SIG DESIGN & TECHNOLOGY

Roofing Membrane System Rhenofol®

Technical Manual Edition 2007

Imprint

Roofing membrane system Rhenofol
Technical manual

Edition 2007

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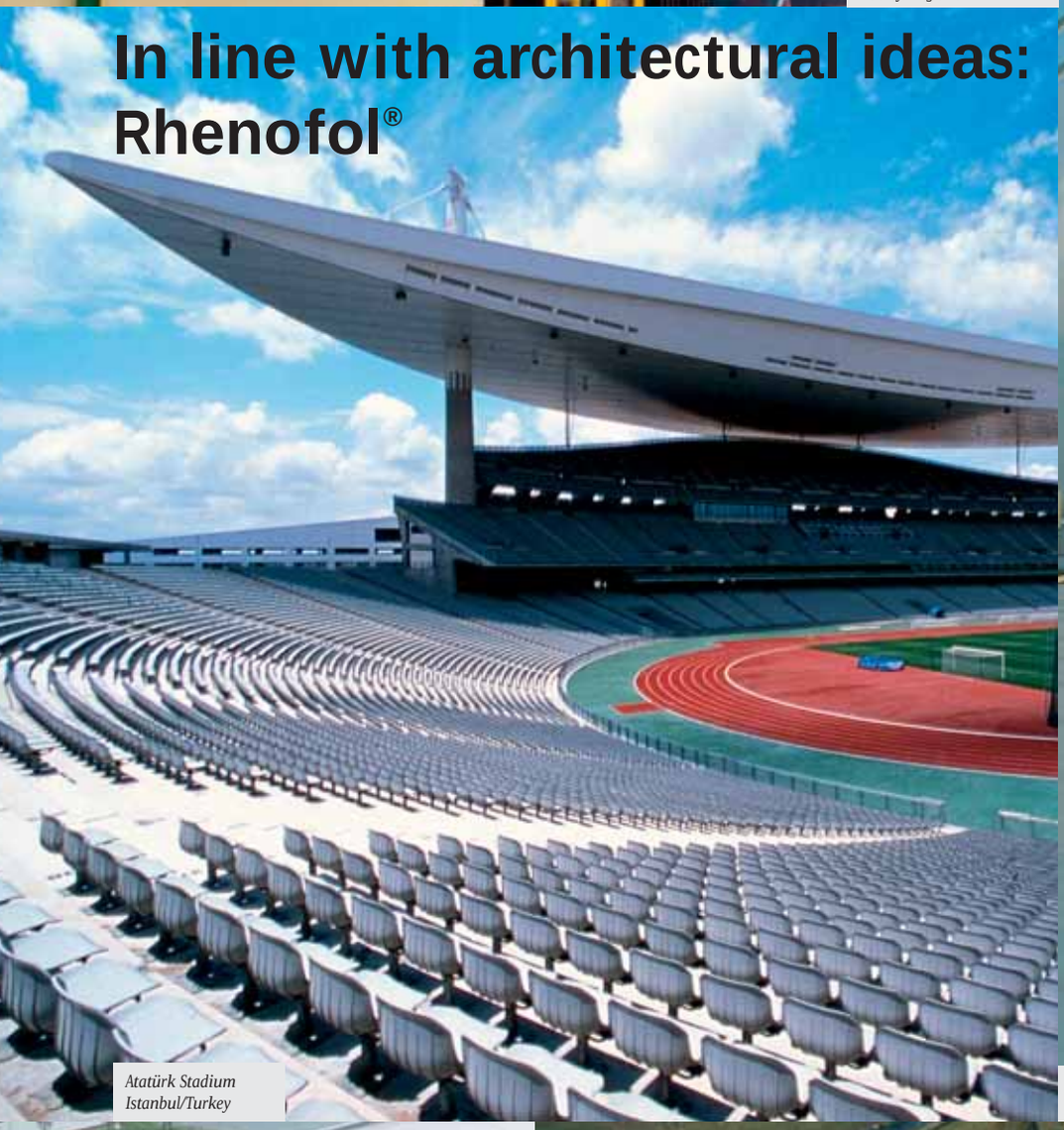
This manual corresponds with the FDT manufacturer application instructions for designers and applicators in the Federal Republic of Germany.
It cannot, however, replace professional knowledge.
Every user is obliged to keep his knowledge up to date!

Valid from October 2007.

Contents

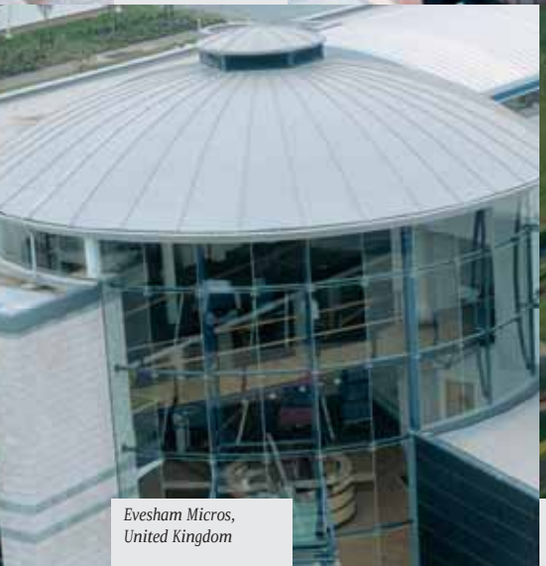
Ravenhurst School, Hadley/England

In line with architectural ideas: Rhenofol®



Atatürk Stadium Istanbul/Turkey

Stade de France Paris/France



Evesham Micros, United Kingdom

Housing Estate Maasbommel/Holland

Rhenofol® – advantages

Central warehouse of the REWE AG in Stelle, securely waterproofed with Rhenofol.

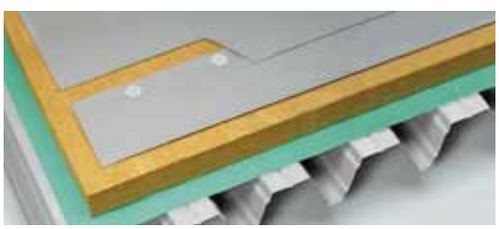
The roofing membrane with widespread advantages

- Particularly efficient and economic application
- Resistant to UV radiation and weathering
- Proven long-term durability all over the world
- Especially designed for the demands of new industrial buildings
- Single-ply with reliable sealing of seams
- Applied without naked flame
- Completely recyclable

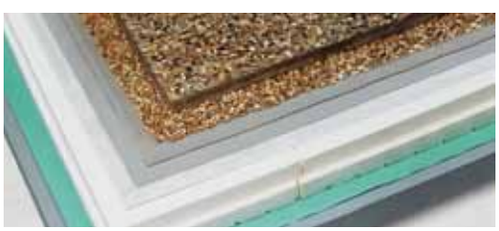
Tailor-made solutions

Depending on the specific requirements of the project the specific roof structure, and the various methods for ensuring secure installation, the roofing membrane system Rhenofol always provides the optimum possible solution.

- For mechanically fastened roof build-ups without ballast:
  Rhenofol CV, the roofing membrane with polyester fibre reinforcement.



- For loose laid roof build-ups with ballast (gravel, paving slabs and vegetation):
  Rhenofol CG, the roofing membrane with glass fleece reinforcement.



- Roof Gardens with **Rhenofol CG** have been tested in a four-year-test (FLL testing) for resistance to root penetration. Thus, the roofing membrane Rhenofol CG has a double function:
  waterproofing and protection against root and rhizome penetration.

Rhenofol® – advantages

Proven quality

The application of Rhenofol not only offers the immediate benefit of fast and efficient installation. The quality is both regularly tested by a schedule of in-house material controls and also neutral and independent institutes carry out tests of our roofing membranes when newly laid. Furthermore, the State Material Testing Institute in Darmstadt, Germany, regularly confirms that even after several years of weather exposure, Rhenofol still shows product qualities that surpass the requirements for synthetic roofing membranes as they leave the production line.

Examples

Testing the roof in an industrial environment. Rhenofol CV 1.2 mm, mechanically fastened, **no leaks** even after decades.

Warehouse and assembly halls of Pfalzmöbel Büroeinrichtungsfabrik GmbH in Bad Schönborn.
Rhenofol CV 1.2 mm, mechanically fastened, **unimpaired performance** after twenty years.

Rhenofol® – advantages PVC and the environment

The raw materials for PVC powder production: petroleum and mineral salt.

Rhenofol is a roofing membrane made of non-rigid polyvinyl chloride (PVC-P), because PVC has many advantages:

- versatile
- post forming
- flexible
- durable
- economical
- weather-proof
- robust
- maintenance-free
- recyclable

PVC stands up even to critical questions:

Production

The basic ingredients for the production of PVC powder are mineral salt (57 %) and petroleum (43 %). The producers have committed themselves to using ecological production techniques and technologies. Additives, such as colouring pigments, are part of all PVC recipes. The colouring pigments are inorganic additives, such as titanium dioxide, that are not detrimental to health and are used, amongst others, for cosmetics and food products.

Processing

Rhenofol seams can be sealed without the use of naked flame, by hot air or solvent-welding agent. Neither during processing nor during subsequent use of the roofing membrane are significant amounts of hazardous substances released.

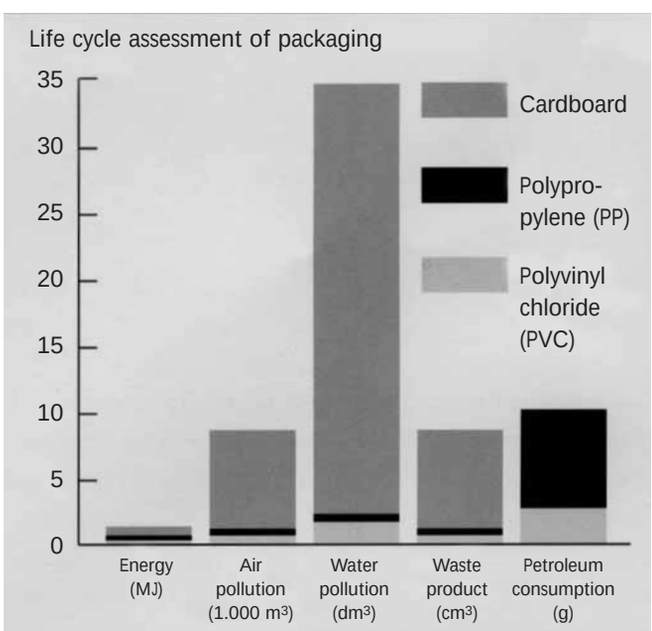
Fire performance

PVC products are extremely hard to ignite and are self-extinguishing. The ignition temperature of Rhenofol is 330 – 400 °C and thus almost twice as high as that of timber which catches fire at temperatures as low as 210 – 270 °C. Also the heat build-up of burning PVC is two thirds less than that of timber.

Energy and resource profile analysis

PVC uses less energy and resources than other materials used for similar purposes. The air and water consumption for production is also relatively small. In order to preserve landfill sites and resources, old PVC-P roofing membranes are recycled.

Example
Life cycle assessment of PVC compared to other materials



Life cyle assessment of packaging.
Source:
Arbeitsgemeinschaft PVC und Umwelt e. V.

Roofcollect® – Recycling system for synthetic roofing and waterproofing membranes

**Europe is in to it -
for the environment's sake**

The trend-setting German recycling solution for post-consumer PVC roofing membranes has become the overall European solution, lead-managed by the EWSA, the European Single ply Waterproofing Association.

Synthetic roofing and waterproofing membranes are perfectly suited for recycling even after years of service on a roof. Throughout Europe, ESWA offers today a future-oriented recycling system of synthetic roofing and waterproofing membranes of any manufacturer. Increasing quantities of post-consumer materials can now be processed.

German Landfill Ordinance

The ordinance on the disposal of commercial waste and certain construction and demolition waste (Commercial Waste Ordinance) that since 2005, in Germany, waste must not be dumped in landfills without pre-treatment. Pursuant to the Waste Disposal Act, residual and used materials shall not be considered waste, if they can be recycled.

Comparative environment relevance studies have revealed that synthetic materials make an indispensable contribution to waste avoidance and reduction.

A second life for synthetic materials

Single-material thermoplastic synthetic products are perfectly suited for recycling. The final products of this process, i. e. the recycled material, show various characteristics which differ only slightly from those of the original material.
Material recycling makes sense, if the post-consumer materials are largely unmixed, clean and available in relatively large quantities.

ROOFCOLLECT®
Recycling System for Thermoplastic Membranes

For further information on the topic of recycling of synthetic roofing and waterproofing membranes, please refer to
www.roofcollect.com
or call +49 6151 21180 /
send a fax to +49 6151 23856.

Quality control

Rhenofol under formal quality control

Because of their practical experience, installers and designers become ever more demanding with regard to the quality of the roofing membranes.
FDT meets these high quality requirements in an exemplary manner, through accurate production methods, permanent production control and monitoring measures in cooperation with official material testing institutes.
The following features, amongst others, are tested during production:

- No blisters or cracks
- Thickness and width consistency
- Flatness
- Weight per square metre
- Tensile strength, elongation at break
- Dimensional stability after storage at + 80 °C
- Bending behaviour at temperatures as low as – 20 °C

Furthermore, the roofing membranes Rhenofol CV and Rhenofol CG are tested at the State Material Testing Institute Darmstadt
- polymeric materials department – in the framework of a quality control agreement.

These regular control measures include the production, external storage and the application on building sites.
The in-house FDT quality control and the quality control carried out by a neutral testing authority provide the certainty that Rhenofol is a reliable and long-term solution to flat roof problems.

Warranty on materials

Warranty certificates are available for all roofing membranes supplied by FDT. FDT offers comprehensive warranty, including warranty on materials and additional agreements in line with NFRC initiatives which deal with the reimbursement of application costs and resulting expenses. A range of options are available to meet the clients requirements.

Quality assurance
Testing according to DIN EN ISO 9001.

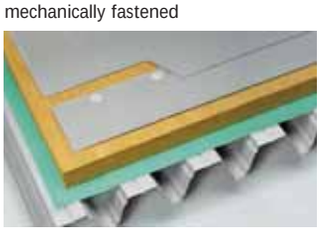
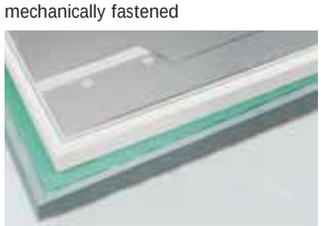
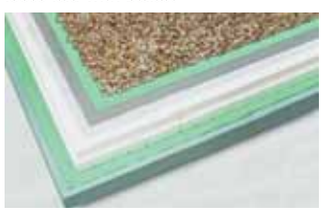
TÜV certificate:
We would be glad to send you a copy on request.

FM Global -
the world leader in industrial risk management - was commissioned by FDT to monitor compliance of the roofing membrane system Rhenofol with international construction and application standards.

FM

Rhenofol® – overview
Application methods and Roof build-ups

Non-traffic roof areas

Roof-type	Supporting deck	Roof slope[1)]	
Non-ventilated roof (warm roof)	Profiled steel decking	Rhenofol CV, mechanically fastened 	
	Reinforced concrete	Rhenofol CV, mechanically fastened 	Rhenofol CG, loose laid with ballast* 
	Lightweight concrete	Rhenofol CV, mechanically fastened 	Rhenofol CG, loose laid with ballast* 
Ventilated roof (cold roof)	Timber board cladding/ derived timber products	Rhenofol CV, mechanically fastened 	Rhenofol CG, loose laid with ballast* 
Inverted roof	Reinforced concrete		Rhenofol CG, loose laid with ballast* 

[1)] up to 10° in according to BS 476 part 3,
up to 20° in according to prEN 1187 part 1.

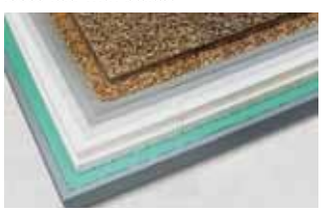
* only for slopes up to 3°.

Rhenofol® – overview
Application methods and Roof build-ups

Decks and terrace roof areas

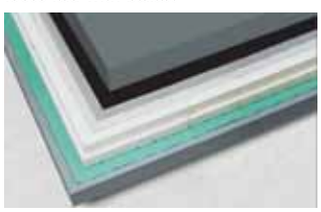
Terraces

Rhenofol CG,
loose laid with ballast*



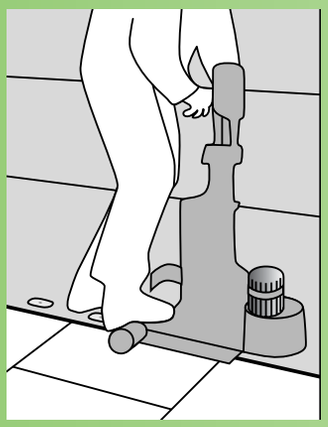
Parking decks

Rhenofol CG,
loose laid with ballast*



Rhenofol CG,
loose laid with ballast*

* only for slopes up to 3°.



Rhenofol® CV mechanically fastened

Jaguar,
Castle Bromwich/
United Kingdom

Ravenhurst School,
Hadley/England

Housing Estate
Maasbommel/Holland

Stade de France,
Paris/France

Atatürk Stadium
Istanbul/Turkey

Safety and functional efficiency, supporting construction

Automated working processes, for example with automatic fastening tools, for economical application.

Safety and functional efficiency

With mechanical fastening, the waterproofing is independent of the other elements in the roof build-up. Movements of these layers and components can therefore not transfer stresses to the membrane, which is significant for the prevention of damage, especially on light-weight roofs.
Every installation has a specific wind uplift calculation in accordance with BS 6399 part 2 1997.

Application instructions

Supporting construction

- The supporting deck structure has to meet the requirements with regard to load-bearing capacity, deflection, anchorage and drainage.
- Joints that may impede the functional efficiency of the waterproofing layer due to their width or movements, have to be formed according to specific design requirements.
- For compatibility reasons, timber board planking, chipboards and the like may be treated only with salt-based wood preservatives. Oil or solvent based impregnation agents must not be used.
- Rapid intrusion of air underneath the waterproofing layer at the roof perimeter and at roof penetrations must be prevented. Therefore these areas have to be made wind tight, in the case of profiled steel decking, for example, by closing the corrugations with suitable material.
- Roofing membranes Rhenofol CV must not come into contact with bitumen or tar.
- National standards and regulations must be observed.

Vapour control layer, thermal insulation layer

Vapour control layer

As vapour control layers, in the case of non-ventilated roofs, we recommend:

- For non air-conditioned rooms (e.g. living rooms and offices or similar rooms without suspended ceiling):
  – vapour control layer PE (polyethylene).

The vapour barrier PE is applied with a seam overlap of 100 mm, with the seams being sealed with connection or seam tape.
The vapour control layer must be taken up and flashed at connections and cappings with connection tape; at roof penetrations it must be flashed.

- For rooms with high air condition loads (e.g. swimming pools and air-conditioned rooms): In case of air-conditioned rooms and rooms with high air condition loads, as well as high pressure rooms, the right layer build-up and application method must be agreed with the FDT experts.

- National standards and regulations must be observed.

Thermal insulation layer

Besides thermal protection requirements, you must also bear in mind resistance to foot traffic when designing the thermal insulation layer on steel profile supporting decks. As materials for thermal insulation layers we recommend:

- Large-sized insulation boards made of expanded polystyrene foam EPS with rebated edges, according to EN 13163, size 1.25 x 1.25 m or 1.25 x 1.00 m.

- Large-sized non-flammable mineral fibre boards according to EN 13162.

- Large-sized insulation boards made of quality assured rigid foam PUR / PIR according to EN 13165.

Small-sized insulation boards can be used, provided they can be properly fastened. Insulation boards or board sections that are not sufficiently fixed by linear fastening must be secured in a stable position with additional fasteners (at least 2 fasteners/m^2) prior to applying the roofing membrane or in accordance with the insulation manufacturers requiremnets. With membrane widths over 1.03 m, the separation layer (if required) should be also fastened with these additional fasteners.

Insulation materials that are not dimensionally stable and which buckle or bulge must not be installed. The insulation elements must be laid with lightly butted joints in a brick bond pattern (with the long side perpendicular to the application direction of the roofing membrane).

- National standards and regulations must be observed.

- The guidelines of the insulation board manufacturer must be observed.

Separation layer, Rhenofol® CV, mechanically fastened at the overlapped membrane edge

Separation layer

When polystyrene insulation is used with Rhenofol CV a separation layer is obligatory.

On top of inflammable thermal insulation materials for fire protection reasons a glass fleece 120 g/m² must be installed as a separation layer, also preventing interaction (e.g. with rigid polystyrene foam).

On top of hard substrates with distinctive edges (e.g. timber boarding, lightweight concrete), the FDT synthetic fleece 300 g/m² must be installed as a separation and protection layer.

For the separation against bituminous layers, e.g. in case of old roof refurbishment, a FDT synthetic fleece 300 g/m² must be installed, if necessary combined with an underlying polyethylene foil.

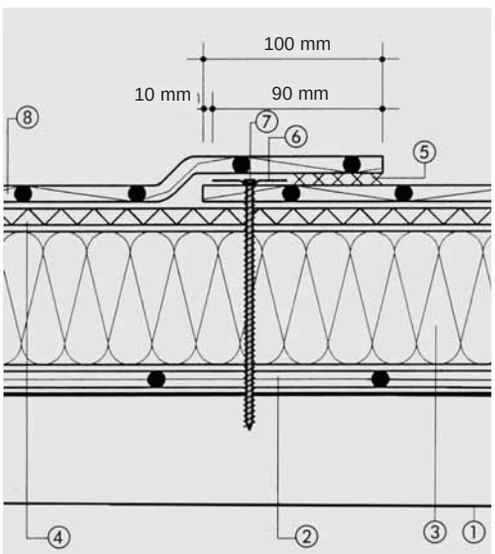
- National standards and regulations must be observed.

Rhenofol CV mechanically fastened at the overlapped membrane edge

Roofing membranes Rhenofol CV are loosely laid and mechanically fastened at the overlapped membrane edge. The seam overlap is 100 mm. Depending on the substrate, different fastening elements are used. The membrane seams are securely joined through solvent or hot air welding.

On profiled steel decking and timber board planking the Rhenofol CV membranes must be orientated perpendicularly to the corrugations or boards to achieve the most regular wind load distribution possible into the supporting deck.

Rhenofol CV can be mechanically fastened on roofs with any slope. With roof slopes over 10°, we recommend agreeing the application with the FDT experts.



Economic laying without naked flame: the mechanically fastening at the overlapped membrane edge.

① Profiled steel decking
② Vapour control layer
③ Thermal insulation layer
④ FDT glass fleece 120 g/m² (if polystyrene insulation)
⑤ Welded seam
⑥ Washer
⑦ Self-tapping screw
⑧ Rhenofol CV

Fasteners/fastener spacing

Amount and arrangement of fasteners

The amount and arrangement of fasteners is designed in accordance with the wind uplift forces and the corresponding design load of the applied fasteners.

On request, computer-based project related calculations of the necessary quantity of fasteners are carried out in accordance with BS 6399 part 2 1997.

