



Budapest University of Technology and Economics
Faculty of Architecture Engineering
Department of Building Constructions





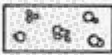

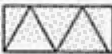

NON EXPLOITED FLAT ROOFS

MATERIALS, TECHNOLOGY

Horváth Sándor - Fülöp Zsuzsanna Ph.D

NON EXPLOITED FLAT ROOFS

LAYERS

| | | |
|------------------------|---|---|
| 1. Loadbearing slab |  r.c. |  trapezoid metal sheet |
| 2. Fixing method | glued or ballasted or mechanically fixed | |
| 3. Drain system | internal (gully) - external (gutter) | |
| 4. Waterproofing (DPC) | plastic or bitumen membranes | |
| 5. Slope of DPC | loadbearing structure |  concrete  thermal insulation |
| 6. UV protection | chemical or mechanical | |
| 7. Thermal insulation |  plastic foam |  mineral wool |
| 8. Vapour barrier | plastic or bitumen membranes | |
| 9. Separation layer | ----- glass or plastic fleece | |

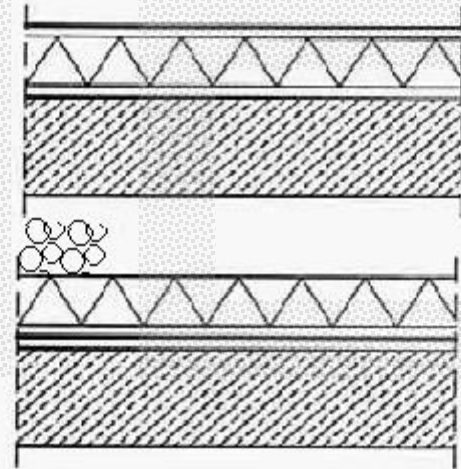


CLASSIFICATION OF NON EXPLOITED FLAT ROOFS

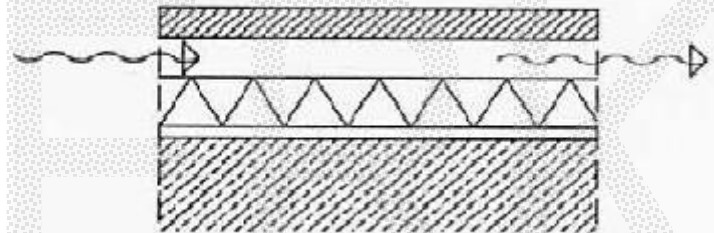
Non ventilated :
there is no ventilation layer

Normal (Conventional) :
waterproofing is above thermal insulation

Inverted: waterproofing is under thermal insulation



Ventilated:
Ventilation layer is between waterproofing and thermal insulation



MATERIALS DEPEND ON THE SYSTEM!



FLAT ROOFS

MATERIALS OF WATERPROOFING

- Bituminous membranes
- Plastic membranes
- Liquid waterproofing



REINFORCED MODIFIED BITUMEN ROOFING MEBRANES PRODUCTS

SINGLE OR DOUBLE PLY SYSTEM

Modified Bitumen – is an evolution of asphalt roofing. It is made from asphalt and a variety of modifiers and solvents. Supported by reinforcement layer



ATACTIC POLYPROPILEN APP

| | | Paraflex Series | | | |
|-----------------------------|--------|------------------|------------------|------------------|------------------|
| | | NT3 | NT4 | W3 | W4 |
| Rolls sizes | m | 10 x 1 | 10 x 1 | 10 x 1 | 10 x 1 |
| Thickness | mm | 3 | 4 | 3 | 4 |
| Colour | | black | black | black | black |
| Tensile strength | N/5 cm | L. 800 T. 600 | L. 800 T. 600 | L. 350 T. 250 | L. 350 T. 250 |
| Ultimate elongation | % | L. 50 T. 50 | L. 50 T. 50 | L. 2,5 T. 2,5 | L. 2,5 T. 2,5 |
| Low temperature flexibility | °C | -25 | -25 | -25 | -25 |



STYREN BUTADHIEN STYREN SBS

General Membrane Spa

Design and production of modified bituminous waterproofing membranes

REINFORCEMENTS OF BITUMEN MEMBRANES



GLASS FIBRE



NON - WOVEN POLYESTER



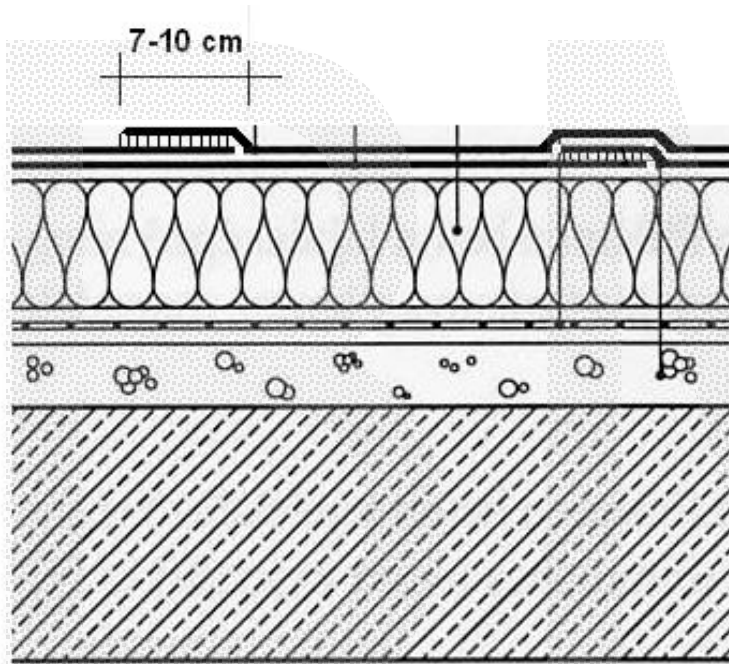
**NON - WOVEN SPUNBOND
POLYESTER WITH GLASS FIBRE**



