BBA BRITISH BOARD OF AGREMENT CERTIFICATE No. 99/3648

BBA BRITISH BOARD OF AGREMENT CERTIFICATE No.99/3220

Cl/SfB (27.9) Tn6

apg5419

a comprehensive technical guide to the specification of warm and cold pitched roofs

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proctor GROUP LTD ..the knowledge to produce solutions

INVESTOR IN PEOPLE

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APG 5419 04/05

Partnerships in action

THE HISTORY

In 1987 **Don and Low Nonwovens** commenced manufacture of spun bond polypropylene materials at their plant in **Forfar, Scotland.**

During 1996, a third expansion of the plant was completed and this £20 million complex now produces some of the most technically advanced textiles and membranes in the world.

The products and services provided by Don and Low Nonwovens meet the toughest process and quality standards required by Total Quality Management and Agrément Certification in construction applications.

THE DEVELOPMENT

Roofshield is the result of a 5 year intensive Research and Development programme. The need for a waterproof, breathable underlay became increasingly apparent during the 1980's.

A carefully monitored critical path has been followed from identification of market requirements to product design, manufacture, laboratory testing and extensive field trials.

Incorporation into a variety of roof constructions including the warm roof, cold roof, timber boarding, sarking and metal cladding, give **Roofshield** an unrivalled pedigree in pitched roofing applications.

(below)
A. Proctor Group's
Head Office-
The Haugh
Blairgowrie, Perthshire

THE A. PROCTOR GROUP

The **A. Proctor Group** has, for over 40 years, been serving the Construction Industry with an extensive portfolio of technically advanced Thermal, Acoustic and Membrane Products.

A commitment to develop a complete membrane range covering Breather Membranes, Vapour Control Layers and Gas Control Membranes has resulted in a unique exclusive partnership with two of the UK's largest and most respected membrane manufacturers.

Don and Low Nonwovens have now added **Roofshield** to Frameshield and Cladshield, the UK's top brands in the Timber Frame and Industrial Cladding Market.

British Sisalkraft, based in Strood, Kent are the only UK manufacturer of reinforced polyethylene barriers to a carefully determined specification for vapour control layers and gas barrier membranes.

A nationwide technical specification team, together with **Tecline Advice Service,** ensure a professional response to the industry's requirements. A national network of distribution outlets ensures prompt and effective service.

Contents

ROLL SPECIFICATION

Thickness	0.6 mm
Weight	175 g/m^2
Roll Length	50 or 100 m
Roll Width	1.00 m (Other sizes available to order)
Colour	Green top surface White under surface

PACKAGING AND SITE HANDLING

Rolls of **Roofshield** are delivered to site, individually wrapped in a polythene sleeve. The sleeve is pre-printed with Product Name, Supplier Information and B.B.A. Number.

A **Roofshield** 'User Guide' is attached to each roll.

Rolls may be stored flat or upright on a clean, level surface and kept under cover.

roofshield

Conventionally Ventilated Cold Roofs

CONVENTIONALLY VENTILATED COLD ROOFS

Introduction
As Building Regulations have required more and more insulation in the loft space over the last 20 years, central heating and double glazing has increased air tightness, therefore the risk of condensation within cold roofs has become a bigger issue.

As the water vapour in the building passes through the plasterboard ceiling and the insulation of high permeability it reaches a cold roof space. The air's ability to hold vapour is reduced, therefore there is a risk of condensation forming on roof timbers which can cause rot, mould growth etc.

Traditionally the vapour has been trapped within the roofspace due to underlays of low permeability ie. bitumen or plastics.

Picture 1
Mould is evident on Timber Boarding due to vapour unable to escape in dormer detail

Picture 2
Mould on rafters evident due to misuse of roofspace by tenant blocking ventilation

Ventilation can spoil the aesthetics of buildings

Conventionally Ventilated Cold Roofs

As these underlays do not allow the roof to breathe, some form of allowing this vapour to escape has had to be designed in cold pitched roofs. This means of escape is encouraged by ventilation at eaves, sometimes including the ridge and tile or slate ventilators.

Blow air in and out

The ventilation provides holes in the roof to allow the vapour to escape at these areas only. The introduction of air into the loft can also allow humidity from outside the building to be brought inside the building. As well as humidity, cold can be introduced into the loft which can create freezing pipes in the loft space. The air movement in the loft can also have an affect on the effectiveness of the insulation and allow heat from the building to escape at these designated areas (see section on Thermography).

Complicated design

The design of ventilation can sometimes be complicated to ensure the adequate release of this vapour. Moisture laden air pockets can be formed in such details as dormers or any protrusions in the roof. Photograph (1) shows condensation forming on the OSB board within a roof with such a detail and here the roof has not been adequately ventilated in this protrusion within an otherwise simple plan roof.

Installation

Another common problem is the installation of tile vents without the underlay being cut, thus rendering the vents useless, and not providing the required ventilation and air movement into the loft.

Key Point to Watch:
Vapour can only escape by vents provided at eaves and ridge.

Long term design

Assuming that the ventilation has been installed correctly, without insulation blocking the vents, and that no air pockets have been formed, and all protrusions and penetrations have been adequately ventilated, and the underlay cut as necessary, the reliance of the roofs performance on the ventilation is still in doubt as it does not necessarily take account of the householders use of the roof. Photograph (2) shows a roof where the homeowner has built a train set in the roof without the knowledge of the effects on the ventilation. As can be seen, mould growth has started on the rafters, and this is due to the limited air movement in the roof caused by obstructions which were not originally designed for.

Items stored within the loft can create the same effect and prevent the intended designed air movement and ventilation through the roof of which the designer or contractor has no control over. This is also true of blocking the vents with glasswool to prevent cold air entering the loft space. There is no control on this issue and therefore ventilation cannot be relied upon as the sole measure for controlling condensation if these obstructions cannot be limited.

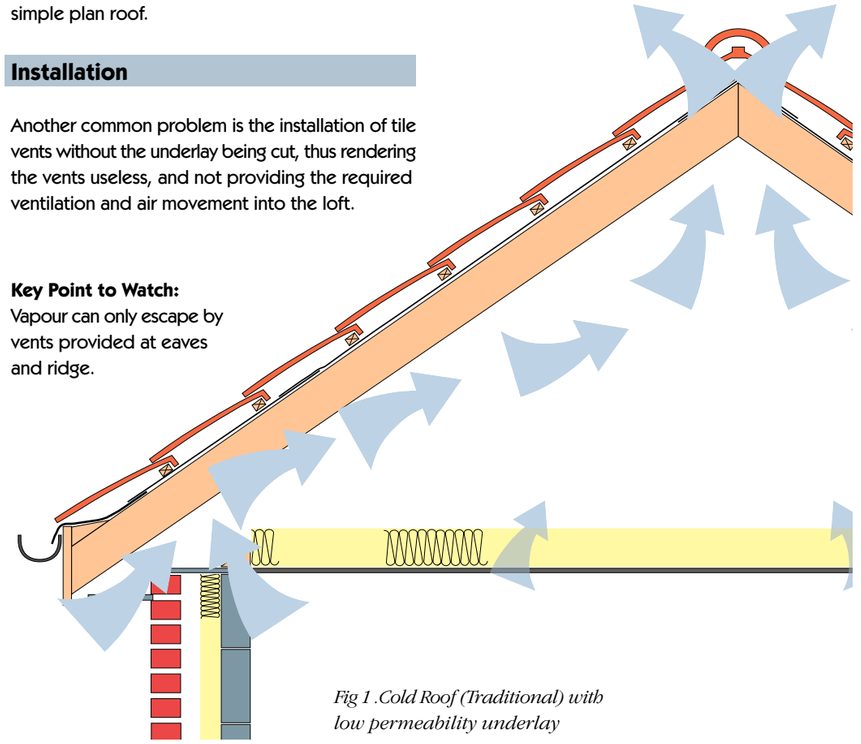


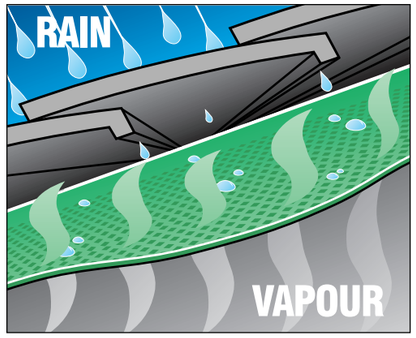
Fig 1 .Cold Roof (Traditional) with low permeability underlay

The Need for a Breather Membrane

INTRODUCTION

Roof underlays and breather membranes are an important component of modern pitched roof construction.

