FIELD OF USE FOR 1ST-2ND-3RD DIVISION PRODUCTS

DIFOBAR

• DIFOBAR ELECTROMAGNETIC/P • DIFOBAR PLUS/P • • DIFOBAR SINT 14 • DIFOBAR/P • DIFOBAR PP • DIFOBAR 510/P • ALUSTOP BV

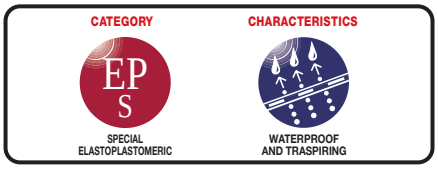
MEMBRANE MULTIFUNCTIONAL LAYER

UNDER-TILE TRANSPIRING POLYMER-BITUMEN WATERPROOFING MEMBRANES AND ACCESSORIES

PROBLEM

HOW TO INTEGRATE WATERPROOFING, RESISTANCE TO SNOW, DUST AND WIND ON A VENTILATED TIMBER ROOF COVERED WITH ROOF TILES OR IMBREX

Under-tile membranes are waterproof sheets applied to pitched roofs immediately below the layer of tiles or slates to protect the underlying structure from water, air, dust and snow which, in certain weather conditions and in the case of pitched roofs with a gradual slope, may penetrate the discontinuous tiled finish above. In roof structures open to air penetration, their primary function is to reduce the load of the wind on the tiles. In winter, water vapour coming from inside the building can form condensation on the underside of the membrane. If the thermal insulation applied underneath the membrane is not protected by a vapour barrier or has an inefficient vapour barrier (tar paper, discontinuous vapour barriers in general), it will become damp with condensation and its insulating properties will be impaired. The consequences are even more serious in the case of roofs with timber structures and curtain walling: the condensation keeps the timber damp and causes it to rot and therefore it is necessary to use waterproof membranes which also form an efficient vapour barrier. In the past, tar paper was used which was not strong enough and also subject to rot. INDEX has developed a series of new transpiring, rot-proof and strong under-tile membranes, which solve the problems of ventilated roofs.



SOLUTION

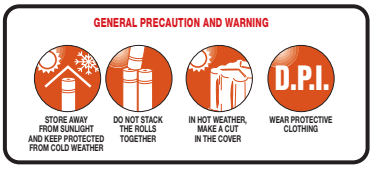
DIFOBAR is the family of transpiring waterproof membranes designed by Index for the under-tile air and water seal. The range is completed by the **ALUSTOP BV** synthetic vapour barrier membrane, which keeps the heat insulation dry and ensures correct thermo hygrometric functioning of the roof build-up.

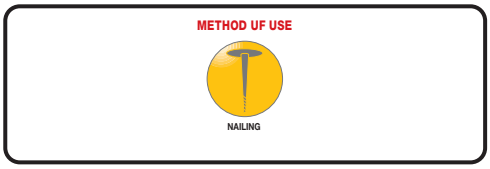
DIFOBAR PLUS/P and **DIFOBAR/P** are polymer bitumen membranes featuring a particular characteristic due to the high thickness of the reinforcement in white "non-woven" polyester fabric, which remains visible on the lower face and reinforces the transpiration of the system. The excellent absorption capacity of the fabric creates a buffer effect, retaining any excess moisture that has condensed below the membrane and eliminating it from the build-up by force of gravity so that it is conveyed to the gutter. This prevents dripping onto the underlying layers and keeps the timber dry, impeding rotting. Both membranes feature excellent resistance to tensile stress and nail tearing, which means they can also be laid in strips without a support surface. **DIFOBAR PLUS/P** features excellent fire resistance qualities and the upper face is covered with green "non-woven" fabric with low heat absorption. The upper face of **DIFOBAR/P** is coated with talc with a patented system.

The underside of **DIFOBAR 510/P**, **DIFOBAR PP**, **DIFOBAR SINT 14**, and **DIFOBAR ELECTROMAGNETIC/P** is covered with "non-woven" fabric which is less thick than that of the other types but in any case provides beneficial "anti-drip" action, eliminating the excess moisture from the layers.