GLASS TISSUE

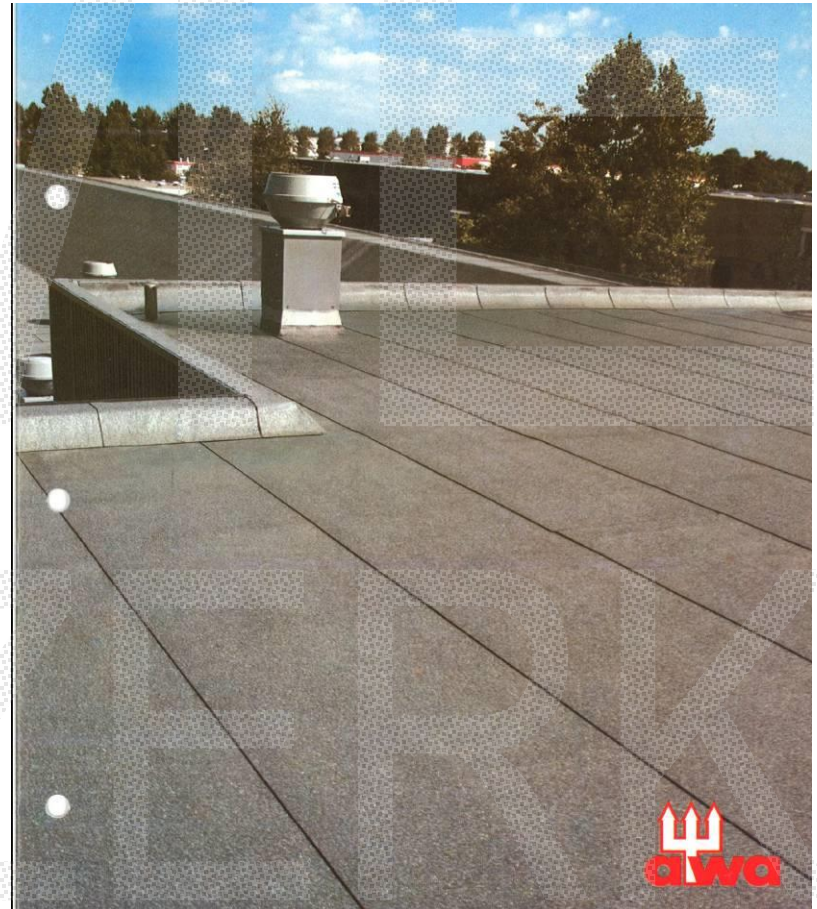


ALLUMINIUM SHEETS



BITUMEN MEMBRANES

DOUBLE PLY SYSTEM



FIXING OF BITUMEN MEMBRANES



FIXING BY GLUING

**Contacted on
whole surface**



FIXING OF BITUMEN MEMBRANES

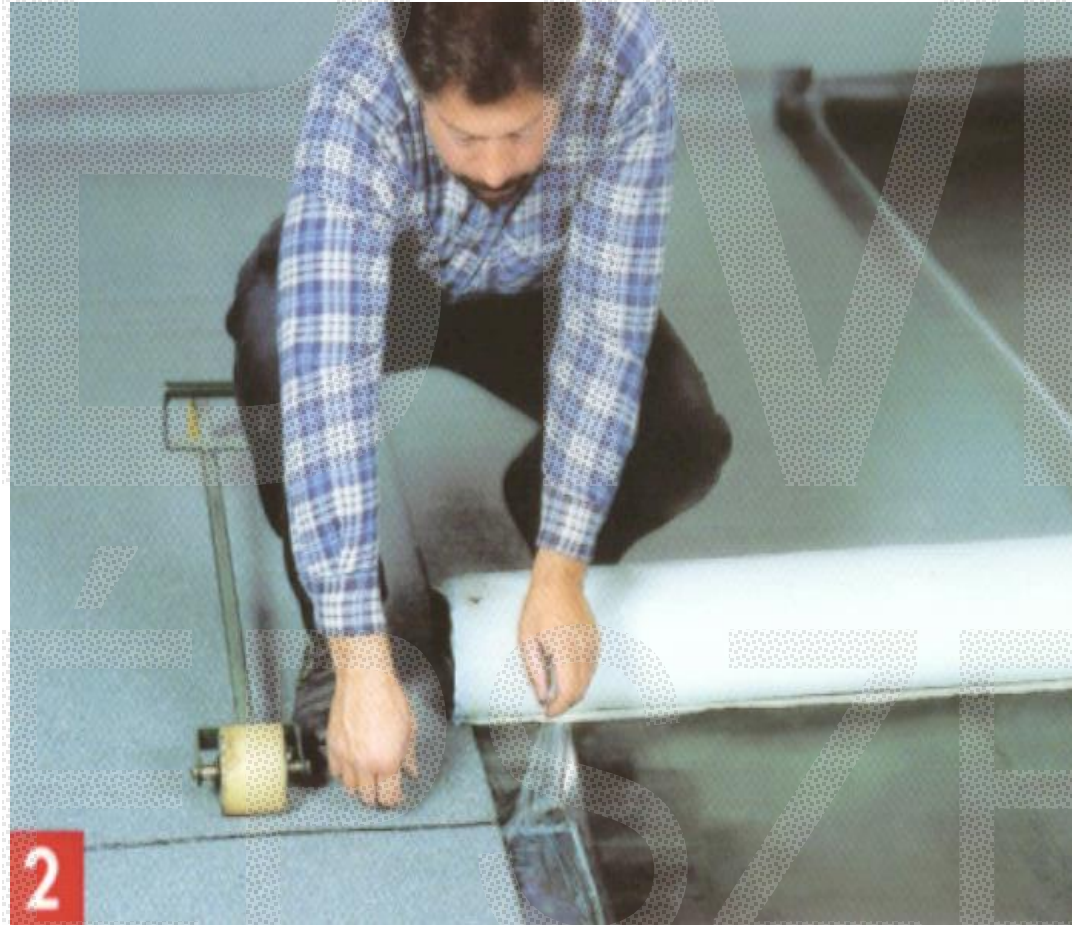


FIXING BY TORCHING

**Contacted on
whole surface**



FIXING OF BITUMEN MEMBRANES



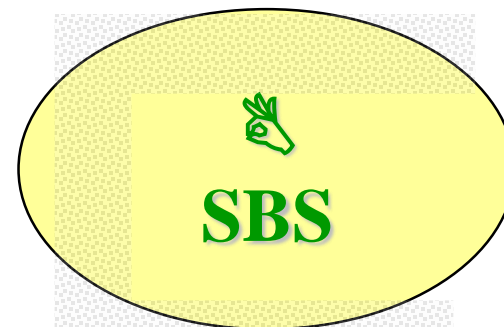
SELF ADHESIVE

**Contacted on
whole surface**





HEAT RESISTANCE

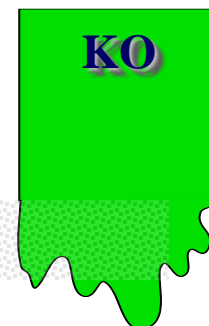
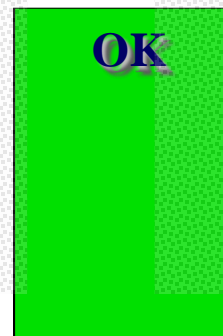
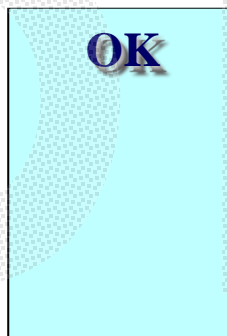


