

MINERAL PROTEADUO HP 25

MULTI-LAYER COMPOSITE POLYMER-BITUMEN WATERPROOFING MEMBRANE WITH HIGH MINERAL SELF-PROTECTION AGAINST HAILSTONES RG5 CERTIFICATION

MINERAL PROTEADUO HP 25 FIRESTOP MINERAL PROTEADUO HP 25/STRIP FIRESTOP

MULTI-LAYER COMPOSITE POLYMER-BITUMEN WATERPROOFING MEMBRANES, RESISTANT TO FIRE WITH HARMLESS FLAME RETARDANTS AND HIGH-RESISTANCE, MINERAL SELF-PROTECTION AGAINST HAILSTONES WITH RG5 CERTIFICATION

GRANTS *LEED* CREDITS

THE ROOF IS A TARGET FOR HAILSTORM



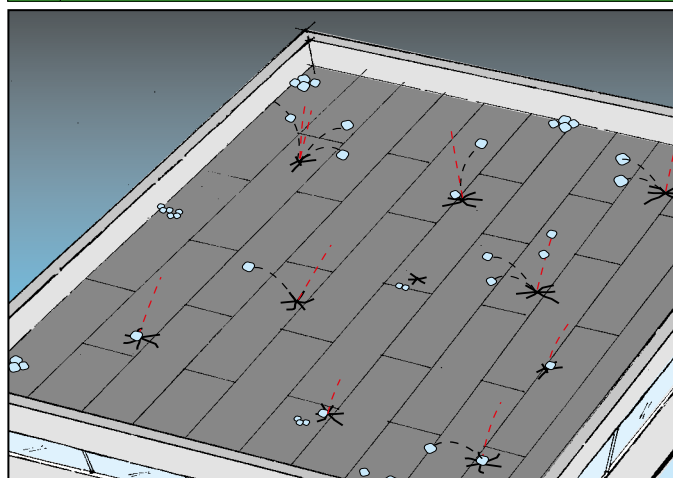
PROTECT IT WITH
MINERAL PROTEADUO HP 25
Waterproofing membrane with outstanding
hail impact resistance - **RG5 certification**

Maximum level RG5 pursuant to Test protocol no. 9 of the Swiss insurance association VKF for public buildings (Vereinigung kantonaler Feuerversicherungen), carried out at the Swiss EMPA laboratories.

CATEGORY	CHARACTERISTICS				ENVIRONMENTAL							METHOD OF USE				
COMPOSITE ELASTOPLASTOMERIC	WATERPROOF	REACTION TO FIRE	FIRE RESISTANT (FR TRIARMATO)	ECO GREEN	ASBESTOS FREE	TAR FREE	CHLORINE FREE	RECYCLABLE	NON DANGEROUS WASTE	EXHAUSTED OIL FREE	TORCH APPLICATION	HOT AIR APPLICATION	NAILING	COLD ADHESIVE BONDING	APPLICATION WITH MOLTEN BLOWN BITUMEN	

* For waterproofing membranes with TEXFLAMINA underface finish only

1 PROBLEM



HOW TO PROTECT THE WATERPROOF COVERING AGAINST HAILSTONE

The only real protection of a waterproof covering against hailstone is the heavy method, but the roof is not always designed to take such a heavy load and the problem still remains for pitched roofs.

In visible coverings without any protection, the damages caused by hailstone that hit a thick covering are not always noticeable merely by visually inspecting the waterproofing, because most of the micro damages, of typical "star-like" appearance, occur on the underlying face. Right above the damage, the waterproofing is still watertight but a simple test will however reveal that it is almost never airtight; air can get through the minute fissures and after a very short amount of time the covering will leak.

Are there really any waterproofing membranes that are totally hail resistant?

Here's what the experts say:

"There are no roofing waterproof membranes that are able to provide the certainty of being completely resistant to perforation, yet there are roofs that are hail resistant, whose resistance has been measured and classified pursuant to a specific test".

THE MEMBRANE DOES NOT APPEAR TO BE PERFORATED ON THE UPPER FACE DESPITE THE FACT IT HAS BEEN HIT BY HAILSTONE



THE UNDERLYING FACE PRESENTS FISSURES THAT COMPROMISE THE AIRTIGHTNESS OF THE MEMBRANE



EVEN IF THE COVERING IS STILL WATERTIGHT, IF SOAPY WATER IS APPLIED UNDER VACUUM, BUBBLES WILL APPEAR, WHICH INDICATE THE LOSS OF AIRTIGHTNESS



2 SOLUTION

INDEX has overcome these problems by designing a membrane with the highest level of hail resistance measurable with a specific test. To assess the hail resistance of a membrane that we have designed to offer maximum protection of a visible covering, we turned to specialists who have developed a specific test; test protocol no. 9 of the Swiss insurance association VKF for public buildings (Vereinigung kantonaler Feuerversicherungen), carried out at the Swiss EMPA laboratories. Ice spheres of increasing diameter (up to a maximum of 50 mm) are shot at the membrane after it has been chilled under ice and whose waterproofing level is subsequently assessed with an airtightness test under vacuum. The problem is a hot topic in Switzerland and each year it causes considerable damages, which have grown progressively with the changes in climate over the last twenty years.

Test protocol no. 9

The test is performed on the membrane resting on a rigid support and also on a flexible support, such as polystyrene foam with density of 20 kg/m³. The test is critical on the flexible support. Standard elastomeric membranes that pass the RG5 test on the rigid support do indeed only just about reach level RG3 on the polystyrene foam support and present the typical "star-like" fissures on the underlying face.