DIFOBAR PP is made of a polymer bitumen film set between two layers of "non-woven" polypropylene fabric, one black and one green, and is suitable for laying on a continuous board. **DIFOBAR 510/P**, on the other hand, is covered with two layers of white "non-woven" polypropylene and reinforced with "non-woven" polyester fabric, giving it greater strength so that it can also be laid in strips without a support surface. The exceptional transpiration capacity of the **DIFOBAR SINT 14** membrane, which can eliminate more than 900 g/m^2 of vapour per day, is due to the particular porous structure of the polymer foil which forms its core, protected on both sides with "non-woven" polypropylene fabric which is green on one side and white on the other. Thanks to its excellent diffusion capacity, the membrane can be laid in a build-up without ventilation and directly on the heat insulation layer, and in any case always on a continuous laying surface. **DIFOBAR ELECTROMAGNETIC/P** is the transpiring waterproof polymer bitumen membrane with the integrated functions of fire resistance and protection against electromagnetic fields, a problem which is described in the following pages. The upper face is made of a screen that reflects the electromagnetic waves generated by radio antennas or electric power lines, which is suitably perforated to maintain the necessary characteristics of transpiration. The reinforcement is single strand "non-woven" polyester fabric featuring high tensile strength and tearing resistance as well as excellent resistance to puncturing, so that it can be laid on a continuous surface or in strips without support surface. The underside is covered with light blue "non-woven" polypropylene fabric and it is applied with the reflecting face towards the roof tiles.

ALUSTOP BV is a multilayer synthetic sheet interplaced with an aluminium film which acts as a vapour barrier. The metallised surface is thermo-reflecting and contributes to the heat insulation of the under-tile area when it remains exposed in the intrados of the roof (see laying system no. 3). Situated on the open face of the heat insulation, it preserves the underlying layers from the risk of condensation. It features good resistance to tearing, allowing it to be mechanically fixed.