Their correct specification, detailing and installation helps to minimise the risk of water ingress into the completed building, giving the construction team greater confidence that new roofs will be reliable and robust.



FUNCTIONS

The underlay must perform four functions:

1. Secondary drainage layer

Wind blown rain and snow which finds its way below tiles and slates, or through side laps in metal sheets, drips onto the continuous underlay and drains safely down into the gutter and out of the building. **Roofshield performs this function.**

2. Temporary waterproofing

During construction, and in the event of future damage of slates or tiles, the underlay protects the insulation and building fabric below. **Roofshield performs this function.**

3. Condensation control

Warm moist air which rises up from within the building and into the roof construction, can pass freely through the breathing underlay.

If condensation forms on the underside of the primary covering, then the drops of water falling onto the underlay would run down into the gutter. **Roofshield performs this function.**

4. Wind

The roofing underlay should provide a barrier to minimise the wind load generated and the wind gusts acting on the slates and tiles and prevent wind driven snow or dust entering the roofspace. **Roofshield performs this function.**

PRODUCT

Roofshield is a spun bonded polypropylene fabric manufactured in the UK and used as a breathing underlay for pitched roofs. It meets the following basic criteria:
Waterproof • Wind resistant • U.V. Stabilised • Rot proof • Tear resistant •

General

Roofshield is satisfactory for use as a fully supported or unsupported underlay in tiled and slated pitched roofs, constructed in accordance to the relevant clauses of BS 5534: Part 1: 1990.

Strength

Roofshield will resist the loads associated with the installation of the roof.

Roofshield has adequate resistance to uplift forces likely to be experienced in most locations in the British Isles and for design purposes, may be considered equal or greater in strength to a Type 1F reinforced bitumen underlay as defined in BS 747: 2000. Tests on **Roofshield** fixed over rafters at 600mm centres with batten centres at 350mm have shown that the material does not extend unduly or tear around nail holes when subjected to a range of negative pressures.

Fire

Tested to DIN 4102 **Roofshield** achieves a B2 fire classification and will shrink away from the fire source.

When the product is used unsupported, there is a risk that fire can spread if the material is accidentally ignited during maintenance works, eg by a roofer's or plumber's torch. As with all types of sarking material, care should be taken during building and maintenance to avoid the material becoming ignited.

Certification

Warm roofs has a current British Board of Agrément Certificate No. 96/3220
Cold roofs has a current British Board of Agrément Certificate No. 99/3648

The Need for a Breather Membrane

NON VENTILATED COLD ROOFS

As described, traditional ventilated cold roofs have a potential, if not correctly specified, installed and maintained, to create problems of condensation within the roofspace.

The A. Proctor Group, over the past two years has carried out extensive research into the use of Daltex **Roofshield** breather membrane as the underlay in cold roofs without ventilation.

Monitoring work has been carried out by the BRE (Building Research Establishment) on a cold roof without ventilation for over a year.
The relative humidity and temperature throughout the construction, inside and outside the loft space, has been taken and moisture contents taken throughout the year to ensure that the timbers' moisture content did not increase.

Throughout this period the timber was found to be decreasing in moisture content and the roof performing well. This construction also included Timber Sarking Boards which reduced in moisture content.

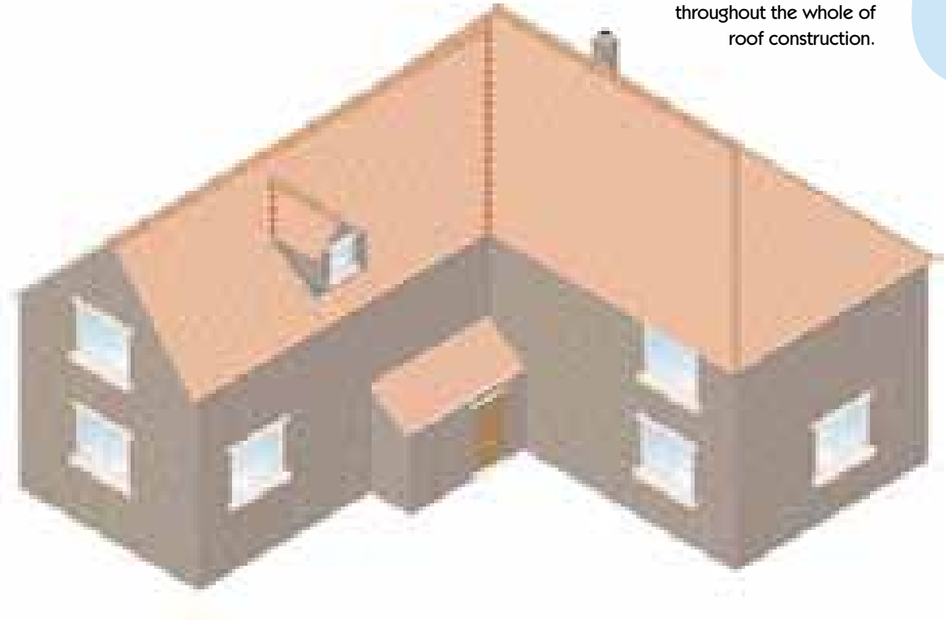
The summary of this research concluded that the moisture contents found in this roof were comparable with the moisture contents found in a conventionally ventilated roofspace.

This encouraging research prompted The A. Proctor Group to apply for a British Board of Agrément Certificate which has been granted, BBA No: 99/3648

This unventilated Cold Roof design offers a number of benefits:

- **No Additional Risk of Condensation**
- **No Requirements for Eaves, Ridge or Tile Ventilation of loft space**
- **Independent Research**
- **Full BBA Certification**
- **Increased Energy Efficiency**
- **Easy to Install (laid the same as a traditional underlay)**
- **Easier Supervision on Site**
- **Simpler Specifications**

Key Point to Watch:
Vapour can escape throughout the whole of roof construction.



Case studies

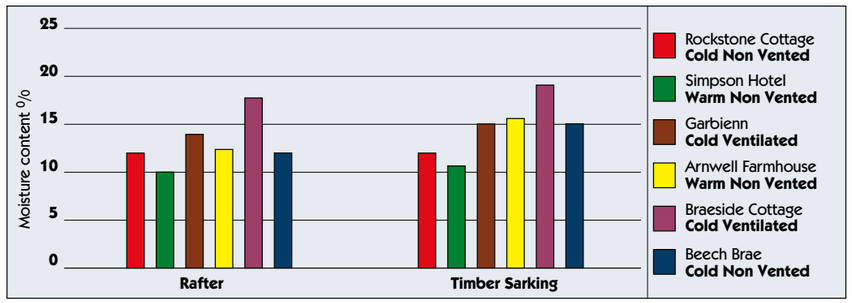
The A Proctor Group has for a number of years carried out some studies on non ventilated roof constructions. These have been carried out on timber sarked roofs as is traditional in Scotland and open roofs. The BRE have also been involved in monitoring the moisture content.

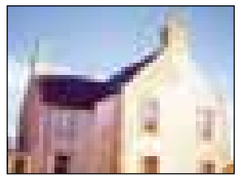
The roofs have all proved successful and the projects that have been monitored for over a year have similar moisture content profiles.

