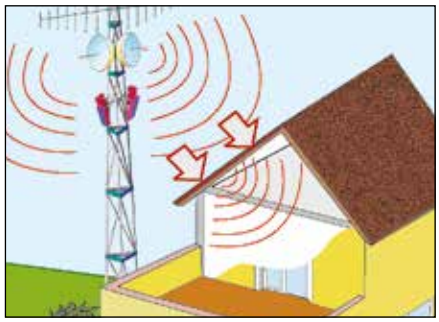
MINERAL ELECTROMAGNETIC SCUTUM POLYESTER ELECTROMAGNETIC BARRIER/V

MULTIFUNCTIONAL ELASTOPLASTOMERIC BITUMEN-POLYMER WATERPROOFING MEMBRANE MADE OF DISTILLED BITUMEN, PLASTOMERS AND ELASTOMERS, WITH A METAL ELECTROMAGNETIC SHIELD FOR PROTECTING ROOFS AGAINST THE ELECTROMAGNETIC FIELDS OF RADIO ANTENNAS, TV RELAY STATIONS, AND ELECTRICAL POWER LINES (ELECTROSMOG)

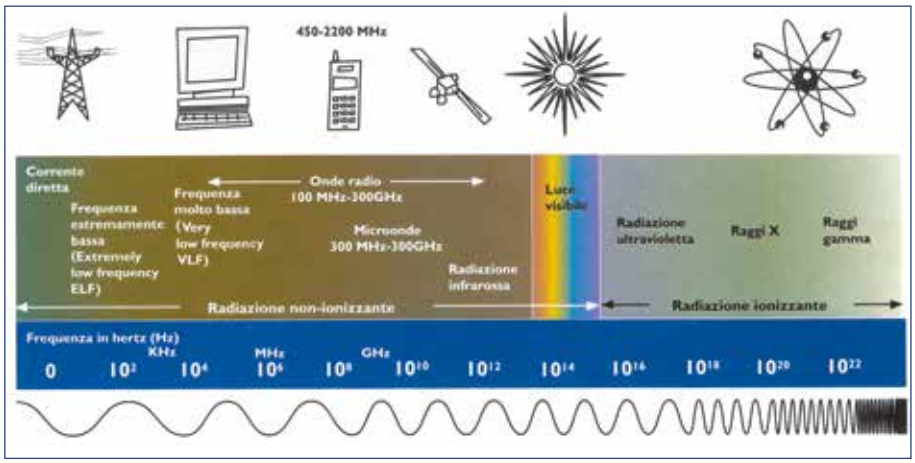
GRANTS *LEED* CREDITS

1 PROBLEM



HOW TO PROTECT ROOFS AGAINST THE ELECTROMAGNETIC RADIATION PRODUCED BY RADIO ANTENNAS AND TV RELAY STATIONS

The presence in Italy of approximately 10,000 transmitter stations for cell-phones 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 cell-phones, 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.

THE REGULATION

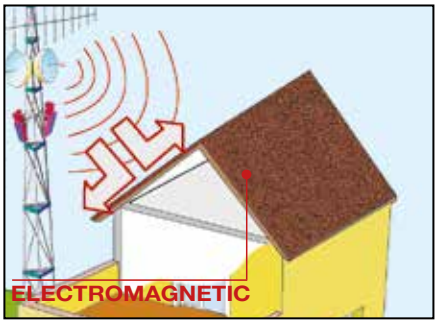
National regulations make a distinction between ELF (Extremely Low Frequency) radiation and RF (High Frequency) radiation. At the moment the following laws are in force in Italy:
Act n. 36 of the 22nd of February 2001, Law for the protection from exposure to magnetic, electric or electromagnetic fields.
For the low frequencies (ELF) the following law is in force:
- Prime Minister's Decree of the 23rd of April 1992 "Maximum limits of exposure to electric and magnetic fields generated at the nominal industrial frequency (50 Hz) in the home or in the environment".
- Prime Minister's Decree of the 28th of September 1995: "Technical rules of procedure for the implementation of the Prime Minister's Decree of the 23rd of April 1992 relevant to long-distance power lines.