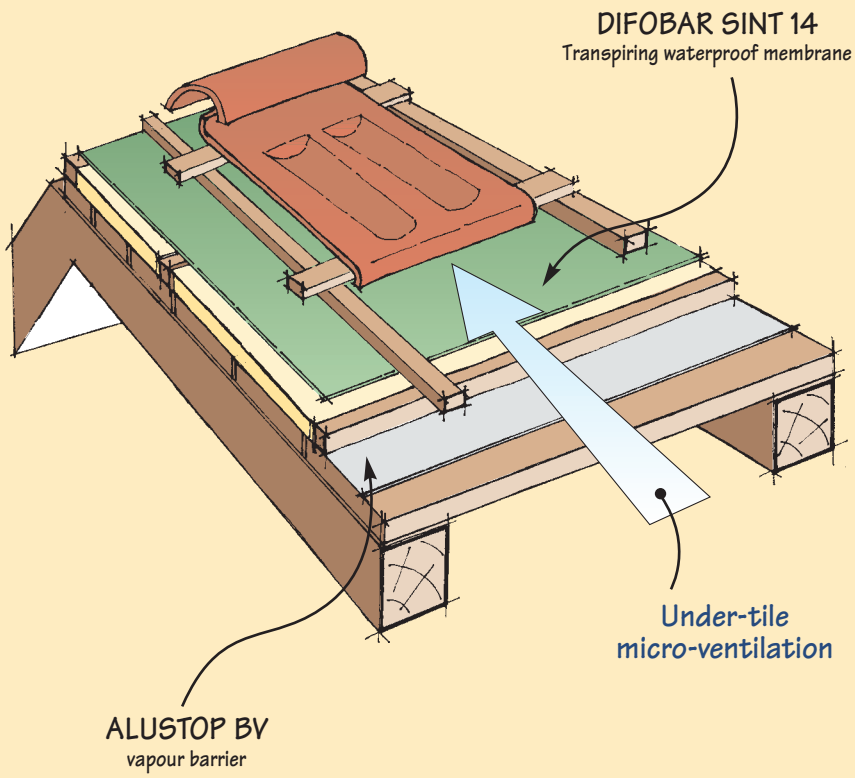
index
Construction Systems and Products

1st DIVISION
1st LINE

1

IN DIRECT CONTACT WITH THE INSULATION

• "HOT ROOF" •

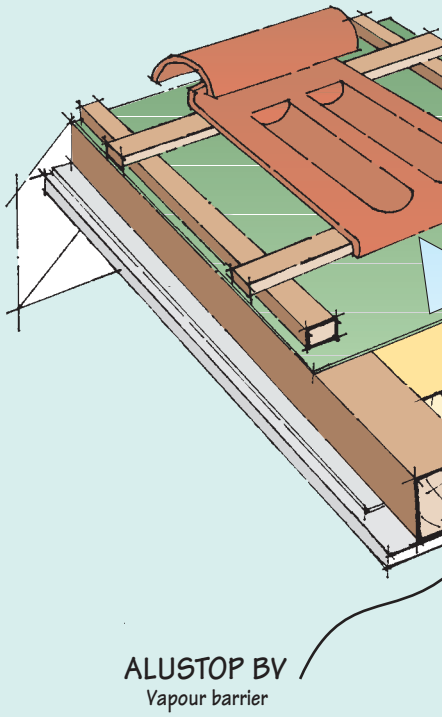


In the hot roof build-up, without ventilation air space, a vapour barrier such as ALUSTOP BV is needed to impede the migration of moisture into the heat insulation. To prevent the accumulation of vapour, which must in any case get through the barrier, the heat insulation must be protected by a waterproof sheet that also has high permeability to water vapour in order to enable rapid diffusion towards the outside. The DIFOBAR SINT 14 waterproof membrane has such a high level of transpirability that it can be placed directly on the insulation even if the insulation is not ventilated.

2

ON WOO

• "VENTILAT

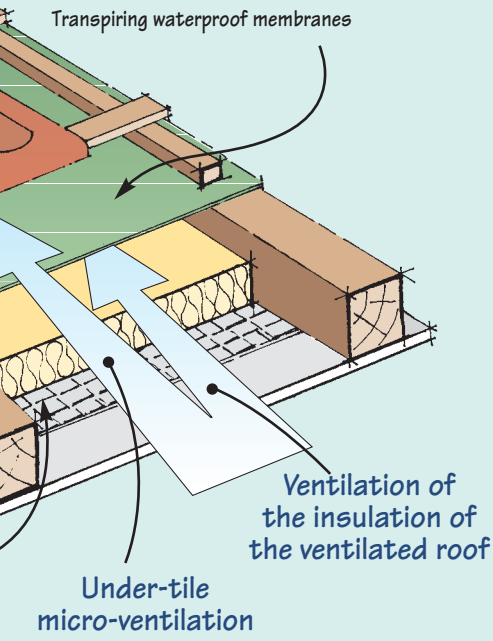


In the build-up of the "cold roof" or "ventilated roof", the presence of an ALUSTOP BV vapour barrier is necessary in the roofing of spaces with high moisture levels where, under certain atmospheric conditions, there is a risk of water vapour condensation. The diffusion of the water vapour through the ventilation air space is added to the transpirability of the waterproof membranes DIFOBAR P, DIFOBAR PLUS, DIFOBAR 510, and DIFOBAR ELECTROMAGNETIC to guarantee that the system functions correctly. These membranes have