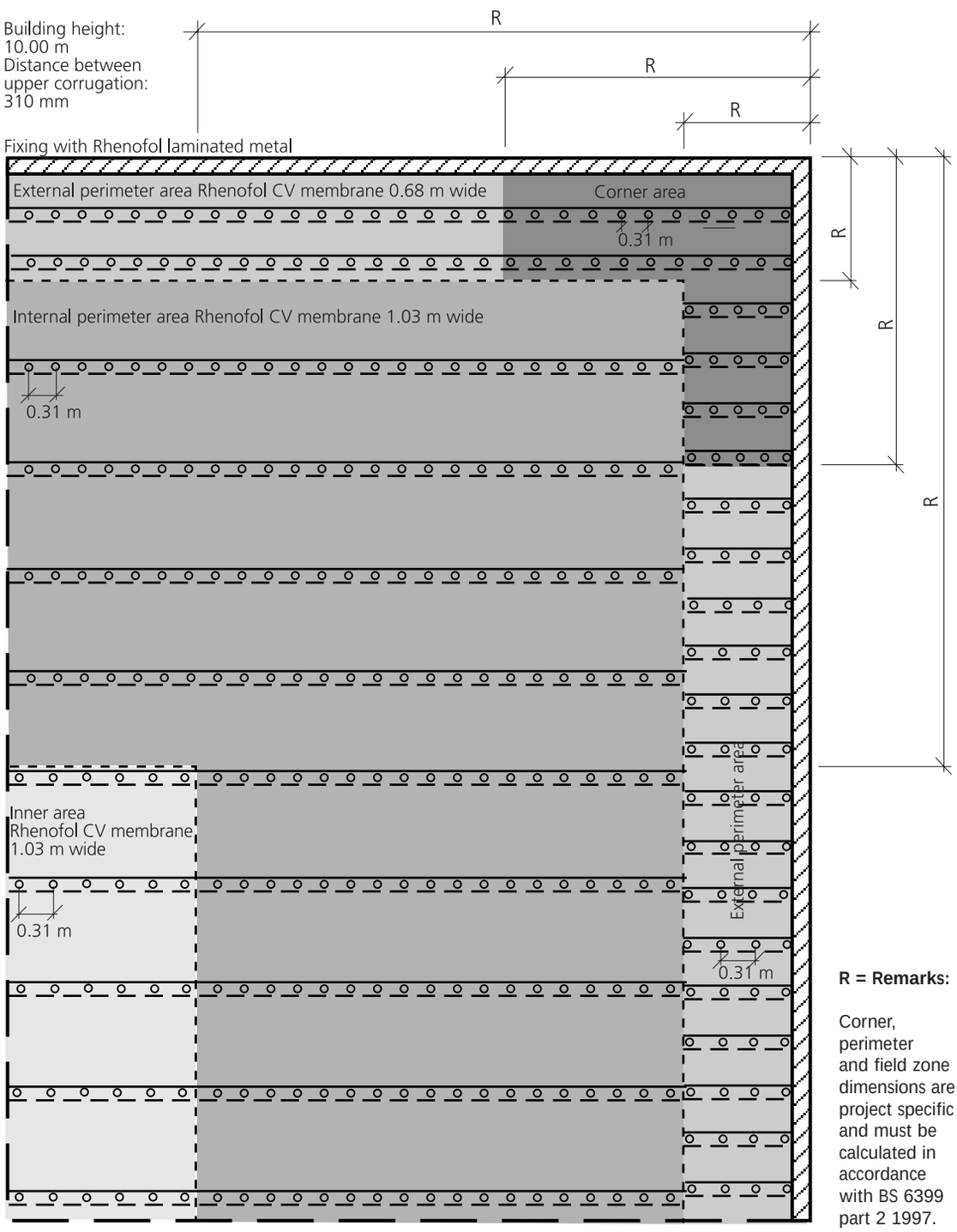
Note:

– In-line fastening spacing min. 150 mm, max. 600 mm.

– Fastener spacing on the same corrugation with profiled steel deckings must not be less than 200 mm.

■ National standards and regulations must be observed.

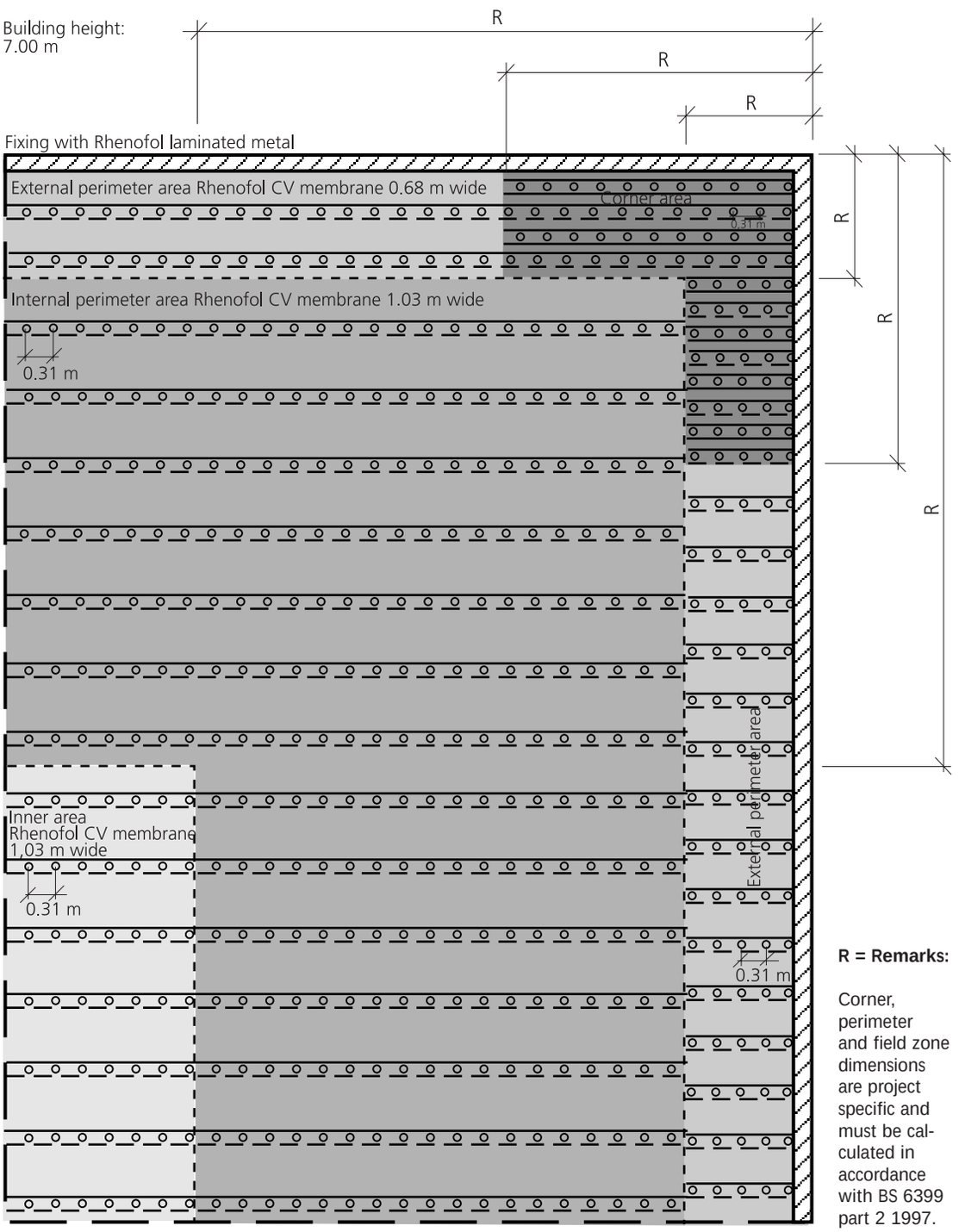
Fastening example: profiled steel decking



R = Remarks:

Corner, perimeter and field zone dimensions are project specific and must be calculated in accordance with BS 6399 part 2 1997.

Fastening example: reinforced concrete



R = Remarks:

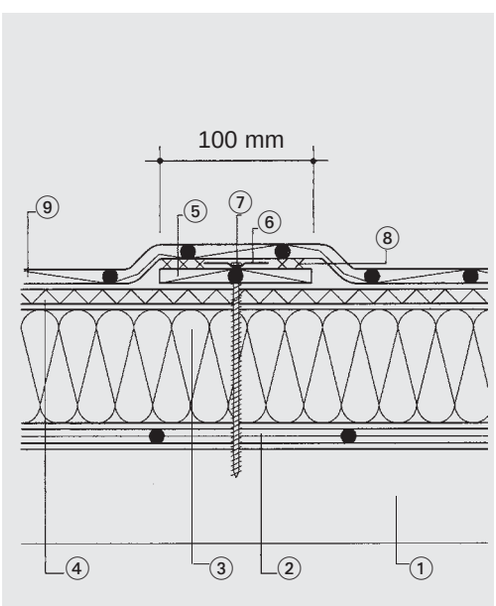
Corner, perimeter and field zone dimensions are project specific and must be calculated in accordance with BS 6399 part 2 1997.

Rhenofol® CV, mechanically fastened with strip and paste system

As an alternative to fastening at the overlapped membrane edge, Rhenofol CV may also be applied with the strip and paste system. Initially, Rhenofol CV strips or Rhenofol CV sets (discs with a diameter of 180 mm) are mechanically fastened. Then the roofing membrane Rhenofol CV is laid. The homogenous connection between roofing membrane and strip is achieved with the Rhenofol welding paste SB that has been specially developed for this application method.

With profiled steel decking and timber planks, the Rhenofol CV strips are arranged perpendicularly to the installation direction of the steel sheets or timber planks, to achieve a regular wind load distribution into the supporting deck.

Sketch
Roof build-up with mechanical fastening of Rhenofol CV with the welding paste system.



Advantages of the strip and paste system:

- The field fastening arrangement provides best possible load distribution, so that, compared to seam fastening, higher design loads are possible. This also means fewer fasteners.
- The strip spacing can be continuously adjusted, which means best possible use of the design load.
- Uniform membrane width of 2.05 m over the complete roof area.
- The seam overlap is only 50 mm, as no fasteners have to be covered.

The welding paste system has proven itself on many roofs since 1993.

The strip spacing and the amount of fasteners are always designed by the FDT experts according to each project.

The application with the strip and paste system requires special professional knowledge. It should therefore be carried out only by specially trained applicators.

① Profiled steel decking
② Vapour control layer
③ Thermal insulation layer
④ FDT glass fleece 120 g/m² (if polystyrene insulation)
⑤ Rhenofol CV strip
⑥ Washer
⑦ Self-tapping screw
⑧ Rhenofol welding paste
⑨ Rhenofol CV

Perimeter fixing
Fastening materials

Perimeter fixing

Due to wind uplift forces, roofing membranes Rhenofol CV must be fixed at all perimeters, penetrations and valleys with a deviation of more than 3° from the horizontal, by welding onto Rhenofol laminated metal sheets.
The fixing is carried out with angles or strips of Rhenofol laminated metal which are fixed to the substrate.

The roofing membrane Rhenofol CV is then secured to the laminated metal by welding.
The laminated metal strips should be cut to a width of at least 80 mm.

If the thermal insulation layers does not have sufficient bearing capacity, e.g. mineral wool, a suitable support must be installed directly below the laminated metal.

Suitable supports for the laminated metal strips are:

- Insulation materials with a compressible strength of at least 0.15 N/mm^2 at max. 10 % compression.
- Timber profiles, at least 30 mm thick, and underlying insulation material with a compression strength of at least 0.1 N/mm^2 at max. 10 % compression.
- Single- or multi-part timber profiles.

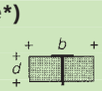
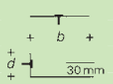
It is permissible under the following conditions to use single fasteners for perimeter fixing, instead of Rhenofol laminated metal strips:

– Building not located in an exposed position
– Building height max. 20 m
– layer build-up thickness above the upper edge of the supporting deck not more than 15 cm.
– Overall roof build up from the top of the supporting deck structure not more than 150 mm.

The necessary amount of fasteners per metre is identical to the amount of fasteners in the external perimeter zone, but not less than 4 fasteners/m.

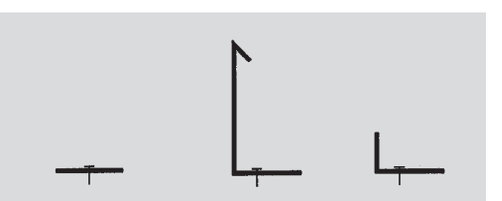
- National standards and regulations must be observed.

Fastening elements and spacing for fixings

Supporting construction	Item to be fastened timber profile*) **d ≥ 30 mm** **b ≥80 mm** **w ≥ 1.5 d** 	Rhenofol laminated metal sheet **d ≥ 45 mm** **b ≥80 mm** 
Reinforced concrete	screw Ø 8 mm with plug Ø 10 mm, type SDF-S Ø 10 by Ejot, spacing 500 mm, or type Spike, by SFS, spacing 300 mm	body-bound rivet 4.8/26 mm spacing 200 mm type DSD-K8 x 40 by Ejot, spacing 200 mm or type Spike, by SFS, spacing 200 mm
Lightweight concrete	lightweight concrete nail anchor Ø 8 mm, spacing 300 mm	lightweight concrete nail anchor Ø 5 mm, spacing 200 mm
Timber beams, timber board cladding/ chipboards	wood screw Ø 8 mm spacing 300 mm or type JA3 Ø 6.5 mm by Ejot spacing 500 mm	wood screws Ø 4.8/25 spacing 200 mm or type JA3-LT- 4.9 x 25 mm by Ejot, spacing 500 mm
Profiled steel decking	self-tapping screw Ø 4.5 mm, spacing 200 mm or type JT3-ST Ø 6.0 by Ejot spacing 200 mm	steel blind rivet Ø 5 mm, spacing 200 mm

*) Countersink the fastening elements in the timber profiles. If necessary, pilot-drill and use washer Ø 10 mm.
The fixing manufacturer's application instructions must be observed.

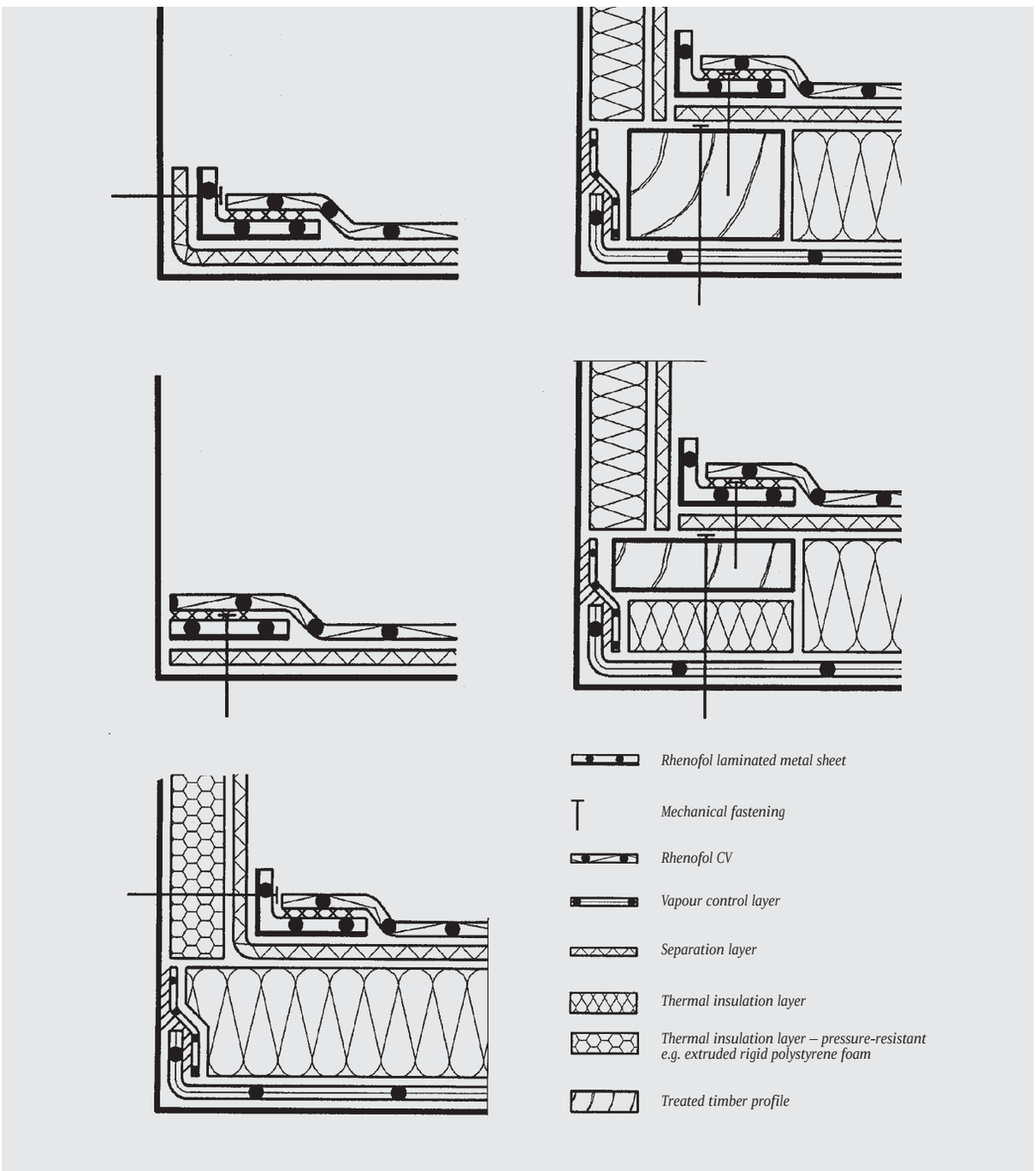
Examples of metal angles for fastening on vertical or sloped surfaces.



Examples of strips or metal angles for fastening on horizontal surfaces.

Perimeter fixing
Application examples

Examples of perimeter fixing with Rhenofol laminated metal strips and angles



Flashings and cappings, application examples

Flashings and cappings

All flashings and cappings are also carried out with Rhenofol CV flashing strips. The flashing strips must be sufficiently fixed.

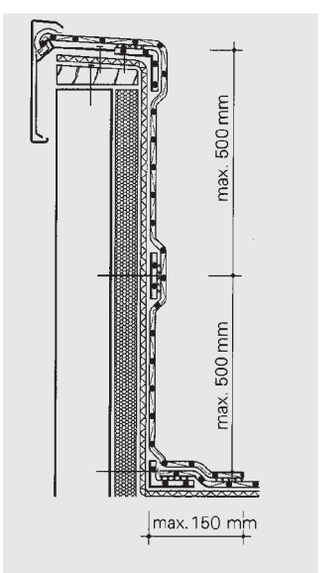
If the flashing membrane is bonded, then at flashing heights over 200 mm fully bonding is necessary, the first 200 mm being left un-bonded.

With mechanical fastening of the flashing membrane - with Rhenofol laminated metal strips or by clamping with the mounting rail of the FDT roof edge trim - the spacing between the lines of fasteners must be not more than 500 mm.

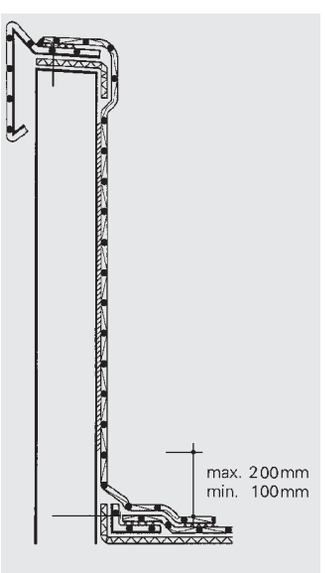
In this case the whole girth dimension must be taken into consideration. The width of the Rhenofol laminated metal strips for intermediate fixing must be at least 50 mm.
You may leave out separation layers in the flashing area, provided the substrate is smooth and even and the edges have a special protection (e.g. with angles made of Rhenofol laminated metal sheets or synthetic fleece).
With non-compatible materials you must always install suitable separation layers.

You will find further examples on this topic in the drawings "Technical details".

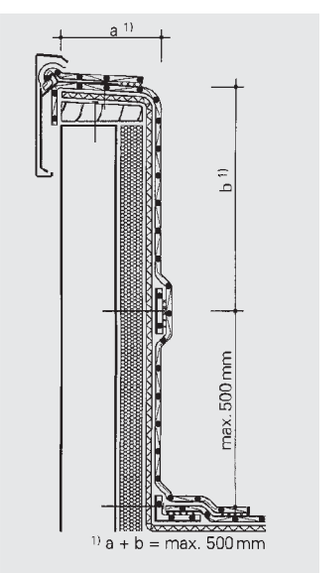
Application examples for flashings and cappings



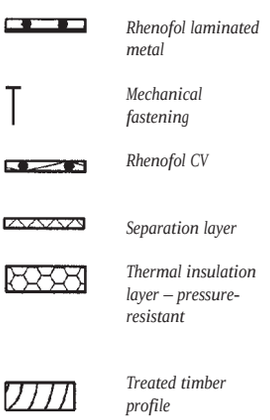
Flashing membrane fastened through the middle with Rhenofol laminated metal strip and angle.



Bonded application.



The roofing membrane is laid under the roof edge trim.

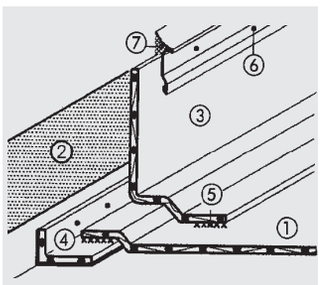


Wall connections, roof light connections, application examples

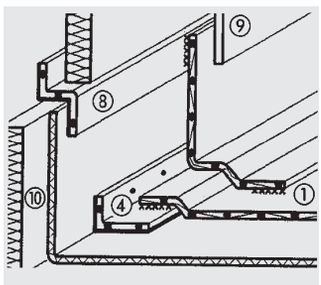
Wall connections

The upper edge of the Rhenofol roofing membrane is clamped to the substrate with rigid FDT aluminium wall connection profiles and additionally weather proofed with FDT sealant A.

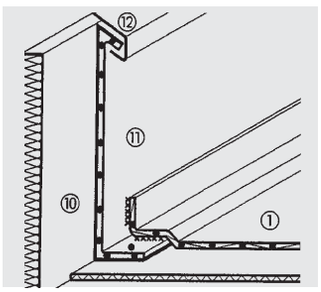
Application examples



Rhenofol laminated metal angle with aluminium wall connection profile



Connection with non-bearing facade



Wall connection with overhang

① Rhenofol CV
② Rhenofol-Contact adhesive 20
③ Rhenofol flashing strip
④ Fixing with angle fillet of Rhenofol laminated metal
⑤ Welding
⑥ FDT aluminium wall connection profile, e.g. Classic or Economy
⑦ FDT sealant A
⑧ Fixing with Z-profile made of Rhenofol laminated metal
⑨ Cladding
⑩ Pressure-resistant thermal insulation
⑪ Fixing with angle fillet made of Rhenofol laminated metal, also achieves wall connection
⑫ Overhang

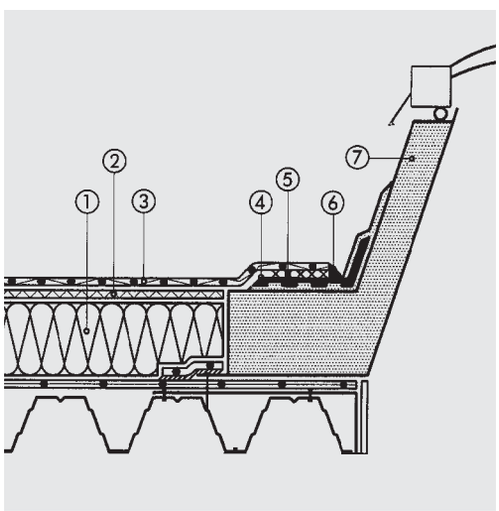
Roof light connections

Roof light upstands are waterproofed to the upper edge with Rhenofol CV strips.
The flashing membrane is bonded to the upstand with the upper end being secured with Rhenofol paste. Particularly advantageous are upstands that are factory prepared for connection with PVC membranes:

– Upstands with Rhenofol roofing membrane factory applied.

– Rigid PVC upstands or upstands with laminate embedded rigid PVC strips, against which the roofing membrane Rhenofol CV is flashed in the roof level by welding. The upstands have to be approved by the roof light manufacturer for this method of attachment, otherwise separate fixing with Rhenofol laminated metal sheet is necessary.