Figure 1 (Stormont Lodge) shows moisture contents on a sarked roof measured by the BRE. Moisture contents in the timbers were found to be at a level as" expected in conventionally ventilated roofs"

Figure 2 Shows the moisture contents as measured in a variety of house types of various roof shapes. At the time of measuring the highest moisture contents were found to be in the only projects ventilated. One was ventilated and had a bitumen underlay. The other used **Roofshield** and vents. The moisture content in this project increased as measurements were taken nearer the vents. This showed that vents can also allow moisture laden air to enter a roof as well as escape.

AVERAGE MOISTURE CONTENT IN RAFTERS AND TIMBER SARKING



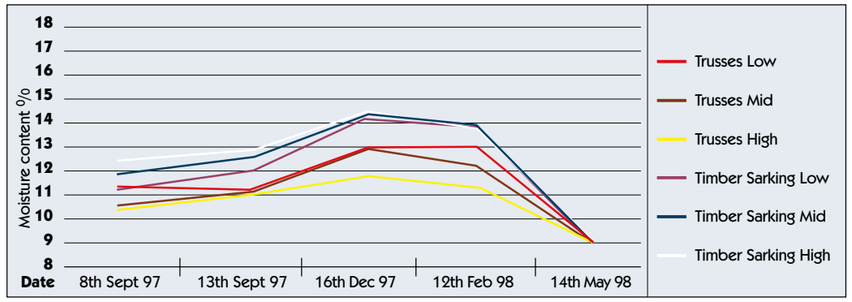


Arnwell Farmhouse

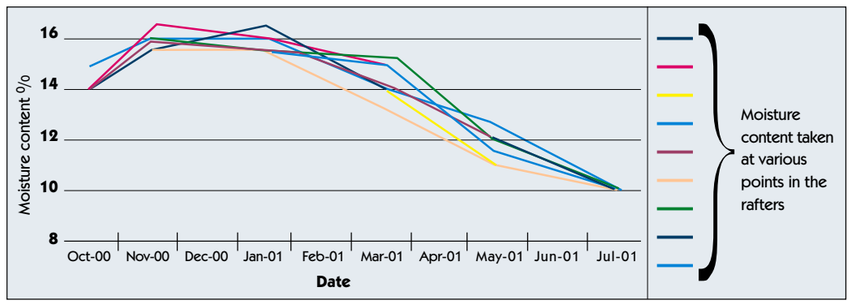
Rockstone Cottage

Beech Brae

STORMONT LODGE - SW ELEVATION



COLD ROOF NON VENTED ROOF (NO SARKING)



Thermography

With the Governments commitment to meet Kyoto agreements there are more pressures to be more energy efficient . Heat losses in the domestic building markets are a significant area which needs to be addressed.

The roof is an element of the building which can contribute to major heat losses. In conventionally ventilated roof constructions energy loss by ventilation can account for up to 25% of the total heat loss through the roof*. The non ventilated roof can substantially reduce the mechanism of heat loss.

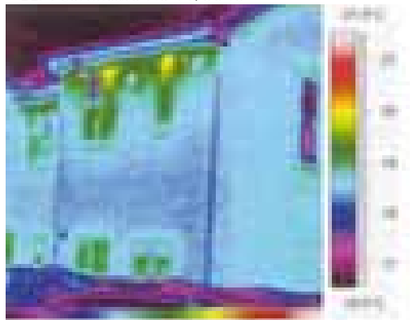
To prove the above the A Proctor Group conducted studies to assess heat loss in a non-ventilated pitched roof utilising **Roofshield** breather membrane as the underlay. There were no special attempts to make the building air tight other than to have no roof ventilation, the underlay was installed as per a traditional underlay.

Thermograph 1 Shows the minor levels of air leakage apparent at the eaves.

Thermograph 2 Shows limited amounts of air leakage. The increases in heat loss shown are areas where insulation was not placed correctly, air leakage is also evident at the window trickle vents.

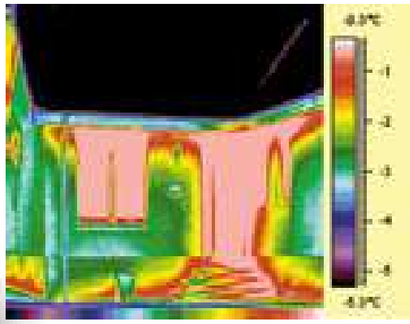
The report summarised that there were very low levels of heat loss from eaves and verge. "The heat loss that is normally apparent in the infrared at eaves details where the roof is ventilated employing eaves and ridge ventilation is markedly higher than is the case at this property". Furthermore "from the prespective of ventilated heat losses from the roof void the **Roofshield** membrane is an effective means by which to reduce these".
Thermograph 3 shows a traditionaly ventilated roof. Heat losses are apparent at eaves where ventilation has been introduced.

* BBA Certificate No 99/3648



1. Non Ventilated Cold Roof

2. Non Ventilated Cold Roof



3. Ventilated Cold Roof

Non Ventilated Cold Roof

Ventilated Cold Roof

Installation

DELIVERY AND SITE HANDLING

Rolls of **Roofshield** are delivered to site, individually wrapped in a polythene sleeve. The sleeve is pre-printed with Product Name, Supplier Information and BBA Number.

A **Roofshield** 'User Guide' is attached to each roll.

Rolls may be stored flat or upright on a clean, level surface and kept under cover.

TILE AND SLATE ROOFS

For tile and slate roof applications, **Roofshield** should be laid horizontally across the rafters starting at the eaves and secured in place with battens or counter-battens.
The green side should be uppermost

The minimum horizontal laps are given in the table, taken from BS5534: 2003.

MINIMUM HORIZONTAL LAP

Rafter Pitch	Partially Supported	Fully Supported
12½°- 14°	225mm	150mm
15° - 34°	150mm	100mm
35°	100mm	75mm

When in a partially supported situation and a horizontal lap occurs between battens, it is good practice to introduce an extra batten 25mm above the bottom edge to restrain the lap from opening under wind uplift.

Vertical laps should be at least 100mm wide and above a rafter position. The edge distance to the fixings should be at least 50mm.

Most slate and tile assemblies are air open enough so that ventilation between the underlay and outer covering is not required. It is advised to ventilate the batten cavity when using fibre cement slates, metal tiles or sheets covering.

DETAILS

Attention to detail is important. Avoid blockages where possible that would otherwise prevent the free drainage of water. At the eaves, an eaves carrier is recommended - alternatively **Roofshield** can be dressed into the gutter.

COLD ROOF INSTALLATION TECHNIQUES

Install **Roofshield** green side uppermost in the traditional manner, parallel to the eaves.

Insulation should be laid horizontally at ceiling level pressed tightly into the eaves against the underlay to ensure no gaps are present. BS 5534: 2003 should be followed for the general installation of the underlay under Tiling and Slating.

Advice related to specific constructions, including U-Value calculations and condensation risk analysis' is available from The Tecline, tel: **01250 872261** or **technical@proctorgroup.com**

The dwelling below the roofspace should be ventilated in accordance with Building Regulations, extractor fans installed in rooms of high humidity e.g. kitchens and bathrooms, cold water tanks in the loft space should be covered and all pipework and ducts lagged.

The air tightness of the slate or tile should be considered when assessing the requirement for ventilation above the underlay.

Penetrations into the loft space from inside and outside must be sealed, loft hatches must ensure a draught free fit.

When using OSB/Plywood, in a cold roof insulation horizontal - ventilation should be provided to the loft space.

Installation

BUILDING REGULATIONS

The **Roofshield** underlay has British Board of Agrément certificates (96/3220 and 99/3648) for use in both warm and cold roofs without the requirement of ventilation below the underlay if installed in accordance with the provisions given in these Certifications.
(These Certifications are available on request)

The BBA Certificates are issued with the agreement of the Secretary of State for England and Wales and the Regulations Authorities in Edinburgh and Belfast.

The Agrément Certificates themselves show how the products comply or can contribute to comply with building regulations. They perform an important function to prove an innovative product's fitness for use in given circumstances.