APP + 140°C

APP + 150°C

SBS + 100°C

SBS + 110°C



| | SOFTENING POINT (RING AND BALL) | HEAT STABILITY |
|-----|---------------------------------|----------------|
| APP | 155°C | 140°C-160°C |
| SBS | 110°C-125°C | 90°C-110°C |

COLD FLEXIBILITY



APP



SBS

SBS MEMBRANES HAVE BETTER COLD FLEXIBILITY THAN APP MEMBRANES

APP

- Cold flexibility = -20°C
- Heat Resistance = 150°C
- UV resistance = YES

SBS

- Cold flexibility = -35°C
- Heat Resistance = 110°C
- UV resistance = NO

EXAMPLE

NOVAGUM-P MINERAL

NOVAGUM-P MINERAL is a (SBS) elastomers modified bitumen waterproofing membrane. soaking the reinforcement into the waterproofing compound based on distilled bitumen made of nonwoven polyester in combination with fibreglass

TECHNICAL DATA

| TEST METHOD | NORM | UNIT | TOLERANCE | VALUE |
|---|---------------|-------|--------------|--------------------|
| Thickness | EN1849-1:1999 | mm | ±0,2 | 4 mm (on selvedge) |
| Weight | EN1849-1:1999 | kg/m2 | ±10% | 3,5-4-4,5-5-5,5 |
| Roll length | EN1848-1:1999 | m | -1% | 10 |
| Roll width | EN1848-1:1999 | m | -1% | 1 |
| Straightness | EN1848-1:1999 | - | 20 mm / 10 m | PASSED |
| Flexibility at low temperature (pliability) | EN1109:1999 | °C | </= | -25 |
| Heat flow resistance | EN1110:1999 | °C | >/= | 100 |
| Watertightness | EN1928-B:2000 | kPa | >/= | 400 |
| Water vapour transmission properties | EN1931:2000 | μ | - | 20.000 |



PLASTIC ROOFING MEMBRANES

SINGLE PLY SYSTEM

Thermoplast

- Poliizobutilén (PIB)
- Polivinil-klorid (PVC)
- Etilén-vinil-acetát (EVA)
- Etilénkopolimer bitumen (ECB)
- Polietilén (HDPE, LDPE)

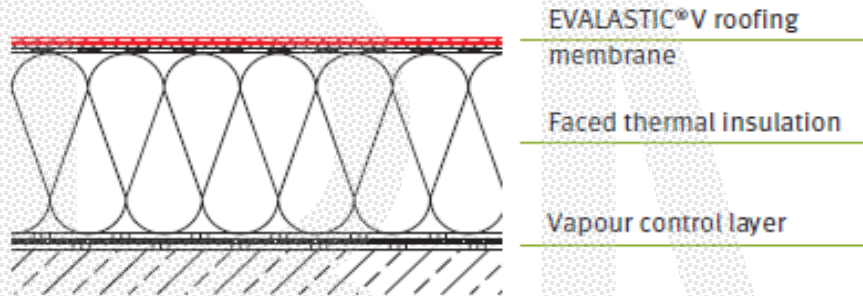
Elasztomer

- Butilkaucsuk (BK)
- Etilénpropilén (EPDM)

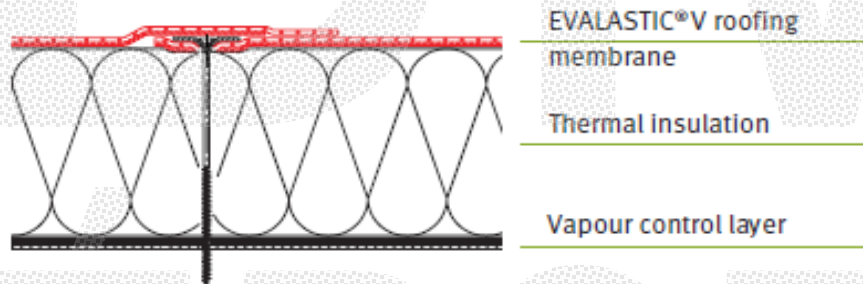
Partially contacted on surface



Bonded roof build-up



Mechanically fastened roof build-up



Ballasted

EVALASTIC®V roofing and waterproofing membranes

PLASTIC ROOFING MEMBRANES

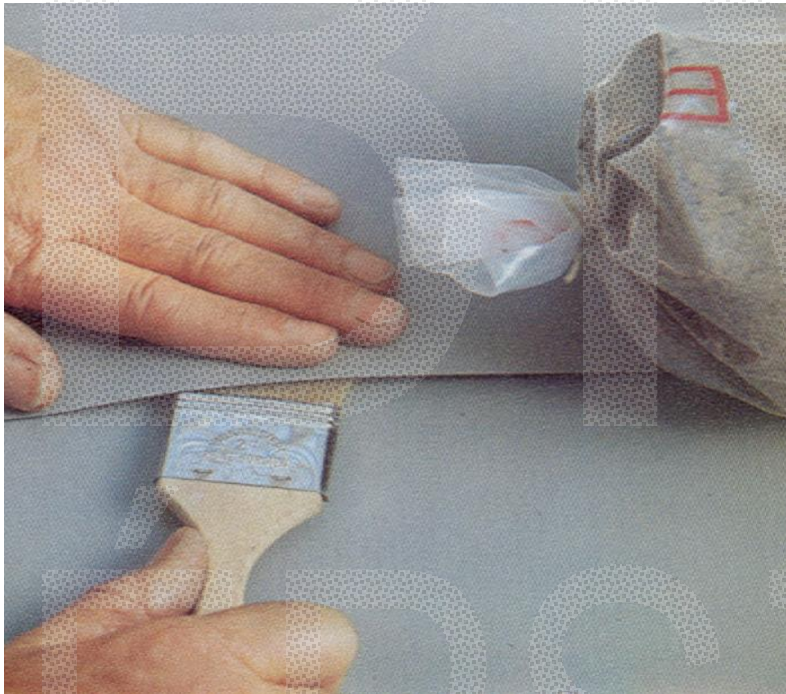
FIXING

Product range

| | EVALASTIC® roofing and waterproofing membranes homogeneous waterproofing membrane, without backing | EVALASTIC®V roofing and waterproofing membranes homogeneous waterproofing membrane, with polyester fleece backing |
|----------------------------------|--|---|
| Thickness excluding backing (mm) | 1.2/1.5 | 1.2/1.5 |
| Membrane widths (m) | 1.05/1.55 | 1.05/1.09 ¹ /1.55 |
| Standard lengths (m) | 25 | 25 |