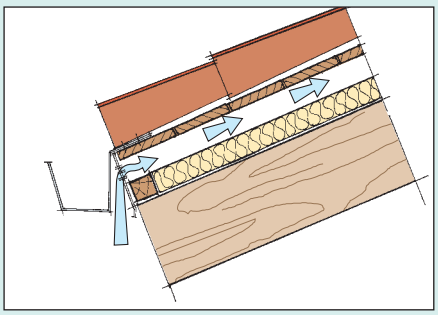
systems

2
D BEAMS
TED ROOF" •

DIFOBAR ELECTROMAGNETIC/P
DIFOBAR PLUS/P
DIFOBAR /P
DIFOBAR 510/P



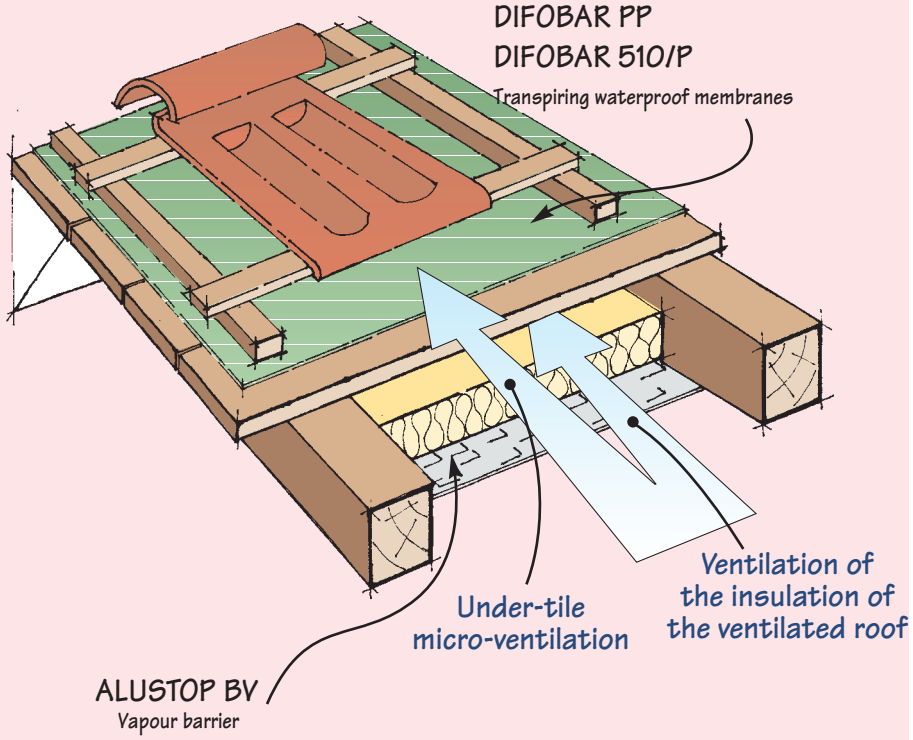
the necessary mechanical resistance to be laid in strips with mechanical fixing without the need to construct a support surface.



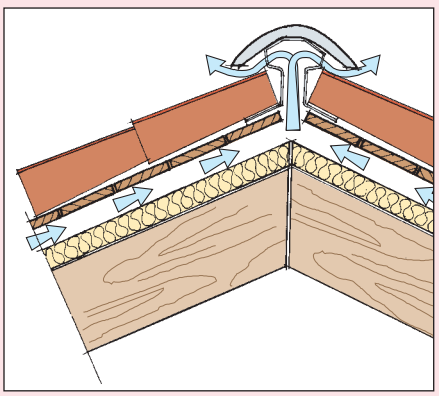
Ventilation entry from the gutter line

3
ON WOOD BEAMS
• "VENTILATED ROOF" •

DIFOBAR ELECTROMAGNETIC/P
DIFOBAR PLUS/P
DIFOBAR SINT 14
DIFOBAR /P
DIFOBAR PP
DIFOBAR 510/P

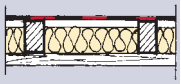
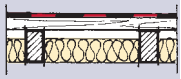
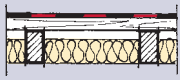
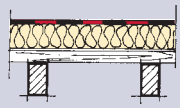
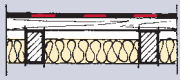
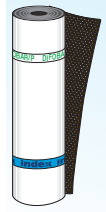
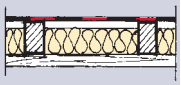
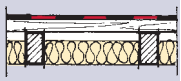
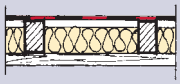
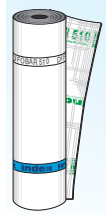
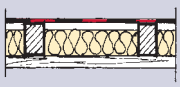
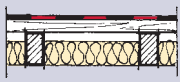
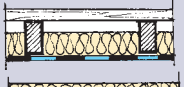
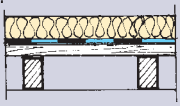


When the waterproof sheet is placed on a board with underlying ventilation air space, all the DIFOBAR types can be used, because vapour diffusion is aided by the ventilation and also because the waterproof sheets lay on the support surface and are less subject to mechanical stress than in the previous example. The heat insulation of a non-inhabited under-roof area (without support surface) must in any case be protected by the ALUSTOP BV thermo-reflecting vapour barrier fixed mechanically to the intrados of the roof beams, which contributes to the air seal of the system.