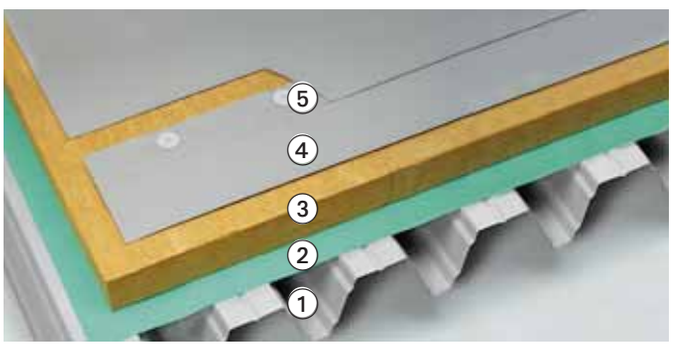
Application example



Roof light connection at upstands with laminate embedded rigid PVC strips

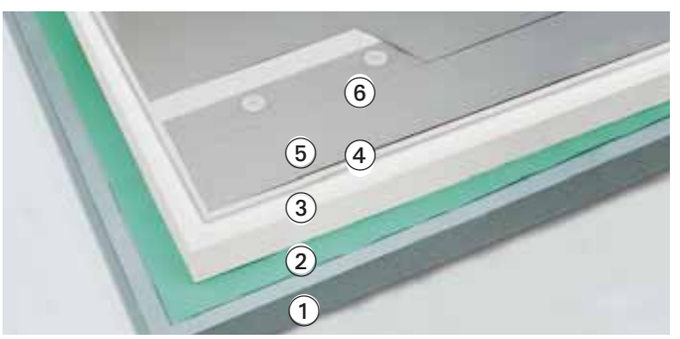
① Thermal insulation layer of expanded polystyrene EPS
② FDT glass fleece 120 g/m^2
③ Roofing membrane Rhenofol CV
④ Laminate embedded rigid PVC strip
⑤ Welded seam
⑥ Rhenofol paste
⑦ Roof light upstand

Layer build-ups

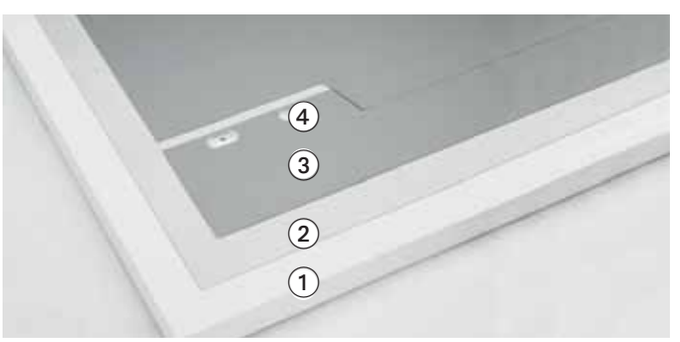


Examples of typical roof build-ups
Non-ventilated roof (warm roof)

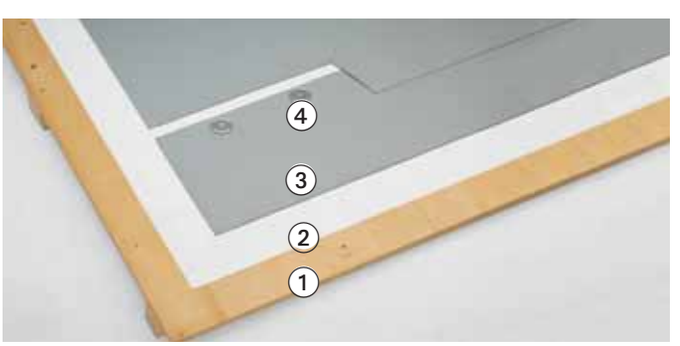
① Corrosion protected profiled steel decking
② FDT vapour control layer PE
③ Mineral fibre thermal insulation layer, if necessary with additional fasteners under the membrane
④ Roofing membrane Rhenofol CV, laid perpendicularly to the corrugations
⑤ Mechanical fastening within overlapped membrane edge with tread-fast fasteners



① Reinforced concrete
② FDT vapour control layer PE
③ EPS thermal insulation layer
④ Separation layer FDT glass fleece 120g/m²
⑤ Roofing membrane Rhenofol CV
⑥ Mechanical fastening within overlapped membrane edge



① Lightweight concrete
② Separation layer FDT synthetic fleece 300 g/m²
③ Roofing membrane Rhenofol CV
④ Mechanical fastening within overlapped membrane edge

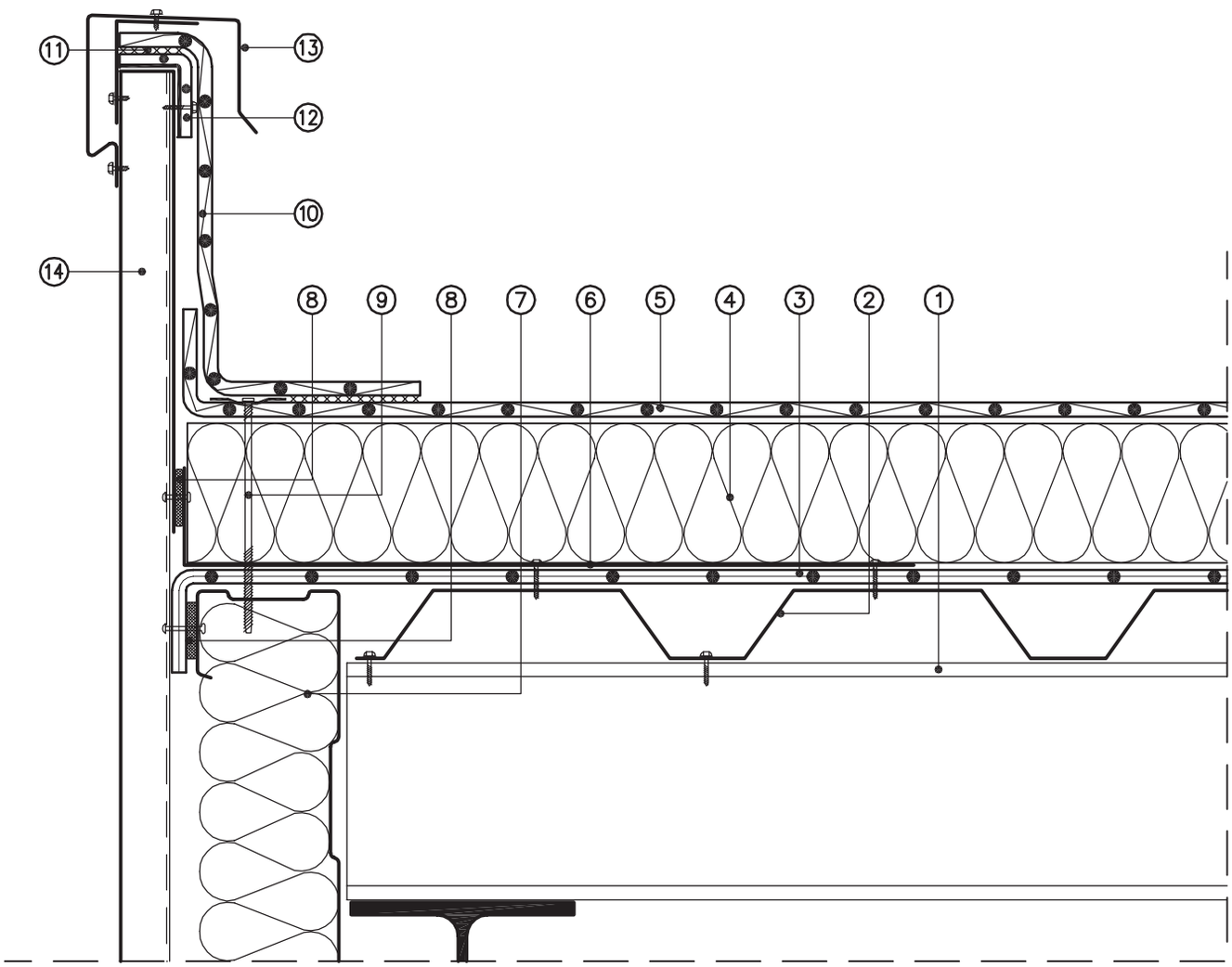


Examples of layer build-ups
Ventilated roof (cold roof)

① Timber board cladding/derived timber products
② Separation layer FDT synthetic fleece 300 g/m²
③ Roofing membrane Rhenofol CV
④ Mechanical fastening within overlapped membrane edge

Parapet
Non ventilated roof (warm roof)

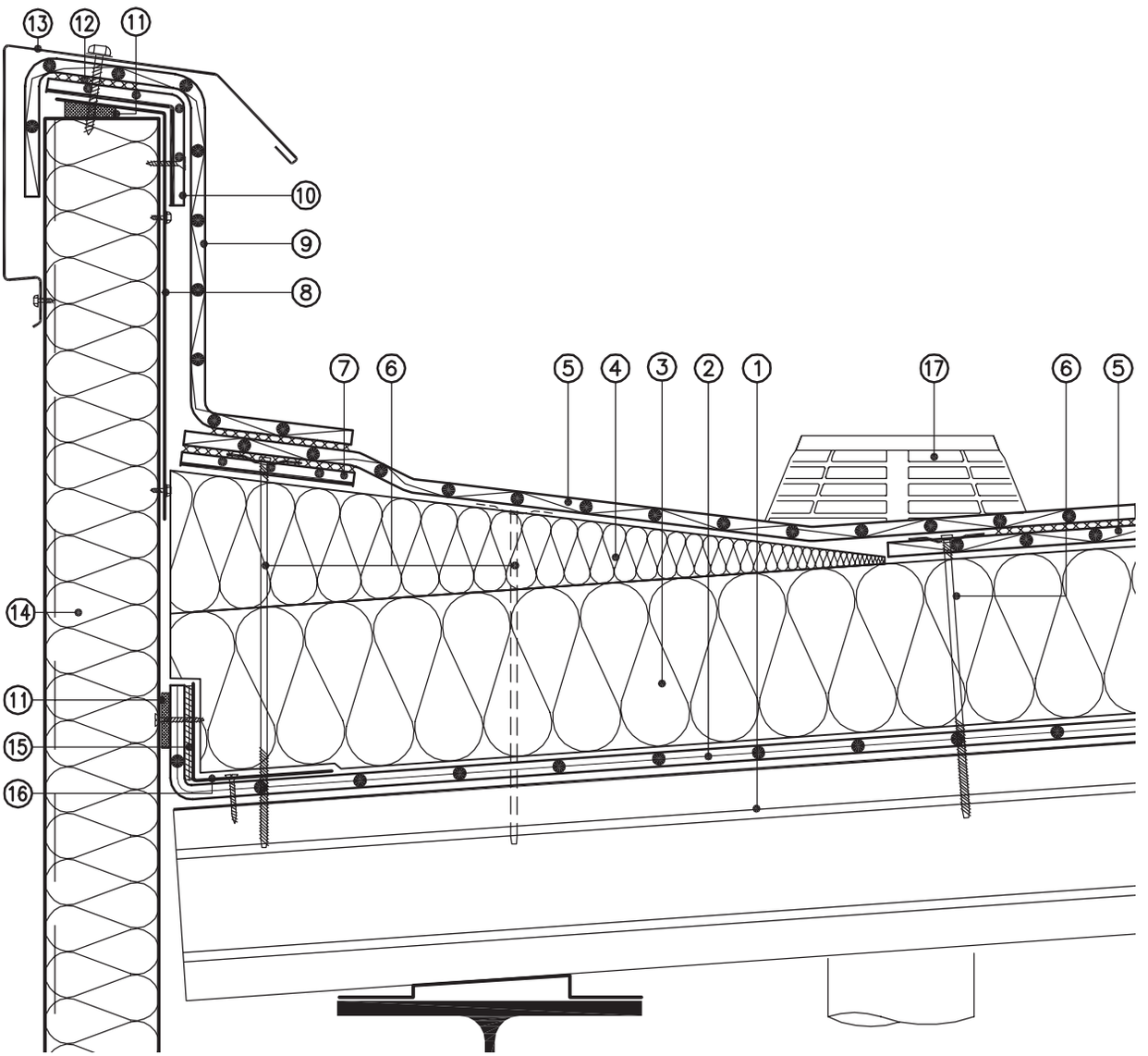
Scale 1:5
(The layers relevant to the sealing are shown accentuated)



① Steel Structure
② Corrosion-protected profiled steel decking
③ FDT vapour control layer PE
④ Thermal insulation to specification
⑤ Roofing membrane Rhenofol CV
⑥ Steel closure flashing
⑦ Thermal insulation
⑧ Airtight sealing tape
⑨ Perimeter fixing
⑩ Flashing strip Rhenofol CV
⑪ Welding
⑫ Rhenofol laminated metal angle
⑬ Capping
⑭ Cladding

Parapet with insulation fillet
Non ventilated roof (warm roof)

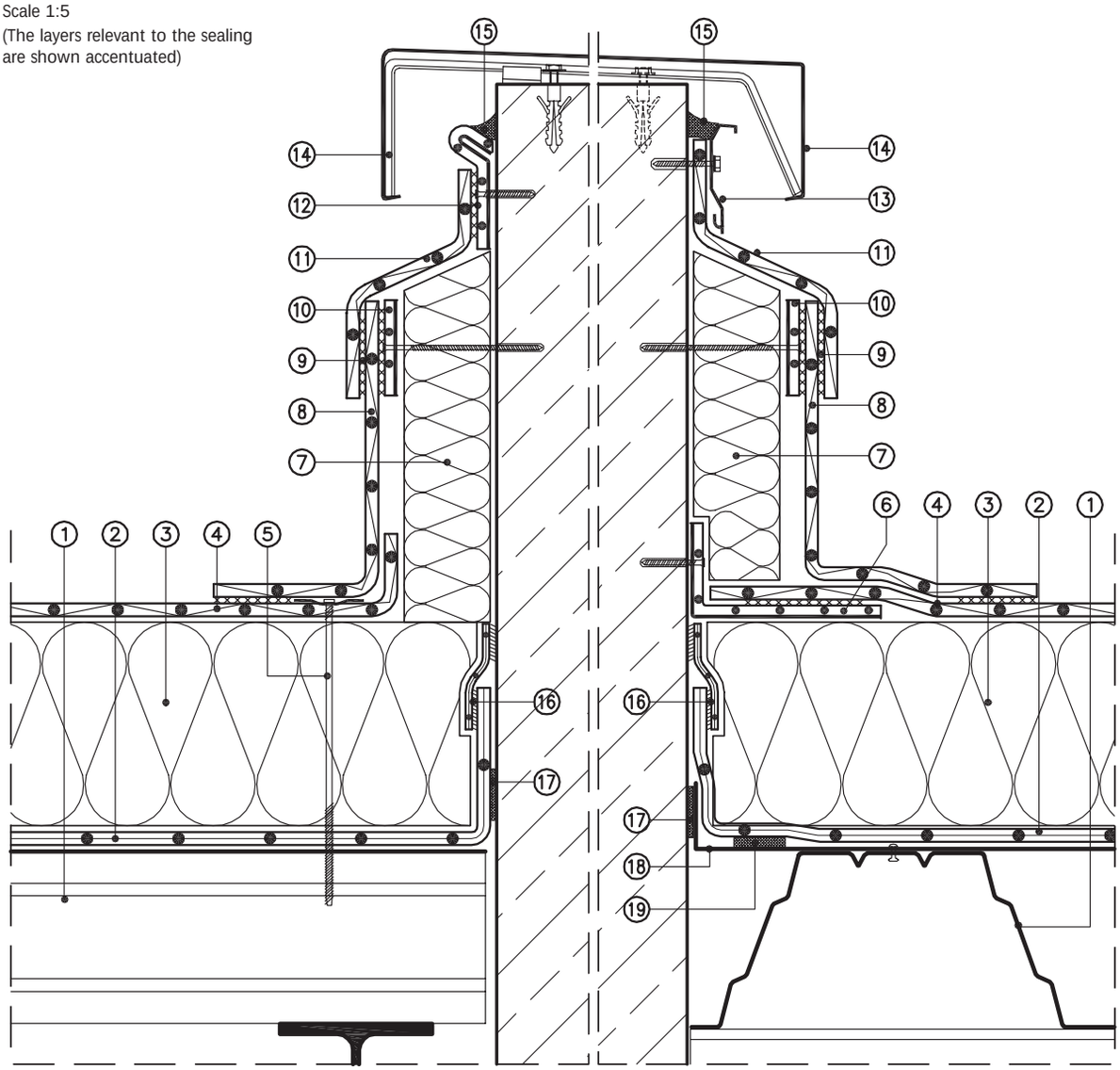
Scale 1:5
(The layers relevant to the sealing are shown accentuated)



① Corrosion-protected profiled steel decking
② FDT vapour control layer PE
③ Insulation to specification
④ Insulation fillet
⑤ Roofing membrane Rhenofol CV
⑥ Fasteners
⑦ Perimeter fixing with Rhenofol laminated metal angle
⑧ Corrosion-protected steel angle
⑨ Flashing strip Rhenofol CV
⑩ Rhenofol laminated metal angle
⑪ Permanently elastic, pre-compressed, single sided self adhesive airtight sealing tape
⑫ Welding
⑬ Parapet capping
⑭ Cladding
⑮ Double-sided adhesive tape
⑯ Corrosion-protected steel angle
⑰ FDT VarioGully roof outlet

Fire wall connection
Non ventilated roof (warm roof)

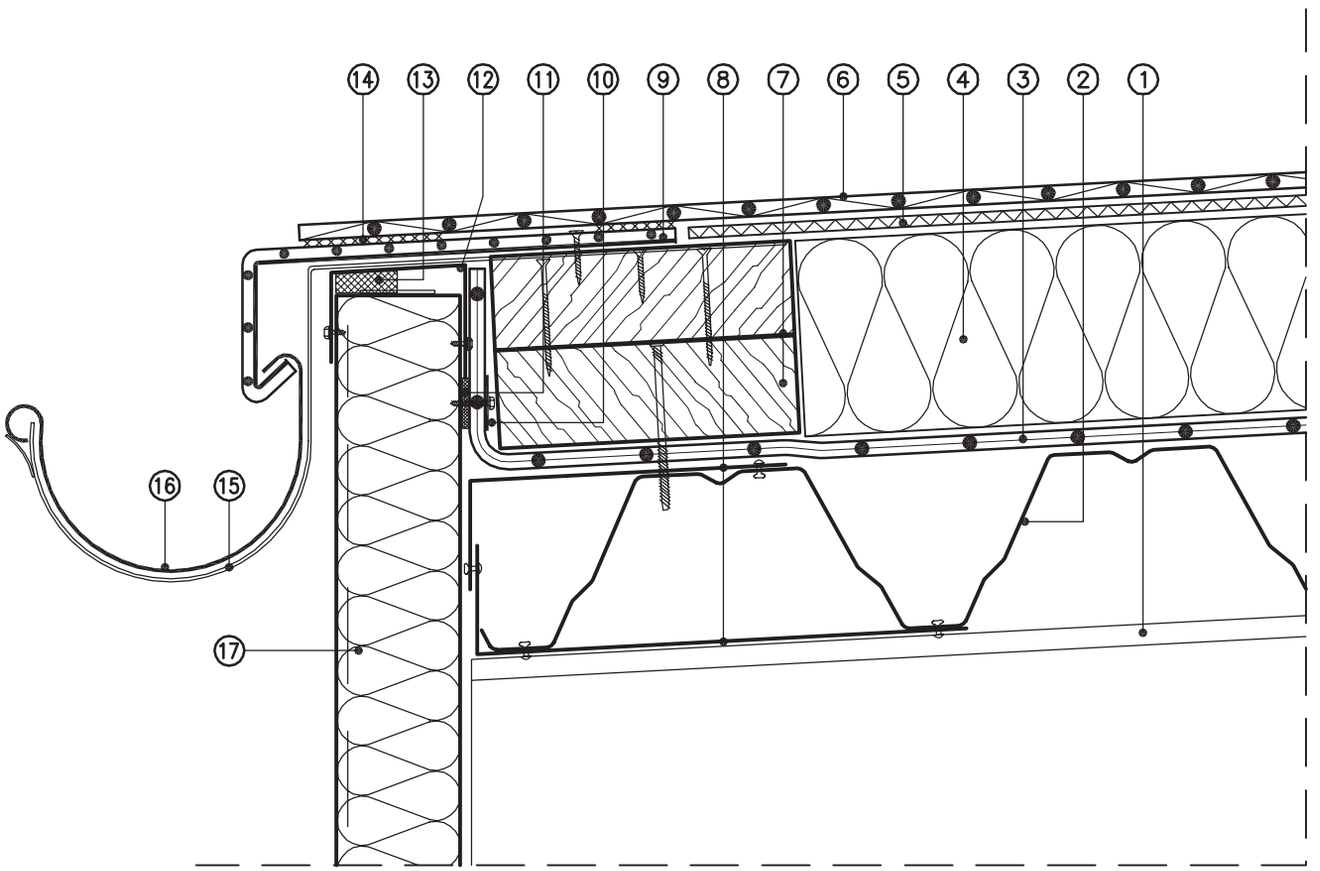
Scale 1:5
(The layers relevant to the sealing are shown accentuated)



① Corrosion-protected profiled steel decking
② FDT vapour control layer PE
③ Thermal insulation to specification
④ Roofing membrane Rhenofol CV
⑤ Alternative perimeter fixing with single fasteners
⑥ Rhenofol laminated metal angle
⑦ Vertical mineral wool insulation
⑧ Rhenofol CV flashing strip
⑨ Welding
⑩ Rhenofol laminated metal strip
⑪ Rhenofol CV flashing strip
⑫ Rhenofol laminated metal angle
⑬ FDT aluminium wall connection profile
⑭ Fire wall capping
⑮ FDT sealant A or sealant S
⑯ FDT connection tape for FDT vapour control layer PE
⑰ Airtight sealing tape
⑱ Steel angle
⑲ FDT connection tape for FDT vapour control layer PE

Gutter
Non ventilated roof (warm roof)

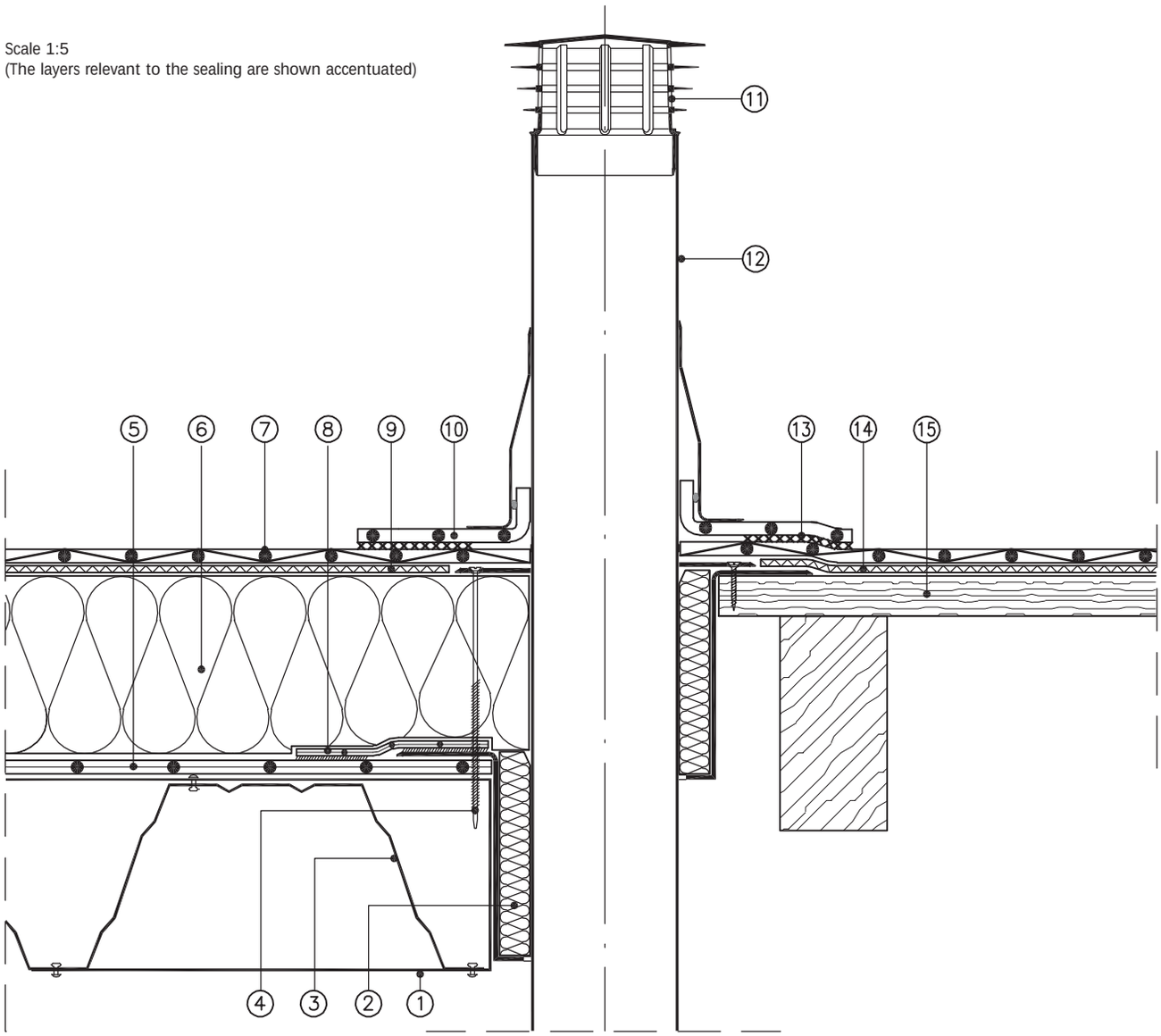
Scale 1:5
(The layers relevant to the sealing are shown accentuated)