The membrane's resistance to violent impact, such as that of hailstone, depends on:

- **the flexibility of the material.** Elastomeric membranes are those that withstand impact best;
- **the presence of self-protection on the surface.** Slate-coated membranes are those that protect the covering best against jagged hailstone;
- **the type of reinforcement.** The non-woven fabric reinforcement is that which resists perforation best, even more so if of

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

EN 13707 - REINFORCED BITUMEN SHEETS FOR ROOF WATERPROOFING

- **Upper layer in multi-layer systems without permanent heavy surface protection (visible)**
- MINERAL PROTEADUO HP 25 POLYESTER
- **Exposed single-layer**
- MINERAL PROTEADUO HP 25 POLYESTER

- high basic weight;
- **the thickness of the covering.** Thicker the better.

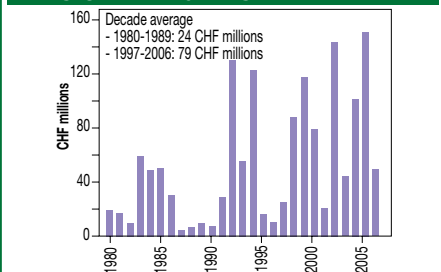
Other factors that affect the resistance of the waterproof covering are:

- **the laying surface (rigid or flexible).** On hard surfaces such as concrete, the covering's resistance is better than on flexible surfaces, such as a panel of thermal insulation;
- **the connection method to the laying surface (adherent or otherwise).** A covering glued in total-adherence resists better than a non-glued covering (dry laying).

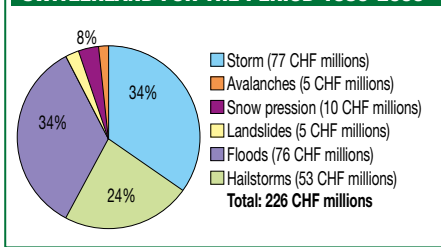
The maximum level RG5 is based on an ice sphere of 50 mm in diameter and 56.9 g in weight, shot at ~111 km/h.

The test is performed on the membrane resting on a rigid support and also on a flexible

HAILSTONE DAMAGE IN SWITZERLAND



AVERAGE YEARLY DAMAGES IN SWITZERLAND FOR THE PERIOD 1980-2006



ICE SPHERE OF 50 mm IN DIAM. 56.9 g IN WEIGHT, "SHOT" AT ~111 km/h USED FOR THE TEST



Class	Diameter	Mass	Speed	Limit
RG1	ø 10 mm	0.50 g	13.8 m/s	0.04 J
RG2	ø 20 mm	3.60 g	19.5 m/s	0.70 J
RG3	ø 30 mm	12.30 g	23.9 m/s	3.50 J
RG4	ø 40 mm	29.20 g	27.5 m/s	11.10 J
RG5	ø 50 mm	56.90 g	30.8 m/s	27.00 J



SAMPLE AFTER TEST IMPACT



support, such as polystyrene foam with density of 20 kg/m³.

INDEX has obtained the maximum resistance level RG5 on both hard and flexible supports with its new MINERAL PROTEADUO

AFTER TESTING ON POLYSTYRENE (EPS), THE MINERAL PROTEADUO HP25 MEMBRANE IS INTACT, BOTH ON THE TOP AND UNDERNEATH



CERTIFICATION



Hail impact resistance certification

**VKF TP09
RG5**

ADUO HP 25 POLYESTERE membrane - 5 mm.

MINERAL PROTEADUO HP 25 is a multi-layer composite polymer-bitumen waterproofing membrane whose reinforcement is soaked in SBS-modified bitumen. Even the lower layer in contact with the laying surface is made of SBS-modified bitumen, while the upper layer is made of APP-modified bitumen.

The elastomeric mix of the lower face is based on distilled bitumen and thermoplastic rubber made up of a copolymer with blocks of radial styrene-butadiene. It offers an ultimate elongation of 2000%, cold flexibility up to -25°C, and very high resistance to thermo-oxidative ageing.

The base of the elastoplastomeric mix making up the protective layer of the upper face of the sheet is distilled bitumen, atactic and isotactic polypropylene and UV-resistant polyolefin elastomers, supplemented with thermal shock stabilisers. Its melting point is above 150°C.

It is reinforced with composite Spunbond nonwoven polyester fabric, stabilized with fiberglass to guarantee stability. The upper face is coated with slate granules, both natural and coloured, to satisfy special aesthetic requirements and to protect the membrane against the impact of jagged hailstone.

The lower face is coated with a Flamina hotmelt film with high shrinkage in contact with the flame. The elastomeric layer ensures excellent adhesion to conventional building materials, to polymer-bitumen membranes and also to oxidised bitumen coatings and old bituminous coverings. To be able to seal the membrane overlaps, the sheets are produced with a side strip of 8 cm approximately without slate granules on the upper face. The slate coating is hot-bonded to the external layer in APP-modified bitumen, ensuring strong and lasting adhesion.

This 5-mm thick membrane has a strong elastomeric component belonging to the **PROTEADUO** family, of which the reinforcement's resistance to perforation has been increased, and can be consequently laid in single-layer or, better still, as a finishing layer

of a visible waterproof covering.

Index chose to strengthen a type of membrane with DVT certification of the ITC-CNR that has renowned properties of resistance to ageing because the materials, as indicated in the technical reports of the Swiss insurance associations and experts of this sector, tend to become less resistant in time. Now, with the addition of **MINERAL PROTEADUO HP 25 - 5 mm** to the range, specific requests can be satisfied concerning the problem of hail resistance of visible coverings, offering a material with definite, tested and certified resistance.

