



Technical Book

**SINGLE PLY WATERPROOFING SYSTEMS
FOR MECHANICALLY FASTENED ROOFS
MAPEPLAN T M**

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FOR MECHANICALLY FASTENED ROOFS**

MAPEPLAN T M



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**SINGLE PLY WATERPROOFING SYSTEMS
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MAPEPLAN T M



1. Foreword

The aim of this Technical book is to provide technical, design and construction information and solutions for the correct installation of waterproofing membranes and thermal insulation mechanically fastened on exposed roof, with the use of MAPEPLAN T M flexible polyolefin (FPO/TPO) synthetic waterproofing membranes.

Waterproofing systems are a key factor in the construction of an exposed roof. Indeed, a successful build starts with the waterproofing system, which must ensure a perfect seal, functionality and long service life, otherwise all the work that has gone in to creating a superior standard of roof will be negated by leak issues.

More specifically, the waterproofing membrane is the roof external covering: it can be seen as the “skin” of the building and, as such, must have superior qualities and performance in addition to being aesthetically attractive. The waterproofing membrane must UV resistant, weathering resistant and wind uplift action resistant; it must be walkable only for roof maintenance and must have a high solar reflectance rating to contribute to improve the energy efficiency of the building.

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2. Polyglass SpA

POLYGLASS SpA is one of the leading and most active European manufacturers of waterproofing systems using FPO/TPO and PVC-P synthetic membranes and polymer distilled bitumen membranes.

POLYGLASS is the first Italian manufacturer into the world market with products and technologies present in over 40 countries.

POLYGLASS main production plant and headquarters is placed in Ponte di Piave in the province of Treviso in Italy.

POLYGLASS SpA is part of the MAPEI Group, an international construction chemicals giant that, at the end of 2016, comprises 81 subsidiaries, including 9 service companies, 18 main R&D centres, including 1 corporate centre, and 70 manufacturing sites operating in 32 countries on five continents, each with its own quality control laboratory.

POLYGLASS waterproofing systems are distributed and applied successfully worldwide, exposed to a whole range of different and critical environmental and service conditions.

POLYGLASS SpA has been an ISO 9001-certified company since 1995 and ISO 14001-certified since 2010, and it is a member of the Green Building Council Italia.



All POLYGLASS products can help earn credits for LEED certification of buildings.

3. Mechanically fastened roofs

On buildings where the roof waterproofing is left exposed, the waterproofing layer, which in this case is realized with mechanically fastened FPO/TPO synthetic membranes, constitutes the external covering. Consequently, in addition to serving the function it was designed for, it also has an aesthetic purpose, being the building finishing element.

The mechanically fastened waterproofing membrane is entirely exposed and must stand up to the weathering, UV radiation and temperature variations that they act everyday, for this reasons it meeting specific requirements to ensure a functional and long-lasting roof.

Advantages and features

The design and realization of exposed roofs with mechanically fastened waterproofing membranes, guarantee excellent functional features and significant advantages, as described below.

- Lightweight membranes allow for application on light roofs. Where the roofing system does not involve permanent structural loads, the weight of an exposed roof build-up system incorporating thermal insulation is generally in the 5-10 kg/m² range. These build-ups are recommended, for example, on roofs with metal framework, on wooden roofs or on roofs with prefabricated structures.
- The rationality, simplicity and speed of application makes it easy to install the system on large roofs, such as roofs on industrial buildings, logistics centres, shopping centres, exhibition centres, hangars, etc.
- Loose-laid application with mechanical fastening system of waterproofing membrane can be used on non-continuous supports, such as thermal insulation panels, roofs with metal framework, wooden roofs and roofs with prefabricated structures.
- Application on flat or pitched roofs or roofs with architecturally complex shapes, such as: domes, vaults, sawtooth (shed), precast concrete V beams, etc.
- Application in roof refurbishment to replace waterproofing or as an energy-efficient upgrade, adding a thermal insulation layer (where none is present) or increasing the existing insulation thickness.
- Option of installing the new waterproofing membrane directly on top of existing waterproofing membranes

and insulating panels, saving the time and cost involved in removing them. In addition to anchoring the new waterproofing system directly to the structure, the mechanical fastening system also serves to stabilize and secure the existing roof build-up mechanically.

- In refurbishment the use of rational work time schedule avoids the risk of water getting inside accidentally while the job is in progress and does not interfere with activities carrying on under the roof in the meantime.
- Roofs with exposed synthetic membranes are walkable and accessible for the purpose of routine maintenance of waterproofing membranes and of any rooftop services.
- The waterproofing membranes surface can have a white top layer (Smart White) with a high solar reflectance rating to realize a “cool roof” waterproofing system with a high Solar Reflectance Index (SRI) value, for energy savings over the summer months.
- If a photovoltaic system is present on the roof, the “Smart White” waterproofing membranes helps boost the system energy performance by lowering the surface temperature of the roof.
- When refurbishing pitched, curved or sawtooth roofs covered with metal or fibre-cement sheeting, the existing “discontinuous” waterproofing system is converted into a heat-welded “continuous” waterproofing system that ensures the fully watertightness also through the roof surface, through junctions (along hip lines or valleys) and around gutters.
- The mechanical fastening system, which must be suitably calculated and sized (refer to the specific chapter), ensures that the thermal insulation and waterproofing layer is anchored directly to the load-bearing structure, it guarantee an appropriately fixation system to withstand pressure even in high-wind zones. During application, the anchoring system is not affected or limited by weather conditions or ambient temperatures.

Key functional layers of an exposed roof

The typical build-up of an exposed roof with waterproofing membranes mechanically fixed, without thermal insulation it is relatively simple. The key functional layers are described below.

Load-bearing structural support

The load-bearing structural support must be sized to withstand permanent action and variable action calculated during the design stage. The advantage is the light weight of the waterproofing system that it is generally in the 5-10 kg/m² range including thermal insulation, suitable for application on light roofs. Various kinds of load-bearing structural support can be used, and are usually: a traditional reinforced concrete deck or prefabricated elements (precast beams), a composite slab, corrugated steel deck, corrugated steel deck with concrete slab, metal sandwich panels or wooden planks. Depending on the roof design, the load-bearing structure can be more or less sloped. In the event the structure does not have a sufficiently steep pitch, the required slope can be built up using concrete screed or suitable sloping insulating panels.

Levelling layer

The purpose of the levelling layer is to level out and compensate for protuberances and unevenness of surface roof, it is being installed on in order to avoid the risk of the waterproofing membrane being punctured. This layer is produced using thermocalandered geotextiles with a suitable weight and relevant properties.

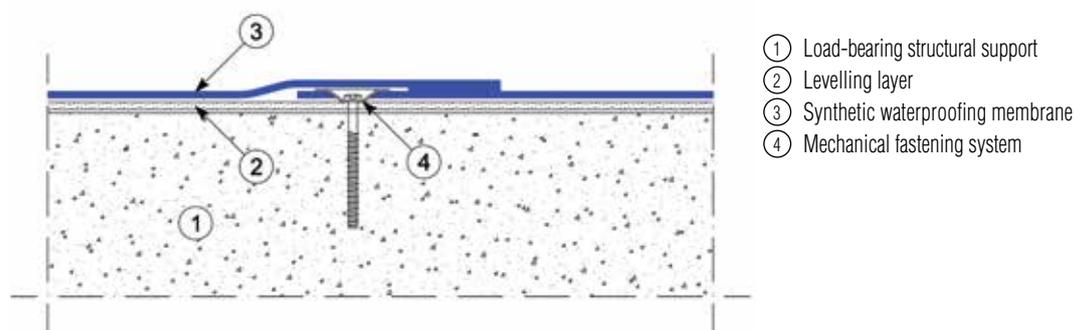
Waterproofing layer

The purpose of the waterproofing layer is to stop rainwater getting inside, as well as protecting the load-bearing structural support from deterioration. It also constitutes the building external covering.

Mechanical fastening system

The mechanical fastening system serves to withstand the wind uplift action on the roof and secure the build-up system to the roof deck.

Sample build-up with key functional layers (non-insulated roof)



Complementary functional layers of an exposed roof

The construction of a thermally insulated roof involves the use of complementary elements, as described below.

Vapour barrier layer

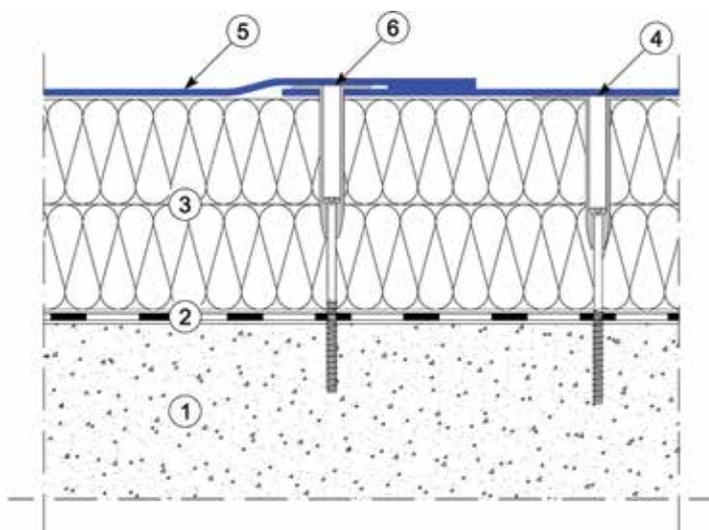
To be included in exposed roof with thermal insulation. The purpose of this layer is to control the flow of vapour passing through the structure, from the inside of the building to the outside, in order to avoid the issue of condensation forming inside the roof assembly. It must be applied under the thermal insulation layer.

Thermal insulation layer

To be applied in thermally insulated exposed roofs. It is possible to use the various usual commercially available insulating materials. The essential requirements are: it must have suitable compressive strength, be dimensionally stable and be compatible with the waterproofing membrane to be applied on top.

The thermal insulation layer should be mechanically fixed regardless of the mechanical fastening of the waterproofing layer.

Sample build-up with key and complementary functional layers (insulated roof)



- ① Load-bearing structural support
- ② Vapour barrier layer
- ③ Thermal insulation layer
- ④ Mechanical fastening system of thermal insulation layer
- ⑤ Synthetic waterproofing membrane
- ⑥ Mechanical fastening system of waterproofing membrane

4. Mechanical fastening systems

MAPEPLAN T M waterproofing membranes can be secured directly to the substrate with different mechanical fastening systems. Mechanical fixings must be sized and calculated correctly to withstand the wind uplift action on the roof, according to the relevant standards of the different countries.

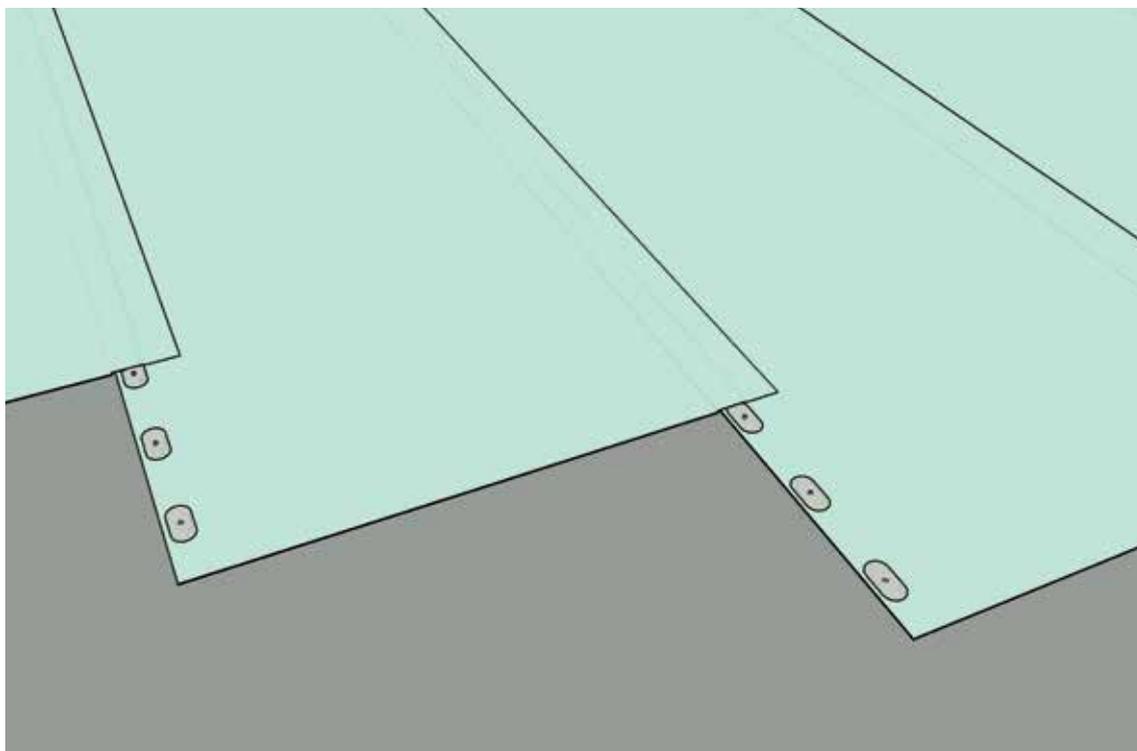
Spot fastening system under overlaps

This fastening system is applied along the edges of the waterproofing sheet under the overlaps and comprises metal stress plates and screws/fasteners. Specific synthetic sleeves can be used in place of the metal stress plates, again in conjunction with screws/fasteners.

The fastening system must be performed with membranes overlapped by approx. 11-12 cm and with stress plates/sleeves placed 1 cm from the edge of the waterproofing membrane.

The thermal insulation layer should be mechanically fixed regardless of the mechanical fastening of the waterproofing layer.

When fixing in to a corrugated steel deck, the membrane must be installed at 90° to the decking profile. This spreads the load evenly across the width of each decking sheet.



Linear fastening system

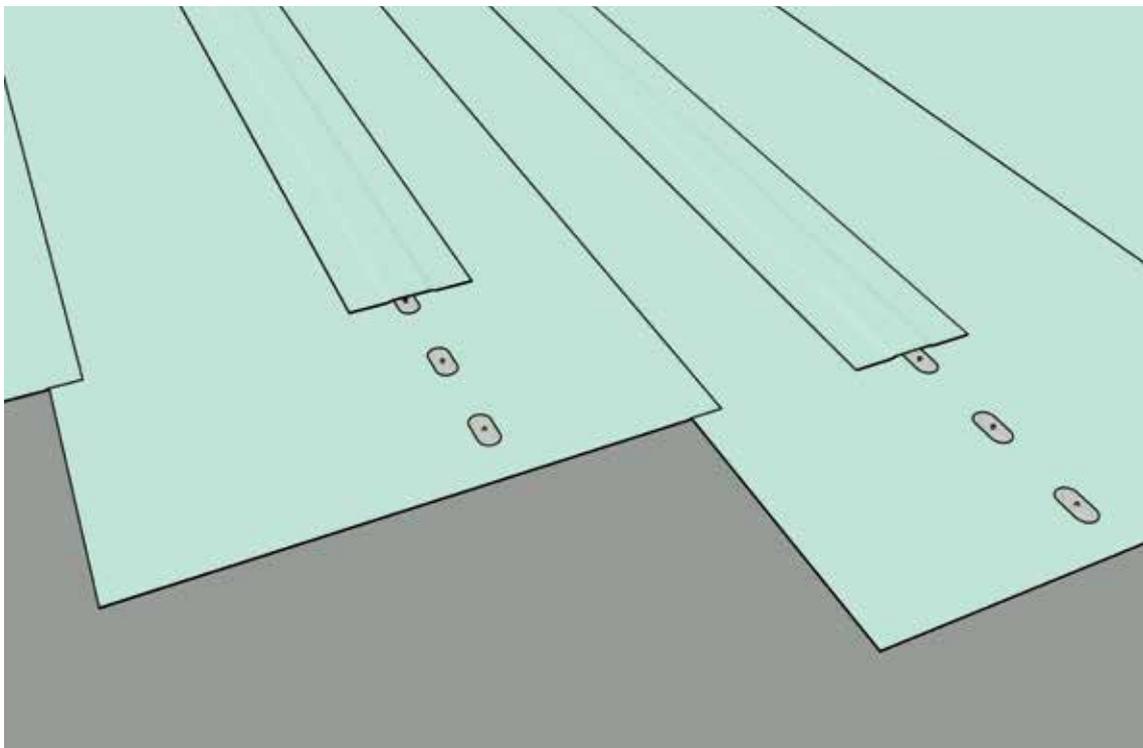
This fastening system is applied on top of the waterproofing membrane independently from the overlaps and comprises metal stress plates and screws/fasteners. Specific synthetics leeves can be used in place of the metal stress plates, again in conjunction with screws/fasteners.

The fixings are linearly distributed across the whole surface of the waterproofing membrane and applied in a straight line so that they can be covered with a strip of the same waterproofing membrane, welded on roofing membrane.

This fastening system is installed where the spot fastening system under overlaps is not a feasible option due to the nature of the substrate, for example on a deck made up of precast reinforced concrete beams or wooden planks, or in the event the spot fastening system under overlaps is not sufficient to withstand wind action and hence needs to be supplemented with a combination system.

The thermal insulation layer should be mechanically fixed regardless of the mechanical fastening of the waterproofing layer.

When fixing in to a corrugated steel deck, the membrane must be installed at 90° to the decking profile. This spreads the load evenly across the width of each decking sheet.



Induction welding fastening system

This fastening system is applied under the waterproofing membrane independently from the overlaps.

The fastening stress plates have a special surface coating allowing the membrane to be heat welded.

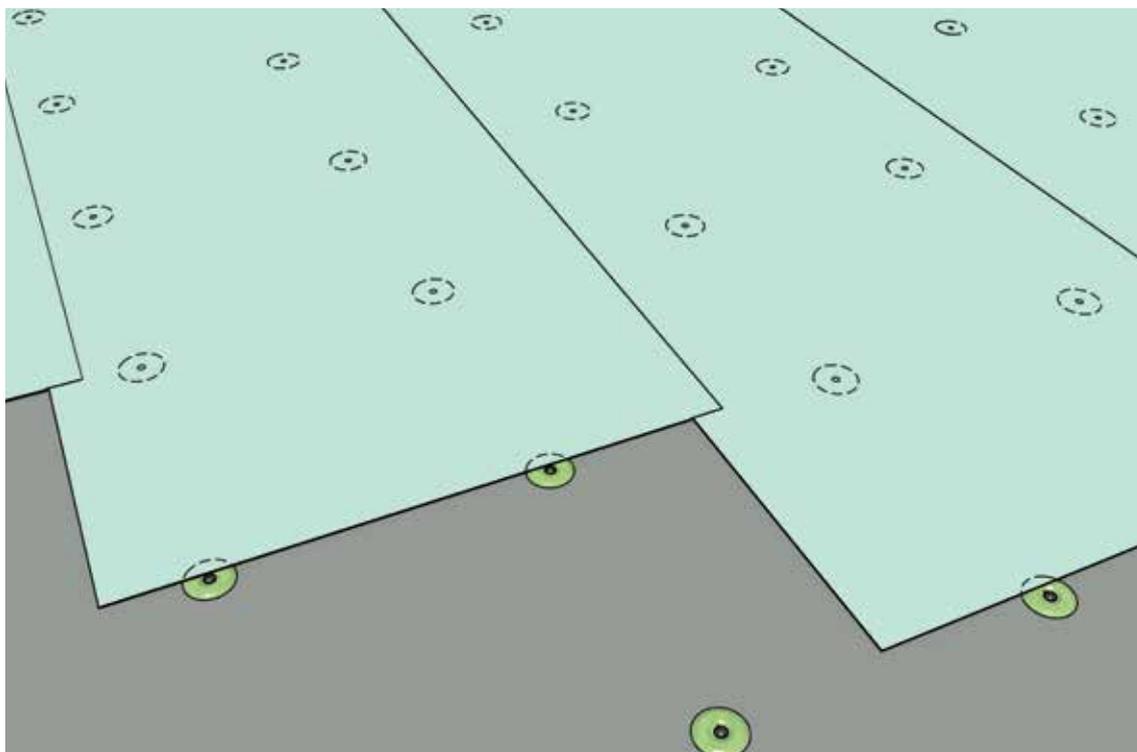
The waterproofing membrane is heat welded to the stress plates by means of a special induction welding tool.

The stress plates must be ribbed and must be thick enough to distribute the stress over the whole surface and must be compatible with the type of waterproofing membrane applied (FPO/TPO).

Electromagnetic induction welding enables attachment points to be distributed evenly over the roof.

Fixings are set out in an evenly spaced pattern or linearly distributed over the whole surface of the waterproofing membrane. The application of this type of fastening system is highly advantageous on critical roof decks or on surfaces with complex shapes, such as a deck made up of precast reinforced concrete beams, wooden planks, profiled metal or metal sandwich panels.

The induction welding fastening system fix the thermal insulation panels and waterproofing membranes on the same time.

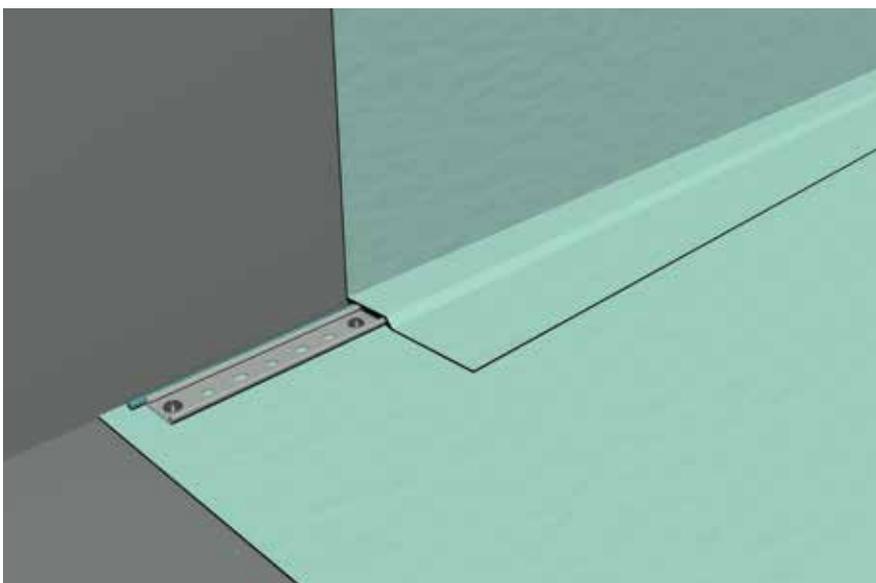
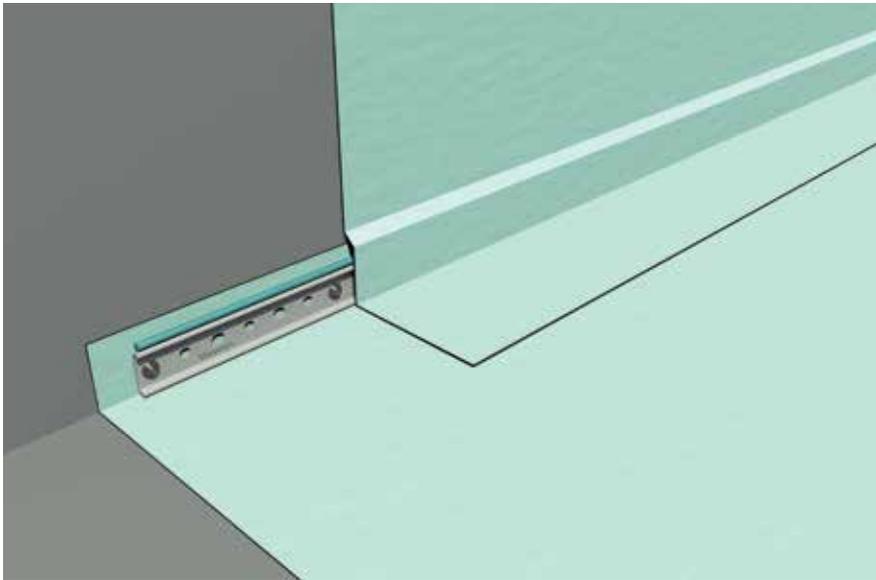


Mechanical fastening at the base of upstands

Regardless of which of the three mechanical fastening systems covered above is used, the MAPEPLAN T M waterproofing membrane must be mechanically fastened at the base of the upstands all around the perimeters of the roof, skylights, wall junctions, etc.

For this mechanical fastening, we suggest to use the linear fixing method consisting in MAPEPLAN METALBAR prepunched metal bars, which are to be placed either on the horizontal plane or vertically on the turn-up.

Tear-resistant MAPEPLAN T CORD is hot-air welded to the waterproofing membrane adjacent to the MAPEPLAN METALBAR prepunched bar to distribute stresses on the profile and waterproofing membrane linearly and evenly.



Mechanical fastening systems features

The metal stress plates and synthetic sleeves must be suitably shaped and ribbed to distribute stress across their whole compression surface without deformation.

The fastening screws and metal stress plates must have specific corrosion-resistant treatment: more specifically, they need to resist at 15 Kesternich cycles according to standard DIN 50018.

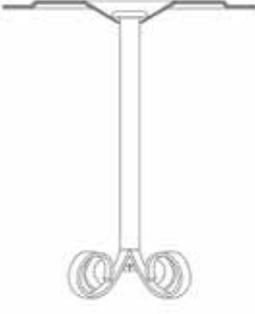
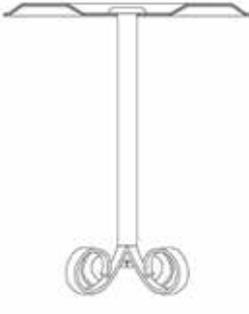
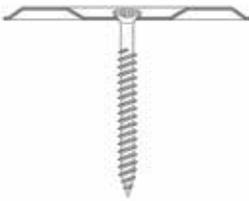
In particularly environmentally challenging settings, we recommend using stainless steel fasteners. Screws/fasteners must be compatible with the type of substrate they are to be anchored to and with the layers they will come into contact with.

The fastener (screw, sleeve, stress plate) must not damage the waterproofing membrane on top.

The most common types of mechanical fixings are illustrated below as a guide only.

Stress Plate + Screw Concrete deck	Sleeve + Screw Concrete deck	Stress Plate + Impact anchor Concrete deck
		
Induction weld plate + Screw Concrete deck	Induction weld plate + Sleeve + Screw Concrete deck	Stress Plate + Screw Metal deck
		

4. Mechanical fastening systems

<p>Sleeve + Screw Metal deck</p>	<p>Induction weld plate + Screw Metal deck</p>	<p>Induction weld plate + Sleeve + Screw Metal deck</p>
		
<p>Stress Plate + Peel rivet Metal deck</p>	<p>Induction weld plate + Peel rivet Metal deck</p>	<p>Stress Plate + Screw Wooden deck</p>
		
<p>Sleeve + Screw Wooden deck</p>	<p>Induction weld plate + Screw Wooden deck</p>	<p>Induction weld plate + Sleeve + Screw Wooden deck</p>
		

Minimum requirements of decks

The mechanical fastening systems are different and specific depending on the type of deck, hence the appropriate anchoring method must be chosen each time.

The decks minimum requirements and the relevant technological solutions that can be adopted for each are featured below in order to ensure the fastening systems are as secure and functional as they can possibly be.

Concrete decks, concrete screed, precast concrete

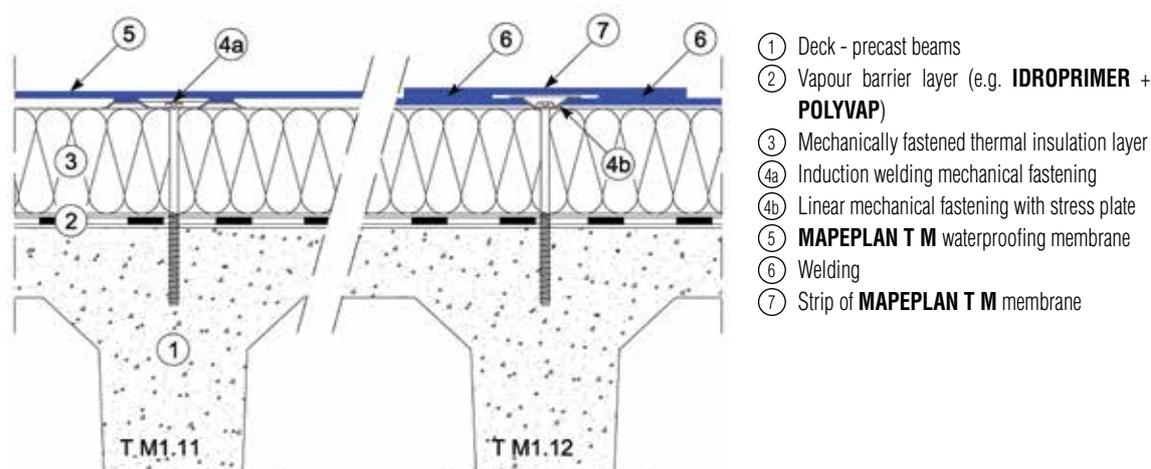
Minimum requirements:

- Compressive strength: minimum strength class C12/15 according to standard EN 206.
- Minimum thickness: 40/60 mm depending on the fastening type.

In the case of refurbishment or other situations where the quality of the deck is unknown, we recommend to do pullout tests directly on site to determine the suitable fastening system.

Critical concrete decks: fastening on precast beams with low thickness

The linear mechanical fastening system or induction welding system can be installed to line up with the stems, as illustrated in the drawings below, in order to avoid breaks or “breaching” on precast beams.



Lightweight concrete screed

When fastening to lightweight concrete screed, given the variety in terms of type, quality and compressive strength, whether the job is a refurbishment or new roof, you should always do pullout tests directly on site to determine the suitable fastening system.

If the test gives insufficient resistance results, the possible alternatives are:

- Cover the lightweight concrete with a concrete screed at least 5 cm thick that offers suitable compressive strength compatible with the mechanical fastening systems.
- Use fasteners with adequate length to fix into load-bearing structural support and pass through the lightweight concrete screed.

Corrugated steel decks

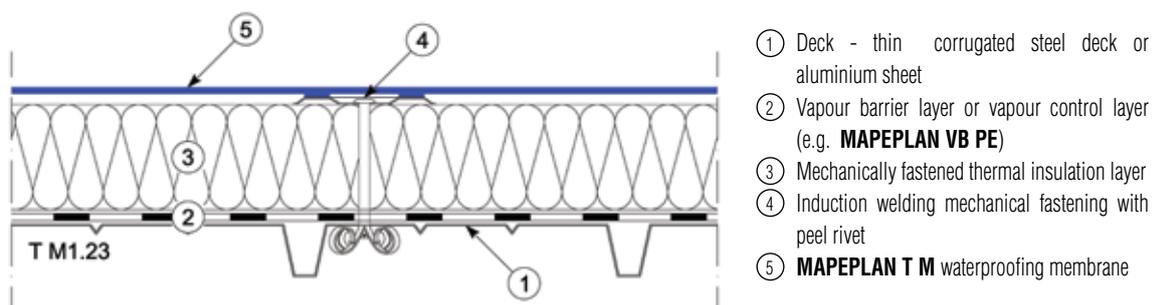
Minimum requirements:

- Type: galvanized steel, stainless steel.
- Minimum thickness: 0,7 mm.

In the case of refurbishment or when dealing with corrugated steel less than 0,7 mm thick or other situations where the quality of the deck is an unknown, we recommend to pullout tests directly on site to determine the suitable fastening system.

Critical corrugated steel decks: fastening on thin corrugated steel decks or aluminium sheet

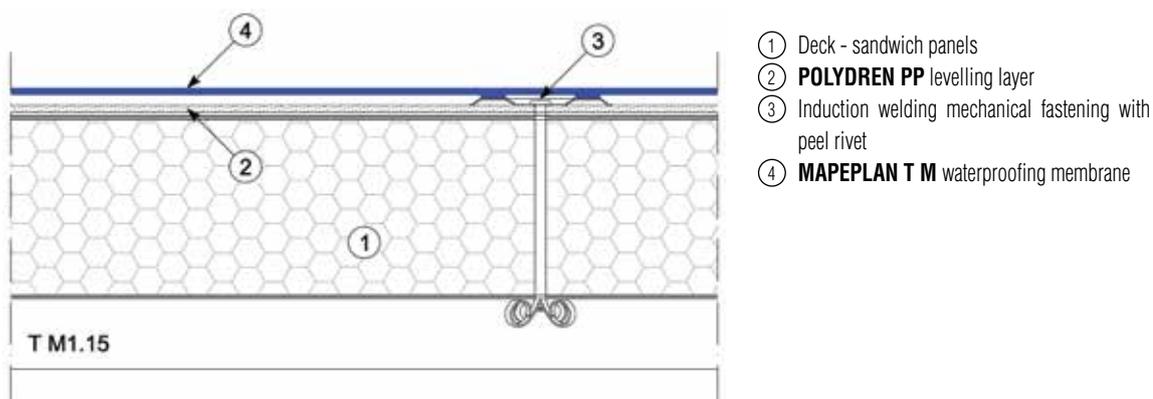
If the corrugated sheet is very thin or made from aluminium, self-drilling/self-tapping screws will not have sufficient resistance, in which case aluminium peel rivets must be used, as illustrated in the drawing below.



- ① Deck - thin corrugated steel deck or aluminium sheet
- ② Vapour barrier layer or vapour control layer (e.g. **MAPEPLAN VB PE**)
- ③ Mechanically fastened thermal insulation layer
- ④ Induction welding mechanical fastening with peel rivet
- ⑤ **MAPEPLAN T M** waterproofing membrane

Sandwich panels

In order to distribute wind loads correctly and avoid tear stress on the sandwich panels, fastening must be done on the underside metal sheet using aluminium peel rivets, as illustrated in the drawing below.



