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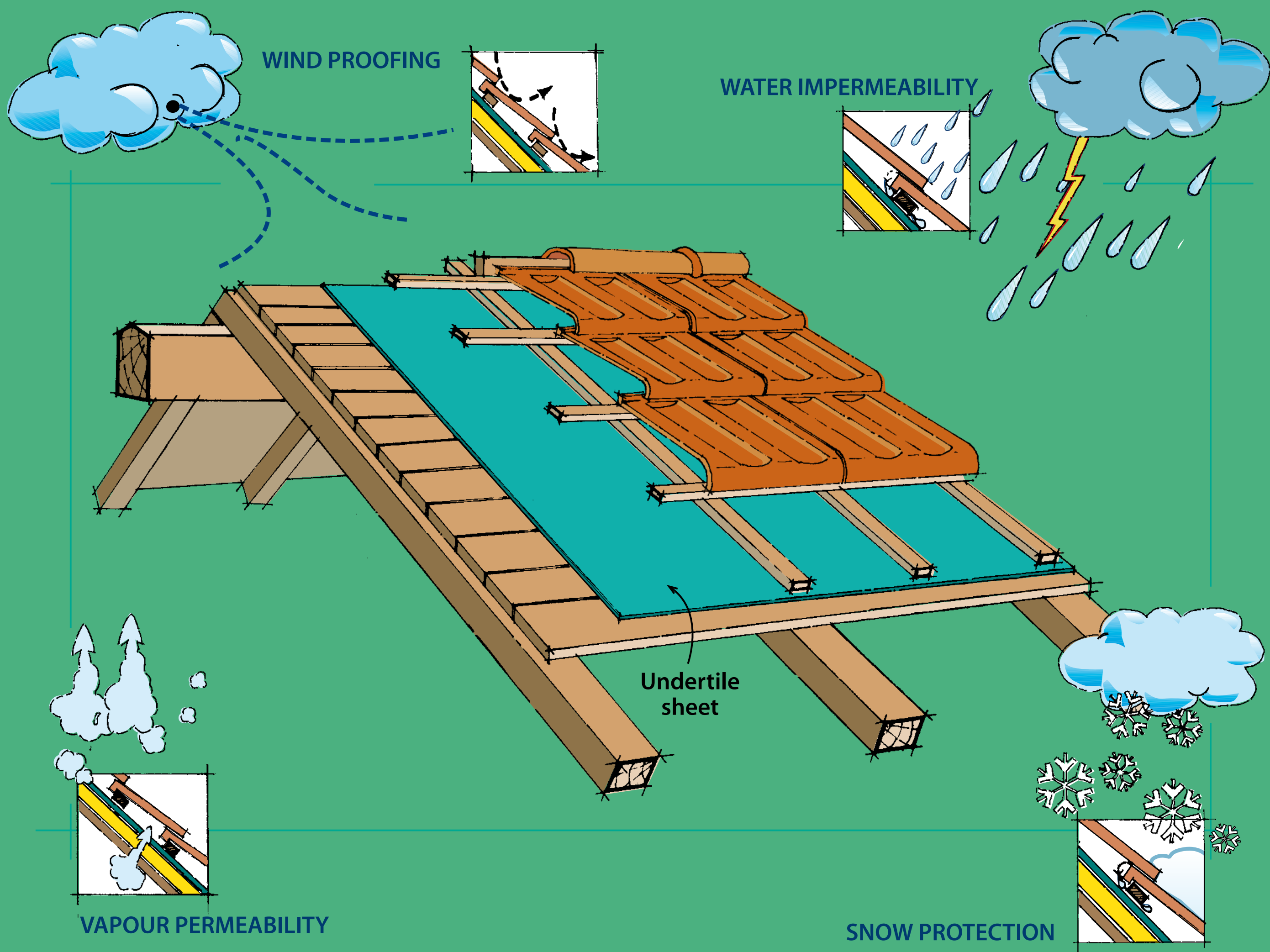
Construction Systems and Products

Guide to undertile protection with breather sheets

The correct choice and the correct installation of undertile breather sheets
(for roofs situated in plain areas and up to a maximum height of 900 m above sea level).



index
Associate of GBC Italia

2012

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This Guide illustrates the solutions to protect roofs with undertile breather sheets.
For further information and further solutions as waterproofing with self-adhesive sheets, see the “GUIDE TO THE UNDERTILE WATERPROOFING OF TIMBER ROOFS” (GUIDA ALL’IMPERMEABILIZZAZIONE SOTTOTEGOLA DELLE COPERTURE IN LEGNO) published by INDEX.

The guides are also available on the company website:
www.indexspa.it

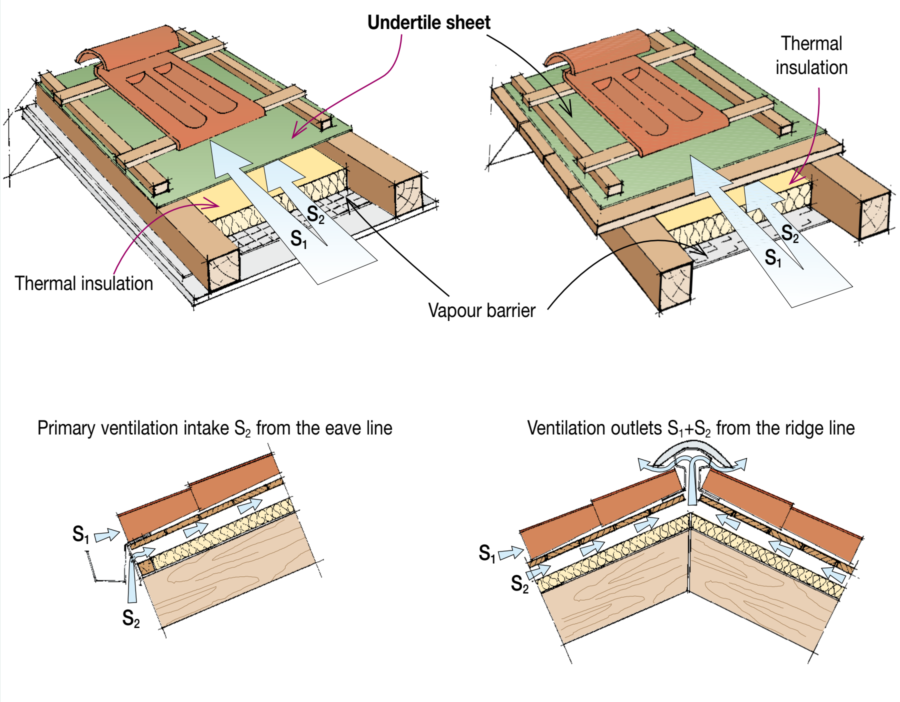
Undertile sheets for timber roofs

Timber roofs are becoming increasingly common, even in geographical areas where roofs are habitually built with solid or hollow-core concrete, structures that are in themselves impermeable to air whose overlying layer of tiles is sufficiently protected against the action of the wind.
In the case of timber roofs, particularly those without continuous board, which are not airtight, the tiles are more exposed to the pressure of the wind, which gets into the roof-space from one side and, in combination with the suction the wind exerts on the opposite side, lifts the covering of tiles on this latter side.
This means that an airproof barrier must be installed between the tiles and the roof-space to oppose the force of the wind, and this is the primary function of an undertile sheet.
The undertile sheet can fulfil other function, acting as:

- A complementary waterproof sheet in particular weather conditions that can overcome the tile covering.
- A barrier to dust and powdery snow.
- A screen against the intrusion of insects and birds.
- An element that collects and channels the water produced when snow that has accumulated on the tiles melts.
- A waterproof safety sheet if the tiles are laid incorrectly, or if the roof pitch is insufficient.

Ventilation, permeability and the vapour barrier

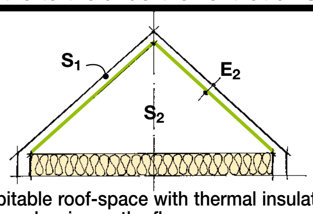
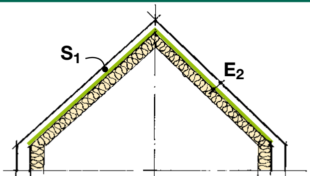
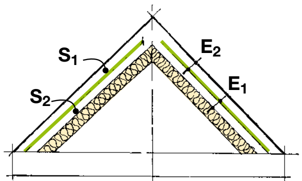
Timber roofs are valued for their lightness, which is an advantage in terms of construction, but a disadvantage in terms of thermal insulation.
The absence of thermal inertia means that the insulating depth must be increased, but often this is not enough to guarantee comfort and limit the energy consumption of air conditioning during the summer, and increasing the thermal insulation should be combined with the introduction of a ventilation space which will often be of constant depth, in the case of a habitable roof-space, or of a depth that varies with the pitch of the roof surfaces, in the case of a non-habitable roof-space.
Installed between the outer layer of tiles and the insulating layer, this assures both “thermal washing” of the heat transmitted to the layers lying under the outer layer of tiles that have been heated by the sun and damp control in winter, caused by gaseous vapour migrating from the inhabited area towards the outside, through the layers of the roof.
The ventilation space is used to evacuate warm water vapour from inhabited rooms before it reaches a concentration such as to condense inside the layers directly underneath it, the temperatures of which decrease towards the outside.
Condensation of steam, in quantities that exceed the re-evaporation capacity of the layer structure in the summer, not only inhibits the insulating properties of the thermal insulation, causing the phenomenon to worsen, it also constitutes a hazard for timber roofs, since it creates an environment that favours the formation of degenerative processes in the timber roof itself.
So ventilation is particularly important for timber roofs, since it affects the life of the load-bearing structure.
While in old roofs the non-inhabited space under the roof could guarantee total or partial ventilation, through the joins in the various kinds of tiles or slates laid on rafters and not on continuous boards, these days, with the use of the roof-space as a living space, this is no longer possible, given the development of regulatory requirements for energy saving, together with the progressive reduction in the air permeability of the outer shell of the building and the introduction of the use of undertile sheets to protect against wind and powdery snow.
The use of continuous board and undertile sheets also means that the ventilation space now consists of two chambers, which may be defined as the primary ventilation space, which is the space between the thermal insulation and the continuous board or undertile sheet, and the secondary ventilation, or microventilation space, which is the space between the continuous board or undertile sheet and the tile covering.
This means that specific air intakes must be incorporated to guarantee the necessary ventilation and supply both the primary and the secondary spaces.
The table in the following pages, extrapolated from studies of the issue by France’s CSTB and DTU installation rules, indicates the cross sections of the intake and outlet openings in the two ventilation chambers, and on the minimum depths of these chambers when steam migration from the rooms beneath is slowed down by a vapour barrier with vapour permeability of less than 0.02 g/m²•h•mm•Hg, laid on the warm side of the insulation.
This latter solution is strongly recommended to avoid the risks of condensation and to reduce the ventilation flow rate.
In the situation described, the problem of the vapour permeability of the board or undertile sheet he two ventilation chambers becomes secondary, since the primary ventilation evacuates the humidity, avoiding the risk of accumulation and the consequent condensation of vapour.
In this case, the impermeability, mechanical resistance and duration of resistance to direct exposure to the outside elements of the undertile sheet are more important.
Whereas, if there is no primary ventilation space and the undertile sheet is resting directly on the thermal insulation or a prefabricated wood panel containing a thermal insulator without ventilation space, then it must be highly transpiring, which means membranes with vapour permeability SD of less than 0.09 m, a characteristic which only bitumen-free synthetic sheets possess.



S_1 = Under-tile microventilation
S_2 = Ventilation of the insulation of a ventilated roof

MINIMUM DIMENSIONING OF VENTILATION OF TIMBER ROOF COVERED WITH UNDERTILE SHEETS

Tile covering (black line) Undertile sheet (green line) Thermal insulation (yellow band)	S_1 = section of the ventilation (1/2 intakes + 1/2 outlets) of the airspace between the under-tile membrane and the tiles, in relation to the area of the tiles to be ventilated S_2 = section of the ventilation (1/2 intakes + 1/2 outlets) of the airspace between the under-tile membrane and the tiles, in relation to the area of the insulation to be ventilated E_1 = depth of space between the undertile sheet and the thermal insulation E_2 = depth of the space between the tiles and the undertile sheet

	Curved tiles	Flat hollow-core clay tiles and concrete tiles	Slate
Percentage contribution of the various types of tile to the undertile ventilation S1	**100%**	**60%**	**40%**
 Non-habitable roof-space with thermal insulation and vapour barrier on the floor. Undertile sheet stretched on battens or laid on continuous board	$S_1 = 0$ $E_2 \geq 2$ cm $S_2 = 1/1200$	$S_1 = 1/5000$ $E_2 \geq 2$ cm $S_2 = 1/1200$	$S_1 = 1/3000$ $E_2 \geq 2$ cm $S_2 = 1/1200$
 Habitable roof-space with thermal insulation and barrier Undertile sheet laid on insulation (valid only for ultra-transpiring synthetic undertile breather sheets) and tiles laid on battens (without continuous boards)	$S_1 = 0$ $E_2 \geq 2$ cm	$S_1 = 1/3000$ $E_2 \geq 2$ cm	$S_1 = 1/2000$ $E_2 \geq 2$ cm
 Habitable roof-space with thermal insulation and vapour barrier Undertile sheet stretched on battens or laid on continuous board	$S_1 = 0$ $E_2 \geq 2$ cm $S_2 = 1/1200$ Stretched undertile sheet (without boards) $E_1 \geq 2$ cm Undertile sheet on continuous boards $E_1 \geq 4$ cm	$S_1 = 1/5000$ $E_2 \geq 2$ cm $S_2 = 1/1200$ Stretched undertile sheet (without boards) $E_1 \geq 2$ cm Undertile sheet on continuous boards $E_1 \geq 4$ cm	$S_1 = 1/3000$ $E_2 \geq 2$ cm $S_2 = 1/1200$ Stretched undertile sheet (without boards) $E_1 \geq 2$ cm Undertile sheet on continuous boards $E_1 \geq 4$ cm

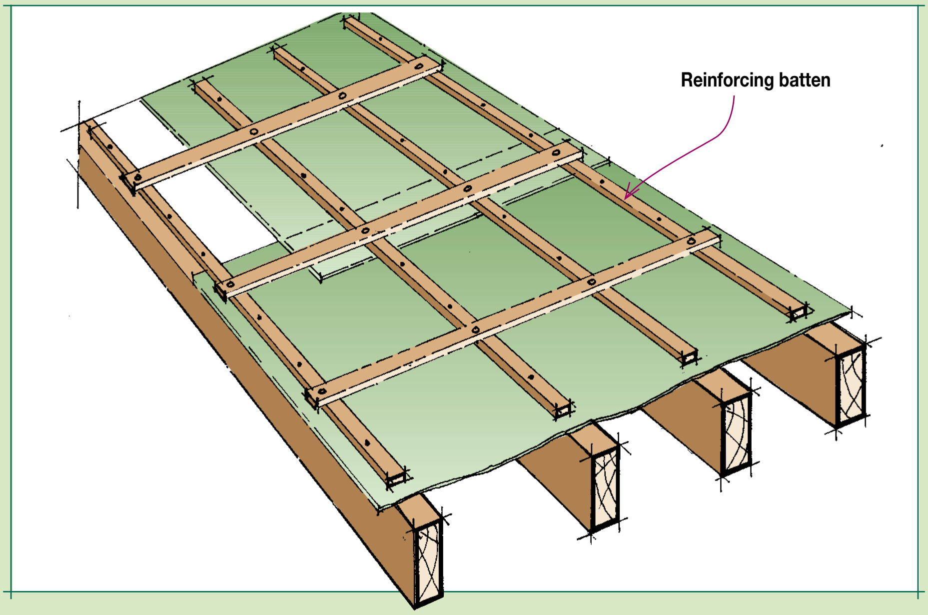
Simplified ventilation arrangements for tiled roof in plane areas up to a maximum of 900 m above sea level valid only with thermal insulation protected by a vapour barrier and on spaces with low or medium relative humidity with ratio

$$\frac{Q}{n} \leq 5 \text{ g/m}^3$$

Q = hourly quantity of vapour produced in the space in g/h
n = hourly air change rate in m³/h

Mechanical tear strength

When undertile sheets are laid on continuous board, they are not particularly subject to high stresses, and only need mechanical resistance sufficient to resist foot traffic during building and the various operational phases of the laying procedure. In general all the sheets specified have the necessary resistance. However, when the sheet is nailed to the rafters without a support, nail tear strength becomes important, to prevent damage due to falling objects, for example: tiles, during tile-laying. The French installation rules have established 3 classes of minimum resistance, according to the spacing between the rafters or battens to which the sheet is nailed (*see table*), and a further guarantee, also to ensure that the stability of the sheet over time, prescribe that the temporary nailing of the sheet be strengthened with the permanent mechanical fixing of a wooden batten of at least 2 cm in thickness and 3.6 cm in width over the line of nailing (*see figure*).