APPLICATION FIELDS

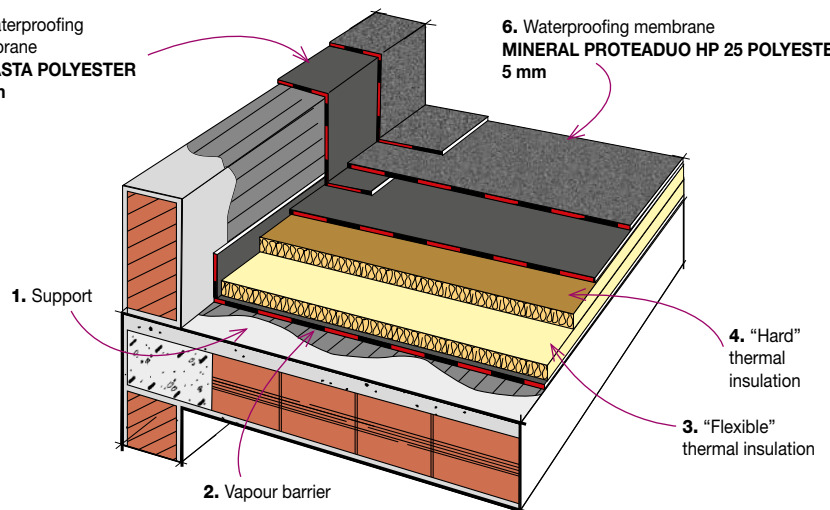
The very high level of flexibility of the mix of the lower layer, the mechanical protection offered by the slate granules, the remarkable resistance to perforation of the reinforcement, combined with the thickness (5 mm), are interacting elements that contribute in conferring unique features of hail resistance to **MINERAL PROTEADUO HP 25**, which allow it to be laid as a single layer or as a finishing layer of a multi-layer visible system. Its high mechanical strength, flexibility, thermal stability and durability mean it can be used on roofs subject to considerable dimensional variations in both hot and cold climates.

How to plan a hail-resistant waterproof covering?

Following the explanations just provided, the covering will be made up of the 5-mm thick membrane of **MINERAL PROTEADUO HP 25**, better still if glued over another elastomeric membrane with DVT certification of the ITC-CNR, such as a 4-mm thick **HELASTA POLYESTER** membrane. The waterproof covering shall be bonded in total adherence with a torch on the laying surface; if the latter is a layer of thermal insulation, it should be as hard as possible, maybe laying a harder insulation layer (that is resistant to the heat of the torch used for laying the membranes) over a softer insulation layer, which may have been used because it is more efficient from a point of view of insulation.

5. Waterproofing membrane **HELASTA POLYESTER** 4 mm

6. Waterproofing membrane **MINERAL PROTEADUO HP 25 POLYESTER** 5 mm



STRATIFIED ELEMENTS

1. Support
2. Vapour barrier
3. "Flexible" thermal insulation
4. "Hard" thermal insulation
5. Waterproofing membrane **HELASTA POLYESTER** - 4 mm
6. Waterproofing membrane **MINERAL PROTEADUO HP 25 POLYESTER** - 5 mm

Bibliographic references and pictures taken from:
 - "Library on hailstone protection", published by "Etablissements Cantonaux D'Assurance"
 - "Evolution of the climate and of the vulnerability of buildings in Switzerland up to 2050", published by "Etablissements Cantonaux D'Assurance"
 - EMPA Laboratory (CH)

MINERAL PROTEADUO HP 25 UNDER PHOTOVOLTAIC SYSTEM

Foreword The waterproof membrane made with **MINERAL PROTEADUO 25 HP** is the ideal solution for roofs where you install a photovoltaic system because it is very **thick; it is resistant to ageing** and lasts at least as long as the PV installation avoiding any costly replacement works that would require its dismantling and re-installation. It has **wind resistance** greater than 10 kPa conforming to EN 16002 both on concrete and on old bituminous membranes, and achieves the **highest level of hail resistance** measured in accordance with Test protocol No. 9 of the Swiss insurance association for public buildings VKF (Vereinigung kantonaler Feuerversicherungen).

2

SOLUTION

In order to meet the point referred to in the Fire Brigade Memorandum, Index also developed the **FIRESTOP** version of **MINERAL PROTEADUO 25 HP** classified **B_{roof}(t2)** as fire resistant, meeting UNI EN 13501-5 on both combustible and incombustible substrates, after passing the UNI ENV 1187:2007 test method 2. It is also important to note that **MINERAL PROTEADUO 25 HP** does not conduct electricity; in fact, contrary to other types of coverings where PV panels are attached, it is an excellent insulator.

We produce two versions:

- **MINERAL PROTEADUO HP 25 FIRESTOP**
- **MINERAL PROTEADUO HP 25/STRIP FIRESTOP**

The **MINERAL PROTEADUO 25 HP FIRESTOP** type, with its underside covered with a film of Flamina, **is bonded on new works with total adherence** like a top layer of a double-layer covering and can also be used in replacing old bituminous membranes still in good condition and sufficiently dry where it can be bonded in total adherence as a single layer. Conversely, if the old layer is degraded and needs renovating as it may still hold moisture, you must first lay a **VAPORDIFFUSER STRIP/V** membrane, that is torch bonded in semi-adherence, only along the thermo-adhesive strips which cover the underside and can then spread the trapped moisture avoiding bubbles, and then you can torch bond onto this the membrane

MINERAL PROTEADUO 25 HP FIRESTOP or the system **HELASTA POLIESTERE + MINERAL PROTEADUO 25 HP FIRESTOP**.