① Steel structure
② Corrosion-protected profiled steel decking
③ FDT vapour control layer PE
④ Thermal insulation to specification
⑤ Separation layer FDT glass fleece 120 g/m^2 (if polystyrene insulation)
⑥ Roofing membrane Rhenofol CV
⑦ Treated timber profile
⑧ Metal closure
⑨ Rhenofol laminated metal angle
⑩ Termination bar
⑪ Airtight sealing tape
⑫ Metal cladding closer
⑬ Sealing tape
⑭ Welding
⑮ Bracket
⑯ Gutter
⑰ Cladding

Vent pipe
Non ventilated roof/ventilated roof (warm roof/cold roof)

Scale 1:5
(The layers relevant to the sealing are shown accentuated)

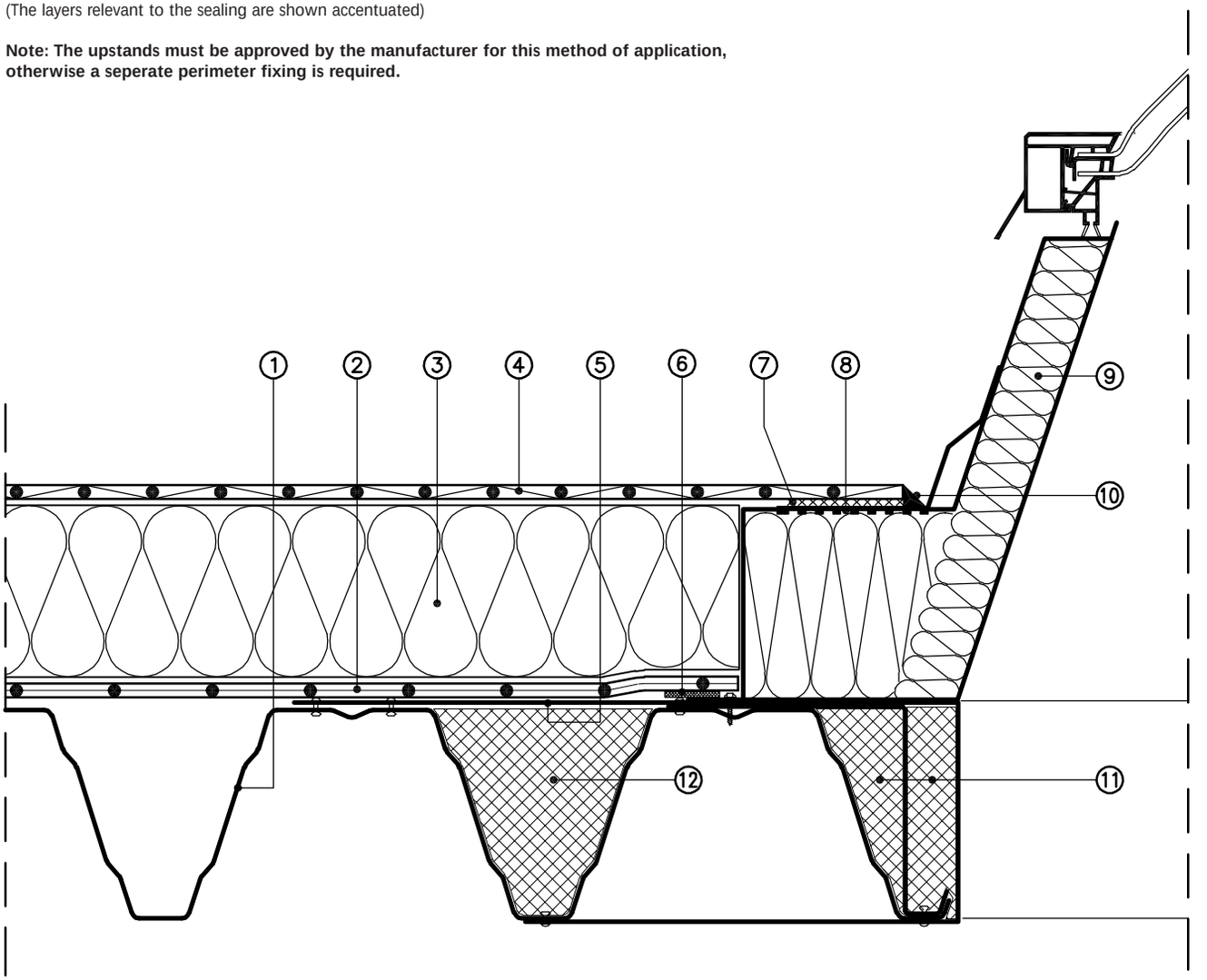


① Internal metal closure
② Penetration kerb insulation sleeve
③ Corrosion-protected profiled steel decking
④ Fixing
⑤ FDT vapour control layer PE
⑥ EPS insulation
⑦ Roofing membrane Rhenofol CV, mechanically fastened
⑧ FDT connection tape for FDT vapour control layer PE
⑨ FDT glass fleece 120 g/m^2
⑩ Rhenofol C collar
⑪ Vent pipe hood - removable
⑫ FDT vent pipe
⑬ Welding
⑭ FDT synthetic fleece 300 g/m^2
⑮ Timber deck

Roof light connection
Roof light with integrated upstand
Non ventilated roof (warm roof)

Scale 1:5
(The layers relevant to the sealing are shown accentuated)

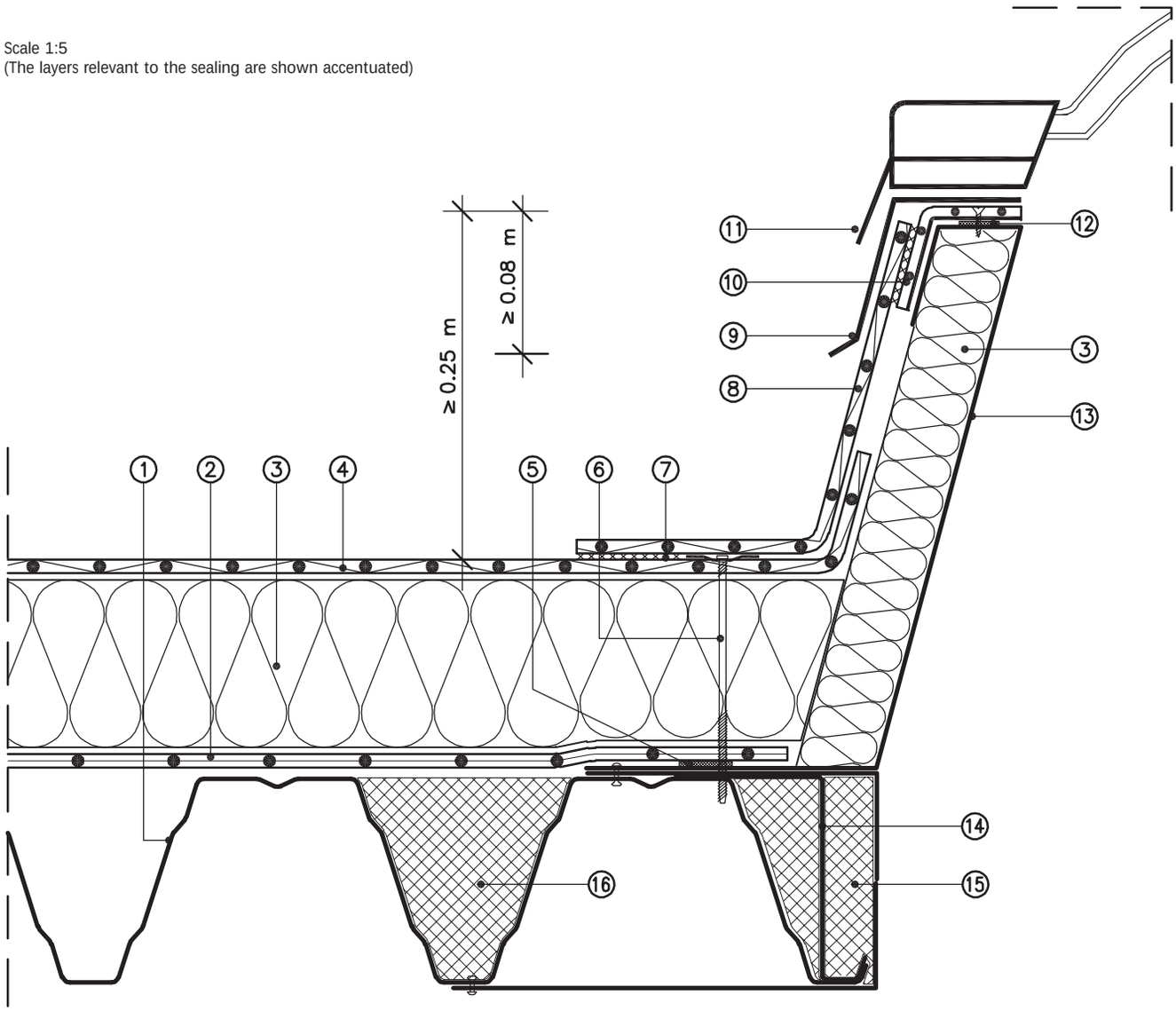
Note: The upstands must be approved by the manufacturer for this method of application, otherwise a seperate perimeter fixing is required.



① Corrosion-protected profiled steel decking
② FDT vapour control layer PE
③ Thermal insulation to specification
④ Roofing membane Rhenofol CV
⑤ Corrosion-protected steel angle
⑥ FDT connection tape for FDT vapour control layer PE
⑦ Welding
⑧ Integrated rigid PVC strip
⑨ Insulated roof light
⑩ Rhenofol paste
⑪ Non-flamable thermal insulation fillet
⑫ Thermal insulation fillet, alternative to item 11

Rooflight connection
Steel upstand
Non ventilated roof (warm roof)

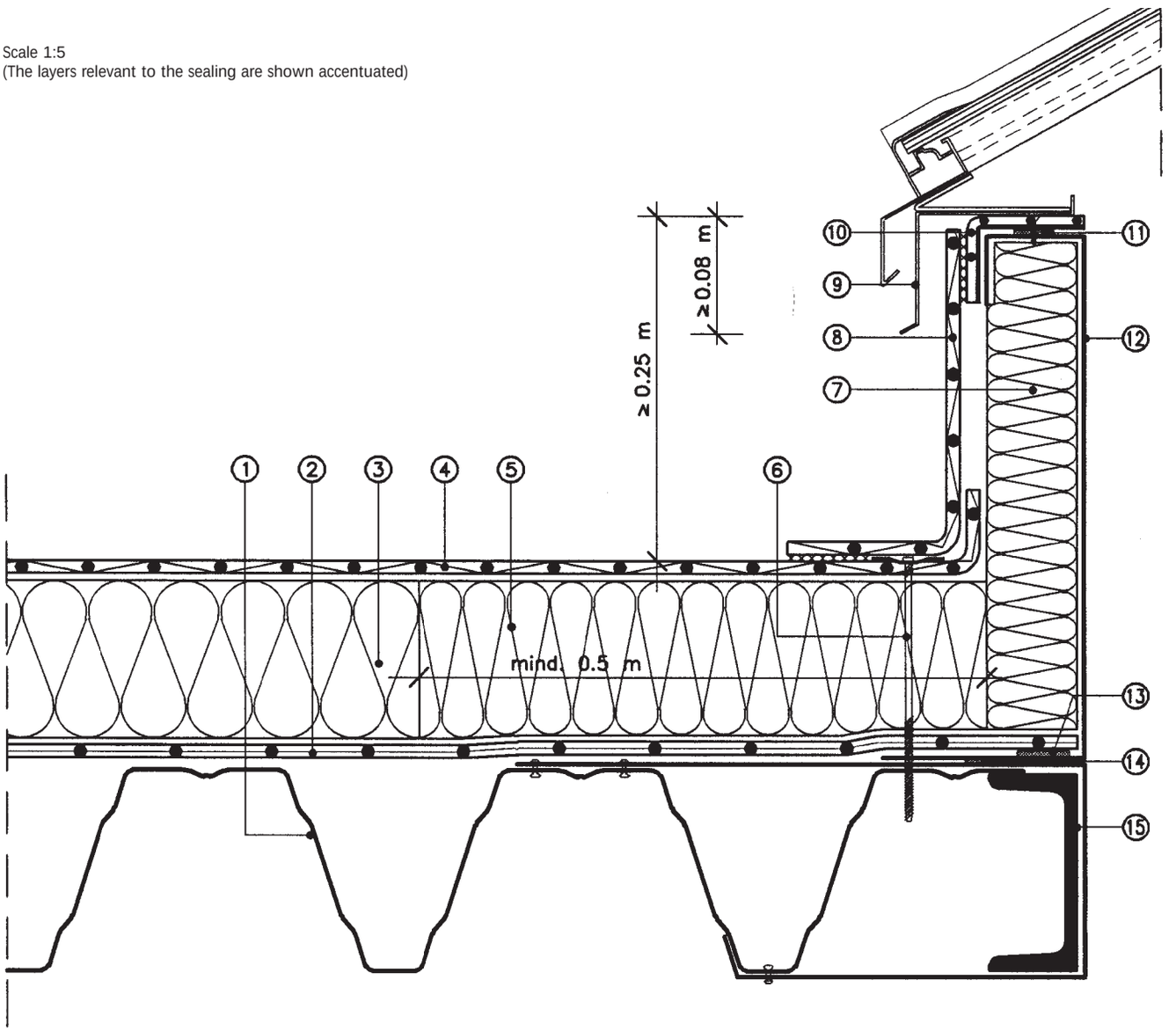
Scale 1:5
(The layers relevant to the sealing are shown accentuated)



① Corrosion-protected profiled steel decking
② FDT vapour control layer PE
③ Thermal insulation to specification
④ Roofing membrane Rhenofol CV
⑤ FDT connection tape for FDT vapour control layer PE
⑥ Rhenofol laminated metal angle
⑦ Welding
⑧ Rhenofol CV flashing strip
⑨ Capping
⑩ Rhenofol laminated metal angle
⑪ Roof light frame
⑫ Airtight sealing tape
⑬ Insulated roof light kerb
⑭ Roof light support
⑮ Non-flamable thermal insulation fillet
⑯ Thermal insulation fillet, alternative to item 15

Roof light connection
Free standing roof light kerb
Non ventilated roof (warm roof)

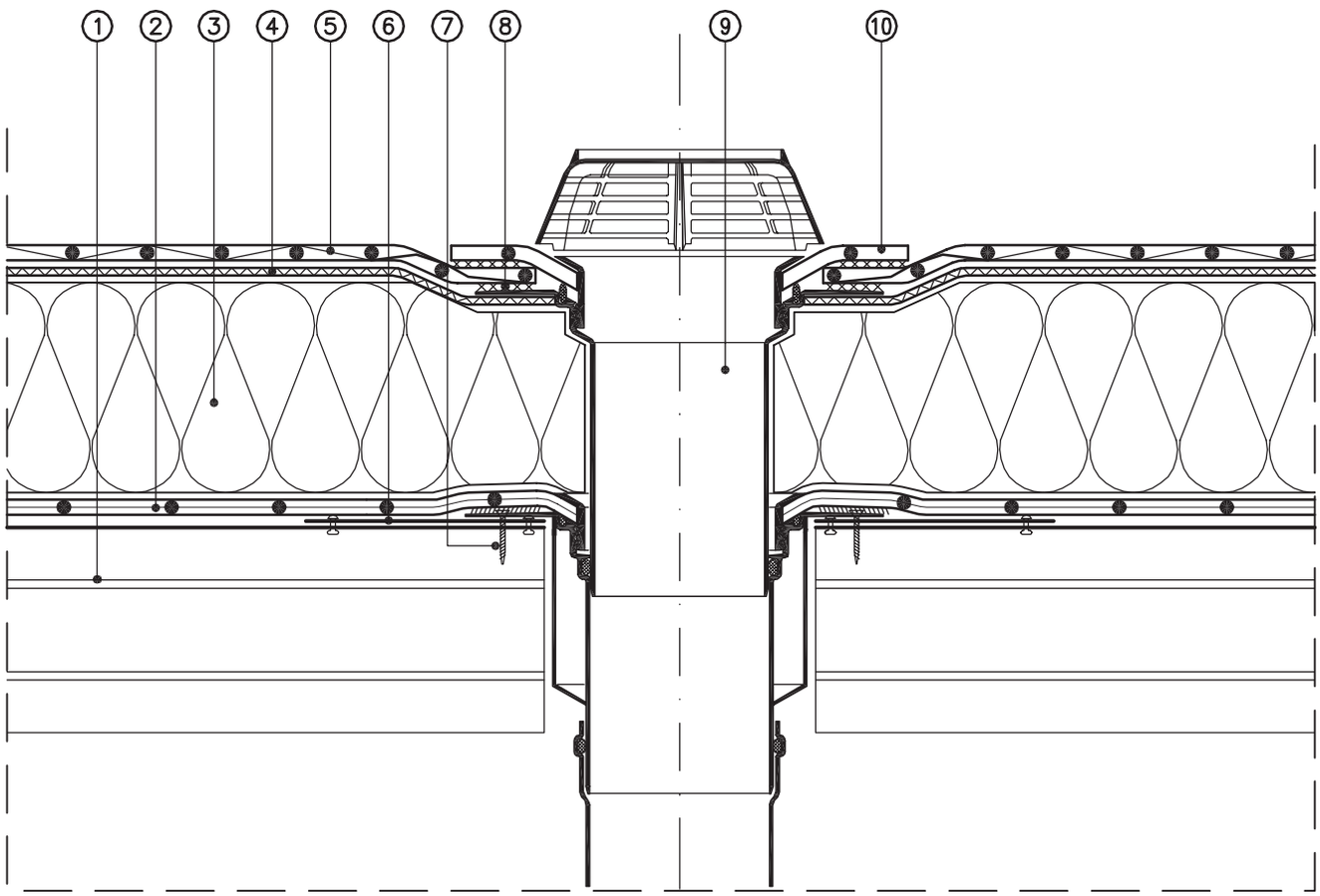
Scale 1:5
(The layers relevant to the sealing are shown accentuated)



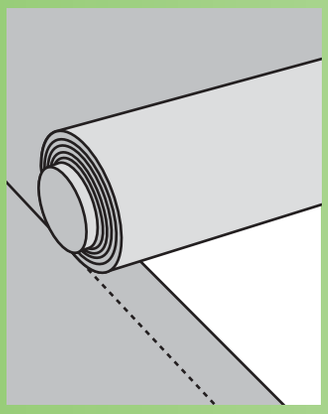
① Corrosion-protected profiled steel decking
② FDT vapour control layer PE
③ Thermal insulation to specification
④ Roofing membrane Rhenofol CV
⑤ Thermal insulation to specification
⑥ Fastener
⑦ Thermal insulation to specification
⑧ Rhenofol CV flashing strip
⑨ Capping
⑩ Rhenofol laminated metal angle
⑪ Airtight sealing tape
⑫ Metal kerb
⑬ FDT connection tape for FDT vapour control layer PE
⑭ Airtight sealing tape
⑮ Steel structure

FDT VarioGully roof outlet
Non ventilated roof (warm roof)

Scale 1:5
(The layers relevant to the sealing are shown accentuated)



① Corrosion-protected profiled steel decking
② FDT vapour control layer PE
③ Thermal insulation to specification
④ Separation layer FDT glass fleece 120 g/m² (see page 15)
⑤ Roofing membrane Rhenofol CV
⑥ Stiffening metal plate
⑦ Rainwater outlet fixings
⑧ Welding
⑨ FDT VarioGully roof outlet
⑩ Rhenofol C collar



Rhenofol® CG
loose laid with ballast

ZCE administrative centre, Pilsen/Czech Republic

Concert Hall, Alfredo Kraus Las Palmas/Spain

Office Center, Halle/Germany

Palacio de Comunicaciones, Madrid/Spain

Safety and functional efficiency, supporting construction, vapour control layer

Safety and functional efficiency

Because of loose laying, the membrane is not attached to the other layers of the build-up across the complete area. Movements and cracks in the supporting construction are not transferred into the waterproofing layer.

The ballast ensures the membrane remains secure against wind uplift forces. The non-shrinking roofing membrane Rhenofol CG with glass fleece reinforcement is loosely laid. Linear perimeter fixing with single fasteners is only necessary with flashings and cappings.

Application instructions

Supporting construction

- The supporting deck structure has to meet the requirements with regard to load-bearing capacity, deflection, anchorage and drainage.
- Clean, dry and even roof surfaces.
- Suitable substrates must be free from open cracks, rough concrete, sharp projections and stones.
- Joints that may impede the functional efficiency of the roof membrane due to their width or movements have to be formed according to constructional requirements.
- The roof slope should not exceed 3° to prevent the ballast slipping off.
- For compatibility reasons, timber board cladding, chipboards and the like may be treated only with salt-based wood preservatives. Oil or solvent based impregnation agents must not be used.
- Rapid intrusion of air underneath the roof sealing at the roof perimeter and at roof penetrations must be prevented. Therefore these areas have to be made wind tight.
- Roofing membrane Rhenofol CG must not come into contact with bitumen or tar.
- National standards and regulations must be observed.

Vapour control layer

As vapour control layers, in the case of non-ventilated roofs, we recommend:

- For non air-conditioned rooms (e.g. living rooms and offices or similar rooms without suspended ceiling):
  – FDT vapour control layer PE (polyethylene) 0.25 mm.

In the case of lightweight concrete supporting decks with correctly calculated thermal insulation, you may leave out a vapour control layer, only if the room temperature stays below 20 °C and the relative air humidity inside the room will not exceed 65 %.

Vapour control layer, thermal insulation layer, separation layer

The vapour control layer PE is applied with a seam overlap of 100 mm, with the seams being sealed with connection or seam tape. The vapour control layer must be taken up and flashed at connections and cappings with connection tape; at roof penetrations it must also be flashed.

- For rooms with high air condition loads (e.g. swimming pools, air-conditioned rooms):
  – aluminium compound foils
  – vapour control membrane with metal tape reinforcement.

In case of doubt, we recommend a calculation of the building physics in order to identify the diffusion characteristics of the roof build-up.

With lightweight steel decking, we also recommend in principle the installation of a separate vapour control layer, which should be formed as an air barrier.

The vapour barrier must be taken up and flashed at connections and cappings with connection tape; at roof penetrations it must be flashed with connection or seam tape.

- National standards and regulations must be observed.

