

General Membrane
waterproofing systems

TECHNICAL SPECIFICATION

IMPRACTICABLE ROOF

B16

BALLAST GRAVEL

INVERTED ROOF

MONOLITHIC CONCRETE

NEVER ENDING
NEW
WATERPROOFING

Date:		# Specifications:	
Purpose:	Impracticable roof – Ballast gravel		# Code: B 16
Revision:			

Building site / project:	
Place:	
Surface:	

Client:	
Draughtsman:	
Building site supervisor:	
General Contractor:	
Specialized-installation company:	

M-26 - rev. 0 del 09/01/2013 – Heading - N.E.W. Specifications



Dear Professional,

General Membrane has developed a number of specifications aimed at supporting the design of the waterproof work. **The N.E.W. specifications** describe solutions for each type of roof; they contain the technical data of the products used, the regulations with which they comply and the laying methods in relation to the type of roof. In each specification proposal there are also exhaustive technical drawings of the project details.

The **N.E.W.** specifications are studied and developed according to an essential but often forgotten principle in the waterproofing of roofs: durability.

The life expectancy of at least **thirty years** of N.E.W. systems guarantees long-term economic savings to the benefit of environmental sustainability, as the materials used do not require premature replacement.

The heart of the N.E.W. systems is **Phoenix Super**, a bituminous membrane laid in a double layer.

"The Phoenix Super compound is created exclusively with APAO amorphous poly-alpha-olefines that are used to obtain a value of flexibility at low membrane temperatures of -35°C, even higher than that of the best SBS membranes.

This characteristic, which makes it easy to adapt the product during installation, remains unchanged over time. During testing, in fact, the low temperature flexibility of the PHOENIX SUPER membrane on new product was equal to -40°C, and after the thermal ageing test (84 d at 70°C) the value measured was equal to -35°C.

*The APAO -35°C compound is extremely resistant to the action of UV rays, thus characterising Phoenix Super as a **no-ageing** membrane, that is, insensitive to thermal ageing and long-term roofing functionality. A further advantage of the product is its high hot shape stability, superior to that of the best APP membranes."*¹

The durability of **Never Ending Waterproofing** systems is the result of the sum of the use of certified materials, with unique performances, with the offer of **substrate, monitoring and maintenance services**.

In particular, the good design of an impermeable work represents one of the most important phases in the creation of a durable roofing. This is why General Membrane develops the N.E.W. specifications offering its know-how in the design phase in compliance with what is stated in the **UNI** standard 8178 (*Building - Roofing - Analysis of the elements and functional layers*).

The N.E.W. proposal of General Membrane develops according to the directives of the standards:

- UNI 9307-1 which indicates the criteria for the design of each functional layer;
- UNI EN 8627 for the definition of compliant functional schemes;
- UNI 11345 which establishes the responsibilities of the various figures in execution of all the activities that result in the construction of a roof.

The company, with the N.E.W. systems, offers durable materials and technical support in the phases of:

- **Executive design:** through the drawing up of ad hoc **executive details**;
- **Installation:** through the **Installation Manual**, the installation check (**TAL**) and the consequent issuing of the **declaration of conformity** of the waterproof work;

¹ Taken from the document of the Institute for Construction Technologies, National Research Council "Technical Assessment Document for use no. DVT-0004 of 17.12.10".



- **Maintenance:** through the **maintenance manual** and the monitoring of the work over time, drawn up in compliance with the UNI EN 11540 standard.

The support process developed by General Membrane around the N.E.W. specification proposals finds its natural fulfilment in a twenty-year warranty which, in addition to covering the normal **Civil Liability** of the Company for the first 10 years from installation, covers the costs of **20 years** for regeneration of the stratigraphy due to product, installation and design defects.

For the purpose of activating the **twenty-year guarantee**, the project must be previously approved by General Membrane S.p.A. and activation will take place after **the installation has been checked** based on the initial project and the consequent issuing of the declaration of conformity.

General Membrane is also a member of the **U.S. Green Building Council**, confirming the Company's commitment to actively promoting the principles of sustainability. The development of sustainable architecture is therefore of primary importance for General Membrane which, through the N.E.W. specifications, proposes products that can contribute to granting **LEED credits (Leadership in Energy and Environmental Design)**.

The N.E.W. specifications comply with the current regulations regarding:

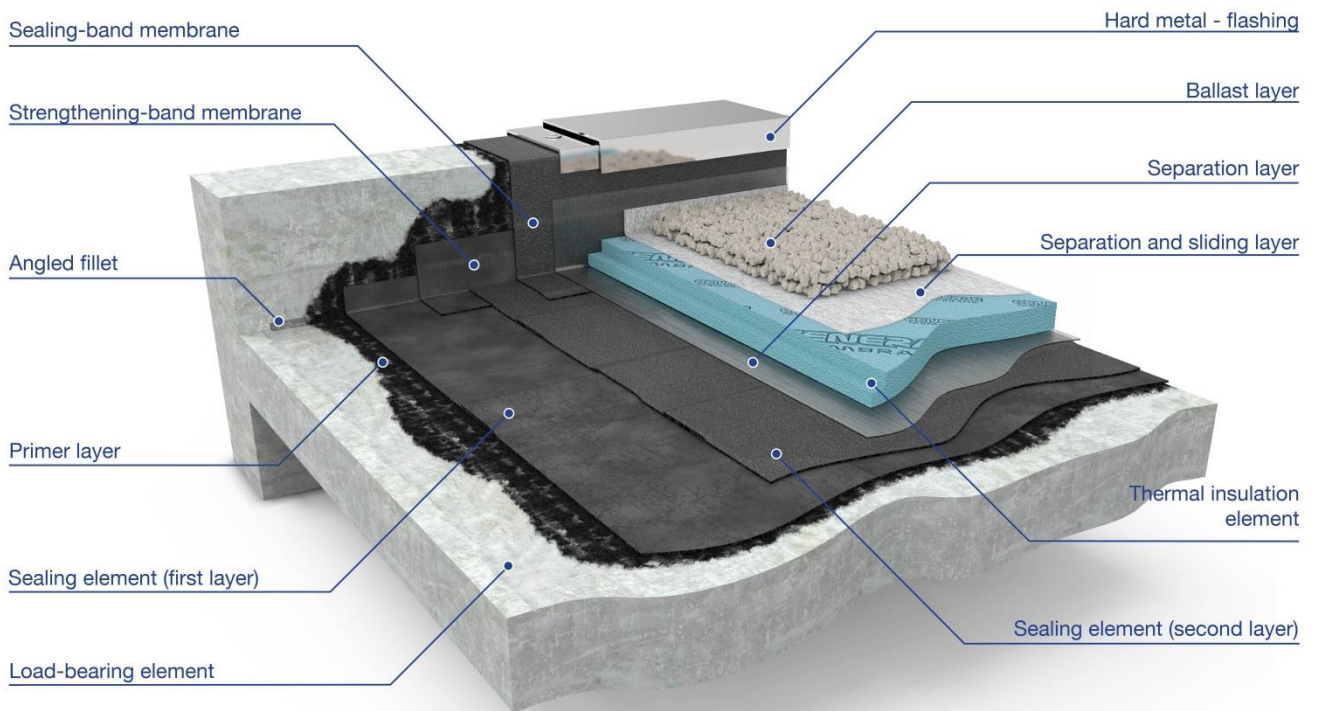
- **Building thermal and hygrometric performance:** The chapter solutions offered by General Membrane propose, where necessary, a thermo-insulating component that satisfies Italian **Legislative Decree 162 - 26 June 2015** to be sized with reference to the specific climatic zone and to the zone to which it belongs, always respecting the thermo-hygrometric balance of the roof according to the **UNI EN ISO 13788 standard**, with reference to the intended use of the underlying premises and to the external climatic conditions;
- **Wind extraction:** General Membrane, in the N.E.W. specifications, seeks to carry out the design of the wind extraction resistance of the solutions in complete exposure, performed in compliance with the **UNI EN 11442** and **UNI EN 16002 standards**;
- **Protection from external fire:** The General terms and conditions of General Membrane offer B-roof certified waterproof and thermo-waterproof proposals according to the **UNI EN 13501-5 standard**. The **B-roof** packs consist of bituminous membranes in **class E** according to the **UNI EN 13501-1 standard** and, where required, of class 1 thermal insulators according to the **UNI 8457** standard with self-extinguishing characteristics and low flammability.