Wooden decks

Minimum requirements:

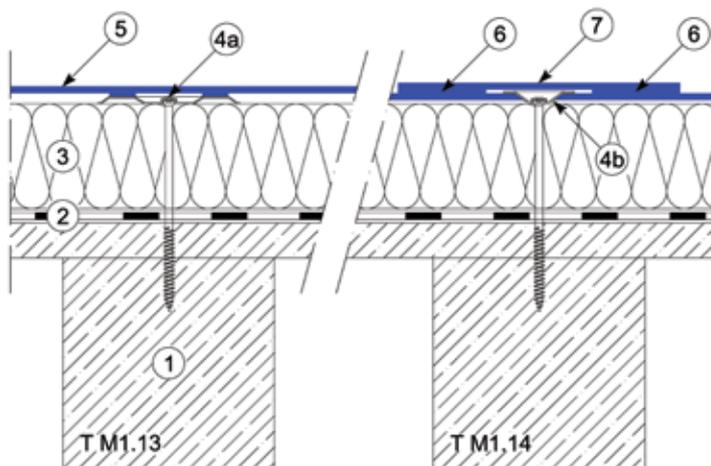
- Type: OSB/3 load-bearing panels according to EN 300, grade P5 particleboards according to EN 312, C24 solid wood according to EN 338, multi-layer laminated panels (X-LAM).
- Minimum thickness: 18 mm (OSB/3); 19 mm (P5); 22 mm (C24).

To ensure suitable fastening and avoid the deck deformation, the boards and/or panels must be fastened to the load-bearing structure using specific wood screws or helical nails for improved grip.

In the case of refurbishment or when dealing with materials that are thinner than the minimum values or other situations where the quality of the deck is unknown, we recommend conducting to do pullout tests directly on site to determine the suitable fastening system.

Critical wooden decks: fastening on thin wooden plank

The linear mechanical fastening system or induction welding system can be installed to line up with the battens, as illustrated in the drawings below, in order to avoid pass trough the thin wooden plank.



- ① Deck - wooden plank
- ② Vapour barrier layer (e.g. **IDROPRIMER** + **POLYVAP**)
- ③ Mechanically fastened thermal insulation layer
- ④a Induction welding mechanical fastening
- ④b Linear mechanical fastening with stress plate
- ⑤ **MAPEPLAN T M** waterproofing membrane
- ⑥ Welding
- ⑦ Strip of **MAPEPLAN T M** membrane

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MAPEPLAN T M



5. MAPEPLAN T M solutions - New roofs

Using MAPEPLAN T M waterproofing membranes, you can design and build reliable, modern, technologically advanced and exceptionally eco-friendly exposed roofs with mechanically fastened membrane. The coming pages feature a series of build-ups showing correct technical solutions with and without thermal insulation.

Please find below a number of technical issues that we have factored in when formulating the MAPEPLAN T M build-ups and solutions featured.

No risk of condensation

Appropriate measures that can/must be taken to avoid the risk of condensation involve correctly sizing the vapour barrier and thermal insulation layer. With a proper hygrothermal analysis, the designer can determine the correct size of the thermal insulation and waterproofing assembly.

Our MAPEPLAN T M technical solutions involve the use of vapour barriers produced with POLYGLASS (POLYVAP SA - POLYVAP RADONSHIELD - PLANA P - POLYVAP FIX) bitumen membranes or vapour control layer made up of a sheet of LDPE (MAPEPLAN VB PE) featuring a suitable controlled water vapour transmission value (Sd value). In addition, a secondary advantage of these vapour barriers/control layer is that they also serve as a provisional waterproofing measure, before the full system is implemented.

Minimum requirements of thermal insulation panels

The thermal insulation panels normally used in the building industry are generally also suitable for building exposed roofs with mechanically fastened membrane (you are advised to refer to the technical literature and directions issued by the individual manufacturers). In our technical solutions, we generally indicate the thermal insulation layer so that the designer, builder and customer can decide on the product they deem best meets their needs and demands.

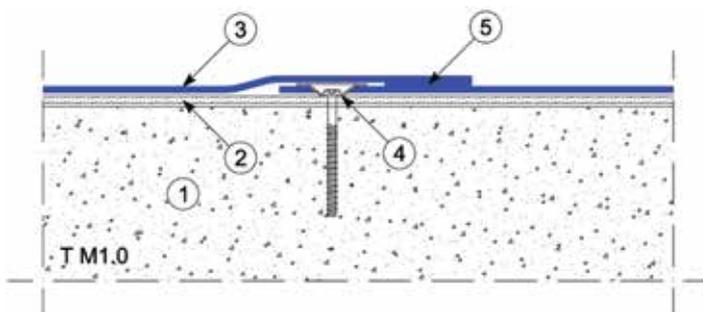
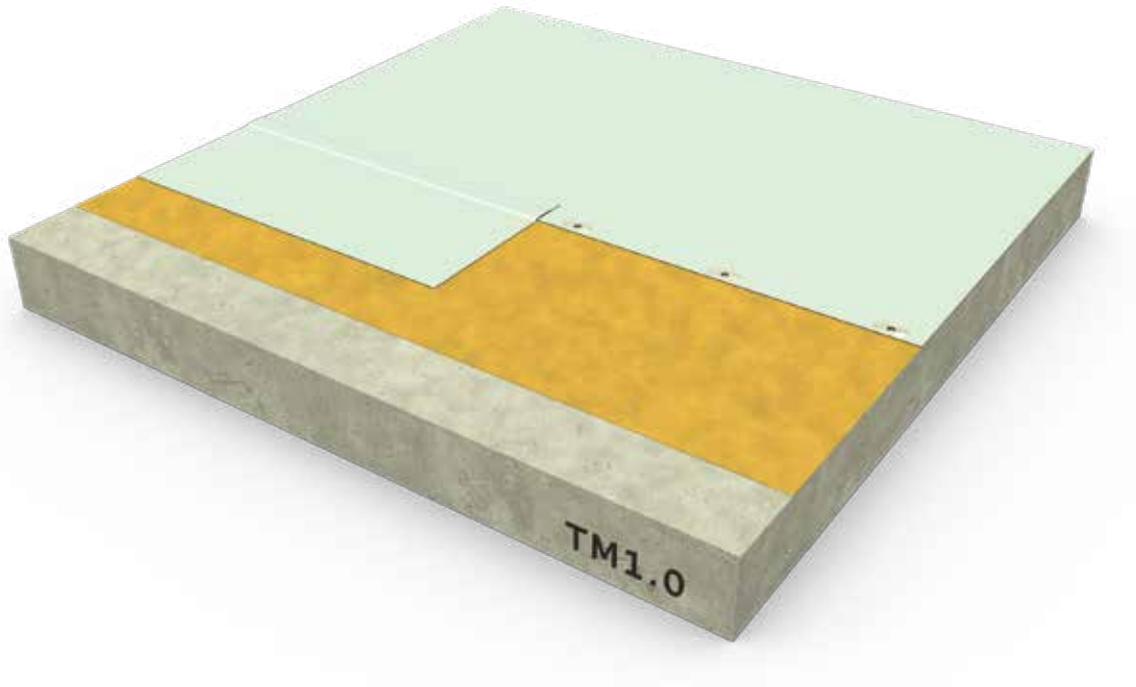
Whatever the case, thermal insulation panels must meet the following minimum requirements:

- Must have adequate compressive strength, which will need to be checked against the anticipated loads and overloading.
- Must be highly dimensionally stable
- Must be fit for purpose and certified by the manufacturer for use on mechanically fastened synthetic exposed membrane roofs.
- Must be either to glued or mechanically fastened to the substrate.

The thermal insulation layer should be mechanically fixed regardless of the mechanical fastening of the waterproofing layer.

BUILD-UP T M1.0

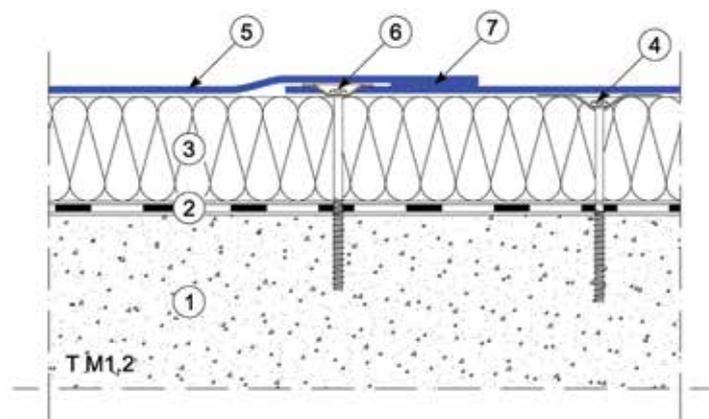
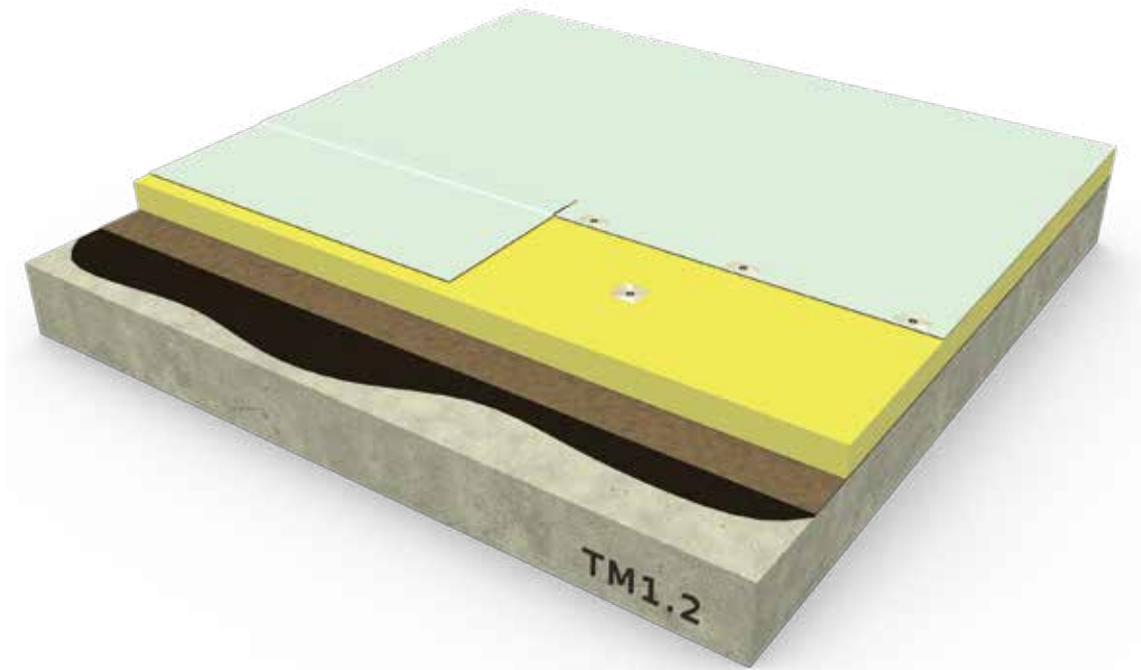
MAPEPLAN T M membrane - Non-insulated roof with concrete deck and spot fastening



- ① Concrete/composite deck
- ② **POLYDREN PP** levelling layer
- ③ **MAPEPLAN T M** waterproofing membrane
- ④ Mechanical fastening with stress plate
- ⑤ Welding

BUILD-UP T M1.2

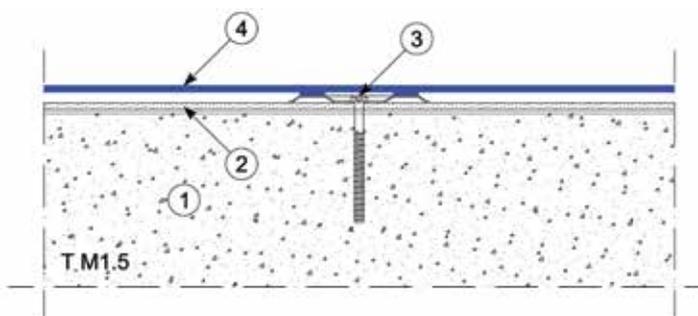
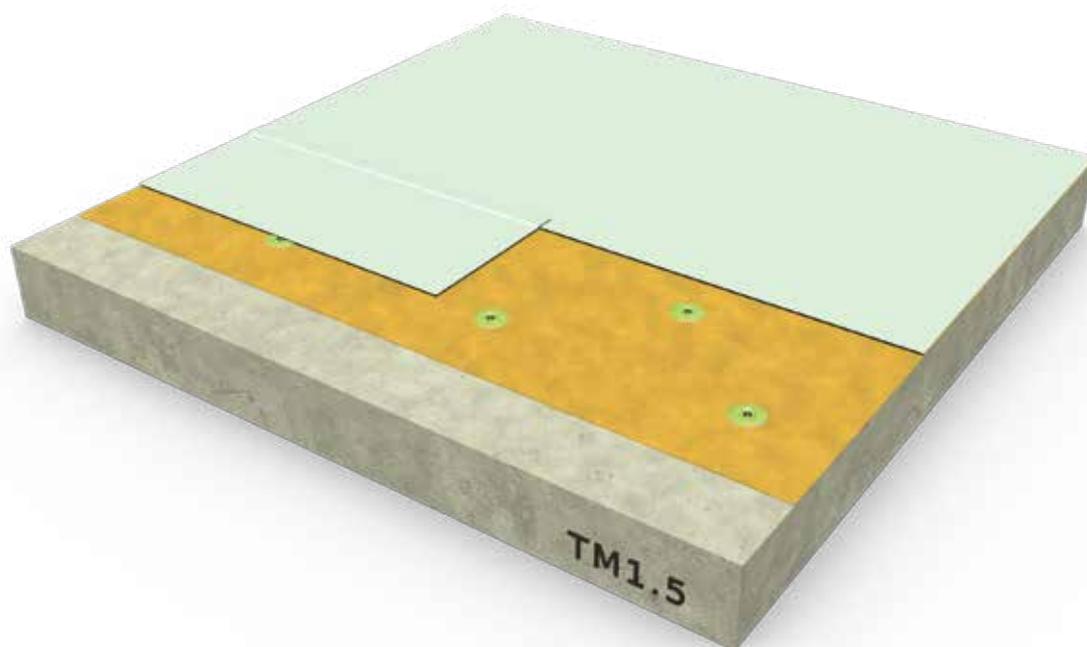
MAPEPLAN T M membrane - Insulated roof with concrete deck and spot fastening



- ① Concrete/composite deck
- ② Vapour barrier layer (e.g. **IDROPRIMER** + **POLYVAP**)
- ③ Mechanically fastened thermal insulation layer
- ④ Mechanical fastening
- ⑤ **MAPEPLAN T M** waterproofing membrane
- ⑥ Mechanical fastening with stress plate
- ⑦ Welding

BUILD-UP T M1.5

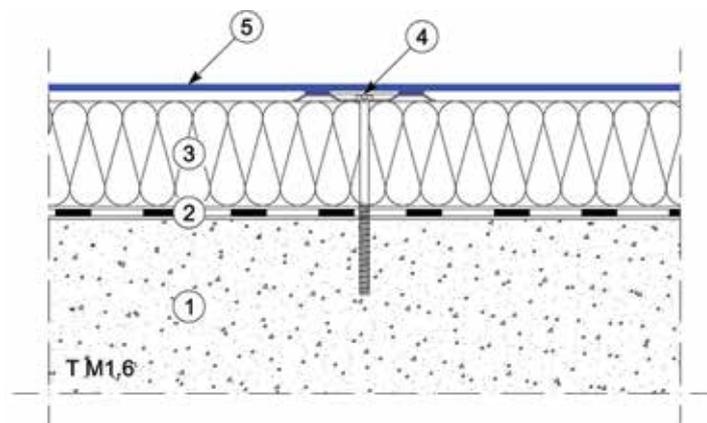
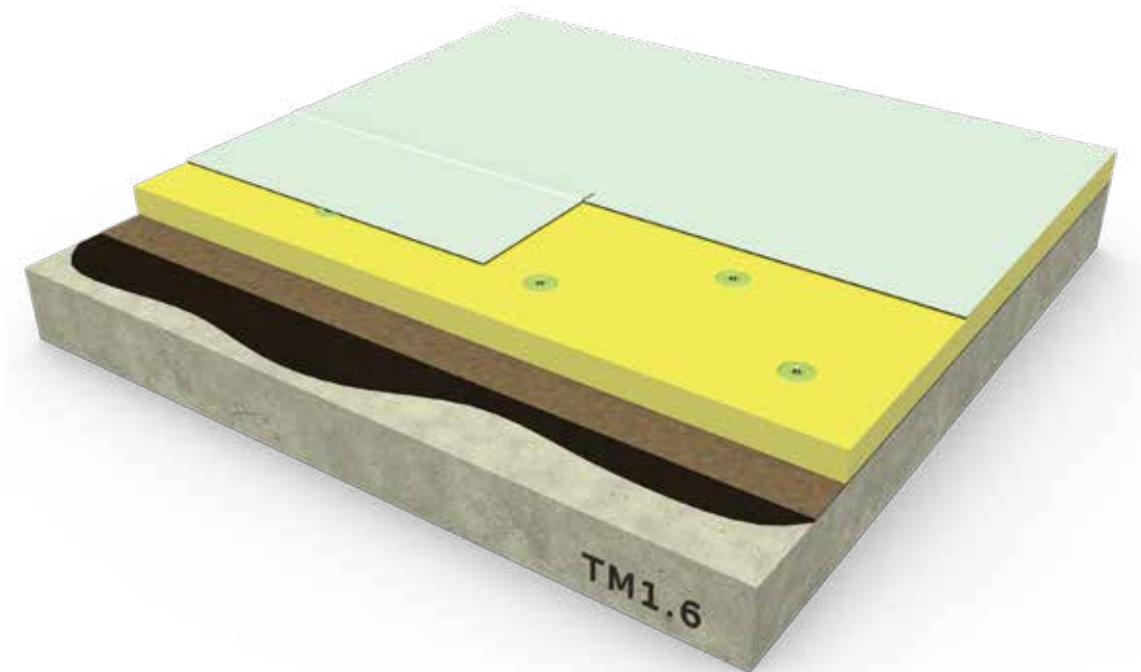
MAPEPLAN T M membrane - Non-insulated roof with concrete deck and induction fastening



- ① Concrete/composite deck
- ② **POLYDREN PP** levelling layer
- ③ Induction welding mechanical fastening
- ④ **MAPEPLAN T M** waterproofing membrane

BUILD-UP T M1.6

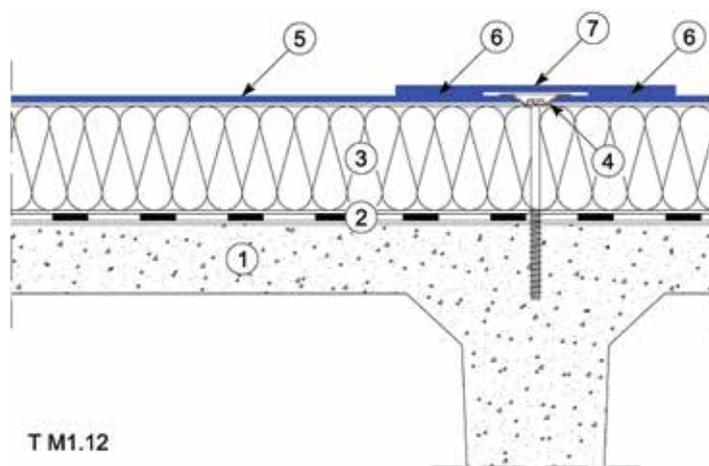
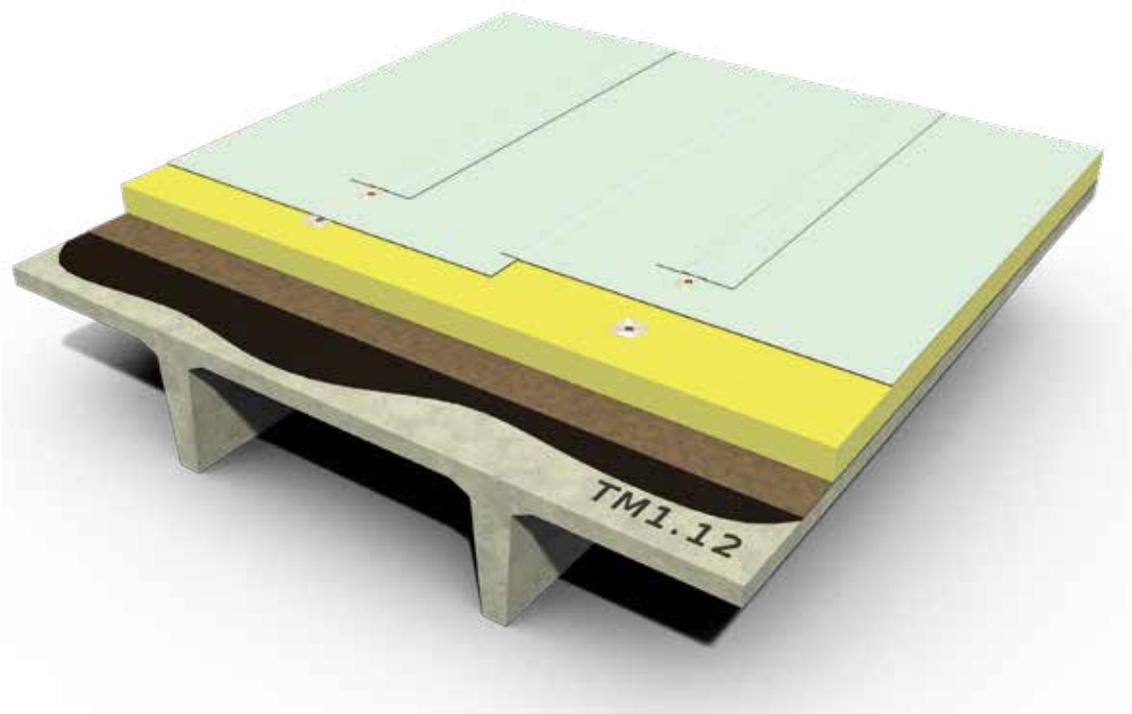
MAPEPLAN T M membrane - Insulated roof with concrete deck and induction fastening



- ① Concrete/composite deck
- ② Vapour barrier layer (e.g. **IDROPRIMER** + **POLYVAP**)
- ③ Mechanically fastened thermal insulation layer
- ④ Induction welding mechanical fastening
- ⑤ **MAPEPLAN T M** waterproofing membrane

BUILD-UP T M1.12

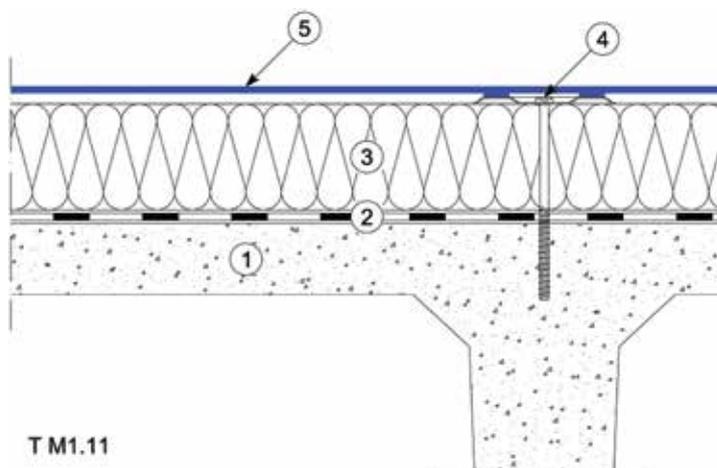
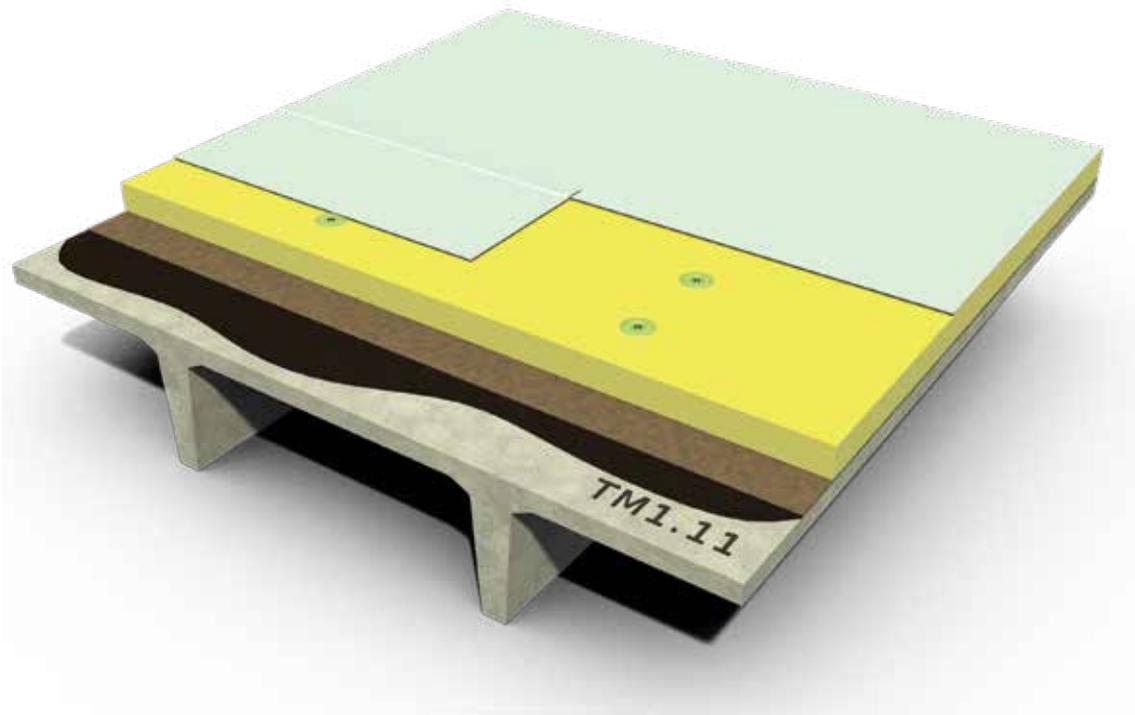
MAPEPLAN T M membrane - Insulated roof with precast concrete beam deck and linear fastening



- ① Deck - precast double tee beams
- ② Vapour barrier layer (e.g. **IDROPRIMER + POLYVAP**)
- ③ Mechanically fastened thermal insulation layer
- ④ Mechanical fastening with stress plate
- ⑤ **MAPEPLAN T M** waterproofing membrane
- ⑥ Welding
- ⑦ Strip of **MAPEPLAN T M** membrane

BUILD-UP T M1.11

MAPEPLAN T M membrane - Insulated roof with precast concrete beam deck and induction fastening

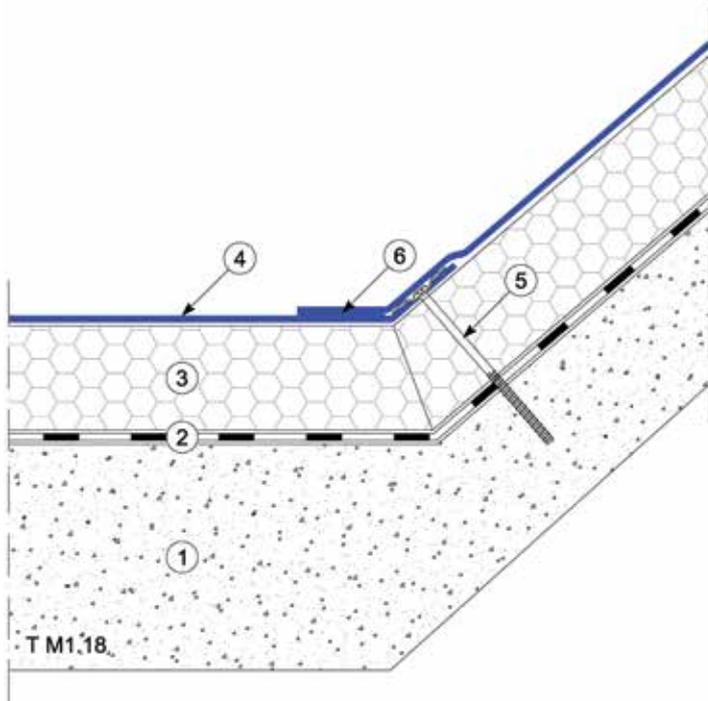
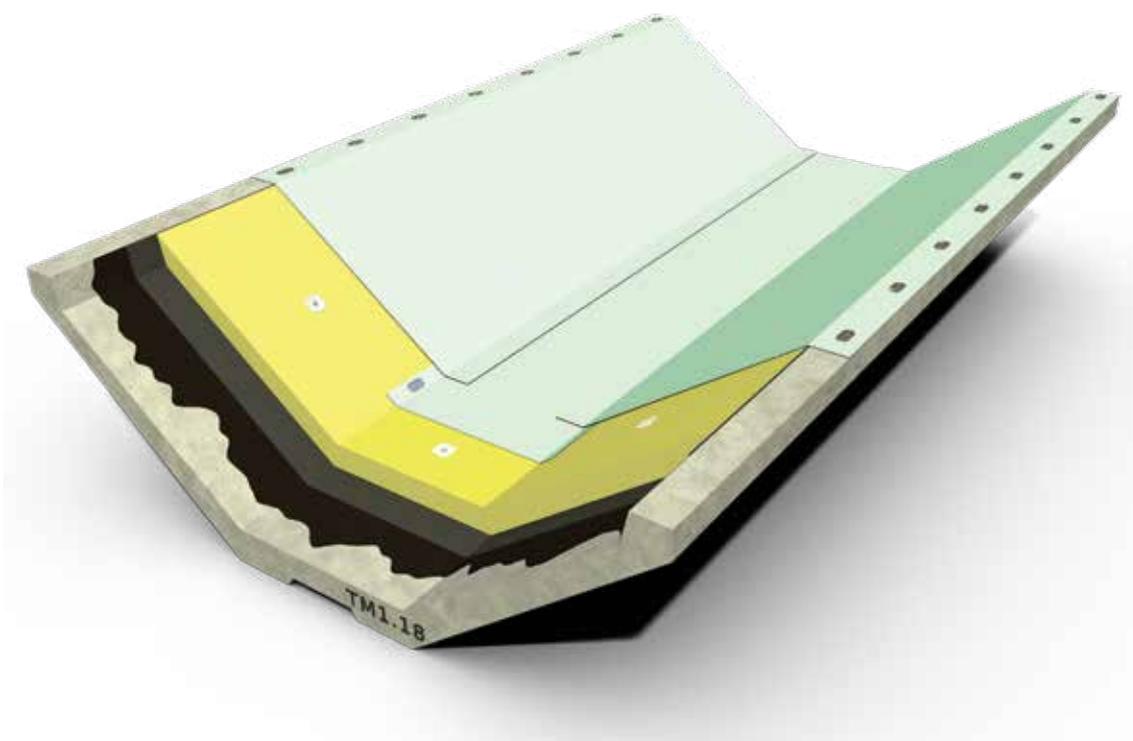


- ① Deck - precast double tee beams
- ② Vapour barrier layer (e.g. **IDROPRIMER + POLYVAP**)
- ③ Mechanically fastened thermal insulation layer
- ④ Induction welding mechanical fastening
- ⑤ **MAPEPLAN T M** waterproofing membrane

T M1.11

BUILD-UP T M1.18

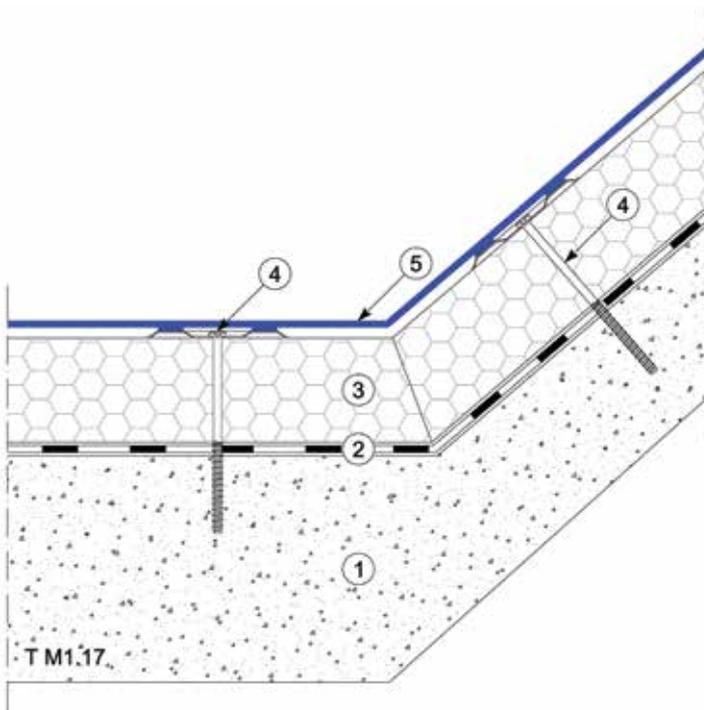
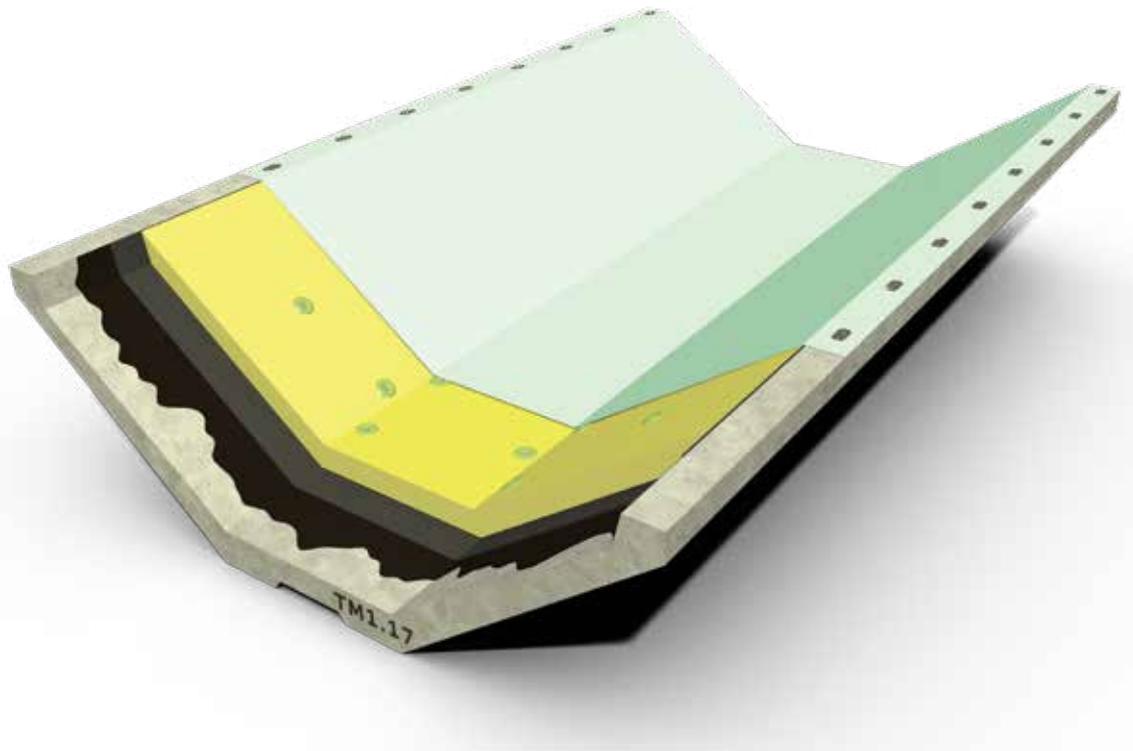
MAPEPLAN T M membrane - Insulated roof with precast concrete V beam deck and spot fastening