PLASTIC ROOFING MEMBRANES

OVERLAPPING



**GLUED OR WELDED AT
OVERLAPPING**



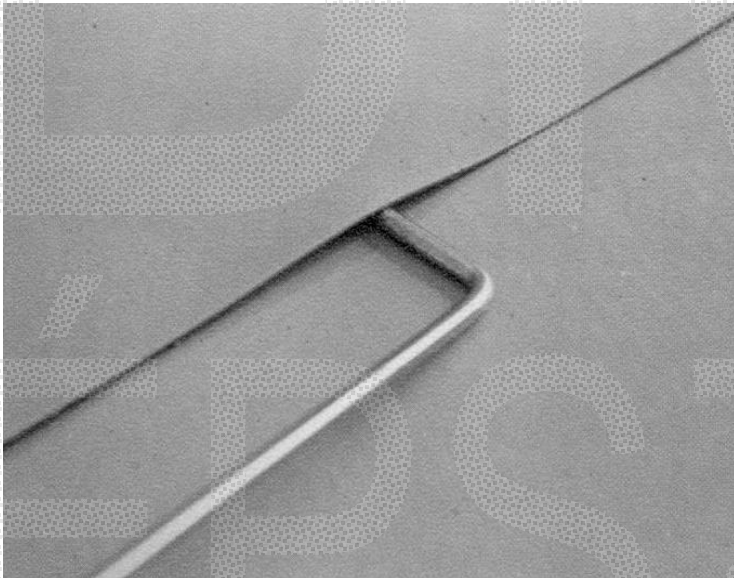
**HOT AIR CONNECTED AT
OVERLAPPING**



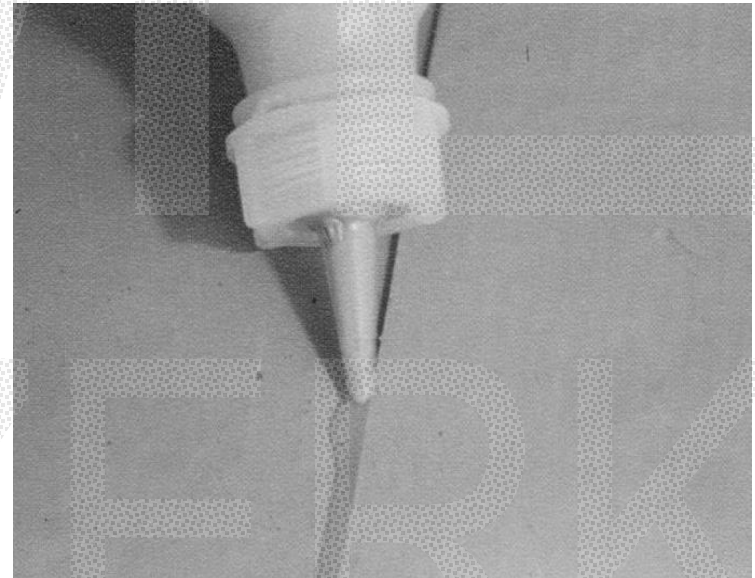
PLASTIC ROOFING MEMBRANES

OVERLAPPING

control

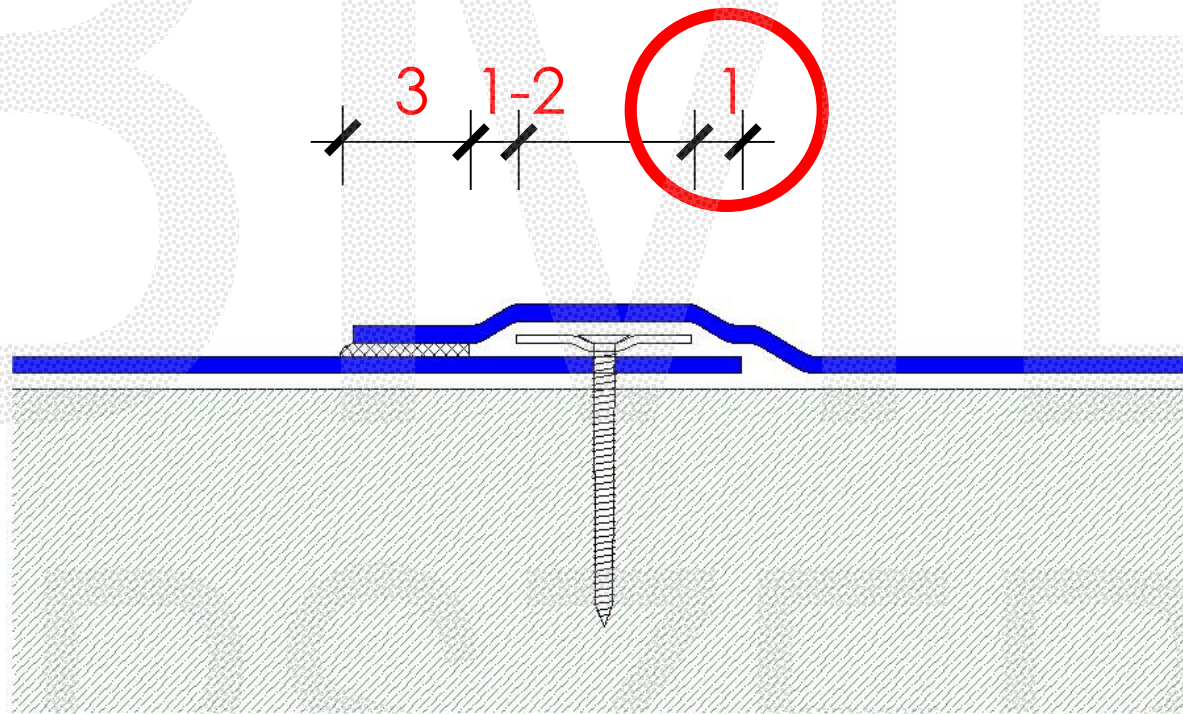


sealing



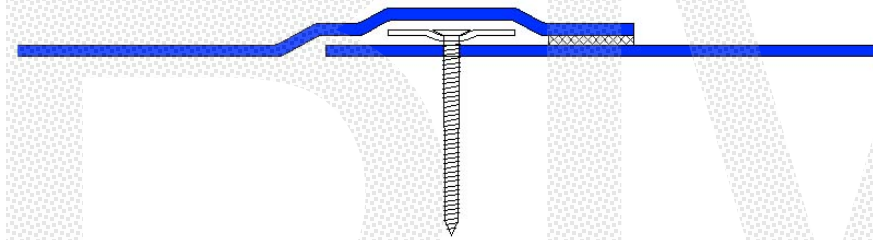
PLASTIC ROOFING MEMBRANES

MECHANICAL FIXING

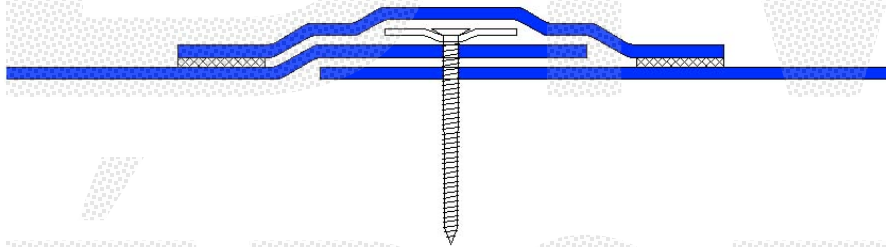


PLASTIC ROOFING MEMBRANES

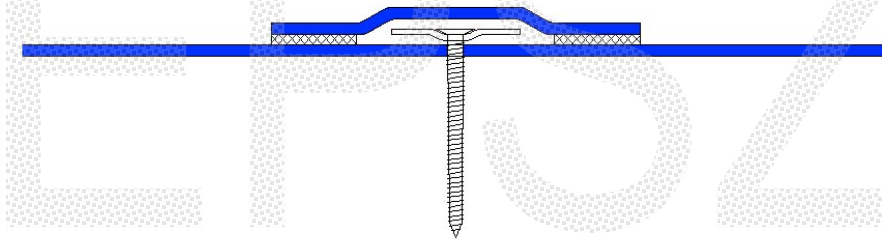