The N.E.W. specification proposals also address the **Heat Island Effect**, providing solutions in line with the strategies of the International **EPA** centre (Environmental Protection Agency, U.S. body for environmental protection):

- **Solutions for green roofs:** **green** roofs contribute significantly to lowering the operating temperatures of the roofs, consequently reducing the phenomenon of heat islands in urban centres. The N.E.W. specifications include 4 **green roof** projects;
- **Solutions with reflective membranes or paints:** all the specifications in total exposure are proposed with exposed membranes surface protection system, conferred by the **Reflect Protection** white mineral coating technology or by the **Reflect Paint** white paints in order to reduce the roof temperature. All this translates into energy savings for the conditioning of buildings, promotes the dissipation of accumulated heat and keeps the membranes in an excellent condition.



Inverted roof – Monolithic concrete



Stratigraphy

B 16

1. Load-Bearing element

5. Separation layer

2. Primer layer

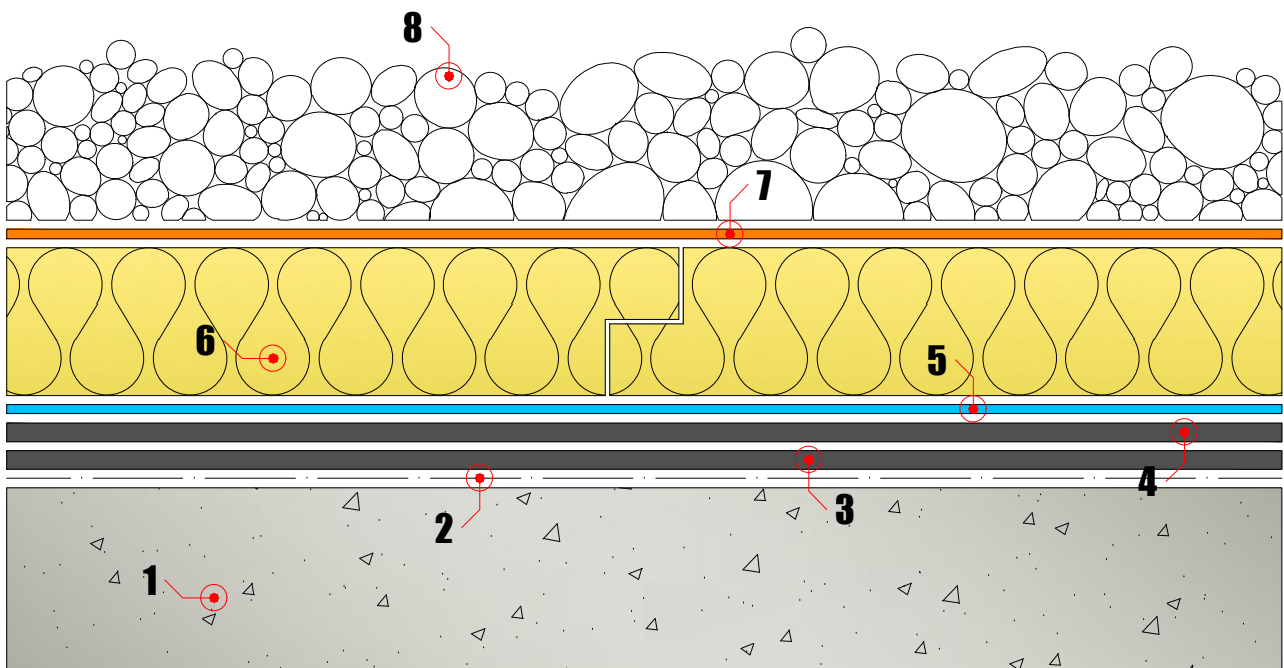
6. Thermal insulation element

3. Waterproofing element (1st layer)

7. Filter layer

4. Waterproofing element (2nd layer)

8. Ballast layer



Summary specifications

Current section

<p>1. Load-bearing element ↗ Base substrate in monolithic concrete</p>	Provided by you
<p>2. Primer layer ↗ Supply and installation of General Eco Primer</p>	m ² €/m ²
<p>3. Sealing element (first layer) ↗ Supply and installation of Phoenix Super 4 mm Installation in total adhesion</p>	m ² €/m ²
<p>4. Sealing element (second layer) ↗ Supply and installation of Phoenix Super 4 mm Installation in total adhesion</p>	m ² €/m ²
<p>5. Separation layer ↗ Supply and installation of LDPE Dry installation</p>	m ² €/m ²
<p>6. Thermal insulation element ↗ Supply and installation EPS Dry installation</p>	m ² €/m ²
<p>7. Filter layer ↗ Supply and installation of General Feltro Bianco 500 g/m² Dry installation</p>	m ² €/m ²
<p>8. Ballasting layer ↗ Supply and installation of washed river gravel Spreading using bucket or automatic blowing equipment</p>	Provided by you



System details and accessories

9. Vertical turn-ups

Connection of the waterproof system between the horizontal plane and the lateral containments

ml
€/ml

10. Elements connecting to the vertical and horizontal downspouts

Outlets connecting to the drain downspouts

pc.
€/pcs

11. Vertical crown elements

Contour and crown flashings

ml
€/ml

12. Vertical turn-up on skylights

Connection of the waterproof system to the skylights

ml
€/ml

13. Expansion joint

Connection of the waterproofing system to the structural joints

ml
€/ml

14. Access thresholds

Connection of the waterproof system to the access thresholds

ml
€/ml

15. Possible elements to complete the roof

Any additional elements that will be designed according to specific roof requirements



Descriptive specifications

Current section

(Detail B16)

1. Load-bearing element

Base substrate in monolithic concrete of adequate consistency (minimum resistance RCK 250 kg/cm²) suitable to receive any mechanical fasteners. The substrate, if considered a flat roof (up to 5° of inclination) must have a minimum slope requirement for rainwater run-off (1.5%). It must also be planar, without unevenness, very cohesive, dry and clean, with suitable surface roughness appropriate to accommodate the waterproof stratigraphy.

Technical note:

All intersections between the plane and vertical must be adequately prepared with mortar shells, of adequate consistency with a guarantee of resistance over time, to avoid abnormal stresses of the bituminous waterproofing stratigraphies.

In anticipation of the Total adhesion installation of bituminous membranes, to guarantee improved adhesion to the base substrate, on all surfaces where the impermeable stratigraphy will subsequently be laid, a layer of bituminous primer such as **General Eco Primer will be applied**.