NAIL TEAR STRENGTH

	Class	Spacing between the rafters
Between 5 and 10 N	1	45 cm
Between 10 and 15 N	2	60 cm
Over 15 N	3	90 cm

Duration of temporary exposure of undertile sheets.

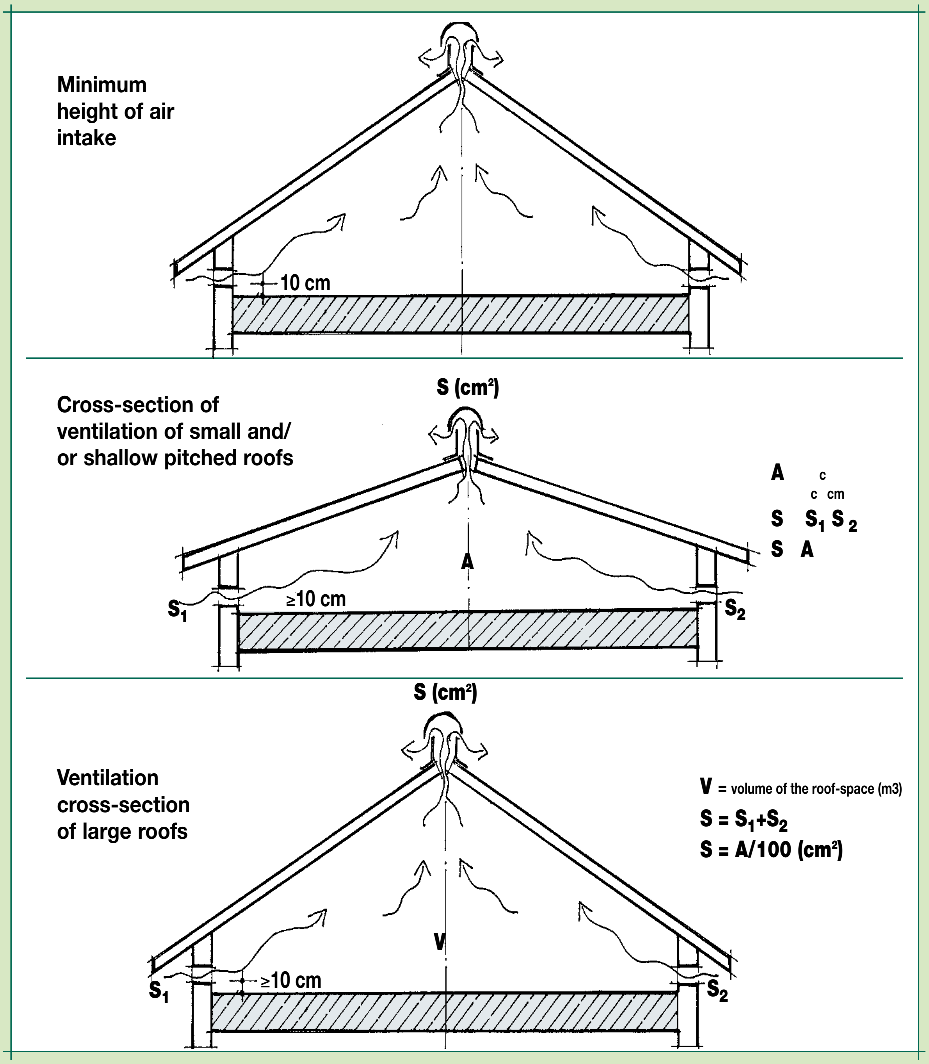
Provided that the stability of the system is not altered, the French installation rules specify that the undertile sheet layer can constitute a temporary protection for no more than 8 days without the overlying tiles, although the resistance of the sheets to exposure to sunlight is greater than this.
If a longer period of exposure without the protection of the tiles is necessary, undertile membranes must be used, not sheets, when possible.

Undertile sheets for concrete roofs

As mentioned above, solid or hollow-core concrete roofs covered with tiles do not suffer the problems of wind resistance or potential rot that are characteristic of timber roofs, but it is still often advantageous to be able to install a further protection from water under the tiles. Water could infiltrate between the tiles in particular weather conditions, due to insufficient roof pitch, during thaws or breakage or movement of the tiles caused by birds.
While in mixed roofs, concrete with a wooden superstructure, the considerations and materials set out earlier for timber roofs continue to apply, for direct installation on concrete substructures the sheet must have higher mechanical resistance to not be punctured on the sharp edges of the concrete as workers walk on the roof during installation.
This property, and the high permeability of ultra-transpiring synthetic breather sheets, will also allow the undertile layer to be applied even before the concrete has fully matured.

Dimensioning the ventilation of the roof-space.

Non-inhabited roof-space of a solid or hollow-core concrete roof
In the case of concrete roofs, variable section ventilation is the predominant type, and ventilation openings should be evenly distributed in the lowest and highest part of the roof.
Air intakes should be positioned at the lowest point, at the eaves at least 10 cm from the plane of the floor, while the outlets should be positioned high up, at the ridge or in any event at a level higher than the level of the air intakes. Normally, for a shallow pitch roof with small ventilation spaces, the specified ventilation cross-section is 1/500th of the surface of the roof, while for large surfaces intake and outlet cross sections of 2 cm^2 per m^3 volume of the roof-space to be ventilated should be used.



Undertile sheets that can be used for each type of support

Undertile sheets for timber roofs that can be used according to the spacing of the rafters or battens.

APPLICATION TO UNEVEN SUPPORT (without boards)

Undertile sheets for timber roofs that can be used according to the spacing of the rafters or battens.

Minimum nail tear strength	50÷100 N	100÷150 N	> 150 N
Spacing between the rafters (cm)	45 cm	60 cm	90 cm
Difobar 510 Polyester	✔	✔	✔
Difobar PP	✔	✔	✔
Difobar Sand 900 Polyester	✔	✔	✔
Difobar Plus 550 Polyester	✔	✔	✔
Difobar Plus Polyester	✔	✔	✔
Difobar Plus 1100 Polyester	✔	✔	✔
Difobar Electromagnetic Pol.	✔	✔	✔
Difobar Ultra Sint 90	✔	✔	–
Difobar Ultra Sint 150	✔	✔	✔
Difobar Ultra Sint Forte	✔	✔	✔

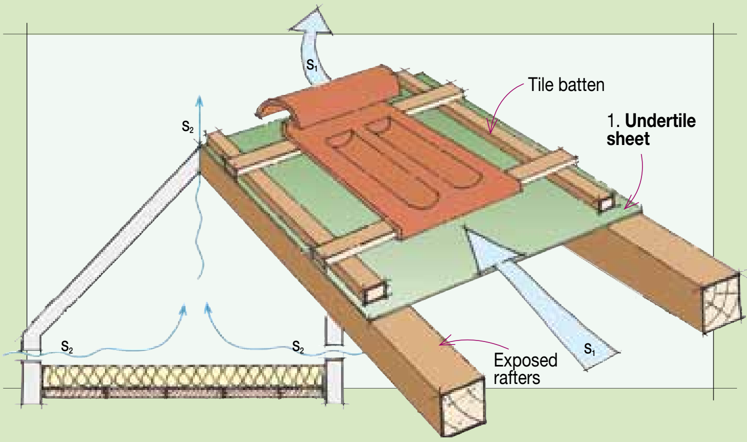
LAID ON CONTINUOUS SUPPORT

Undertile sheets that can be used for each type of support

Ventilated continuous board	Thermal insulation (installation in contact without primary ventilation).	Sandwich panel (installation in contact without primary ventilation).	Solid concrete, hollow-core concrete
Difobar PP	Difobar Ultra Sint 90	Difobar Ultra Sint 90	Difobar Ultra Sint Forte
Difobar Ultra Sint 90	Difobar Ultra Sint 150 (up to a max. spacing of 60 cm between the battens)	Difobar Ultra Sint 150	
Difobar Ultra Sint 150		Difobar Ultra Sint Forte	
Difobar Ultra Sint Forte	Difobar Ultra Sint Forte (up to a max. spacing of 90 cm between the battens)		
Difobar 510 Pol.			
Difobar Sand 900 P			
Difobar Plus 550 Pol.			
Difobar Plus Polyester			
Difobar Plus 1100 Pol.			
Difobar Electromagnetic Pol.			
Difobar Overlaps S.A. Pol.			

1

Undertile sheet stretched over the exposed rafters from the intrados



- Horizontal thermal insulation on the floor of the roof-space protected by vapour barrier

Vapour barrier that can be used
Alustop BV

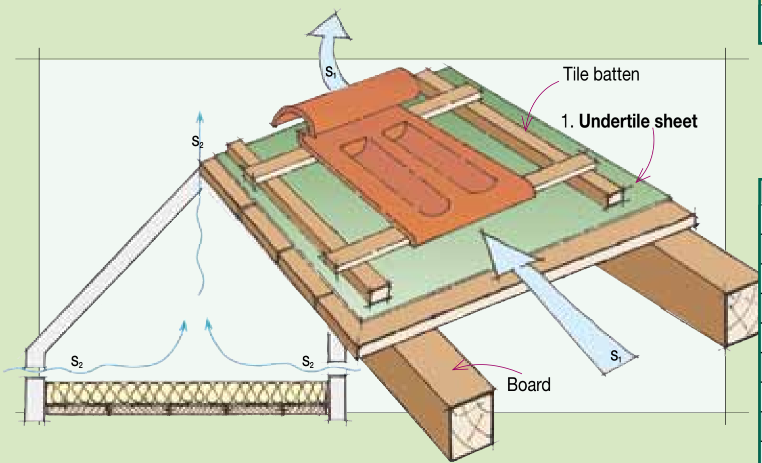
- Primary ventilation chamber S_2 of variable section (roof-space)
- Undertile sheet stretched over the exposed rafters and nailed, on the intrados

Undertile sheets that can be used	Spacing between the rafters (cm)		
	45 cm	60 cm	90 cm
Difobar 510 Polyester	✔	✔	✔
Difobar PP	✔	✔	✔
Difobar Sand 900 Polyester	✔	✔	✔
Difobar Plus 550 Polyester	✔	✔	✔
Difobar Plus Polyester	✔	✔	✔
Difobar Plus 1100 Polyester	✔	✔	✔
Difobar Electromagnetic Pol.	✔	✔	✔
Difobar Ultra Sint 90	✔	✔	–
Difobar Ultra Sint 150	✔	✔	✔
Difobar Ultra Sint Forte	✔	✔	✔

- Undertile secondary ventilation space S_1 over 2 cm deep
- Tile battens

2 TIMBER ROOF WITH NON-HABITABLE ROOF-SPACE

Undertile sheet on ventilated continuous board



- Horizontal thermal insulation on the floor of the roof-space protected by vapour barrier

Vapour barrier that can be used
Alustop BV

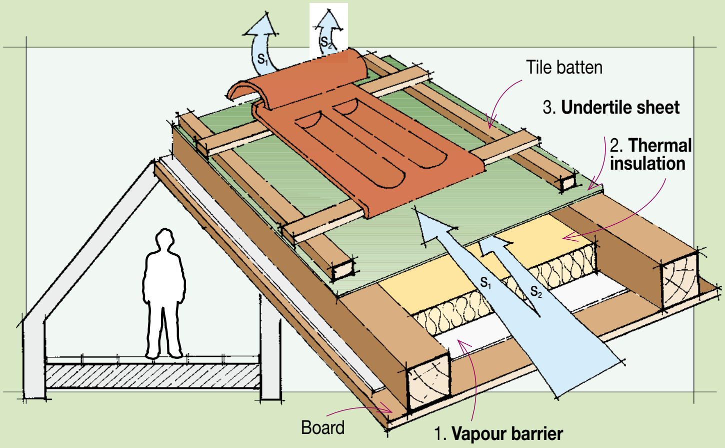
- Primary ventilation chamber S_2 of variable section (roof-space)
- Undertile sheet laid on continuous board attached to beams

Undertile sheets that can be used
Difobar 510 Polyester
Difobar PP
Difobar Overlaps Poliestere
Difobar Sand 900 Polyester
Difobar Plus 550 Polyester
Difobar Plus Polyester
Difobar Plus 1100 Polyester
Difobar Electromagnetic Polyester
Difobar Ultra Sint 90
Difobar Ultra Sint 150
Difobar Ultra Sint Forte

- Undertile secondary ventilation space S_1 over 2 cm deep
- Tile battens

3 TIMBER ROOF WITH HABITABLE ROOF-SPACE

Undertile sheet stretched on rafters



- Continuous lining in wood or plasterboard
- Thermal insulation on roof pitch protected by vapour barrier attached to the rafter intrados before lining

Vapour barrier that can be used
Alustop BV

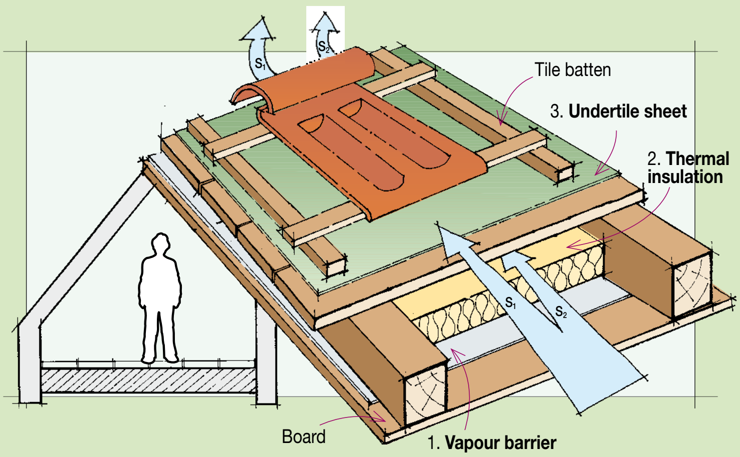
- Undertile secondary ventilation space S_2 with constant section, over 2 cm deep
- Undertile sheet stretched and nailed on rafters