- ① Deck - precast V beams
- ② Vapour barrier layer (e.g. **IDROPRIMER + POLYVAP**)
- ③ Mechanically fastened thermal insulation layer
- ④ **MAPEPLAN T M** waterproofing membrane
- ⑤ Mechanical fastening with stress plate
- ⑥ Welding

BUILD-UP T M1.17

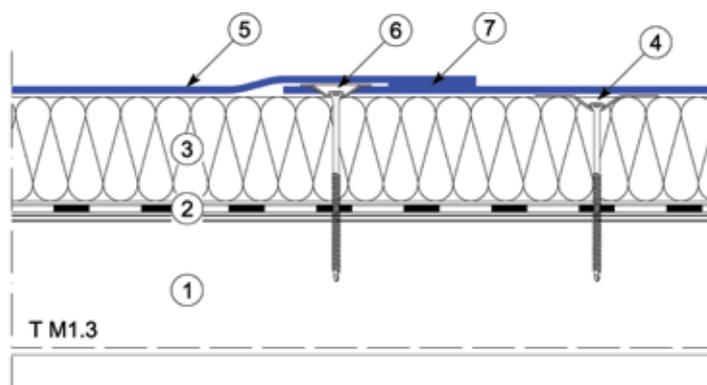
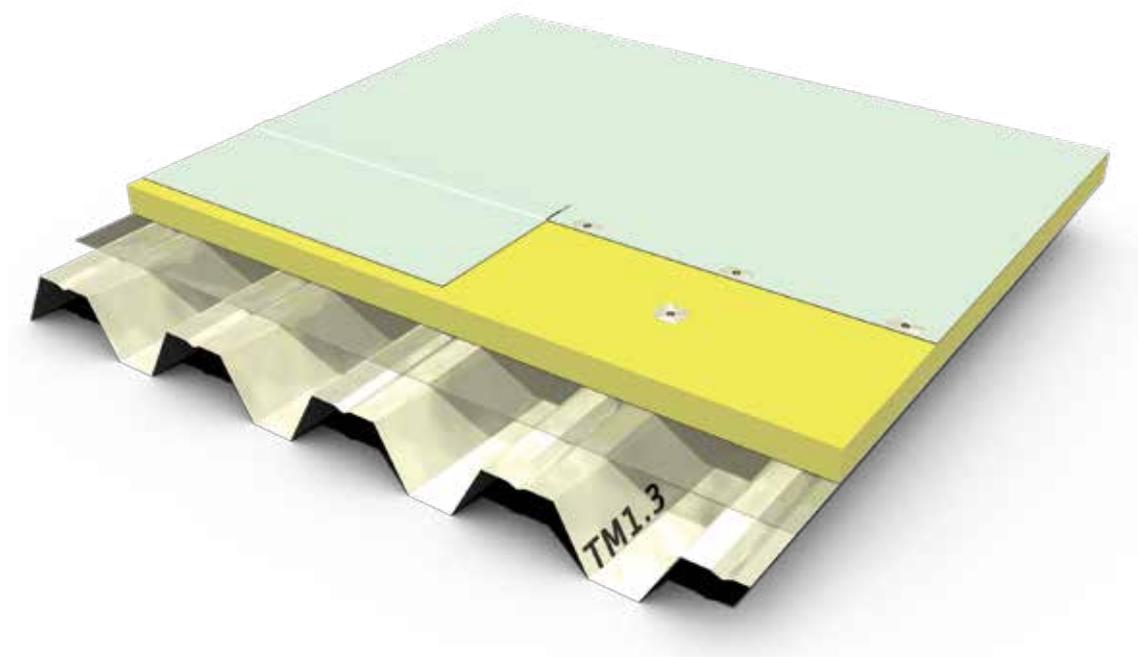
MAPEPLAN T M membrane - Insulated roof with precast concrete V beam deck and induction fastening



- ① Deck - precast V beams
- ② Vapour barrier layer (e.g. **IDROPRIMER** + **POLYVAP**)
- ③ Mechanically fastened thermal insulation layer
- ④ Induction welding mechanical fastening
- ⑤ **MAPEPLAN T M** waterproofing membrane

BUILD-UP T M1.13

MAPEPLAN T M membrane - Insulated roof with corrugated steel deck and spot fastening



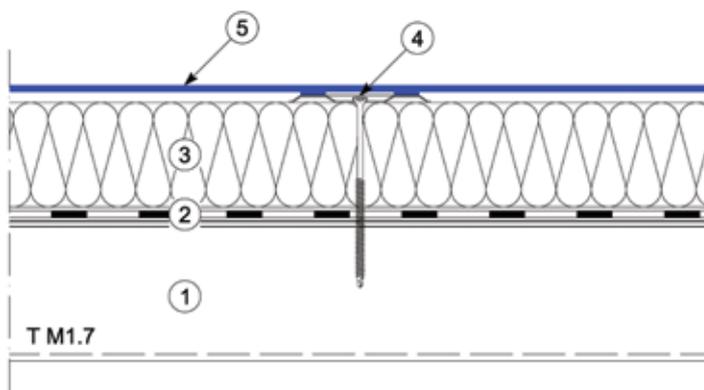
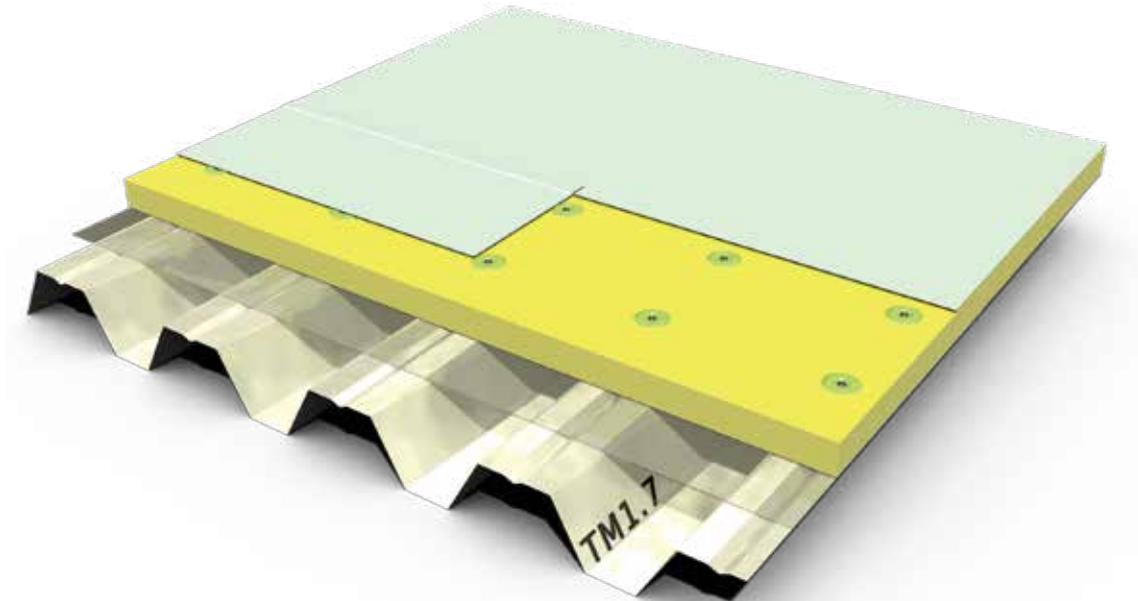
- ① Corrugated steel deck
- ② Vapour barrier layer or vapour control layer (e.g. **MAPEPLAN VB PE**)
- ③ Mechanically fastened thermal insulation layer
- ④ Mechanical fastening
- ⑤ **MAPEPLAN T M** waterproofing membrane *
- ⑥ Mechanical fastening with stress plate
- ⑦ Welding

*** NOTE:**

When fixing in to a corrugated steel deck, the membrane must be installed at 90° to the decking profile.

BUILD-UP T M1.7

MAPEPLAN T M membrane - Insulated roof with corrugated steel deck and induction fastening



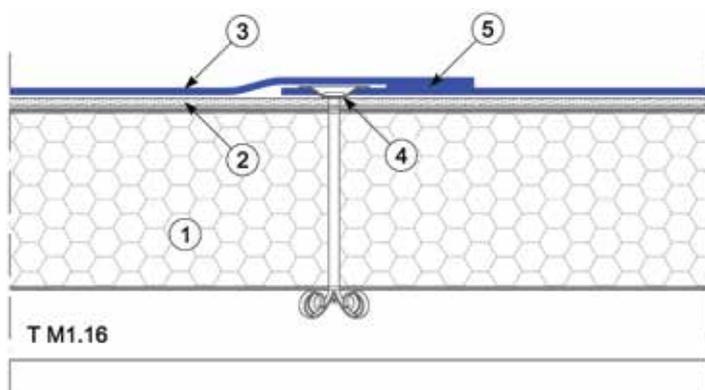
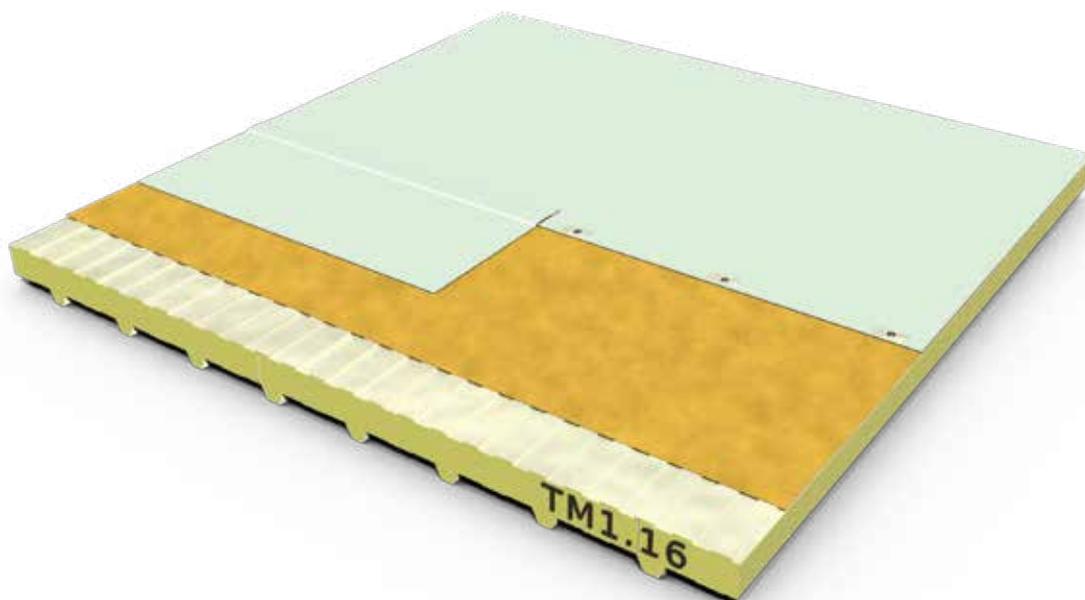
- ① Corrugated steel deck
- ② Vapour barrier layer or vapour control layer (e.g. MAPEPLAN VB PE)
- ③ Mechanically fastened thermal insulation layer
- ④ Induction welding mechanical fastening
- ⑤ MAPEPLAN T M waterproofing membrane *

*** NOTE:**

When fixing in to a corrugated steel deck, the membrane must be installed at 90° to the decking profile.

BUILD-UP T M1.16

MAPEPLAN T M membrane - Insulated roof with sandwich panel deck and spot fastening



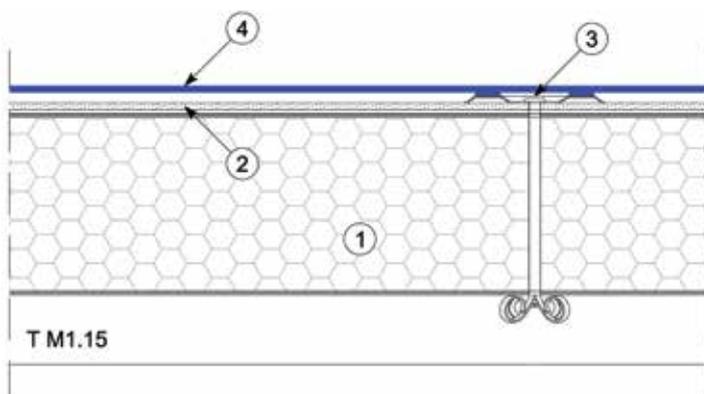
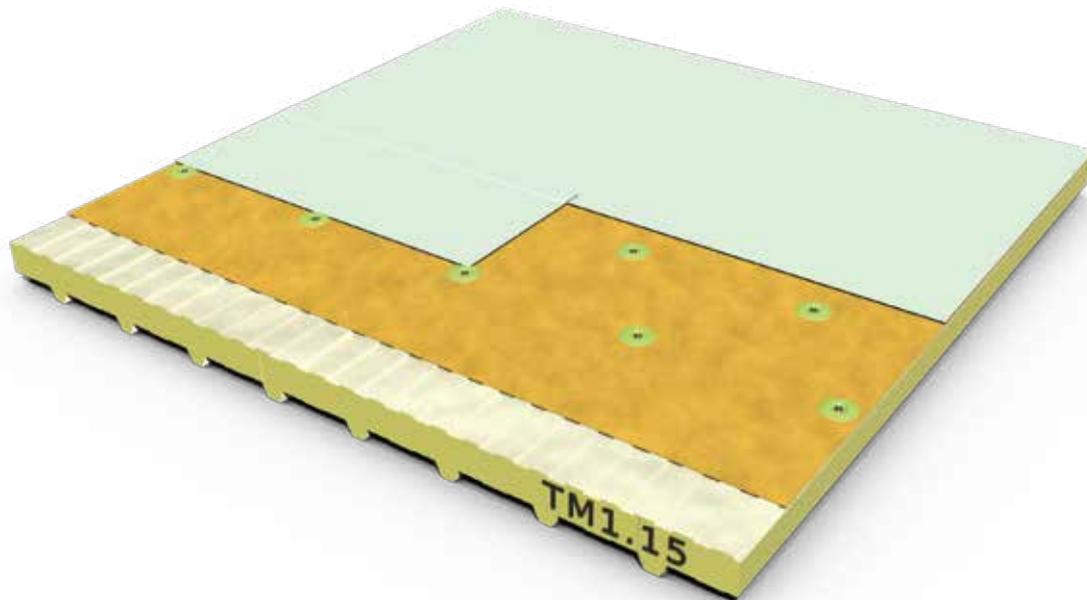
- ① Deck - sandwich panels
- ② **POLYDREN PP** levelling layer
- ③ **MAPEPLAN T M** waterproofing membrane *
- ④ Mechanical fastening with stress plate
- ⑤ Welding

*** NOTE:**

When fixing in to a sandwich panels deck, the membrane must be installed at 90° to the decking profile.

BUILD-UP T M1.15

MAPEPLAN T M membrane - Insulated roof with sandwich panel deck and induction fastening



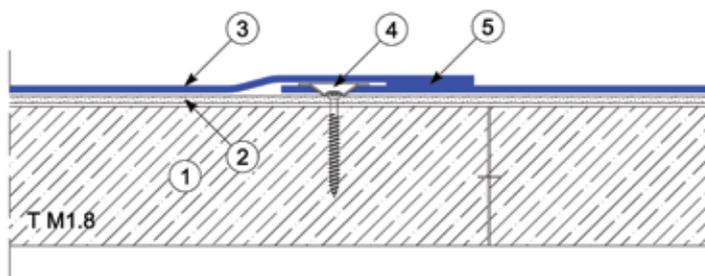
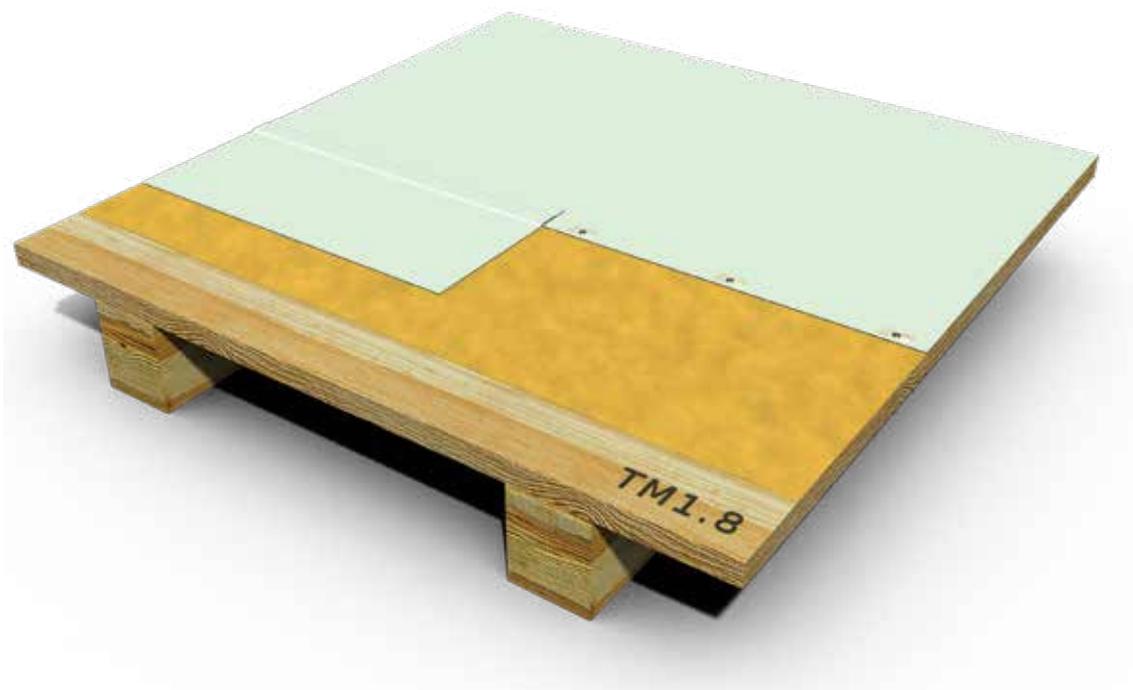
- ① Deck - sandwich panels
- ② POLYDREN PP levelling layer
- ③ Induction welding mechanical fastening
- ④ MAPEPLAN T M waterproofing membrane *

*** NOTE:**

When fixing in to a sandwich panels deck, the membrane must be installed at 90° to the decking profile.

BUILD-UP T M1.8

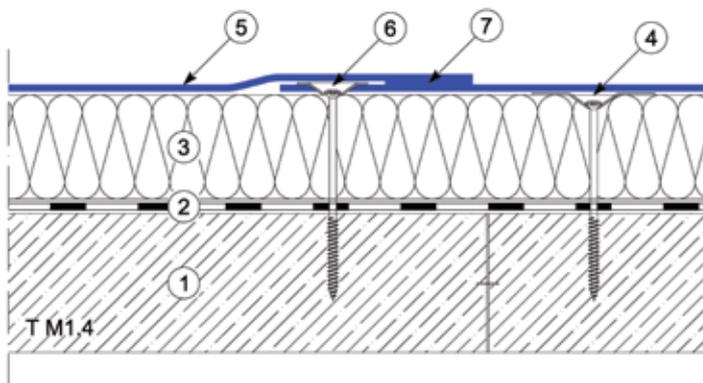
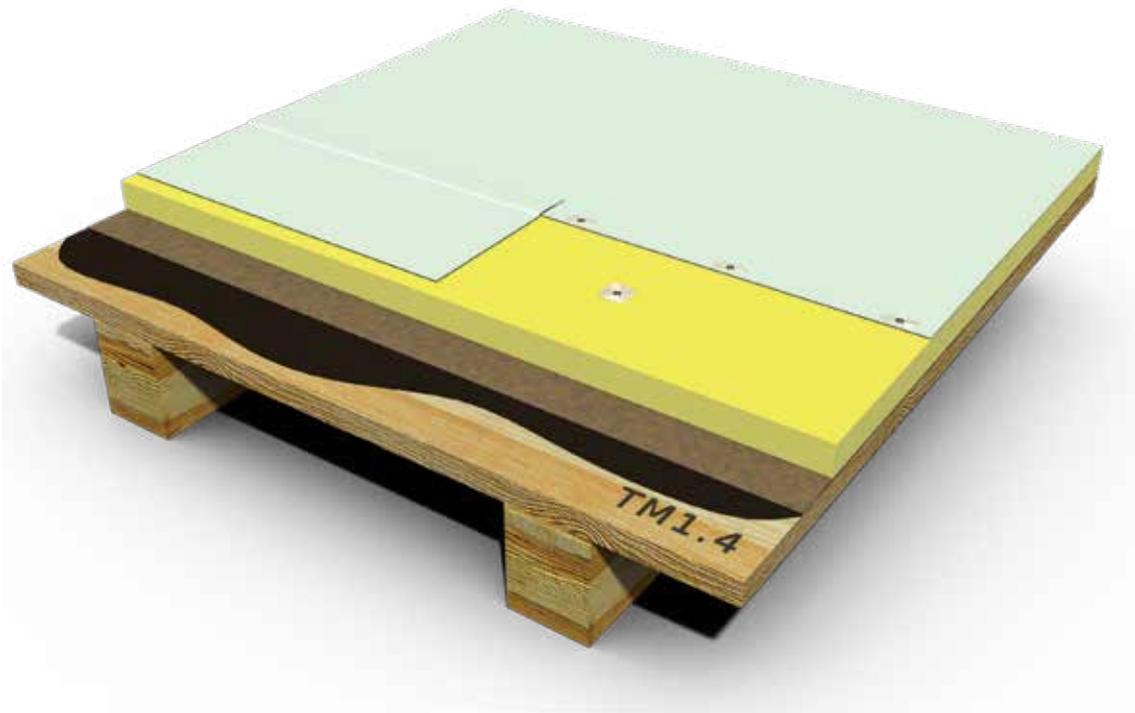
MAPEPLAN T M membrane - Non-insulated roof with thick wooden deck and spot fastening



- ① Wooden deck
- ② **POLYDREN PP** levelling layer
- ③ **MAPEPLAN T M** waterproofing membrane
- ④ Mechanical fastening with stress plate
- ⑤ Welding

BUILD-UP T M1.4

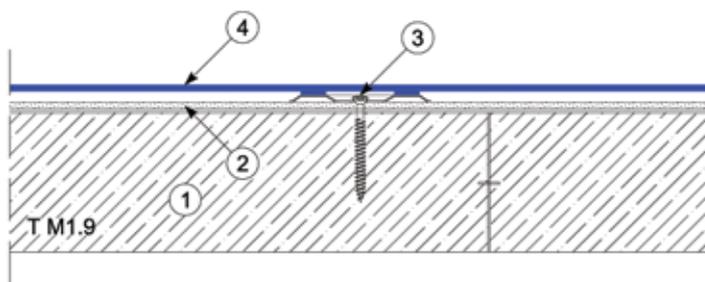
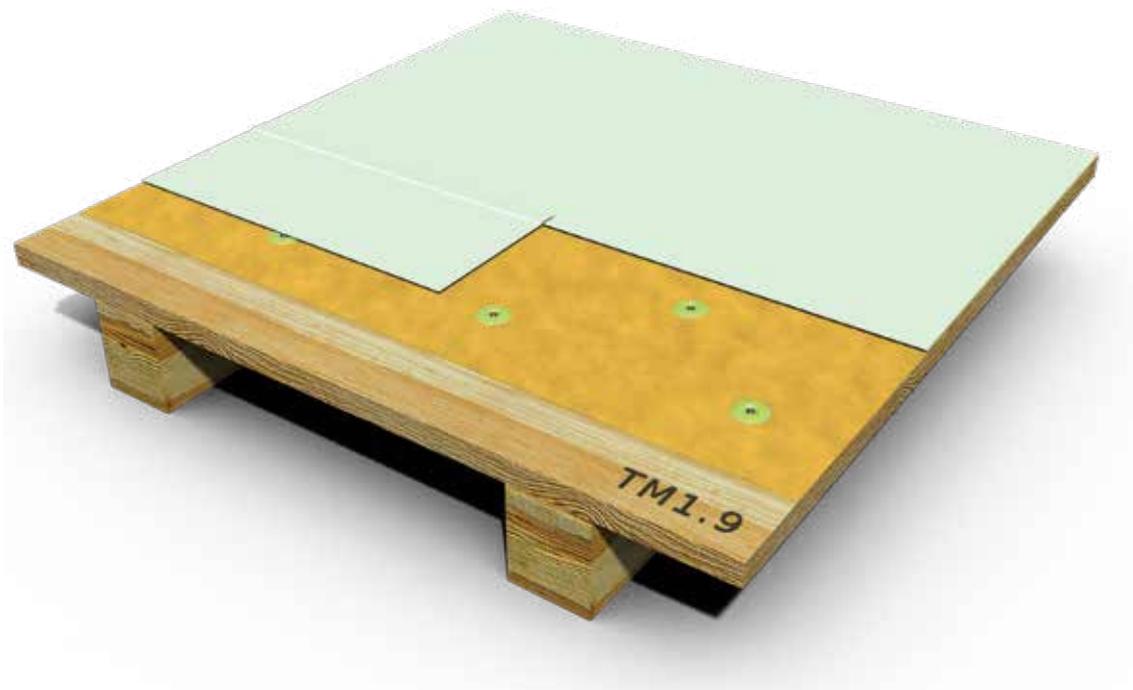
MAPEPLAN T M membrane - Insulated roof with thick wooden deck and spot fastening



- ① Wooden deck
- ② Vapour barrier layer (e.g. **IDROPRIMER** + **POLYVAP**)
- ③ Mechanically fastened thermal insulation layer
- ④ Mechanical fastening
- ⑤ **MAPEPLAN T M** waterproofing membrane
- ⑥ Mechanical fastening with stress plate
- ⑦ Welding

BUILD-UP T M1.9

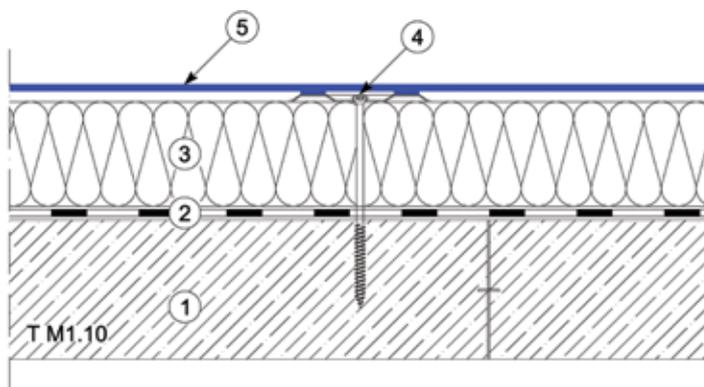
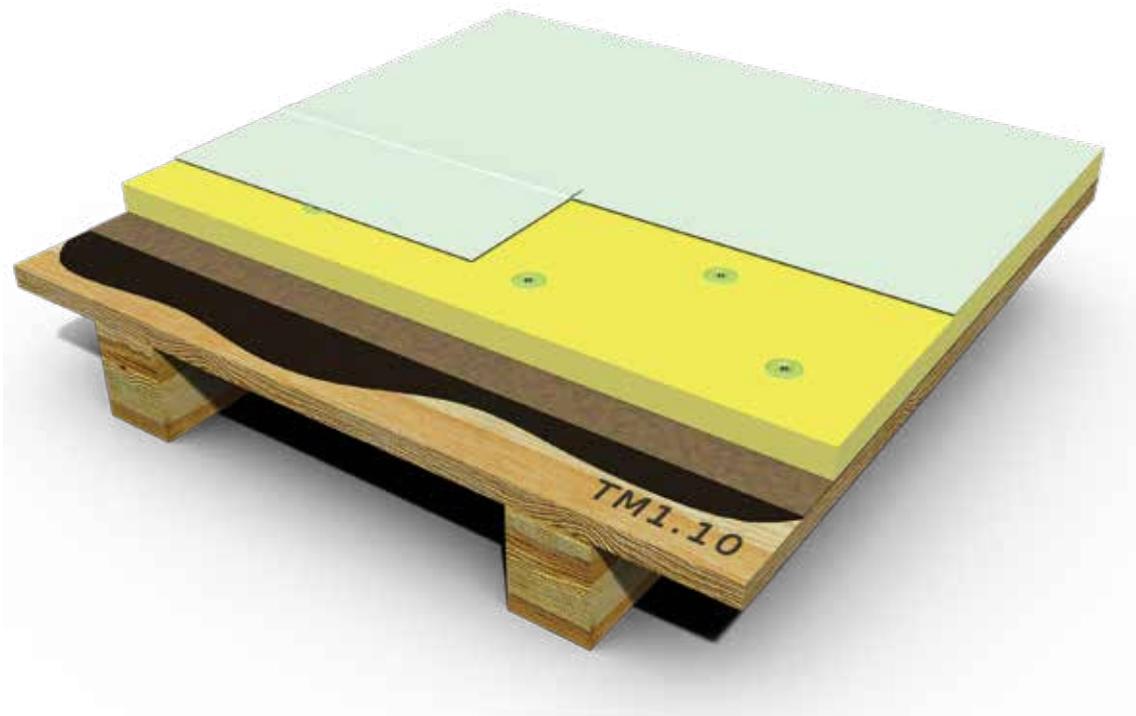
MAPEPLAN T M membrane - Non-insulated roof with thick wooden deck and induction fastening



- ① Wooden deck
- ② **POLYDREN PP** levelling layer
- ③ Induction welding mechanical fastening
- ④ **MAPEPLAN T M** waterproofing membrane

BUILD-UP T M1.10

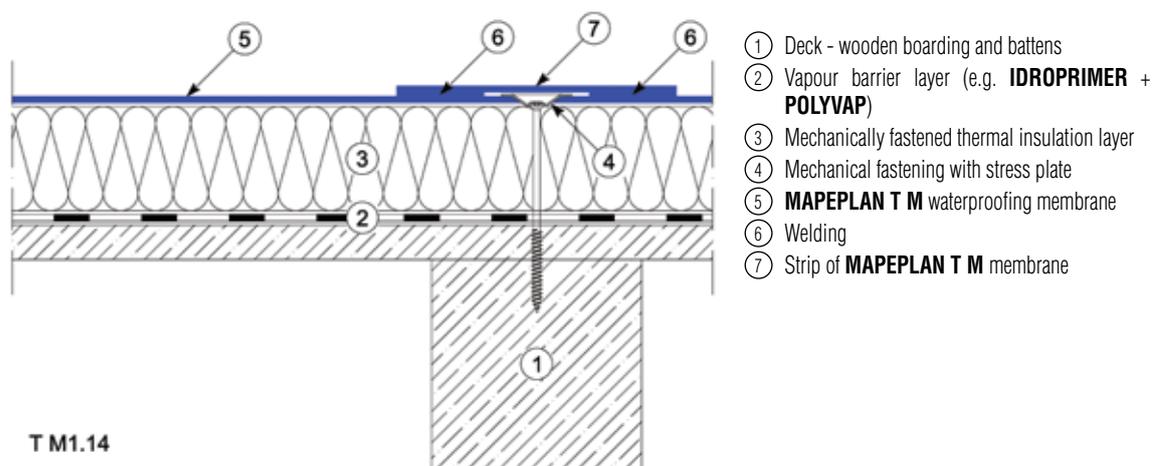
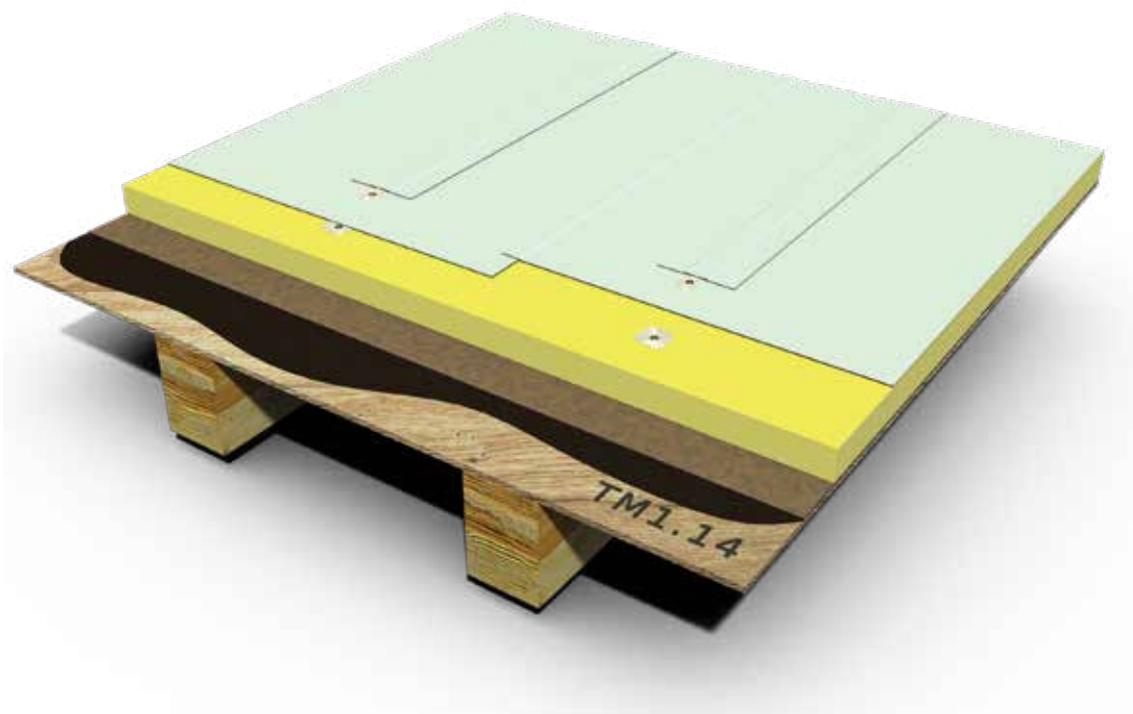
MAPEPLAN T M membrane - Insulated roof with thick wooden deck and induction fastening