Provided by you

2. Primer layer

Supply and installation of **General Eco Primer**

Bituminous primer based on bitumen in aqueous emulsion and additives, solvent-free, having the function of modifying the surface physical-chemical characteristics of the substrate in order to promote cortical consolidation and adhesion of the elements or upper layers. General Eco Primer is free from any type of solvent. It is therefore not harmful. The water base prevents the risk of flammability.

The product has a VOC content of 385 g/l which satisfies the characteristics of the IEQ 4.1 credit requirements of the **LEED** protocol, an evaluation system of the eco-sustainability of buildings developed by **Green Building Council**.

The product must comply with the following minimum values reported in the declaration of performance :

Volume density 20°C

0.90-1.00 Kg/cm³

Viscosity at 20°C

20-25" DIN 4

Dust-dry drying time at 20°C

240 - 360 min

Depth drying time

360 - 480 min

Flash point

Non-flammable



- **Installation**

The primer will be created using a roller, a brush or an airless spray (a nozzle with a 0.5 mm \varnothing at 150 atm) across the entire surface, spreading a layer to the extent of 0.150/0.300 kg/m².

Technical notes:

Before the surface priming works, an adhesion test will be performed with two portions of the membrane making them adhere to the substrate, the first on a primed part and the second on an area without primer. Subsequently a peeling test will be performed and use of the primer layer will be evaluated according to the adherence found.

It is important that the surfaces to be painted are as dry as possible, free from oils or dusty powders. The primer must penetrate into the cementitious surface fixing the dust, but must never create a continuous film. The visual presence of different coloured patches is not a sign of insufficient conformity.

m²
€/m²

3. Sealing element (first layer)

Supply and installation of **Phoenix Super 4 mm**

Bituminous prefabricated waterproofing membrane based on bitumen modified with amorphous poly- α olefin (APAO) reinforced with non-woven polyester fabric with continuous wire stabilised with a thickness of 4mm, Phoenix Super type. The membrane has a characteristic of flexibility at low temperatures of **-35°C** both from new and after ageing for 6 months at 70°C according to **UNI EN 1296/UNI EN 1109** and hot shape stability, with the same principle, of **140 °C** according to **UNI EN 1296/UNI EN 1110**.

The membrane ensures its qualities with the control over time through external certification of **ITC-CNR** (*Institute for Construction Technologies - National Research Council*) and **BBA** (*British Board of Agrément*), guaranteeing the durability and maintenance characteristics of the physical-mechanical properties over time, certified by **Agrément DVT certifications no. 0004/10** (former I.C.I.T.E. no. 610/03) and **BBA Agrément Certificate no. 99/3586**.

Phoenix Super has characteristics of reaction to fire in **class E** according to **UNI EN 13501-1** (*Fire classification of products and building elements - Part 1: Classification based on the results of fire reaction tests*).

The membrane has CE marking according to the directives specified in the **UNI EN 13707 standard** (*Flexible membranes for waterproofing - Bituminous membranes reinforced for the waterproofing of roofs - Definitions and characteristics*) for the precise intended use as a sealing element and must comply with the following minimum values reported in the declaration of performance:

Maximum load long./transv. connections
tensile strength:
UNI EN 12317-1 **500 / 500 N/50mm**
minimum value

Maximum load long./transv. tensile strength:
UNI EN 12311-1 **900/650 N/50mm \pm 20%**

Long./transv. break elongation:
UNI EN 12311-1 **40/45% \pm 2 absolute**

Long./transv. tear resistance:
UNI EN 12310-1 **200/200 N -30N**

Long./transv. dimensional stability:
UNI EN 1107-1 met. At **\pm 0.3%** maximum
value



Artificial ageing through long-term exposure to the combination of UV radiation, high temperature and water:
UNI EN 1297/UNI EN 1850-1
test passed

Fatigue cycles test (stress simulation on the insulating panel alignment line or on discontinuous base substrates):
EOTA TR 0088 test for 1500 cycles
test passed

Reaction to fire:
UNI EN 13501-1 **class E**

- **Total adhesion installation**

The membrane will be laid in total adhesion by propane gas flame to the first impermeable layer, with longitudinal offset of the sheets. Furthermore, it must be offset both longitudinally and transversely with respect to the first sealed layer.

The membrane must be turned upside down along the vertical walls as described in the specific detail item. The longitudinal overlaps will be heat sealed in total adhesion by a propane gas flame for at least 10 cm and the head ones by at least 15 cm. The "T" intersections between multiple sheets must provide a 45° chamfer in the corners of the membrane receiving the overlap.

Technical note:

In heat sealing of the continuity overlaps it will be necessary to operate in such a way as to create the uniform outlet of a melted compound joint seal, an indicator of sealing and correct heat sealing at the points of membrane overlap.

The operations will be performed with laying according to a professional standard referred to by the **UNI EN 11333 standard** (*Laying of flexible membranes for waterproofing*).

m²
€/m²

4. Sealing element (second layer)

Supply and installation of **Phoenix Super** 4 mm

Bituminous prefabricated waterproofing membrane based on bitumen modified with amorphous poly- α olefin (APAO) reinforced with non-woven polyester fabric with continuous wire stabilised with a thickness of 4mm, Phoenix Super type. The membrane has a characteristic of flexibility at low temperatures of **-35°C** both from new and after ageing for 6 months at 70°C according to **UNI EN 1296/UNI EN 1109** and hot shape stability, with the same principle, of **140 °C** according to **UNI EN 1296/UNI EN 1110**.

The membrane ensures its qualities with the control over time through external certification of **ITC-CNR** (*Institute for Construction Technologies - National Research Council*) and **BBA** (*British Board of Agrément*), guaranteeing the durability and maintenance characteristics of the physical-mechanical properties over time, certified by **Agrément DVT certifications no. 0004/10** (former I.C.I.T.E. no. 610/03) and **BBA Agrément Certificate no. 99/3586**.

Phoenix Super has characteristics of reaction to fire in **class E** according to **UNI EN 13501-1** (*Fire classification of products and building elements - Part 1: Classification based on the results of fire reaction tests*).

The membrane has CE marking according to the directives specified in the **UNI EN 13707 standard** (*Flexible membranes for waterproofing - Bituminous membranes reinforced for the waterproofing of roofs - Definitions and characteristics*) for the precise intended use as a sealing



element and must comply with the following minimum values reported in the declaration of performance:

Maximum load long./transv. connections
tensile strength:
UNI EN 12317-1 **500 / 500 N/50mm**
minimum value

Artificial ageing through long-term exposure
to the combination of UV radiation, high
temperature and water:
UNI EN 1297/UNI EN 1850-1
test passed

Maximum load long./transv. tensile strength:
UNI EN 12311-1 **900/650 N/50mm** $\pm 20\%$

Reaction to fire:
UNI EN 13501-1 **class E**

Long./transv. break elongation:
UNI EN 12311-1 **40/45%** ± 2 absolute

Fatigue cycles test (stress simulation on the
insulating panel alignment line or on
discontinuous base substrates):
EOTA TR 0088 test for 1500 cycles
test passed

Long./transv. tear resistance:
UNI EN 12310-1 **200/200 N** -30N

Long./transv. dimensional stability:
UNI EN 1107-1 met. At $\pm 0.3\%$ maximum
value

- **Total adhesion installation**

The membrane will be laid in total adhesion by propane gas flame to the first impermeable layer, with longitudinal offset of the sheets. Furthermore, it must be offset both longitudinally and transversely with respect to the first sealed layer.