It may otherwise not be included in a deemed to satisfy provision from the regulatory authorities.

The **Roofshield**'s Agrément Certificate for it's use in non-ventilated cold pitched roofs clearly shows on the front page how the material, if installed in accordance with the certificate, enables the roof to meet the requirements relating to controlling condensation in the roofspace and interstitial condensation.

This Certificate confirms that the product is fit for purpose. Therefore the British Board of Agrément Certificate allows the specifier or contractor to show how the product enables Building regulations to be complied with and this will be accepted by Building control personnel nationwide, if the product is installed as per the Agrément Certificate.

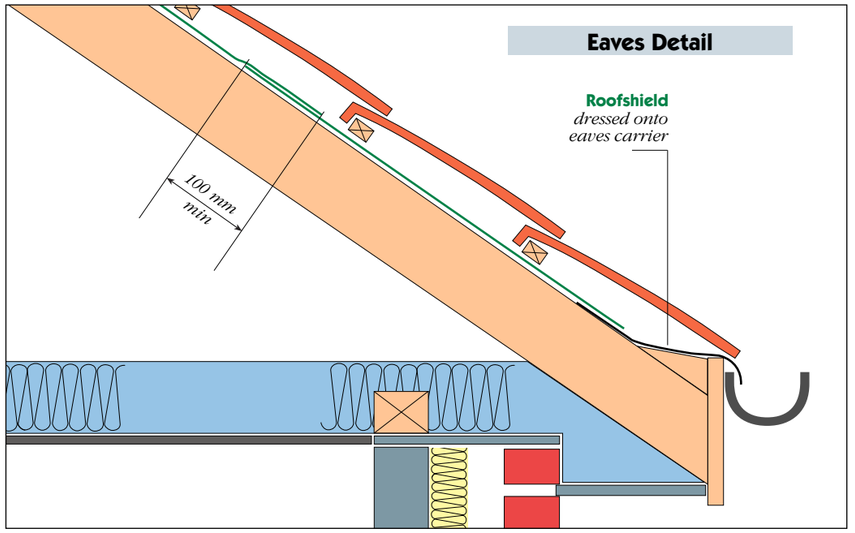


Figure 2

Key Point to Watch:
Insulation should be pressed tight into eaves to ensure no gaps.

Not all Breather Membranes are the same

There are a number of breather membranes on the market and the designer must consider a number of issues when deciding which breather membrane should be used. **Roofshield** is the result of many years' research in providing the latest technology in non woven fabrics.

Roofshield is a three layer laminate designed to combine water hold out properties with high breathability. The central layer is a fine-fibred meltblown material which differs from other breather membranes on the market - see page 13. This unique central layer provides a fibrous structure which allows for a much higher breathability than other laminates which may include films. These small fibres give increased water hold out over spunbond single layer products and afford a number of advantages which are listed below.

Issues that a specifier ought to consider include:

1. Resistance to water vapour - 'the lower the better'

To reduce condensation problems, the underlay needs to breathe. The measure by which an underlay can be judged is by its resistance to water vapour - this being the lower the better.

The present legislation requires that a breather membrane must have a vapour resistance of less than 0.25 MNs/g and is classified as a low resistance underlay. Roofshield has a vapour resistance of 0.09 MNs/g and can therefore be classified as a type LR underlay.

The latest industry research concluded that the underlay's resistance to water vapour is important when assessing the risk of condensation. The lower the vapour resistance of a breather membrane the further it inhibits the formation of condensation.

In the table below it can be seen that **Roofshield** has the lowest resistance to water vapour when compared to other products and complies with BS 4016, BS 5534 and BS 5250 as an LR underlay.

WATER VAPOUR RESISTANCE

Statutory Requirements	MNs/g	BS 4016 < 0.60 MNs/g	BS 5534 < 0.25 MNs/g	BS 5250 < 0.25 MNs/g
Type 1F felt	50	x	x	x
Microperforated polyethylene	10	x	x	x
OSB 9mm sarking	0.94	x	x	x
Non woven HDPE	0.21	Yes	Yes	Yes
Film Laminate	0.20	Yes	Yes	Yes
Roofshield	0.09	Yes	Yes	Yes

2. Air Permeability

Roofshield, in addition to having a low vapour resistance is also air permeable. Industry research concluded that air permeability combined with low vapour resistance, further inhibits the formation of condensation in a pitched roof.

The combined benefits of low vapour resistance and air permeability, unique to Roofshield, can be downloaded from the A. Proctor Group website. The combined benefits of low vapour resistance and air permeability, unique to Roofshield, can be down loaded from the A. Proctor Group website at www.proctorgroup.com under the heading "Partners in Innovation report".

3. Waterproof when fully supported - 'some breather membranes can leak'

Early camping experiences have proven that if you touch the inside face of a canvas tent on a rainy day, the surface tension is broken and rainwater comes in. The same is also true for some types of breather membranes which need to be pulled taught over the rafters, otherwise water may penetrate through where the membrane touches the supports.

Roofshield can be laid in direct contact with rafters, timber sarking boards or insulation with no loss of its waterproofing properties.

4. 'Ventilation to the underside of underlay not required in warm or cold roof applications'

The BBA Certificate confirms that the membrane may be used without a ventilated airspace below the underlay in cold or warm roofs.

See BBA certificate for installation/applications advice.

Roofshield has undergone a number of tests to prove that ventilation is not required to the underside of the underlay in both warm and cold roof applications. Ventilation to loft space is advised when utilizing plywood or OSB sarking in cold roofs. The British Board of Agrement have carried out a number of tests on a variety of roof constructions proving that the product can be used in conventional plan roofs of any size.

Features assessed include duo-pitched, mono-pitched, hipped, mansard, gable-end, valleys, room in the roof, dormers and timber sarking. Roofs incorporating any other feature can be proved, and the A. Proctor Group's advice should be sought before proceeding.

As well as the BBA work, a number of case studies have been carried out on projects over a number of years. Results are displayed on Page 8.

Not all Breather Membranes are the same

5. Drumming noise under wind action- 'use a flexible sheet'

Wind blowing up into the eaves of a roof can cause a 'chatter' type noise with some types of underlay. **Roofshield** is silent in such situations.

As **Roofshield** is silent and does not suffer from the "chatter" effect, the membrane does not have to be pulled taut or have any special fixing instructions compared to that of traditional underlays.

Counterbattens can be provided to increase the air movement when using with close-fitting slates or tiles, or to increase the drainage below the tile battens.

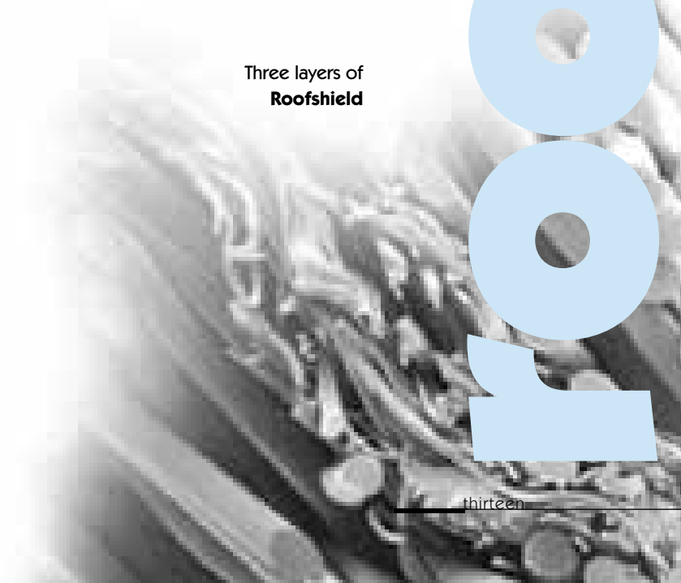
6. Timber Treatment

All 3 layers of the **Roofshield** underlay have additives to increase the water hold out of the membrane. Timber treatments containing fungicides, insecticides and wood preservatives are extensively used in the building trade to protect rafters, sarking boards and tile battens. As such, a number of tests have been carried out to see if these timber treatments will affect the water hold out properties of **Roofshield**.