- ① Wooden deck
- ② Vapour barrier layer (e.g. **IDROPRIMER** + **POLYVAP**)
- ③ Mechanically fastened thermal insulation layer
- ④ Induction welding mechanical fastening
- ⑤ **MAPEPLAN T M** waterproofing membrane

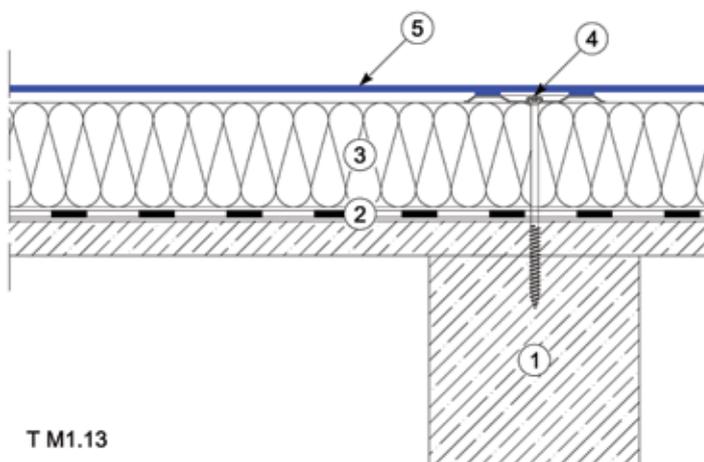
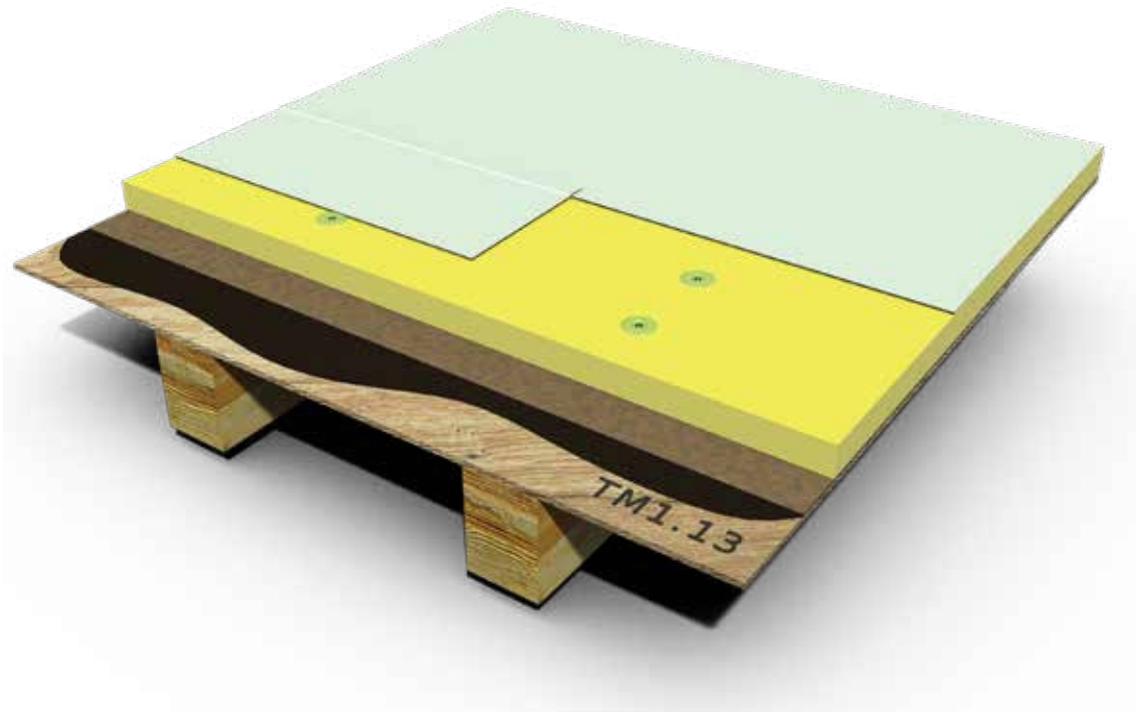
BUILD-UP T M1.14

MAPEPLAN T M membrane - Insulated roof with thin wooden deck and linear fastening



BUILD-UP T M1.13

MAPEPLAN T M membrane - Insulated roof with thin wooden deck and induction fastening

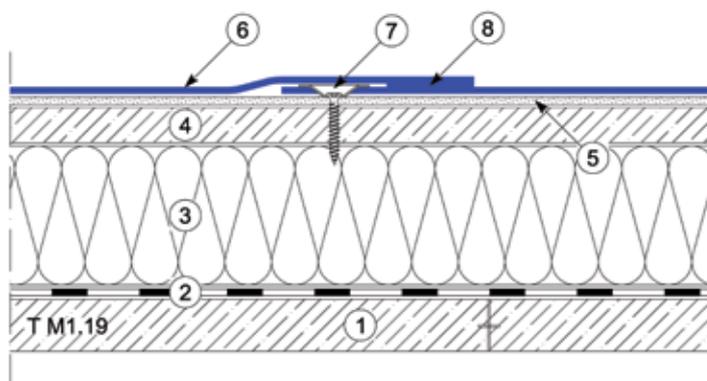
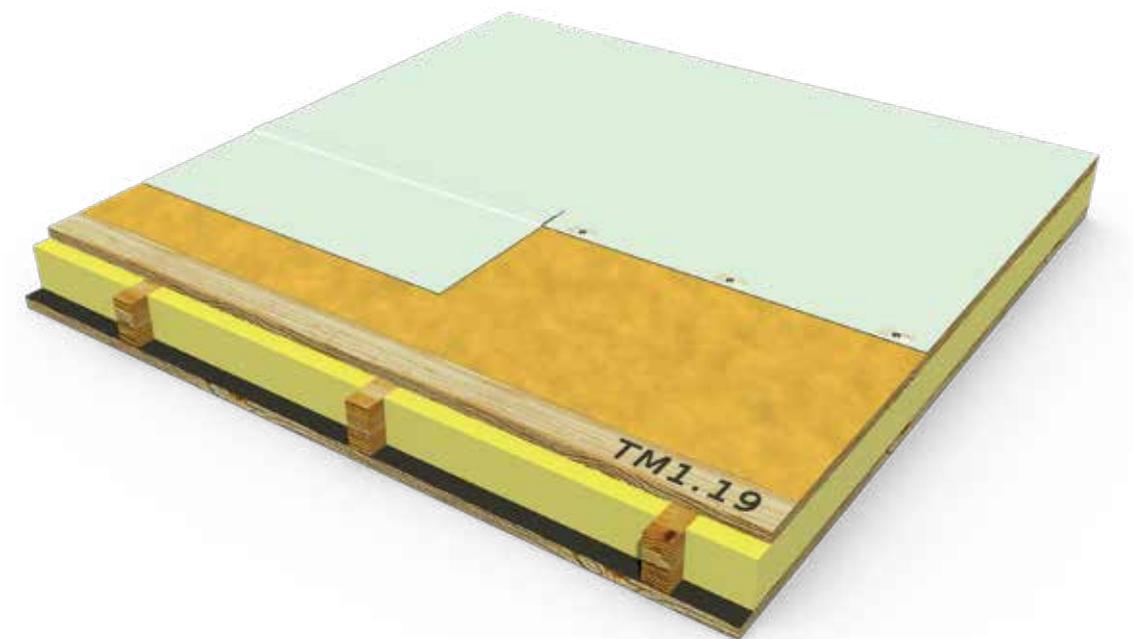


- ① Deck - wooden boarding and battens
- ② Vapour barrier layer (e.g. **IDROPRIMER** + **POLYVAP**)
- ③ Mechanically fastened thermal insulation layer
- ④ Induction welding mechanical fastening
- ⑤ **MAPEPLAN T M** waterproofing membrane

T M1.13

BUILD-UP T M1.19

MAPEPLAN T M membrane - Insulated roof with double-sheathed wooden deck and spot fastening



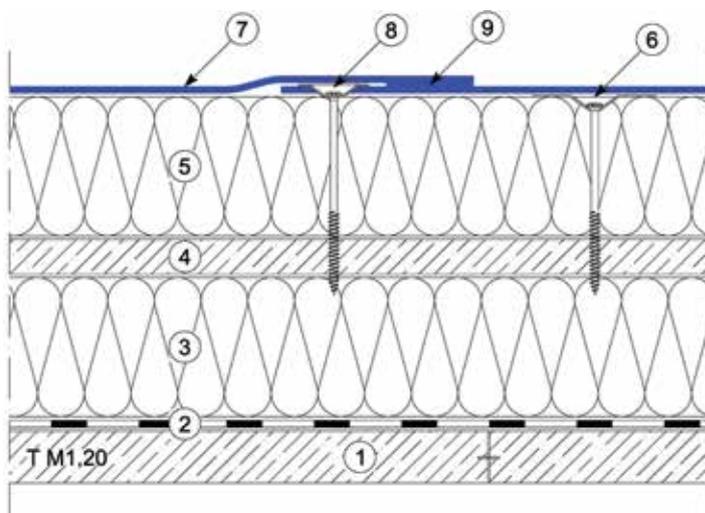
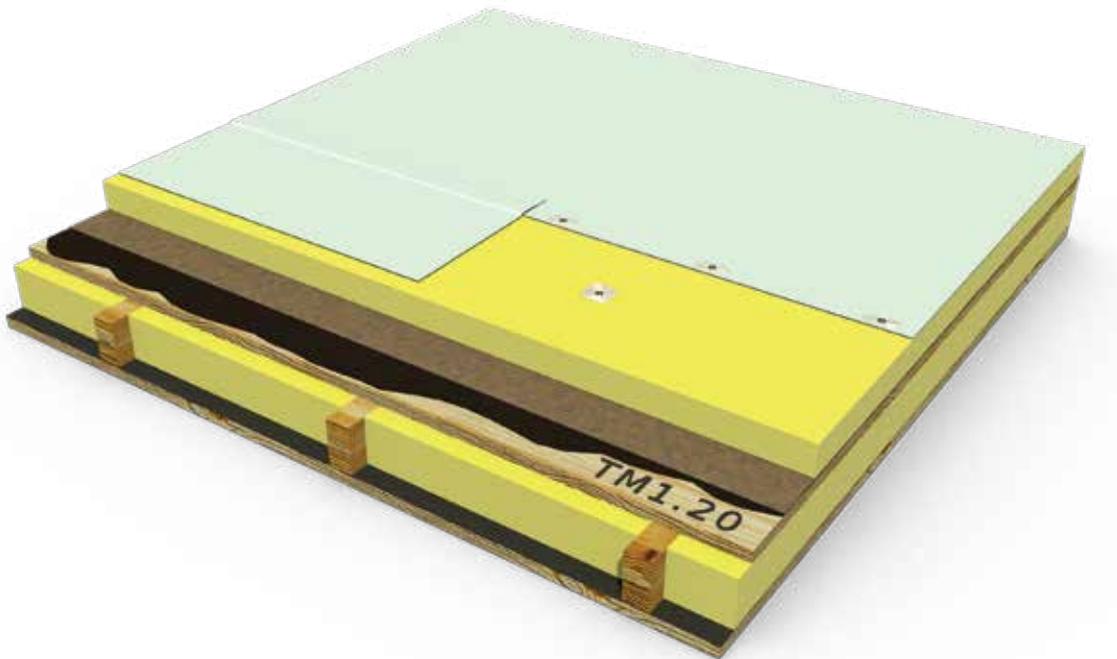
- ① Deck - 1st wooden board
- ② Vapour barrier layer (e.g. **IDROPRIMER + POLYVAP**) *
- ③ Thermal insulation layer
- ④ 2nd wooden board
- ⑤ **POLYDREN PP** levelling layer
- ⑥ **MAPEPLAN T M** waterproofing membrane
- ⑦ Mechanical fastening with stress plate
- ⑧ Welding

*** NOTE:**

The vapour barrier layer must be suitably sized based on the waterproofing roof membrane, meaning it must have a water vapour resistance value higher than the MAPEPLAN T M waterproofing membrane.

BUILD-UP T M1.20

MAPEPLAN T M membrane - Insulated roof with double-sheathed wooden deck and spot fastening



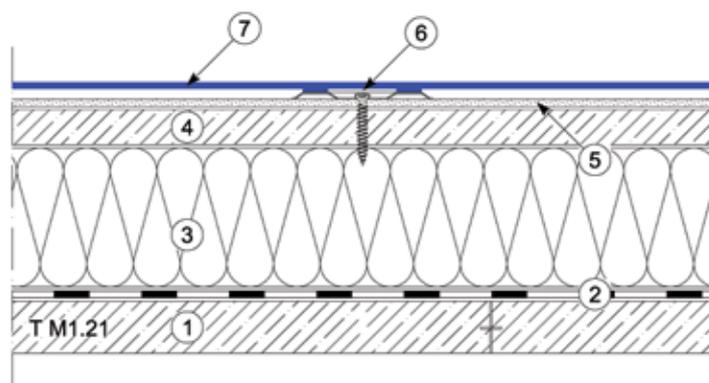
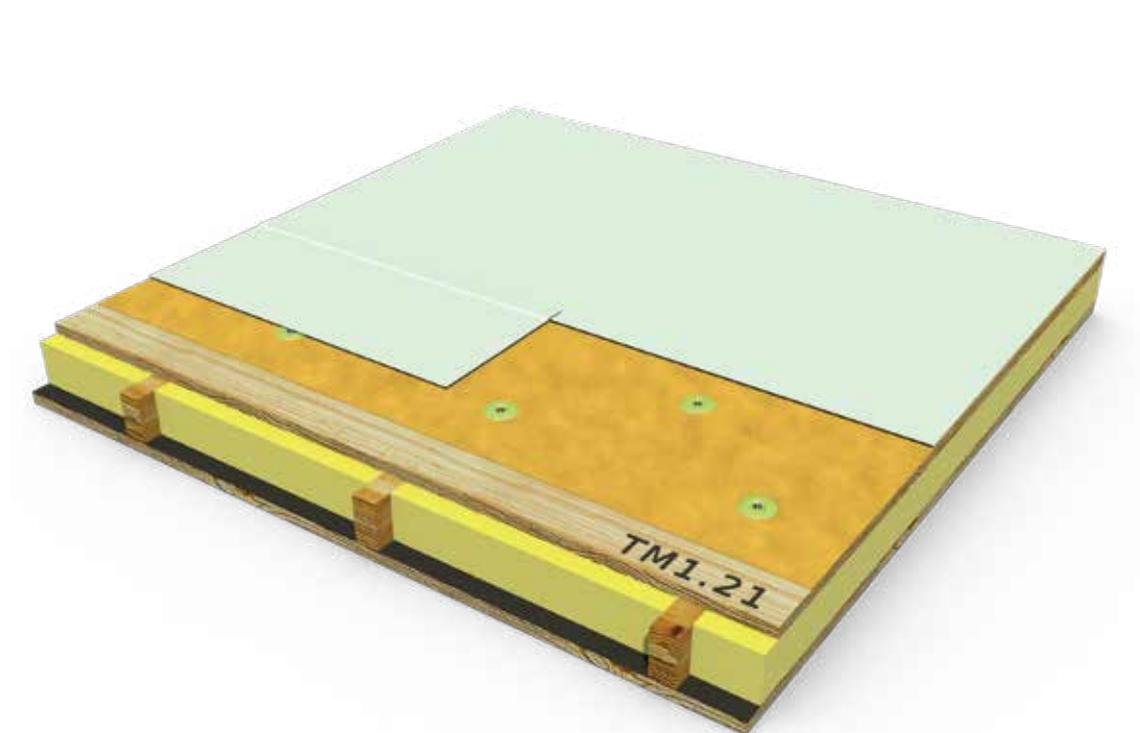
- ① Deck - 1st wooden board
- ② Vapour barrier layer (e.g. **IDROPRIMER + POLYVAP**) *
- ③ Thermal insulation layer
- ④ 2nd wooden board
- ⑤ Mechanically fastened thermal insulation layer
- ⑥ Mechanical fastening
- ⑦ **MAPEPLAN T M** waterproofing membrane
- ⑧ Mechanical fastening with stress plate
- ⑨ Welding

*** NOTE:**

The vapour barrier layer must be suitably sized based on the waterproofing roof membrane, meaning it must have a water vapour resistance value higher than the MAPEPLAN T M waterproofing membrane.

BUILD-UP T M1.21

MAPEPLAN T M membrane - Insulated roof with double-sheathed wooden deck and induction fastening



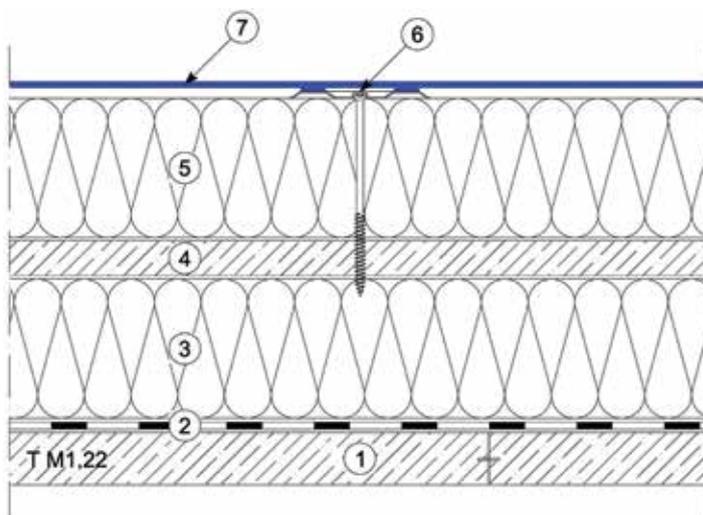
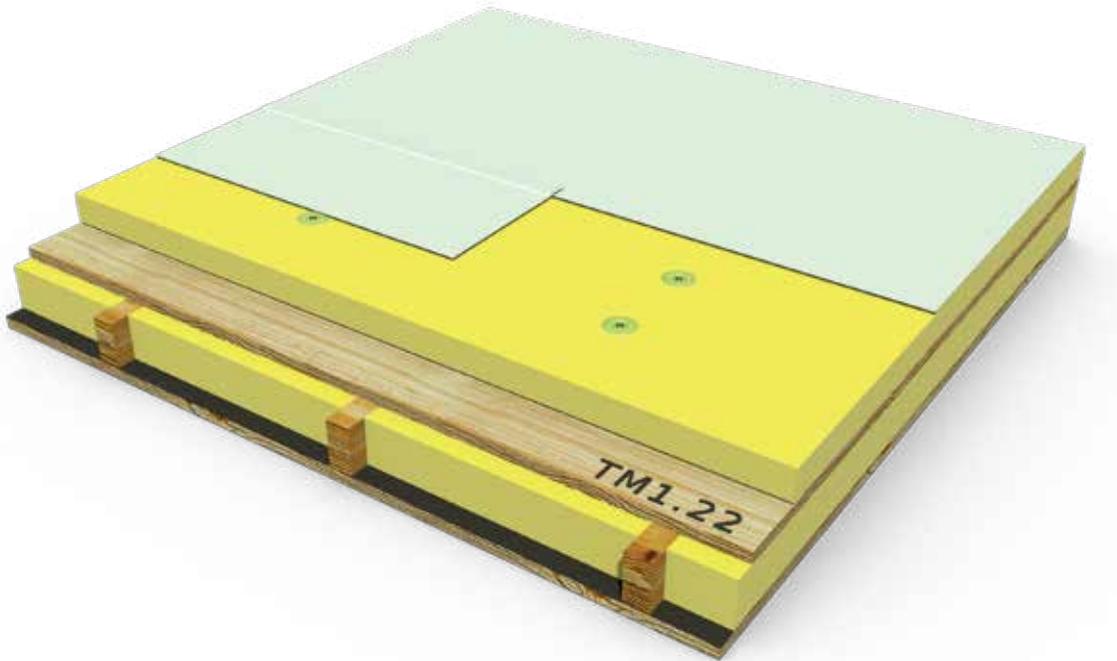
- ① Deck - 1st wooden board
- ② Vapour barrier layer (e.g. **IDROPRIMER + POLYVAP**) *
- ③ Thermal insulation layer
- ④ 2nd wooden board
- ⑤ **POLYDREN PP** levelling layer
- ⑥ Induction welding mechanical fastening
- ⑦ **MAPEPLAN T M** waterproofing membrane

*** NOTE:**

The vapour barrier layer must be suitably sized based on the waterproofing roof membrane, meaning it must have a water vapour resistance value higher than the MAPEPLAN T M waterproofing membrane.

BUILD-UP T M1.22

MAPEPLAN T M membrane - Insulated roof with double-sheathed wooden deck and induction fastening



- ① Deck - 1st wooden board
- ② Vapour barrier layer (e.g. **IDROPRIMER + POLYVAP**) *
- ③ Thermal insulation layer
- ④ 2nd wooden board
- ⑤ Mechanically fastened thermal insulation layer
- ⑥ Induction welding mechanical fastening
- ⑦ **MAPEPLAN T M** waterproofing membrane

*** NOTE:**

The vapour barrier layer must be suitably sized based on the waterproofing roof membrane, meaning it must have a water vapour resistance value higher than the MAPEPLAN T M waterproofing membrane.

6. MAPEPLAN T M solutions - Refurbishment

MAPEPLAN T M waterproofing membranes can be used to design and carry out cost-effective and functional waterproofing refurbishment jobs on existing roofs, with the added option of incorporating additional thermal insulation to improve the building energy efficiency.

But first, it is worth noting that there are two kinds of approach when refurbishing a roof and/or reroofing:

- **Total reroofing**, which consists in stripping back the layers of the existing roof build-up to expose the supporting structure. In this case, the new roof system counts as a new build, hence all the information given so far applies for this type of job, so please refer to the previous chapter 5.
- **Over-roofing**, which consists in leaving the existing build-up system in place and applying the new waterproofing build-up on top, possibly incorporating thermal insulation, where required.

This chapter will cover the latter approach, “over-roofing”, which can be performed over existing bituminous, synthetic, resin- or concrete-based waterproofing systems.

With suitable shaped insulating panels, over-roofing can also be performed on top of corrugated metal sheeting, sandwich panels and corrugated fibre-cement sheeting.

Key to the success of any refurbishment is to first determine the origin of the existing issues, only then can they be remedied properly and permanently.

Comprehensive information is required to understand the issues and all essential data must be procured in order to come up with the correct technical solution, both by checking the documents for the existing roof (invoices, as-built drawings, specifications, etc.) and by conducting on-site surveys.

Document checks can provide us with important preliminary information, which will then be verified with inspections and surveys performed on site.

On-site inspections and surveys - possibly involving taking core samples - are useful and necessary in order to gather information on the composition and condition of the existing roof build-up, on the quality of the substrates to determine whether the mechanical fastening system can be applied and on whether or not the roof is affected by surface or interstitial condensation.

A hygrothermal analysis can help determine whether condensation can form and hence whether action may be required, namely applying a vapour barrier or vapour control layer, and/or whether a new thermal insulation layer should be applied or the existing one upgraded, in which case the insulation will need to be checked for moisture and assessed to determine its compressive strength.

You will need to inspect the existing waterproofing layer, check its adhesion to the substrate and, in the event it is

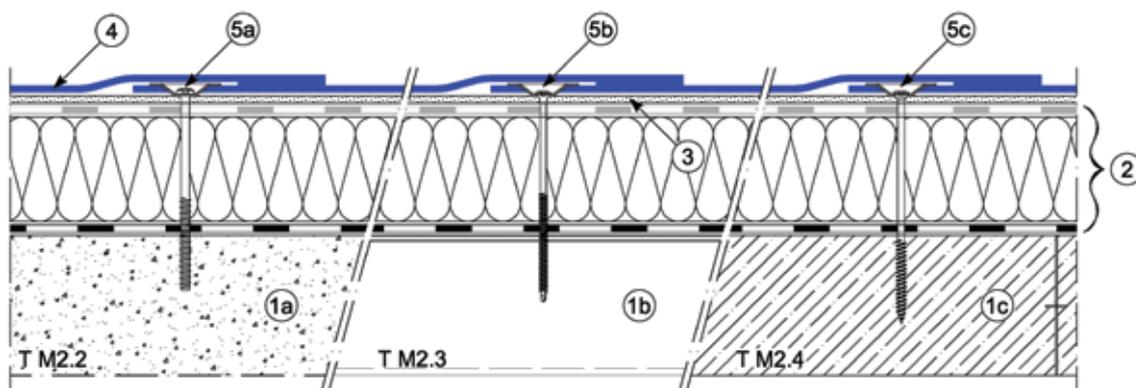
mechanically fastened, check all its fixings and remove any that are no longer effective as, if they are not removed, they might damage the new waterproofing membrane as they move, lift or pull out.

Any protuberances, creases, unevenness or blistering must be removed in order to produce as level a substrate as possible. If no new thermal insulation layer is due to be applied, the substrate will nonetheless be covered with a geotextile levelling and regulating layer (POLYDREN PP) of a suitable thickness and weight before the new MAPEPLAN T M waterproofing membrane is laid on top.

The minimum requirements for the successful installation of a functional and long-lasting over-roof system are:

- Substrate to have a smooth and even surface.
- Substrate to have suitable compressive strength and withstand foot traffic.
- Correct build-up based on temperature and humidity conditions.
- Supporting structure to be suitable for mechanical fastening system (see minimum requirements of decks in chapter 4).
- Water to run off correctly and suitable and functional slopes.
- Possibility to for connection to rooftop building services, if any.

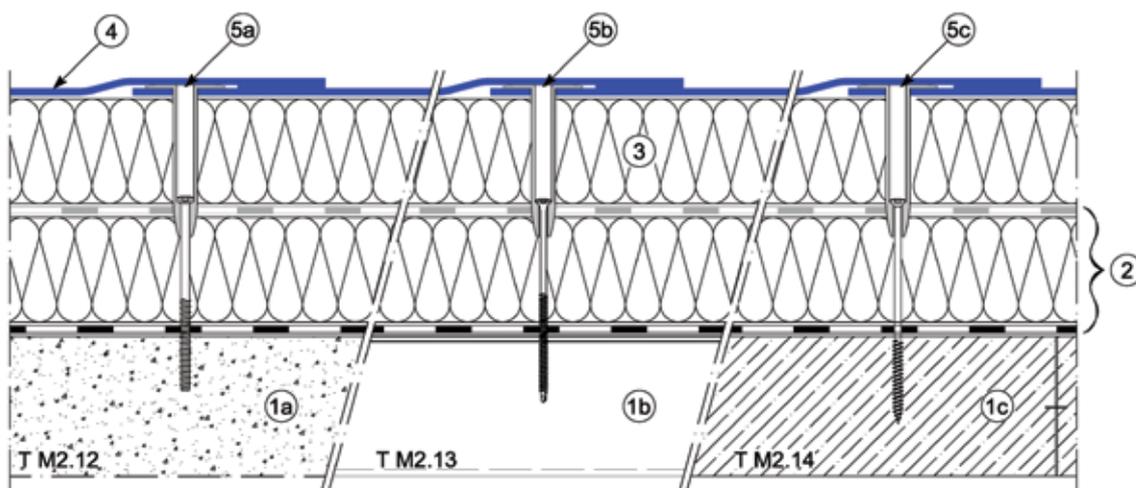
MAPEPLAN T M membrane - Over-roofing refurbishment with spot fastening



- ①a Concrete/composite deck
- ①b Corrugated steel deck
- ①c Laminated timber deck
- ② Existing waterproofing build-up
- ③ **POLYDREN PP** separating layer

- ④ **MAPEPLAN T M** waterproofing membrane
- ⑤a Fastening system on concrete
- ⑤b Fastening system on corrugated steel
- ⑤c Fastening system on laminated timber

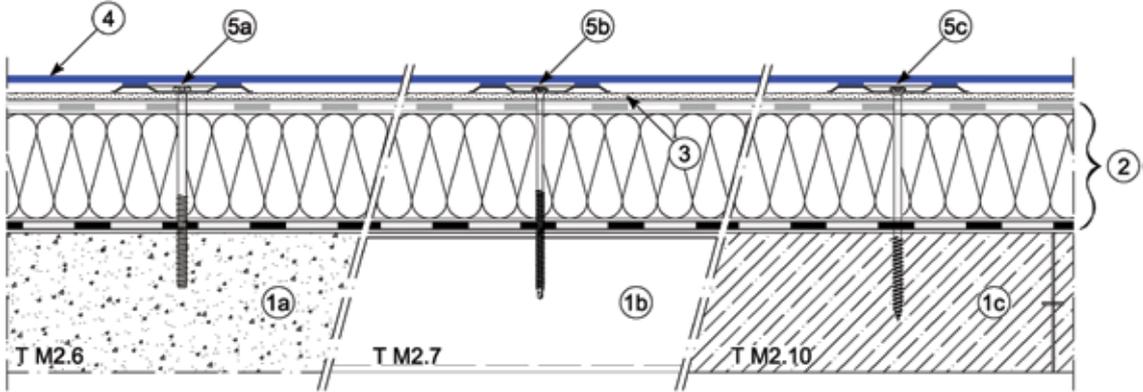
MAPEPLAN T M membrane - Refurbishment incorporating thermal insulation and spot fastening



- ①a Concrete/composite deck
- ①b Corrugated steel deck
- ①c Laminated timber deck
- ② Existing waterproofing build-up
- ③ Supplementary thermal insulation layer

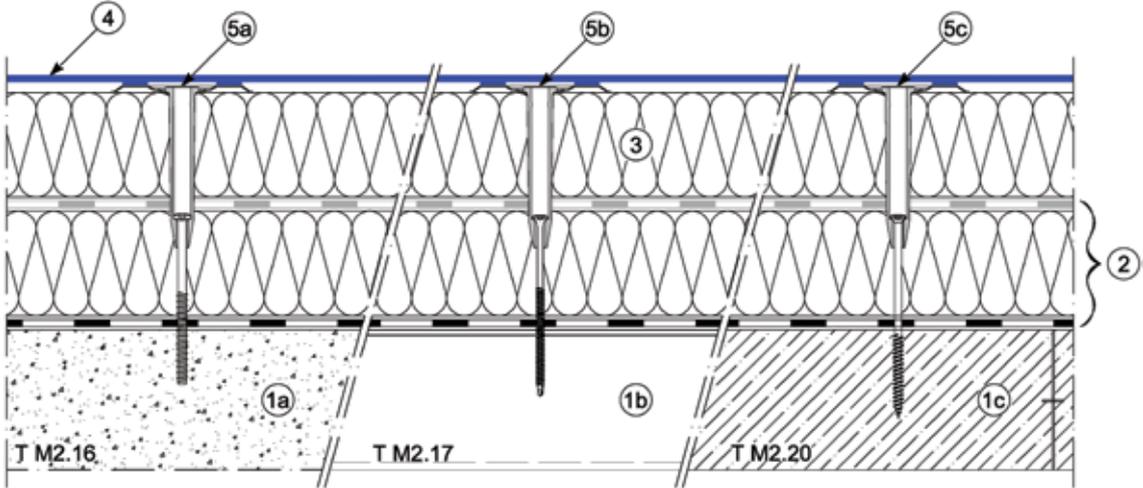
- ④ **MAPEPLAN T M** waterproofing membrane
- ⑤a Fastening system on concrete
- ⑤b Fastening system on corrugated steel
- ⑤c Fastening system on laminated timber

MAPEPLAN T M membrane - Over-roofing refurbishment with induction fastening



- ①a Concrete/composite deck
- ①b Corrugated steel deck
- ①c Laminated timber deck
- ② Existing waterproofing build-up
- ③ **POLYDREN PP** separating layer
- ④ **MAPEPLAN T M** waterproofing membrane
- ⑤a Fastening system on concrete
- ⑤b Fastening system on corrugated steel
- ⑤c Fastening system on laminated timber

MAPEPLAN T M membrane - Refurbishment incorporating thermal insulation with induction fastening



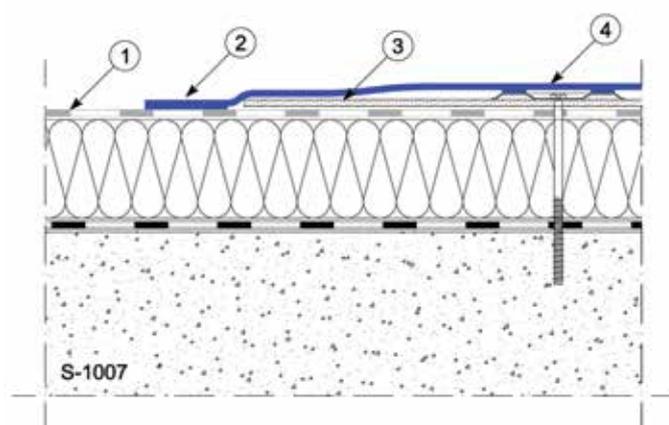
- ①a Concrete/composite deck
- ①b Corrugated steel deck
- ①c Laminated timber deck
- ② Existing waterproofing build-up
- ③ Supplementary thermal insulation layer
- ④ **MAPEPLAN T M** waterproofing membrane
- ⑤a Fastening system on concrete
- ⑤b Fastening system on corrugated steel
- ⑤c Fastening system on laminated timber



Daily provisional waterproofing sealing

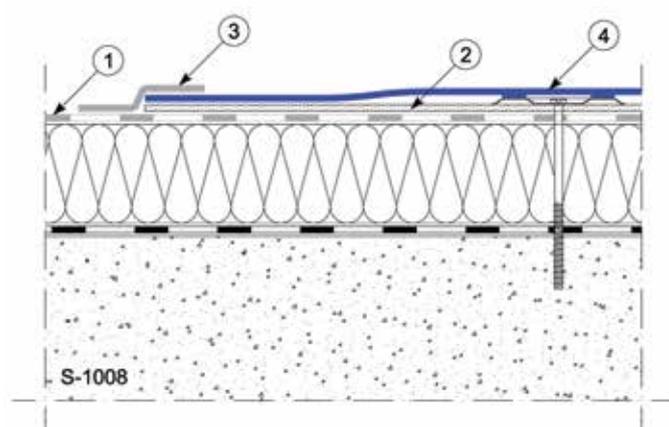
The daily provisional waterproofing sealing avoids the risk of water getting inside accidentally while the job is in progress as the roof weathertightness is ensured at every stage of the project. When dealing with MAPEPLAN T M FPO/TPO flexible polyolefin synthetic membranes, rational and functional sealing can be done in any situation likely to be encountered. By way of a guide, a few possible solutions are given below.