The membrane must be turned upside down along the vertical walls as described in the specific detail item. The longitudinal overlaps will be heat sealed in total adhesion by a propane gas flame for at least 10 cm and the head ones by at least 15 cm. The "T" intersections between multiple sheets must provide a 45° chamfer in the corners of the membrane receiving the overlap.

Technical note:

In heat sealing of the continuity overlaps it will be necessary to operate in such a way as to create the uniform outlet of a melted compound joint seal, an indicator of sealing and correct heat sealing at the points of membrane overlap.

The operations will be performed with laying according to a professional standard referred to by the **UNI EN 11333 standard** (*Laying of flexible membranes for waterproofing*).

m²
€/m²

5. Separation layer

Supply and installation of **LDPE**

Medium density polyethylene (MDPE) micro-perforated film with high breathability, grey covering the thickness of... mm and cold micro-perforated in line of distance... x... cm. The product, although used as a separating layer under ballast and not left in total exposure as a finishing layer, is treated with special additives capable of resisting UV rays.

LDPE must comply with the following minimum values reported in the declaration of performance:

Coeff. of resistance to the passage of steam:
UNI EN 1931 ... **Sd (m)**

UNI 10351 ... Kg/m²s

Steam permeability:

Tensile strength:
UNI EN ISO 527-3 \geq ... **MPa**



Elongation at the breaking point:
UNI EN ISO 527-3 $\geq \dots\%$

Test of impact resistance – bend:
UNI EN ISO 7765-1 Met. A $\geq \dots$ cN

Test of impact resistance – flat:
UNI EN ISO 7765-1 Met. A $\geq \dots$ cN

- **Dry installation**

The polyethylene film will be laid dry on the receiving surface with overlapping sheets of 10 cm. Sealing of the longitudinal and overlapping overlaps will be carried out with single-sided polyethylene tape 5 cm wide.

m²
€/m²

6. Thermal insulation element

Supply and installation of EPS

Technical sheet in high density sintered expanded polystyrene, moulded (with closed cells also on the surface), without adding external foaming agents, with declared conductivity $\lambda_D = \dots$ W/mK, with dimensions... x... mm and thickness (of... mm) according to the specific climatic zone, respecting the legal limits in force and according to the **UNI/TS 11300 standard** (*energy performance of buildings*). The heat-insulating element has a characteristic compressive strength... kPa.

The panel will be pre-coupled with a solution of continuity to a 2 mm thick bitumen polymer membrane reinforced with glass film that is able to accommodate the total adhesion laying of the subsequent impermeable layers, also preserving the physical-mechanical characteristics of the thermal insulation element.

Technical note:

The thermal insulation component must meet the minimum values of thermal insulation dictated by **Italian Legislative Decree 29 December 2006, no. 311** on the energy performance of buildings, with reference to the specific climatic zone and to the zone to which they belong.

Thermal transmittance of horizontal or inclined opaque structures:

Table 3.1	Roofs (U limit in W/m ² K) - Legal limits
Climate zone	From 1 July 2015
A	0.38
B	0.38
C	0.36
D	0.30
E	0.25
F	0.23

A modelling of the thermal properties of the building is also recommended, as established by the requirements of the EA 1 credit, for an assessment of the thermal performance of the entire building envelope and for the allocation of credits if the building is subject to the **LEED** protocol, evaluation system of the eco-sustainability of buildings developed by the **Green Building Council**.



The panel has CE marking according to the directives specified in the **UNI EN 13163 standard** (*Thermal insulation products for buildings - Factory made polystyrene foam products (EPS) - Specification*) with reference to the precise intended use as a thermal insulating element and must respect the following minimum values reported in the declaration of performance:

Declared thermal conductivity determined at the average temperature of 10°C:
UNI EN 12939 ... λ_D (W/mK)

Factor of resistance to the diffusion of water vapour:
UNI EN 12086 ... $\mu \pm \dots$

Linear thermal expansion coefficient
UNI 6348 ... K^{-1}

Water absorption - total immersion test for 365 days:
UNI EN 12087 ... % own weight

- **Dry installation**

The panel will be laid dry on the receiving surface and distributed in a longitudinally staggered pattern with respect to the longer side, being sure to pull the flattened sides together to avoid thermal bridges.

m²
€/m²

7. Separation and sliding layer

Supply and installation of **General Feltro Bianco** 500 g/m²

White non-woven polyester geotextile co-joined by mechanical picking and calendering, with the exclusion of adhesives or chemical binders, of 500 g/m², General Feltro Bianco type. The product has CE marking and must comply with the following minimum values reported in the declaration of performance:

Tensile strength MD/CMD
EN ISO 10319 **4.2/5.2 kN/m** -25%

EN ISO 12236 **0.8 kN** -40%

Elongation at maximum load MD/CMD
EN ISO 10319 **60/70%** $\pm 30\%$

Dynamic punch resistance
EN ISO 13433 **16 mm** +30%

Resistance to CBR static punching

Porosimetry
ISO 12956 **45 μ m** $\pm 40\%$

- **Dry installation**

General Feltro will be laid dry on the receiving surface with 10 cm overlaps on both the longitudinal and head sides.

m²
€/m²

8. Ballasting layer

Waterproof stratigraphy ballast created with washed round river gravel, with a grain size of 16-32 mm.

- **Installation**

Spreading of a uniform layer with a thickness of approximately 5 cm using bucket or automatic blowing machinery.

Provided by you



System details and accessories

9. Vertical turn ups (detail B16/1)

The steam diffusion control layer must be turned up and laid in total adhesion by means of a propane gas flame on the vertical elevation exceeding the level of the thermal insulation element, after priming of the area concerned using primers as described in the specific item, thus ensuring the temporary site "outflow of water".

After laying the thermal insulating panel, the layer constituting the first sealing element must be turned up to a minimum height necessary to achieve sealing with the appropriate steam barrier/brake, thus ensuring a new temporary "water outlet". A perimetric mechanical fixing will therefore be provided which will connect all the functional layers so far described to the base substrate. At the same time, a strip of membrane laid in total adhesion by means of a propane gas flame must seal the corner, adhering to the first sealing element coming from the horizontal plane and rising to a minimum height of at least 7 cm, always ensuring the hydraulic seal.

Using the same criterion the next step is laying of the second sealing element, this time up to the wall, without performing any turn-up. A subsequent strip will cover the vertical elevation for a minimum height such as to exceed by at least 10 cm the height of the first strip, adhering to the wall and turning up for at least 15/20 cm on the heads and on the longitudinal sides of the sealing element placed on the horizontal roof plane.

An insulating panel with a precise mechanical protection function will be placed behind the perimeter vertical during installation and maintenance of the roof garden. Both the protection, separation, sliding and drainage layer and the filtering layer will rise on the vertical for a minimum height useful to keep the sealing elements protected from the clay and from the gravel edge that will be provided along the entire perimeter of the roof.

Both the separation layer and the separation and sliding layer will rise on the perimeter vertical for a minimum height useful to keep the sealing elements protected from the gravel ballast layer.

The described vertical turn-up system is coherent with what is prescribed and designed in the executive details of the **UNI EN 11333-2 standard** (*Laying of flexible membranes for waterproofing*).

Complete closure of the perimeter will be guaranteed by adequate vertical crown elements, as described in the specific detail item.

Furthermore, the internal and external corners must be created by adhesion, joint heat sealing and features in compliance with what is prescribed and designed in the executive details of the **UNI EN 11333-2 standard** (*Laying of flexible membranes for waterproofing*).