Ventilation exit from the rooftop line

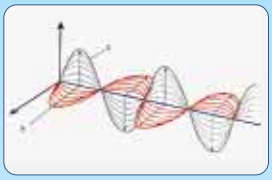
The products

	Surface finishes	Specifications	ADVANTAGES	Reference to laying systems
		**• DIFOBAR ELECTROMAGNETIC/P •** Transpiring waterproof polymer bitumen membrane for the under-tile space of ventilated roofs, weight 800 g/m², reinforced with fire resistant "non-woven" single strand polyester fabric, with the integrated function as a screen against electromagnetic waves generated by radio-TV repeaters, telecommunications systems, and electric power lines. Permeability to water vapour as per EN 1931 Sd=4.80 m, RF electromagnetic screening power 30÷1.000 MHz = 40 dB and attenuation of ELF electrical field at 50 Hz: 9 V/m to 0.2 V/m. Upper face: Reflecting electromagnetic screen Underside: light blue "non-woven" polypropylene fabric	• High mechanical resistance. • Protects from both electromagnetic waves and fire. • Reflective, contributing to heat insulation.	2  3 
		**• DIFOBAR PLUS/P •** Transpiring waterproof polymer bitumen membrane for the under-tile space of ventilated roofs, fire resistant, weight 700 g/m², reinforced with absorbent "non-woven" polyester fabric visible on the underside. Permeability to water vapour as per EN 1931 EN1931 Sd=2.40 m, fire resistance on wooden board as per prEN 1187 ⁄ 3 ≤55 cm cm and resistance to tearing L/T=180/180 N as per EN12310-1. Upper face: Green "non-woven" polypropylene fabric Underside: White "non-woven" polypropylene fabric	• High mechanical resistance. • Good resistance to fire. • Absorbent upper face which keeps the wood dry.	2  3 
		**• DIFOBAR SINT 14 •** Waterproof polymeric membrane set between two highly transpiring sheets of "non-woven" polypropylene fabric for the under-tile area of roofs, also non-ventilated roofs, weight 150 g/m². Permeability to water vapour as per EN1931 WDD = 946g/m² 24h and Sd=0.03 m. Upper face: Green "non-woven" polypropylene fabric Underside: White "non-woven" polypropylene fabric	• Very high breathability. • Can be used on both ventilated roofs and hot roofs laid on insulation.	1  3 
		**• DIFOBAR/P •** Transpiring waterproof polymer bitumen membrane for the under-tile space of ventilated roofs, weight 800 g/m², reinforced with absorbent "non-woven" polyester fabric visible on the underside. Permeability to water vapour as Sd=2.60m, resistance to tearing L/T=160/150 N as per EN 12310-1 and tensile strength L/T=700/400 N/50 mm as per EN 12311-1. Upper face: Polymer bitumen and serigraphed talcing Underside: White "non-woven" polyester fabric	• Good mechanical resistance. • Absorbent lower face which keeps the wood dry.	2  3 
		**• DIFOBAR PP •** Transpiring waterproof polymer bitumen membrane for the under-tile space of ventilated roofs, weight 430g/m², made of oxidized bitumen covered on both sides with "non-woven" polypropylene fabric. Permeability to water vapour as per EN 1931 Sd=7.38 m. Faccia superiore: Green "non-woven" polypropylene fabric Underside: Black "non-woven" polypropylene fabric	• Product in 1.25 m length compared to the 1 m of other bituminous sheets.	2 
		**• DIFOBAR 510/P •** Transpiring waterproof polymer bitumen membrane for the under-tile space of ventilated roofs, weight 410 g/m², made of oxidized bitumen, reinforced with "non-woven" polyester and covered on both sides with white "non-woven" polypropylene fabric. Permeability to water vapour as per EN1931 Sd=3.65 m and resistance to tearing L/T=160/150 N as per EN 12310-1. Upper face: White "non-woven" polypropylene fabric Underside: White "non-woven" polypropylene fabric	• Economical but good mechanical resistance.	2  3 
		**• ALUSTOP BY •** Multilayer synthetic thermo-reflecting sheet for the vapour barrier of heat insulation in build-ups under ventilated and non-ventilated roofs, weight 105 g/m². Permeability to water vapour as per EN 1931 Sd =1.00 m. Upper face: Reflecting metallic film Underside: Support in white polyethylene	• Reflective vapour barrier, thus it also contributes to heat insulation.	1  2  3 