Four timber treatments were investigated, these being two water based micro-emulsions, a solvent based and a CCA. Treatments were applied to the fabric and allowed to dry, then the water resistance of the material was tested. The **Roofshield** membrane was not affected by these timber treatments, in terms of water resistance.

Unique three layers of **Roofshield**

Water resistance testing



Three layers of **Roofshield**

Typical Roof Constructions

Uninsulated Tile
(Cold Roof)

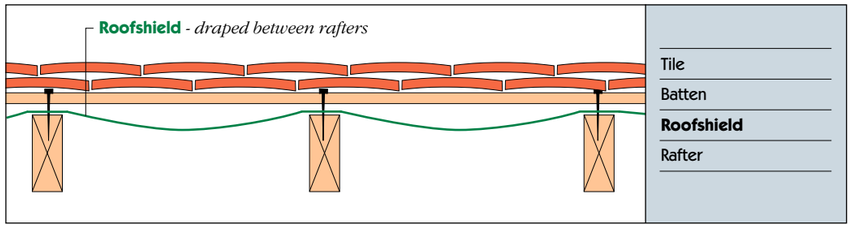


Figure 3

Uninsulated Slate
(Cold Roof - Scottish Detail)

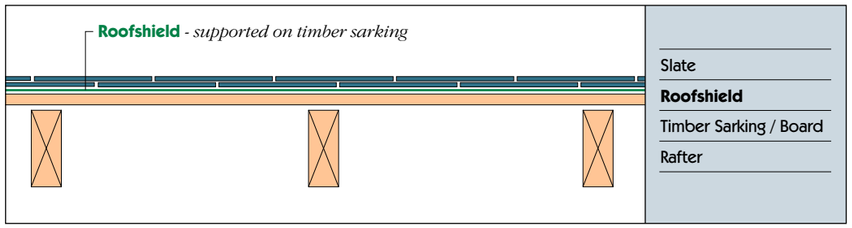


Figure 4

Insulated Tile
(Warm Roof)

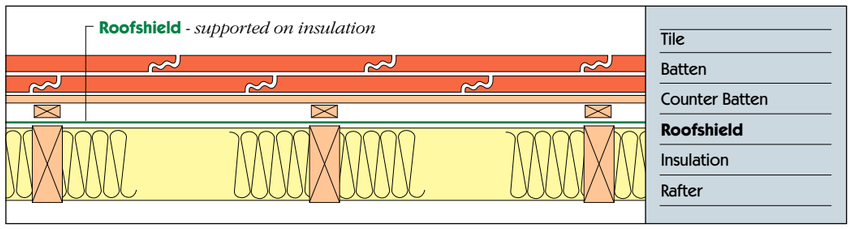


Figure 5

Insulated Slate
(Warm Roof - Scottish Detail)

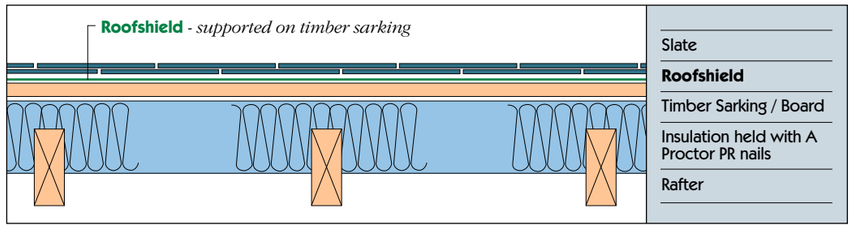


Figure 6

Built-Up Metal

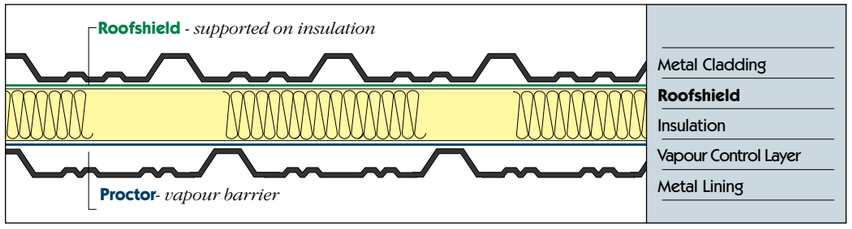


Figure 7

Warm Roof

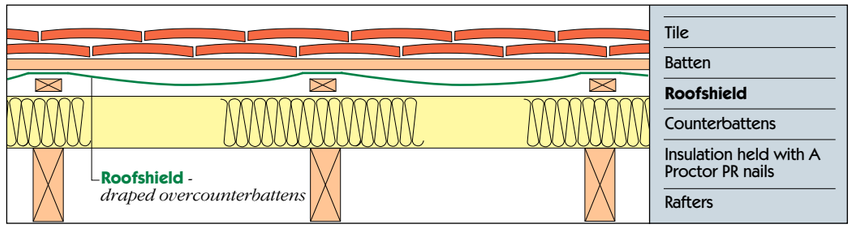


Figure 8

Roofshield Details

RIDGES

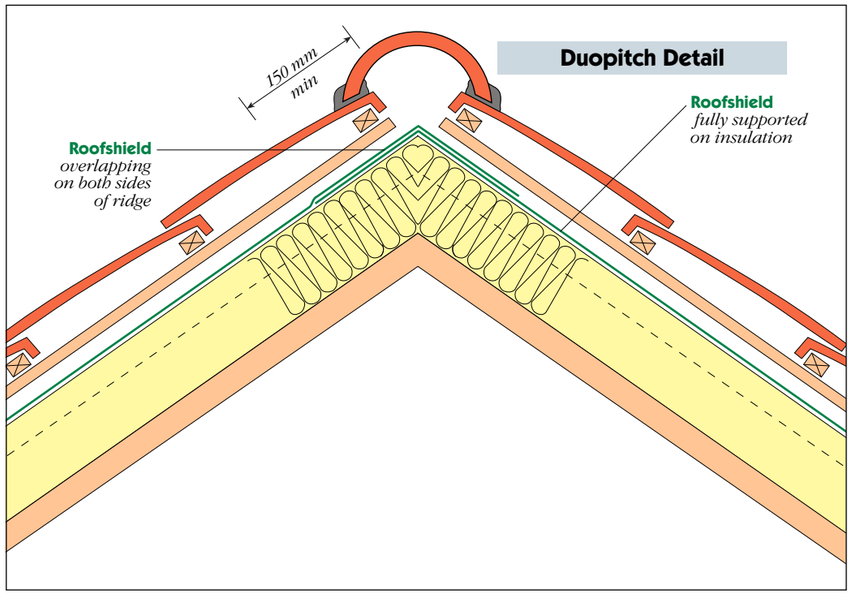


Figure 9 (Duopitch detail - warm roof)

Key Point to Watch
Roofshield overlaps both sides of ridge

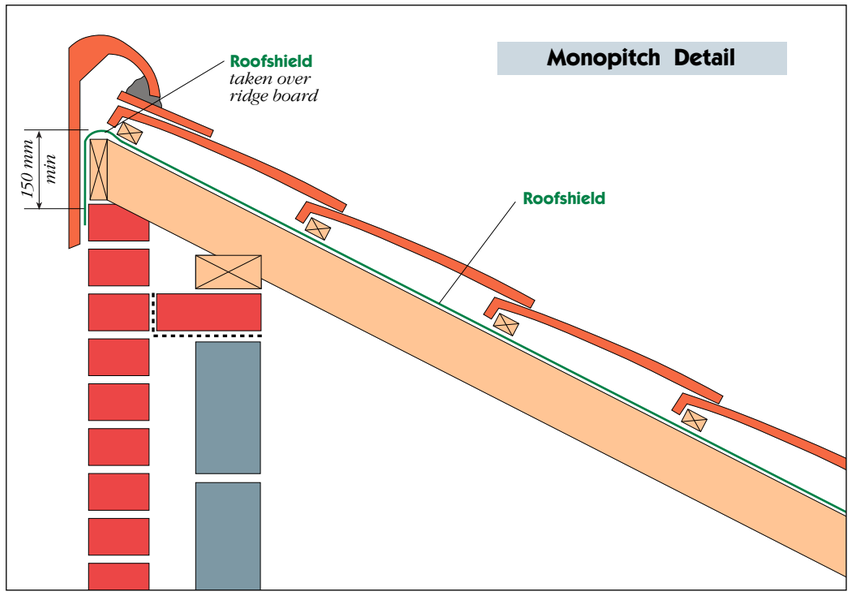


Figure 10 (Monopitch detail - cold roof)

Key Point to Watch
Roofshield is taken over ridge board

Roofshield Details

VERGE AND SLOPING VALLEY

Key Point to Watch:
Ensure **Roofshield** is turned up along verges.