Technical notes:

For appropriate sealing of the vertical elevations it is forbidden to create the membrane flap, with a continuity solution, using the sheets coming from the horizontal roof plane. The strips constituting the vertical seal will be created by cutting portions of membrane in a transverse direction with respect to the length of the sheet, with a maximum width equal to the size of the sheet (generally 100 cm), which may eventually increase up to 250 cm if the laying, always in total adhesion with a propane gas flame, is performed simultaneously by 2 operators.

ml
€/ml



10. Elements connecting to the vertical and horizontal downspouts

(detail B16/2, B16/3 and B16/5)

Connection to the descending downspouts will be created with prefabricated rigid drain outlets, compatible with the described waterproofing, of diameter and length of the shank suitable for connection to the descending elements present in the structure. They must be provided in such a number as to ensure a safe run-off of the rainwater from the roof.

The planar and corner outlets must be consistently placed at the lowest points of the roof and, if possible, the slot into which they are placed must be lower with respect to the laying plane to facilitate water disposal. The drains will be placed over the first impermeable layer. They must be secured by means of adequate mechanical fasteners to the base substrate, at a rate of 3pc/outlet. The second layer constituting the sealing element must be shaped and heat sealed inside the cone of the discharge outlet.

Before laying the drainage layer, grating covers must be provided, previously placed above the drain outlets, which will delimit the areas where the clay has fallen and of the next cultivation earth, avoiding obstructing the downspouts and compromising correct disposal of the rainwater from the roof.

The "overflow" drains will be created, with the same criterion, on the vertical elevations of the perimeters at a height of approximately 10/15 cm with respect to the horizontal planar height.

The outlets will be provided, depending on the intended use of the roof, with "spider" leaf guard or interlocking gravel guard, including fins to prevent them from escaping from the funnel.

Technical notes:

In areas with a high rainfall index, if there is concern for regurgitation, it is advisable to use downspouts with cup connection fitted with an "o-ring" sealing ring on which the shank of the drain outlet is inserted, thus avoiding phenomena of overflow of the downpipe inside the buildings.

If the provisional nature of the water outflow guaranteed by the vapour barrier/brake should last for long periods, it is advisable to insert an additional outlet to the descending downspouts which will be connected coaxially to the upper pipe union located under the second sealing element.

pc.
€/pcs

11. Vertical crown elements

(detail B16/4)

Contour and crown flashings of vertical reliefs sealed against air and water and appropriately shaped according to site requirements dictated by the configuration of the type of vertical turn up. The nature of the material, the thickness and colours are chosen by the Director of Works.

ml
€/ml

12. Vertical turn up on skylights

(detail B16/6)

The sealing elements must be raised in a similar manner to that described in the detail item of the perimeter verticals, turning up the closing strip until the vertical head is completely covered. At its summit, the skylight bracket will be mechanically secured, following interposition of the windproof band in compressible material (polyethylene or reticular polypropylenes).

ml
€/ml



13. Expansion joints (detail B16/7)

All structural joints must be adequately sealed with a continuity solution, being sure to maintain appropriate membrane excesses to avoid tensioning of the sealing elements at the intersection points, caused by the dilator movements of the prefabricated elements.

A membrane strip will be laid in total adhesion along the intersection lines, connecting the sealing element constituting the first impermeable layer coming from the adjacent elements. The creation of this bridging must be performed being sure to maintain a suitable excess between the two prefabricated elements, however minimal to be able to accommodate a compressible flexible tube inside it. Subsequently, the second layer of waterproofing will be applied, which will end close to the compressible element. At its extrados, a sealing strip will be laid in total adhesion, completing sealing along the structural joint.

Technical note:

The choice of using technical detail does not exempt the designer/Director of Works from evaluating the effective efficiency of this detail in relation to the calculation of movement of the structural joint.

ml
€/ml

14. Access thresholds (detail B16/8)

Generally speaking, the thresholds must be set in place, with no exceptions, only and exclusively after laying subthreshold waterproofing. Conceptually, depending on the configuration and on the type of sub-threshold structural works, the membranes with waterproof sealing function must turn up in all vertical confinements with respect to the laying level of the threshold. The height of the overlaps must always be higher than the sliding plane of the sealing element.

The sub-threshold waterproofing will be connected to the sealing layers coming from the horizontal plane by means of installation in total adhesion with a propane gas flame. The membranes must be laid on the entire laying plane of the access door thresholds and tilted on the vertical elevations for a height of at least 20 cm.

Technical note:

If, for time reasons, a door threshold is laid before the waterproof stratigraphy, the sub door threshold waterproofing will in any case be laid before the door threshold itself leaving a wide area for its subsequent attachment to the sealing elements, located on the horizontal plane of the roof.

Particular attention is required to avoid damaging the sub door threshold during the laying operations, using for anchoring of the same door threshold materials that are compatible with the sealing element (sand beds, mortar, glues, etc.), or any materials that are free from organic and solvent substances.

ml
€/ml

15. Possible elements to complete the roof

To complete this specification, in relation to the specific needs of the roof, the executive details relating to any works not contemplated will be designed.