The limits of exposure indicated in Prime Minister's Decree of the 23rd of April 1992 are the same levels indicated in the European Council's recommendation n. 1999/519/CE of the 12th of July 1999.
For the high frequencies (RF):
- Decree n. 381 of the Ministry of the Environment dating 10th of September 1998: "Rules and regulations for determining the limits of radio frequencies compatible with the health of humans".

The above-mentioned decree n. 381 in article 4 paragraph 3 establishes the competence of the regional authorities on the question of installations and modifications relevant to radio communications systems.
On the subject of the protection from electromagnetic radiation there are also the Decrees of the Regional Authorities and the Local Authorities are given the power to regulate the installation of systems and to monitor the exposure of the population to electromagnetic fields.

CATEGORY	CHARACTERISTICS			ENVIRONRMENTAL							METHOD OF USE		
SPECIAL ELASTOPLASTOMERIC FOR SPECIFIC USES	WATERPROOF	ELECTROMAGNETIC SCREEN	REACTION TO FIRE	ECO GREEN	ASBESTOS FREE	TAR FREE	CHLORINE FREE	RECYCLABLE	NON DANGEROUS WASTE	EXHAUSTED OIL FREE	TORCH APPLICATION	HOT AIR APPLICATION	NAILING

2 SOLUTION



MINERAL ELECTROMAGNETIC SCUTUM POLYESTER and **BARRIER/V** are the waterproofing membranes designed by INDEX as a protective layer against electromagnetic waves. Both the membranes have a continuous screen made of a special metallic alloy capable of screening electromagnetic fields. The metallic screen is protected by a specific elastoplastomeric compound made of distilled bitumen, selected for industrial use, with a high content of elastomeric and plastomeric polymer additives to obtain a phase inversion compound whose continuous phase is formed by polymers in which the bitumen is dispersed. The performance of the bitumen is therefore incremented along with the durability and the resistance to high and low temperatures while the already optimum adhesive and impermeable qualities of the bitumen remain unchanged.

ELECTROMAGNETIC BARRIER/V is further reinforced with highly stable, rot-proof fibreglass mat and the upper face is coated with serigraphed talc. The extra thickness of the metallic screen of **BARRIER/V** provides a high level of resistance also to the passage of water vapour.

MINERAL ELECTROMAGNETIC SCUTUM POLYESTER is reinforced with rot-proof, elastic, "non-woven" single strand polyester fabric with a high resistance to tensile stress and puncturing. The upper face is protected with hot-bonded pressed slate chips with the exception of the overlapping lateral strips without slate chips and protected with Flamina, a film that melts when the joint is torched. The underside of both membranes is coated with Flamina, a plastic film that melts when torched, suitably embossed to obtain the appropriate pre-tension and the optimal retraction of the film, guaranteeing rapid installation and reliable adhesion.

APPLICATION FIELDS

MINERAL ELECTROMAGNETIC SCUTUM POLYESTER, ELECTROMAGNETIC BARRIER/V membranes have 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 membranes have proved to possess a high screening capacity for RF high frequency electromagnetic waves and good attenuation of the electrical field at 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.)

ELECTROMAGNETIC BARRIER/V should be used in build-ups where heat insulation materials will be installed and it is an effective vapour barrier as well as protecting the areas below from electromagnetic waves.

MINERAL ELECTROMAGNETIC SCUTUM POLYESTER, on the other hand, can be used as the last layer of visible coverings on both new buildings and the refurbishment of old waterproof layers where you wish to add the protective element against electromagnetic waves.

METHOD OF USE AND PRECAUTIONS

The efficiency of the protective screen of the membranes does not depend on their being earthed.

The **BARRIER/V** type should not be installed in a waterproofing layer but rather is used in the place of a vapour barrier. **MINERAL ELECTROMAGNETIC SCUTUM POLYESTER** and **ELECTROMAGNETIC BARRIER/V** can be used in the same build-up.