Thermal insulation layer

Besides thermal protection requirements, you must also bear in mind tread-fastness when designing the thermal insulation layer on steel profile supporting decks.

Expanded polystyrene boards EPS DAA dm, building materials class B 1, with rebated edge are especially suitable materials for thermal insulation layers.

Insulation materials that are not dimensional stable and which buckle or bulge must not be installed.

The insulation elements must be laid with pressed joints in bond.

- National standards and regulations must be observed.
- The guidelines of the insulation board manufacturer must be observed.

Separation layer

Between the roofing membrane Rhenofol CG and the substrate or insualtion except for building class A fibre insulation material, a separation layer is obligatory.

On top of inflammable thermal insulation materials, a glass fleece 120 g/m^2 must be installed as a separation layer, preventing interaction (e. g. with rigid polystyrene foam) and serving as a fire retarding layer in exposed upstand / flashing areas.

On top of hard substrates with distinctive edges (e.g. timber board cladding, lightweight concrete) the FDT synthetic fleece 300 g/m^2 must be installed as a separation and protection layer.

For the separation against bituminous layers, e.g. in case of old roof refurbishment, a synthetic fleece 300 g/m^2 must be installed, if necessary combined with an underlying polyethylene foil.

- National standards and regulations must be observed.

Rhenofol CG loose laid, upper separation layer/perimeter fixing, ballast

Rhenofol CG, loose laid

Roofing membrane Rhenofol CG is loose laid with a seam overlap of 50 mm. The membrane seams are securely joined through solvent or hot air welding.

Upper separation layer/perimeter fixing

Between the roofing membrane Rhenofol CG and the gravel ballast, a separation layer of 0.2 mm to 0.25 mm thick, normally inflammable PE foil (e. g. vapour control layer PE) should preferably be installed.

You may leave out the PE foil separation layer if the thickness of the membrane is not less than 1.5 mm.

In principle, you will need perimeter fixing (at least 4 single fasteners/m or fixing with Rhenofol laminated metal angles) at all flashings and cappings, built-in details etc.

Ballast

Place ballast immediately onto loose laid roofing membranes to secure it against wind uplift. Suitable materials are:

- bulk gravel layers, min. 50 mm thick, natural uncrushed stones, fraction 20/40 river washed.
- paving slabs on paving pad supports.
- paving slabs in a fine gravel bed.

If appropriate gravel is not available or the gravel is applied pneumatically, then, as under paving slabs, you will need an additional protection layer (e.g. synthetic fleece 300 g/m^2 or FDT protection layer). For compatibility reasons, coarse rubber protective sheets must be laid on a separation layer (e.g. synthetic fleece).

- National standards and regulations must be observed.

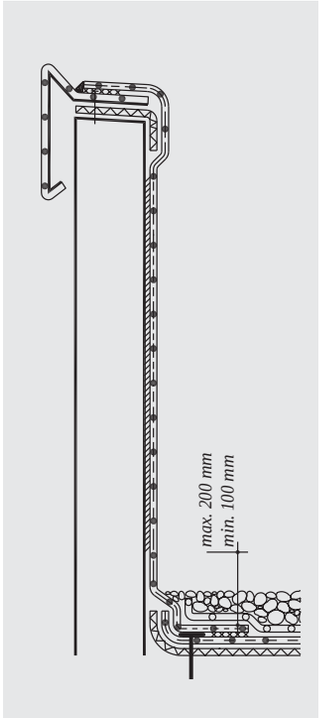
Flashings and cappings

Flashings and cappings

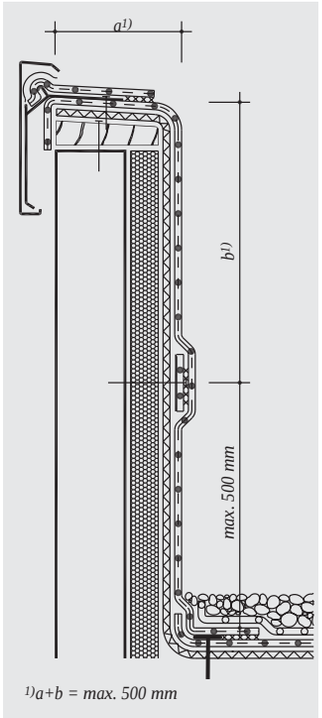
All flashings and cappings are also carried out with Rhenofol CG flashing strips. The flashing strips must be sufficiently fixed.

If the flashing membrane is bonded, then at flashing heights over 200 mm fully bonding is necessary, the first 200 mm being left un-bonded.

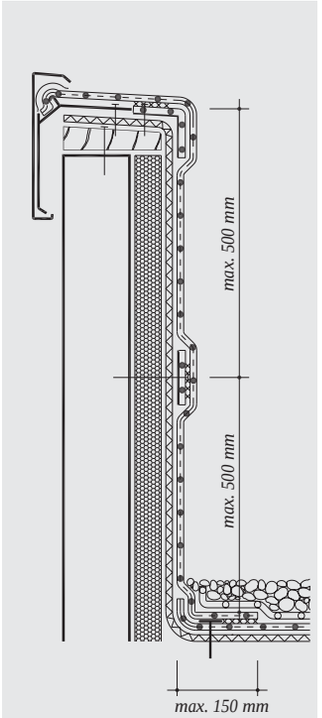
With mechanical fastening of the flashing membrane - with Rhenofol laminated metal sheets or by clamping with the mounting rail of the roof edge trim profile - the spacing between the in-line fasteners must be not more than 500 mm. In this case the whole girth dimension must be taken into consideration. The width of the Rhenofol laminated metal sheets for intermediate fixing must be at least 50 mm.



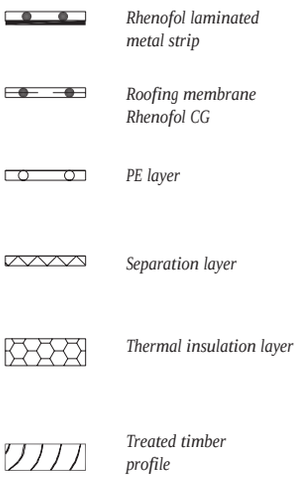
Bonded roof capping.



The roofing membrane is laid under the roof edge trim.



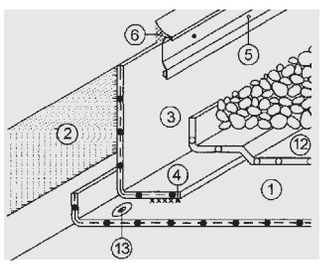
Roofing membrane fastened through the middle with Rhenofol laminated metal strip and angles.



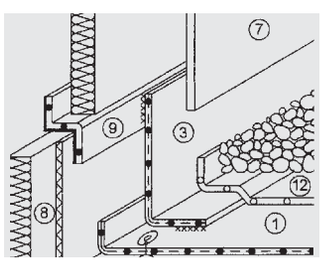
Wall connections, roof light connections

Wall connections Rhenofol CG

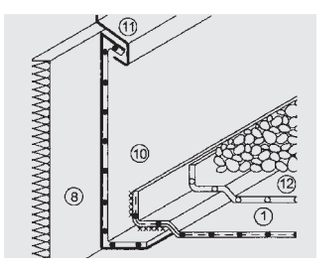
The upper edge of the Rhenofol roofing membrane is clamped to the substrate with rigid wall connection profiles and additionally secured with sealant A.



Flashing with wall connection profile.



Flashing against non-bearing facade.

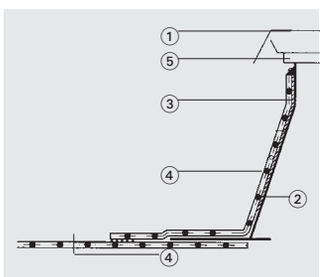


Wall connection with overhang.

① Roofing membrane Rhenofol CG
② Rhenofol-contact adhesive 20
③ Rhenofol flashing strip
④ Welding
⑤ FDT aluminium wall connection profile Classic
⑥ Sealant A
⑦ Cladding
⑧ Thermal insulation layer
⑨ Fixing with Z-profile made of Rhenofol laminated metal sheet
⑩ Angle fillet made of Rhenofol laminated metal sheet, also achieves wall connection
⑪ Overhang
⑫ PE layer 0.2 mm – 0.25 mm thick (e.g. FDT vapour control layer PE)
⑬ Perimeter fixing with single fasteners

Roof light connection Rhenofol CG

Roof light upstands are waterproofed to the upper edge with Rhenofol CG strips. The flashing membrane is bonded to the upstand with the upper end being sealed with Rhenofol paste.

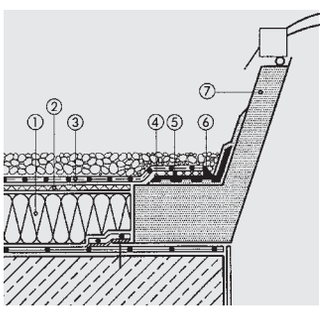


① Roof light
② Upstand
③ Rhenofol contact adhesive 20
④ Roofing membrane Rhenofol CG
⑤ Rhenofol paste

Rhenofol CG under and on the upstand.

Particularly advantageous are upstands that are factory prepared for connection with PVC membranes:

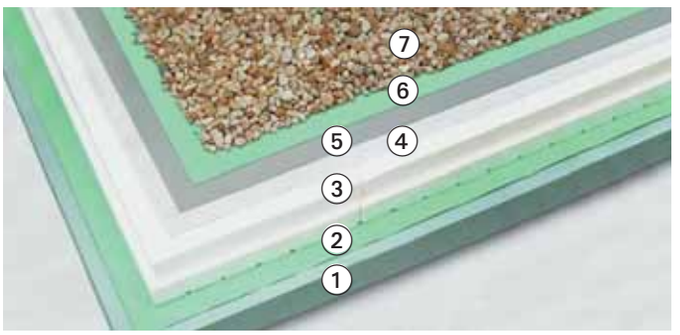
– Upstands with Rhenofol roofing membrane factory applied.
– Rigid PVC upstands or upstands with laminate embedded rigid PVC strips, against which the roofing membrane Rhenofol CG is flashed at roof level by welding. The upstands have to be approved by the manufacturer for this method of attachment, otherwise separate perimeter fixing is necessary.



① Thermal insulation layer
② FDT glass fleece
③ Roofing membane Rhenofol CG 1.5 mm
④ Laminate embedded rigid PVC strip
⑤ Welding
⑥ Rhenofol paste
⑦ Roof light

Roof light with laminate embedded rigid PVC strips.

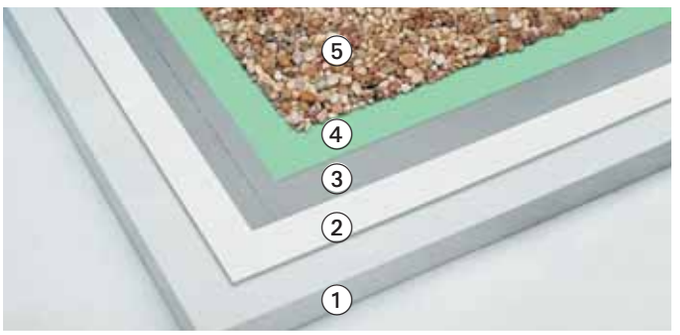
Layer build-ups



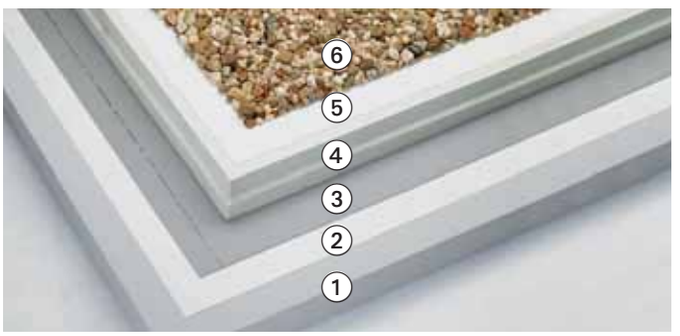
Examples of layer build-ups

Non-ventilated roof (warm roof)

① Reinforced concrete
② FDT vapour control layer PE 0.25 mm thick
③ Thermal insulation layer
④ Separation layer FDT glass fleece 120g/m²
⑤ Roofing membrane Rhenofol CG
⑥ PE separation layer 0.25 mm thick
⑦ Bulk gravel, fraction 20/40 mm

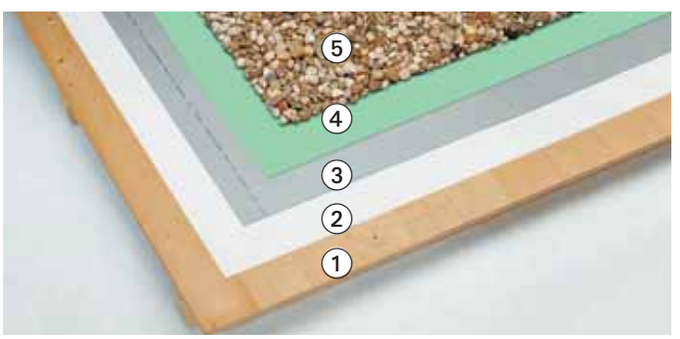


① Lightweight concrete
② Separation layer FDT synthetic fleece 300 g/m²
③ Roofing membrane Rhenofol CG
④ PE separation layer 0.25 mm thick
⑤ Bulk gravel, fraction 20/40 mm



Inverted roof

① Reinforced concrete
② Protection layer FDT synthetic fleece 300 g/m²
③ Roofing membrane Rhenofol CG
④ Thermal insulation layer of extruded rigid polystyrene foam (XPS)
⑤ Synthetic fleece gravel stop
⑥ Bulk gravel, fraction 20/40 mm

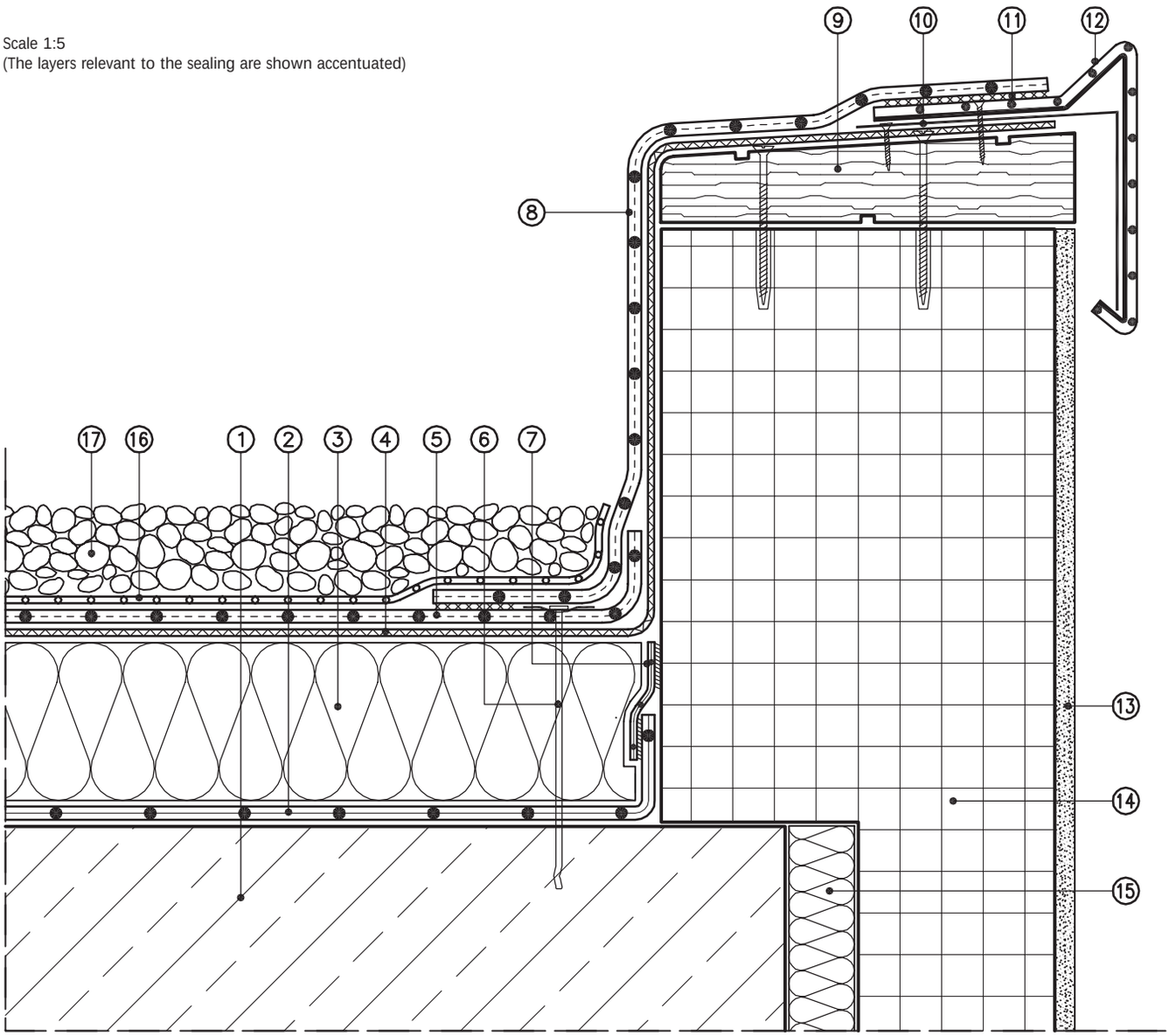


Ventilated roof (cold roof)

① Timber board cladding/derived timber products
② Separation layer FDT synthetic fleece 300 g/m²
③ Roofing membrane Rhenofol CG
④ PE separation layer 0.25 mm thick
⑤ Bulk gravel, fraction 20/40 mm

Parapet
Non ventilated roof (warm roof)

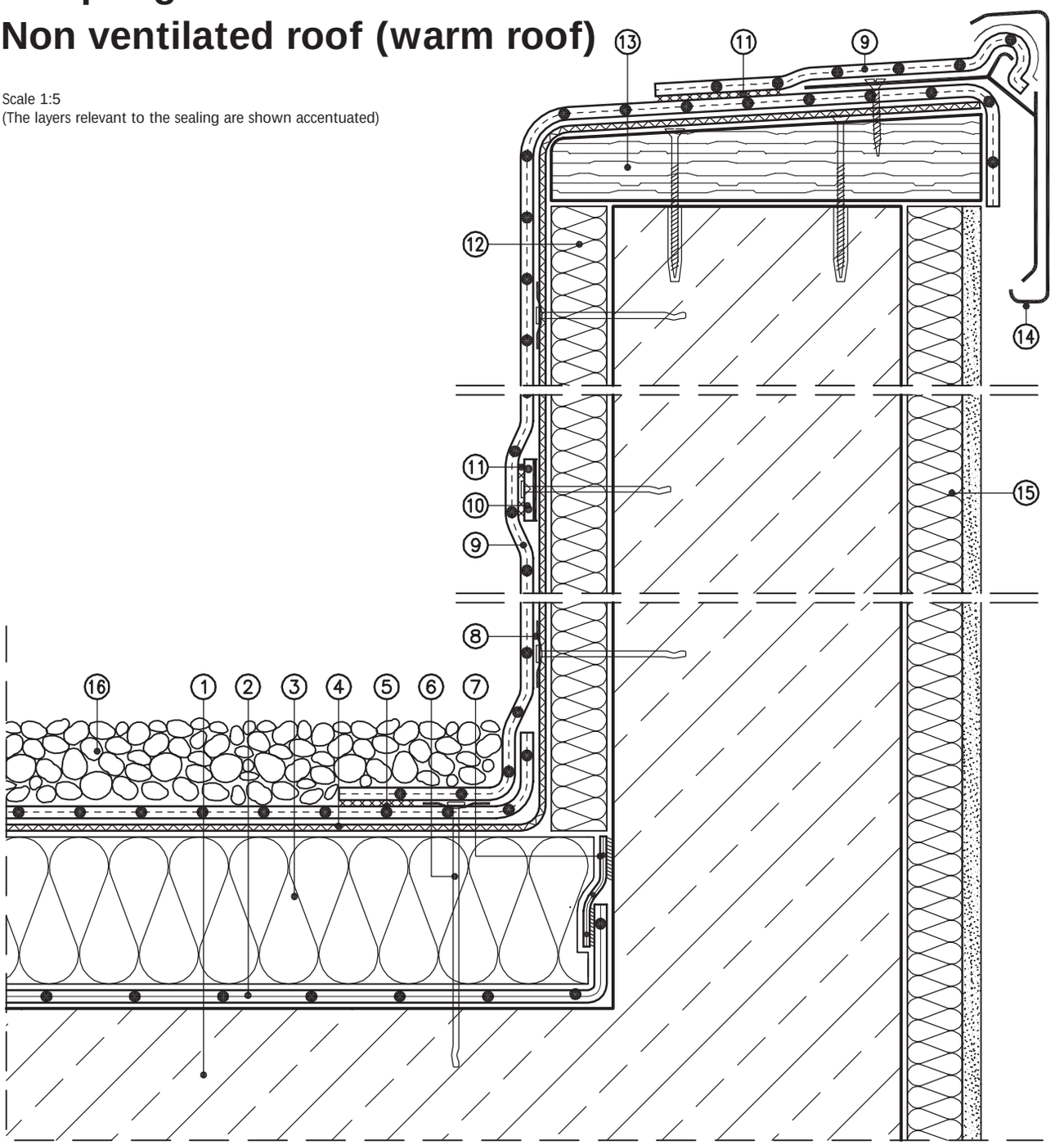
Scale 1:5
(The layers relevant to the sealing are shown accentuated)



① Reinforced concrete
② FDT vapour control layer PE
③ Thermal insulation to specification
④ Separation layer, FDT glass fleece 120 g/m²
⑤ Roofing membrane Rhenofol CG
⑥ Perimeter fixing
⑦ FDT connection tape for FDT vapour control layer PE
⑧ Rhenofol CG flashing strip
⑨ Treated timber profile
⑩ Stiffening profile
⑪ Welding
⑫ Rhenofol laminated metal drip
⑬ Render finish
⑭ Lightwight brick work
⑮ Thermal insulation
⑯ PE seperation layer, 0.2 mm thick
⑰ Min. 50 mm round washed gravel (20 mm - 40 mm diam.)