Insulation from electromagnetic fields with
DIFOBAR ELECTROMAGNETIC

THE PROBLEM OF ELECTROMAGNETIC FIELDS (EMF)

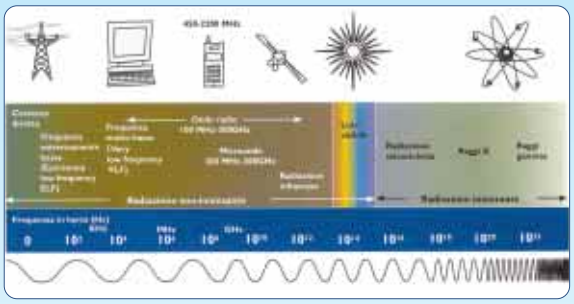
HOW TO PROTECT THE ROOF FROM ELECTROMAGNETIC RADIATION PRODUCED BY RADIO ANTENNAS OR TELEVISION RELAY STATIONS



The presence in Italy of approximately 10,000 transmitter stations for cellphones and over 60,000 aerials transmitting radio and television programs has led to the approval of act n. 36 of the 26th of February 2001 for the protection of the population against electromagnetic pollution as the estimates reckon that more than 200,000 Italians are exposed to emissions which are over the accepted limit of 0.5 m microtesia above which it is believed that this form of pollution can be dangerous.

Electromagnetic waves can be caused by natural phenomena such as the sun or the stars, the earth itself generates a magnetic field, or they can be produced by artificial sources such as electrical power lines, household appliances, telecommunications systems and cellphones, etc. These are the source of oscillations in electrical charges which produce electric and magnetic fields that disperse in the air in the form of waves where the magnetic and electric fields oscillate at right angles to the direction of the wave.

It is the frequency, in other words the number of oscillations per second, that characterises each electromagnetic wave: light for example is an electromagnetic wave like x-rays and radio waves. The higher the frequency, the more energy the wave carries. The complete range of all electromagnetic waves and frequency variations is called the electromagnetic spectrum.



As can be seen in the illustration the spectrum can be divided into two areas:

- NIR or Non Ionising Radiation
- IR or Ionising Radiation

depending on whether the energy carried by the electromagnetic waves is more or less capable of ionising the atoms, in other words of attracting their electrons and therefore breaking the atomic bonds which hold the molecules of the cells together. Non-ionising radiation includes the frequencies up to visible light. Ionising radiation includes the part of the spectrum ranging from ultraviolet light to gamma rays.

When the term electromagnetic pollution or electrosmog is used, this refers to non-ionised electromagnetic radiation with a frequency lower than that of infrared light. Non-ionised radiation can be divided into two groups of frequencies in relation to the possible effects of the waves on living organisms.

Different mechanisms for interacting with living matter are associated with the two different groups as well as different potential risks for humans.

High frequency fields or Radio Frequencies (RF) lose energy to tissue by heating it. Low frequency fields or Extremely Low Frequencies (ELF) induce currents in the human body.

Frequenze estremamente basse	ELF (Extremely Low Frequencies)	0 Hz-300 Hz	Linee elettriche, elettrodomestici, ecc.
Radiofrequenze	RF	300 Hz-300 GHz	Cellulari, ripetitori, radioTv, forni a microonde, ecc.

The regulations

The national regulations consider Elf (Extremely Low Frequencies) radiation separately from RF (Radio Frequencies) radiation. Currently the following laws are in force: general policy law on the protection from exposure to electric, magnetic and electromagnetic fields.

For low frequencies (ELF) the following laws are in force:

- Decree of the President of the Council of Ministers of the 23rd of April 1992: "Maximum limits of exposure to electric and magnetic fields generated at the nominal industrial frequency (50Hz) in homes and outdoors"
- Decree of the President of the Council of Ministers of the 28th of September 1995: "Procedural and Substantive Rules for the implementation of the Decree of the President of the Council of Ministers of the 23rd of April 1992 relevant to electrical power lines". The limits of exposure indicated in Decree of the President of the Council of Ministers of the 23rd of April 1992 coincide with the levels of reference indicated in the Recommendations of the Council of the European Union n. 199/519/CE of the 12/7/99.