Undertile sheets that can be used	Spacing between the rafters (cm)		
	45 cm	60 cm	90 cm
Difobar 510 Polyester	✓	✓	✓
Difobar PP	✓	✓	✓
Difobar Sand 900 Polyester	✓	✓	✓
Difobar Plus 550 Polyester	✓	✓	✓
Difobar Plus Polyester	✓	✓	✓
Difobar Plus 1100 Polyester	✓	✓	✓
Difobar Electromagnetic Pol.	✓	✓	✓
Difobar Ultra Sint 90	✓	✓	–
Difobar Ultra Sint 150	✓	✓	✓
Difobar Ultra Sint Forte	✓	✓	✓

- Undertile secondary ventilation space S_1 over 2 cm deep
- Tile battens nailed to rafters

4 TIMBER ROOF WITH HABITABLE ROOF-SPACE

Undertile sheet on ventilated continuous board



- Continuous lining in wood or plasterboard with vapour barrier attached to rafter intrados
- Thermal insulation on roof pitch protected by vapour barrier attached to the rafter intrados before lining

Vapour barrier that can be used
Alustop BV

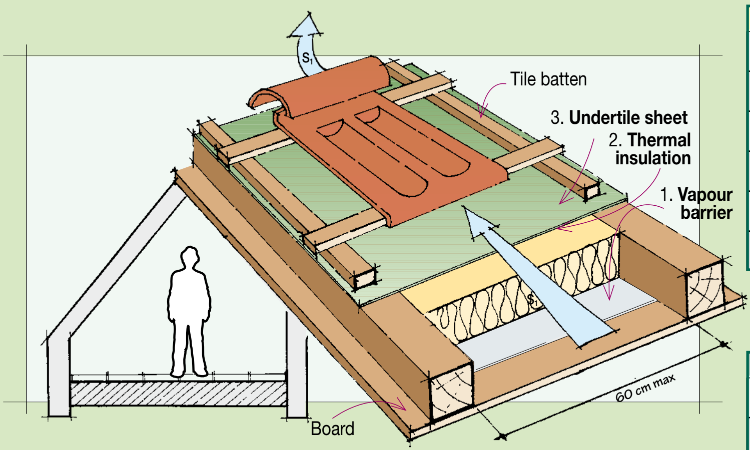
- Undertile secondary ventilation space S_2 with constant section, over 4 cm deep
- Undertile sheet laid on continuous board

Undertile sheets that can be used
Difobar 510 Polyester
Difobar PP
Difobar Overlaps Poliestere
Difobar Sand 900 Polyester
Difobar Plus 550 Polyester
Difobar Plus Polyester
Difobar Plus 1100 Polyester
Difobar Electromagnetic Polyester
Difobar Ultra Sint 90
Difobar Ultra Sint 150
Difobar Ultra Sint Forte

- Undertile secondary ventilation space S_1 over 2 cm deep
- Tile battens nailed to rafters

5 TIMBER ROOF WITH HABITABLE ROOF-SPACE

Ultraundertile breather sheet laid on non-ventilated thermal insulation • with concealed rafters



- Wood lining of rafters with maximum spacing of 60 cm

Vapour barrier that can be used
Alustop BV

- Thermal insulation on roof pitch protected by vapour barrier attached to the rafter intrados before lining

Thermal insulation that can be used
Sintered expanded polystyrene
Extruded expanded polystyrene
Polyurethane, PIR, espanded
Mineral fibre
Cellulose perlite
Other as indicated by the manufacturer

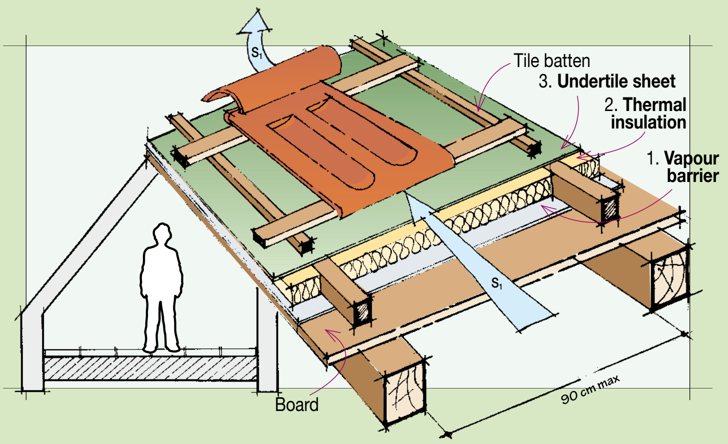
- Primary ventilation space S_2=absent
- Undertile sheet laid on thermal insulation and nailed to beams

Undertile sheets that can be used
Difobar Ultra Sint 90
Difobar Ultra Sint 150
Difobar Ultra Sint Forte

- Undertile secondary ventilation space S_1 over 2 cm deep
- Tile battens nailed to rafters

6 TIMBER ROOF WITH HABITABLE ROOF-SPACE

Ultraundertile breather sheet laid on non-ventilated thermal insulation • with exposed rafters



- Wood lining on rafters with maximum spacing of 90 cm

Vapour barrier that can be used
Alustop BV

- Thermal insulation of the pitch sandwiched between battens attached to the rafters protected by vapour barrier attached to the boards

Thermal insulation that can be used
Sintered expanded polystyrene
Extruded expanded polystyrene
Polyurethane, PIR, espanded
Mineral fibre
Cellulose perlite
Other as indicated by the manufacturer

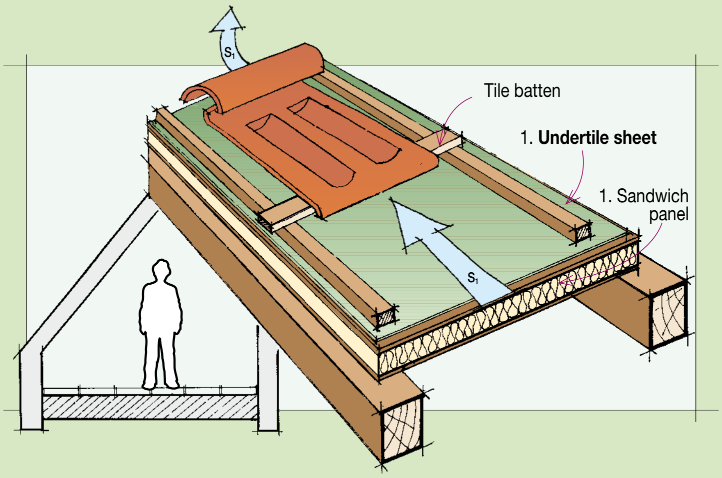
- Primary ventilation space S_2=absent
- Undertile sheet laid on thermal insulation and nailed to battens

Undertile sheets that can be used
Difobar Ultra Sint 90 (for spacing up to 60 cm)
Difobar Ultra Sint 150 (for spacing up to 90 cm)
Difobar Ultra Sint Forte (for spacing up to 90 cm)

- Undertile secondary ventilation space S_1 over 2 cm deep
- Tile battens nailed to battens at rafters

7 TIMBER ROOF WITH HABITABLE ROOF-SPACE

Ultraundertile breather sheet laid on non-ventilated sandwich panel.



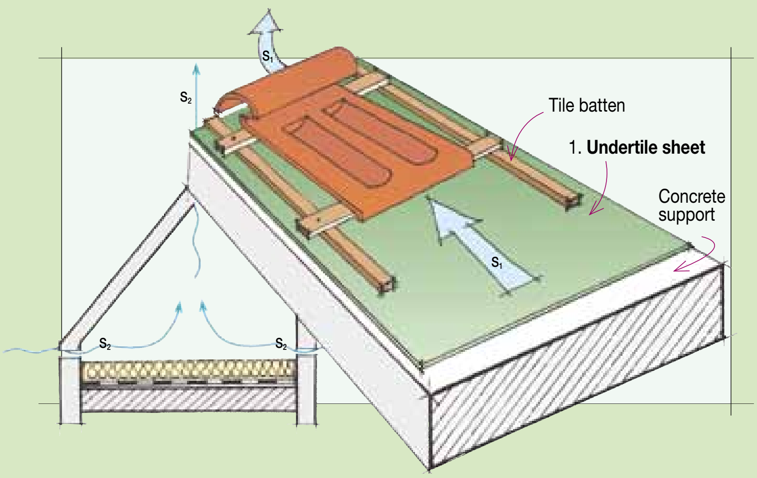
- Beams with spacing indicated by panel manufacturer
- Primary ventilation space S_2=absent
- Undertile sheet laid on sandwich panel

Undertile sheets that can be used
Difobar Ultra Sint 90
Difobar Ultra Sint 150
Difobar Ultra Sint Forte

- Undertile secondary ventilation space S_1 over 2 cm deep
- Tile battens with spacing indicated by panel manufacturer

8 SOLID OR HOLLOW-CORE ROOF WITH NON-HABITABLE ROOF-SPACE

Ultraundertile breather sheet on concrete substructure (still curing)



- Horizontal thermal insulation on the floor of the roof-space protected by vapour barrier

Vapour barrier that can be used
Alustop BV

- Primary ventilation chamber S_2 of variable section (roof-space)
- Undertile sheet laid on concrete substructure

Undertile sheets that can be used
Difobar Ultra Sint Forte

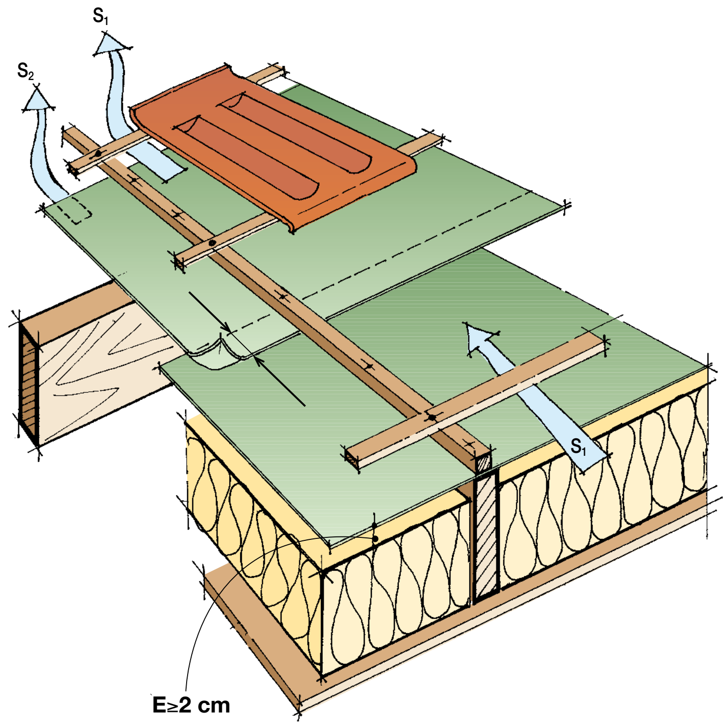
- Undertile secondary ventilation space S_1 over 2 cm deep
- Tile battens

APPLYINGUNDERTILE SHEETS

There are three application systems, depending on the presence or absence of a continuous substructure and on the permeability of the sheet:
• Undertile sheet stretched on roof frame
• Sheet attached to ventilated continuous board
• Sheet laid on non-ventilated sandwich panels or thermal insulation.

Undertile sheet stretched on roof frame

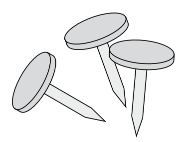
In this case the sheet is not supported by a continuous substructure but is nailed to the roof frame, rafters or battens, with the sheet held taut against them by counter-battens at least 2 cm thick and at least 36 mm wide.
The sheet constitutes the layer that separates the primary ventilation chamber, which disposes of the water vapour that passes through the thermal insulation, and the secondary ventilation chamber, which keeps the underside of the tiles dry.
French standards specify three classes of maximum spacing between the battens or rafters to which the sheet is nailed: 45, 60 and 90 cm, which are in turn divided into three classes of minimum tear strength for the sheets that can be applied, as indicated above.
The choice of sheet will therefore be determined by the spacing of the roof frame on which it will be laid.
The sheets should be applied parallel to the eave line starting from the eaves, to end 2-5 cm from the ridge line to permit ventilation, and will be overlapped as indicated in the table below, which shows the minimum dimension of the overlaps between sheets in relation to the pitch of the roof.



MINIMUM OVERLAP OF SHEETS ARRANGED PARALLEL TO THE EAVE LINE	
(caniers du CSTB no. 3356 of 26/03/2001)	
Pitch ≤30%	Pitch > 30%
20 cm	15 cm

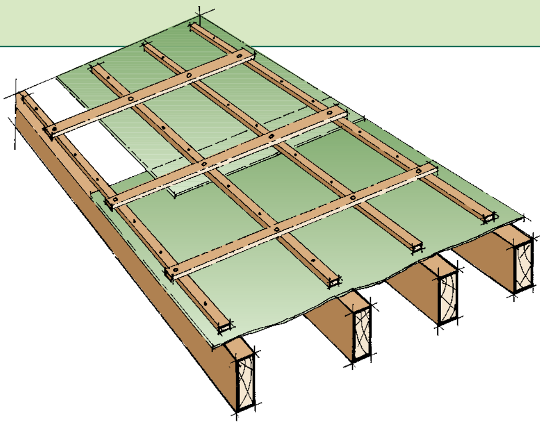
Steel nails

Nails to attach undertile sheets to the roof frame and to wooden boards
Dimensions: length 25 mm
Head diameter: ø 10 mm

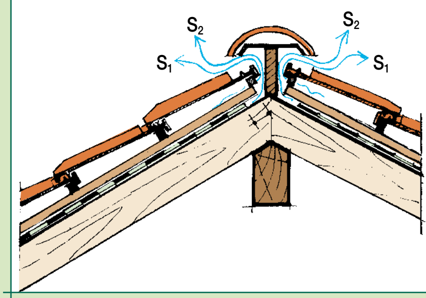


The ventilation gap may also be created by laying one or more tiles of a suitable shape near the ridge on each gap between the rafters, cutting holes in the sheet to allow the exit of air from both ventilation chambers.
During application, the sheets are temporarily stapled or nailed to the rafter with three fixings per linear metre, ensuring that the sheet is held taut so as to ensure the primary ventilation chamber is at least 2 cm, and then permanently attached by nailing the aforementioned counter-batten on top.
The counter-batten must be at least 2 cm thick, but if the depth of the undertile secondary ventilation chamber must be increased, as is the case when applying the DIFOBAR ELECTROMAGNETIC shield, a depth of at least 4 cm is advisable. This can be achieved by applying thicker battens.