Daily sealing by welding together MAPEPLAN T M and existing FPO/TPO waterproofing membrane - Thermal welding



- ① Existing FPO/TPO waterproofing layer
- ② Welding at end of day
- ③ **POLYDREN PP** levelling layer
- ④ New **MAPEPLAN T M** waterproofing membrane

Daily sealing by taping together MAPEPLAN T M and existing PVC-P or FPO/TPO waterproofing membrane - BUTYLSTRIP tape

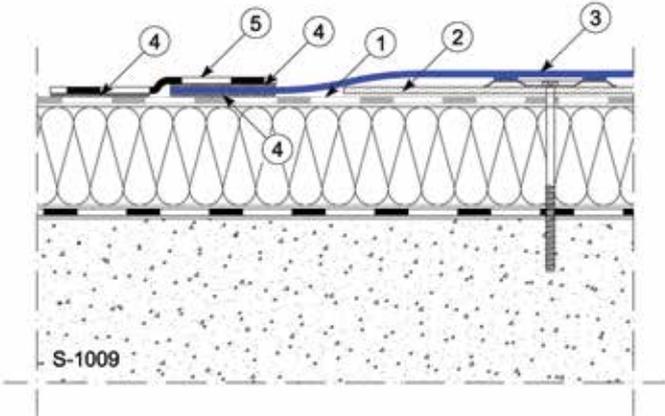


- ① Existing PVC-P or FPO/TPO waterproofing layer
- ② **POLYDREN PP** separating layer, if necessary
- ③ Sealing at end of day with **BUTYLSTRIP** single-sided butyl adhesive tape
- ④ New **MAPEPLAN T M** waterproofing membrane

NOTE:

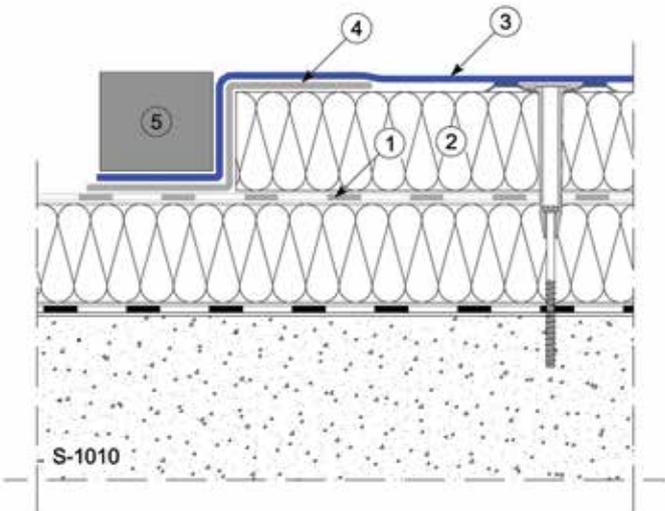
These connections should be considered temporary to stop water ingress while work is in progress.

Daily sealing between MAPEPLAN T M and existing polymer bitumen waterproofing membrane



- ① Existing MBDP waterproofing layer
- ② **POLYDREN PP** separating layer, if necessary
- ③ New **MAPEPLAN T M** waterproofing membrane
- ④ Hot-air welding
- ⑤ Sealing with strip of elastomeric MBDP

Daily sealing between MAPEPLAN T M and existing waterproofing layer on build-up incorporating thermal insulation



- ① Existing waterproofing layer
- ② New supplementary thermal insulation layer
- ③ New **MAPEPLAN T M** waterproofing membrane
- ④ Sealing at end of day with strip of material compatible with existing waterproofing layer
- ⑤ Removable ballast

NOTE:
These connections should be considered temporary to stop water ingress while work is in progress.

7. Basic requirements of single ply waterproofing membranes for mechanically fastened roofs

As mentioned earlier in the foreword, the exposed membrane waterproofing system is a key factor in producing a roof that is built properly and will have a long service life. More specifically, the synthetic waterproofing membrane must meet specific basic requirements, which are key to ensuring adequate and necessary performance. MAPEPLAN T M waterproofing membranes meet all the requirements given below.

To be fit for use on exposed roofs, the synthetic waterproofing membrane must:

- Meet the requirements, points and conditions listed in standard *EN 13956*, according to the relevant tests described, in order for the membrane to earn the certificate of conformity with harmonized European standards and hence CE marking. Specific reference standard: *standard EN 13956 - Flexible sheets for waterproofing - Plastic and rubber sheets for roof waterproofing - Definitions and characteristics*.
- Be waterproof and withstand the pressure of the water. Specific reference standard: *Determination of watertightness test according to standard EN 1928*.
- Be UV stable, resistant to ageing and durable, ensuring the waterproofing system offers decades of service. Specific reference standard: *Method of Artificial ageing by long-term exposure to the combination of UV radiation, elevated temperature and water test according to standard EN 1297*.
- Have dimensional stability and have a low coefficient of thermal expansion. This trait is essential during the waterproofing membranes application as well as during its service life given that the fully exposed membrane is exposed to considerable changes in temperature. Dimensional stability is important to minimize movement, expansion and pulling on the membrane for both technical and aesthetic reasons. Only a membrane reinforced with an internal carrier can guarantee this kind of performance. Specific reference standard: *Determination of dimensional stability test according to standard EN 1107-2*.
- Have high tensile strength and low elongation, to resist wind uplift forces, *Determination of tensile properties test according to standard EN 12311-2*.

- Feature high tear strength, *Determination of resistance to tearing* test according to *standard EN 12310-2*.
- Have high puncture strength. The waterproofing membrane must be able to withstand, with a sufficient safety margin, the loads, impact and accidental damage that might occur during the roofs construction and service. Specific reference standards: *Determination of resistance to static loading* test according to *standard EN 12730*, *Determination of resistance to impact* test according to *standard EN 12691*, *Determination of hail resistance* test according to *standard EN 13583*.
- Have excellent foldability at low temperatures as this, in addition to being a functional trait in cold climates, indicates that the synthetic membrane is good quality. Specific reference standard: *Determination of foldability at low temperatures* according to *standard EN 495-5*.
- Be easy to work with and weld so that even the most complex shapes and complicated features on the roof can be covered securely. Specific reference standards: *Determination of peel resistance of joints* test according to *standard EN 12316-2* and *Determination of shear resistance of joints* test according to *standard EN 12317-2*.
- Have sufficiently good fire performance for the requirements of the job and current code.
The specific reference standards in effect in Europe are described in the following section.

Reference standards for fire behaviour of building materials

Below are the reference standards for the fire behaviour of building materials, which include FPO/TPO synthetic waterproofing membranes.

Standard EN 13501-1

Fire classification of construction products and building elements.

Part 1: Classification using data from reaction to fire tests.

Standard EN 13501-1 classifies building materials - including waterproofing membranes - using test data from reaction to fire tests, in seven classes:

Class A1	Class A2	Class B	Class C	Class D	Class E	Class F
----------	----------	---------	---------	---------	---------	---------

The higher class identify a material with less contribute to the spread of fire:

- Class A1 - Class A1 products will not contribute in any stage of the fire, including the fully developed fire.
- Class F - Products for which no reaction to fire performances are determined or which cannot be classified in one of the classes A1, A2, B, C, D, E.

Given the nature of the product, FPO/TPO synthetic waterproofing membranes are rated Class E:

- Class E - Products capable of resisting, for a short period, a small flame attack without substantial flame spread. Products must meet the criteria determined according to test EN ISO 11925-2.

For further information, please refer to standard EN 13501-1.

Standard EN 13501-5

Fire classification of construction products and building elements.

Part 5: Classification using data from external fire exposure to roof tests.

Standard EN 13501-5 classifies building materials - including waterproofing membranes - using test data from exposing roofs to external fire.

Please note that this fire performance classification refers to the whole roof build-up (deck, vapour barrier, insulation, waterproofing membrane, etc.), it does not refer just to the waterproofing membrane, consequently this classification applies only to the build-ups tested at an accredited laboratory.

More specifically, the standard specifies 4 different test methods, defined by standard CEN/TS 1187:

- Test 1: Method with burning brands
- Test 2: Method with burning brands and wind
- Test 3: Method with burning brands, wind and supplementary radiant heat
- Test 4: Two-stage method incorporating burning brands, wind and supplementary radiant heat

The standard specifies that there are four distinct test methods and that they correspond to different fire hazard scenarios. It also clearly specifies that there is no direct correlation between the test results of the four methods and hence there is no implied ranking order, with each test standing on its own without the possibility to substitute or exchange one for another.

Depending on the test methods adopted, the classification is as follows:

Class B _{ROOF} (t1)	Class B _{ROOF} (t2)	Class B _{ROOF} (t3)	Class B _{ROOF} (t4)
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Build-ups for which no external fire performance is determined are rated Class F_{ROOF}.

For further information, please refer to standard EN 13501-5.

MAPEPLAN T M B_{ROOF} (t1), B_{ROOF} (t2), B_{ROOF} (t3)

MAPEPLAN T M synthetic membranes also come in the B_{ROOF} (t1), B_{ROOF} (t2) and B_{ROOF} (t3), version; the external fire classification refers to the whole roof build-up, not just the waterproofing membrane, consequently you will need to check with the POLYGLASS sales network to find out which MAPEPLAN T M build-ups have been tested and certified in the different B_{ROOF} (t1) (t2) (t3) classifications.

**SINGLE PLY WATERPROOFING SYSTEMS
FOR MECHANICALLY FASTENED ROOFS**

MAPEPLAN T M



8. MAPEPLAN T M waterproofing membranes

The MAPEPLAN T M waterproofing system comprises a UV-stable and weather-resistant FPO/TPO flexible polyolefin waterproofing membrane featuring a mechanically very strong and highly dimensionally stable internal polyester mesh carrier specifically designed and manufactured for exposed roofs with mechanically fastened membrane.

Features and advantages of the MAPEPLAN T M system

The MAPEPLAN T M waterproofing membrane is made from FPO/TPO flexible polyolefin. The special features of this membrane are summarized below.

INTERNAL FLEXIBILITY

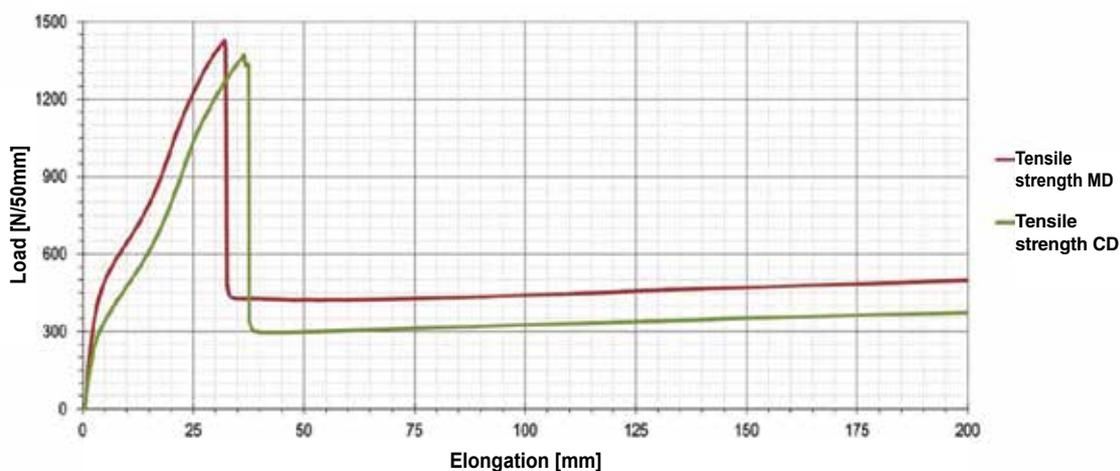
Innovative waterproofing membrane formulated without plasticizers or volatile substances.

The membrane gets its flexibility from the special chemical structure of its polymer component: the element that renders it so flexible is found in the molecular chain and is “chemically bonded” to it. This chemical bond is very strong and difficult to separate, which essentially results in the membrane inherent qualities lasting longer, in greater resistance to aggressive substances, as well as improved weathering resistance and resistance to microorganisms and bacteria.

TENSILE STRENGTH

Mechanically very strong internal polyester mesh carrier that ensures high ultimate strength and low elongation. This is an essential property in mechanical fastening systems to resist wind uplift forces.

Tensile properties of test samples according to EN 12311-2



UV STABILITY

The MAPEPLAN T M waterproofing membrane has been specifically formulated and stabilized so that it can be left fully exposed to the elements and UV radiation. As indicated in greater detail in chapter 10, the MAPEPLAN T M membrane meets and far exceeds the minimum requirements of the reference standards.

DIMENSIONAL STABILITY

Dimensional stability and low coefficient of linear thermal expansion are assured by the internal reinforcement and by the “multi-extrusion coating” production process.

DURABILITY

The MAPEPLAN T M waterproofing membrane features superior durability. In point of fact, accelerated ageing tests confirm many decades of service.

These values are also confirmed by numerous tests carried out by the producers of the raw material (flexible polyolefins). Flexible polyolefin membranes have been applied worldwide for decades with excellent results.

To draw a comparison that everyone can understand, let's take those plastic shopping bags (which are also made mostly from polyolefin): the issue with these bags is not durability, on the contrary it's their excellent and long-lasting resistance to chemicals and physical and mechanical strength that are the problem. In the case of shopping bags, these traits are not seen as advantages, while they definitely are for a waterproofing membrane that is instead required to last a long time.

Below is an excerpt from the BBA Technical Agrément, section 12 - DURABILITY: “Accelerated weathering tests confirm that satisfactory retention of physical properties is achieved. Under normal conditions, the membranes will have a service life in excess of 25 years”.

SMART WHITE SURFACE COLOUR

The MAPEPLAN T M Smart White waterproofing membrane has a special white top layer, which gives the product its excellent solar reflectance.

MAPEPLAN T M Smart White reduces roof surface temperature by over 50% compared to a dark/black-coloured roof, also resulting in lower temperatures inside the building and helping to keep them constant.

This is an undeniable advantage during the warmer months: lower surface temperatures actually result in reduced and optimized use of the air-conditioning system, which also translates into energy and financial savings.

It is also worth remembering that this unique Smart White colour runs through the material and is an integral part of it, which is of more benefit than subsequently applied treatments.

The SRI (Solar Reflectance Index) value is 102 according to standard ASTM E1980, for standard membranes, while the SRI (Solar Reflectance Index) value is 96 according to standard ASTM E1980 for B_{ROOF} T1 membranes and 99 for B_{ROOF} T2-T3 membranes.

Moreover, in the event photovoltaic systems are installed on the roof, the high reflectance rating and low surface temperature greatly benefit the photovoltaic system in question, whose performance in terms of energy output is increased.

SIGNAL LAYER SURFACE COLOUR

The different colour on the membrane surface also has the advantage of acting as a warning layer, providing visual evidence of any accidental mechanical damage or surface scratching as a result of work carried out once the membrane has been laid.

“MULTI-EXTRUSION COATING” PRODUCTION PROCESS

The MAPEPLAN T M membrane is manufactured in a modern, technologically advanced and environmentally friendly “Multi-extrusion coating” plant.

This production system allows the FPO/TPO synthetic matrix to be applied directly and at the same time to both faces of the carrier in one go, thus ensuring that it is incorporated perfectly in the membranes structure.

This special process means the MAPEPLAN T M membrane is not prone to delamination problems, instead essentially qualifying as a single-ply membrane that offers good resistance to foreseeable stress (physical, chemical, thermal).

MAPEPLAN T M membranes are not produced using pre-laminated sheets that then have to be bonded together.

MOLECULAR WELDING

The MAPEPLAN T M waterproofing membranes are thermoplastic plastomers, which means they have excellent weldability properties and are actually thermal welded with hot air. This welding method effectively fuses together the molecular chains: the welding of MAPEPLAN T M membrane withstand the pressure of the water and are mechanically strong.

LOOSE-LAID SYSTEM WITH MECHANICAL FASTENING SYSTEM

The loose-laid system used for all layers in the roof build-up offers the advantage of being able to absorb the movements and expansion of the substrate without them affecting the waterproofing membrane, which can slide relative to the substrate. Consequently, splitting, cracking, expansion or any other defects that might occur in the substrate cannot damage the waterproofing membrane. The MAPEPLAN T M system offers the highest performance in terms of “crack bridging”. Loose laying also means waterproofing membrane seams and surfaces can be checked using a “Tracer gas” or “high voltage or low voltage systems”: the same type of systems also used to detect leaks as well as to conduct functional testing in service.

Securing the waterproofing membrane with a mechanical fastening system has the advantage of fixing the membrane securely directly to the load-bearing structure underneath. What enables the membrane to withstand wind uplift is actually the specific mechanical fixing system, which is calculated and sized to meet the requirements of the relevant standards (Eurocode is the standard in effect in Europe) based on actual job conditions, such as:

- building height and shape;
- positioning, location;
- type of substrate;
- type of waterproofing membrane and carrier;
- design wind speed.

GREEN CREDENTIALS

Being free from plasticizers and volatile substances and containing no substances that are detrimental or harmful to people or the environment, MAPEPLAN T M is a highly eco-friendly product. The modern and technologically advanced production system has been designed and built to deliver the lowest possible environmental impact. This low environmental impact is guaranteed during all stages of the membrane life cycle: manufacture, transport, installation, service life, end-of-life disposal.

Once the waterproofing membrane reaches the end of its life cycle, it can be removed and recycled/reused to produce new raw material.

EPD - Environmental Product Declaration



MAPEPLAN T M waterproofing membranes come with an EPD (Environmental Product Declaration).

The EPD is defined by standard ISO 14025 as a document containing quantified environmental data for a product with pre-set categories of parameters calculated using the Life Cycle Assessment (LCA) method and hence based on the ISO 14040 series of standards. Nonetheless, the EPD declarations do not exclude additional environmental information.

The Environmental Product Declarations (EPD) are just another mark of the transparency espoused by POLYGLASS SpA and the MAPEI Group in their dealings with the market to provide information on the environmental performance of their products and services, according to relevant categories of parameters and following internationally standardized guidelines.

Additional information on the environmental impact of MAPEPLAN T M waterproofing membranes:

- Production system that uses water in a closed loop, hence waste free.
- Production scrap is reused/recycled.
- The POLYGLASS facility complies with all pollution control parameters, including air quality standards.
- POLYGLASS pursues a policy of total energy efficiency (electricity, heating) regarding the production cycle and all business activities.
- POLYGLASS has a cogeneration plant for rational and environmentally conscious electricity production.

LEED CERTIFICATION

MAPEPLAN T M waterproofing membranes help meet the requirements for earning credits for LEED (Leadership in Energy and Environmental Design) certification.

POLYGLASS is a member of the Green Building Council.



9. COOL ROOF - Reflectance and improved building energy efficiency

The MAPEPLAN T M waterproofing membrane has a special white top layer, called “Smart White”, which gives the product its excellent solar reflectance.

MAPEPLAN T M Smart White can reduce roof surface temperature by over 50% compared to a dark/black-coloured roof, also resulting in lower temperatures inside the building and helping to keep them constant. This is an undeniable advantage during the warmer months: lower surface temperatures actually result in reduced and optimized use of the air-conditioning system, which also translates into energy and financial savings.

For MAPEPLAN T M, the SRI (Solar Reflectance Index) value is 102 according to standard ASTM E1980.

The solar reflectance rating is 81% according to standard ASTM E903.

The thermal emissivity rating is 91% according to standard ASTM C1371.

For the MAPEPLAN T M _{BROOF} T2-T3 version, the SRI value is 99 according to standard ASTM E1980.

The solar reflectance rating is 79% according to standard ASTM E903.

The thermal emissivity rating is 92% according to standard ASTM C1371.

For the MAPEPLAN T M _{BROOF} T1 version, the SRI value is 96 according to standard ASTM E1980.

The solar reflectance rating is 77% according to standard ASTM E903.

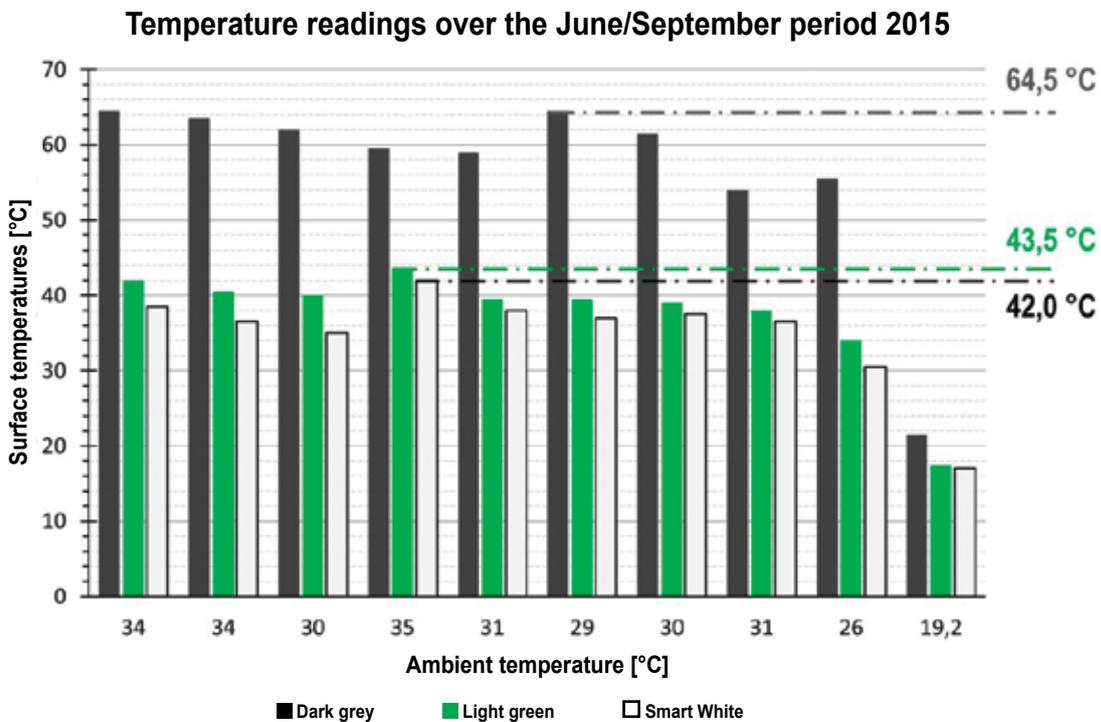
The thermal emissivity rating is 91% according to standard ASTM C1371.



FIELD TESTS

In the summer of 2015 - the hottest on record in recent decades - measurements were taken directly off a roof in Ponte di Piave (province of Treviso in Italy's Northeast) to record the surface temperatures of three MAPEPLAN T M waterproofing membranes with different coloured top layers.

Measurements were taken at the hottest time of day (2pm) with the membranes in full sun. Below is a chart giving the surface temperatures for the three different MAPEPLAN T M membrane colours along the Y-axis, while the outside temperature is given along the X-axis. As you can see, on the surface of the MAPEPLAN T M membrane in Smart White, the surface temperature reading was around +40 °C, approx. 20-25 °C less than the dark grey version, thus confirming that the Smart White colour really works.



The MAPEPLAN T M Smart White waterproofing membrane makes a significant contribution to improving building energy efficiency.

GENERAL INFORMATION

To help you gain a better understanding of aspects relating to solar reflectance and “cool roofs”, below is some information of a general nature that is applicable to MAPEPLAN T M.

What are cool roofs?

Cool roofs are roofs that are highly effective in reflecting incident solar radiation, while also emitting thermal energy at infrared wavelengths, namely they have a high solar reflectance rating and high thermal emissivity.

Cool roofs are roofs that have a low surface temperature, even over the summer months and in direct sunlight.

Advantages of cool roofs

There are several advantages that can be achieved by producing a cool roof:

- Improved ambient conditions inside the building during summer months.
- Less energy required for air-conditioning to cool rooms inside the building in summer.
- Improved energy efficiency of the whole building envelope.
- Reduced heat island effect (the term heat island is used to describe the phenomenon whereby the temperature generated in urban areas is higher than that recorded in rural areas).
- Greater dimensional stability of roof build-up system and underlying load-bearing structures as the effect of high summer temperatures is mitigated (less movement, expansion, cracking, etc.).
- Longer service life expectancy of waterproofing roofing membranes as the low surface temperature greatly reduces the natural heat-induced ageing process.

What is solar reflectance?

Solar reflectance is a measure of the ability of a material/surface to reflect incident solar radiation. A surface with a high solar reflectance reflects most of the incident solar radiation and hence stays cooler on the surface.

Light colours, especially white, have a high solar reflectance. Solar reflectance is rated from 0 to 1 or as a %.

What is thermal emissivity?

Thermal emissivity is a measure of the ability of a material/surface to disperse heat.

A surface with a high thermal emissivity rating has the property of effectively radiating heat to the surrounding environment.

FPO/TPO polymer waterproofing membranes have high thermal emissivity. Emissivity is rated from 0 to 1 or as a %.

What is the SRI (Solar Reflectance Index) value?

This is a value worked out using a calculation method to determine and measure the combination of reflectance and emissivity properties of a material/surface. The combined impact of the solar reflectance and thermal emissivity factors is measured according to standard ASTM E1980, and is calculated based on three wind speed conditions (low, medium, high). The SRI value is given as a %. The higher the SRI value, the lower the temperature of the surface exposed to sunlight. *Note: since this calculation method is based on reference values/surfaces, the result may be higher than 100%.*

Reference to LEED

LEED (Leadership in Energy and Environmental Design) is a rating system for high-performance environmentally sustainable buildings. LEED certification refers to the building as a whole, certifying its environmental impact and sustainability, and was developed in the US in the early 90s.

The certification system is based on a series of credits awarded for different categories. More specifically, cool roofs can earn points towards certification under:

Category 1 - Sustainable sites.

- Credit 7.2 - Heat island effect: Roof.

In order to achieve the credit for reducing the heat island effect, the finished roof should:

- Have an SRI ≥ 78 (for roofs with a slope $\leq 15\%$).
- Have an SRI ≥ 29 (for roofs with a slope $> 15\%$).

10. UV radiation ageing and exposure tests

Artificial ageing testing of MAPEPLAN T M by long-term exposure to the combination of UV radiation, elevated temperature and moisture, according to standard EN 1297.

UV stability and resistance to ageing are essential requirements for a waterproofing membrane to be used on mechanically fastened exposed roofs.

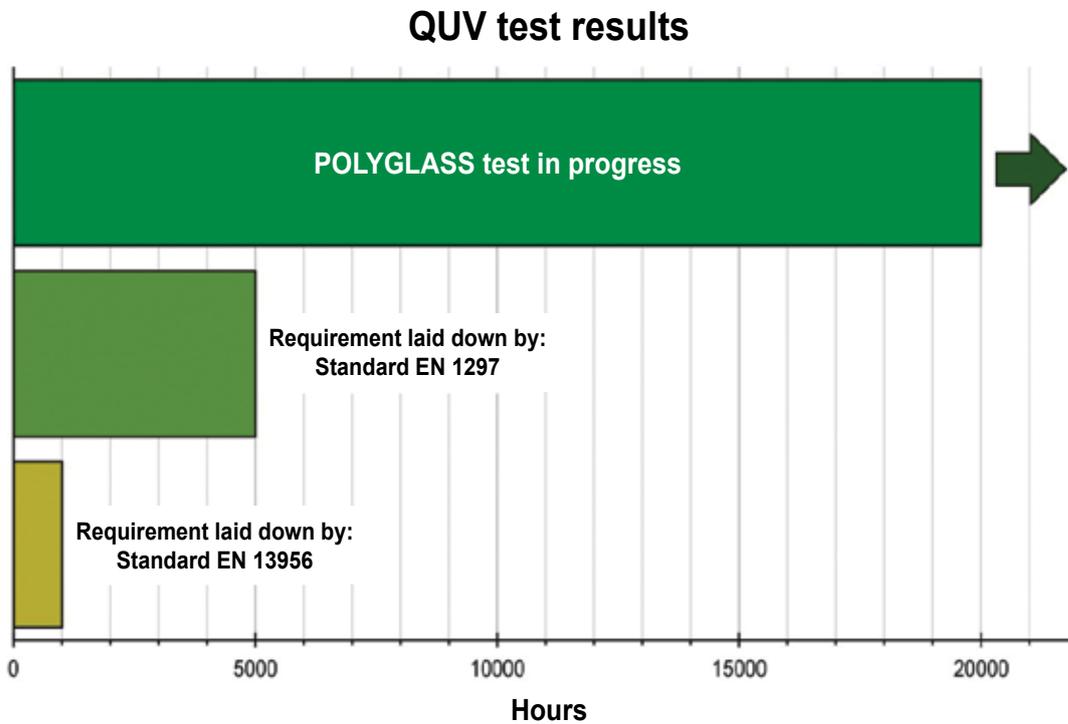
STANDARD: *EN 1297 - Flexible sheets for waterproofing. Bitumen, plastic and rubber sheets for roof waterproofing. Method of artificial ageing by long-term exposure to the combination of UV radiation, elevated temperature and water.*

Minimum exposure required according to EN 13956 - roof product standard: 1000 hours.

METHOD: a single exposure cycle lasts 360 minutes and consists in 300 minutes of UV radiation in a dry atmosphere at 60 °C, followed by 60 minutes of thermal shock in a wet atmosphere (water spray) in accordance with standard EN ISO 4892-3. During this final stage, there is neither radiation nor heating.

ASSESSMENT OF RESULTS: the test determines how long the specimen is exposed to UV radiation before cracks start to form (visible under a microscope) on the surface of the membrane or there are significant changes in the colour or shape of the sample.





TESTING CONDUCTED BY POLYGLASS LABORATORY ON MAPEPLAN T M - ACCORDING TO EN 1297

Given the good test results, the exposure test continues beyond the minimum requirements laid down by the standards. The results of the exposure tests carried out on the MAPEPLAN T M waterproofing membrane according to reference standard EN 1297 are given on the coming pages.

Reference sample: MAPEPLAN T M

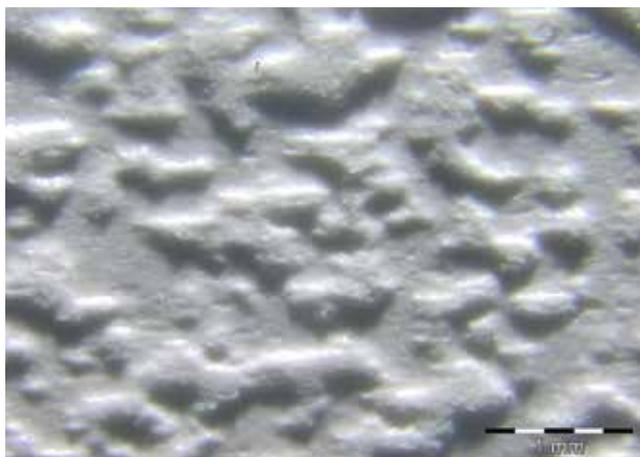
The following photos are a 20x magnification of the waterproofing membrane surface; the depressions that give the embossed pattern its shape can be seen under the microscope.

Ratings according to EN 1297

Samples are examined under the microscope for cracks, and to determine the dimensions of any such cracks, and are assessed as follows:

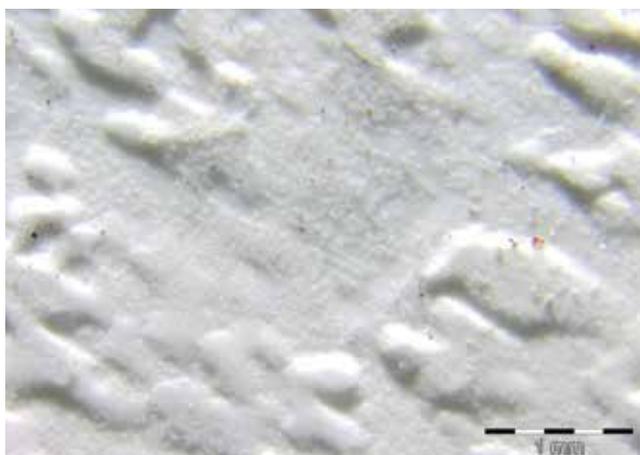
- Grade 0 - no cracks or crazes
- Grade 1 - Faint and flat crazes
- Grade 2 - Moderately broad and moderately deep cracks
- Grade 3 - Broad and deep cracks

20x magnified photo - Assessment at 0 hours of UV radiation



Rating: 0 - no cracks.