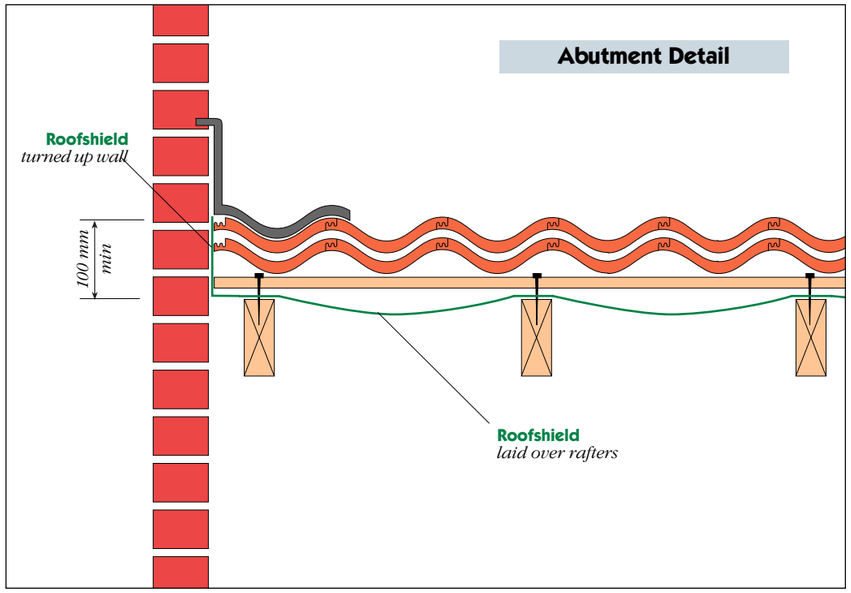


Figure 11 (Abutment detail - cold roof)

Key Point to Watch:
Additional piece of **Roofshield** laid up sloping valley.

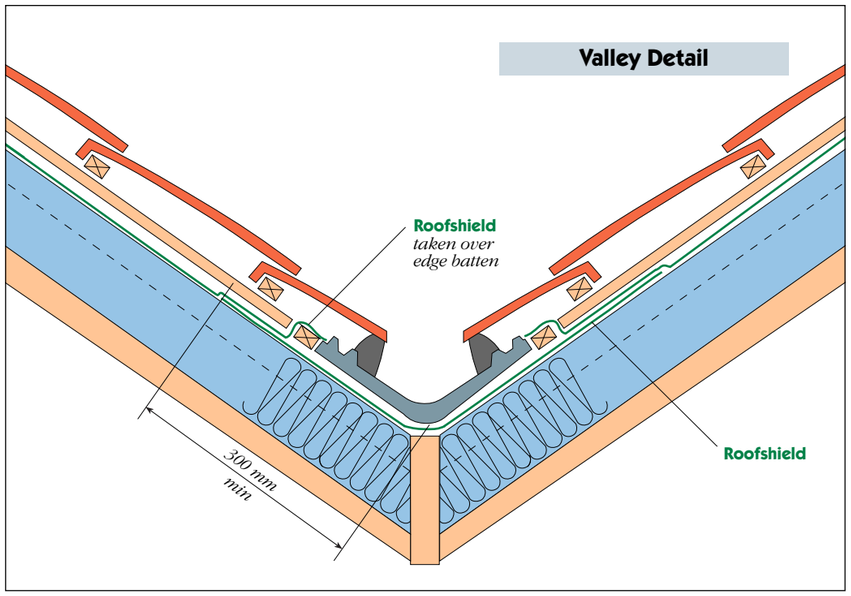


Figure 12 (Valley detail - warm roof)

Roofshield Details

PIPE PENETRATION AND EAVES

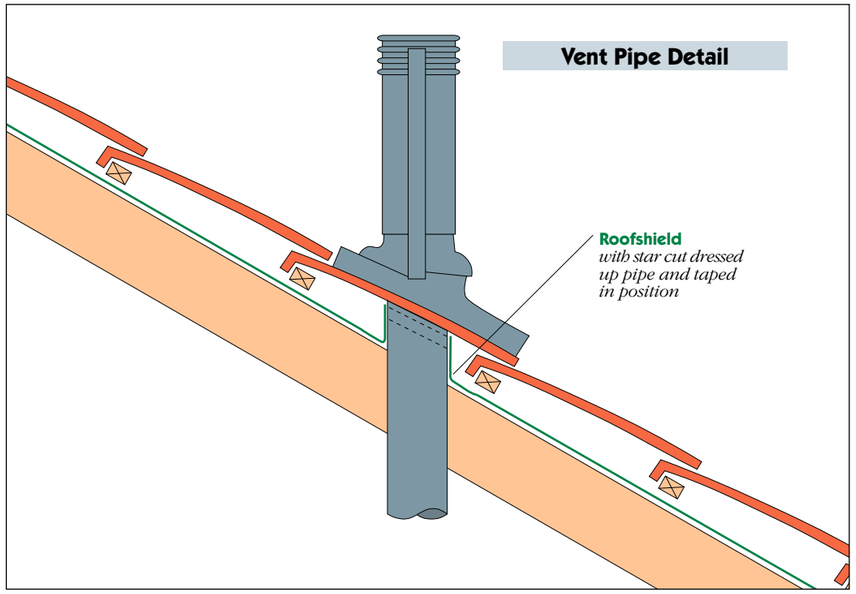


Figure 13 (Vent pipe detail - cold roof)

Key Point to Watch:
Roofshield dressed up side of penetration to keep water away from opening.

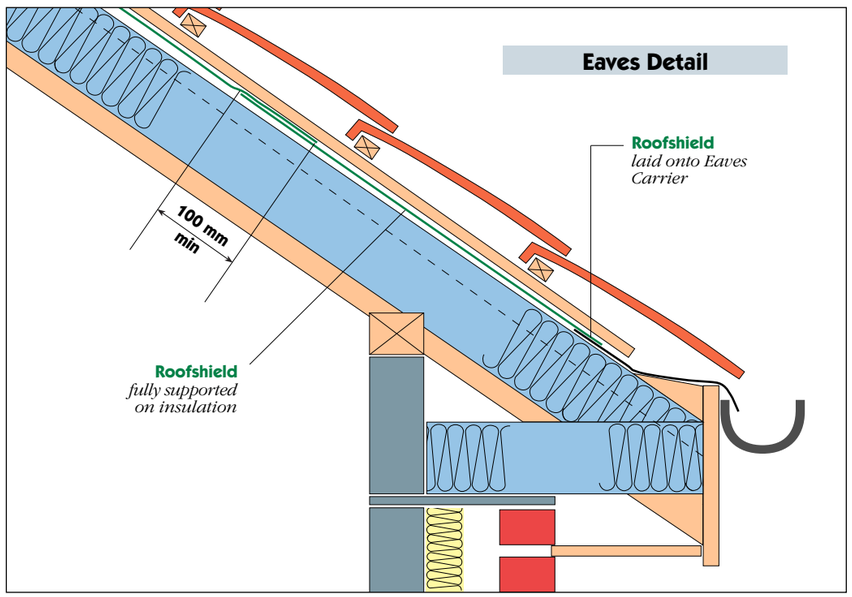


Figure 14 (Eaves detail - warm roof)

Key Point to Watch:
Roofshield laid onto Eaves Carrier to discharge water into gutter.