For high frequencies (RF)

- Decree of the Minister for the Environment of the 10th of September 1998, n. 381: "Rules with the regulations for determining the threshold of radio frequency compatible with the health of humans".

The above decree n. 381 in article 4, paragraph 3, indicates that the regions are responsible for the installing and modifying radio communications plants.

On the subject of the protection from electromagnetic radiation there are also the decrees of the Regional and Municipal authorities that are responsible for regulating the installation of plants and the exposure of the population to electromagnetic fields.

(Excerpt from ARPAV publications)

SOLUTION

DIFOBAR ELECTROMAGNETIC is a transpiring under-tile membrane developed by Index S.p.A. which also has the function of protection from electromagnetic waves.

The **DIFOBAR ELECTROMAGNETIC** membrane has been tested according to the severest military specifications LIL-STD-285 (method of Military standard attenuation measurements for enclosures, electromagnetic shielding, for electronic test purposes) using the SEMS (Shielding Effectiveness Measuring System) equipment for measuring the SE (Shielding Effectiveness) of screened materials. The membrane has proved to possess a high screening capacity for both RF high frequency electromagnetic waves and ELF waves generated by electrical fields at low frequency (50 Hz). Therefore, when installed on the roofs of buildings they will offer a high level of protection to the areas below. (Note: Protection against the electrical fields generated by power lines at 50 Hz has not been proven.)

The upper face of the sheet consists of an electromagnetic screen which is suitably perforated to maintain the transpiration characteristics necessary for its particular use.

Thanks to the reflecting surface, it also contributes to the heat insulation of the roof. It acts like a Thermos, reflecting the heat emitted from the tiles in summer and reducing the dispersion of inside heat in winter.

DIFOBAR ELECTROMAGNETIC also features greater fire resistance than that of normal under-tile sheets. It passes the fire test according to the Swedish standard SS024824-NT FIRE 006 NORD TEST, which has been homologated as a design for European standard prEN1187/3.

It provides resistance to fire from the outside generated by sparks that may fall on the sheet during construction or between the fissures of the tile layer once the roof is finished.

METHOD OF USE AND PRECAUTIONS

The membrane is part of an often complex stratigraphy, made up of different types of layers with different functions, which are often discontinuous and interact with each other. The high quality of the membrane alone is not enough to guarantee the successful implementation or the durability of waterproofing work in time, which are in fact the result of an inseparable combination of planning and the thorough knowledge of the build-up behaviour which makes it possible to choose exactly the right materials for the job with a correct and attentive installation of the same, along with a meticulous attention to detail. Therefore, we advise the reader to study the laying methods, the behaviour of the materials and the connections between layers in depth, by consulting the handbooks published by Index S.p.A.