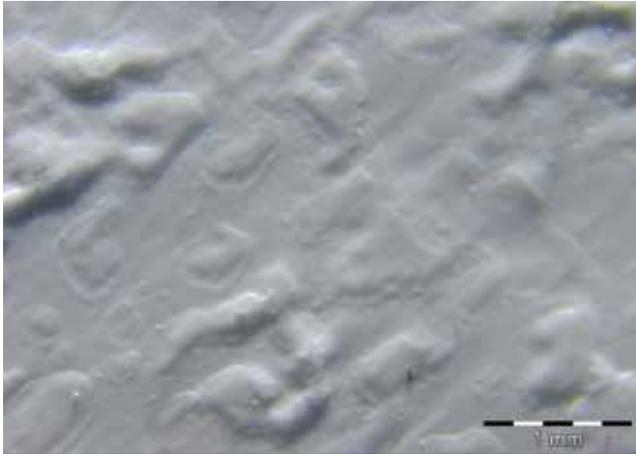
20x magnified photo - Assessment after 1000 hours of UV radiation



Rating: 0 - no cracks.

Limit laid down by standard EN 13956.

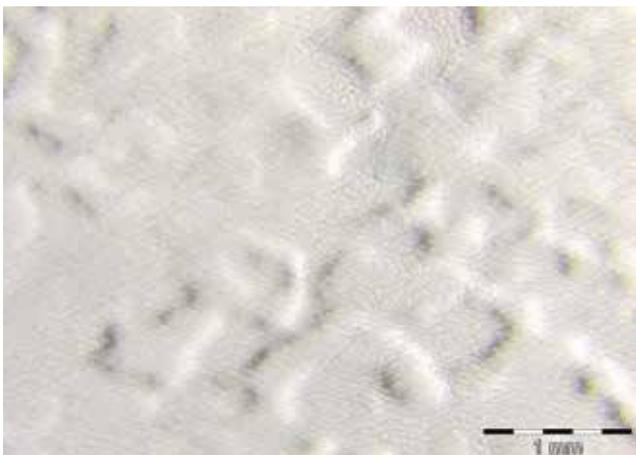
20x magnified photo - Assessment after 5000 hours of UV radiation



Rating: no cracks.

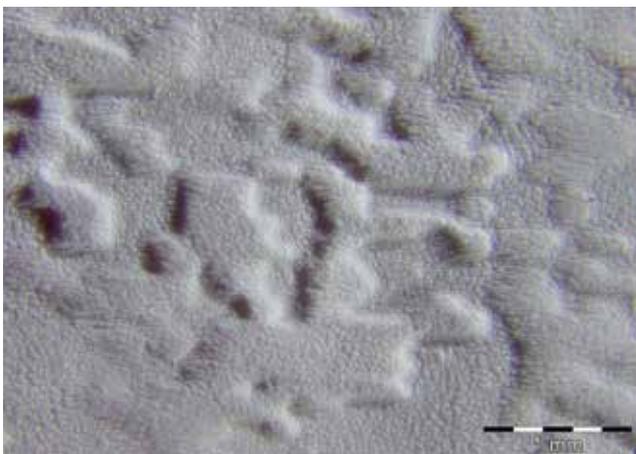
Limit laid down by standard EN 1297.

20x magnified photo - Assessment after 10000 hours of UV radiation



Rating: no cracks.

20x magnified photo - Assessment after 20000 hours of UV radiation



Rating: no cracks.

11. Action of wind on mechanically fastened roofs

On building roofs, pressure generated by the wind results in wind uplift and the formation of vortices, which have a significant effect on roofing membranes.

The wind uplift effect generated on the MAPEPLAN T M waterproofing membrane is opposed by the internal polyester mesh carrier and mechanical fastening system, which must be specifically calculated for each building on a project-by-project basis and in accordance with the standards in effect in the country where the job is to take place.

Every country has specific standards that need to be referred to and provide information on the action of wind on roofs. The applicable standard in Europe is called EUROCODE 1-4 - WIND ACTIONS and is further supplemented with local standards and laws (Annex) that give specific details for each individual country.

EUROCODE 1-4 - WIND ACTIONS - NATIONAL ANNEX

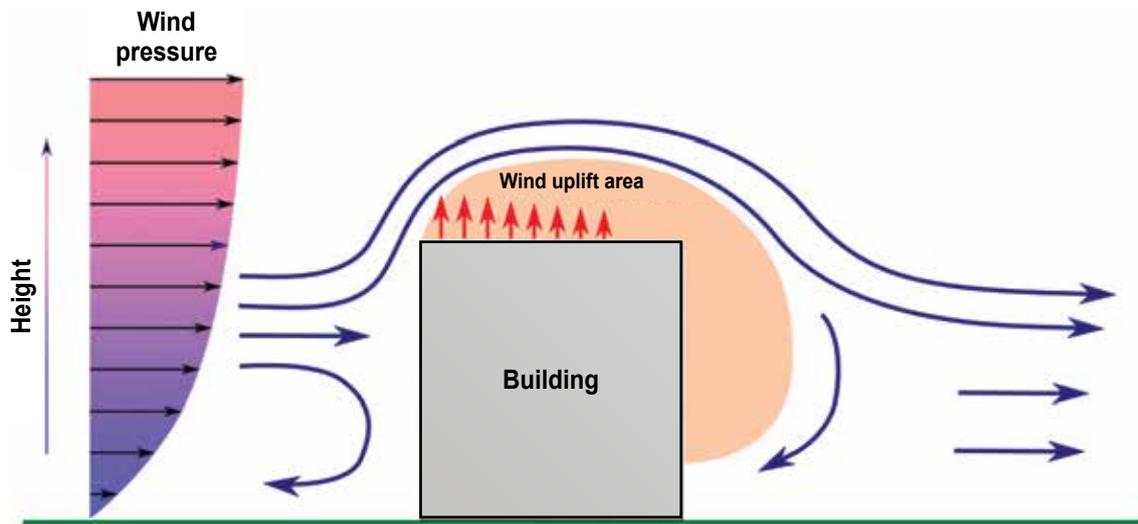
Procedure for calculating wind action on the roof.

Given the broad scope and complexity of the issue, we recommend you refer to the relevant individual standards, laws and good practice codes.

To sum up, it is worth remembering that the mechanical fastening system must be designed and sized for each individual roof according to the standards and legislation in force, which takes into account for each individual building:

- positioning, location
- design wind speed
- building height and shape
- shape and gradient of the roof
- parapets installed around the roof
- surrounding morphology and presence of other adjacent buildings
- type of substrate
- substrate air permeability
- type and strength of waterproofing membrane and carrier
- type and strength of mechanical fastening system

How wind acts on the roof



MAPEPLAN ADS 300



MAPEPLAN ADS 300 is a polichloroprenic monocomponent solvent adhesive for double coating (contact adhesive), designed to bond MAPEPLAN T M membrane on vertical surfaces.

MAPEPLAN METALBAR - MAPEPLAN T CORD



MAPEPLAN METALBAR is a metal fixing profile in galvanized carbon steel, prepunched, with oval perforations, to be used around the perimeter of the waterproofing membrane to anchor the sheet.

Anti-tear cord MAPEPLAN T CORD is applied adjacent to the slotted profiles to complete the fastening of the perimeter.

POLYDREN PP

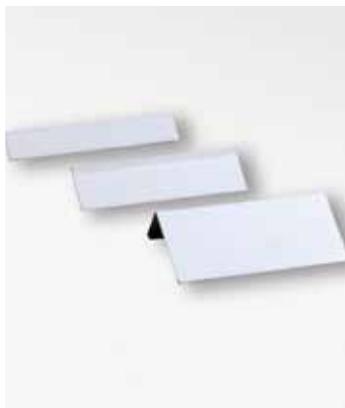


POLYDREN PP is a 100% polypropylene woven-non-woven geotextile, needle punched and thermocalandered.

POLYDREN PP has been manufactured to meet standards EN 13249; EN 13254; EN 13250; EN 13255; EN 13251; EN13256; EN 13252; EN 13257; EN 13253; EN 13265.

It is used as a levelling and separating layer.

MAPEPLAN T LAMINATED METAL SHEET



Zinc steel sheet having the surface laminated with MAPEPLAN T FPO/TPO waterproofing membrane.

It is resistant to weathering and ultraviolet rays.

These coated metal sheets are used as press-formed finishing profiles and flashings for MAPEPLAN T M membrane.

MAPEPLAN TD 15



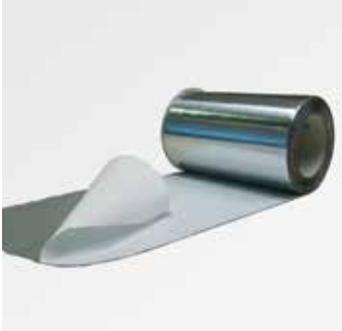
MAPEPLAN T D 15 is an unreinforced synthetic waterproofing membrane manufactured from flexible polyolefin FPO/TPO, produced in one multi-extrusion process, with high quality raw materials, offering UV stability and weathering resistance. Used for completing details and finishing elements on site - such as inside and outside corners, pipe and post junctions/penetration flashings, etc. - it can be applied in conjunction with MAPEPLAN T M waterproofing membranes, as an alternative to MAPEPLAN T prefabricated accessories.

MAPEPLAN T WALKWAY



MAPEPLAN T WALKWAY is a FPO/TPO protection rooftop membrane with a composite glass fleece/glass fibre combi reinforcement, produced with a structured non-slip surface making the roof suitable for foot traffic and allowing access for maintenance purposes. Designed to be applied on top of MAPEPLAN T M membranes to form marked walkways. MAPEPLAN T WALKWAY is also handy for use as extra protection around rooftop building services and equipment. Offers UV stability and weathering resistance.

BUTYLSTRIP



BUTYLSTRIP is a high-adhesive butyl sealing tape protected by a reinforced aluminum film. The aluminum film gives to the product resistance to ageing, to oxidizing and to the aggression of chemical and atmospheric agents. It is cold applied, waterproof and self-sealing, features good adhesion at low temperatures and heat stability, does not release oily substances and is solvent free. It can be used for daily provisional waterproofing sealing jobs.

MAPEPLAN VB PE - MAPEPLAN VB PE SD 220



MAPEPLAN VB PE - MAPEPLAN VB PE SD 220 is a vapour control layer in low density LDPE polyethylene. It is used to as vapour control layers and as a functional element in producing build-up systems for warm roofs. Designed to be applied on the “warm side” of the thermal insulation.

IDROPRIMER



IDROPRIMER is a water-based bituminous primer made with select bitumen used as an adhesion promoter and dust-repellant primer before laying prefabricated bitumen membranes, in this case used as a vapour barrier. It has the major advantage of not being flammable and being odourless.

POLYVAP SA



POLYVAP SA is a prefabricated double-sided self-adhesive bitumen membrane produced using ADESO technology, made up of a special self-adhesive elastomeric compound (SBS) reinforced with an aluminium foil. For use as a vapour barrier, it meets the requirements of standard EN 13970. Its use is recommended in all cases where application not involves torching.

POLYVAP RADONSHIELD



POLYVAP RADONSHIELD is a prefabricated waterproofing elastomeric-plastomeric membrane, with a distilled bitumen-based compound modified with polypropylene, reinforced with a 6/100 thickness aluminum strip bonded to reinforced glass fibre.

For use as a vapour barrier and as a provisional waterproofing measure to stop water getting in temporarily, it meets the requirements of standard EN 13970.

PLANA P



PLANA P is a prefabricated waterproofing elastomeric-plastomeric membrane, with a distilled bitumen-based compound modified with polypropylene and staple non-woven polyester fabric reinforment.

For use as a vapour barrier and as a provisional waterproofing measure to stop water getting in temporarily, it meets the requirements of standard EN 13970 and EN 13707.

POLYVAP FIX - POLYVAP FIX AL



POLYVAP FIX and POLYVAP FIX AL are prefabricated membranes produced by co-estrusion of an elastomeric polymer bitumen compound.

POLYVAP FIX is a vapour control layer with non-woven polyester fabric reinforcement stabilized and reinforced with glass strands parallel to the machine direction. POLYVAP FIX AL is a vapour barrier reinforced with a 6/100 thickness aluminum strip bonded to reinforced glass fibre set within the membrane.

For use as a vapour barrier /control layer and as a provisional waterproofing measure to stop water getting in temporarily, they meet the requirements of standard EN 13970.

SINGLE PLY WATERPROOFING SYSTEMS
FOR MECHANICALLY FASTENED ROOFS

MAPEPLAN T M



13. Technical drawings

ROOF PARAPET



WALL CONNECTION



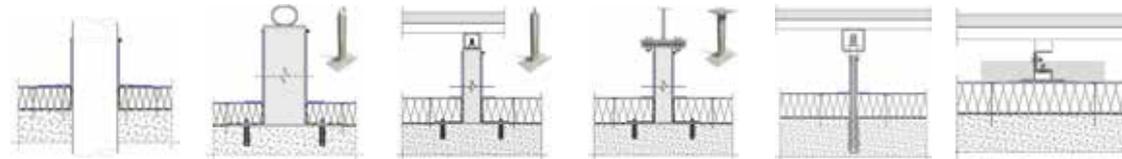
SKYLIGHT CONNECTION



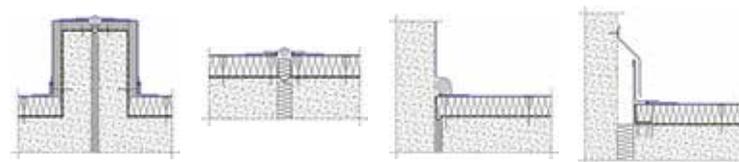
ROOF DRAIN



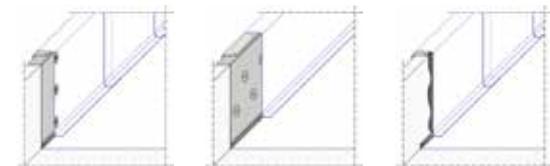
PIPE/ANCHOR CONNECTION



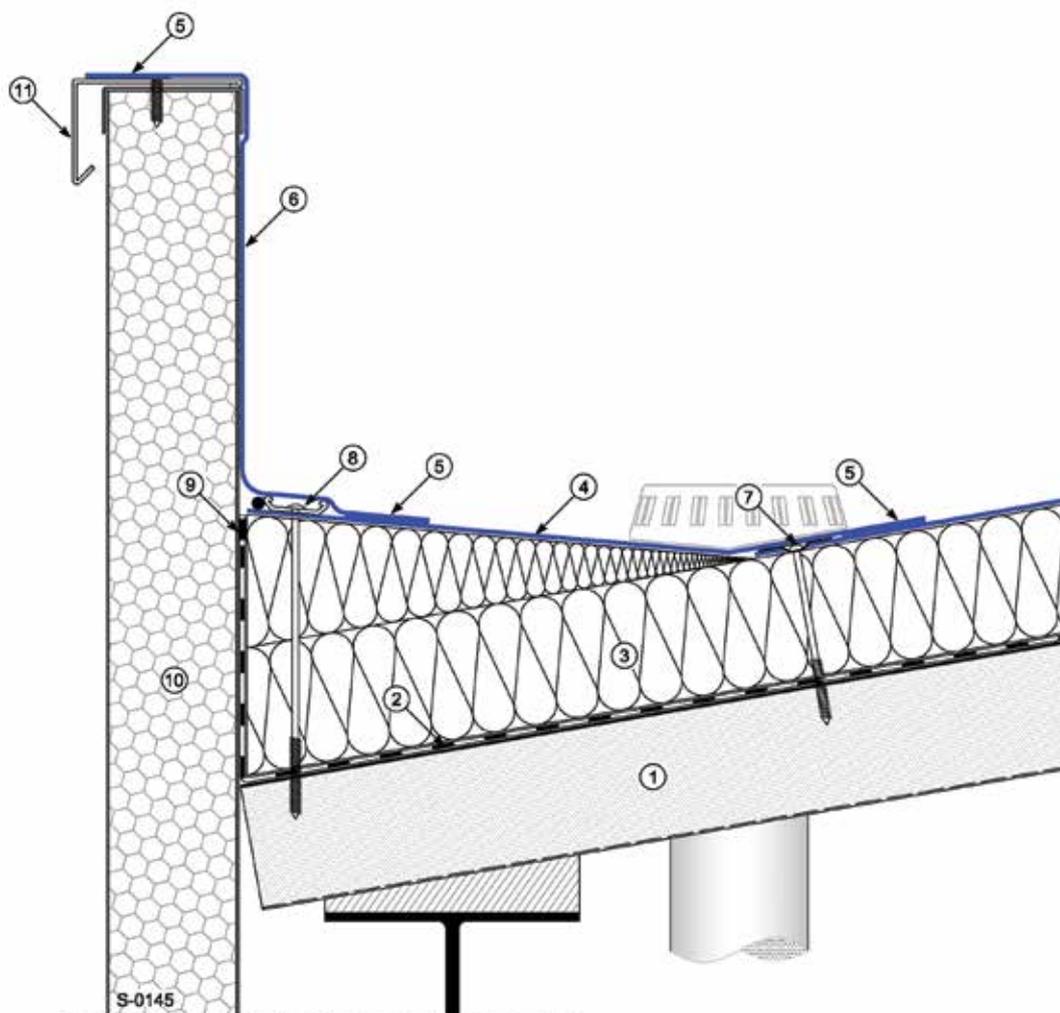
EXPANSION JOINT



VERTICAL UPSTAND

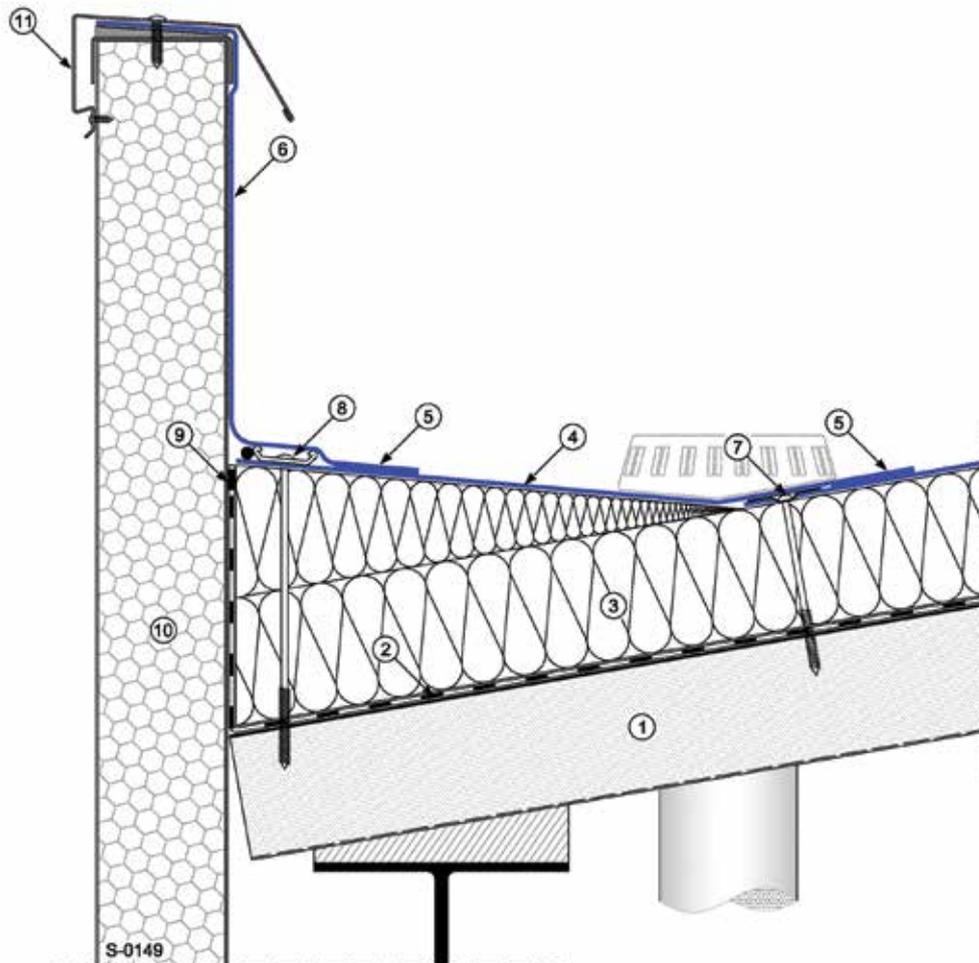


Detail S-0145 - Roof parapet



- | | |
|--|---|
| ① Deck | ⑦ Spot mechanical fastening with stress plates |
| ② Vapour barrier sealed on overlaps and on perimeters | ⑧ MAPEPLAN METALBAR mechanical fastening |
| ③ Mechanically fastened thermal insulation layer | ⑨ Perimeter sealing |
| ④ Mechanically fastened MAPEPLAN T M waterproofing membrane | ⑩ Wall |
| ⑤ Welding | ⑪ MAPEPLAN T perimeter profile |
| ⑥ Fully adhered MAPEPLAN T waterproofing membrane | |

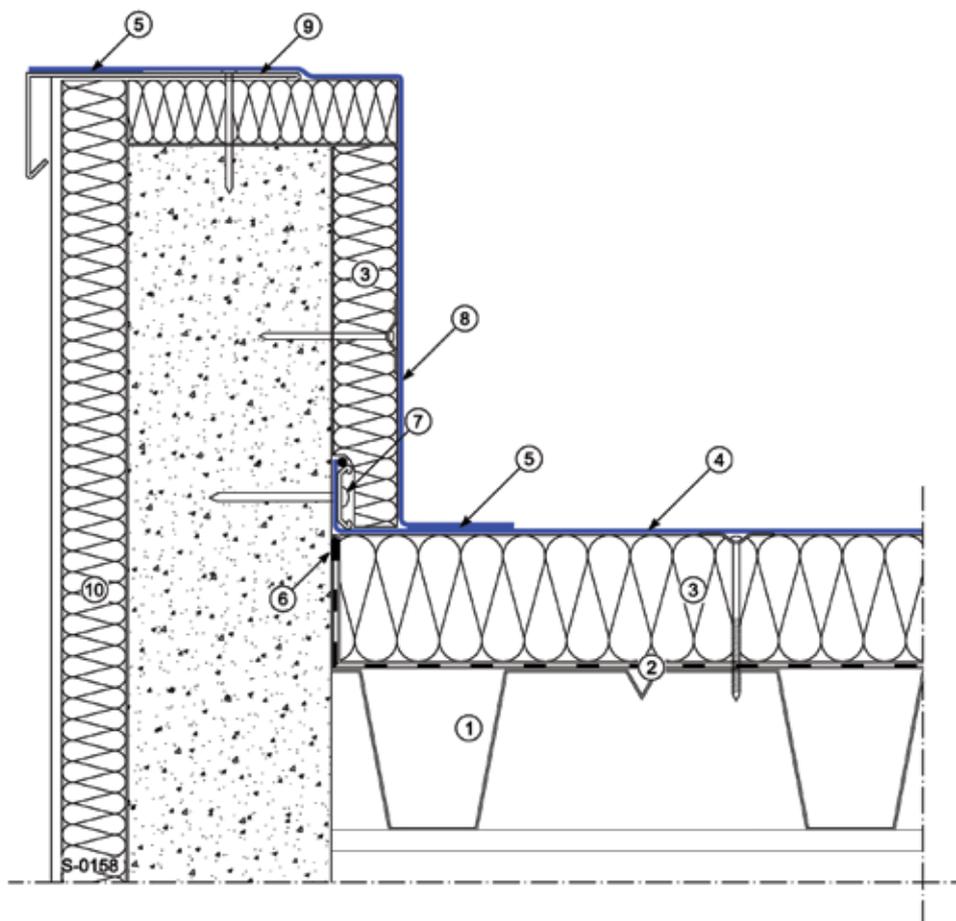
Detail S-0149 - Roof parapet



- ① Deck
- ② Vapour barrier sealed on overlaps and on perimeters
- ③ Mechanically fastened thermal insulation layer
- ④ Mechanically fastened **MAPEPLAN T M** waterproofing membrane
- ⑤ Welding
- ⑥ Fully adhered **MAPEPLAN T** waterproofing membrane

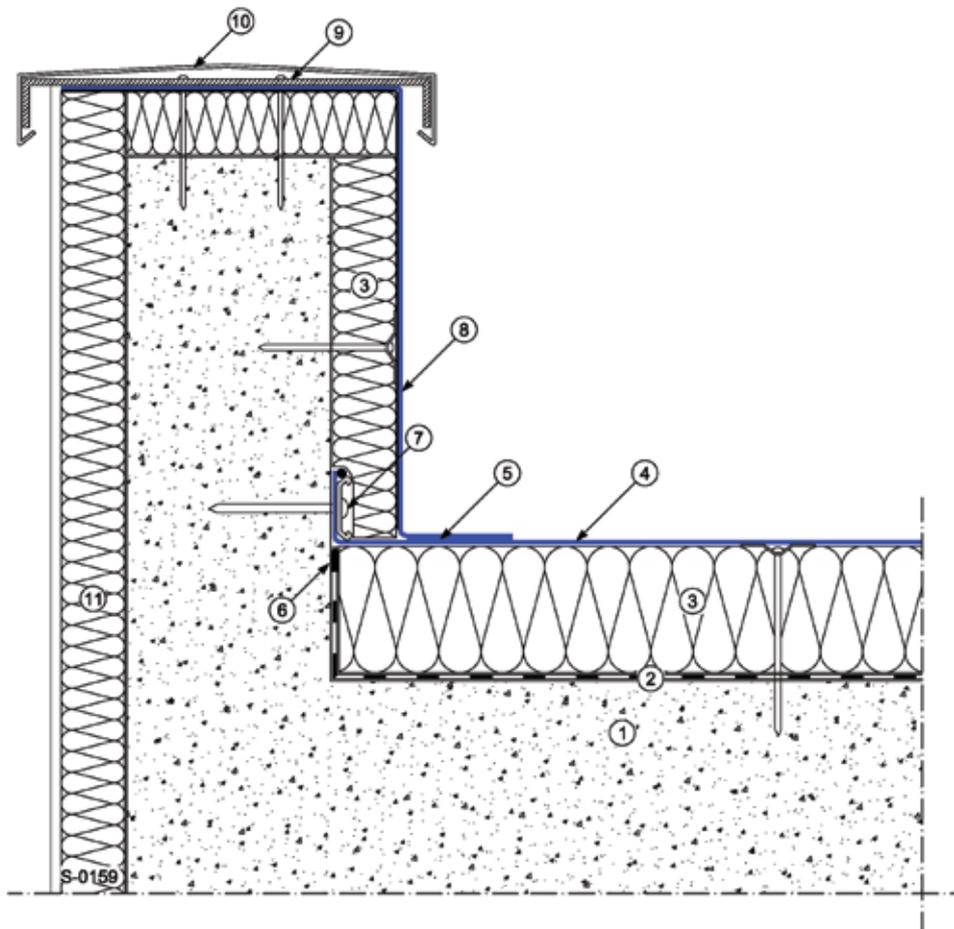
- ⑦ Spot mechanical fastening with stress plates
- ⑧ **MAPEPLAN METALBAR** mechanical fastening
- ⑨ Perimeter sealing
- ⑩ Wall
- ⑪ Flashing

Detail S-0158 - Roof parapet



- | | |
|--|--|
| ① Deck | ⑥ Perimeter sealing |
| ② Vapour barrier sealed on overlaps and on perimeters | ⑦ MAPEPLAN METALBAR mechanical fastening |
| ③ Mechanically fastened thermal insulation layer | ⑧ Fully adhered MAPEPLAN T waterproofing membrane |
| ④ Mechanically fastened MAPEPLAN T M waterproofing membrane | ⑨ MAPEPLAN T perimeter profile |
| ⑤ Welding | ⑩ Thermal insulation on façade |

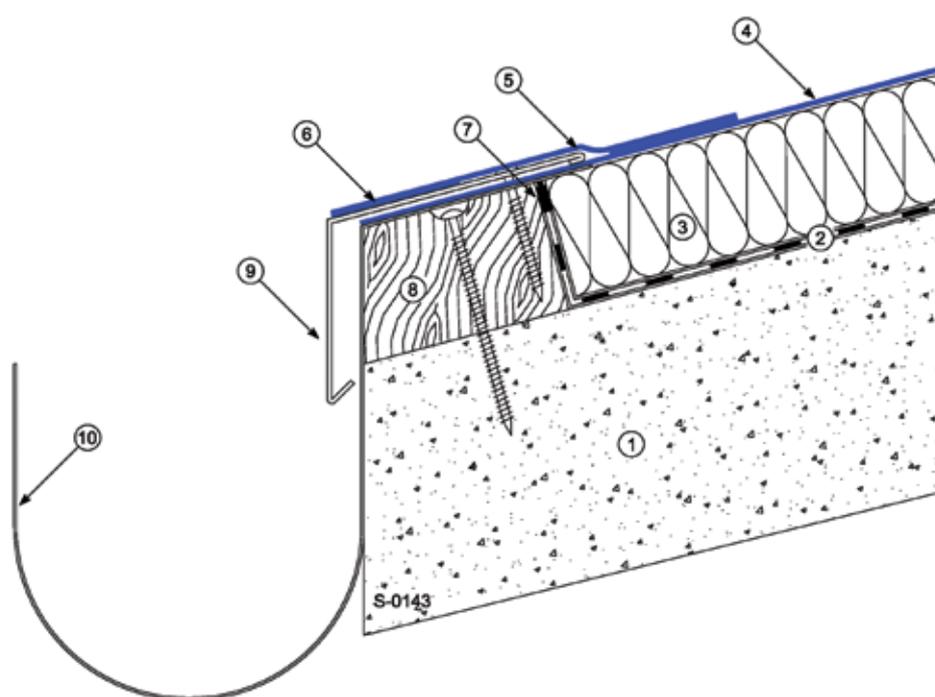
Detail S-0159 - Roof parapet



- ① Deck
- ② Vapour barrier sealed on overlaps and on perimeters (e.g. **IDROPRIMER + POLYVAP**)
- ③ Mechanically fastened thermal insulation layer
- ④ Mechanically fastened **MAPEPLAN T M** waterproofing membrane
- ⑤ Welding

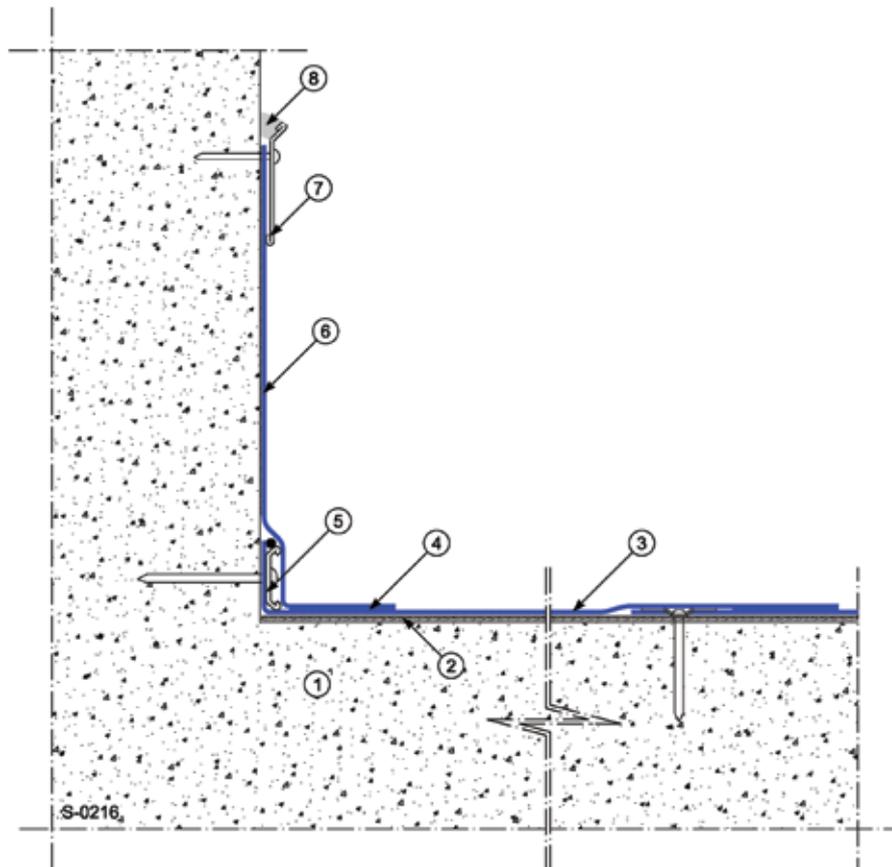
- ⑥ Perimeter sealing
- ⑦ **MAPEPLAN METALBAR** mechanical fastening
- ⑧ Fully adhered **MAPEPLAN T** waterproofing membrane
- ⑨ Anchor bracket
- ⑩ Finishing flashing
- ⑪ Thermal insulation on façade

Detail S-0143 - Roof parapet



- | | |
|---|---------------------------------------|
| ① Deck | ⑥ Welding |
| ② Vapour barrier sealed on overlaps and on perimeters (e.g. IDROPRIMER + POLYVAP) | ⑦ Perimeter sealing |
| ③ Mechanically fastened thermal insulation layer | ⑧ Wooden batten |
| ④ Mechanically fastened MAPEPLAN T M waterproofing membrane | ⑨ MAPEPLAN T perimeter profile |
| ⑤ Strip of MAPEPLAN T M membrane | ⑩ Gutter |