Details

ROOM IN THE ROOF

The use of the roof as a living space has increased over recent years as people utilise this extra space for home working, play areas or extra bedrooms.

Often more economical and simpler than extensions, it is seen as the way to increase floor space easily.

By utilising the **Roofshield** as the underlay at initial construction stage the conversion of the attic space becomes less complicated without the requirement for unsightly or sometimes complicated ventilation techniques, or encroaching on the roofspace due to insulation and ventilation depth requirements.

In New Build, no requirement for ventilation of the loft space also helps make the specification and installation of this construction easier.

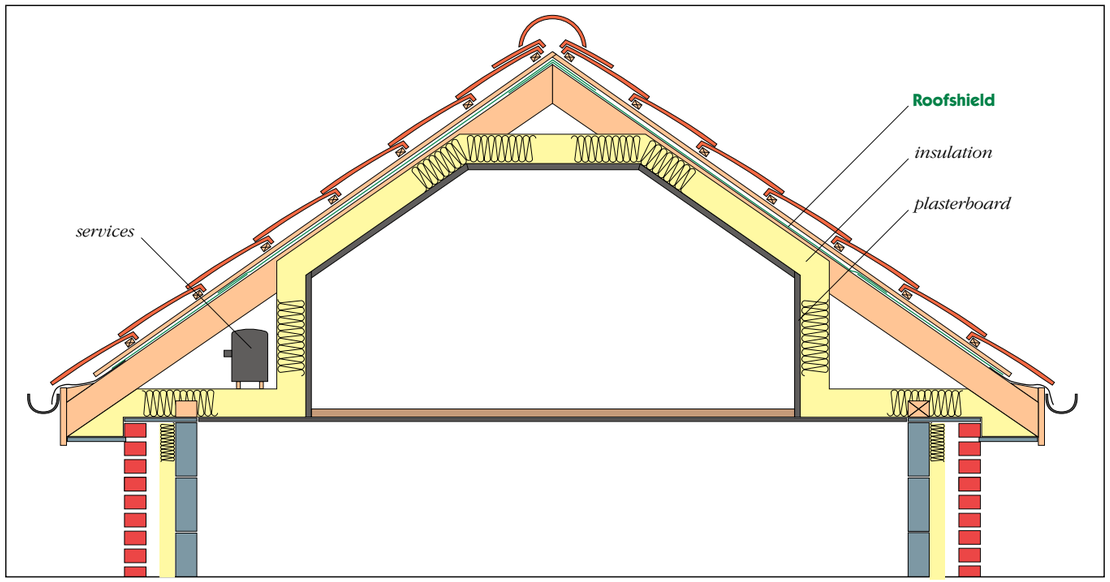


Figure 15

LOFT HATCHES AND SERVICES

To reduce the amount of vapour entering the loft space it is advised to seal round loft hatches and service openings as annotated in *Figure 16.*

Recessed lighting is not recommended unless a seal round these areas can be provided. Refer to manufacturers.

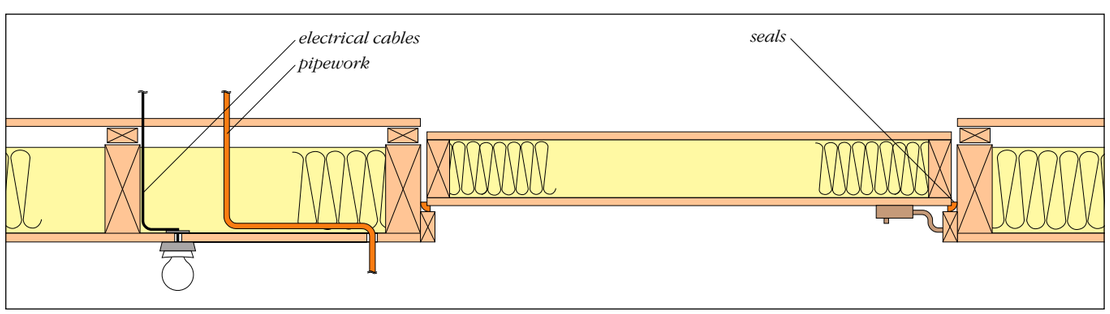


Figure 16

Condensation Risk Analysis

TECLINE

The A. Proctor Group has a dedicated Technical Department which can deal with installation details, view drawings for approval and give specialist advice on the correct use of the A. Proctor Group products. The service also includes U-Value calculations and Condensation Risk Analysis'.

This computer analysis allows the specifier or contractor to view where, if any, condensation risks would be and whether this will cause potential problems in a given roof construction on any particular project.

DETERMINING THE U-VALUE

(No account taken of thermal bridges)

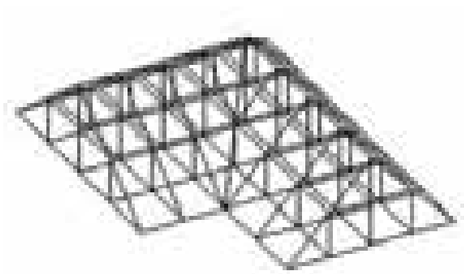
Construction Type (Typical Example)

Element:	Pitched roof with horizontal ceiling
Roof pitch:	30.00° Cold pitched roof
Exposure:	Normal
Internal surface emissivity:	High
External surface emissivity:	High
Building use:	House or Flat

	Thickness (mm)	Thermal Conductivity (W/mk)	Thermal Resistance (m^2K/W)
1. Outside surface resistance	-	-	0.040
2. Concrete Tiles	8.00	1.100	0.007
2. Airspace	25.00	-	0.120
4. **Roofshield**	0.60	0.130	0.005
5. Loft space	-	-	0.180
6. Mineral Wool	200.00	0.039	5.128
7. Gypsum Plasterboard	12.50	0.160	0.078
8. Inside surface resistance	-	-	0.100

U-value
U-value: 0.18 W/m^2k

To prove the system Condensation Risk Analysis has been carried out using specially developed software to assess 3D roof sections of various shapes and sizes.