INTENDED USE OF "CE" MARKING SPECIFIED ACCORDING TO THE AISPEC-MBP GUIDLINES

EN 13707 - REINFORCED BITUMEN SHEETS FOR ROOF WATERPROOFING

• Upper layer in multi-layer systems without permanent heavy surface protection

- MIN. ELECTROMAGNETIC SCUTUM POLYESTER

EN 13859-1 - UNDERLAY FOR DISCONTINOUS ROOFING

- MIN. ELECTROMAGNETIC SCUTUM POLYESTER

EN 13970 - BITUMEN WATER VAPOUR CONTROL LAYERS

- ELECTROMAGNETIC BARRIER/V

ADVANTAGES

- **A single product protects from both water and electromagnetic fields.**
- **ELECTROMAGNETIC doesn't need to be earthed.**
- **The metallic screen of MINERAL ELECTROMAGNETIC SCUTUM POLYESTER also protects the waterproof layer from fire.**
- **The metallic screen of ELECTROMAGNETIC BARRIER/V also acts as a vapour barrier.**

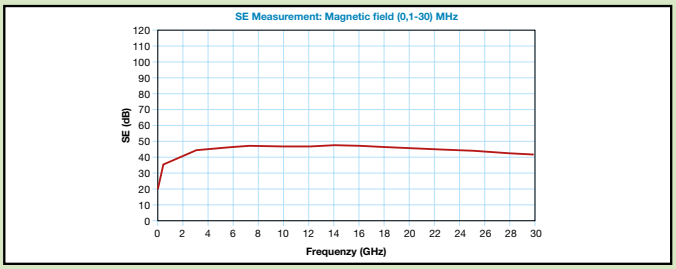
CERTIFICATION

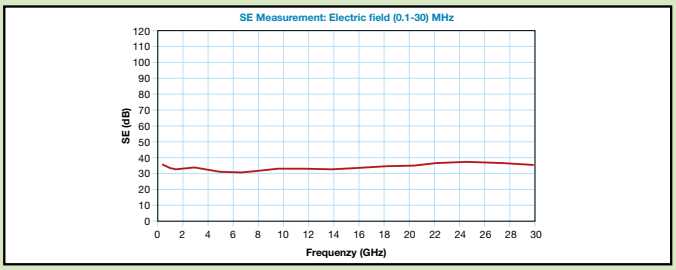
SINAL accreditated laboratory