MECHANICAL FIXING



„IN OVERLAPPING”



„ABOVE OVERLAPPING”

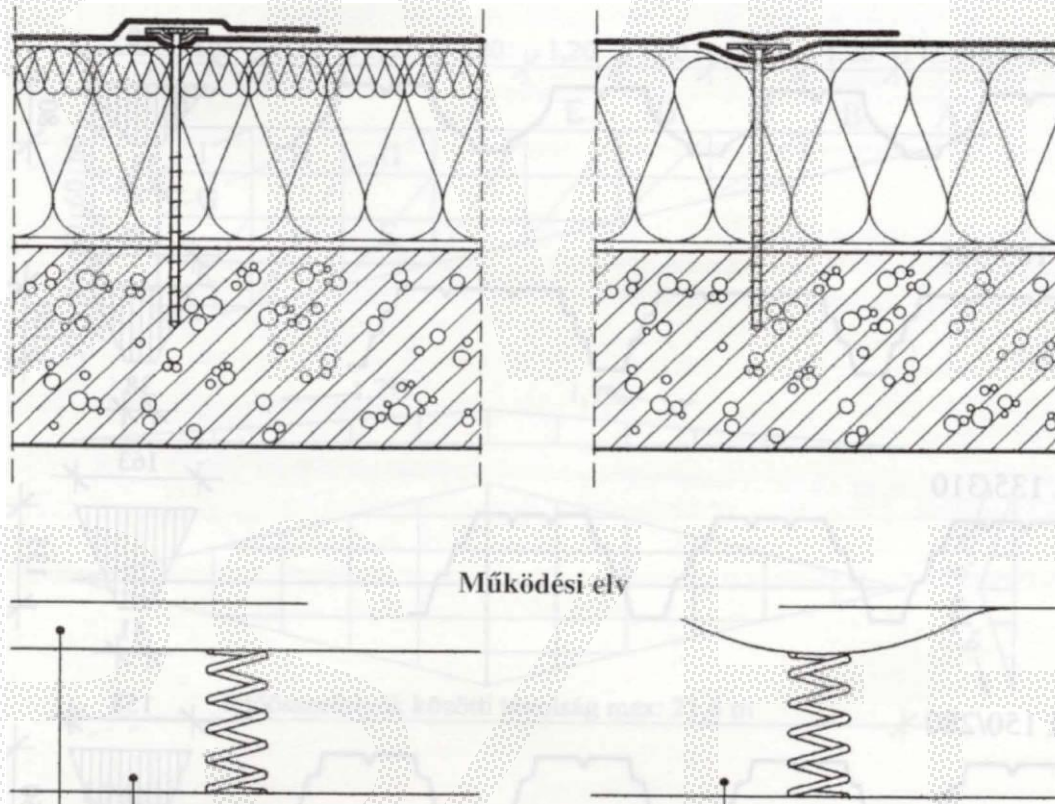


„ON GENERAL SURFACE”

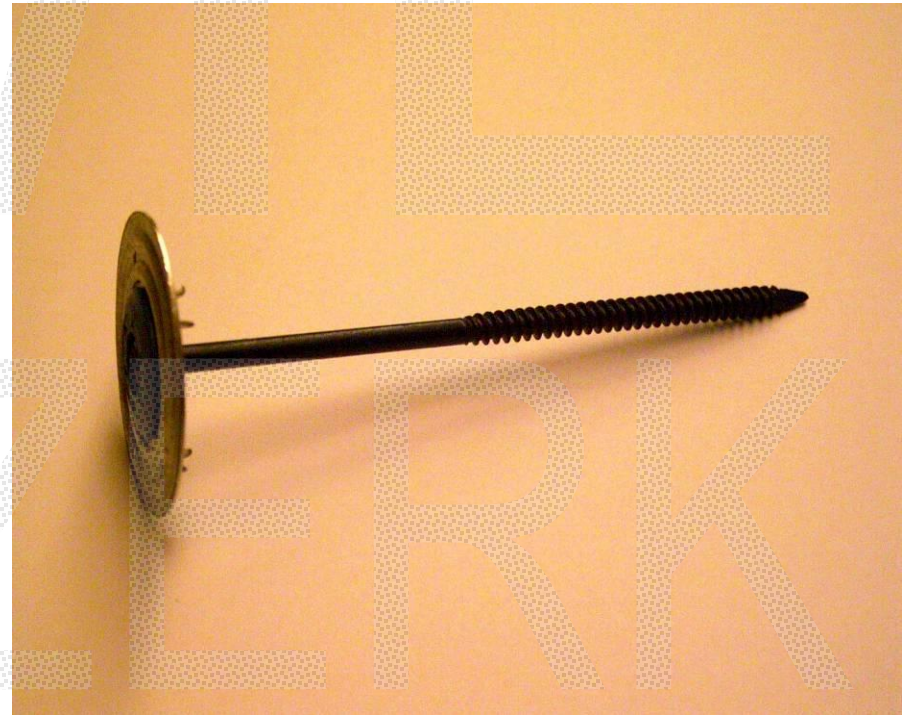


PLASTIC ROOFING MEMBRANES

MECHANICAL FIXING



PLASTIC ROOFING MEMBRANES MECHANICAL FIXING



PLASTIC ROOFING MEMBRANES

FPO



Thermoplan T SV

Flexible polyolefin membrane for mechanically fixed installations, reinforced with a pre-coated polyester cross-weaved matting which provides high levels of tear resistance.