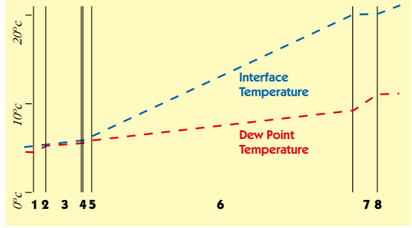


Condensation Risk Analysis

DETERMINING THE DEW POINT

Internal RH 55.0% External RH 95.0%

Winter Temperature Profile Graph

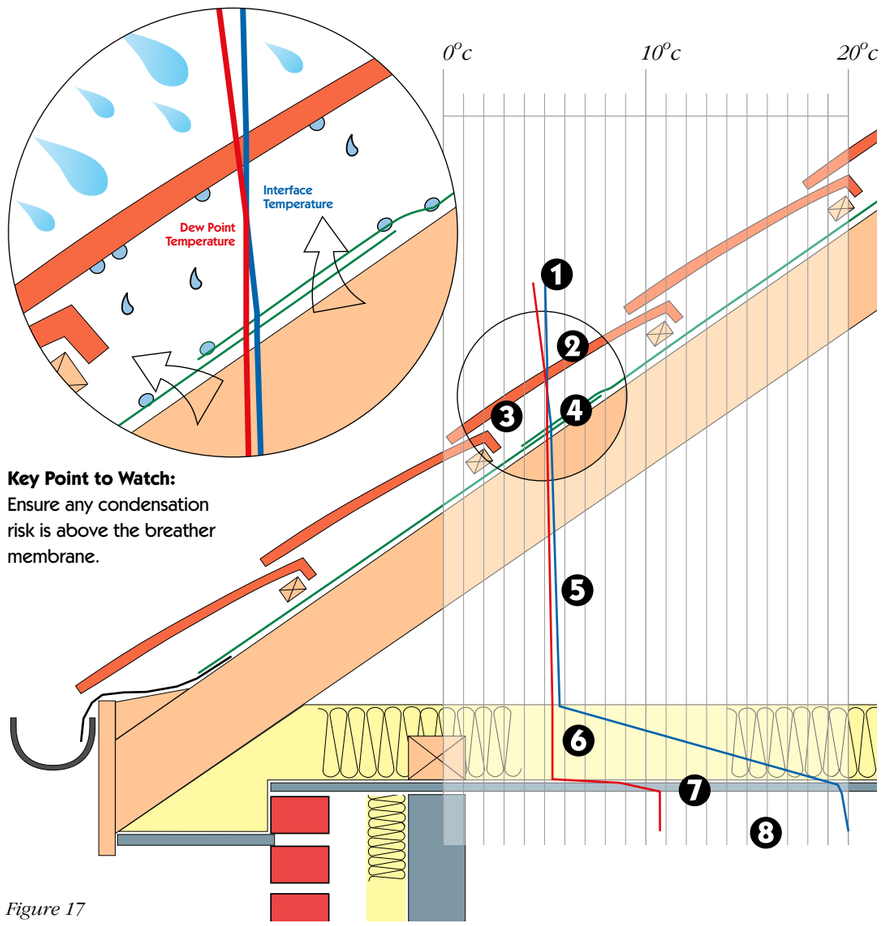


Above: Typical Profile Graph available from the A. Proctor - Technical Department

Construction

1. Outside surface resistance
2. Concrete Tiles
3. Airspace
4. Roofshield
5. Loft space
6. Mineral Wool
7. Gypsum Plasterboard
8. Inside surface resistance

HOW THE PROFILE GRAPH WORKS



Key Point to Watch:
Ensure any condensation risk is above the breather membrane.

Figure 17

Membrane Information Sheet

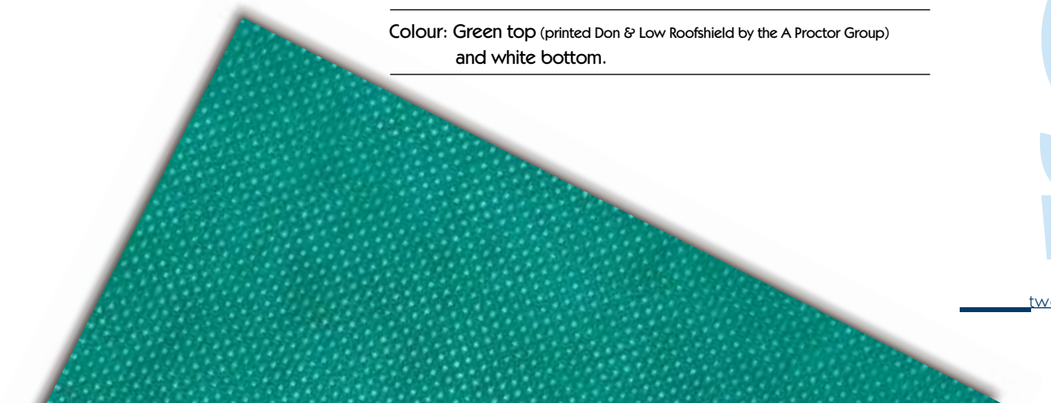
Roofshield

A triple layer spun bonded polypropylene breather membrane designed for use as an underlay on pitched roofs and for buildings with high internal temperatures and humidities. **Roofshield** provides temporary weather protection during the construction phase with full rainwater hold out.
BBA Certificate No. 96/3220 (warm roof) **BBA Certificate 99/3648** (cold roof)

Physical Properties	Test Method	Result
Nominal Weight		175 g/m²
Nominal Thickness		0.6 mm
Tensile Strength: 56 days aged @ 60°C	BS 2782:320A	
along the roll		6.37 kN/m
across the roll		4.60 kN/m
Nail Tear Resistance	MOAT No: 27 : 5.4.1	
along the roll		156 N
across the roll		131 N
Burst Strength, wet/dry	BS 3137	488 kN/m²
Water Vapour Resistance	BS 3177	0.09 MNs/g
Moisture Vapour Permeability	BS 3177	2409 g/m²/day
Resistance to Water Penetration (Eosin Test)	BS 4016	Pass
Air Permeability	EDANA 140.2-99	70 l/m²/s
Fire Resistance to Spread of Flame	DIN 4102	B2
Head of Water	BSEN20811	1135mm

Roll Specification:

Roll Length:	50m
Roll Width: *(Other sizes available on request)*	1m
Weight: *(1m x 50m roll)*	8.75kg
Colour: Green top (printed Don & Low Roofshield by the A Proctor Group) and white bottom.	



Roofshield Specification

The following information is provided to assist the Specifier preparing contract documents in accordance with the National Building Specification.

SPECIFICATION

H60 PLAIN ROOF TILING
H61 FIBRE CEMENT SLATING
H62 NATURAL SLATING

Underlay: **Roofshield**

Lay as clause 240, directly over **rafters**

Minimum horizontal lap: **150**mm

240 Underlay:
Handle carefully to prevent tears and punctures and repair with adhesive tape any which do occur.

Lay parallel to eaves, maintaining consistent tautness.

Vertical laps not less than 100mm wide, coinciding with supports. Horizontal laps of the dimensions specified. Fix with corrosion resistant staples or galvanised clout nails.

Where pipes and other components penetrate the underlay, cut neatly and accurately and turn flanges up to give a tight, watershedding fit.

H30 FIBRE CEMENT PROFILED SHEET CLADDING/COVERING
H31 METAL PROFILED/FLAT SHEET CLADDING/COVERING

Breather Membrane: As clause 350

350 Breather Membrane:

Material: **Roofshield**

Manufacturer and reference:
A. Proctor Group

Lay over insulation as the work proceeds ensuring continuity.

Lap sides and ends of sheets not less than 150mm to shed water away from insulation.

Ensure that bottom edges overlap flashings, gutters, sills, etc. to allow free drainage to the exterior.

GUIDANCE NOTES

Underlay:
Insert **Roofshield**, which is permeable to minimise the rise of condensation, and is of adequate strength. **Roofshield** is covered by Agrément Certificate No 96/3220 and 99/3648

Horizontal lap width taken from table on page 10

240
See BRE Defect Action Sheets 9 and 10
Note: If tear occurs, batten above should be lifted, cut new section of underlay, remove torn section by cutting close to sides of rafters, slide up new section of underlay, staple sides to rafters and finally nail down batten above.

350
There have been many failures of insulated industrial roofs due to condensation dripping from the underside of the roofing sheets, saturating the insulation, corroding fastenings and damaging linings, ceilings and the contents of the building.
To reduce the risk of dripping condensate within the ventilated cavity, a breather membrane should be provided to protect the insulation and allow any water to drain freely to the gutter at the edge of the roof.

Please note:
The advice given in the Technical Manual is based upon good practice and information currently available. It is offered as a general guide to the construction team and detailed technical enquiries should be addressed to the Tecline, telephone 01250 872261.

Recent Projects

RECENT PROJECTS UTILISING ROOFSHIELD

Skillbase
Livingstone, Bellfield (1999)
Area - 3000 m^2

West Register House
Princes' Street, Edinburgh (1999)
Area - 600 m^2

East Port Works
Dundee (1999)
Area - 2200 m^2

Virgin Multiplex Cinema
Area - 5000 m^2

Stormont Lodge
Blairgowrie
Area - 500 m^2

Trent Bridge Cricket Ground
Nottingham
Area - 2500 m^2

Boughton House
Duke of Buccleugh Estates
Area - 2000 m^2

London Zoo Glass House
Area - 1600 m^2

Flats
Salford, Manchester
Area - 2000 m^2