Parapet greater than 500 mm
Non ventilated roof (warm roof)

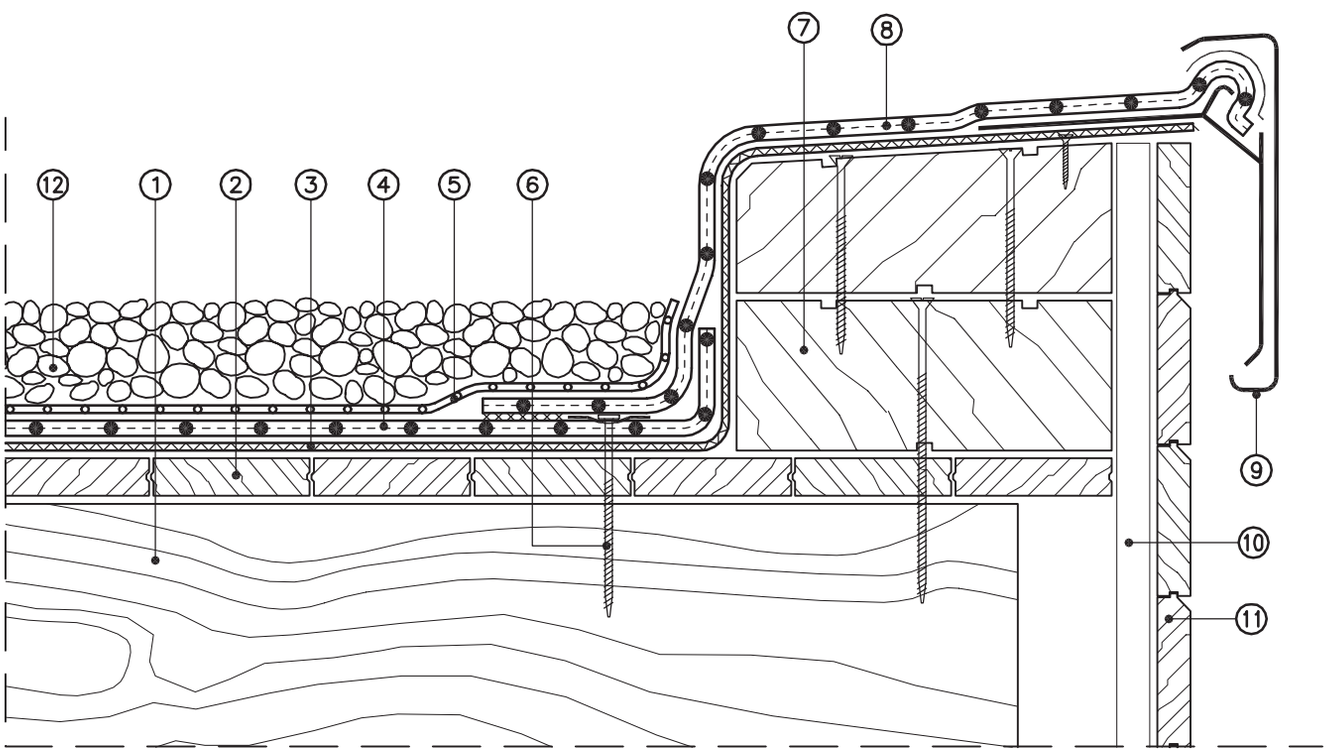
Scale 1:5
(The layers relevant to the sealing are shown accentuated)



① Reinforced concrete
② FDT vapour control layer PE
③ Thermal insulation to specification
④ Separation layer, FDT glass fleece 120 g/m² (See page 36)
⑤ Roofing membrane Rhenofol CG 1.5 mm thick (See page 37)
⑥ Perimeter fixing
⑦ FDT connection tape for FDT vapour control layer PE
⑧ Mechanical fixing
⑨ Rhenofol CG flashing strip
⑩ Rhenofol laminated metal strip (Minimum width: 50 mm)
⑪ Welding
⑫ Thermal insulation
⑬ Treated timber profile
⑭ FDT edge trim profile
⑮ Thermal insulation
⑯ Min. 50 mm round washed gravel (20 mm - 40 mm diam.)

Parapet
Ventilated roof (cold roof)

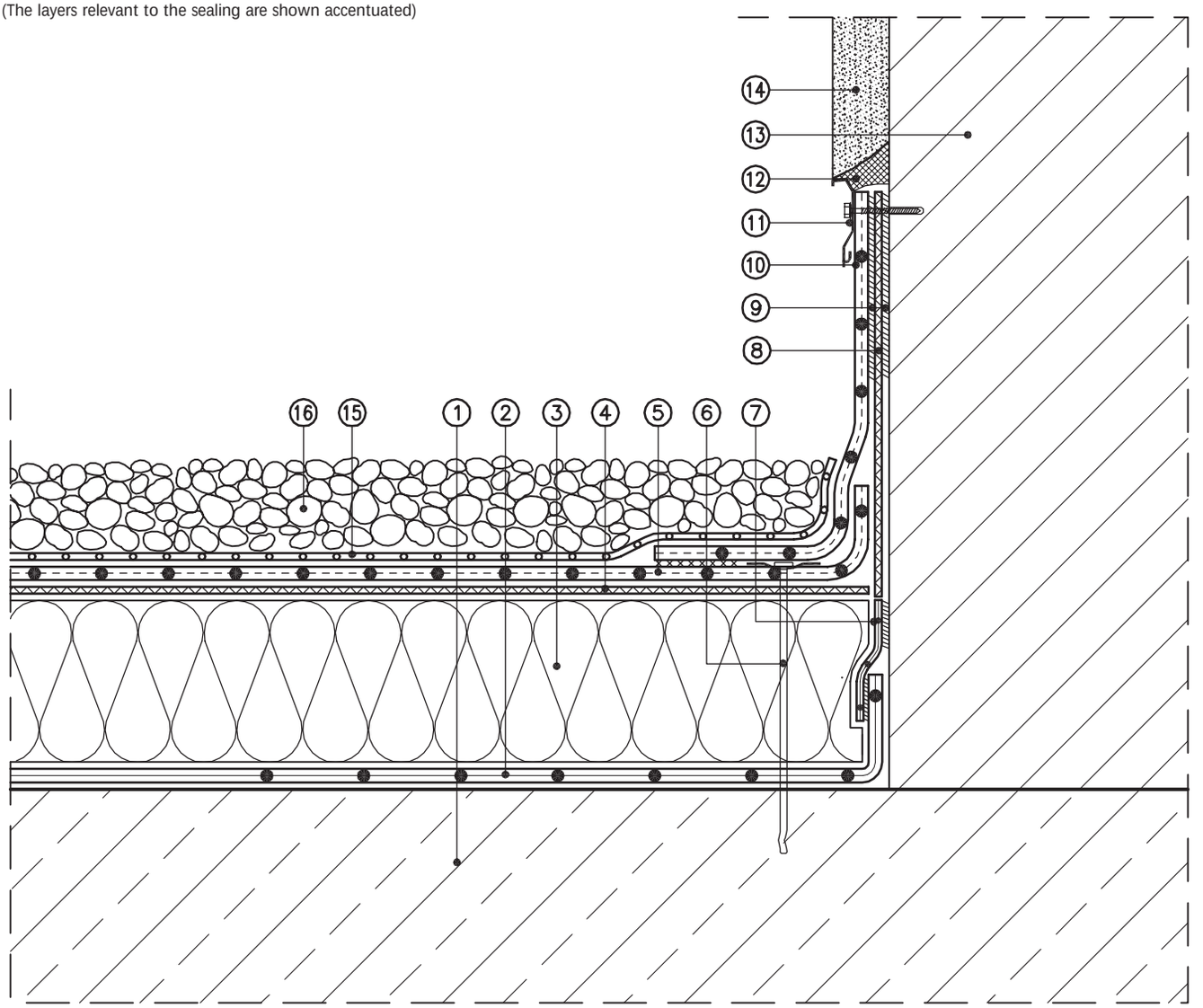
Scale 1:5
(The layers relevant to the sealing are shown accentuated)



① Joist
② Close boarded timber
③ Separation layer FDT synthetic fleece (See page 36)
④ Roofing membrane Rhenofol CG
⑤ PE separation layer, 0.2 mm thick (See page 37)
⑥ Perimeter fixing
⑦ Treated timber profile
⑧ Rhenofol CG flashing strip
⑨ FDT roof edge trim
⑩ Counter battern
⑪ Close boarded cladding
⑫ Min. 50 mm round washed gravel (20 mm - 40 mm diam.)

Wall connection
Non ventilated roof (warm roof)

Scale 1:5
(The layers relevant to the sealing are shown accentuated)

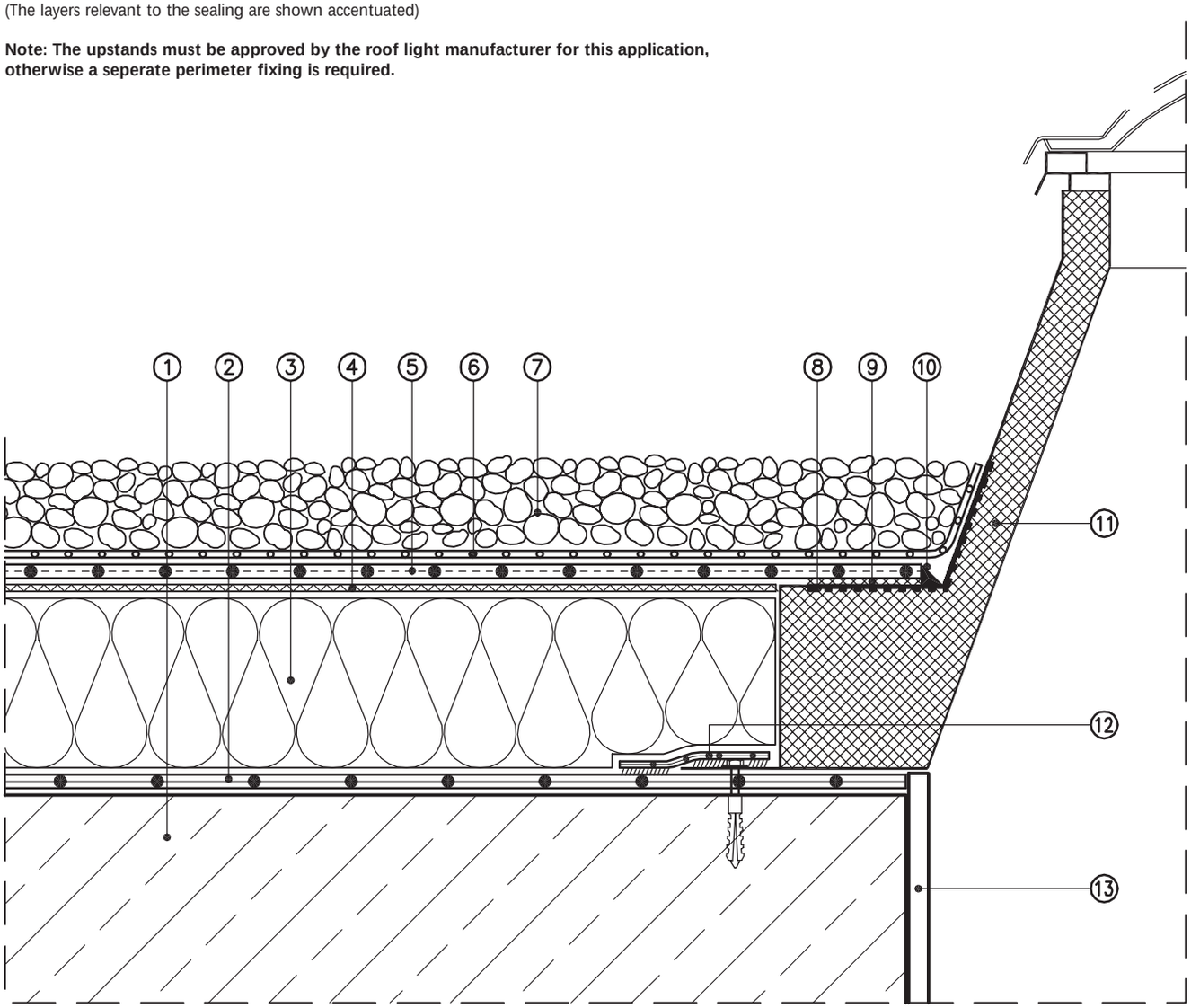


① Reinforced concrete
② FDT vapour control layer PE
③ Thermal insulation to specification
④ Separation layer, FDT glass fleece 120 g/m² (See page 36)
⑤ Roofing membrane Rhenofol CG
⑥ Perimeter fixing
⑦ FDT connection tape for FDT vapour control layer PE
⑧ Separation layer as required
⑨ Rhenofol Contact Adhesive No. 20
⑩ Rhenofol CG flashing strip
⑪ FDT Wall connection profile
⑫ FDT acrylic sealant
⑬ Blockwork
⑭ Render finish
⑮ PE sepearation layer, 0.2 mm thick
⑯ Min. 50 mm round washed gravel (20 mm - 40 mm diam.)

Rooflight connection
Non ventilated roof (warm roof)

Scale 1:5
(The layers relevant to the sealing are shown accentuated)

Note: The upstands must be approved by the roof light manufacturer for this application, otherwise a seperate perimeter fixing is required.



1. Reinforced concrete
2. FDT vapour control layer
3. Thermal insulation to specification
4. Separation layer, FDT glass fleece 120 g/m^2 (See page 36)
5. Roofing membrane Rhenofol CG
6. PE separation layer, 0.2 mm thick (See page 37)
7. Min. 50 mm round washed gravel (20 mm - 40 mm diam.)
8. Integrated rigid PVC strip
9. Welding
10. Rhenofol paste
11. Insulation roof light kerb
12. FDT connection tape for vapour control layer PE
13. Plaster

Rhenofol CG for decks and terraced areas: Safety and functional efficiency, supporting construction

Parking deck of a housing estate in Frankfurt am Main, waterproofed with Rhenofol CG.

Safety and functional efficiency

Roofing and waterproofing membrane Rhenofol CG meets all the requirements set up for reliable waterproofing of terrace deck roof areas. Being loose laid, the roof membrane is not attached to the other layers of the build-up across the complete area, ensuring that shrinkage and tension cracks in adjoining layers will not impair the waterproofing.

The membrane is loose laid between two protection layers and thus meets the requirements of a "sealing against non-pressurised water".

The ballast ensures the membrane remains secure against wind uplift forces.

The membrane is rot-proof and permanently tight even without being compressed. Solutions containing natural chemicals, humic acid and de-icing salts do not impair its long term efficiency.

- National standards and regulations must be observed.

Application instructions

Supporting construction

- The supporting deck structure has to meet the requirements with regard to load-bearing capacity, deflection, anchorage and drainage.
- Clean, dry and even roof surfaces.
- Substrates for application must be free of open cracks, rough concrete, sharp projections and stones.
- National standards and regulations must be observed.

Rhenofol CG for deck areas: Supporting construction, vapour control layer

Supporting construction

- Joints that may impede the functional efficiency of the roof membrane due to their width or movements have to be formed according to constructional requirements. With precast concrete supporting decks, joints must be completely pointed, open joints must be covered, e. g. with metal strips fixed on one side

- The waterproofing level and the covering surface of parking decks and roof terraces must be sloped. The designed slope should be 10 % or more. Slope layers have to consist of gravel concrete.

- For compatibility reasons, timber board cladding and derived timber products may be treated only with salt-based wood preservatives. Oil or solvent based impregnation agents must not be used.

- On roof terraces immediately above residential storeys, appropriate acoustic insulation must be installed.

- The membrane may only be exposed to pressure forces perpendicular to its surface, not to tensile or shearing forces (e. g. when driving off or braking). If necessary, abutments, anchors or similar must be installed to prevent solid coverings slipping off or buckling.

- An intrusion of air underneath the roof sealing at the roof perimeter and at roof penetrations must be prevented. Therefore these areas have to be made wind tight.

- Rhenofol CG must not come into contact with bitumen or tar.

- National standards and regulations must be observed.

Vapour control layer

As vapour control layers, in the case of non-ventilated roofs, we recommend:

- For non air-conditioned rooms (e.g. living rooms and offices or similar rooms without suspended ceiling):
  – vapour barrier PE (polyethylene).

- The vapour control layer PE is applied with a seam overlap of 100 mm, with the seams being sealed with connection or seam tape. The vapour control layer must be taken up and flashed at connections and cappings with connection tape; at roof penetrations it must be flashed.

- For rooms with high air condition loads (e.g. swimming pools, air-conditioned rooms):
  – aluminium compound foils
  – vapour control membrane with metal tape reinforcement.

In case of doubt, we recommend a calculation of the building physics in order to identify the diffusion characteristics of the roof build-up.

The vapour control layer must be taken up and flashed at connections and cappings with connection tape; at roof penetrations it must be flashed with connection or seam tape.

- National standards and regulations must be observed.

Rhenofol CG for decks and terraced areas: thermal insulation layer lower protection layer sealing upper protection layer

Thermal insulation layer

The thermal insulation layer is to be designed in accordance with the thermal and humidity protection requirements.

In order to avoid deformation damage, you must use insulation materials that will resist the static and dynamic loads. Expanded polystyrene foam boards EPS are especially suitable materials.
The boards must have a rebated edge and meet the requirements for the area of application DAA and the pressure load capacity dh. Compressive strain or strength reference values at 10 % compression set:

– roof terrace:
Min. 150 kPa (0.15 N/mm²)

– parking deck:
Min. 200 kPa (0.20 N/mm²) for all decks.

As permissible pressure load on insulation layers, we recommend using only 20% of the indicated measured values.
Insulation materials that are not dimensionally stable and which buckle or bulge must not be installed. The insulation elements must be laid with pressed joints in bond.
If designed as inverted roof the instructions of the insulation material manufacturer must be observed.

- National standards and regulations must be observed.

- The guidelines of the insulation board manufacturer must be observed.

Lower protection layer

Under the membrane a FDT synthetic fleece protection 300 g/m² is applied.

The protection layer provides reliable protection of the sealing against mechanical impact originating from the substrate and prevents interaction e.g. with rigid polystyrene foam.

- National standards and regulations must be observed.

Sealing

Waterproofing is carried out with at least 1.5 mm thick, loose laid roofing membranes Rhenofol CG.

Note:
Place ballast immediately onto loosely laid roofing membranes to secure its position against wind uplift.

- National standards and regulations must be observed.

Upper protection layer

As an upper protection layer, 1.8 mm thick FDT protection layers (PIB with polyester fleece backing) are installed with a seam overlap of 50 mm, hot-air welded or connected using Rhepanol sealing tape.
At flashings and cappings a separate flashing strip is used, loosely overlapping the protection layer at roof level by 250 mm.
FDT protection layer provide protection against mechanical damage, prevent screed or concrete from sticking and allow for the careful compensation of possible movement in solid wear and protection layers.
For compatibility reasons coarse rubber protective sheets must be laid on a separation layer (e. g. synthetic fleece).

- National standards and regulations must be observed.

Rhenofol CG for decks and terraced areas: protective layer/ballast perimeter fixing flashings and cappings/built-in details

Protective layer/ballast

Vehicular traffic or heavy load roof areas will be equipped with a statically determined reinforced concrete panel, which serves as a protective layer at the same time.

In order to prevent damaging the water-proofing by movements and deformations of the solid protective layer, concrete layers must be partitioned by joints. The panel size of open concrete layers should not exceed 2.15 x 2.5 m (= half of the panel width). After inserting back-fill material the panel joints are pointed with joint sealant.

- National standards and regulations must be observed.

Perimeter fixing

In principle, you will need linear perimeter fixing (at least 4 single fasteners/m or fixing with Rhenofol laminated metal sheet) at all flashings and cappings, built-in details etc.

Flashings and cappings/built-in details

All flashings and cappings are also carried out with Rhenofol CG flashing strips. The flashing strips must be sufficiently fixed.

If the flashing membrane is bonded, then at flashing heights over 200 mm fully bonding is necessary, the first 200 mm being left un-bonded.

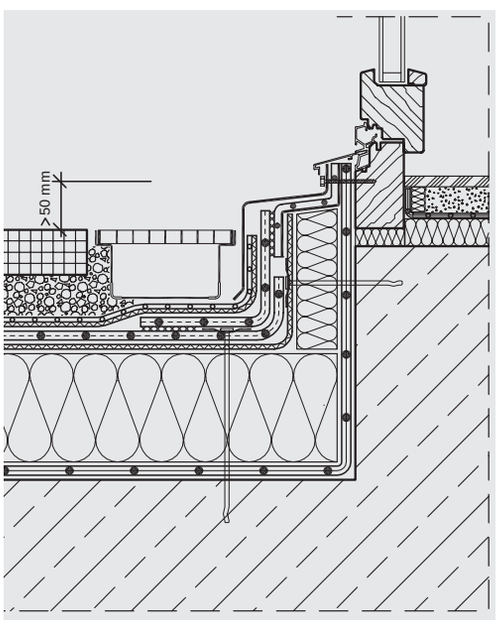
With mechanical fastening of the flashing membrane - with Rhenofol laminated metal sheets or by clamping with the mounting rail of the roof edge trim - the spacing between the in-line fasteners must be not more than 500 mm. In this case the whole girth dimension must be taken into consideration.

The width of the Rhenofol laminated metal sheets for intermediate fixing must be at least 50 mm. See also the sketches on page 38.

At all flashings the sealing must be taken up at least 150 mm over the surface of the protective or wear layer, fixed with mounting rails and made rain-proof.

When sealing roofs of soil-covered buildings, the waterproofing must be taken down at least by 200 mm under the joint between ceiling and walls.

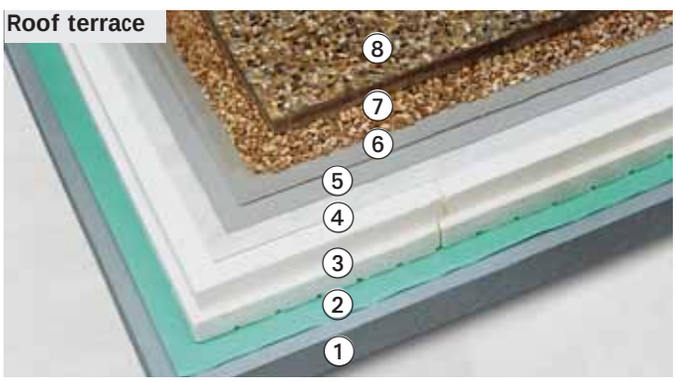
Example: Flashing built-in detail door



At door flashings the membrane is protected against mechanical damage by a metal overhang.