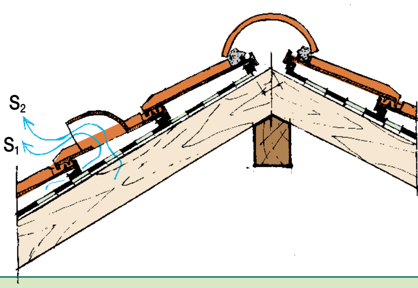
Counter-battens to anchor the sheet



Continuous ventilation line on the ridge

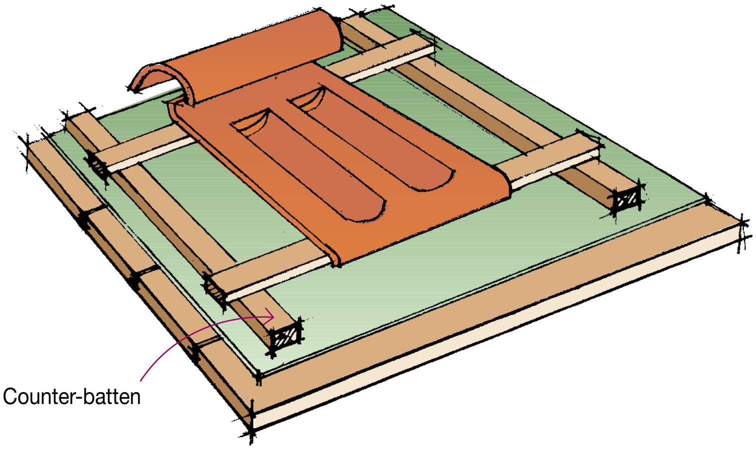


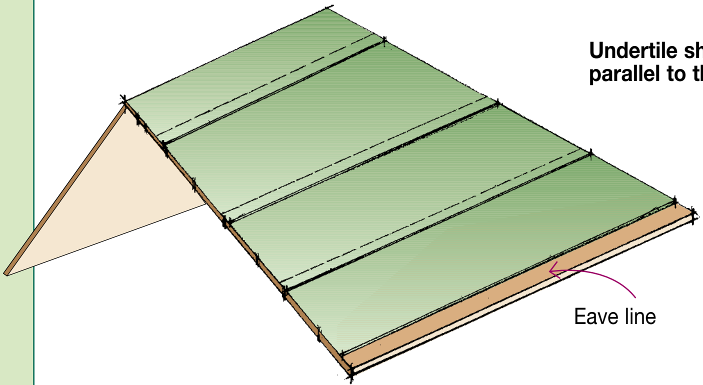
Ventilation openings through ventilation tiles.

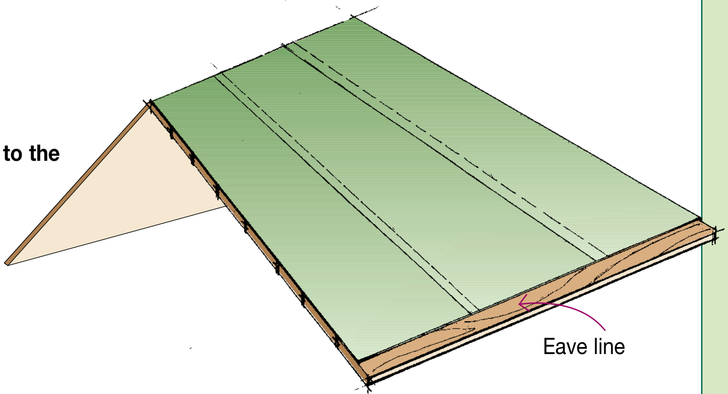


Sheet attached to ventilated continuous board

In this case the sheet lies on a continuous and ventilated substructure, on which all the specified types may be used.
The support can consist of boards of solid wood, or wood-based panels such as plywood or OSB, the lower faces of which will be ventilated by a primary ventilation chamber of variable section (roof-space) or of constant section no less than 4 cm thick.
The sheets should preferably be arranged in parallel with the eave line and starting from the eaves, with overlaps appropriate for the pitch of the roof, as indicated in the table in the previous section.
The sheets should be temporarily nailed or stapled at 33 cm intervals under the overlap at least 4 cm from the edge of the sheet and then definitively anchored by the battens applied on top.
A counter-batten at least 2 cm thick nailed to the board through the sheet will determine the minimum depth of the undertile ventilation chamber, which can be increased if greater ventilation depths are necessary.
The sheets can also be arranged perpendicular to the eaves with overlaps of at least 10 cm which will be temporarily nailed through the overlaps at 33 cm intervals, but in this case the joins must be glued with a strip of HEADCOLL adhesive at least 5 cm wide.
The same adhesive, packaged in cartridges, can be used to extrude a bead to seal the overlaps of the sheets arranged parallel to the eaves for a better seal against air and water.
To permit ventilation, both the board and the undertile sheet will stop 2-5 cm below the ridge line.

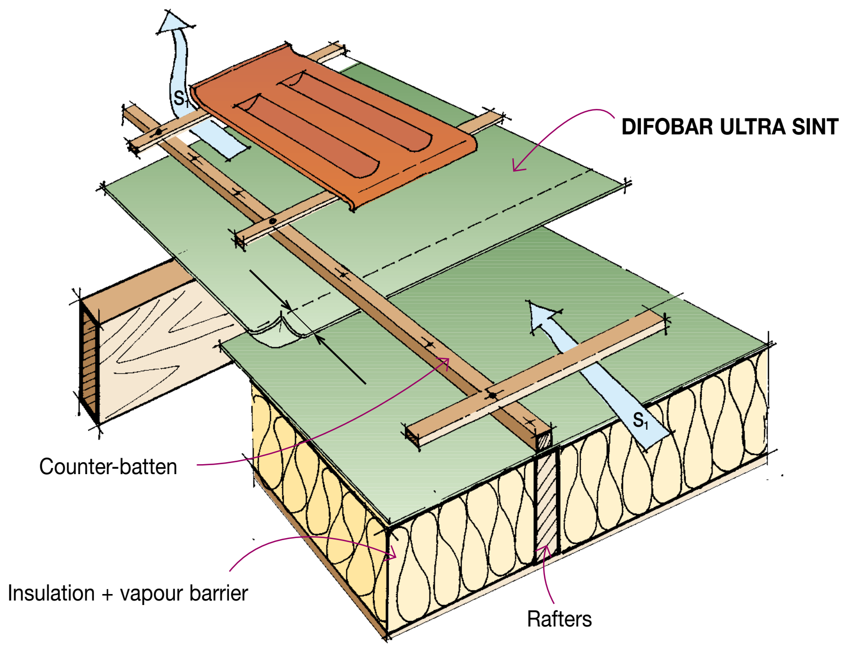






Sheet laid on non-ventilated sandwich panels or thermal insulation.

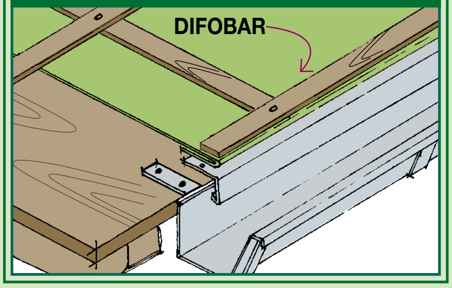
The laying procedure and detail execution are similar to the cases illustrated above, and, respectively, direct laying on insulation corresponds to laying on the roof frame, since the sheets are in any event attached to the rafters, while laying on sandwich panels with wood-derivate panels on the surface is similar to laying on continuous boards.
The difference is the lack of primary ventilation, and thus since the substructure is not ventilated, it may only be covered with ultra-transpiring DIFOBAR ULTRA SINT 90 and DIFOBAR ULTRA SINT 150 breather sheets.



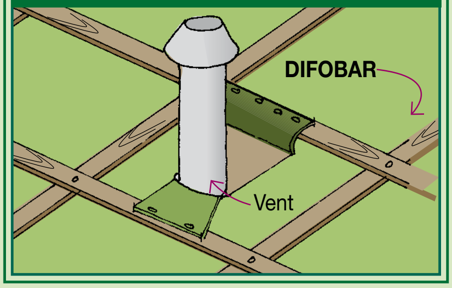
Installation details

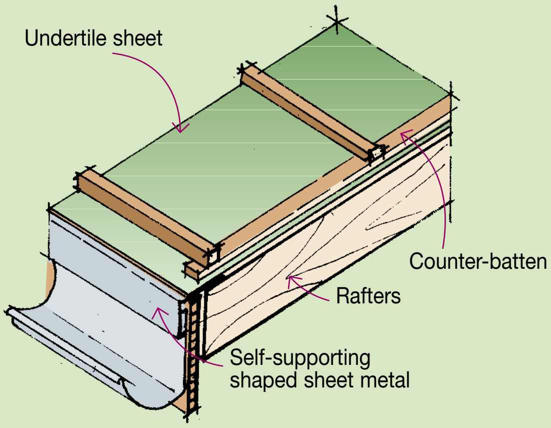
The sheet must extend right to the edge of the eave line, but no further, so it remains always protected by the tiles and in the absence of continuous board it will be connected through a self-supporting bent sheet of metal that acts as a gutter, attached to the rafters and sufficiently wide to allow the undertile sheet to overlap it by at least 10 cm.
Alternatively, thinner sheet metal can be used, which will be supported and nailed onto a wooden board attached to the edge of the rafters. This board is not necessary in the presence of continuous board.
All the parts that protrude from the plane of the roof, such as chimneys, skylights, pipe work of various kinds, will be protected above, with devices that deviate the water that could flow onto the undertile membrane.
This also applies to the lines on the other side where the sheet is interrupted, or if continuity is maintained the gap will be covered by a continuous board.

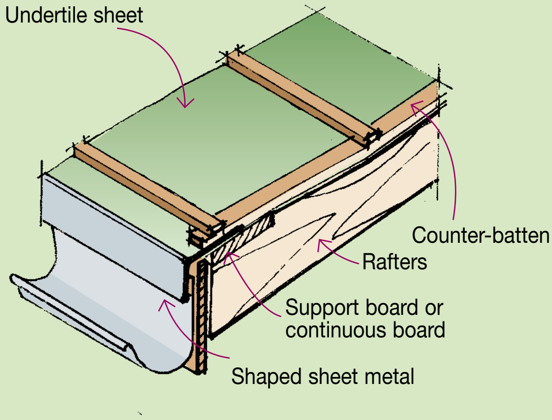
ATTACHING DIFOBAR AT THE EAVES



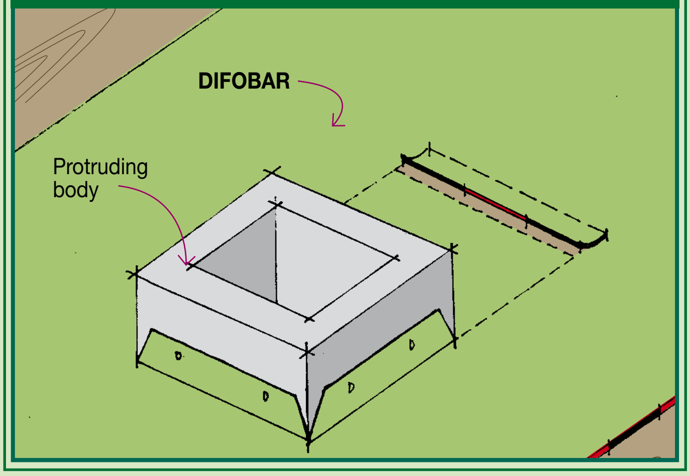
VENTS



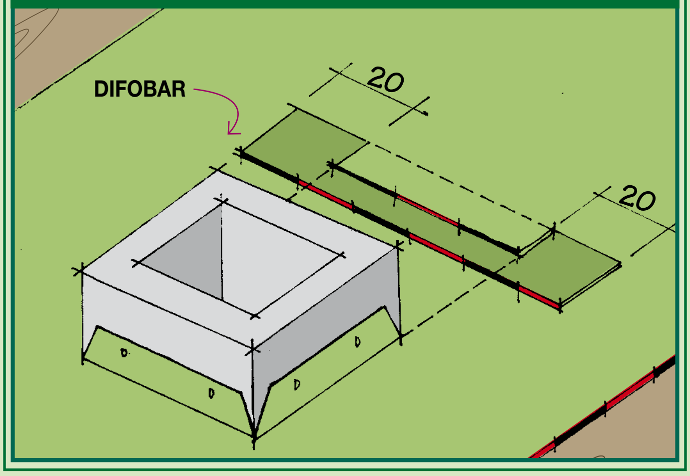




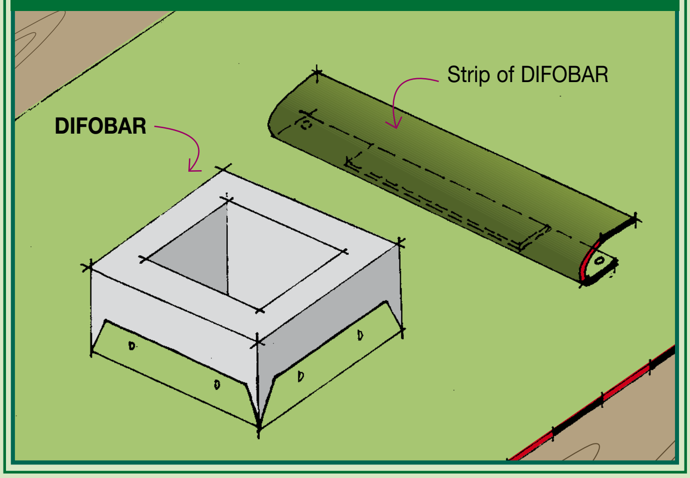
1. INCISION OF DIFOBAR ABOVE THE EMERGING BODY



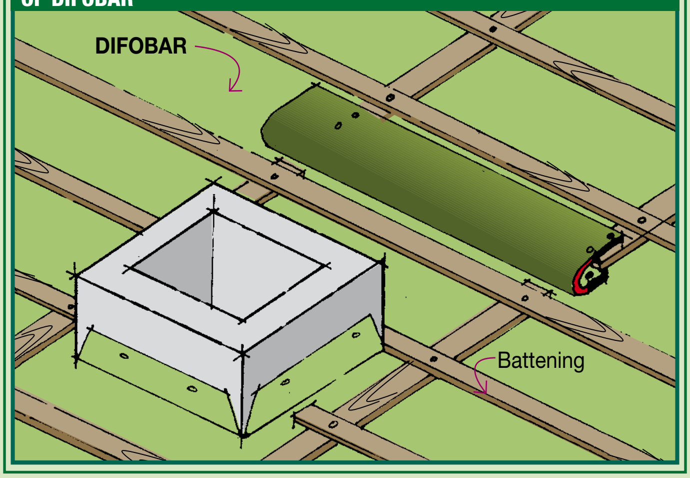
2. POSITIONING OF ADDITIONAL STRIP OF DIFOBAR