TECHNICAL CHARACTERISTICS

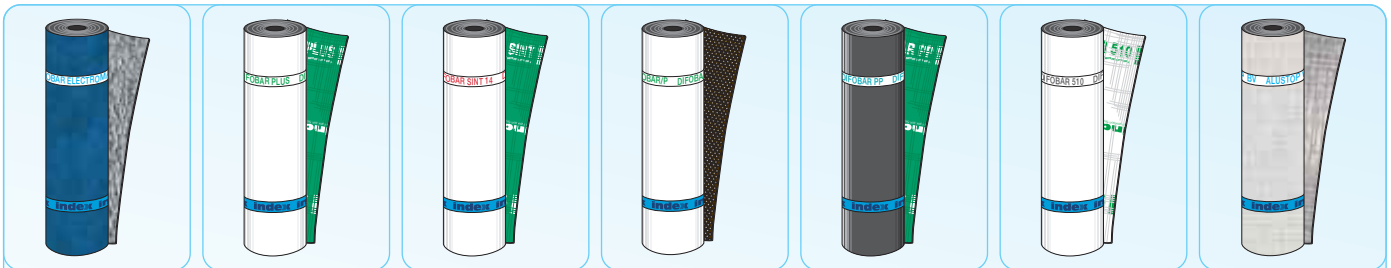
	DIFOBAR ELECTROMAGNETIC/P	DIFOBAR PLUS/P	DIFOBAR SINT 14	DIFOBAR P	DIFOBAR PP	DIFOBAR 510/P	ALUSTOP BV
Aeric mass (EN 1849/1)	800 g/m²	700 g/m²	150 g/m²	800 g/m²	430 g/m²	410 g/m²	105 g/m²
Dimensional stability in hot conditions (EN 1110)	150°C	150°C	-	150° C	150° C	150°C	-
Flexibility in cold conditions (EN 1109)	-30°C	-30°C	-	-20°C	-30°C	-30°C	-
Tensile strength L/T (EN 12311-1) (¹)	900/700 N/50 mm	750/550 N/50 mm	230/180 N/50 mm	700/400 N/50 mm	250/180 N/50 mm	430/380 N/50 mm	100 N/50 mm
Ultimate elongation L/T (EN 12311-1) (¹)	40/40%	45/45%	60/70%	40/40%	-	35/45%	-
Resistance to tearing (max. load) (EN 12310-1)	220/220 N	180/180 N	95/95 N	160/150 N	95/85 N	160/150 N	90 N
Permeability to water vapour (EN 1931)							
• S d	4,80 m	2,40 m	0,03 m	2,60 m	7,38 m	3,65 m	100 m
• μ	3.000	2.020	36	2.600	8.400	5.600	400.000
Fire resistance Pr (EN 1187 | 3) Limit 55 cm) on wood (cm)							
• on wood (cm)							
- wind speed 2 m/s	28 OK	41 OK					
- wind speed 4 m/s	15 OK	27 OK					
• on mineral wool (cm)							
- wind speed 2 m/s	35 OK	57 NO					
- wind speed 4 m/s	25 OK	45 OK					
SHIELDING EFFECTIVENESS (MIL-STD-285) (*)							
Screening power							
• 100 MHz	96,5% 29 dB						
• 900 MHz	98,7% 38 dB						
• 30÷1000 MHz	40 dB						
Attenuation of electric field at 50 Hz	97,7% 33,06 dB						
	da 9 V/m a 0,20 V/m						

(¹) Tolerances on the nominal value in compliance with UEAtc regulations of January 1984 for polymer bitumen membranes.
(*) SINAL accredited laboratory. Certification no. RP009302 of 03-07-02.

INDEX's exclusive production systems are covered by registered patents.

ring the numerous possible uses and the possible interference of conditions or elements beyond our control, we assume no responsibility regarding the results which are obtained. The purchasers, of their own accord and under their own responsibility, must establish the suitability of the product for the envisaged use.

DIMENSIONS AND PACKAGING



DIFOBAR ELECTROMAGNETIC/P			DIFOBAR PLUS/P			DIFOBAR SINT 14			DIFOBAR P			DIFOBAR PP			DIFOBAR 510/P			ALUSTOP BV		
Weight kg/m²	Size of rolls m	N. rolls per pallet	Weight kg/m²	Size of rolls m	N. rolls per pallet	Weight kg/m²	Size of rolls m	N. rolls per pallet	Weight kg/m²	Size of rolls m	N. rolls per pallet	Weight kg/m²	Size of rolls m	N. rolls per pallet	Weight kg/m²	Size of rolls m	N. rolls per pallet	Weight kg/m²	Size of rolls m	N. rolls per pallet
0,8	1×30	25	0,7	1×30	25	0,15	1,5×30	25	0,8	1×30	25	0,45	1,25×50	30	0,4	1×50	30	0,16	1,5×50	50

The figures shown are average indicative figures relevant to current production and may be changed or updated by INDEX S.p.A at any time without previous warning. The advice and technical information provided, is what results from our best knowledge regarding the properties and the use of the product. Conside

- FOR ANY FURTHER INFORMATION OR ADVICE ON PARTICULAR APPLICATIONS, CONTACT OUR TECHNICAL OFFICE
- IN ORDER TO CORRECTLY USE OUR PRODUCTS, REFER TO INDEX TECHNICAL SPECIFICATIONS

index
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Environmental Management Systems index UNI EN ISO 14001

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