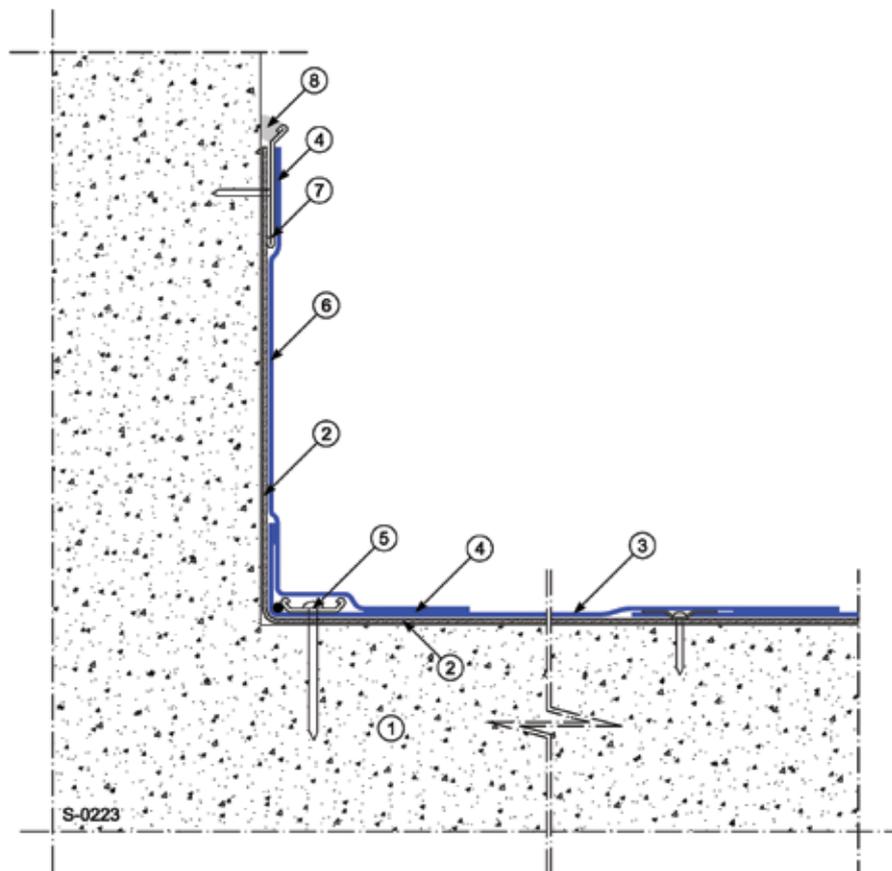
Detail S-0216 - Wall connection



- ① Deck
- ② **POLYDREN** levelling layer
- ③ Mechanically fastened **MAPEPLAN T M** waterproofing membrane
- ④ Welding

- ⑤ **MAPEPLAN METALBAR** mechanical fastening
- ⑥ Fully adhered **MAPEPLAN T** waterproofing membrane
- ⑦ **MAPEPLAN T** termination strip profile
- ⑧ Sealing with **MAPEPLAN SEALANT KIT**

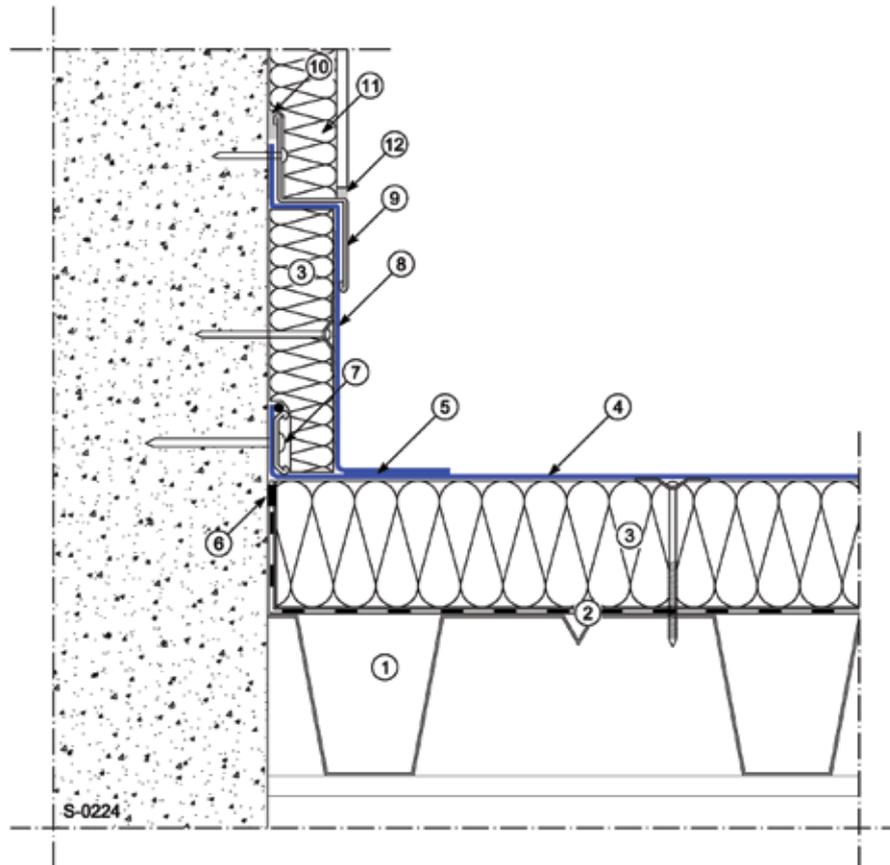
Detail S-0223 - Wall connection



- ① Deck
- ② **POLYDREN** levelling layer
- ③ Mechanically fastened **MAPEPLAN T M** waterproofing membrane
- ④ Welding

- ⑤ **MAPEPLAN METALBAR** mechanical fastening
- ⑥ Fastened **MAPEPLAN T** membrane
- ⑦ **MAPEPLAN T** termination strip profile
- ⑧ Sealing with **MAPEPLAN SEALANT KIT**

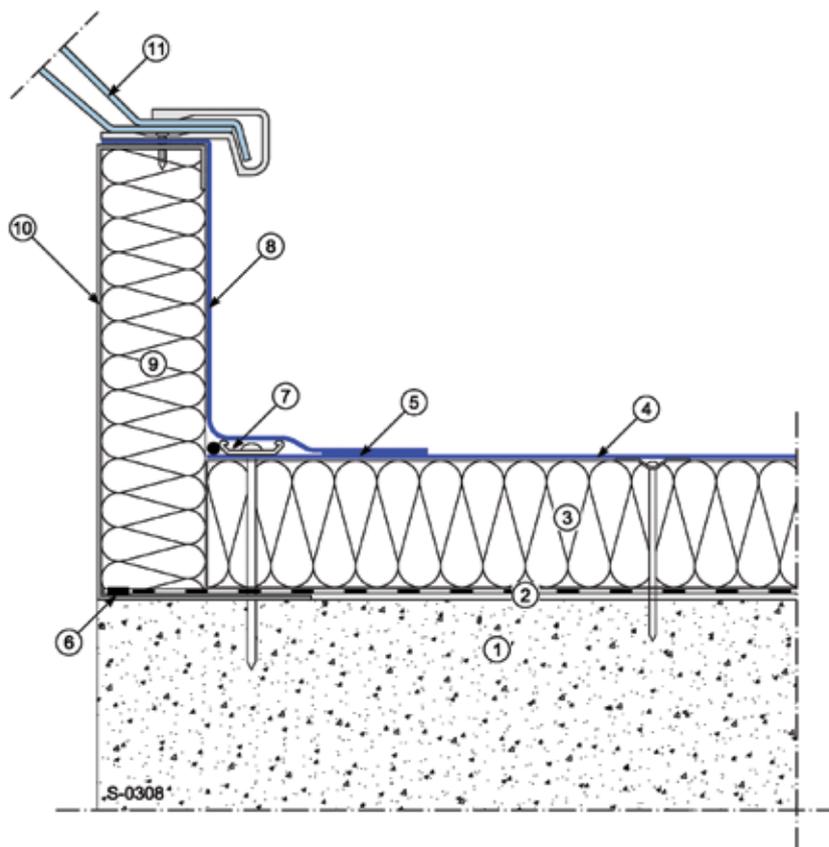
Detail S-0224 - Wall connection



- ① Deck
- ② Vapour barrier sealed on overlaps and on perimeters
- ③ Mechanically fastened thermal insulation layer
- ④ Mechanically fastened **MAPEPLAN T M** waterproofing membrane
- ⑤ Welding
- ⑥ Perimeter sealing

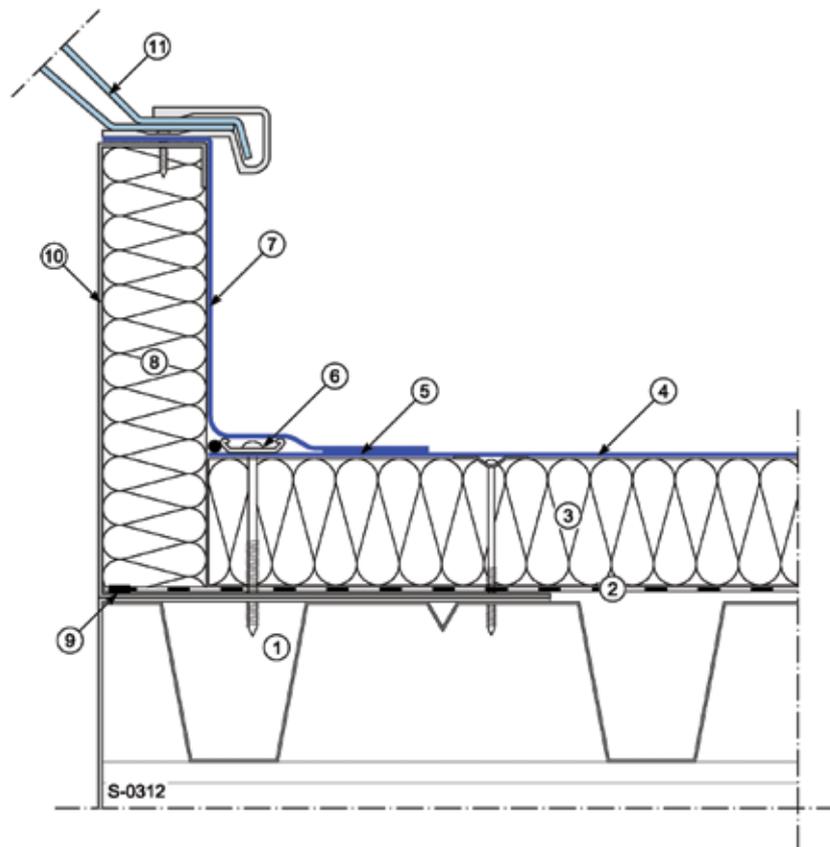
- ⑦ **MAPEPLAN METALBAR** mechanical fastening
- ⑧ Fully adhered **MAPEPLAN T** waterproofing membrane
- ⑨ Flashing
- ⑩ Sealing with **MAPEPLAN SEALANT KIT**
- ⑪ Thermal insulation on façade
- ⑫ Elastic sealing

Detail S-0308 - Skylight connection



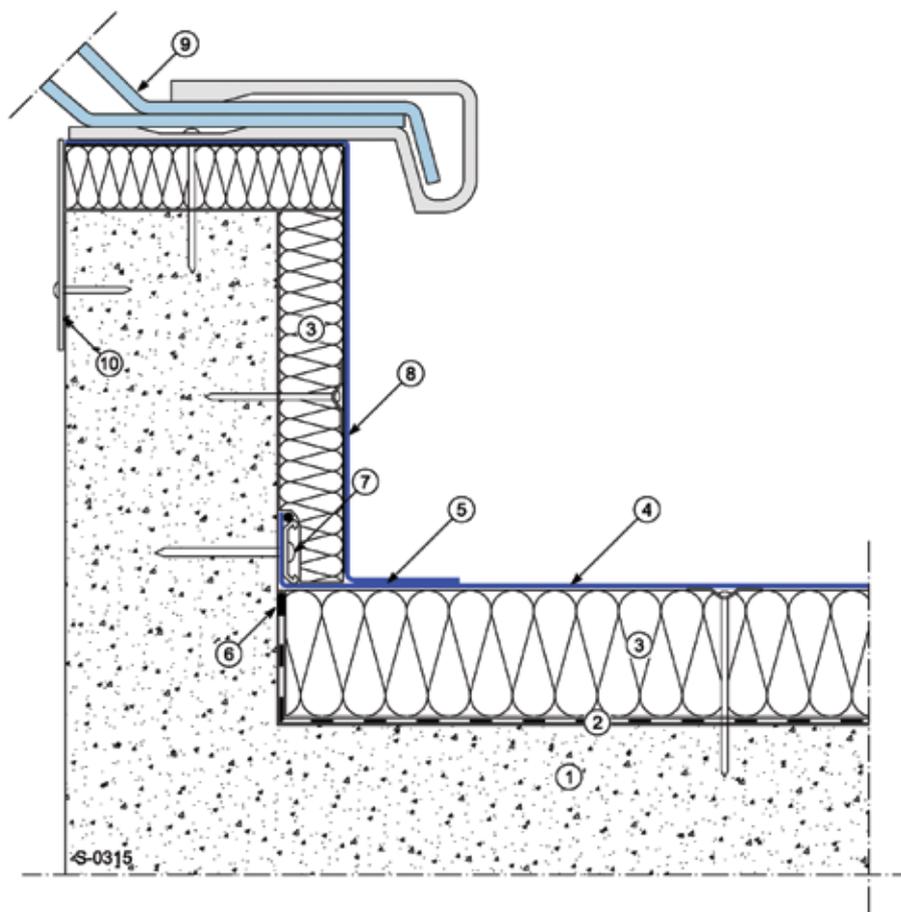
- | | |
|---|--|
| ① Deck | ⑥ Perimeter sealing |
| ② Vapour barrier sealed on overlaps and on perimeters (e.g. IDROPRIMER + POLYVAP) | ⑦ MAPEPLAN METALBAR mechanical fastening |
| ③ Mechanically fastened thermal insulation layer | ⑧ Fully adhered MAPEPLAN T waterproofing membrane |
| ④ Mechanically fastened MAPEPLAN T M waterproofing membrane | ⑨ Polyurethane panel + glass fleece |
| ⑤ Welding | ⑩ Skylight basement |
| | ⑪ Skylight |

Detail S-0312 - Skylight connection



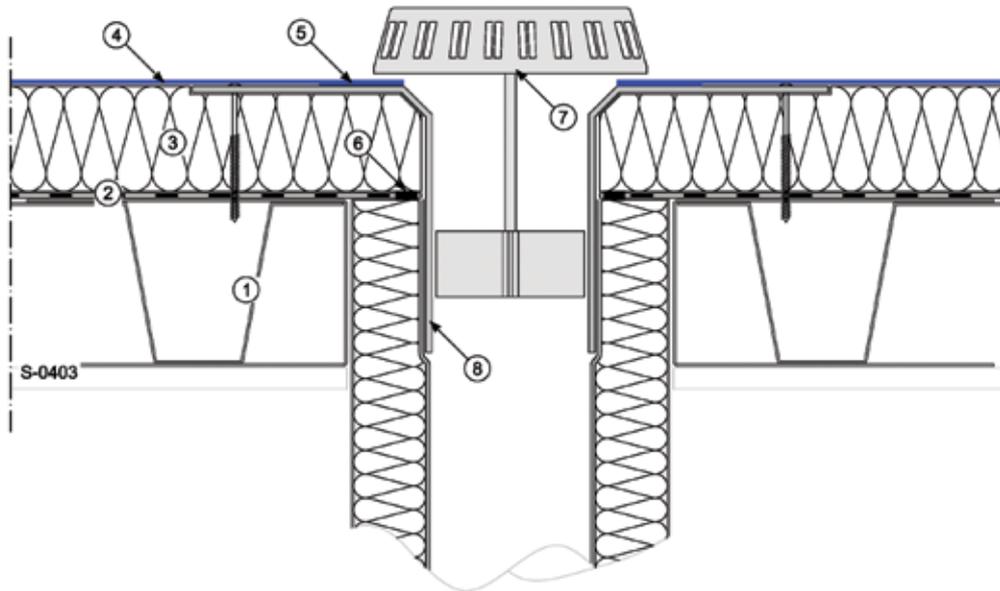
- | | |
|--|--|
| ① Deck | ⑦ Fully adhered MAPEPLAN T waterproofing membrane |
| ② Vapour barrier sealed on overlaps and on perimeters | ⑧ Polyurethane panel + glass fleece |
| ③ Mechanically fastened thermal insulation layer | ⑨ Perimeter sealing |
| ④ Mechanically fastened MAPEPLAN T M waterproofing membrane | ⑩ Skylight basement |
| ⑤ Welding | ⑪ Skylight |
| ⑥ MAPEPLAN METALBAR mechanical fastening | |

Detail S-0315 - Skylight connection



- | | |
|---|--|
| ① Deck | ⑥ Perimeter sealing |
| ② Vapour barrier sealed on overlaps and on perimeters (e.g. IDROPRIMER + POLYVAP) | ⑦ MAPEPLAN METALBAR mechanical fastening |
| ③ Mechanically fastened thermal insulation layer | ⑧ Fully adhered MAPEPLAN T waterproofing membrane |
| ④ Mechanically fastened MAPEPLAN T M waterproofing membrane | ⑨ Skylight |
| ⑤ Welding | ⑩ Closure and/or finishing profile, if necessary |

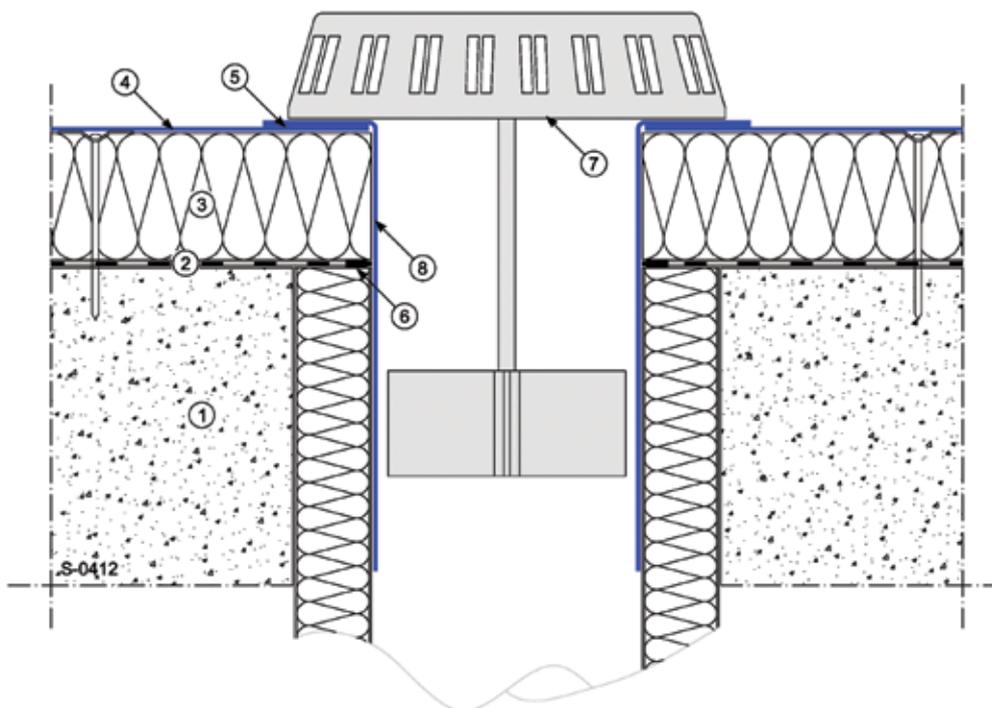
Detail S-0403 - Roof drain



- ① Deck
- ② Vapour barrier sealed on overlaps and on perimeters
- ③ Mechanically fastened thermal insulation layer
- ④ Mechanically fastened **MAPEPLAN T M** waterproofing membrane

- ⑤ Welding
- ⑥ Perimeter sealing
- ⑦ Leaf/gravel guard
- ⑧ Drain outlet

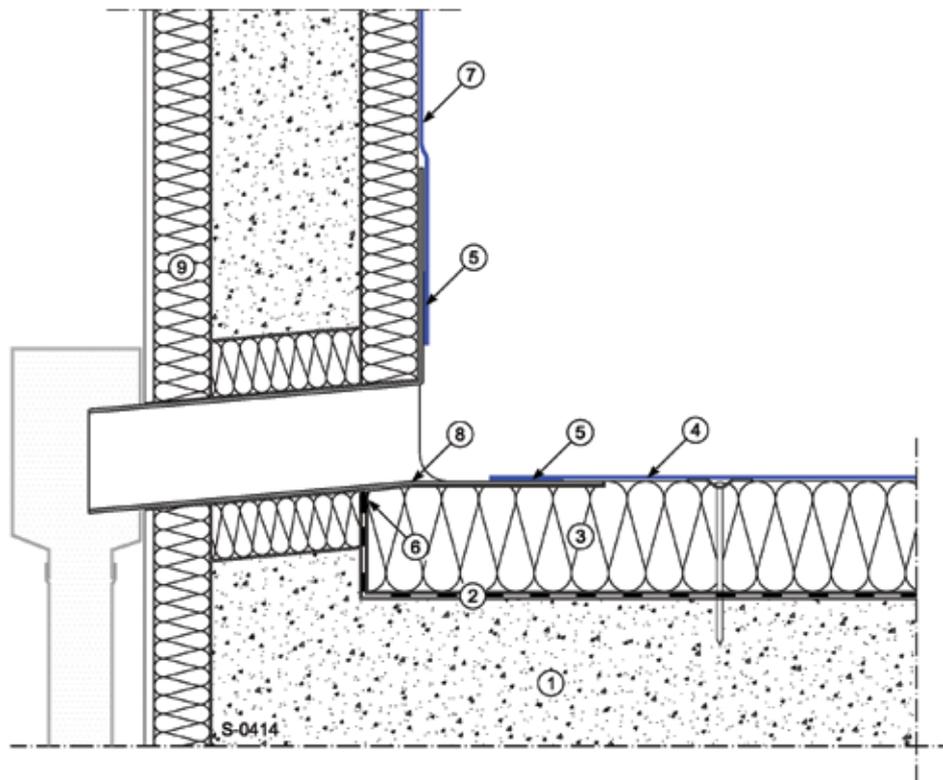
Detail S-0412 - Roof drain



- ① Deck
- ② Vapour barrier sealed on overlaps and on perimeters (e.g. **IDROPRIMER + POLYVAP**)
- ③ Mechanically fastened thermal insulation layer
- ④ Mechanically fastened **MAPEPLAN T M** waterproofing membrane

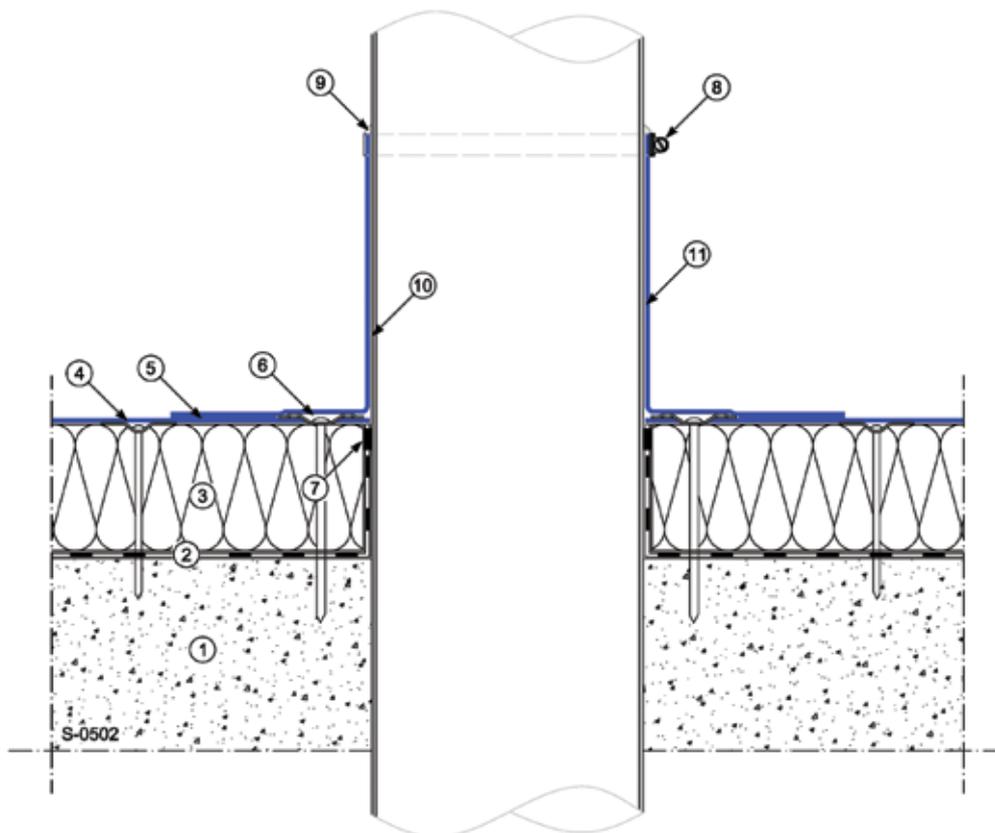
- ⑤ Welding
- ⑥ Perimeter sealing
- ⑦ Leaf/gravel guard
- ⑧ Drain outlet

Detail S-0414 - Roof drain



- | | |
|--|--|
| ① Deck | ⑤ Welding |
| ② Vapour barrier sealed on overlaps and on perimeters
(e.g. IDROPRIMER + POLYVAP) | ⑥ Perimeter sealing |
| ③ Mechanically fastened thermal insulation layer | ⑦ Fully adhered MAPEPLAN T waterproofing membrane |
| ④ Mechanically fastened MAPEPLAN T M waterproofing membrane | ⑧ Scupper outlet |
| | ⑨ Thermal insulation on façade |

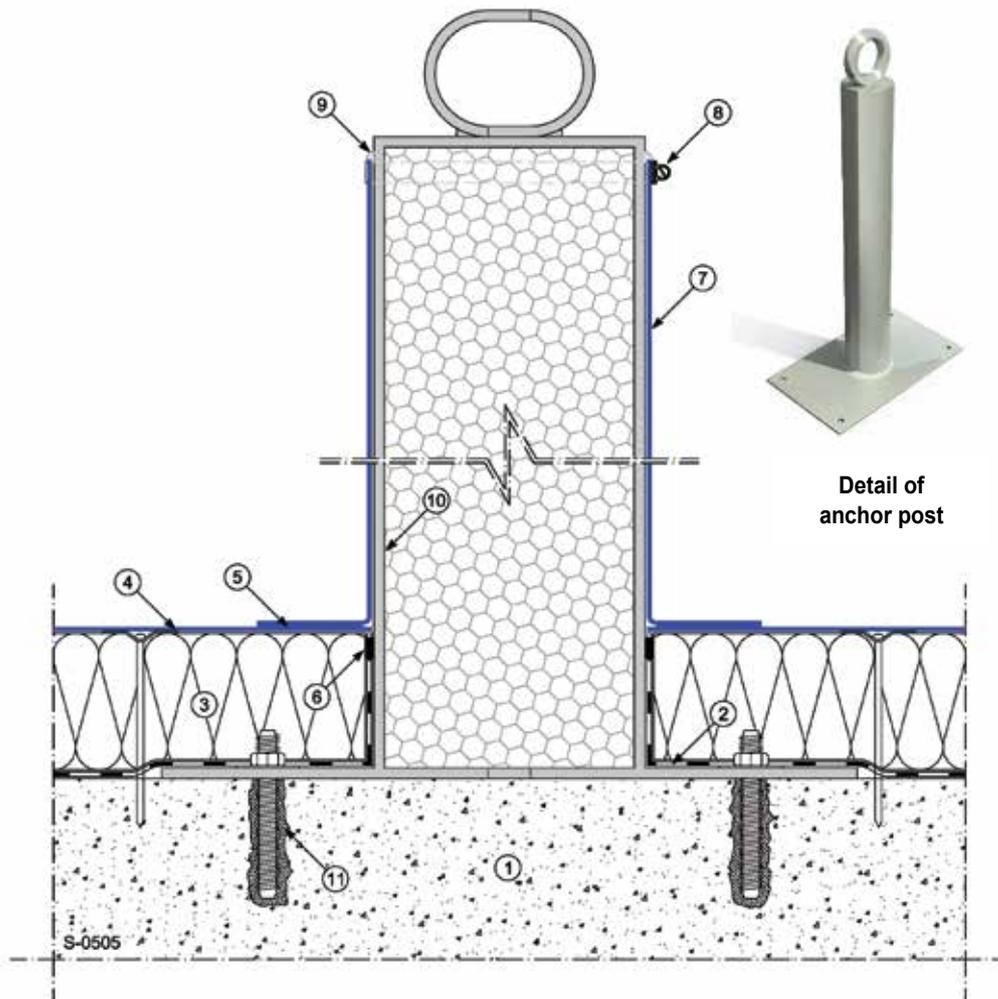
Detail S-0502 - Pipe penetration



- ① Deck
- ② Vapour barrier sealed on overlaps and on perimeters (e.g. **IDROPRIMER + POLYVAP**)
- ③ Mechanically fastened thermal insulation layer
- ④ Mechanically fastened **MAPEPLAN T M** waterproofing membrane
- ⑤ Welding

- ⑥ Mechanical fastening with plates
- ⑦ Perimeter sealing
- ⑧ Stainless steel clamp
- ⑨ Sealing with **MAPEPLAN SEALANT KIT**
- ⑩ Pipe
- ⑪ **MAPEPLAN T** collar

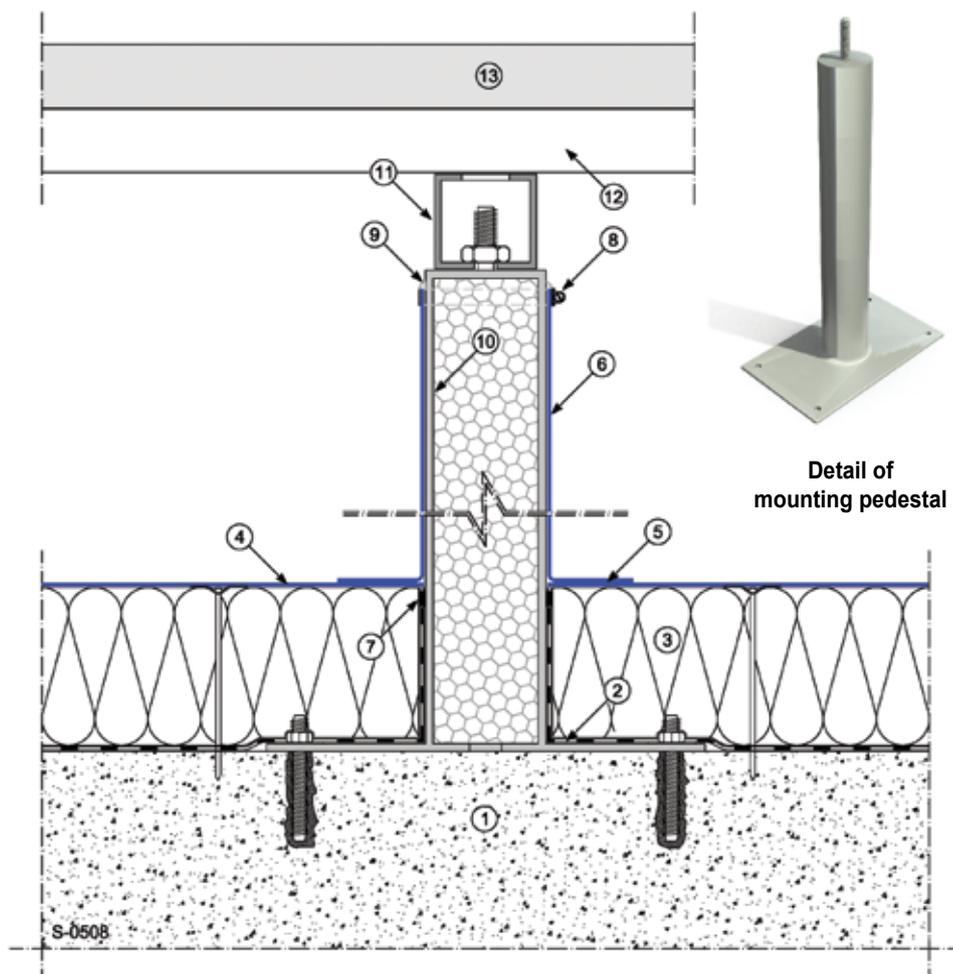
Detail S-0505 - Fall arrest anchor fastening



- ① Deck
- ② Vapour barrier sealed on overlaps and on perimeters (e.g. **IDROPRIMER + POLYVAP**)
- ③ Mechanically fastened thermal insulation layer
- ④ Mechanically fastened **MAPEPLAN T M** waterproofing membrane
- ⑤ Welding

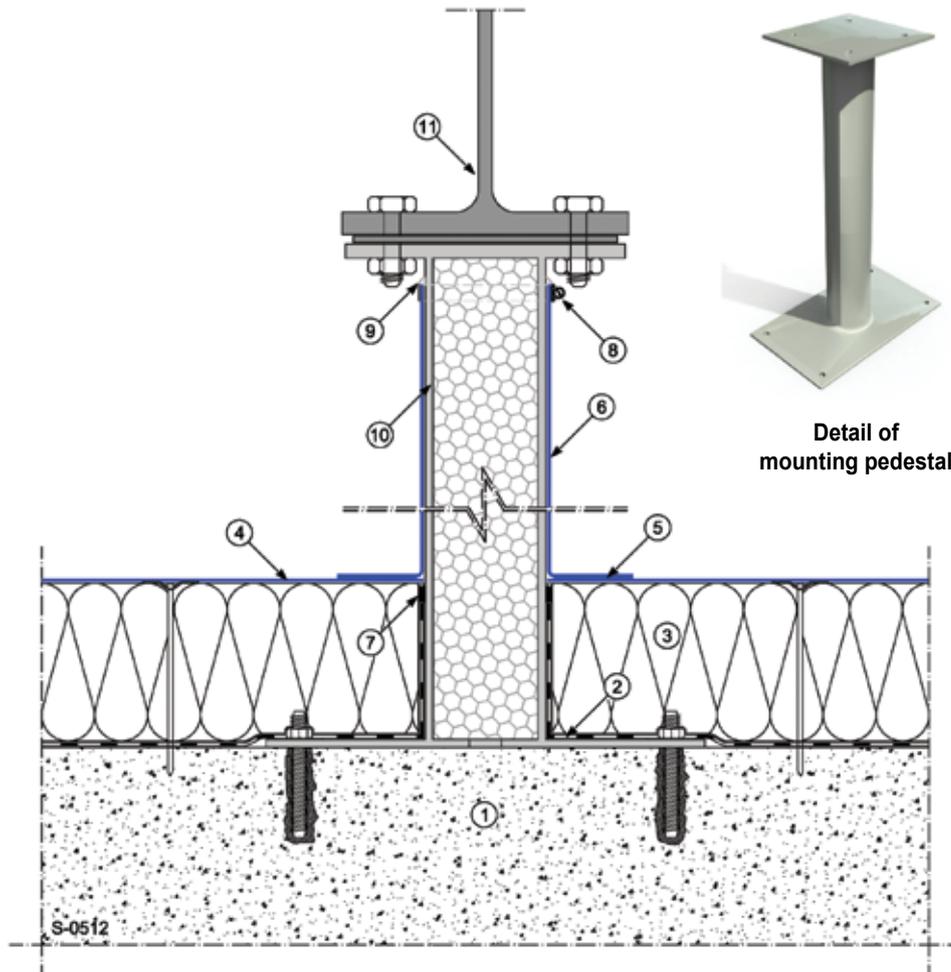
- ⑥ Perimeter sealing
- ⑦ **MAPEPLAN T** collar
- ⑧ Stainless steel clamp
- ⑨ Sealing with **MAPEPLAN SEALANT KIT**
- ⑩ Fall arrest anchor post
- ⑪ Fall arrest anchor fastening