3. FOLDED STRIP OF DIFOBAR



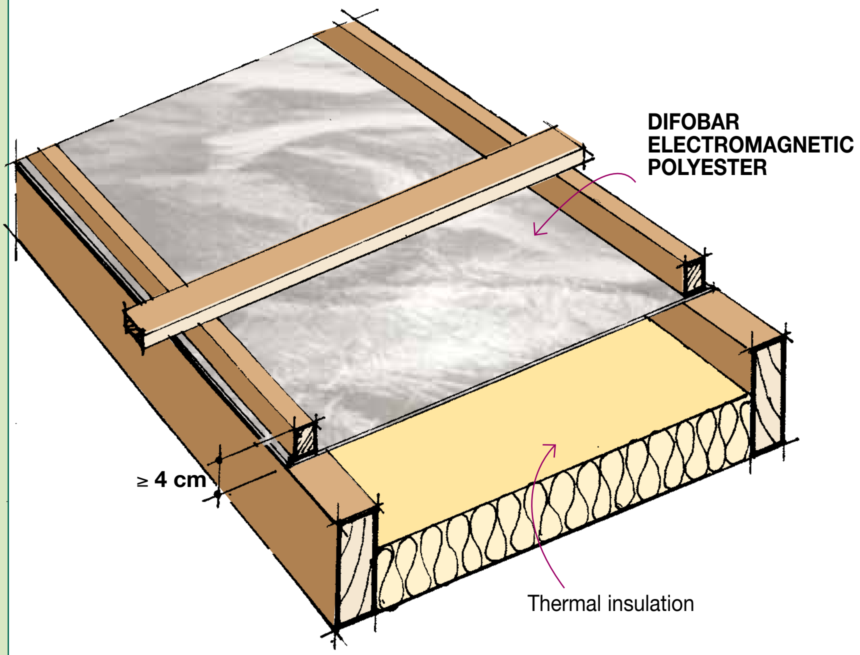
4. APPLYING THE BATTENS AND ATTACHING THE ADDITIONAL STRIP OF DIFOBAR



Use of DIFOBAR ELECTROMAGNETIC POLYESTER

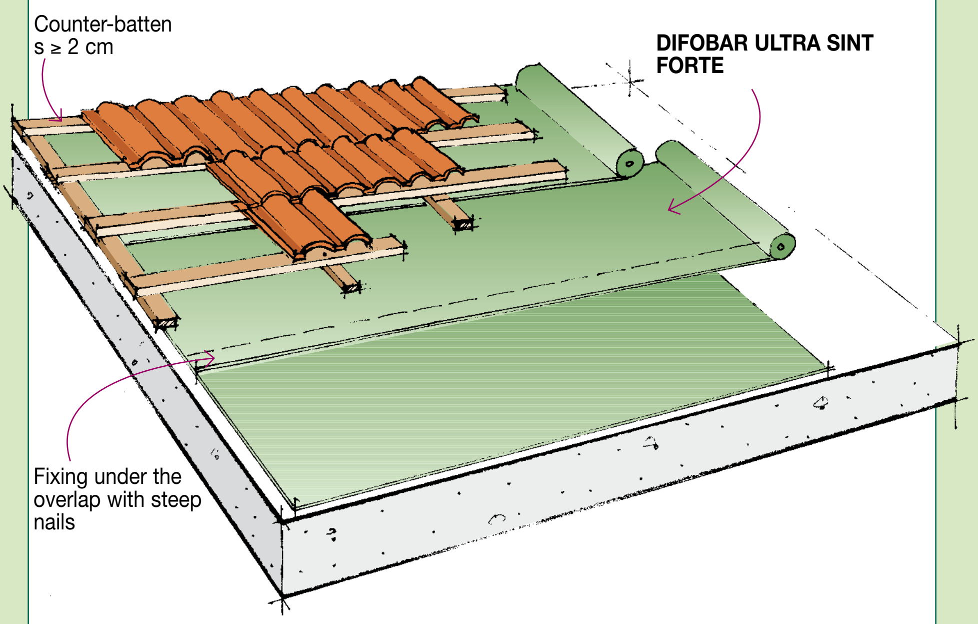
In the summer, especially in hot climates, the solar radiation that heats tiled roofs makes the roof-space areas unliveable, and increases the energy consumption of air conditioning. Dark surfaces such as tiles absorb most of the solar radiation, and as they increase in temperature they trasmit the accumulated heat under the roof, heating the areas underneath.
DIFOBAR ELECTROMAGNETIC POLYESTER not only constitutes a shield against electromagnatic radiation, it also reflects radiant heat, both (types) are always laid on a surface with ventilation underneath, and both are laid in the sale way as the other DIFOBAR sheets for undertile air and water sealing, but are used ionly in ventilated roofs with thermal insulation protected with a vapour barrier, on both wooden boards and stretched between battens, to cover spaces with low and medium humidity, less than 5 g/m^3, expressed as the ratio g/h: the amount of vapour produced in an hour divided by the air exchange rate in m^3/h.
The reflecting face on the top side of both sheets is laid facing the tile, to reflect the heat emanating from the underside of the tile.
The depth and air vents of the principal ventilation chamber are as usual, while to dissipate the increase in temperature generated by the reflection of the shield into the secondary ventilation chamber, between the shield and the tile, both the air vents and the depth needs to be increased, increasing the former to Se+i=20 cm^2 (Se+i=Total section of ventilation vent [Intake+Outlet] per linear metre of the roof to be allocated equally per linear metre of eaves and ridge) and the depth to at least 4 cm, using counter-battens of this thickness.
The air vents may be linear, composed of perforated eave profile, while the outlet may be located in the ventilated ridge or through special ventilation tiles.

WARNINGS
DIFOBAR ELETTROMAGNETIC POLYESTER is not thermal insulation, and does not replace the insulation, but in summer it reduces the temperature of the primary ventilation chamber and contributes to the thermal comfort of the inhabited roof-space, limiting the energy consumption of the air conditioner. .



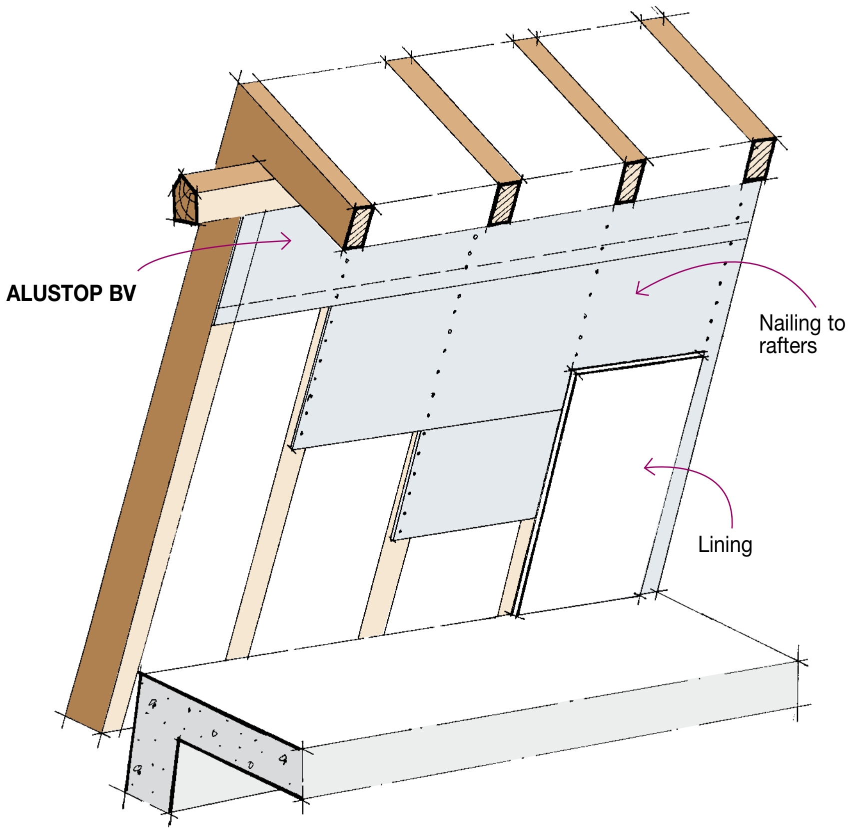
Applying DIFOBAR SINT FORTE highly-transpiring undertile breather sheets on solid or hollow-core concrete roofs

The sheets will be laid in parallel lines starting from the eave line, nailed to the concrete with steel nails at 33 cm under the overlaps.
As for the preceding cases, the sheets will be permanently fixed when the tile-bearing battens are laid on top, after the creation of a space with 2 cm thick counter-battens to create the minimum depth of undertile ventilation.
The sheets will be continued across the ridge to the adjacent roof surface.

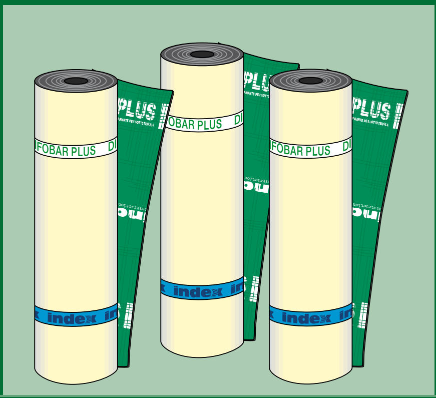


APPLYING VAPOUR BARRIER

The vapour barrier should be positioned under the thermal insulation, and if attached to the timber roof frame, when the inclined roof plane is to be insulated, this should be attached in lines parallel to the eave line, from the bottom, with overlaps of at least 10 cm, attached with broad head nails or staples to the rafter intrados, covered with wood or plasterboard lining.
If the rafters of the inclined roof have been boarded, the vapour barrier will be laid over this before the insulation is applied, again arranging the sheets in parallel lines from the eave line and attaching them every 10 cm and at least 5 cm from the edge of the sheet above and below the overlap.
The sheets can also be laid perpendicular to the eaves, and in this case they will be nailed down at the top and on the longitudinal overlaps.
When the steam barrier protects the insulation on the flat surface, on the floor of a non-inhabited roof-space, no fixing is necessary, and the sheets should be laid dry on the floor, before the thermal insulation is laid, with overlaps of at least 10 cm.



Fixing of the vapour barrier to the rafter intrados.



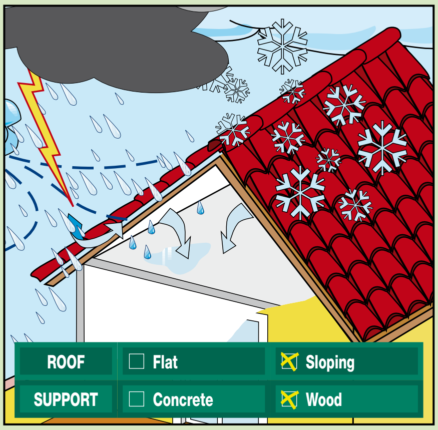
DIFOBAR PLUS 1100 POLYESTER
DIFOBAR PLUS POLYESTER
DIFOBAR PLUS 550 POLYESTER

WATERPROOFING UNDERTILE BREATHER SHEETS FOR VENTILATED ROOFS

QUALIFIES FOR *LEED* CREDITS

CATEGORY	CHARACTERISTICS		ENVIRONMENTAL IMPACT							PROCEDURE FOR USE
SPECIAL ELASTOPLASTOMERS FOR SPECIFIC USES	IMPERMEABLE AND TRANSPIRING	REACTION TO FIRE	ECO GREEN	DOES NOT CONTAIN ASBESTOS	DOES NOT CONTAIN TAR	DOES NOT CONTAIN CHLORINE COMPOUNDS	RECYCLABLE	NON HAZARDOUS WASTE	DOES NOT CONTAIN USED OILS	APPLICATION WITH NAILS

1 PROBLEM/ISSUE



HOW TO BUILD RESISTANCE TO WATER, SNOW, DUST AND WIND INTO A VENTILATED TIMBER ROOF COVERED WITH FLAT OR CURVED TILES

In critical situations, the roof covering in flat or curved tile of pitched timber roofs is not, on its own, able to guarantee protection from water, snow and dust, and in some cases the wind can lift the tiles.

2 SOLUTION

DIFOBAR PLUS 1100 POLYESTER, **DIFOBAR PLUS POLYESTER** and **DIFOBAR PLUS 550 POLYESTER** are bitumen polymer undertile breather sheets with the special characteristic, due to the great thickness of the non-woven fabric reinforcement in white polyester, of remaining exposed on the lower side, and which strengthens the transpiration of the system.

The excellent absorbing capacity of the non-woven fabric has a buffer effect that traps any excess moisture that has condensed under the membrane and disposes of it by gravity outside the overlaps, and hence in the eaves.

In this way, there is no dripping on the layers underneath, and the wood stays dry, preventing rot.

These sheets have a higher mass per unit area, and resist exposure to external conditions for long periods, up to about 8 months.

The sheets have high tensile strength and high nail tear strength, and they can all also be laid without board on roof frames with maximum spacing of 90 cm between the rafters.

DIFOBAR PLUS POLYESTER breather sheets have superior fire resistance, and their upper side is covered with green non-woven fabric with reduced heat absorption.

CE — **INTENDED USE OF “CE” MARKING SPECIFIED BASED ON THE AISPEC-MBP GUIDELINES**

EN 13859-1 – UNDERTILE MEMBRANE
- **Undertile breather (membrane)**

- DIFOBAR PLUS 550 POLYESTER
- DIFOBAR PLUS POLYESTER
- DIFOBAR PLUS 1100 POLYESTER

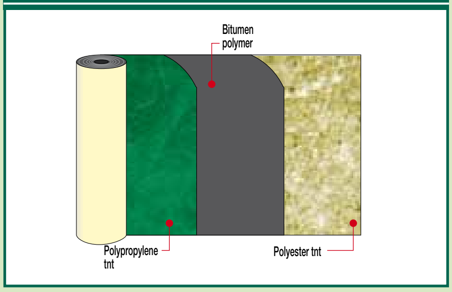
TECHNICAL FEATURES

	Regulation	T	DIFOBAR PLUS 1100 POLYESTER	DIFOBAR PLUS POLYESTER	DIFOBAR PLUS 550 POLYESTER
Reinforcement			–	–	–
Mass per unit area	EN 1849-1	±10%	1 100 g/m²	700 g/m²	550 g/m²
Roll dimensions	EN 1848-1	≥	1x30 m	1x30 m	1x30 m
Maximum tensile force L/T	EN 12311-1	-20%	400/350 N/50 mm	400/350 N/50 mm	400/350 N/50 mm
Elongation at tensile force L/T	EN 12311-1	-15% V.A.	35/35%	35/35%	35/35%
Nail tear strength L/T	EN 12310-1	-30%	150/150 N	150/150 N	150/150 N
Cold flexibility	EN 1109	≤	-20°C	-20°C	-20°C
Permeability to water vapour • after ageing	EN 1931 EN 1296-1931	-20% -20%	μ = 34 000 NPD	μ = 34 000 700 mm	μ = 34 000 NPD
Water penetration • after ageing	EN 1928 EN 1296-1928		W1 –	W1 –	W1 –
Reaction-to-fire Euroclass	EN 13501-1		E	E	E
External fire behaviour	EN 13501-5		–	–	–
Diffusion of water vapour thickness of equivalent layer	EN 1931		40 m	35 m	32 m
Density of water vapour flow	EN 1931		1·10⁻⁸kg/m² sec	1·10⁻⁸kg/m² sec	1·10⁻⁸kg/m² sec
Thermal characteristics					
Thermal conductivity			0.2 W/mK	0.2 W/mK	0.2 W/mK
Thermal capacity			1.43 KJ/K	0.90 KJ/K	0.70 KJ/K

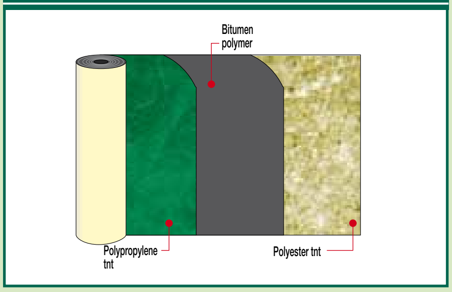
Considering the many possible uses and the possible interference of elements not under our control, we take no responsibility for the results. The Purchaser is responsible for establishing the suitability of the product for the use envisaged.