The underside of the **MINERAL PROTEADUO HP 25/STRIP FIRESTOP** type is covered over an area of 40% with strips of a special highly thermo-adhesive mix protected by a Flamina film, that is activated by the heat of a torch. It is made of selected bitumen and elastomeric copolymers with high compatibility with both old oxidized bitumen membranes and polymer-bitumen membranes of any kind, that determine a **semi-independent bonding** that is wind resistant, safe and durable even on old slate-based coverings. **You do not need to use primers** as long as the laying surface is clean, dry and free from dust and flaking material.

It is used for replacement in single layers of old bituminous coverings that may still hold moisture that can spread in the micro air spaces between the strips, avoiding the formation of bubbles on the new covering.

1 PROBLEM

The particular case of installing photovoltaic panels with class 2 fire resistance classification. When installing PV panels with Class 2 fire resistance on roofs of **businesses subject to fire prevention controls**, in order to evaluate whether the fire risk complies with case 3/a of Annex B of the Italian Fire Brigade Memorandum dated 04/05/2012, the behaviour towards fire of the waterproof covering must be classified as **B_{roof}(t2)** or **B_{roof}(t3)** or **B_{roof}(t4)** in compliance with UNI EN 13501-5. Another point highlighted in the Fire Brigade's Guide concerns the risk of electrocution that firemen may be exposed to during fire-fighting operations.

FIRE RESISTANCE TEST UNI ENV 1187:2007 METHOD 2 - [B_{roof}(t2)]

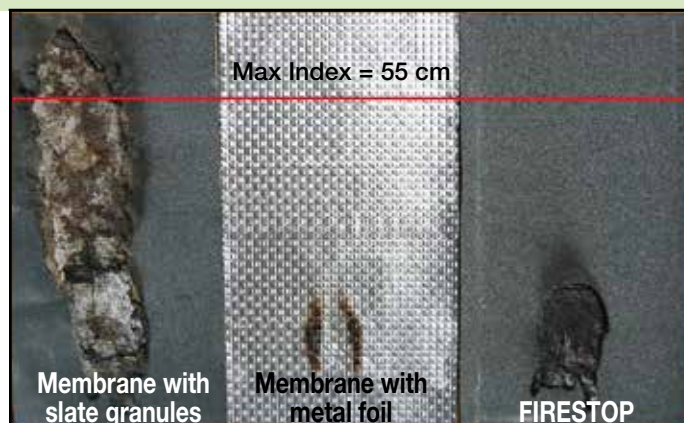
Equipment complying ENV 1187/2



Running test



Comparison of the results



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

EN 13707 - REINFORCED BITUMEN SHEETS FOR ROOF WATERPROOFING

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- MINERAL PROTEADUO HP 25 FIRESTOP
- **Exposed single-layer**
- MINERAL PROTEADUO HP 25 FIRESTOP
- MINERAL PROTEADUO HP 25/STRIP FIRESTOP

CERTIFICATION



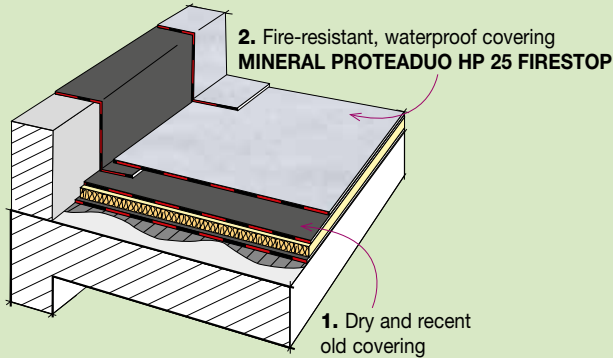
"Istituto Giordano"

It has passed the fire-resistance tests pursuant to ENV 1187/2 and is classified compliant with EN 13501-5: **B_{roof}(t2)**.

Replacing single layers

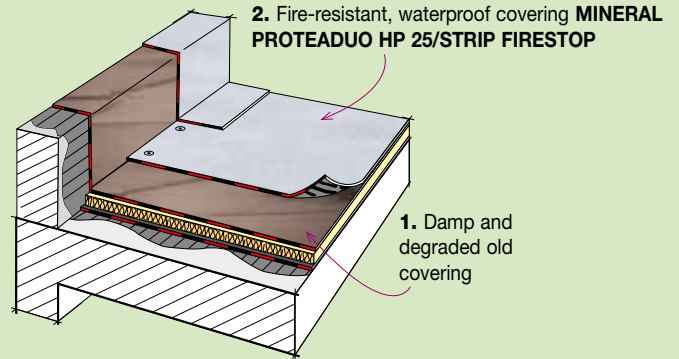
REPLACING SINGLE-LAYERS IN TOTAL ADHESION (TORCH-BOND) ON RECENT EXISTENT, WELL ADHERING COVERINGS, THAT ARE STILL WATERTIGHT.

(valid for roof pitches $\leq 40\%$) for roof pitches between 40÷100%, bonding of the waterproof covering will be integrated with mechanical nail/screw and washer fixture (diameter 50-mm) arranged every 20-cm under the end overlaps of the last layer.



REPLACING SINGLE LAYERS IN SEMI-ADHESION WITH STRIPS ON RECENT, EXISTENT, WELL ADHERING COVERINGS THAT MAY STILL RETAIN MOISTURE

(valid for roof pitches $\leq 15\%$) for roof pitches between 15÷40%, bonding of the waterproof covering will be integrated with mechanical nail/screw and washer fixture (diameter 50-mm) arranged every 20-cm under the end overlaps of the last layer.