Detail S-0508 - Photovoltaic panel fastening



- | | |
|---|--|
| ① Deck | ⑦ Perimeter sealing |
| ② Vapour barrier sealed on overlaps and on perimeters (e.g. IDROPRIMER + POLYVAP) | ⑧ Stainless steel clamp |
| ③ Mechanically fastened thermal insulation layer | ⑨ Sealing with MAPEPLAN SEALANT KIT |
| ④ Mechanically fastened MAPEPLAN T M waterproofing membrane | ⑩ Mounting pedestal |
| ⑤ Welding | ⑪ Load-bearing tubular attachment |
| ⑥ MAPEPLAN T collar | ⑫ Photovoltaic module mounting profile |
| | ⑬ Photovoltaic module |

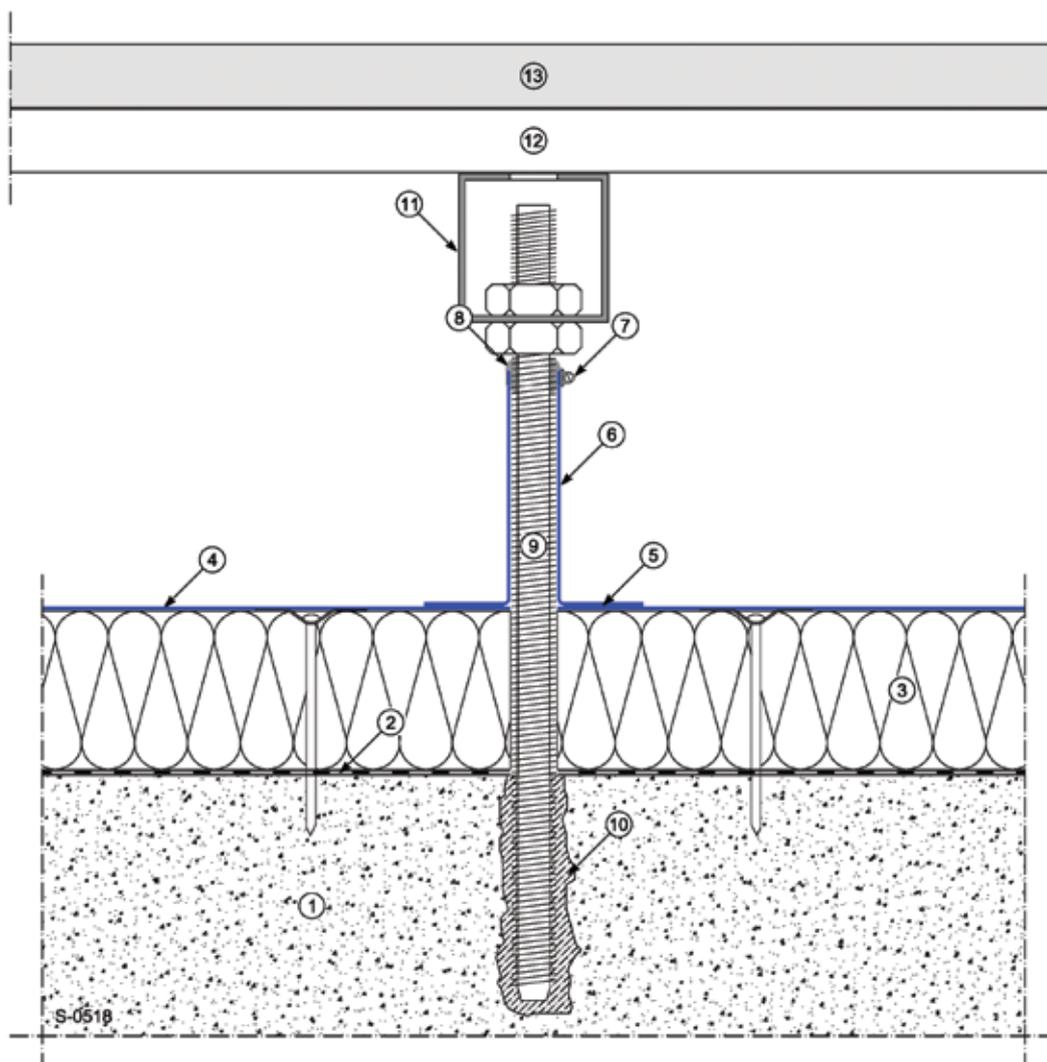
Detail S-0512 - Services fastening



- ① Deck
- ② Vapour barrier sealed on overlaps and on perimeters (e.g. **IDROPRIMER + POLYVAP**)
- ③ Mechanically fastened thermal insulation layer
- ④ Mechanically fastened **MAPEPLAN T M** waterproofing membrane
- ⑤ Welding

- ⑥ **MAPEPLAN T** collar
- ⑦ Perimeter sealing
- ⑧ Stainless steel clamp
- ⑨ Sealing with **MAPEPLAN SEALANT KIT**
- ⑩ Mounting pedestal
- ⑪ Services mounting profile

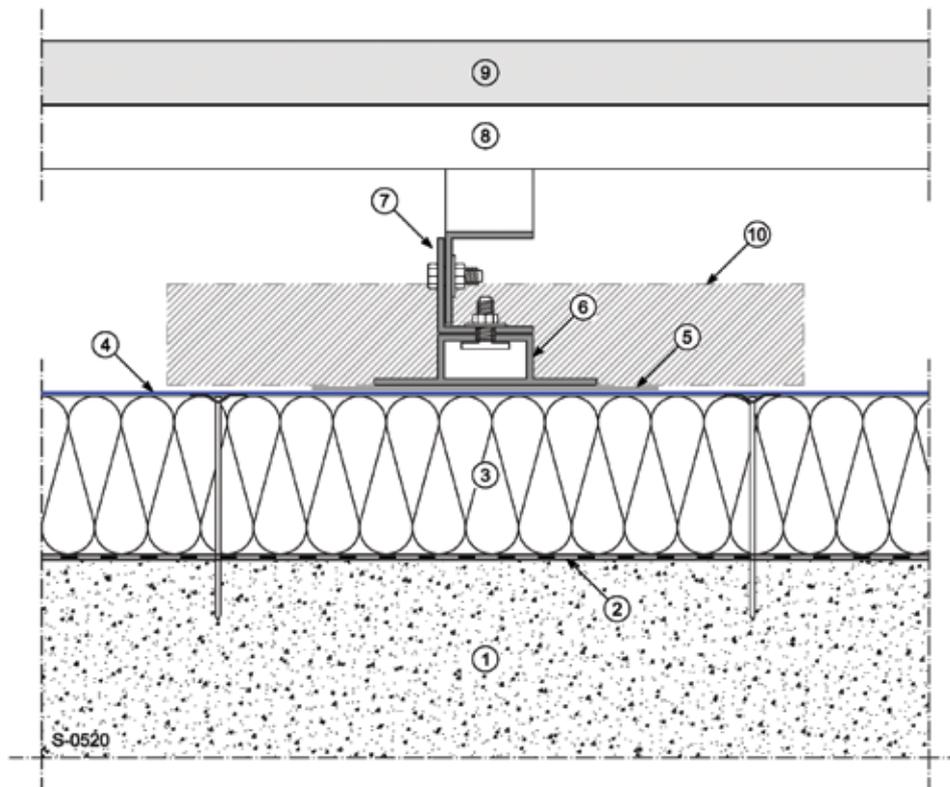
Detail S-0518 - Photovoltaic panel fastening



- ① Deck
- ② Vapour barrier layer sealed around outside edges and at overlaps (e.g. **IDROPRIMER + POLYVAP**)
- ③ Mechanically fastened thermal insulation layer
- ④ Mechanically fastened **MAPEPLAN T M** waterproofing membrane
- ⑤ Welding
- ⑥ **MAPEPLAN T** collar

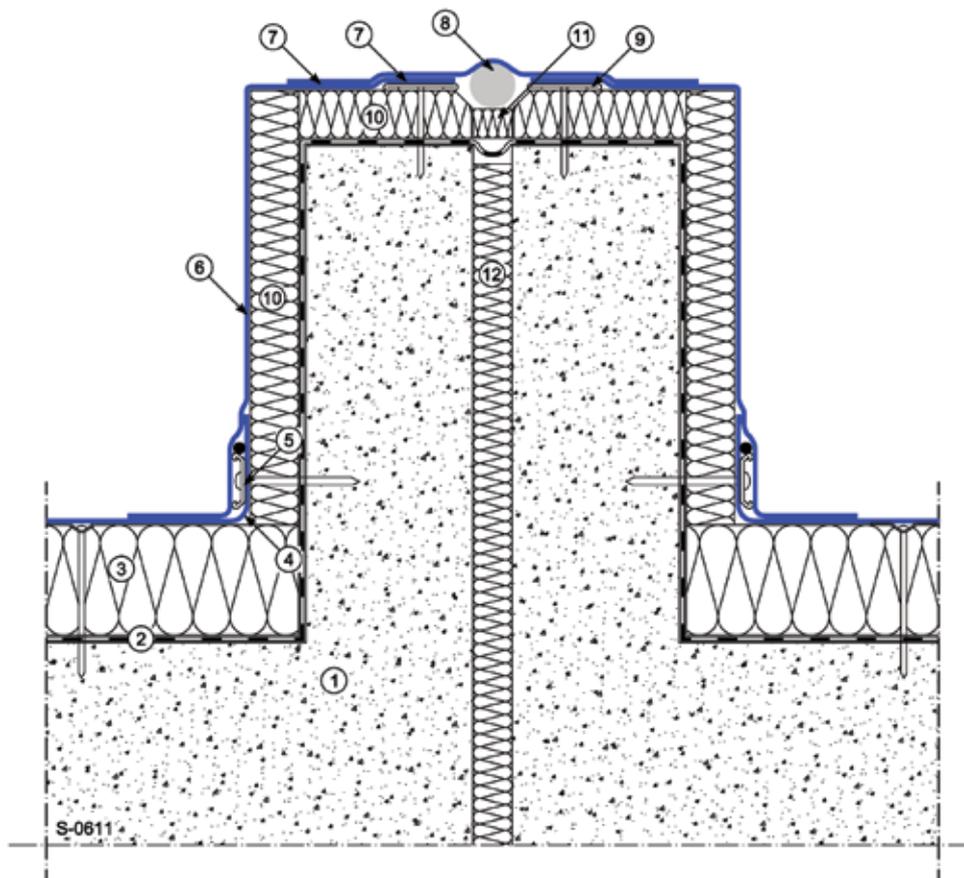
- ⑦ Stainless steel clamp
- ⑧ Sealing with **MAPEPLAN SEALANT KIT**
- ⑨ Stainless steel threaded bar
- ⑩ Chemical anchor
- ⑪ Load-bearing tubular attachment
- ⑫ Photovoltaic module mounting profile
- ⑬ Photovoltaic module

Detail S-0520 - Photovoltaic panel fastening



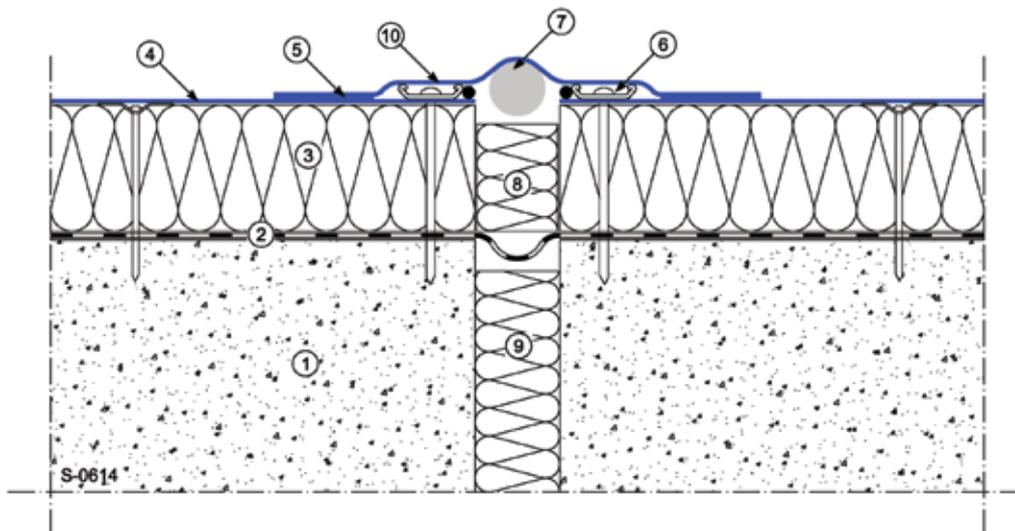
- | | |
|--|---|
| ① Deck | ⑥ Aluminium guide profile |
| ② Vapour barrier layer sealed around outside edges and at overlaps (e.g. IDROPRIMER + POLYVAP) | ⑦ Photovoltaic module load-bearing framework profiles |
| ③ Mechanically fastened thermal insulation layer | ⑧ Photovoltaic module mounting profile |
| ④ Mechanically fastened MAPEPLAN T M waterproofing membrane | ⑨ Photovoltaic module |
| ⑤ MAPEPLAN T protective membrane | ⑩ Ballast plate |

Detail S-0611 - Expansion joint



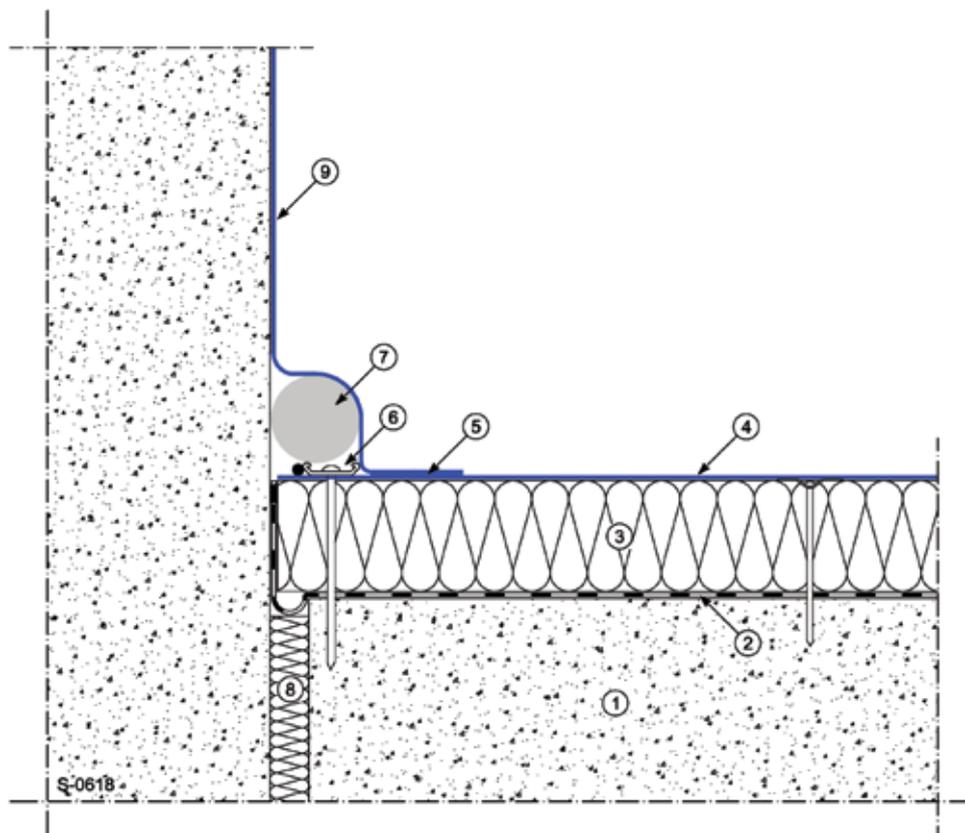
- | | |
|---|--|
| ① Deck | ⑦ Welding |
| ② Vapour barrier sealed on overlaps and on perimeters (e.g. IDROPRIMER + POLYVAP) | ⑧ Expanded PE nosing |
| ③ Mechanically fastened thermal insulation layer | ⑨ MAPEPLAN T strip profile |
| ④ Mechanically fastened MAPEPLAN T M waterproofing membrane | ⑩ Fastened or glued thermal insulation layer |
| ⑤ MAPEPLAN METALBAR mechanical fastening | ⑪ Rock wool insulation |
| ⑥ Fastened MAPEPLAN T membrane | ⑫ Insulation |

Detail S-0614 - Expansion joint



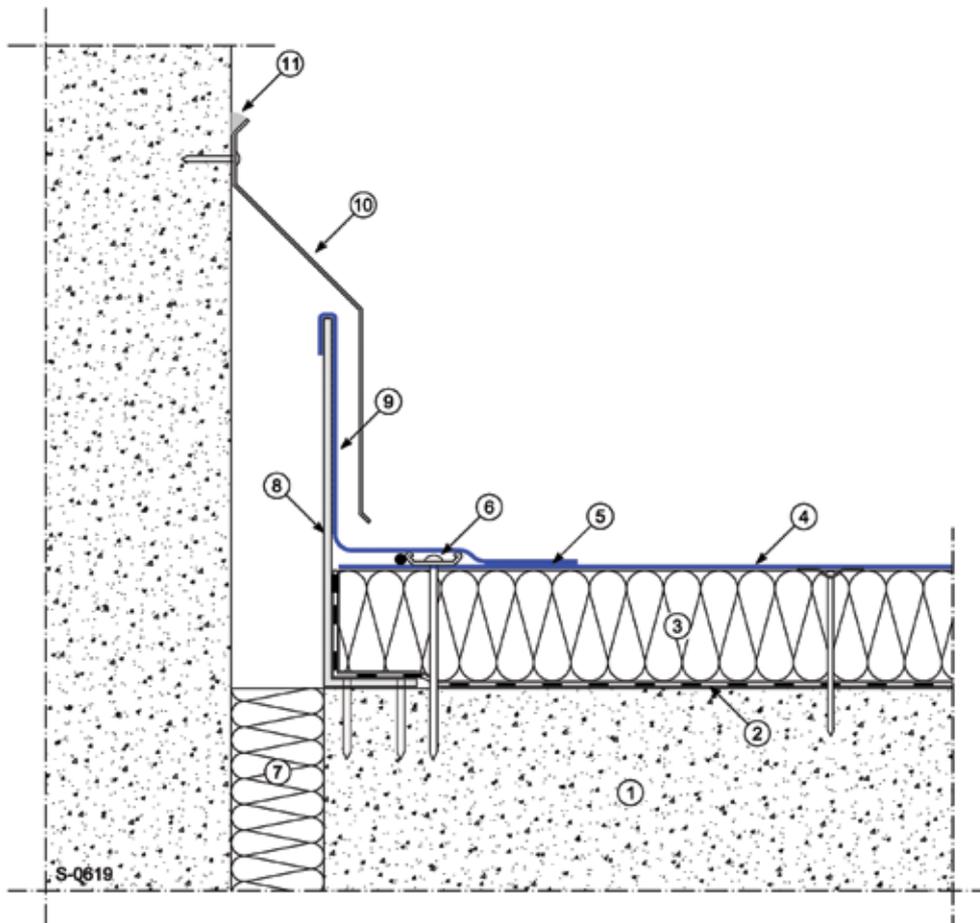
- | | |
|---|---|
| ① Deck | ⑥ MAPEPLAN METALBAR mechanical fastening |
| ② Vapour barrier sealed on overlaps and on perimeters (e.g. IDROPRIMER + POLYVAP) | ⑦ Expanded PE nosing |
| ③ Mechanically fastened thermal insulation layer | ⑧ Rock wool insulation |
| ④ Mechanically fastened MAPEPLAN T M waterproofing membrane | ⑨ Insulation |
| ⑤ Welding | ⑩ Strip of MAPEPLAN T M membrane |

Detail S-0618 - Expansion joint



- | | |
|---|--|
| ① Deck | ⑤ Welding |
| ② Vapour barrier sealed on overlaps and on perimeters (e.g. IDROPRIMER + POLYVAP) | ⑥ MAPEPLAN METALBAR mechanical fastening |
| ③ Mechanically fastened thermal insulation layer | ⑦ Expanded PE nosing |
| ④ Mechanically fastened MAPEPLAN T M waterproofing membrane | ⑧ Insulation |
| | ⑨ Fully adhered MAPEPLAN T waterproofing membrane |

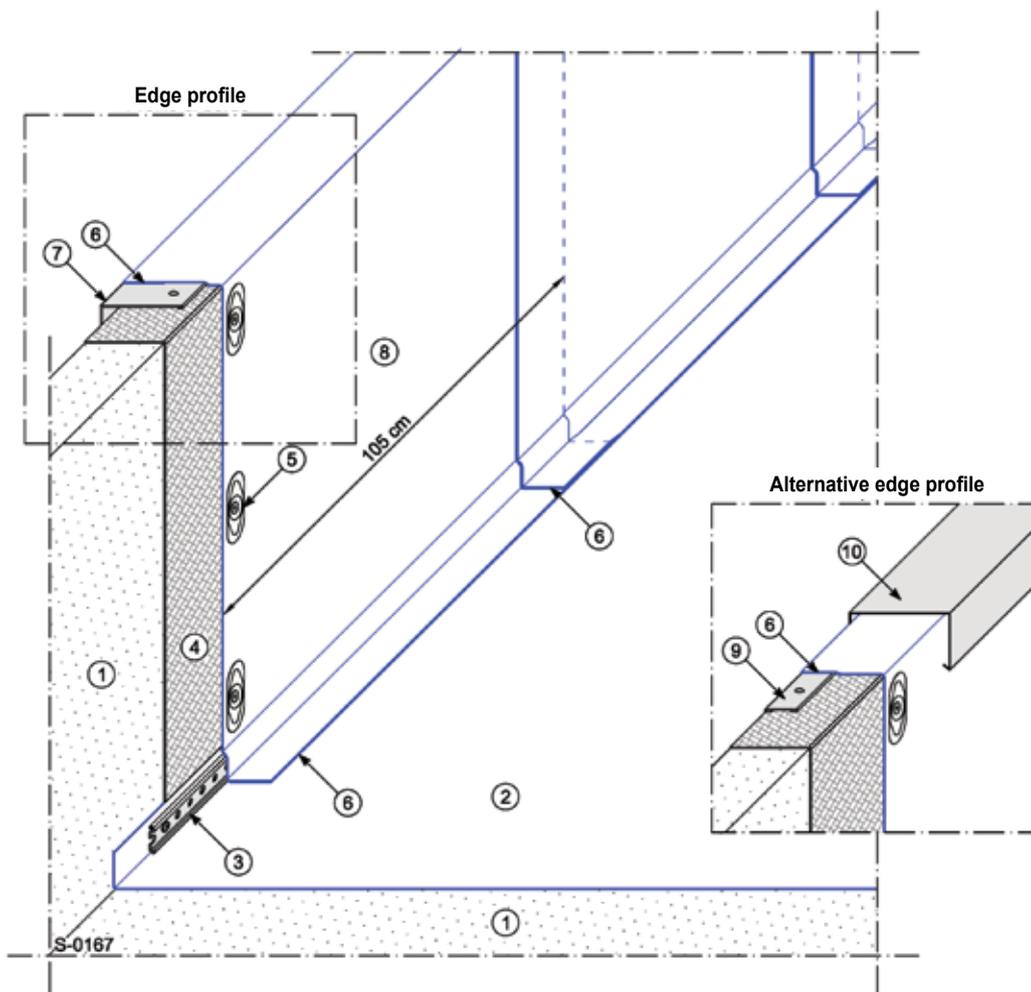
Detail S-0619 - Expansion joint



- ① Deck
- ② Vapour barrier sealed on overlaps and on perimeters (e.g. **IDROPRIMER + POLYVAP**)
- ③ Mechanically fastened thermal insulation layer
- ④ Mechanically fastened **MAPEPLAN T M** waterproofing membrane
- ⑤ Welding

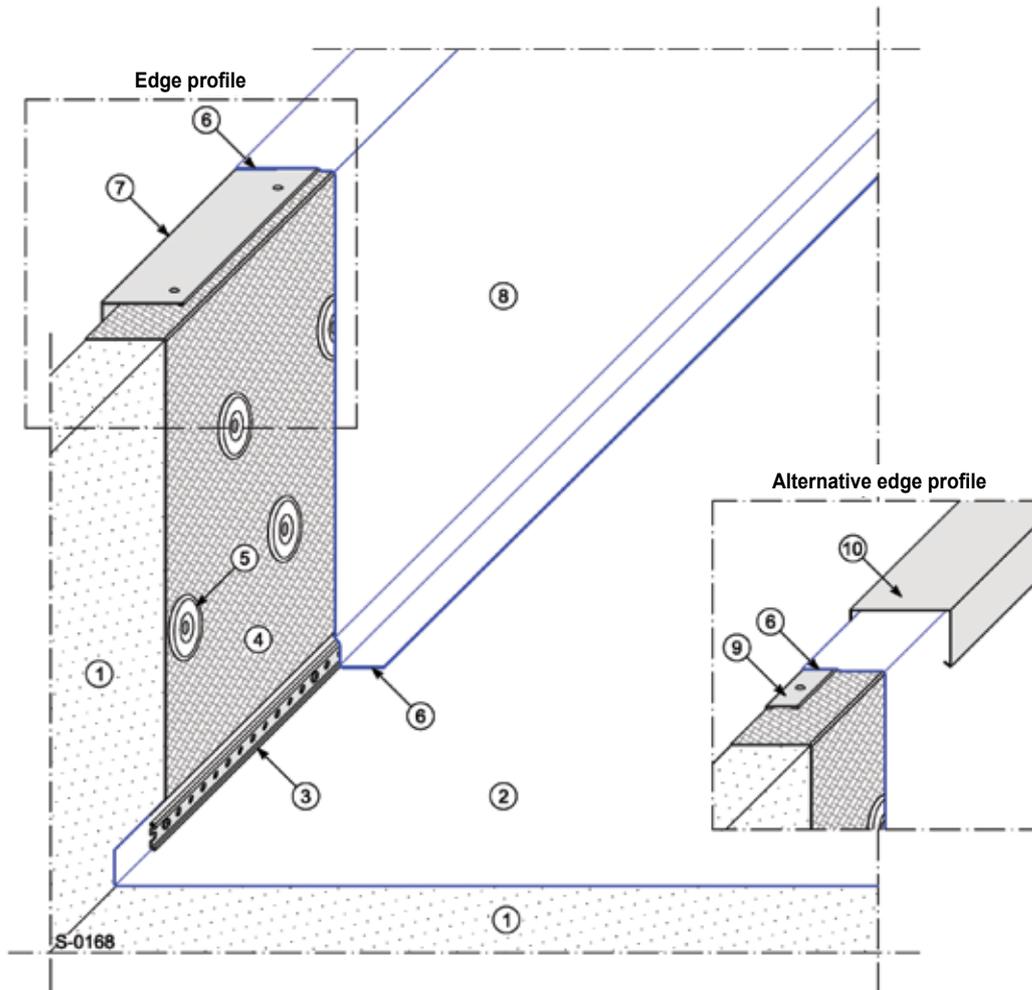
- ⑥ **MAPEPLAN METALBAR** mechanical fastening
- ⑦ Insulation
- ⑧ Press-formed metal sheet supporting
- ⑨ Fully adhered **MAPEPLAN T** waterproofing membrane
- ⑩ Finishing flashing
- ⑪ Sealing with **MAPEPLAN SEALANT KIT**

Detail S-0167 - Vertical upstand with spot fastening



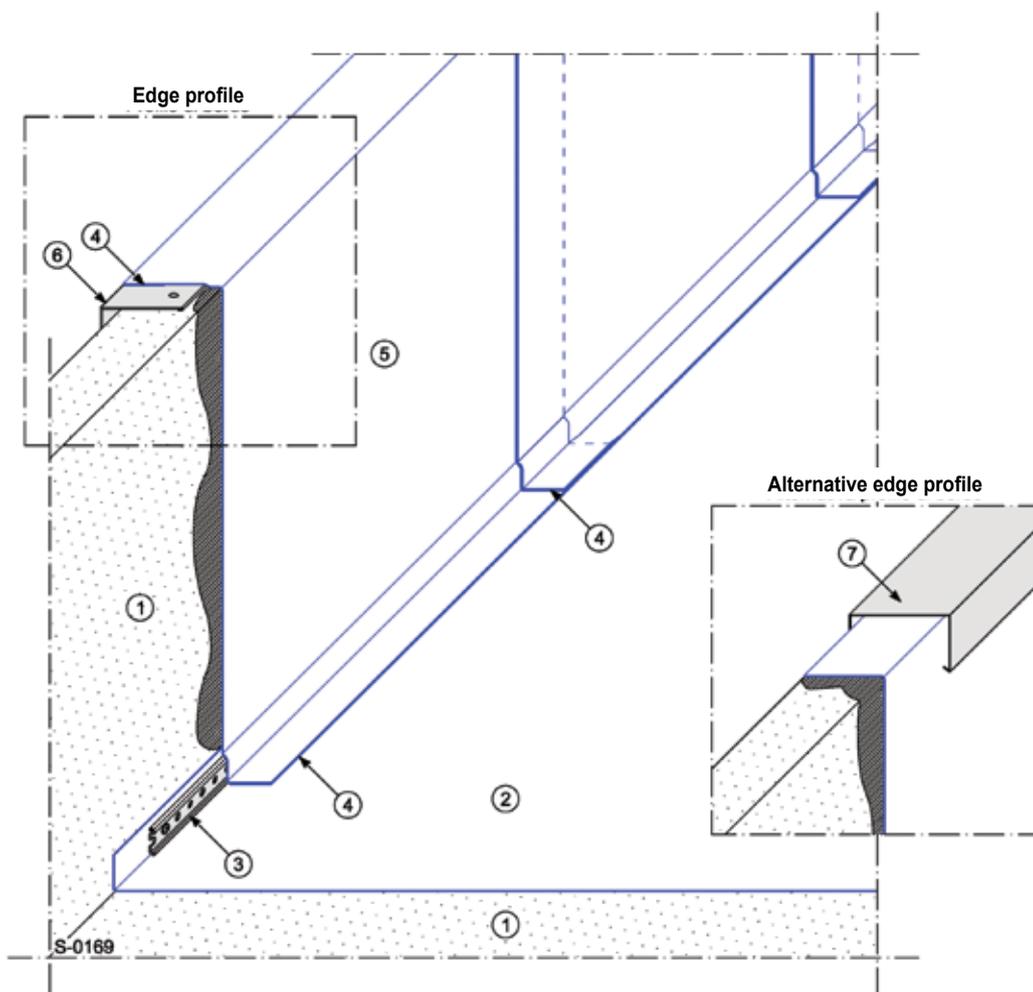
- | | |
|--|--|
| ① Substrate | ⑥ Welding |
| ② Mechanically fastened MAPEPLAN T M waterproofing membrane | ⑦ MAPEPLAN T perimeter profile |
| ③ Mechanical fastening MAPEPLAN METALBAR + MAPEPLAN T CORD | ⑧ Mechanically fastened MAPEPLAN T waterproofing membrane |
| ④ POLYDREN levelling layer (if necessary) | ⑨ Strip profile MAPEPLAN T |
| ⑤ Stress plate for spot fastening | ⑩ Finishing flashing |

Detail S-0168 - Vertical upstand with induction fastening



- | | |
|--|--|
| ① Substrate | ⑥ Welding |
| ② Mechanically fastened MAPEPLAN T M waterproofing membrane | ⑦ MAPEPLAN T perimeter profile |
| ③ Mechanical fastening MAPEPLAN METALBAR + MAPEPLAN T CORD | ⑧ Mechanically fastened MAPEPLAN T waterproofing membrane |
| ④ POLYDREN levelling layer (if necessary) | ⑨ Strip profile MAPEPLAN T |
| ⑤ Stress plate for induction welding fastening | ⑩ Finishing flashing |

Detail S-0169 - Fully adhered vertical upstand



- ① Substrate
- ② Mechanically fastened **MAPEPLAN T M** waterproofing membrane
- ③ Mechanical fastening **MAPEPLAN METALBAR + MAPEPLAN T CORD**

- ④ Welding
- ⑤ Fully adhered **MAPEPLAN T** waterproofing membrane
- ⑥ **MAPEPLAN T** perimeter profile
- ⑦ Finishing flashing

RELATED TECHNICAL DOCUMENTS

The technical literature mentioned below can be accessed via the website www.polyglass.com

Use, inspection and maintenance SYNTHETIC WATERPROOFING MEMBRANES MAPEPLAN T FPO/TPO

This document contains more in-depth technical information on the use, inspection and maintenance of MAPEPLAN T waterproofing membranes.

MAPEPLAN T FPO/TPO installation manual

This document contains correct, detailed instructions on installing and laying MAPEPLAN T waterproofing membranes.

Technical Book for Waterproofing Systems for GREEN ROOFS Mapeplan TB

This document provides technical, design and construction information and solutions for the correct installation of green roof waterproofing and thermal insulation systems, with the use of MAPEPLAN T B flexible polyolefin (FPO/TPO) synthetic waterproofing membranes.

Technical Book

SINGLE PLY WATERPROOFING SYSTEMS FOR MECHANICALLY FASTENED ROOFS

MAPEPLAN T M

In line with our policy of continuous product development,
we reserve the right to make any required changes without prior notice.



Products from the MAPEPLAN line are manufactured by



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