COMPOSITION OF THE MEMBRANE

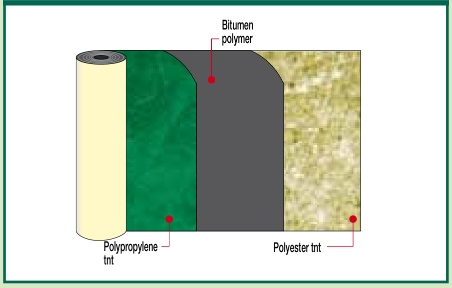
DIFOBAR PLUS 1100 POLYESTER



DIFOBAR PLUS POLYESTER



DIFOBAR PLUS 550 POLYESTER



PRODUCT FINISHES

POLYPROPYLENE TNT

POLYESTER TNT

The data provided are indicative mean data for current production and may be changed and updated by INDEX S.p.A. at any time, without notice. The technical information and suggestions provided represent our best knowledge of the properties of the product in use.

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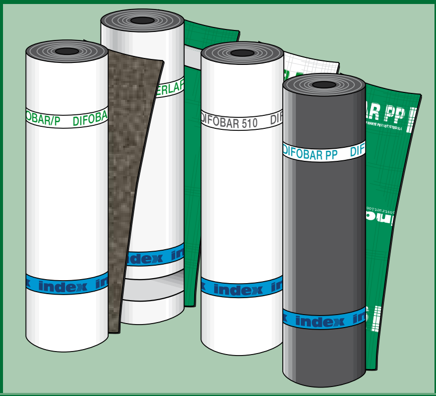


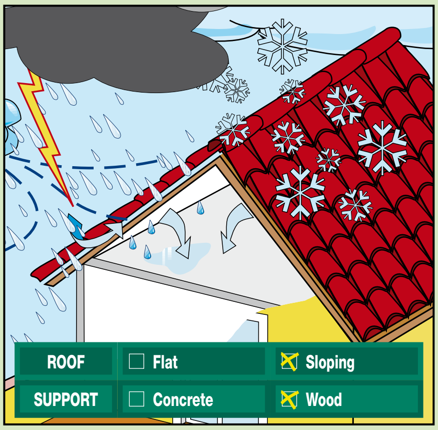
DIFOBAR SAND 900 POLYESTER
DIFOBAR OVERLAPS S.A. POLYESTER
DIFOBAR 510 POLYESTER
DIFOBAR PP

WATERPROOFING UNDERTILE BREATHER SHEETS FOR VENTILATED ROOFS

QUALIFIES FOR *LEED* CREDITS

CATEGORY	CHARACTERISTICS		ENVIRONMENTAL IMPACT							PROCEDURE FOR USE
EP S		Reazione al fuoco		ASBESTOS FREE	TAR FREE	CHLORINE FREE				
SPECIAL ELASTOPLASTOMERS FOR SPECIFIC USES	IMPERMEABLE AND TRANSPIRING	REACTION TO FIRE	ECO GREEN	DOES NOT CONTAIN ASBESTOS	DOES NOT CONTAIN TAR	DOES NOT CONTAIN CHLORINE COMPOUNDS	RECYCLABLE	NON HAZARDOUS WASTE	DOES NOT CONTAIN USED OILS	APPLICATION WITH NAILS

1 PROBLEM/ISSUE



HOW TO BUILD RESISTANCE TO WATER, SNOW, DUST AND WIND INTO A VENTILATED TIMBER ROOF COVERED WITH FLAT OR CURVED TILES

In critical situations, the roof covering in flat or curved tile of pitched timber roofs is not, on its own, able to guarantee protection from water, snow and dust, and in some cases the wind can lift the tiles.

2 SOLUTION

DIFOBAR OVERLAPS S.A. POLYESTER and **DIFOBAR SAND 900 POLYESTER** are bitumen polymer undertile breather sheets with the special characteristic, due to the great thickness of the non-woven fabric reinforcement in white polyester, of remaining exposed on the lower side, and which strengthens the transpiration of the system.
The excellent absorbing capacity of the non-woven fabric has a buffer effect that traps any excess moisture that has condensed under the membrane and disposes of it by gravity outside the overlaps, and hence in the eaves.
In this way, there is no dripping on the layers underneath, and the wood stays dry, preventing rot.
These sheets have a higher mass per unit area, and resist exposure to external conditions for long periods, up to about 8 months.
The sheets have high tensile strength and high nail tear strength, and they can all also be laid without board on roof frames with maximum spacing of 90 cm between the rafters.
DIFOBAR OVERLAPS S.A. POLYESTER maintains the absorbent properties that distinguish **DIFOBAR** breather membranes because the thickness of the reinforcement in composite polyester stabilised with glass fibre that remains visible on the lower face keeps dry the wood surfaces on which it is laid, and it also has two opposing self-adhesive edges, one on the upper face and the other on the lower, protected by a strip of siliconate film that allows the sheet overlaps to be bonded by simply pressure without using any special tools.
The upper face of the membrane is covered in green non-woven fabric.
DIFOBAR OVERLAPS S.A. POLYESTER with bonded overlaps resists wind better, and laying can continue without interruptions even in poor weather conditions.
With **DIFOBAR OVERLAPS S.A. POLYESTER** the overlaps still breathe because the two adhesive strips are bonded on the surface, not on the fabrics that cover the faces and seal the overlaps from water and wind but are permeable to water vapour.
The lightest undertile sheets, **DIFOBAR 510 POLYESTER** and **DIFOBAR PP** can remain exposed for a period of 4 months, and even if covered in a thinner non-woven fabric than the previous type, the lower faces still exercise a beneficial "antidrip" action, discharging the excess humidity outside the overlaps.
DIFOBAR PP is composed of a bitumen polymer film sandwiched between two non-woven polypropylene fabrics, one black and the other red, and is indicated for application to continuous board or the roof frame with up to 90 cm spacing between the rafters. **DIFOBAR 510 POLYESTER** is covered with two white non-woven polypropylene fabrics and is reinforced with a polyester non-woven fabric that offers greater resistance.

CE **INTENDED USE OF "CE" MARKING SPECIFIED BASED ON THE AISPEC-MBP GUIDELINES**

EN 13859-1 – UNDERTILE MEMBRANE
• Undertile breather (membrane)
- DIFOBAR SAND 900 POLYESTER
- DIFOBAR OVERLAPS S.A. POLYESTER
- DIFOBAR 510 POLYESTER
- DIFOBAR PP

1ª DIVISIONE
4ª LINEA

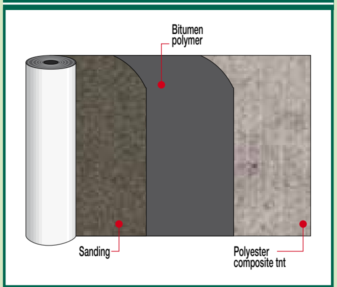
index Construction Systems and Products

TECHNICAL FEATURES

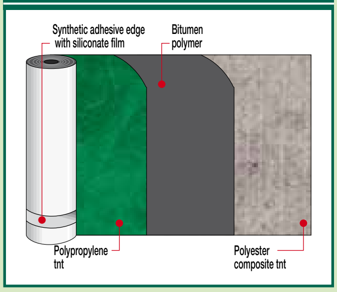
	Regulation	T	DIFOBAR SAND 900 POLYESTER	DIFOBAR OVERLAPS S.A. POLYESTER	DIFOBAR 510 POLYESTER	DIFOBAR PP
Reinforcement			–	–	–	–
Mass per unit area	EN 1849-1	±10%	900 g/m²	800 g/m²	400 g/m²	380 g/m²
Roll dimensions	EN 1848-1	≥	1×30 m	1×30 m	1×50 m	1.25×50 m
Maximum tensile force L/T	EN 12311-1	-20%	400/350 N/50 mm	400/350 N/50 mm	350/300 N/50 mm	350/300 N/50 mm
Elongation at tensile force L/T	EN 12311-1	-15% V.A.	35/35%	35/35%	40/50%	40/50%
Nail tear strength L/T	EN 12310-1	-30%	150/150 N	150/150 N	150/150 N	150/150 N
Cold flexibility	EN 1109	≤	-20°C	-20°C	-20°C	-20°C
Permeability to water vapour • after ageing	EN 1931 EN 1296-1931	-20% -20%	μ = 34 000 NPD	μ = 25,000 700 mm	μ = 115,400 NPD	μ = 115,400 NPD
Water penetration • after ageing	EN 1928 EN 1296-1928		W1 –	W1 –	W1 –	W1 –
Reaction-to-fire Euroclass	EN 13501-1		E	E	E	E
External fire behaviour	EN 13501-5		–	–	–	–
Diffusion of water vapour thickness of equivalent layer	EN 1931		35 m	30 m	75 m	75 m
Density of water vapour flow	EN 1931		$1 \cdot 10^{-8}$kg/m² sec	$1.2 \cdot 10^{-8}$kg/m² sec	$6.6 \cdot 10^{-9}$kg/m² sec	$6.6 \cdot 10^{-9}$kg/m² sec
Thermal characteristics						
Thermal conductivity			0.2 W/mK	0.2 W/mK	0.2 W/mK	0.2 W/mK
Thermal capacity			1.17 KJ/K	1.04 KJ/K	0.50 KJ/K	0.50 KJ/K

COMPOSITION OF THE MEMBRANE

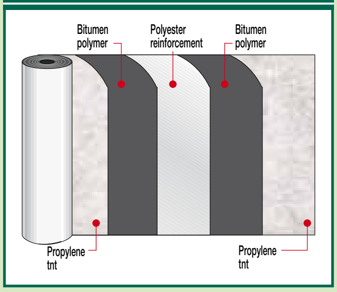
DIFOBAR SAND 900 POLYESTER



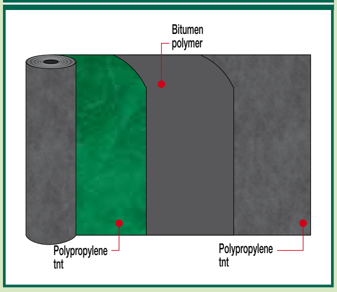
DIFOBAR OVERLAPS S.A. POLYESTER



DIFOBAR 510 POLYESTER



DIFOBAR PP



PRODUCT FINISHES

SANDING. Carried out by hot gluing of mineral sand without free silica, prevents adhesion of the coils of the roll and acts as adhesion intermediary for varnishes and adhesives applied hot and cold.

POLYPROPYLENE TNT.

POLYESTER COMPOSITE TNT.

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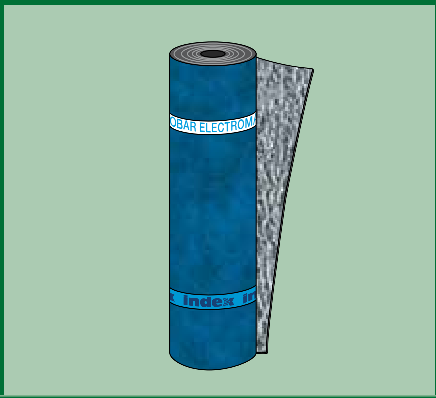


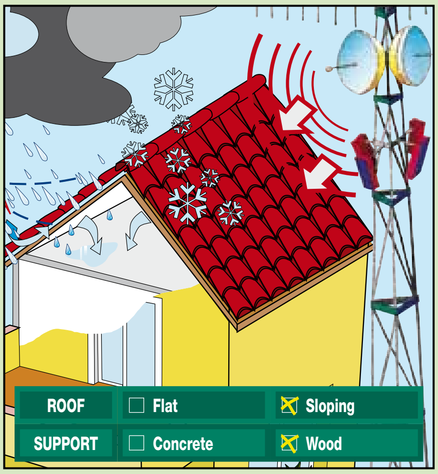
DIFOBAR ELECTROMAGNETIC POLYESTER

REFLECTING, WATERPROOF UNDERTILE BREATHER MEMBRANE FOR VENTILATED ROOFS WITH INTEGRATED SHIELDING AGAINST THERMAL RADIATION AND ELECTROMAGNETIC WAVES.

QUALIFIES FOR *LEED* CREDITS

CATEGORY	CHARACTERISTICS			ENVIRONMENTAL IMPACT							PROCEDURE FOR USE
EP S			Reazione al fuoco		ASBESTOS FREE	TAR FREE	CHLORINE FREE				
SPECIAL ELASTOPLASTOMERS FOR SPECIFIC USES	IMPERMEABLE AND TRANSPIRING	IMPERMEABLE AND ELECTROMAGNETIC SHIELD	REACTION TO FIRE	ECO GREEN	DOES NOT CONTAIN ASBESTOS	DOES NOT CONTAIN TAR	DOES NOT CONTAIN CHLORINE COMPOUNDS	RECYCLABLE	NON HAZARDOUS WASTE	DOES NOT CONTAIN USED OILS	APPLICATION WITH NAILS

1 PROBLEM/ISSUE



HOW TO PROTECT THE HABITABLE ROOF-SPACES OF VENTILATED ROOFS AGAINST ELECTROMAGNETIC RF (radio frequency) RADIATION FROM RADIO ANTENNAS OR TELEVISION REPEATER STATIONS.

The electromagnetic fields generated in Italy by 10,000 radio base stations and over 6,000 radio and television transmitting antennas exposes over 200,000 Italians to radiation which can have negative effects on their health. The electromagnetic waves can be the result of natural phenomena such as the sun and stars; and the earth itself generates a magnetic field. Or they can be produced by artificial sources such as electricity lines, electrical appliances, telecommunications equipment, mobile telephones, etc. These sources of oscillations in electric charges that produce an electric field and a magnetic field that propagate in space in the form of waves where the magnetic and electric fields oscillate perpendicular to the direction of the wave. It is the frequency, that is the number of oscillations per second, that characterises each type of electromagnetic wave: for example, light is an electromagnetic wave, as are X-rays and radio waves. The higher the frequency, the higher the energy that the wave transports. Collectively, all the possible electromagnetic waves, of varying frequency, are called the electromagnetic spectrum. When people talk about electromagnetic pollution, they are referring to non-ionising electromagnetic radiation with frequency lower than that of infrared light. Non-ionising radiations may be divided into two groups of frequencies in relation to the possible effects of the waves on living organisms:

- extremely low frequencies: ELF - 0÷300 Hz
- radiofrequencies: RF - 300 Hz÷300 GHz

Different mechanisms of interaction with living material, and different potential risks to human health, are associated with the two groups of frequencies. The high frequency fields (RF) transfer energy to tissues in the form of heat, while the low frequency fields (ELF) induce currents in the human body.