Thicknesses of 1.2mm, 1.5mm and 2.0mm

The stocked product, T SV 15 is available in silver grey (RAL 7001) or pearl white (RAL 1013), whilst the 1.2 and 2.0mm are only available in pearl white.



PLASTIC ROOFING MEMBRANES

PVC



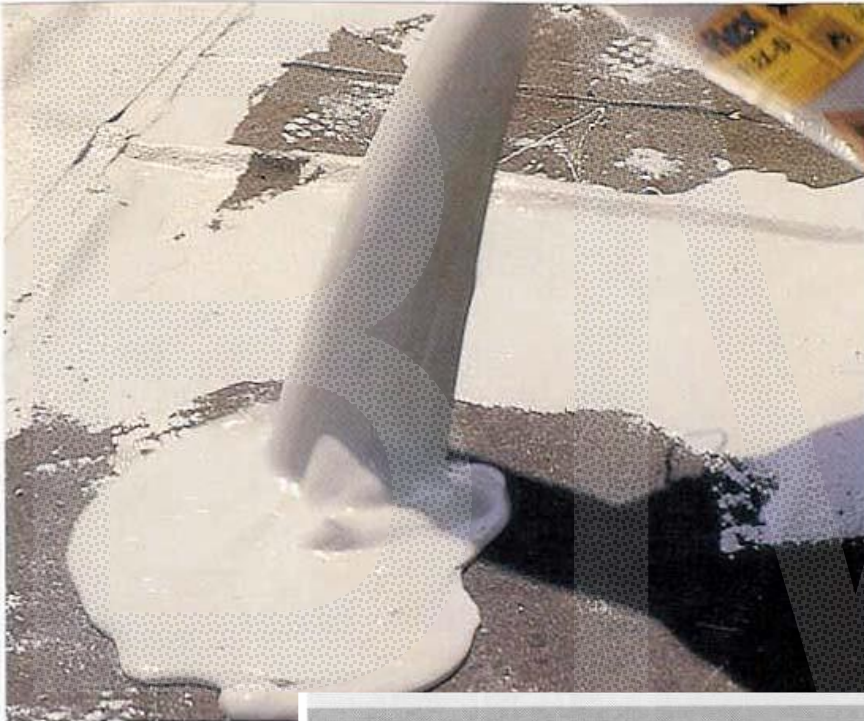
Polyvinyl chloride membrane for mechanically fixed installations, reinforced with a pre-coated polyester cross-weaved matting which provides high levels of tear resistance.

Thicknesses of 1.2mm, 1.5mm and 2.0mm

Thermofol U

The stocked product, T SV 15 is available in light grey (RAL 7035), blue grey (RAL 7031) and anthracite (RAL 7016) whilst the 1.2 and 2.0mm are only available in light grey.





FLAT ROOFS

LIQUID WATERPROOFING

example

Mapelastic is a two-component mortar based on cements, graded fine-grain aggregates with special additives and synthetic polymers in water dispersion. Once the two components are mixed, the product becomes a smooth mix that can be easily applied, even on vertical surfaces, in thicknesses up to 2 mm per coat.

PRODUCT IDENTITY

| | Part A | Part B |
|---|---|--|
| Consistency: | powder | liquid |
| Colour: | grey | white |
| Specific gravity (g/cm³): | 1.4 | 1.1 |
| Dry solids content (%): | 100 | 50 |
| Storage: | 12 months in original unopened packaging | 24 months in original unopened packaging in a dry place |



FLAT ROOFS LIQUID WATERPROOFING

FINAL PERFORMANCES

Adhesion to concrete (N/mm²):

| | |
|---|-----|
| – after 28 days at +23°C and 50% R.H.: | 1.1 |
| – after 7 days at +23°C and 50% R.H. + 21 days in water: | 0.6 |

Elongation DIN 53504 (modified)

| | |
|--|----|
| – after 28 days at +23°C and 50% R.H. (%): | 18 |
|--|----|

Waterproofing DIN 1048 (modified 1-3 atm. for 7 days)

| | |
|--|------------|
| – after 28 days at +23°C and 50% R.H.: | waterproof |
|--|------------|

Crack Bridging:

| | |
|---|---------------------|
| – after 28 days at +23°C and 50% R.H.: | up to 1-1.2 mm wide |
| – after 7 days at +23°C and 50% R.H. + 21 days in water: | 0.8 mm wide |
| – after 7 days at +23°C and 50% R.H. + 18 months in water: | 0.6 mm wide |

PROBLEMS

- Thickness
- Properties
- Cracks

Mapelastic



FLAT ROOFS

LIQUID WATERPROOFING

application



EASYGUM (Ecological bituminous elastomer liquid membrane, water based)

EASYGUM is a ready-to-use semi-dense thixotropic paste, made up of an emulsion of selected distilled bitumen, additives and special rubbers that give to the dried product excellent properties of waterproofing, adhesion, elasticity and resistance to atmospheric agents.