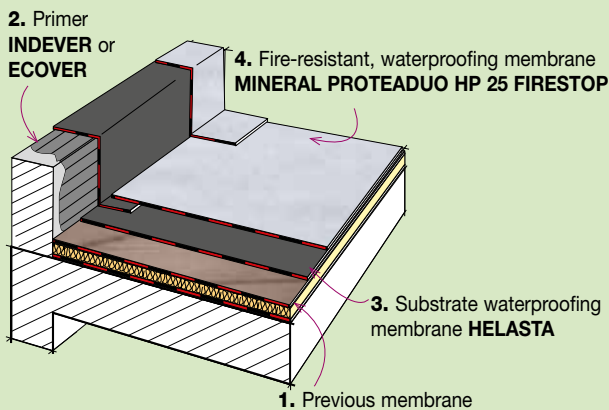


Note. If laid in semi-adhesion with strips, it is a good idea to nail the covering every 33 cm to be base.

Double-layer replacement

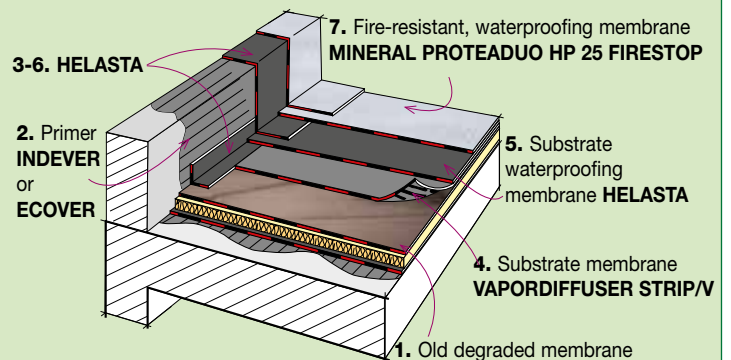
DOUBLE-LAYER WATERPROOF COVERING IN TOTAL ADHESION (TORCH-BOND) ON RECENT EXISTENT, WELL ADHERING COVERINGS, THAT ARE STILL WATERTIGHT.

(valid for roof pitches $\leq 40\%$) for roof pitches between 40÷100%, bonding of the waterproof covering will be integrated with mechanical nail/screw and washer fixture (diameter 50-mm) arranged every 20-cm under the end overlaps of the last layer.



REPLACING DOUBLE-LAYER IN SEMI-ADHESION WITH STRIPS ON RECENT, EXISTENT, WELL ADHERING COVERINGS THAT MAY STILL RETAIN MOISTURE

(valid for roof pitches $\leq 15\%$) for roof pitches between 15÷40%, bonding of the waterproof covering will be integrated with mechanical nail/screw and washer fixture (diameter 50-mm) arranged every 20-cm under the end overlaps of the last layer.

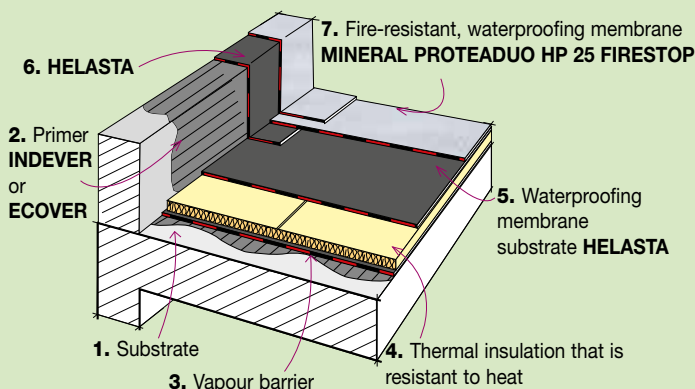


Note. If laid in semi-adhesion with strips, it is a good idea to nail the covering every 33 cm to be base.

New jobs

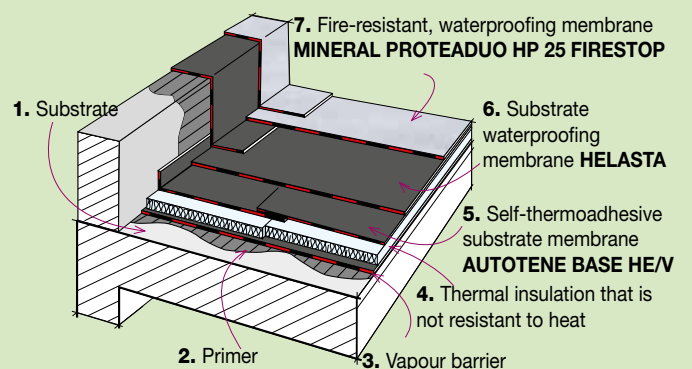
DOUBLE-LAYER WATERPROOF COVERING IN TOTAL ADHESION (TORCH-BOND) ON THERMAL INSULATION RESISTANT TO HEAT

(valid for roof pitches $\leq 40\%$) for roof pitches between 40÷100%, bonding of the waterproof covering will be integrated with mechanical nail/screw and washer fixture (diameter 50-mm) arranged every 20-cm under the end overlaps of the last layer.



DOUBLE-LAYER WATERPROOF COVERING IN TOTAL ADHESION (TORCH-BOND) ON SELF-HEAT-ADHESIVE MEMBRANE ON HEAT INSULATION THAT IS NOT RESISTANT TO HEAT

(valid for roof pitches $\leq 15\%$) for roof pitches between 15÷40%, bonding of the waterproof covering will be integrated with mechanical nail/screw and washer fixture (diameter 50-mm) arranged every 20-cm under the end overlaps of the last layer.