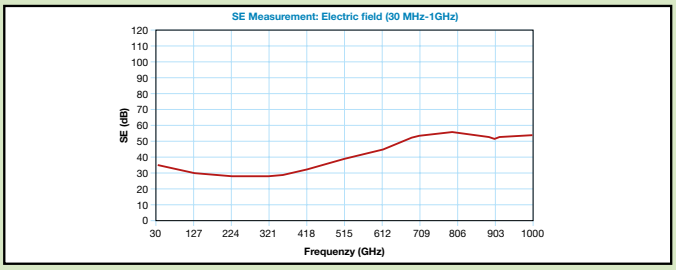
TECNOLAB

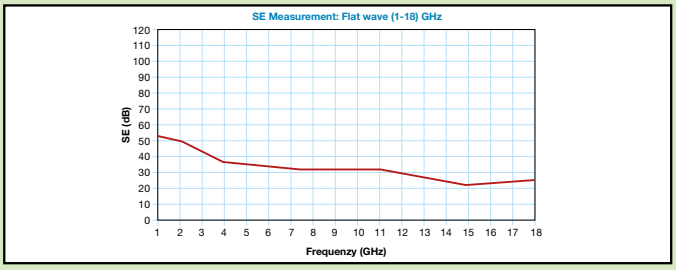
TEST RESULTS

MINERAL ELECTROMAGNETIC SCUTUM POLYESTER



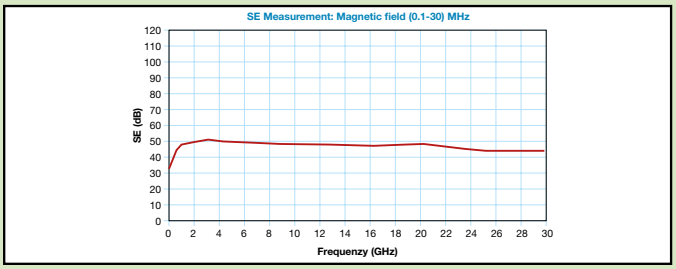


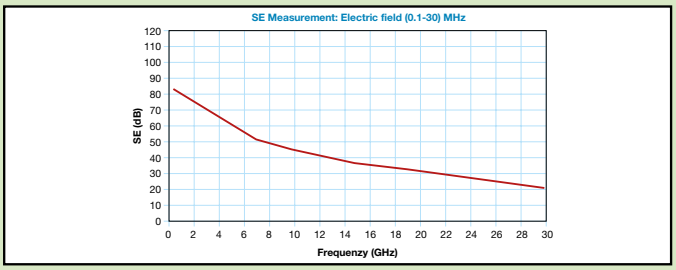


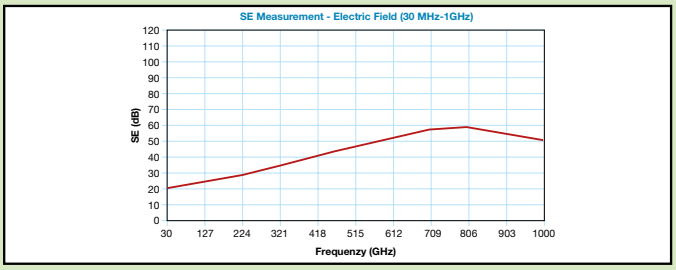


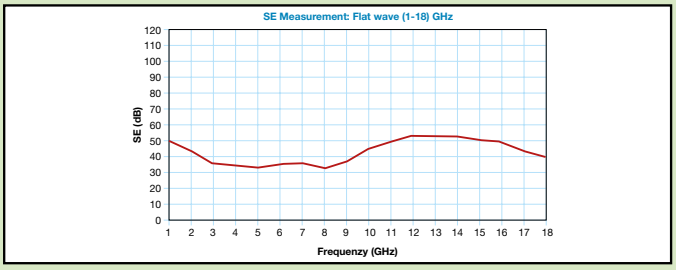
From the graphs it is possible do draw the following conclusions:
- **Screening power 100 MHz: 31 dB; 97,2%**
- **Screening power 900 MHz: 51 dB; 99,7%**
- **Screening power 30÷1000 MHz: 37-53 dB**
- **Attenuation of electric field at 50 Hz: 20,05 dB; 90,1% from 9 V/m to 0,85 V/m**

ELECTROMAGNETIC BARRIER/V









From the graphs it is possible do draw the following conclusions:
- **Screening power 100 MHz: 22 dB; 92,1%**
- **Screening power 900 MHz: 51 dB; 99,7%**
- **Screening power 30÷1000 MHz: 20-49 dB**
- **Attenuation of electric field at 50 Hz: 32,24 dB; 97,5% from 9 V/m to 0,22 V/m**