Roof build-ups for terraced areas

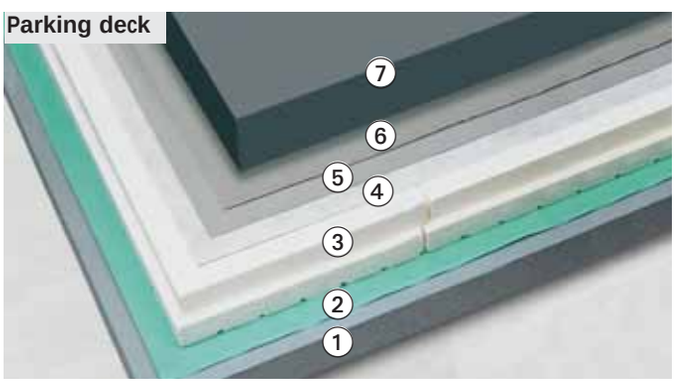
Roof terrace



Examples of roof build-ups
Non-ventilated roof (warm roof)

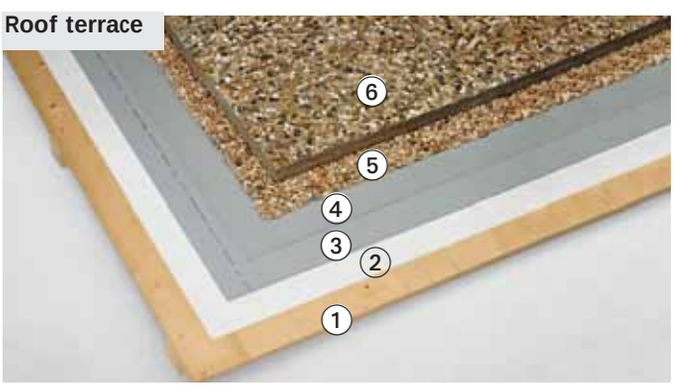
① Reinforced concrete
② FDT vapour control layer PE 0.25 mm thick
③ Thermal insulation layer, pressure-resistant
④ Separation layer FDT synthetic fleece 300 g/m²
⑤ Roofing membrane Rhenofol CG, 1.5 mm thickness
⑥ FDT protection layer
⑦ Gravel bed 8/16
⑧ Paving slabs

Parking deck



① Reinforced concrete
② FDT vapour control layer PE 0.25 mm thick
③ Thermal insulation layer, pressure-resistant
④ Separation layer FDT synthetic fleece 300 g/m²
⑤ Roofing membrane Rhenofol CG, 1.5 mm thickness
⑥ FDT protection layer
⑦ Concrete road surface

Roof terrace

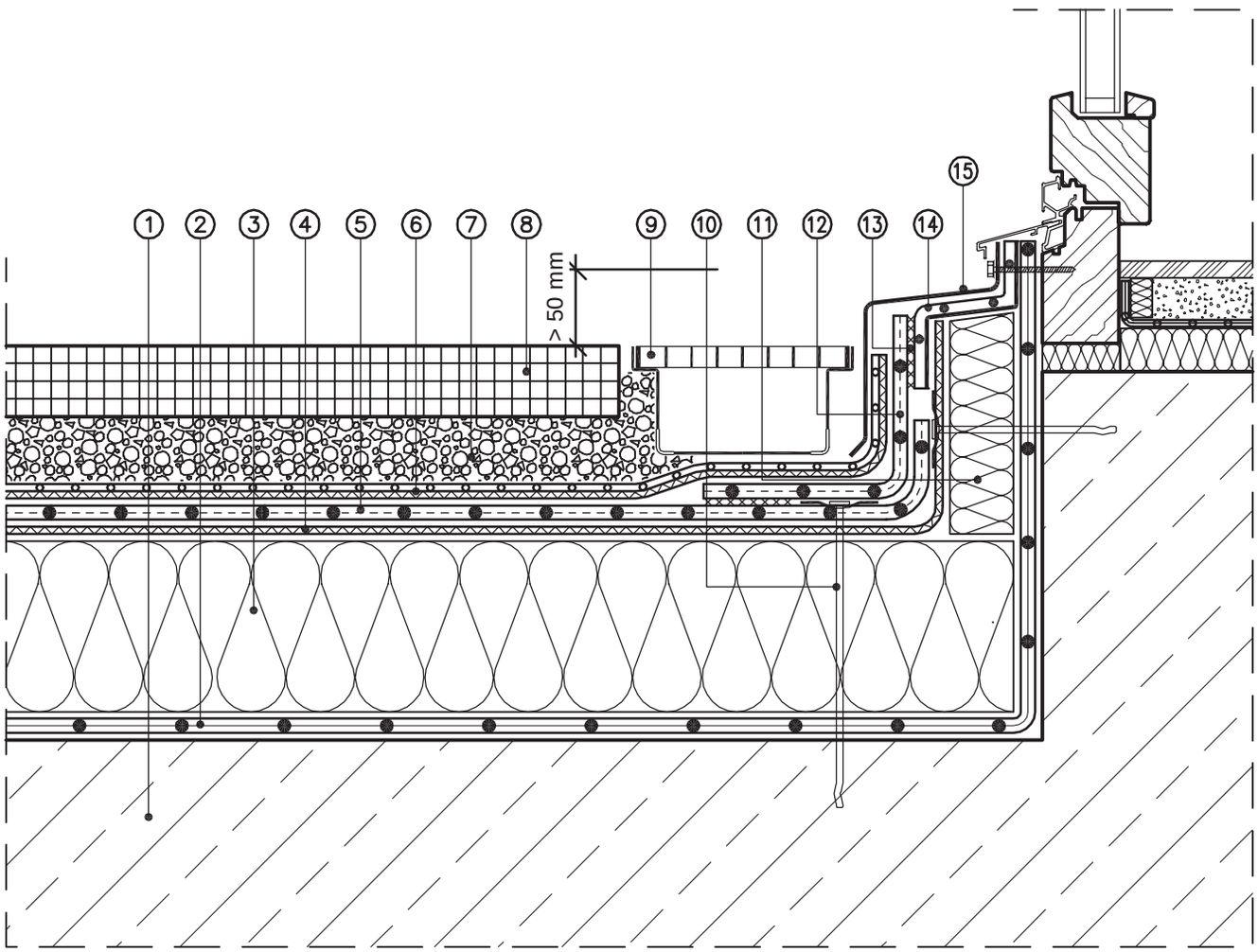


Ventilated roof (cold roof)

① Timber board cladding/derived timber products
② Separation layer FDT synthetic fleece 300 g/m²
③ Roofing membrame Rhenofol CG, 1.5 mm thickness
④ FDT protection layer
⑤ Gravel bed 8/16
⑥ Paving slabs

Terraced Areas
Flashing against door sill with gutter
Non ventilated roof (warm roof)

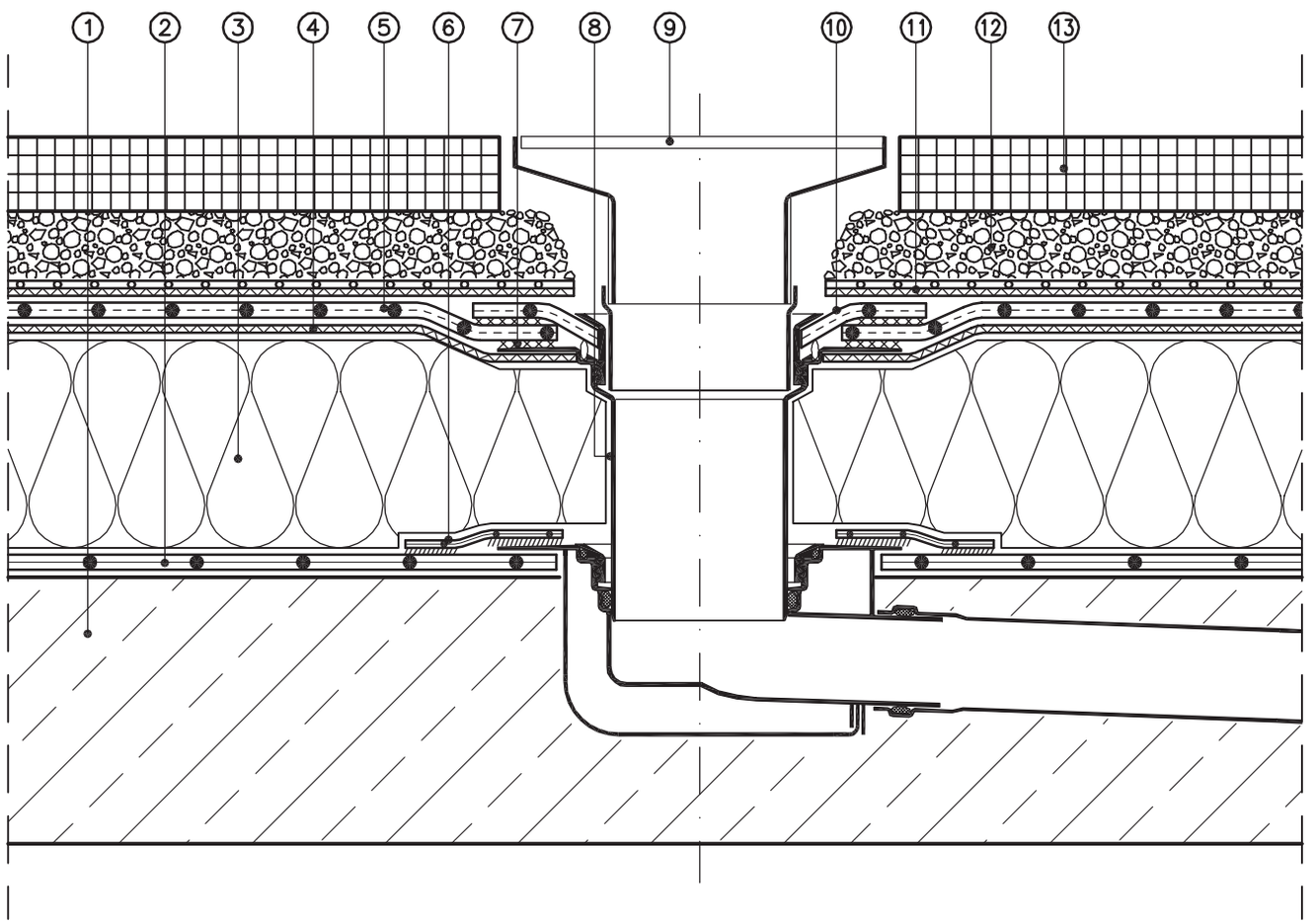
Scale 1:5
(The layers relevant to the sealing are shown accentuated)



① Reinforced concrete
② FDT vapour control layer PE
③ Thermal insulation to specification
④ Separation layer FDT glass fleece 120 g/m^2 (See page 48)
⑤ Roofing membrane Rhenofol CG, min. 1.5 mm thick (See page 48)
⑥ FDT protection layer
⑦ Soft sand
⑧ Paving slabs
⑨ Gutter with grid
⑩ Perimeter fixing
⑪ Thermal insulation
⑫ Rhenofol CG flashing strip
⑬ Welding
⑭ Rhenofol laminated metal angle
⑮ Metal flashing

Flashing against roof outlet
Non ventilated roof (warm roof)

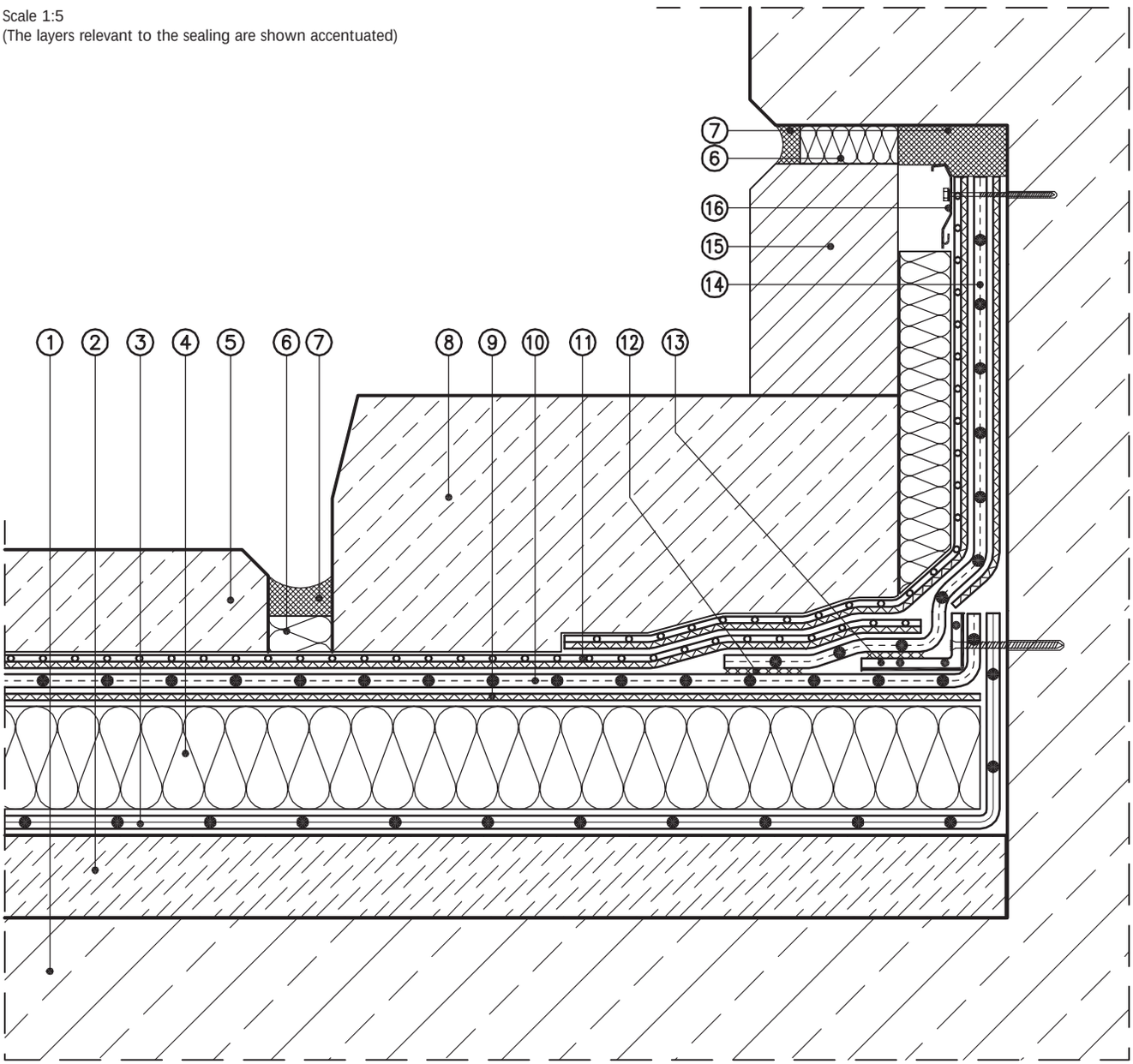
Scale 1:5
(The layers relevant to the sealing are shown accentuated)



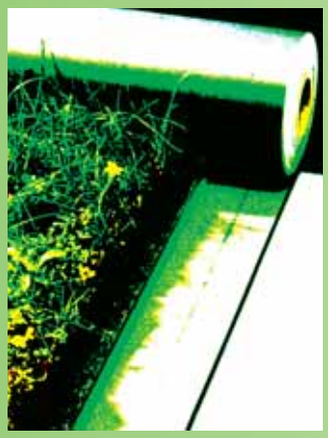
① Reinforced concrete
② FDT vapour control layer PE
③ Thermal insulation to specification
④ Separation layer FDT glass fleece 300 g/m² (See page 48)
⑤ Roofing membrane Rhenofol CG, min. 1.5 mm thick (See page 48)
⑥ FDT connection tape for FDT vapour control layer PE
⑦ Welding
⑧ FDT VarioGully roof outlet low profile side outlet
⑨ Leaf guard with lifting ring
⑩ Rhenofol C collar
⑪ FDT protection layer
⑫ Soft sand
⑬ Paving slabs

Terraced areas and parking decks
Wall connection
Non ventilated roof (warm roof)

Scale 1:5
(The layers relevant to the sealing are shown accentuated)



① Reinforced concrete
② Screed to falls
③ FDT vapour control layer PE
④ Thermal insulation to specification
⑤ Concrete screed
⑥ Mineral wool
⑦ Mastic
⑧ Kerb
⑨ Separation layer FDT synthetic fleece 300 g/m^2
⑩ Roofing membrane Rhenofol CG, 1.8 mm thick
⑪ FDT protection layer
⑫ Welding
⑬ Rhenofol laminated metal angle
⑭ Rhenofol CG flashing strip
⑮ Concrete
⑯ FDT wall connection profile



Roof gardens with Rhenofol® CG loose laid with ballast

Zoological garden, Giraffe house, Magdeburg/Germany

Office and business centre, Hamburg/Germany

Safety and functional efficiency

Safety and functional efficiency

Roofing membranes Rhenofol CG meet all requirements set up for reliable waterproofing of green roofs.

In terms of resistance to root/rhizome penetration, Rhenofol CG meets the test requirements of the FLL testing method. That means that the roofing membranes Rhenofol CG serve as both waterproofing and as a protection against root penetration at the same time. There is no need for a separate root protection layer.

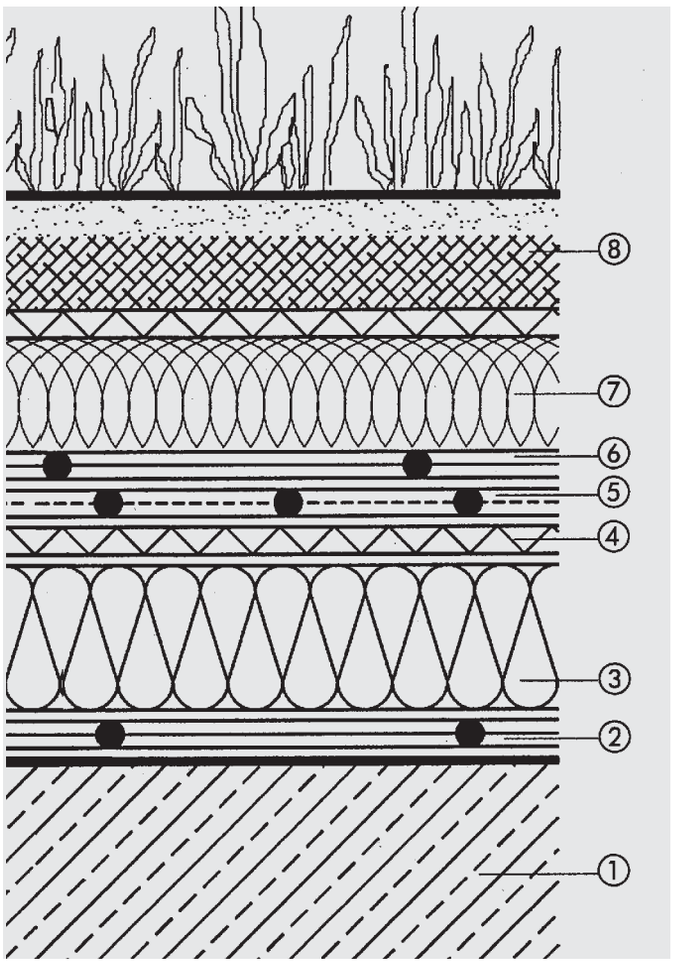
Because of loose laying between the two protection layers, the roof membrane is not attached to the other layers of the build-up across the complete area, ensuring that shrinkage and tension cracks in adjoining layers will not impair the performance of the membrane.

In most cases the ballast in form of a vegetation mat is sufficient for ensuring stability against wind uplift.

The membrane is rot resistant. Solutions containing natural chemicals and humic acid do not impair the functional efficiency.

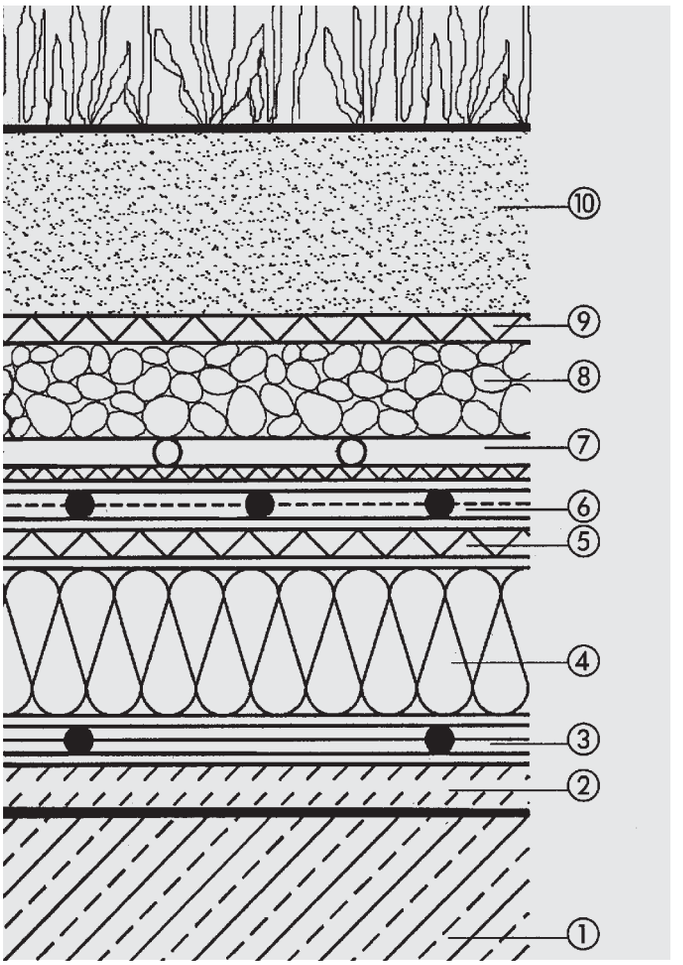
Layer build-ups
Extensive roof gardens
Intensive roof gardens

Example for layer build-up:
Extensive roof garden



① Reinforced concrete
② FDT vapour control layer PE
③ Thermal insulation to specification
④ Separation layer, FDT synthetic fleece 300 g/m², alternatively FDT glass fleece 120 g/m²
⑤ Roofing membrane Rhenofol CG 1.5 mm
⑥ PE separation layer, 0.2 mm thick
⑦ Combined drainage, filter and protection layer
⑧ Vegetation mat

Example for layer build-up:
Intensive roof garden



① Reinforced concrete
② Screed to falls
③ FDT vapour control layer PE
④ Thermal insulation to specification
⑤ Separation layer FDT synthetic fleece 300 g/m²
⑥ Roofing membrane Rhenofol CG 1.5 mm
⑦ FDT protection layer sheet as upper protection layer
⑧ Drainage layer
⑨ Filter layer
⑩ Vegetation layer, without storage irrigation

Supporting construction, vapour control layer

Application instructions

Supporting construction

- The supporting deck structure has to meet the requirements with regard to load-bearing capacity, deflection, anchorage and drainage.
- Clean, dry and even roof surfaces.
- Suitable substrates must be free of open cracks, rough concrete, sharp projections and stones.
- Joints that may impede the functional efficiency of the roof sealing due to their width or movements, have to be formed according to constructional requirements.
- Green roofs should be designed with a slope. The designed slope should be 2% or more.
- With steeper roof slopes (from approx. 7°) special shearing protection measures are necessary, which must be agreed with the manufacturer of the green roof system, depending on the project. In this respect, the instruction of the manufacturer of the green roof system must be observed.
- For compatibility reasons, timber board cladding or chipboards may be treated only with salt-based wood preservatives. Oil or solvent based impregnation agents must not be used.
- An intrusion of air underneath the roof sealing at the roof perimeter and at roof penetrations must be prevented. Therefore these areas have to be made windtight.
- Rhenofol roofing membranes must not come into contact with bitumen or tar.
- National standards and regulations must be observed.

Vapour control layer

As vapour control layers, in the case of non-ventilated roofs, we recommend:

- For non air-conditioned rooms (e.g. living rooms and offices or similar rooms without suspended ceiling):
  – FDT vapour control layer PE (polyethylene).

The FDT vapour control layer PE is applied with a 100 mm seam overlap. The seams are sealed with seam or connection tape.

- For rooms with high air condition loads (e.g. swimming pools, air-conditioned rooms):
  – aluminium compound foils
  – our control membrane with metal tape reinforcement.

In case of doubt, we recommend a calculation of the building physics in order to identify the diffusion characteristics of the roof build-up.

The vapour control layer must be taken up and flashed at connections and cappings with connection tape; at roof penetrations it must be flashed.

- National standards and regulations must be observed.

Thermal insulation layer
lower protection layer
sealing
upper protection layer

Thermal insulation layer

You must bear in mind tread-fastness when designing the thermal insulation layer on steel profile supporting decks.
As materials for thermal insulation layers we recommend:

- Insulation boards made of expanded polystyrene, with rebated edge, according to EN 13163.
- Non-flammable mineral fibre boards, according to EN 13162.
- Large-sized insulation boards made of quality assured rigid foam PUR / PIR according to EN 13165.

Insulation materials that are not dimensionally stable and which buckle or bulge must not be installed. The insulation boards must be laid with lightly buttet joints in brick bond.

- National standards and regulations must be observed.
- The guidelines of the insulation board manufacturer must be observed.

Lower protection layer

Under the membrane a FDT synthetic fleece protection 300 g/m² is applied. In case of extensive green roofs and polystyrene thermal insulation layers you may also use FDT glass fleece 120g/m². The protection layer provides reliable protection of the membrane against mechanical impact originating from the substrate and prevents interaction e.g. with rigid polystyrene foam.

- National standards and regulations must be observed.

Sealing

Green roof areas are sealed with loose laid roofing membranes Rhenofol CG, at least 1.5 mm thick. Place ballast immediately onto loose laid roofing membranes to secure its position against wind uplift.

- National standards and regulations must be observed.

Perimeter fixing

In principle, you will need perimeter fixing (at least 4 single fasteners/m or fixing with Rhenofol laminated metal sheet) at all flashings and cappings, built-in details etc.

Upper protection layer

As an upper protection layer, 1.8 mm thick FDT protection layer (PIB with polyester fleece backing) are installed with a seam overlap of 5 cm, hot-air welded or connected using Rhepanol sealing tape.

At flashings and cappings a separate flashing strip is used loosely overlapping the protection layer at roof level by 250 mm (see page 64/ item 12).

With extensive green roof systems instead of FDT protection layer a min. 0.2 mm thick PE foil can be applied as an upper separation layer, provided that on top of the PE foil a drainage layer is installed serving as upper protection layer at the same time.

For compatibility reasons coarse rubber protective sheets must be laid on a separation layer (e. g. synthetic fleece).

- National standards and regulations must be observed.

Roof garden system/position stability

Roof gardens system/position stability

Greening of the roof is done with standard roof garden systems.

You must use only drained green roof systems, since the described roof build-ups are not designed for storage irrigation.

Note:

- As regards green roof layers (drainage, filter and vegetation layer), the instruction of the manufacturer of the green roof system must be observed.

The green roof build-up in many cases also provides adequate ballast against wind uplift.