HOW TO MAKE A "COOL ROOF" COVERING AND INCREASE THE PERFORMANCE

The MINERAL REFLEX WHITE treatment

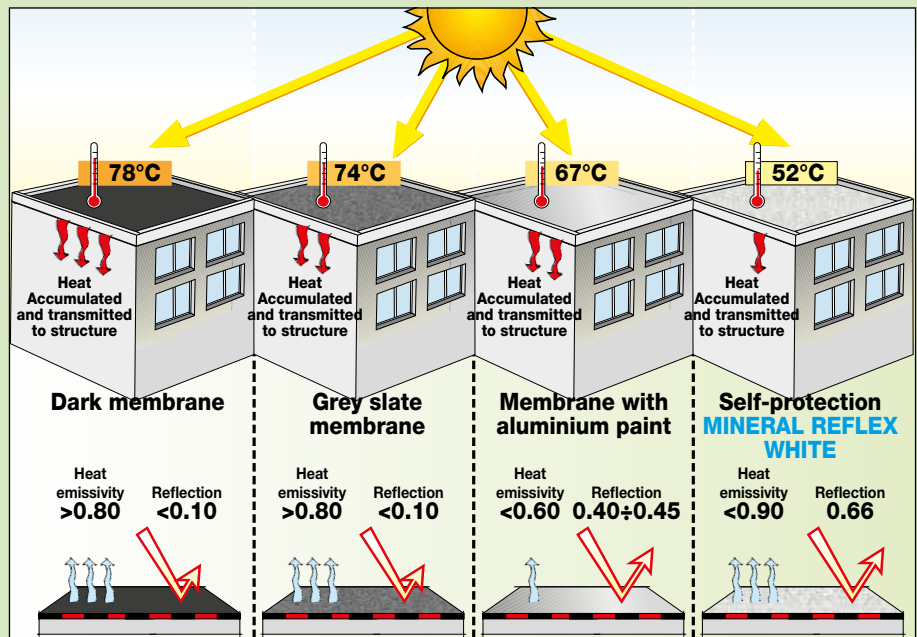
The **MINERAL PROTEADUO HP 25** membranes are produced with the top face self-protected with grey slate granules but can also be requested with special white mineral finish consisting of **MINERAL WHITE REFLEX** ultra-reflecting ceramic granules with high saturation and brightness.

More than 90% of roofs are dark in colour and the roof surface reaches temperatures of around 80°C through solar radiation, which also negatively affects the photovoltaic panels installed on them, whose performance decreases as the temperature rises.

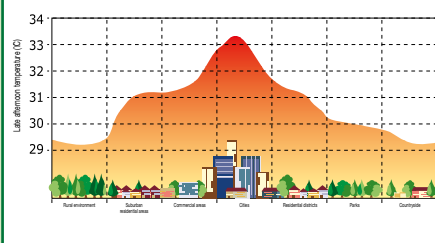
The technology to increase the roof's reflection of the sun's rays, called "Cool Roof", is one of three strategies (cool roof, green roof and cool pavements) for reducing urban heat islands that were studied at length in the United States. Recent studies at the Lawrence Berkeley National Laboratory published in March 2014 showed, with a cost/benefit comparison, the superior effectiveness of the cool roof compared to the green roof in combating climate change. The cool roof is three times more reflective than the green roof and they estimated that if all the roofs in the world were white it could reduce the Earth's temperature by at least 1°C.

The increase in solar reflectance of the roof surface using specific surface treatments of the waterproof covering allows you to **reduce its temperature**, and consequently prolong the life of the waterproof covering, **improve the efficiency of the photovoltaic panels**, save energy from air conditioning in summer in the rooms below, and at the same time **increase the albedo**, since the incident radiation fraction is reflected from the roof surface and produces **the benefit of increased performance of the PV system also during dimmer daylight hours**. The choice of white for the mineral self-protection of membranes **MINERAL PROTEADUO POLIESTERE HP 25** that we recommend should be of the self-protected type with **MINERAL WHITE REFLEX** ultra-reflecting ceramic granules, is the first applicable strategy to increase the reflection of solar radiation. The figure shows the temperatures recorded in Northern Italy in July 2007 under differently-protected bituminous surfaces.

The protection of the **MINERAL PROTEADUO POLIESTERE HP 25** membrane with **MINERAL WHITE REFLEX** ultra-reflecting ceramic



URBAN HEAT ISLANDS EFFECT



granules with high saturation and brightness prevents further surface painting that could also affect its behaviour towards fire and also allows you to create a cool roof that fulfils the criteria of solar reflectance **above 0.65** as required for "cool roof" flat roofs in **Annex 1 of the Interministerial Legislative Decree of 26/06/2015 in force since 01/10/2015**. The **MINERAL WHITE REFLEX** protection, with a Solar Reflectance Index **RSI = 80%**, certified by the EELab of the University of Modena and Reggio Emilia, meets the **CAM minimum environmental criteria for flat roofs in the Ministerial Decree of 24 December 2015 in force since 2 February 2016 in point**

Solar Reflectance Index

MINERAL REFLEX WHITE
SRI* = 79÷81

* SRI according to wind speed: low wind=79%, medium wind=80% and high wind=81%.