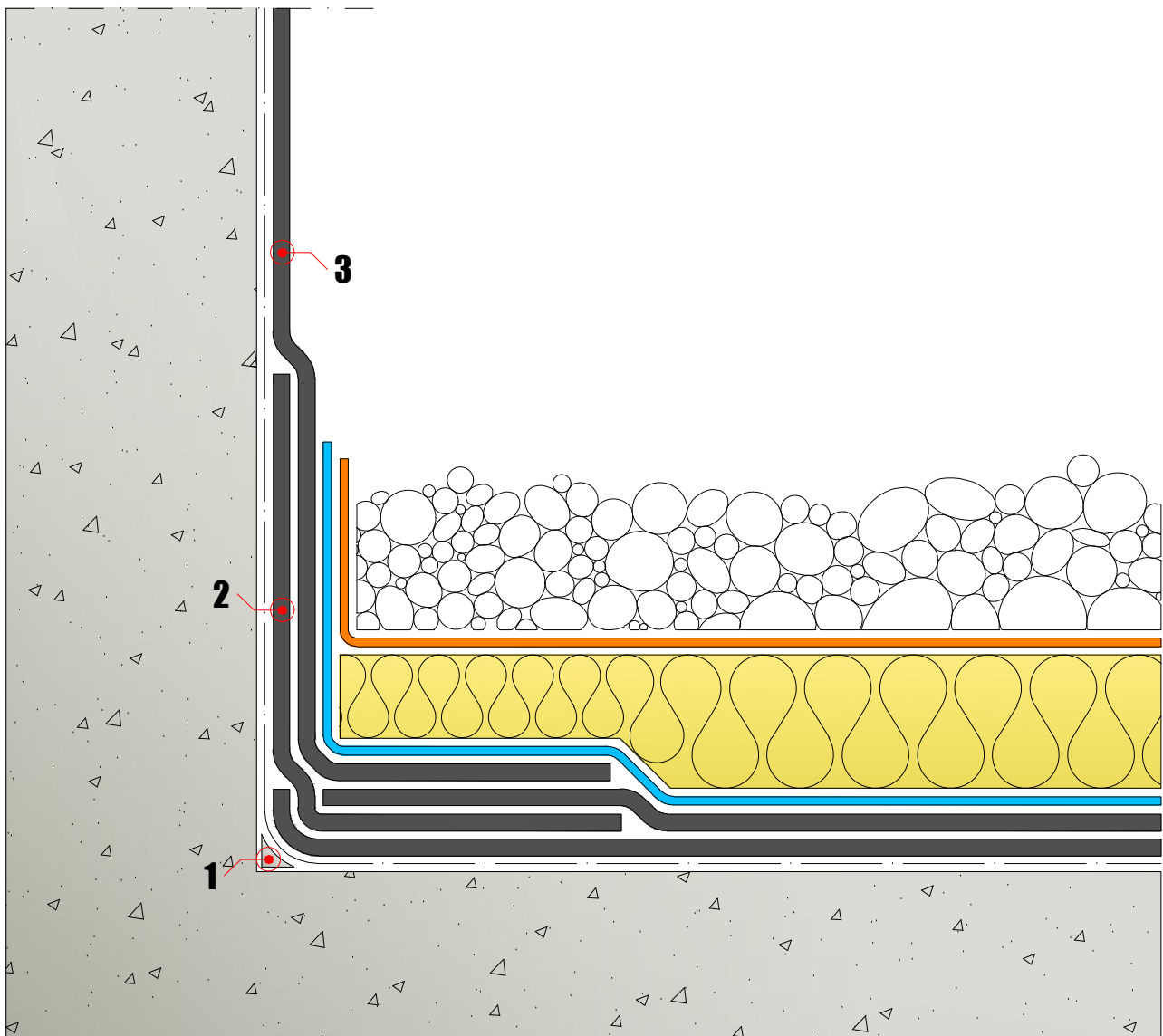
Vertical walls

B 16/1

1. Angled filled

3. Sealing-band membrane

2. Strengthening-band membrane



Drains

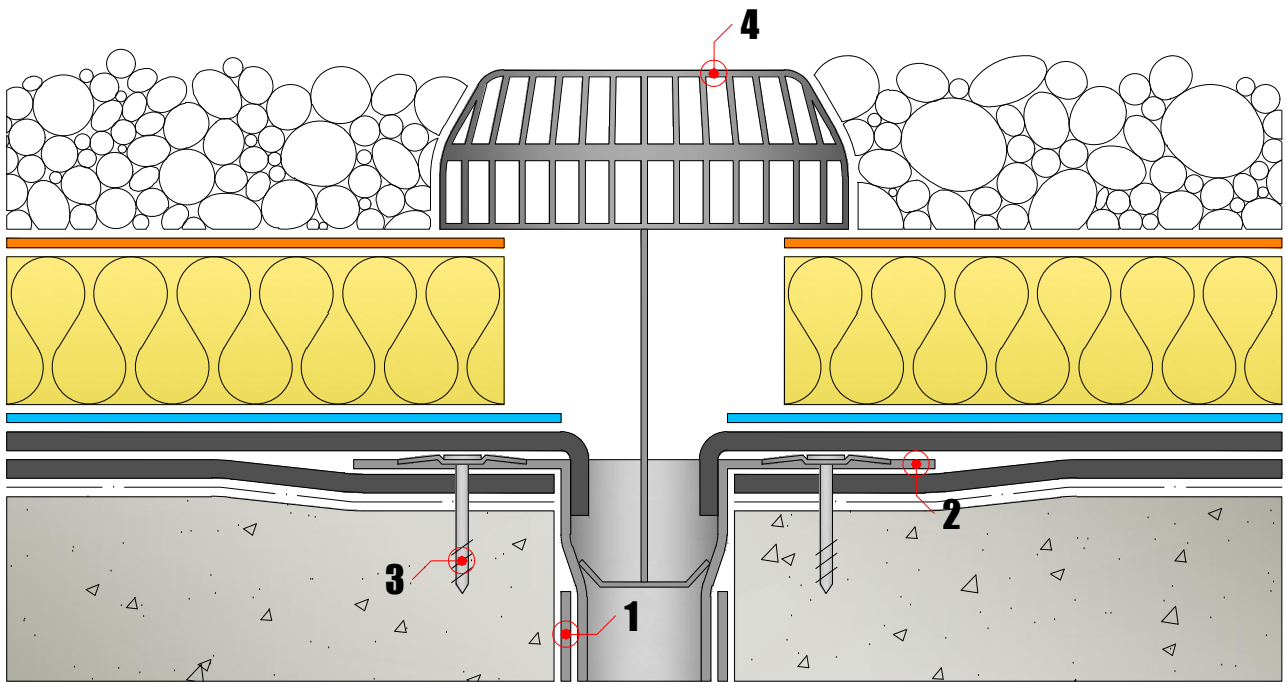
B 16/2

1. Pluvial

3. Mechanical fixing

2. Drain

4. Leaf-Guard



Angular drains

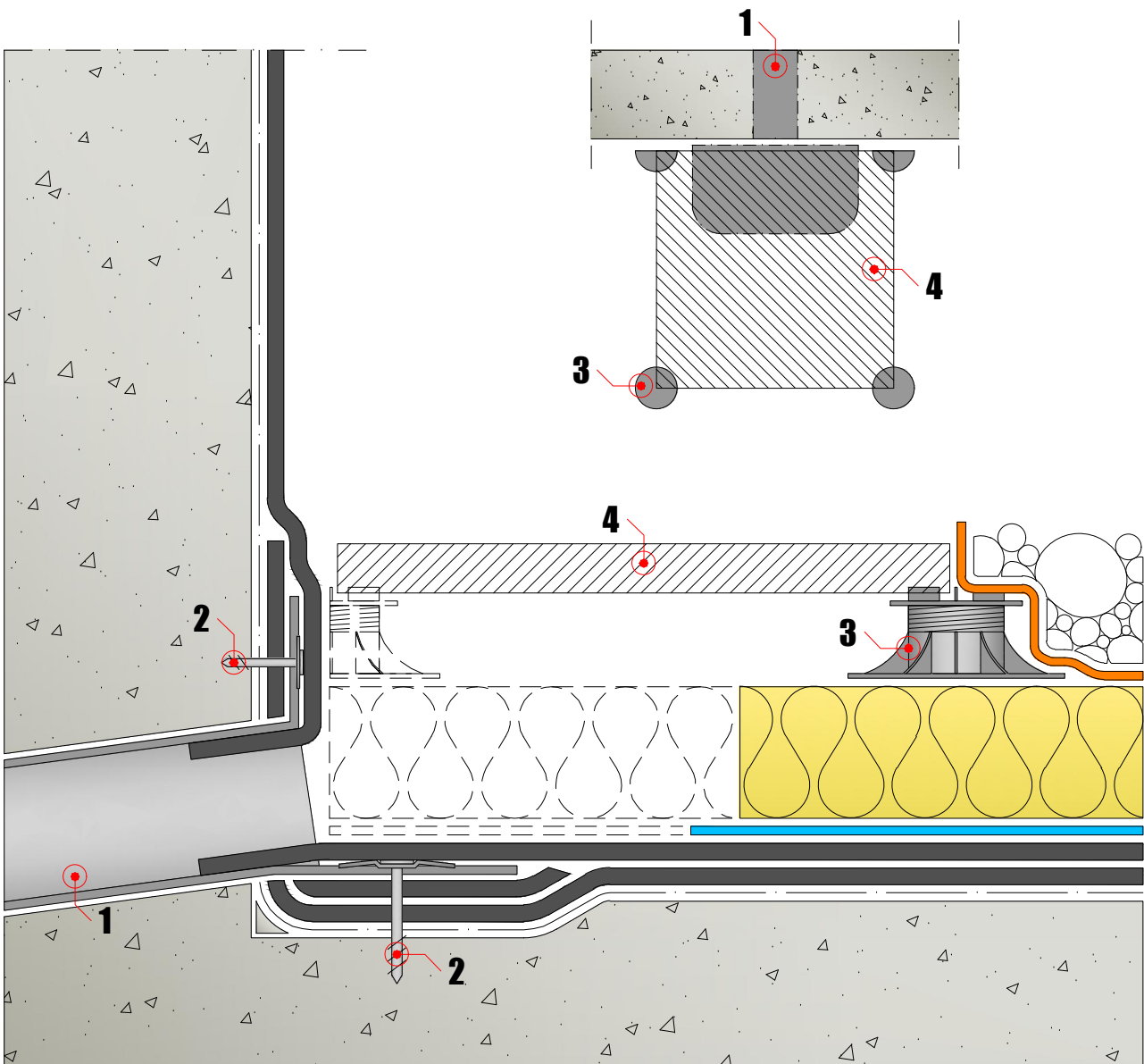
B 16/3

1. Angular drain

3. Leaf-Guard