2 SOLUTION

DIFOBAR ELECTROMAGNETIC POLYESTER is an undertile breather sheet in bitumen polymer reinforced with non-woven polyester fabric for ventilated roofs only that can be stretched on roof frames with rafter spacing of up to 90 cm or laid on continuous board.
The ventilation layer between the sheet and the tiles must be at least 4 cm deep.
The blue polypropylene non-woven fabric covering the lower face exerts a beneficial "antidrip" action, removing any excess humidity that condenses on the lower face of the sheet outside the overlaps, while the metal covering of the upper face reflects the thermal radiation in the intrados of the tiles heated by the sun, and acts as a shield against electromagnetic radiation.
DIFOBAR ELECTROMAGNETIC POLYESTER sheet has been tested following the severe military specifications MIL–STD–285 (Military standard attenuation measurements for enclosures, electromagnetic shielding, for electronic test purposes, method of) using SEMS (Shielding Effectiveness Measuring System) specialist equipment to measure the characteristic SE of shielding materials. The membrane has been shown to have high capacity to shield against high frequency RF electromagnetic waves, and so when applied to building roofs it can offer a high decree of protection to the spaces underneath (*note: the protection against the magnetic fields generated by 50 Hz electric lines has not been tested, although the sheet was shown to possess attenuation capacity*).
The upper face of the sheet is composed of a electromagnetic shield suitably perforated to maintain the breathing characteristics needed for its intended use.
DIFOBAR ELECTROMAGNETIC POLYESTER also has fire resistance that is greater than normal undertile sheets. It passes the fire test specified in Swedish standard SS024824-NT FIRE 006 NORD TEST, a test that has been endorsed as draft European standard prEN1187/3.
It offers resistance to fire generated from outside by sparks or embers that might fall during costruction of the sheet or through cracks in the tile covering once the roof is finished.

CE INTENDED USE OF "CE" MARKING SPECIFIED BASED ON THE AISPEC-MBP GUIDELINES

EN 13859-1 – UNDERTILE MEMBRANE
• Undertile breather (membrane)
- DIFOBAR ELECTROMAGNETIC POLYESTER

WARNINGS

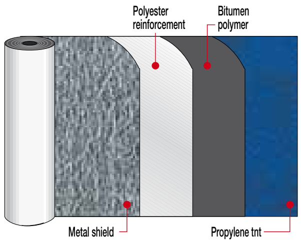
- **DIFOBAR ELETTROMAGNETIC POLYESTER** is not thermal insulation, and does not replace the insulation, but in summer it reduces the temperature of the primary ventilation chamber and contributes to the thermal comfort of the inhabited roof-space, limiting the energy consumption of the air conditioner. .
- **DIFOBAR ELECTROMAGNETIC POLYESTER** should only be used on ventilated roofs with thermal insulation with a vapour barrier

TECHNICAL FEATURES

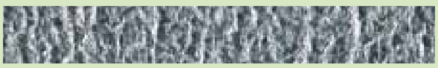
	Regulation	T	DIFOBAR ELECTROMAGNETIC POLYESTER
Reinforcement			–
Mass per unit area	EN 1849-1	±10%	800 g/m²
Roll dimensions	EN 1848-1	≥	1x30 m
Maximum tensile force L/T	EN 12311-1	-20%	900/700 N/50 mm
Elongation at tensile force L/T	EN 12311-1	-15% V.A.	40/40%
Nail tear strength L/T	EN 12310-1	-30%	220/220 N
Cold flexibility	EN 1109	≤	-20°C
Permeability to water vapour • after ageing	EN 1931 EN 1296-1931	-20% -20%	μ = 13,000 NPD
Water penetration • after ageing	EN 1928 EN 1296-1928		W1 –
Reaction-to-fire Euroclass	EN 13501-1		F
External fire behaviour	EN 13501-5		–
Diffusion of water vapour thickness of equivalent layer	EN 1931		40 m
Density of water vapour flow	EN 1931		$1.8 \cdot 10^{-8}$ kg/m² sec
SHIELDING EFFECTIVENESS (**MIL-STD-285**)			
• Shielding power	100 MHz		96.50% 29.00 dB
• Shielding power	900 MHz		98.70% 38.00 dB
• Shielding power	30÷1 000 MHz		40 dB
• Attenuation of electric field	50 Hz		97.70% 33.60 dB 9÷0.20 V/m
Thermal characteristics			
Thermal conductivity			0.2 W/mK
Thermal capacity			1.00 KJ/K

COMPOSITION OF THE MEMBRANE

DIFOBAR ELECTROMAGNETIC POLYESTER



PRODUCT FINISHES



METAL SHIELD.

POLYPROPYLENE TNT.

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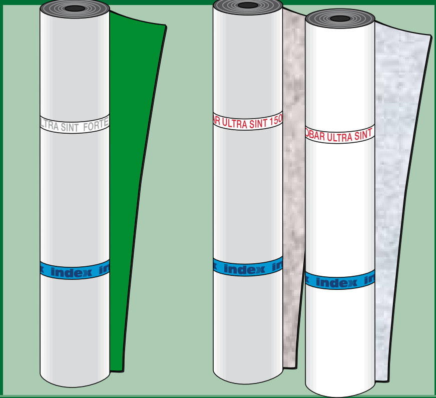
MBDP



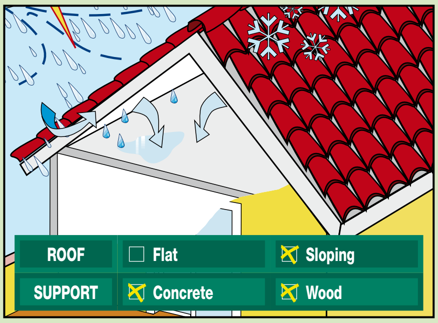
DIFOBAR ULTRA SINT FORTE
DIFOBAR ULTRA SINT 150
DIFOBAR ULTRA SINT 90

WATERPROOFING AND ULTRA-TRANSPIRING UNDERTILE BREATHER SHEETS FOR VENTILATED AND NON-VENTILATED TIMBER ROOFS.

QUALIFIES FOR *LEED* CREDITS

CATEGORY	CHARACTERISTICS		ENVIRONMENTAL IMPACT							PROCEDURE FOR USE
SYNT		Reazione al fuoco		ASBESTOS FREE	TAR FREE	CHLORINE FREE				
SYNTHETIC	IMPERMEABLE AND TRANSPIRING	REACTION TO FIRE	ECO GREEN	DOES NOT CONTAIN ASBESTOS	DOES NOT CONTAIN TAR	DOES NOT CONTAIN CHLORINE COMPOUNDS	RECYCLABLE	NON HAZARDOUS WASTE	DOES NOT CONTAIN USED OILS	APPLICATION WITH NAILS

1 PROBLEM/ISSUE



HOW TO CREATE UNDERTILE PROTECTION OF A ROOF WITHOUT VENTILATION AVOIDING CONDENSATION OF WATER VAPOUR

Using ultra-transpiring DIFOBAR ULTRASINT synthetic undertile breather sheets, which allow vapour but not water to pass, undertile protection can be achieved even in roofs without ventilation, avoiding condensation. And they can be laid directly on the thermal insulation.

2 SOLUTION

The exceptional transpirability of **DIFOBAR ULTRA SINT 90** and **DIFOBAR ULTRA SINT 150** “ultra-transpiring” synthetic breather membranes is able to dispose of large quantities of vapour per day.
This property is due to the special microporous structure of the polymer layer that constitutes its core, and which is protected on both sides with polypropylene non-woven fabric.
DIFOBAR ULTRA SINT 90 and **DIFOBAR ULTRA SINT 150** consist of a microporous polymer layer sandwiched between two layers of polypropylene non-woven fabric that are used solely for timber roofs.
DIFOBAR ULTRA SINT FORTE with high mechanical resistance consists of a microporous polymer layer sandwiched between two layers of heavier polypropylene non-woven fabric that can be used on both wooden and concrete roofs.

FIELDS OF USE

The very high diffusion capacity of the synthetic undertile sheets allows them to be used even in a layer structure that is not ventilated, and directly on the thermal insulation layer or on prefabricated sandwich panels containing the thermal insulation.
The membranes can also be used on both ventilated timber roofs and wooden board, stretched on the roof frame without supporting board with rafter spacing up to 90 cm, in the case of **DIFOBAR ULTRA SINT FORTE** and **DIFOBAR ULTRA SINT 150;** and 60 cm in the case of **DIFOBAR ULTRA SINT 90**.
As well as on timber roofs, **DIFOBAR SINT FORTE** can also be used on roofs in solid or hollow-core concrete roofs, even if not completely cured, since the exceptional transpiration of the sheet allows the roof to continue to dry.

CE

INTENDED USE OF “CE” MARKING SPECIFIED BASED ON THE AISPEC-MBP GUIDELINES

EN 13859-1 – UNDERTILE MEMBRANE
• Undertile breather (membrane)
- DIFOBAR ULTRA SINT FORTE
- DIFOBAR ULTRA SINT 150
- DIFOBAR ULTRA SINT 90

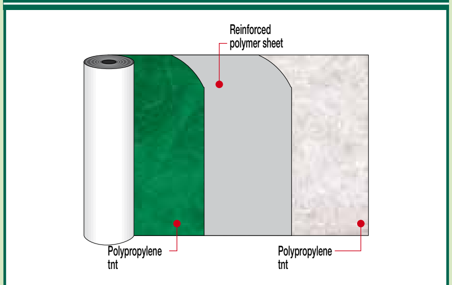
TECHNICAL FEATURES

	Regulation	T	DIFOBAR ULTRA SINT FORTE	DIFOBAR ULTRA SINT 150	DIFOBAR ULTRA SINT 90
Reinforcement			–	–	–
Mass per unit area	EN 1849-1	±10%	160 g/m^2	150 g/m^2	90 g/m^2
Roll dimensions	EN 1848-1	≥	1.5×50 m	1.5×50 m	1.5×50 m
Maximum tensile force L/T	EN 12311-1	-20%	300/270 N/50 mm	300/230 N/50 mm	160/90 N/50 mm
Elongation at tensile force L/T	EN 12311-1	-15% V.A.	20/20%	85/75%	80/80%
Nail tear strength L/T	EN 12310-1	-30%	200/200 N	160/180 N	80/110 N
Cold flexibility	EN 1109	≤	–	–	–
Permeability to water vapour • after ageing	EN 1931 EN 1296-1931	-20% -20%	μ = 30 NPD	μ = 30 700 mm	μ = 75 NPD
Water penetration • after ageing	EN 1928 EN 1296-1928		W1 –	W1 –	W1 W1
Reaction-to-fire Euroclass	EN 13501-1		E (*)	E (*)	E
External fire behaviour	EN 13501-5		–	–	–
Diffusion of water vapour thickness of equivalent layer	EN 1931		0.02 m	0.02 m	0.03 m
Density of water vapour flow	EN 1931		$1.60 \cdot 10^{-5}$ kg/m^2 sec	$1.60 \cdot 10^{-5}$ kg/m^2 sec	$3.67 \cdot 10^{-5}$ kg/m^2 sec
Thermal characteristics					
Thermal conductivity			0.050 W/mK	0.050 W/mK	0.050 W/mK
Thermal capacity			0.21 KJ/K	0.21 KJ/K	0.21 KJ/K

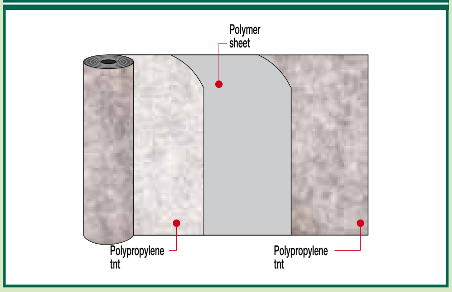
(*) Product supported by boards.

COMPOSITION OF THE MEMBRANE

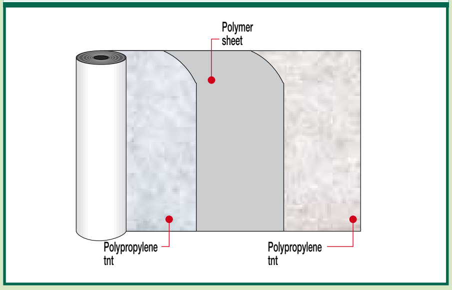
DIFOBAR ULTRA SINT FORTE



DIFOBAR ULTRA SINT 150



DIFOBAR ULTRA SINT 90



PRODUCT FINISHES

POLYPROPYLENE TNT.

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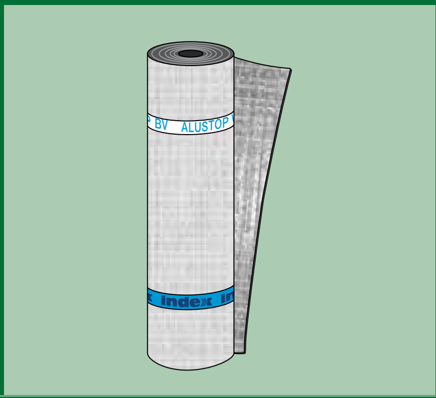


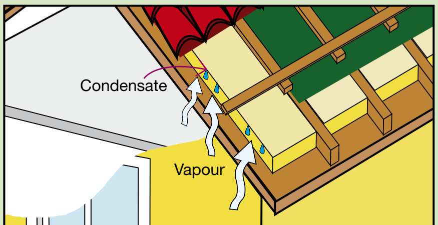
QUALIFIES FOR *LEED* CREDITS

ALUSTOP BV

SYNTHETIC SHEET FOR VAPOUR BARRIER OF THE THERMAL INSULATION OF UNDERTILE LAYERS OF VENTILATED AND UNVENTILATED ROOFS

CATEGORY	CHARACTERISTICS	ENVIRONMENTAL IMPACT							PROCEDURE FOR USE
SYNT			ASBESTOS FREE	TAR FREE	CHLORINE FREE				
SYNTHETIC	VAPOUR BARRIER	ECO GREEN	DOES NOT CONTAIN ASBESTOS	DOES NOT CONTAIN TAR	DOES NOT CONTAIN CHLORINE COMPOUNDS	RECYCLABLE	NON HAZARDOUS WASTE	DOES NOT CONTAIN USED OILS	APPLICATION WITH NAILS

1 PROBLEM/ISSUE



ROOF	☐ Flat	☒ Sloping
SUPPORT	☐ Concrete	☒ Wood

HOW TO KEEP DRY THE THERMAL INSULATION OF TILED ROOFS

The vapour that human activities produce in habitable roof-spaces, migrating to the outside through the layers of the roof, can condense in winter in the thermal insulation, reducing its insulating properties and causing the timber roof frame to rot in roofs that are not correctly ventilated.