The increase in the reflectance and emissivity provided by the **WHITE REFLEX** paint applied to the waterproof covering

Surface	Reflection	Emissivity
Dark membrane	<10% (<0.1)	>80% (>0.8)
Painted aluminium membrane	40÷45% (0.40÷0.45)	<60% (<0.6)
Self-protected membrane MINERAL REFLEX WHITE	66% (0.66)	<90% (<0.90)

2.2.3 (SRI ≥ 78), those provided for by the **ITACA Protocol standard UNI/PdR 13.1:2015 CRITERION C.6.8. (SRI ≥75)** and those of the **Protocol LEED GBC ITALY "To design, build and renovate institutional and commercial buildings"** of 2009 updated on 9 February 2016 under the item **SS CREDIT 7.2 - HEAT ISLAND EFFECT (SRI ≥78)**.



The advantages of MINERAL REFLEX WHITE self-protection

- It increases the efficiency of photovoltaic panels.
- You avoid painting operations and it is more durable.
- It extends the life of the waterproof covering
- It improves comfort and you save on the costs of summer air conditioning.
- It reduces the temperature of urban heat islands and also power consumption and therefore emissions of CO₂.

PERFORMANCE OF PHOTOVOLTAIC SYSTEMS

REPLACING A ROOF SURFACE WITH MEMBRANE WITH MINERAL REFLEX WHITE SELF-PROTECTION



REFERENCES



Membrane with natural slate finish

Membrane with standard white slate finish

Membrane with **MINERAL REFLEX WHITE** self protection



SPECIFICATION ITEMS

MINERAL PROTEADUO HP 25 - Multi-layer composite polymer-bitumen waterproofing membrane, 5 mm thick (EN 1849-1), type MINERAL PROTEADUO HP 25 POLIESTERE, self-protected with slate granules, consisting of an upper layer in elasto-plastomeric polymer-bitumen with ring and ball softening point (EN 1427) of 150°C, a lower layer in elasto-plastomeric polymer-bitumen with elastic recovery (NF XP 84-360) of 300% and a stabilised composite reinforcement with high resistance to perforation in polyester "non-woven fabrics" with continuous Spunbond thread, impregnated with elasto-plastomeric polymer-bitumen. The membrane will have RG5 level hailstone resistance compliant with Test protocol EMPA no. 9 of the Swiss insurance company association for public buildings (VKF) and will be classified with Euroclass E reaction to fire (EN 13501-1), will have a maximum tensile strength (EN 12311-1) L/T of 1000/900 N/50 mm, an elongation at max. tensile force (EN 12311-1) L/T of 50/50%, resistance to tearing (EN 12310-1) L/T of 250/250 N, resistance to impact (EN 12691 method A) of 1,500 mm, resistance to static load (EN 12730) of 20 kg, heat dimensional stability (EN 1107-1), L/T of -0.25%/+0.10%, cold bend (EN 1109) of the upper layer of -15 and -25°C for the lower layer.

MINERAL PROTEADUO HP 25 FIRESTOP - Multi-layer composite polymer-bitumen waterproofing membrane, 5 mm thick (EN 1849-1), type MINERAL PROTEADUO HP 25 POLIESTERE, self-protected with slate granules, consisting of an upper layer in elasto-plastomeric polymer-bitumen with ring and ball softening point (EN 1427) of 150°C, a lower layer in elasto-plastomeric polymer-bitumen with elastic recovery (NF XP 84-360) of 300% and a stabilised composite reinforcement with high resistance to perforation in polyester "non-woven fabrics" with continuous Spunbond thread, impregnated with elasto-plastomeric polymer-bitumen. The membrane will have RG5 level hailstone resistance compliant with Test protocol EMPA no. 9 of the Swiss insurance company association for WKF public buildings. The membrane will be classified in fire reaction Euroclass E (EN13501-1), with resistance to external fires on roofs and Broof (t2) roof coverings and on both combustible and incombustible substrates (according to the UNI EN 13501-5:2009 fire classification of construction products and elements - part 5: classification on the basis of the results of exposure tests of roofs to an external fire in accordance with UNI ENV 1187:2007). The membrane will have a maximum tensile force (EN 12311-1) L/T of 1200/1000 N/50 mm, elongation at max. tensile force (EN 12311-1) L/T of 45/45%, resistance to tearing (EN 12310-1) L/T of 400/500 N, resistance to impact (EN 12691 method A) of 2,000 mm, resistance to static load (EN 12730) of 25 kg, heat dimensional stability (EN 1107-1), L/T of -0.20%/+0.10%, cold bend (EN 1109) of the upper layer of -15 and -25°C for the lower layer.

MINERAL PROTEADUO HP 25 FIRESTOP - Multi-layer composite polymer-bitumen waterproofing membrane, 5 mm thick (EN 1849-1), type MINERAL PROTEADUO HP 25/STRIP POLIESTERE, self-protected with slate granules, consisting of an upper layer in elastoplastomeric polymer-bitumen with ring and ball softening point (EN 1427) of 150°C, a lower layer in elastoplastomeric polymer-bitumen with elastic recovery (NF XP 84-360) of 300% and a stabilised composite reinforcement with high resistance to perforation in polyester "non-woven fabrics" with continuous Spunbond thread, impregnated with elastoplastomeric polymer-bitumen, which will have special thermo-adhesive strips, about 1 mm thick, spread over 40% of the lower face which, only partially adhering through torching, will allow the distribution of the moisture trapped by the old covering, thus avoiding bubbles and condensation. The membrane will have RG5 level hailstone resistance compliant with Test protocol EMPA no. 9 of the Swiss insurance company association for WKF public buildings. The membrane will be classified in fire reaction Euroclass E (EN13501-1), with resistance to external fires on roofs and Broof (t2) roof coverings and on both combustible and incombustible substrates (according to the UNI EN 13501-5:2009 fire classification of construction products and elements - part 5: classification on the basis of the results of exposure tests of roofs to an external fire in accordance with UNI ENV 1187:2007). The membrane will have a maximum tensile force (EN 12311-1) L/T of 1200/1000 N/50 mm, elongation at max. tensile force (EN 12311-1) L/T of 45/45%, resistance to tearing (EN 12310-1) L/T of 400/500 N, resistance to impact (EN 12691 method A) of 2,000 mm, resistance to static load (EN 12730) of 25 kg, heat dimensional stability (EN 1107-1), L/T of -0.20%/+0.10%, cold bend (EN 1109) of the upper layer of -15 and -25°C for the lower layer.

