** .....

..... **E-mail:** .....

Projet ref: .....

Building type

(please tick **one** only)

- ☐ Office / shop
- ☐ Domestic / residential
- ☐ Public / community building
- ☐ Church
- ☐ School
- ☐ Sports / activity
- ☐ Swimming pool
- ☐ Other .....

Pitched roof system

(please tick **one** only)

- ☐ Insulation at joist level (roof pitch .....)
- ☐ Insulation beneath rafters
- ☐ Insulation beneath & between rafters
- ☐ Insulation between rafters
- ☐ Insulation between and over rafters
- ☐ Insulation over rafters
- ☐ Insulation over rafters & between counter battens
- ☐ Other .....

Rafters / joists = ...mm x ..... mm @ .....centres

Exposure rating (please specify) ☐ sheltered ☐ normal ☐ exposed

Construction details (please list construction build-up starting with the external layers)

Outside 1.....

2.....

3.....

4.....

5.....

6.....

7.....

8.....

Inside 9.....

Typical example:

Tiles / slates
25 x 38mm battens
DuPont™ Tyvek® Supro
10mm airspace
100mm PIR Insulation
50mm PIR insulation
DuPont™ AirGuard® Reflective
12,5mm plasterboard.

British & European Standards

BS3177: 1959 (95)	Method for determining the permeability to water vapour of flexible sheet materials used for packaging
BS2782: Pt 3 1976 (96)	Methods of testing plastics: Mechanical properties. Methods 320A-320F. Tensile strength, elongation and elastic modulus
BS4016: 1997	Specification for Flexible building membranes (breather type)
BS5250:2011	Code of practice for Control of condensation in buildings
BS EN ISO 13788: 2002	Calculation methods (Interstitial condensation)
BS5534: 2014	Code of practice for Slating and tiling
BS6399: Part 2:1997	Code of practice for wind loads
BS EN 20811: 1992 (96)	Textiles - Determination of resistance to water penetration. Hydrostatic pressure tests
Moat No.27: 1983	General Directive for the Assessment of Roof Waterproofing Systems
BS EN 12114: 2000	Thermal performance of buildings - Air permeability of building components and building elements - Laboratory test method
EN 12311-1: 2000	Flexible sheets for waterproofing - Determination of tensile properties - Part 1 - Bitumen sheets for roof waterproofing
EN ISO 11925-2: 2002	Reaction to fire tests - Ignitability of building products subjected to direct impingement of flame - Single-flame source test
EN ISO 12572: 2001	Hygrothermal performance of building materials and products - Determination of water vapour transmission properties
EN 13859-1 (Feb 2005)	Flexible sheets for water proofing - Part 1: Underlays for discontinuous roofing
EN 13984 (Dec 2004)	Plastic and rubber vapour control layers
ISO 9001: 2000	Quality systems - Model for quality assurance in design, development, production, installation and servicing
ISO 14001: 1994	Implementation of an Environmental Management System (EMS)

Regulations and Technical References

- Building Regulations 2000 (as amended)
  Approved Document L (L1A, L1B, L2A, L2B)
- Building Regulations 2000 (as amended)
  Approved Document C (C2)
- Building (Scotland) Regulations 2004 The Scottish Building Standards:
  > Section 3.10.1 Precipitation - General Provisions (G3.1)
  > Section 3.15.4 Condensation - Interstitial Condensation (G4.1)
  > Section 6.2.1 Building Insulation Envelope - Elemental Method (J3.2, J8.3)
- TRADA Wood Information Sheet 1-35
- TRADA Technology, Timber Frame Construction
  (4th Edition 2007)
- CIBSE Guide A: Environmental Design (7th Edition 2006).

About DuPont



DuPont Luxembourg site

DuPont is a science company. Founded in 1802, DuPont puts science to work by solving problems and creating solutions that make people's lives better, safer and easier. Operating in more than 70 countries, the company offers a wide range of products and services to markets including agriculture, nutrition, electronics, communications, safety and protection, home and construction, transportation and apparel. Recognized as the number 1 for scientifically driven solutions, DuPont is the world's leading company in chemical technology and innovation, with more than 200 years of experience in developing and introducing very successful products (such as Corian®, Teflon®, Kevlar®, Nomex®, SentryGlas®), which have changed the lives of millions of people.

In the world of construction, DuPont developed Tyvek® 50 years ago and has more than 40 years experience in the market with Tyvek® construction membranes, which are used extensively today in the protection of roofs and walls of millions of homes all over the world. Since its first installation, more than 15 million buildings have been protected with Tyvek® membranes worldwide. This shows that Tyvek® membranes have a well-established pedigree and are fit for purpose over the entire lifetime of the building. As part of DuPont's company culture and core values of safety and protection, DuPont protects buildings and their occupants through the use of unique and highly advanced technological materials such as Tyvek®. At the same time, DuPont also protects the environment for future generations, as Tyvek® roofs and walls are extremely efficient - cutting energy consumption, heating bills and greenhouse gas emissions to the atmosphere, and thus reducing the risk of global warming.

With one of the best R&D capabilities in the world, DuPont has an outstanding track record as a strong and reliable manufacturer with a long standing commitment to sustainable growth, meeting the specific needs and requirements of all customers, such as architects, designers, specifiers, builders, roofing contractors, etc.

DuPont is the world's largest manufacturer of breather membranes for construction. The company carries out exhaustive market research and listens to the market, applying continuous technological improvement and focusing on market development.

For additional information please contact:

DuPont Protection Solutions
BBSP1
Bristol & Bath Science Park
Dirac Crescent
Emersons Green
Bristol
BS16 7FR
Telephone: 08444 068 722

Regional Business Managers Details

Scotland & Northern England: Tel: 07557 590 849
North Wales & Midlands: Tel: 07793 307 358
North London & East Anglia: Tel: 07764 837 505
South London & Southern England: Tel: 07764 837 502
South Wales & South West: Tel: 07766 133 005
Ireland: Tel: 00353 879 222 740

www.construction.tyvek.co.uk

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 testing 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 infrige any patent right.

Tyvek® construction membranes are manufactured by DuPont under an ISO 9001:2008 Quality Assurance System.

DUPONT
Tyvek.

Copyright © 2017 DuPont. All rights reserved. The DuPont Oval Logo, DuPont™, For Greater Good™, Tyvek® and all products denoted with ® or ™ are registered trademarks or trademarks of E.I. du Pont de Nemours and Company or its affiliates.

07/2017