2. Mechanical fixing

4. Tile



Vertical crowing elements

B 16/4

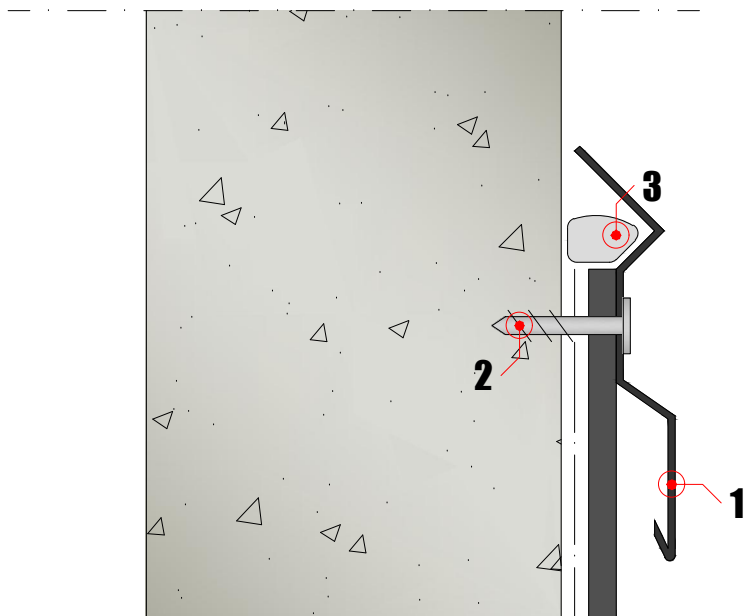
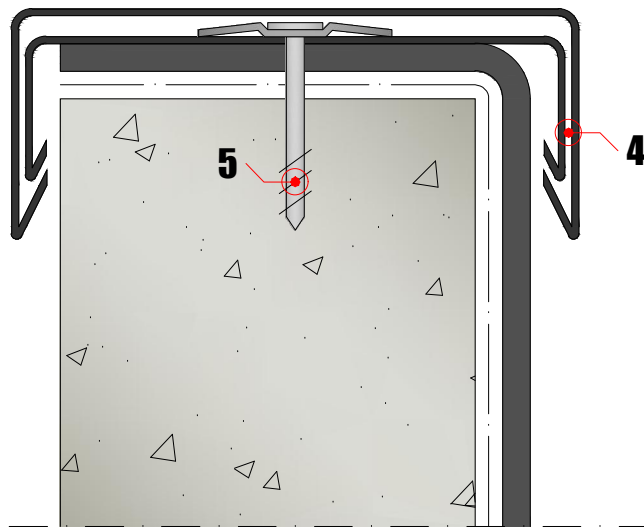
1. Vertical metal-flashing

4. Head metal-flashing

2. Mechanical fixing

5. Mechanical fixing

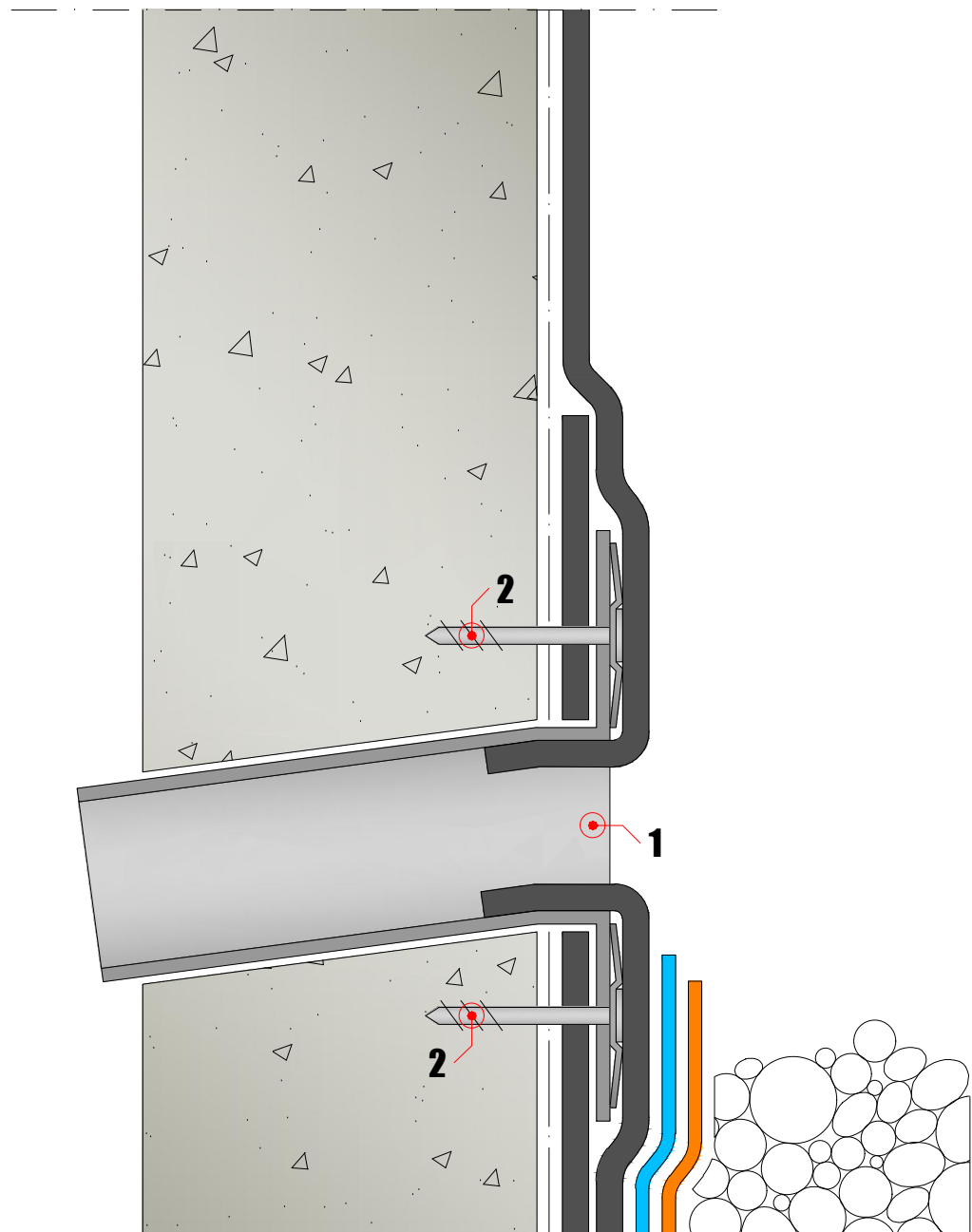
3. Sealing



"Overflow" drains**B 16/5**

1. "Overflow drain"