Screening power 30÷1000 MHz

MINERAL ELECTROMAGNETIC SCUTUM POLYESTER

37÷53 dB

which means a significant reduction of the electromagnetic field

70÷450 times

ELECTROMAGNETIC BARRIER/V

20÷49 dB

which means a significant reduction of the electromagnetic field

10÷300 times

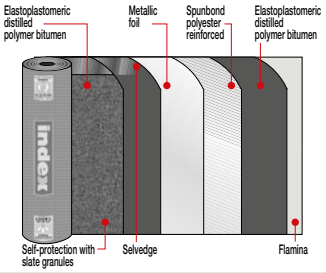
TECHNICAL CHARACTERISTICS

	Standard	T	MINERAL ELECTROMAGNETIC SCUTUM POLYESTER	ELECTROMAGNETIC BARRIER/V
Reinforcement			"Non-woven" Spunbond polyester and metallic alloy foil	Fibeglass and metallic alloy foil
Thickness	**EN 1849-1**	±0,2	–	4 mm
Mass per unit area MINERAL	**EN 1849-1**	±15%	4.5 kg/m²	–
Roll size	**EN 1848-1**	–1%	1×10 m	1×10 m
Watertightness	**EN 1928 – B**	≥	60 kPa	60 kPa
Shear resistance L/T	**EN 12317-1**	–20%	–	NPD
Maximum tensile force L/T • after ageing	**EN 12311-1**	–20%	900/700 N 50 mm NPD	450/350 N 50 mm –
Elongation L/T • after ageing	**EN 12311-1**	–15% V.A.	40/40% NPD	3/3% –
Resistance to impact	**EN 12691 – A**		–	700 mm
Resistance to tearing (nail shank) L/T	**EN 12310-1**	–30%	220/220 N	70/70 N
Dimensional stability L/T	**EN 1107-1**	≤	NPD	–
Flexibility to low temp. • after ageing	**EN 1109** **EN 1296-1109**	≤ +15°C	–15°C –5°C	–10°C –
Flow resist. at high temp. • after ageing	**EN 1110** **EN 1296-1110**	≥ –10°C	120°C 110°C	120°C –
Water vapour transmission • after ageing	**EN 1931** **EN 1296-1931**	–20% –20%	– –	μ = 1 500 000 NPD
Res. to water penetration • after ageing	**EN 1928** **EN 1296-1928**		W1 W1	– –
Reaction to fire Euroclass	**EN 13501-1**		E	E
External fire performance	**EN 13501-5**		F roof	–
SHIELDING EFFECTIVENESS (**MIL-STD-285**)				
• Screening power	100 MHz		97.20% 31.00 dB	92.10% 22.00 dB
• Screening power	900 MHz		99.70% 51.00 dB	99.70% 51.00 dB
• Screening power	30÷1 000 MHz		37-53 dB	20-49 dB
• Attenuation of electric field	50 Hz		90.10% 20.05 dB 9÷0.85 V/m	97.50% 32.24 dB 9÷0.22 V/m
Thermal specifications				
Thermal conductivity			0.2 W/mK	0.2 W/mK
Heat capacity			5.40 KJ/K	5.20 KJ/K

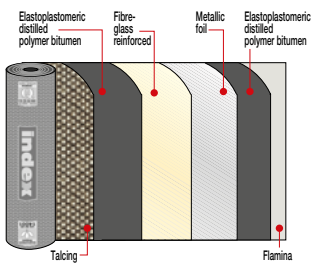
Compliant with EN 13707 in terms of the resistance factor to steam penetration for reinforced polymer-bitumen membranes, the value of μ = 20 000 may be considered, unless declared otherwise.

COMPOSITION OF THE MEMBRANE

MINERAL ELECTROMAGNETIC SCUTUM POLYESTER



ELECTROMAGNETIC BARRER/V



PRODUCT FINISHING

EMBOSSING FLAMINA. The embossing on the lower surfaces of the membranes finished with Flamina film makes it possible to lay the product precisely and quickly; forming a smooth surface when melted with the torch. It indicates the correct melting temperature and lets the film retract faster. The embossing also enables optimal vapour diffusion; in spot bonded and loose laid installation, in the points where it remains intact, preventing blisters and swelling.

TALC SURFACING. The talcing of the top face is carried out with a technique which evenly spreads the very thin talc over the top surface with a special pattern, preventing accumulation or zones without talc. This new system allow a quick unroll and gives the surface a pleasant aspect, which enable to torch it faster if compared to the other coarser mineral finishes.

SELF-PROTECTION WITH SLATE GRANULES. On the visible face of the membrane, a protective coating made up of slate granules of various colours is hot bonded. This mineral shield protects the membrane from ageing caused by UV rays.

The colour of slated membranes may vary according to the storage time. The problem is resolved within 2-3 months of application and the shades become uniform, returning to their original colour. This is a normal phenomenon for this type of membranes and cannot be a reason for complaints. The same is valid for the maintenance of colour and the different shades that can be found on areas of the roof that are more or less exposed for artificially coloured membranes.

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.

The figures shown are average indicative figures relevant to current production and may be changed or updated by INDEX 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. Considering

• 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 •

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