THERMAL INSULATION MATERIALS

PLASTIC FOAM

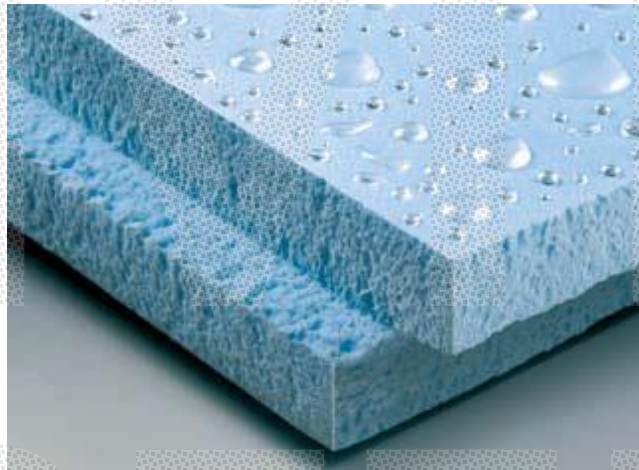
Density: ca 25-30 kg/m³



EXPANDED
PS FOAM

Dimensions: 50/60x100/120 cm

λ : 0,03-0,05 W/mK



PU FOAM

50/60x100/120 cm

0,03 W/mK

EXTRUDED
PS FOAM

50/60x100/120 cm

0,02-0,04 W/mK



THERMAL INSULATION MATERIALS

ROCKWOOL



Dimensions:

50/60x100/120 cm

Density:

ca 150 kg/m³

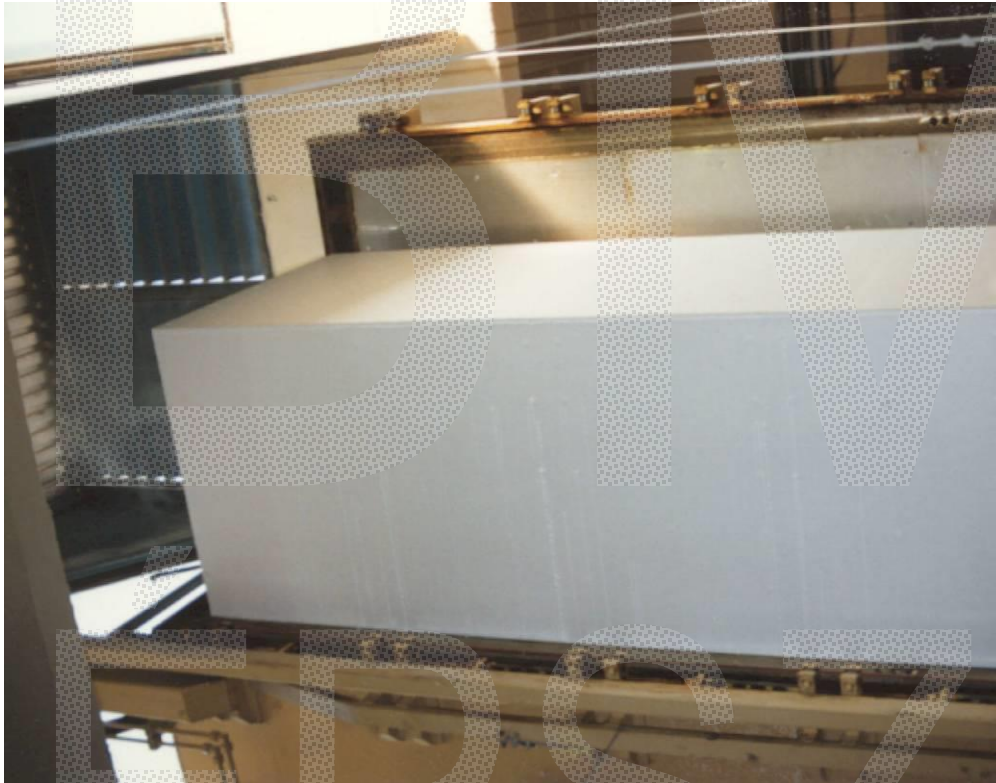
λ :

0,03-0,04 W/mK

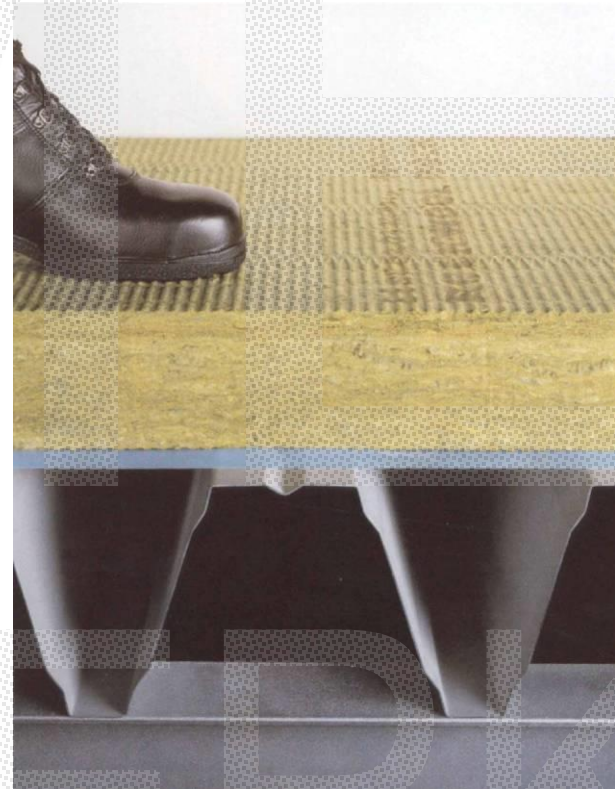


THERMAL INSULATION LAYER

NORMAL ROOF



**EXPANDED P.S. (EPS) OR
POLIURETHANE (PU) FOAM**

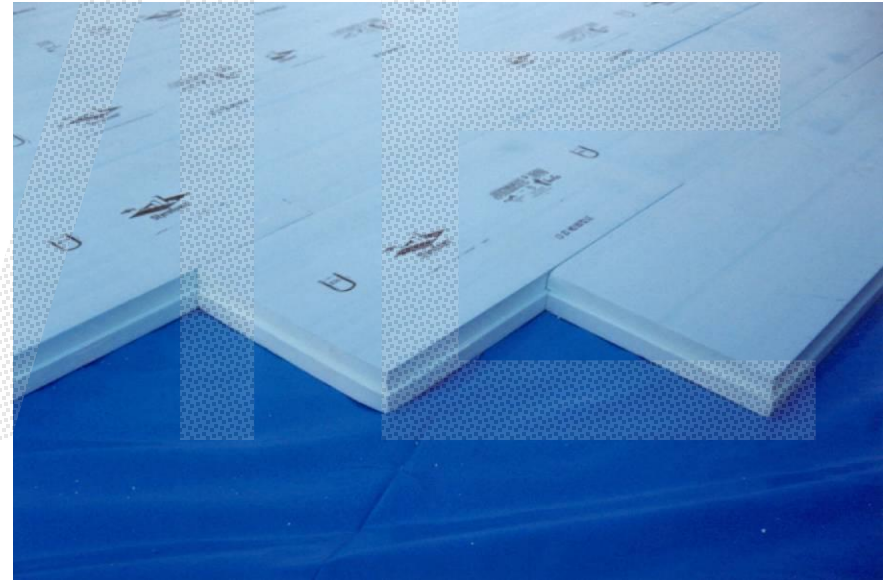
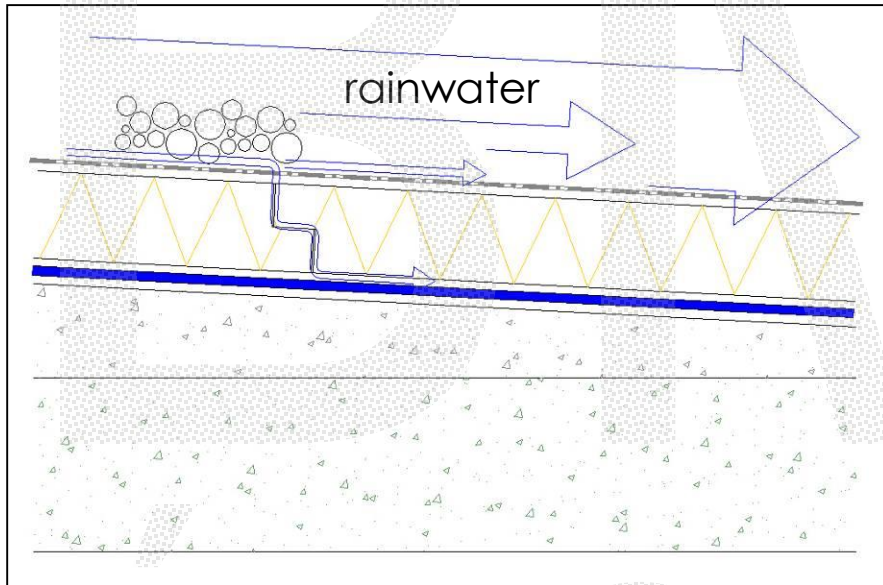