2 SOLUTION

ALUSTOP BV vapour barrier applied before the thermal insulation prevents the passage of vapour by the barrier effect created by the metal film incorporated in the barrier, and allows the number of air changes needed and the size of the ventilation space to be reduced.
ALUSTOP BV synthetic vapour barrier sheet completes the range of undertile sheets to compose the correct layering of the roof with thermal insulation, both for ventilated roofs and for hot roofs when the insulation ventilation chamber is not present.
In the winter, the vapour barrier limits the migration of vapour from the heated interior to the colder outer layers of the roof, where it could condense, reducing the thermal capacity of the insulation and triggering degenerative processes in the wooden structures.
ALUSTOP BV synthetic sheet is bonded to a metal film that is highly resistant to the passage of vapour.

The vapour barrier reduces the need for ventilation and the cross-sections of the ventilation intakes and outlets can be reduced, as can the depth of the ventilation space.
ALUSTOP BV is composed of a polythene film covered with aluminium and reinforced with a polypropylene mesh.

FIELDS OF USE

The sheets of vapour barrier can be attached to the intrados of the rafters or to continuous board.
ALUSTOP BV is used as vapour barrier to protect the thermal insulation of tiled pitched roofs against damp.

CE — INTENDED USE OF "CE" MARKING SPECIFIED BASED ON THE AISPEC-MBP GUIDELINES

EN 13984 – LAYERS OF PLASTIC AND RUBBER FOR VAPOUR CONTROL
- ALUSTOP BV

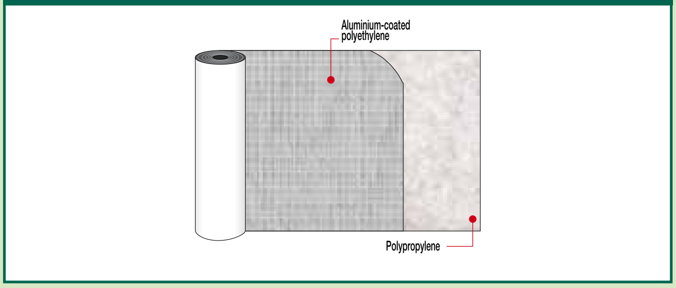
TECHNICAL FEATURES

	Regulation	T	ALUSTOP BV
Reinforcement			–
Mass per unit area	EN 1849-1	±10%	105 g/m²
Roll dimensions	EN 1848-1	≥	1.6×50 m
Maximum tensile force L/T	EN 12311-1	-20%	185/185 N/50 mm
Elongation at tensile force L/T	EN 12311-1	-15% V.A.	10/10%
Nail tear strength L/T	EN 12310-1	-30%	110/90 N
Cold flexibility	EN 1109	≤	–
Permeability to water vapour • after ageing	EN 1931 EN 1296-1931	-20% -20%	μ = 1,500,000 NPD
Water penetration • after ageing	EN 1928 EN 1296-1928		W1 –
Reaction-to-fire Euroclass	EN 13501-1		F
External fire behaviour	EN 13501-5		–
Diffusion of water vapour thickness of equivalent layer	EN 1931		440 m

The data provided are indicative mean data for current production and may be changed and updated by INDEX S.p.A. at any time, without notice. The technical information and suggestions provided represent our best knowledge of the properties of the product in use. Considering the many possible uses and the possible interference of elements not under our control, we take no responsibility for the results. The Purchaser is responsible for establishing the suitability of the product for the use envisaged.

COMPOSITION OF THE MEMBRANE

ALUSTOP BV



PRODUCT FINISHES

POLYETHYLENE COATED WITH ALUMINIUM .

POLYPROPYLENE.

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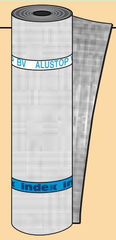
TECHNICAL SPECIFICATIONS

VAPOUR BARRIER

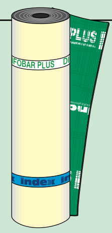
ALUSTOP BV



To protect the thermal insulation from the water vapour from habitable spaces, ALUSTOP BV will be applied: a vapour barrier of 105 g/m^2 in weight composed of a polyethylene film coated with an aluminium film and reinforced with a polypropylene mesh with water vapour permeability (ED 1931) Sd over 440 m, maximum tensile strength (EN 12311-1) L/T 185/185 N/50 mm ,elongation at maximum tensile strength (EN 12311-1) L/T 10/10% and nail tear strength (EN 12310-1) L/T 110/90 N.

TIMBER ROOFS — UNDERTILE BREATHER SHEET FOR VENTILATED ROOFS

DIFOBAR PLUS 1100 POLYESTER • applied to ventilated continuous board (*)

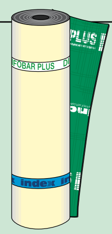


To protect the area under the roof from water and dust, and as draught proofing, a DIFOBAR PLUS POLYESTER undertile breather membrane will be applied to the continuous board before the tiles are applied: a barrier of 1,100 g/m^2 in weight and W1 class water impermeability, with the lower face of thick, absorbent, high resistance non-woven polyester fabric, with, on the upper side, a layer of bitumen polymer covered with non-woven polypropylene fabric with water vapour permeability (EN 1931) Sd=35 m, maximum tensile strength (EN 12311-1) L/T 400/350 N/50 mm, elongation at maximum tensile strength (EN 12311-1) L/T 35/35% and nail tear strength (EN 12310-1) L/T 150/150 N.

DIFOBAR PLUS POLYESTER • applied to ventilated continuous board (*)

To protect the area under the roof from water and dust, and as draught proofing, a DIFOBAR PLUS POLYESTER undertile breather membrane will be applied to the continuous board before the tiles are applied: a barrier of 700 g/m^2 in weight and W1 class water impermeability, with the lower face of thick, absorbent, high resistance non-woven polyester fabric, with, on the upper side, a layer of bitumen polymer covered with non-woven polypropylene fabric with water vapour permeability (EN 1931) Sd=35 m, maximum tensile strength (EN 12311-1) L/T 400/350 N/50 mm, elongation at maximum tensile strength (EN 12311-1) L/T 35/35% and nail tear strength (EN 12310-1) L/T 150/150 N.

DIFOBAR PLUS 550 POLYESTER • applied to ventilated continuous board (*)



To protect the area under the roof from water and dust, and as draught proofing, a DIFOBAR PLUS POLYESTER undertile breather membrane will be applied to the continuous board before the tiles are applied: a barrier of 550 g/m^2 in weight and W1 class water impermeability, with the lower face of thick, absorbent, high resistance non-woven polyester fabric, with, on the upper side, a layer of bitumen polymer covered with non-woven polypropylene fabric with water vapour permeability (EN 1931) Sd=35 m, maximum tensile strength (EN 12311-1) L/T 400/350 N/50 mm, elongation at maximum tensile strength (EN 12311-1) L/T 35/35% and nail tear strength (EN 12310-1) L/T 150/150 N.

DIFOBAR SAND 900 POLYESTER • applied to ventilated continuous board (*)

To protect the area under the roof from water and dust, and as draught proofing, a DIFOBAR SAND 900 POLYESTER undertile breather membrane will be applied to the continuous board before the tiles are applied: a barrier of 900 g/m^2 in weight and W1 class water impermeability, with the lower face of thick, absorbent, high resistance non-woven polyester fabric, with, on the upper side, a layer of bitumen polymer covered with non-woven polypropylene fabric with water vapour permeability (EN 1931) Sd=35 m, maximum tensile strength (EN 12311-1) L/T 400/350 N/50 mm, elongation at maximum tensile strength (EN 12311-1) L/T 35/35% and nail tear strength (EN 12310-1) L/T 150/150 N.

DIFOBAR OVERLAPS S.A. POLYESTER • applied to ventilated continuous board (*)

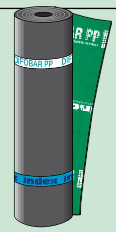
To protect the area under the roof from water and dust, and as draught proofing, a DIFOBAR OVERLAPS S.A. POLYESTER undertile breather membrane with opposing self-adhesive edges will be applied to the continuous board before the tiles are applied: a barrier of 800 g/m^2 in weight and W1 class water impermeability, with the lower face of absorbent, non-woven polyester composite fabric, with, on the upper side, a layer of bitumen polymer covered with non-woven polypropylene fabric with water vapour permeability (EN 1931) Sd=30 m, maximum tensile strength (EN 12311-1) L/T 400/350 N/50 mm, elongation at maximum tensile strength (EN 12311-1) L/T 35/35% and nail tear strength (EN 12310-1) L/T 150/150 N.

(*) Note: in layered structures marked with an asterisk, the specifications provided are for the most suitable application of the undertile sheets in question. This does not exclude the possibility of using these sheets on both roof frames and on continuous board

TIMBER ROOFS — UNDERTILE BREATHER SHEET FOR VENTILATED ROOFS

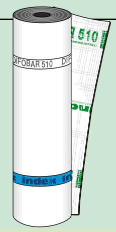
DIFOBAR 510 POLIESTERE • applied stretched on the roof frame (*)

To protect the area under the roof against water and dust, and as draught-proofing a DIFOBAR 510 POLYESTER undertile breather membrane will be applied before the tiles are applied above the ventilation space of ther thermal insulation, stretched across the roof-frame: a barrier of 400 g/m^2 in weight and W1 class water impermeability, composed of a layer of non-woven polyester fabric impregnated with bitumen polymer sandwiched between two layers of non-woven polypropylene fabric, with water vapour permeability (EN 1931) Sd=75 m, maximum tensile strength (EN 12311-1) of L/T 350/300 N/50 mm, elongation at maximum tensile strength (EN 12311-1) of L/T 40/50% and nail tear strength (EN 12310-1) of L/T 150/150 N.



DIFOBAR PP • applied stretched on the roof frame (*)

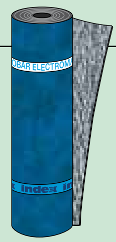
To protect the area under the roof against water and dust, and as draught-proofing a DIFOBAR PP undertile breather membrane will be applied before the tiles are applied above the ventilation space of the thermal insulation, stretched across the roof-frame: a barrier of 380 g/m^2 in weight and W1 class water impermeability, composed of a layer of bitumen polymer sandwiched between two layers of non-woven polypropylene fabric, with water vapour permeability (EN 1931) Sd=75 m, maximum tensile strength (EN 12311-1) of L/T 350/300 N/50 mm, elongation at maximum tensile strength (EN 12311-1) of L/T 40/50% and nail tear strength (EN 12310-1) of L/T 150/150 N.



TIMBER ROOFS — MULTIFUNCTIONAL UNDERTILE SHEET OR VENTILATED ROOFS

DIFOBAR ELECTROMAGNETIC POLYESTER • for protection against high frequency RF electromagnetic radiation and thermal radiation in the tile intrados.

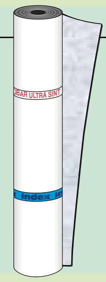
To protect the roof-space from water and dust, as draught proofing and as a shield against high frequency electromagnetic radiation and thermal radiation of the tile intrados, a DIFOBAR ELECTROMAGNETIC POLYSTER breather membrane in bitumen polymer reinforced with non-woven polyester fabric will be applied before the tiles are laid, over the ventilation space of the thermal insulation layer, stretched across the roof frame or on continuous board: a barrier of 800 g/m^2 in weight and W1 class water impermeability, with the lower face covered in non-woven polypropylene fabric and the upper face covered with a microperforated metal reflective shield with emissivity coefficient ε= 0.020, with water vapour permeability (EN 1931) Sd =20 m, maximum tensile strength (EN 12311-1) L/T 900/700 N/50 mm, elongation at maximum tensile strength (EN 12311-1) L/T 40/40% and nail tear strength (EN 12310-1) L/T 220/220 N able to exert shielding power (MIL-STD-285) of 96.5% (29dB) against 100 MHz electromagnetic radiation, 98.7% (38 dB) against 900 MHz radiation, with an attenuation of 40 dB in the field from 30 to 1000 MHz inclusive.



TIMBER ROOFS — ULTRA-TRANSPIRING SYNTHETIC UNDERTILE BREATHER SHEET FOR UNVENTILATED ROOFS

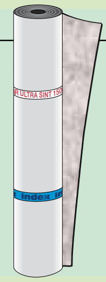
DIFOBAR ULTRA SINT 90 • applied directly on thermal insulation (*)

To protect the area under the roof from water and dust, and as draught-proofing a synthetic ultra-transpiring DIFOBAR ULTRA SINT 90 undertile breather membrane will be applied directly to the curing thermal insulation before the tiles are applied: a barrier of 90 g/m^2 in weight and W1 class water impermeability, composed of a layer of microporous polymer reinforced with a mesh in the same material sandwiched between two layers of non-woven polypropylene fabric, with water vapour permeability (EN ISO 12572:2001) Sd=0.03 m, maximum tensile strength (EN 12311-1) L/T 160/90 N/50 mm, elongation at maximum tensile strength (EN 12311-1) L/T 80/80% and nail tear strength (EN 12310-1) L/T 80/100 N.



DIFOBAR ULTRA SINT 150 • applied directly on thermal insulation (*)

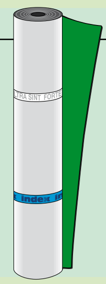
To protect the area under the roof from water and dust, and as draught-proofing a synthetic ultra-transpiring DIFOBAR ULTRA SINT 150 undertile breather membrane will be applied directly to the curing thermal insulation before the tiles are applied: a barrier of 150 g/m^2 in weight and W1 class water impermeability, composed of a layer of microporous polymer reinforced with a mesh in the same material sandwiched between two layers of non-woven polypropylene fabric, with water vapour permeability (EN ISO 12572:2001) Sd=0.02 m, maximum tensile strength (EN 12311-1) L/T 300/230 N/50 mm, elongation at maximum tensile strength (EN 12311-1) L/T 85/75% and nail tear strength (EN 12310-1) L/T 160/180 N.



CONCRETE ROOFS — ULTRA-TRANSPIRING SYNTHETIC UNDERTILE BREATHER SHEET (for curing concrete roofs)

DIFOBAR ULTRA SINT FORTE • applied directly to concrete substructure (*)

To further protect the area under the roof from water , a synthetic ultra-transpiring high mechanical resistance DIFOBAR ULTRASINT FORTE undertile breather membrane will be applied directly to the curing concrete substructure before the tiles are applied: a barrier of 160 g/m^2 in weight and W1 class water impermeability, composed of a layer of microporous polymer reinforced with a mesh in the same material sandwiched between two layers of non-woven polypropylene fabric, with water vapour permeability (EN ISO 12572:2001) Sd=0.02 m, maximum tensile strength (EN 12311-1) L/T 300/270 N/50 mm, elongation at maximum tensile strength (EN 12311-1) L/T 20/20% and nail tear strength (EN 12310-1) L/T 200/200 N.



(*) Note: in layered structures marked with an asterisk, the specifications provided are for the most suitable application of the undertile sheets in question. This does not exclude the possibility of using these sheets on both roof frames and on continuous board

Notes

Guide to undertile protection with breather sheets

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Cr - 1.000 - 8/2012