2. Mechanical fixing



Skylights

B 16/6

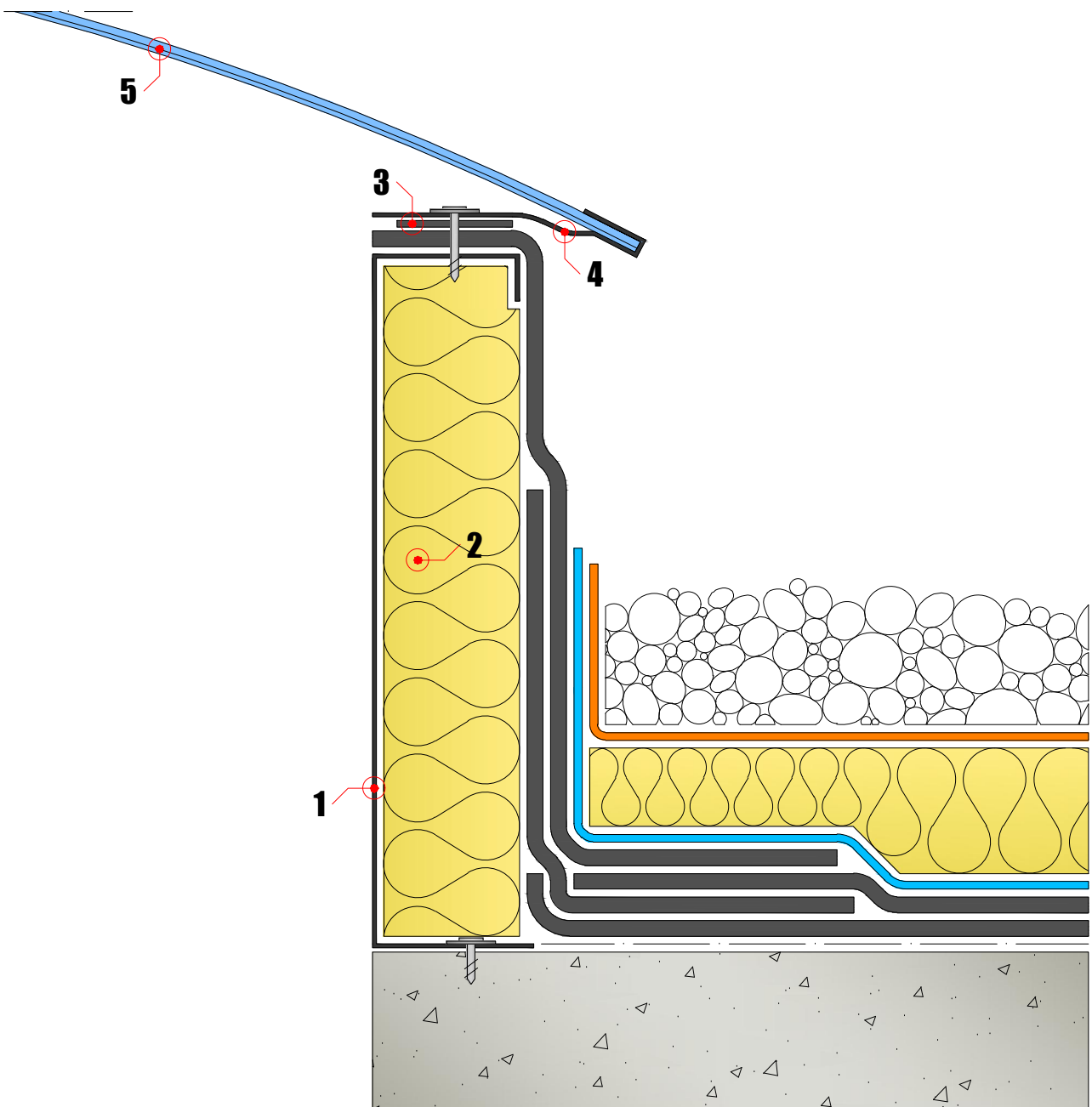
1. Metal support

4. Bracket

2. Theraml insulation

5. Skylight

3. Windproof tape



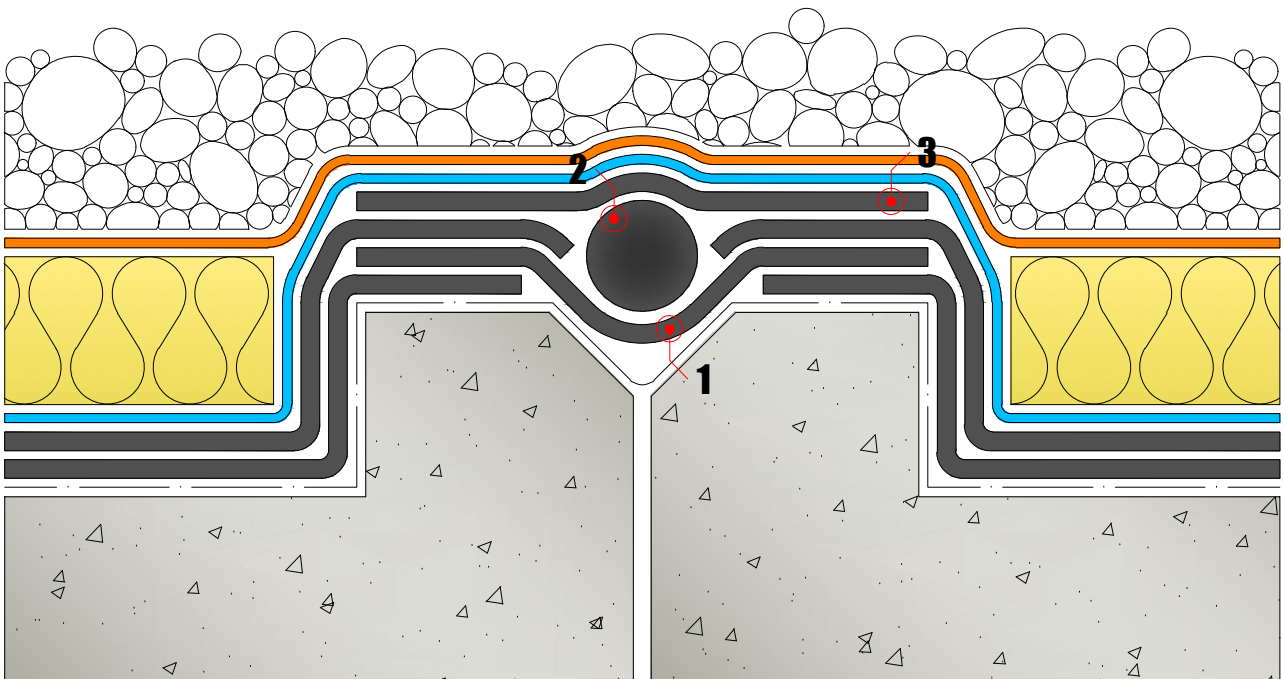
Expansion joint

B 16/7

1. Pontage

3. Sealing band-membrane

2. Flexible element



Access thresholds

B 16/8

1. Base

3. Doorstep

2. Floor

4. Door