Self-protection MINERAL REFLEX WHITE -(to be added to the items mentioned so far if it is a cool roof) - The MINERAL REFLEX WHITE version of the membrane features a self-protection with ultra-reflecting ceramic granules with high saturation and brightness that fulfils the criteria of solar reflectance above 0.65 as required for "cool roof" flat roofs in Annex 1 of the Interministerial Legislative Decree dated 26/06/2015 in force since 1/10/2015 and with a Solar Reflectance Index RSI = 80%, certified by the EELab of the University of Modena and Reggio Emilia, and meets the CAM minimum environmental criteria in the Ministerial Decree of 24 December 2015, in force since 2 February 2016 in point 2.2.3, and those provided for by the ITACA Protocol standard UNI/PdR 13.1:2015 CRITERION C.6.8.

TECHNICAL CHARACTERISTICS

	Standard	T	MINERAL PROTEADUO HP 25	MINERAL PROTEADUO HP 25 FIRESTOP	MINERAL PROTEADUO HP 25/STRIP FIRESTOP
Reinforcement			"Non-woven" composite polyester stabilized with fibreglass	"Non-woven" composite polyester stabilized with fibreglass	"Non-woven" composite polyester stabilized with fibreglass
Thickness	EN 1849-1	±0.2	5 mm (1)	5 mm (1)	5 mm (2)
Mass per unit area MINERAL	EN 1849-1	±15%	-	-	-
Roll size	EN 1848-1	-1%	1x10 m	1x10 m	1x8 m
Watertightness	EN 1928 - B EN 1926-1928	≥ ≥	60 kPa	60 kPa	60 kPa
Shear resistance L/T	EN 12317-1	-20%	900/800 N/50 mm	1 000/900 N/50 mm	1 000/900 N/50 mm
Maximum tensile force L/T	EN 12311-1	-20%	1 000/900 N/50 mm	1 200/1 000 N/50 mm	1 200/1 000 N/50 mm
Elongation L/T	EN 12311-1	-15% V.A.	50/50%	45/45%	45/45%
Resistance to impact	EN 12691 - A		1 500 mm	2 000 mm	2 000 mm
Resistance to static loading	EN 12730 - A		20 kg	25 kg	25 kg
Resistance to tearing (nail shank) L/T	EN 12310-1	-30%	250/250 N	400/500 N	400/450 N
Dimensional stability L/T	EN 1107-1	≤	-0.30/+0.10%	-0.20/+0.10%	-0.20/+0.10%
Flexibility to low temp. (upper/downside)	EN 1109	≤	-15°C/-25°C	-15°C/-25°C	-15°C/-25°C
• after ageing	EN 1296-1109	+15°C	-20°C	-20°C	-20°C
Flow resist. at high temp.	EN 1110	≥	100°C	100°C	100°C
• after ageing	EN 1296-1110	-10°C	90°C	90°C	90°C
UV ageing	EN 1297		-	-	-
Reaction to fire Euroclass	EN 13501-1		E	E	E
External fire performance	EN 13501-5		F roof	B roof (t2) (4)	B roof (t2) (4)

Stated membranes may change colour depending on the storage periods. The membrane goes away within 2-3 months for the colour to return to their original colour. It is not necessary to request this type of membrane and cannot be the basis for a complaint. The same is true regarding the maintenance of colour and the different colourings that can occur among the variously exposed areas of the covering based on the types of artificial colouring.

Hail impact resistance characteristics

Hail impact resistance (9)	VKF TP09		Exceeds Level 5	Exceeds Level 5	Exceeds Level 5
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Specific characteristics of resistance to wind uplift (EN 16002)

with expanded polystyrene ≥ 100	EN 16002		Δ _{adm} = 10 000 N/m ²	Δ _{adm} = 10 000 N/m ²	Δ _{adm} = 10 000 N/m ²
with extruded expanded polystyrene	EN 16002		Δ _{adm} = 10 000 N/m ²	Δ _{adm} = 10 000 N/m ²	Δ _{adm} = 10 000 N/m ²
with polyurethane	EN 16002		Δ _{adm} = 10 000 N/m ²	Δ _{adm} = 10 000 N/m ²	Δ _{adm} = 10 000 N/m ²

Thermal specifications

Thermal conductivity			0.2 W/mK	0.2 W/mK	0.2 W/mK
Heat capacity			6.00 KJ/K·m ²	6.00 KJ/K·m ²	6.00 KJ/K·m ²

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.

(1) Thickness measured on membrane width, in compliance with EN1849-1, tolerance 10%.

(2) Test protocol no. 9 of the Swiss insurance association for public buildings (Vereinigung kantonaler Feuerversicherungen).

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.

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.



FLAMINA/SAND ON TOP OF HEAT ADHESIVE STRIPS



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.



MINERAL REFLEX WHITE SELF-PROTECTION. A special high saturation and luminosity white mineral self-protection is applied to the face of the membrane to remain visible, which protects it from ageing due to UV rays, with high solar reflectance and very high heat emissivity. * Surface treatment suitable for application under photovoltaic systems.

• 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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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