ROCK WOOL



THERMAL INSULATION LAYER

INVERTED ROOF

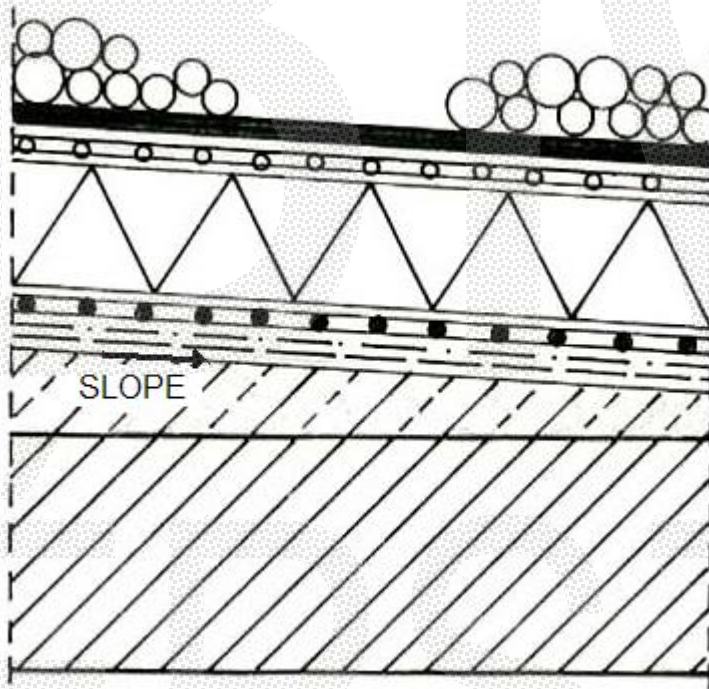


EXTRUDED P.S. (XPS) FOAM



NON EXPLOITED FLAT ROOFS

normal, non ventilated 1.



layers

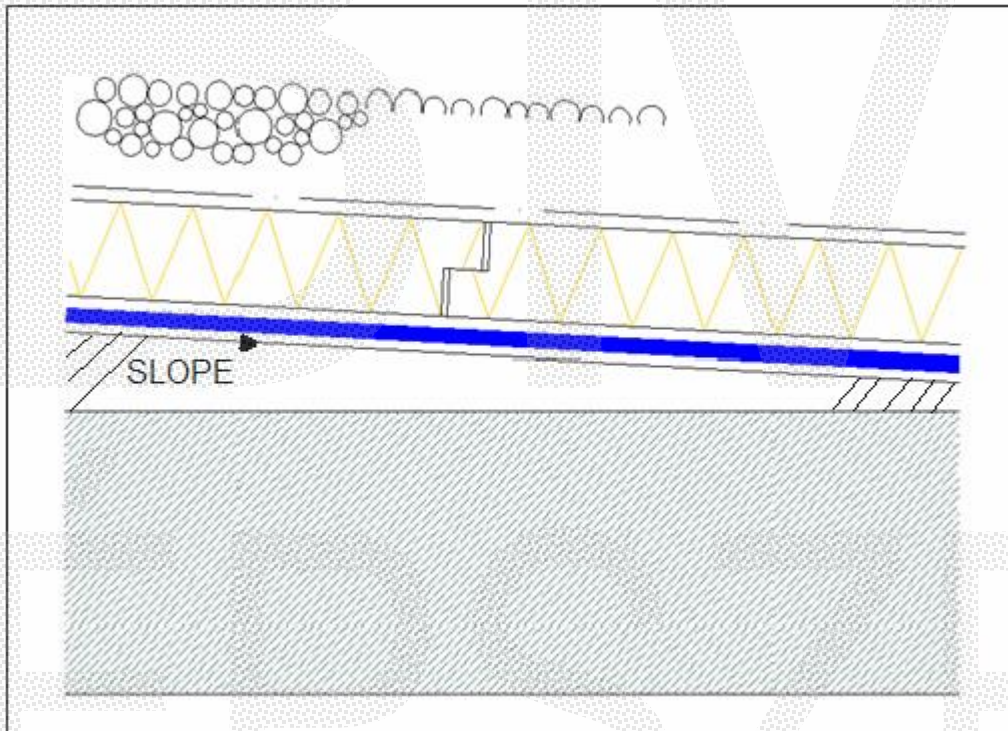
- UV protection or/and ballasting
- waterproofing
- (separation)
- thermal insulation
- vapour barrier
- (separation)
- (priming)
- smoothing
- Screed in slope
- load bearing slab

MATERIALS DEPEND ON THE SYSTEM!



NON EXPLOITED FLAT ROOFS

inverted, non ventilated roof



LAYERS

Ballasting (e.g. gravel)
Separation
Thermal insulation (**XPS**)
Waterproofing
Screed
Load bearing slab
(min 20 cm r.c. slab)

Horváth Sándor

MATERIALS DEPEND ON THE SYSTEM!



THANK YOU FOR YOUR ATTENTION!

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