The calculated wind loads must be observed. Only the dry weight of the green roof build-up will be taken into consideration.

If the green roof system does not provide sufficient ballast, e.g. in case of lightweight extensive green roofs at the perimeter and corner areas of the roof, the roofing membrane must be mechanically fastened in these areas, e.g. at the overlapped membrane edge. Spacing of the mechanical fastening is normally done with respect to the overall wind load. In this case, the weight of the green roof layers should not be taken into consideration.

- National standards and regulations must be observed.

Flashings and cappings/built-in details

Flashings and cappings/built-in details

All flashings and cappings are also carried out with Rhenofol CG flashing strips.

The flashing strips must be sufficiently fixed. If the flashing membrane is bonded, then at flashing heights over 200 mm fully bonding is necessary, the first 200 mm being left un-bonded.

With mechanical fastening of the flashing membrane - with Rhenofol laminated metal sheets or by clamping with the mounting rail of the roof edge trim - the spacing between the in-line fasteners must be not more than 500 mm. In this case the whole girth dimension must be taken into consideration.
The width of the Rhenofol laminated metal sheets for intermediate fixing must be at least 50 mm.

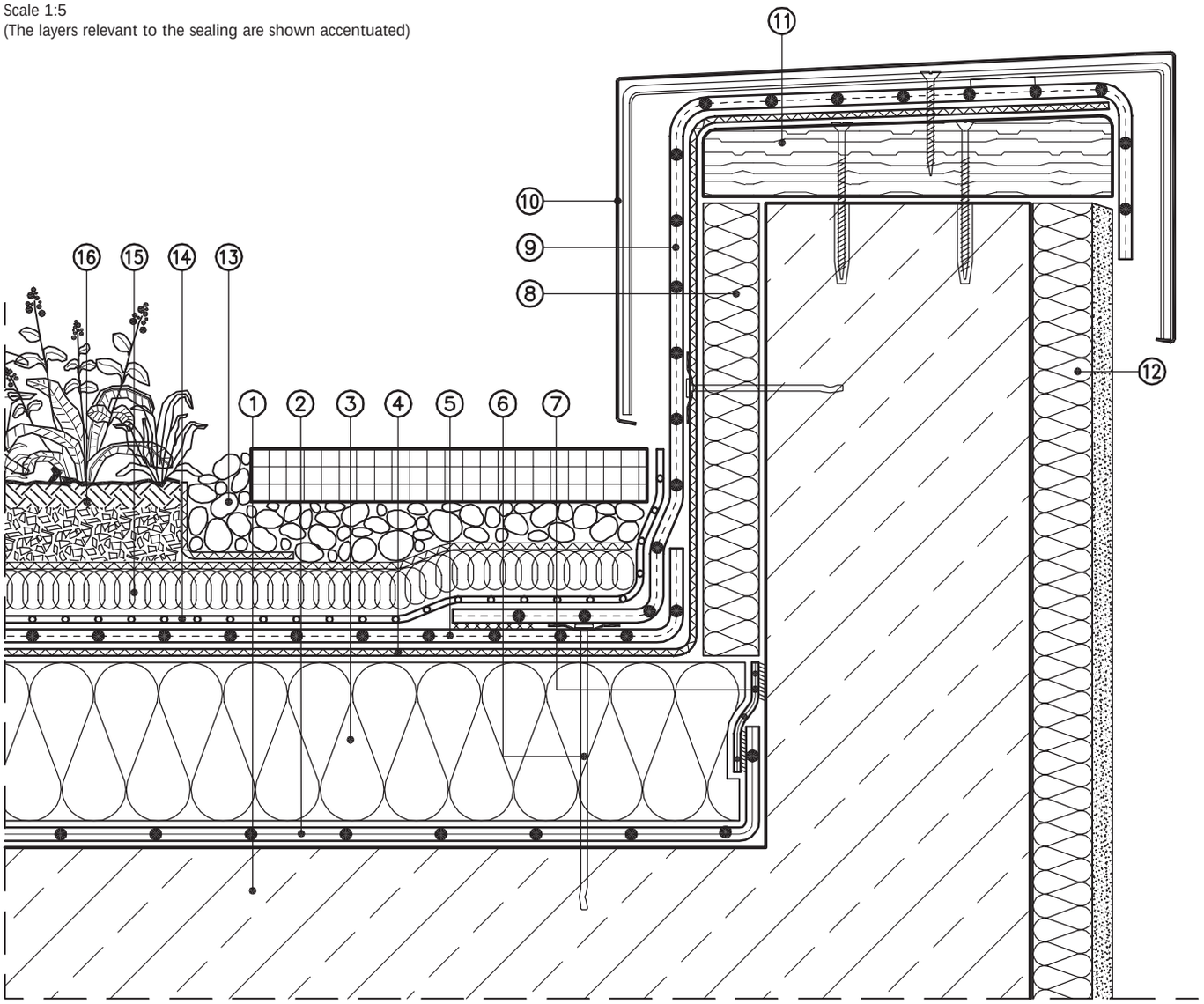
All flashings and cappings, roof penetrations etc. must be kept free of vegetation. Paving slabs in a fine gravel bed are most suitable for these purposes.

Roof outlets should be at least 500 mm away from all edges of the building as well as from joints and penetrations. Besides this, they must be designed to be accessible at any time.

At all flashings the sealing must be taken up at least 150 mm over the surface of the green roof, fixed with mounting rails and made rain-proof.

Parapet
Non ventilated roof (warm roof)

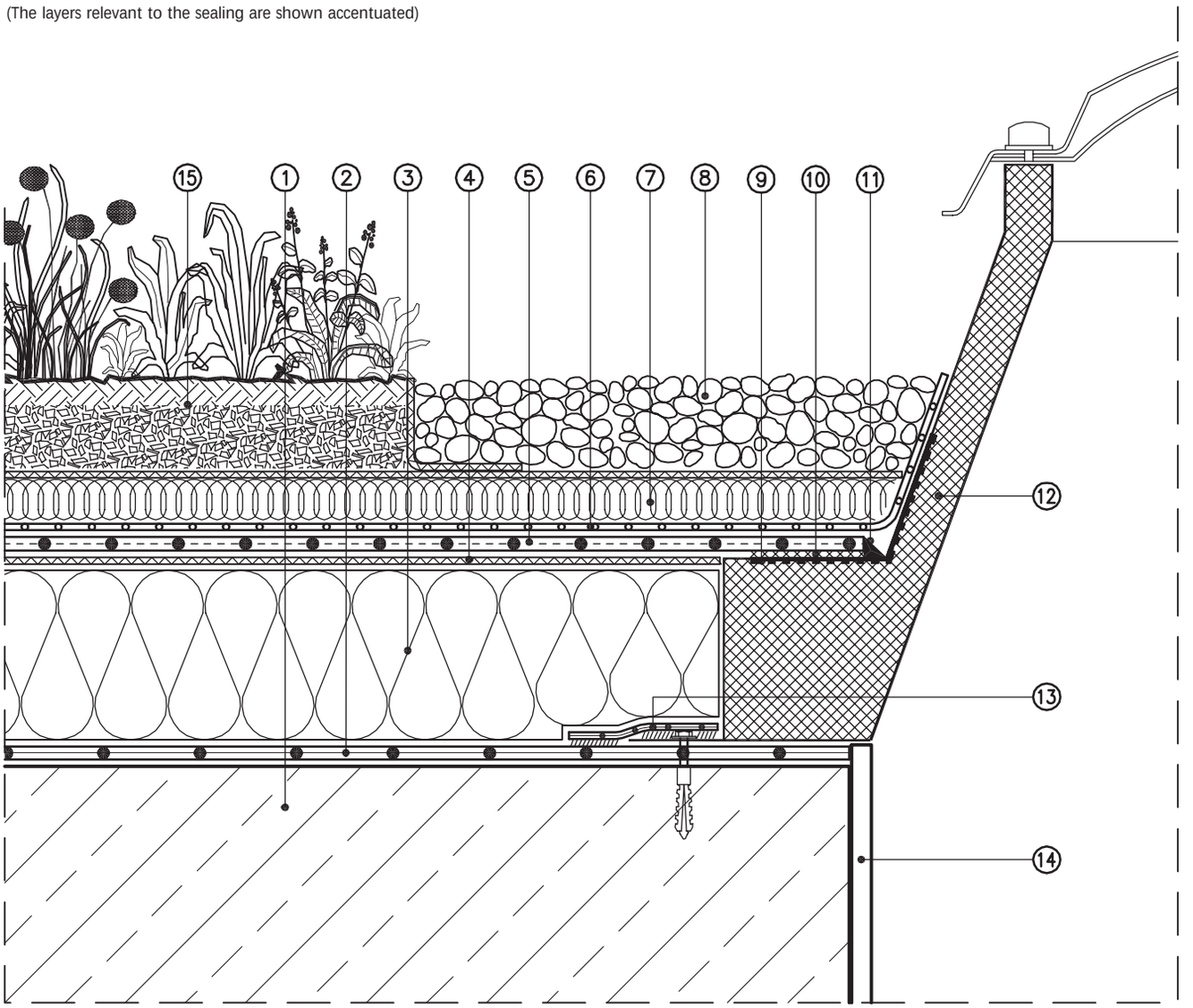
Scale 1:5
(The layers relevant to the sealing are shown accentuated)



① Reinforced concrete
② FDT vapour control layer PE
③ Thermal insulation to specification
④ Separation layer FDT synthetic fleece 300 g/m²
⑤ Roofing membrane Rhenofol CG 1.5 mm thick
⑥ Perimeter fixing
⑦ FDT connection tape for vapour control layer PE
⑧ Thermal insulation
⑨ Rhenofol CG flashing strip
⑩ Capping
⑪ Treated timber profile
⑫ Thermal insulation
⑬ Paving slabs in gravel bed
⑭ PE separation layer, 0.2 mm thick
⑮ Drainage and filter mat
⑯ Vegetation mat

Rooflight connection
Non ventilated roof (warm roof)

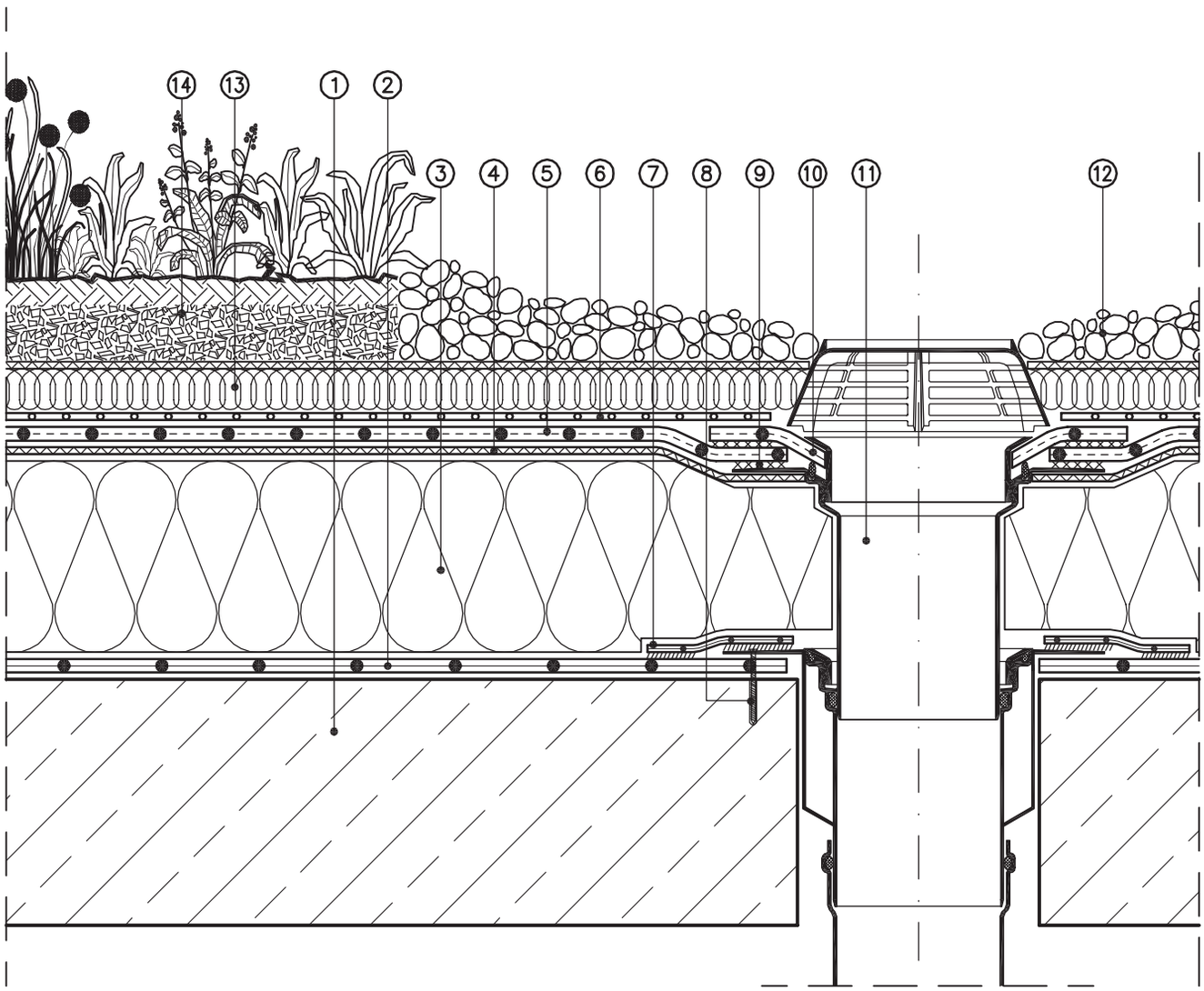
Scale 1:5
(The layers relevant to the sealing are shown accentuated)



① Reinforced concrete
② FDT vapour control layer PE
③ Thermal insulation to specification
④ Separation layer FDT glass fleece 120 g/m^2
⑤ Roofing membrane Rhenofol CG, 1.5 mm thick
⑥ PE separation layer, 0.2 mm thick
⑦ Drainage and filter mat
⑧ Min. 50 mm round washed gravel (20 mm - 40 mm diam.)
⑨ Integrade rigid PVC strip
⑩ Welding
⑪ Rhenofol paste
⑫ Insulated roof light kerb
⑬ FDT connection tape for vapour barrier PE
⑭ Plaster
⑮ Vegetation mat

Roof outlet
Non ventilated roof (warm roof)

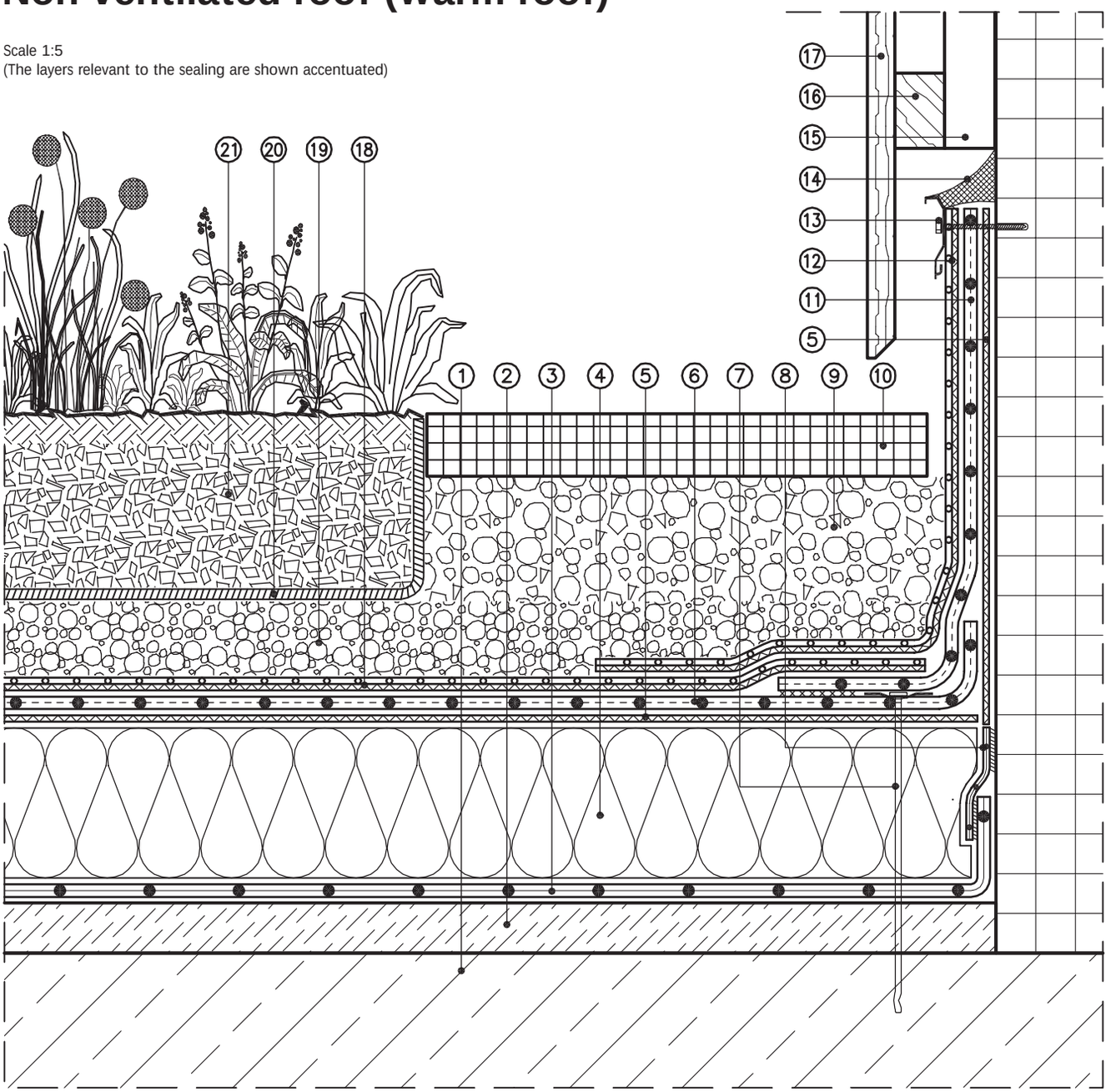
Scale 1:5
(The layers relevant to the sealing are shown accentuated)



① Reinforced concrete
② FDT vapour control layer PE
③ Thermal insulation to specification
④ Separation layer FDT synthetic fleece 300 g/m^2 (See page 58)
⑤ Roofing membrane Rhenofol CG, 1.5 mm thick (See page 58)
⑥ PE separation layer, 0.2 mm thick
⑦ FDT connection tape for FDT vapour control layer PE
⑧ Rainwater outlet fixings
⑨ Welding
⑩ Rhenofol Ccollar
⑪ FDT VarioGully roof outlet with warm roof attachment
⑫ Round washed gravel (20 mm - 40 mm daim.)
⑬ Drainage and filter mat
⑭ Vegetation mat

Intensive roof garden with Rhenofol® CG
Parapet
Non ventilated roof (warm roof)

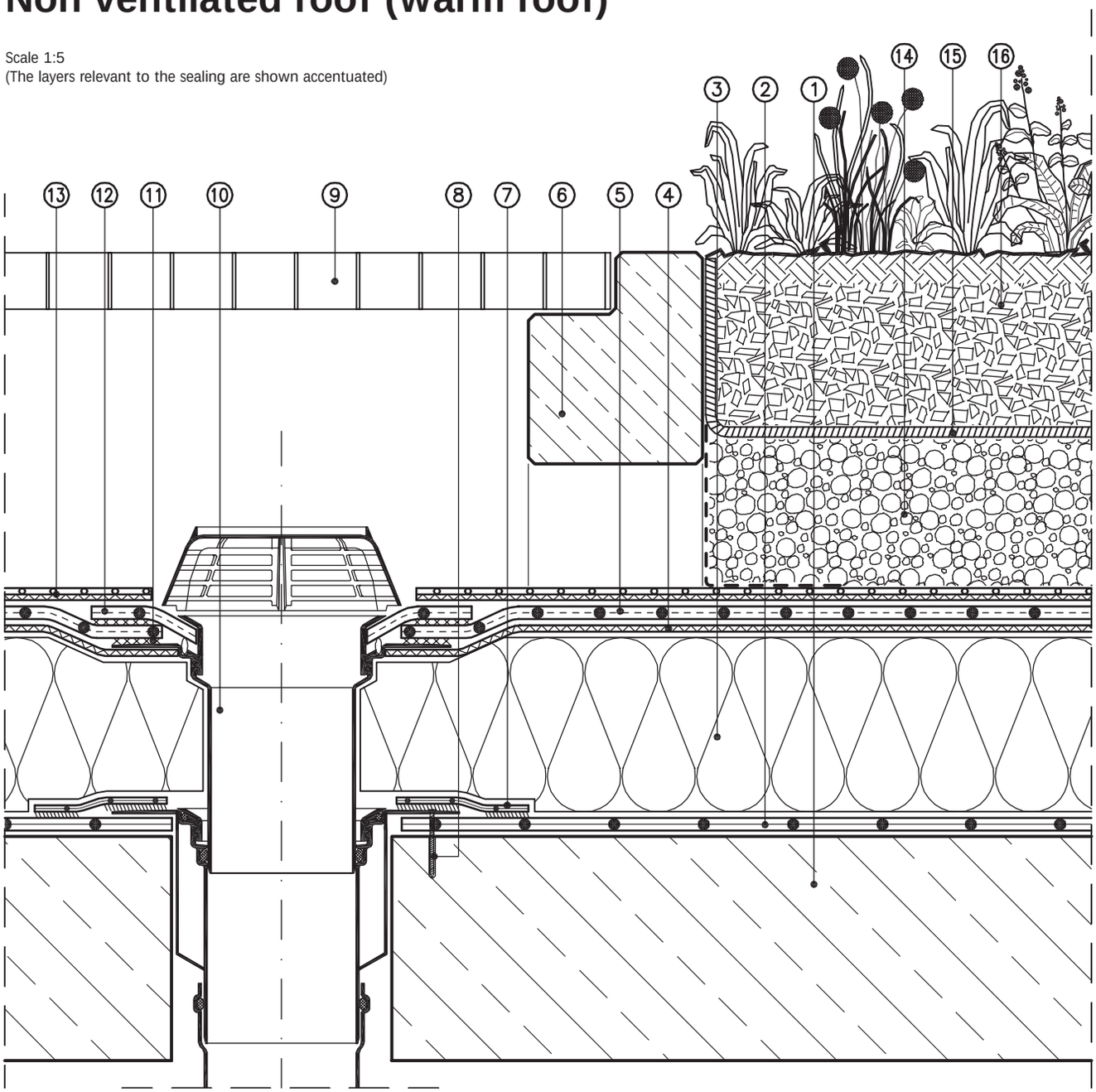
Scale 1:5
(The layers relevant to the sealing are shown accentuated)



① Reinforced concrete
② Screed to falls
③ FDT vapour control layer PE
④ Thermal insulation to specification
⑤ Separation Layer FDT synthetic fleece 300 g/m² (See page 58)
⑥ Roofing membrane Rhenofol CG, 1.5 mm thick (See page 58)
⑦ Perimeter fixing
⑧ FDT connection tape for FDT vapour control layer PE
⑨ Gravel bed
⑩ Paving slabs
⑪ Rhenofol CG flashing strip
⑫ FDT protection strip
⑬ FDT aluminium wall connection profile Classic
⑭ FDT sealant A
⑮ Timber battern
⑯ Counter battern
⑰ Cladding
⑱ FDT protection layer
⑲ Drainage layer
⑳ Filter layer
㉑ Vegetation layer

Intensive roof garden with Rhenofol CG
Roof outlet with concrete ring
Non ventilated roof (warm roof)

Scale 1:5
(The layers relevant to the sealing are shown accentuated)



① Reinforced concrete
② FDT vapour control layer PE
③ Thermal insulation to specification
④ Separation Layer FDT synthetic fleece 300 g/m² (See page 58)
⑤ Roofing membrane Rhenofol CG, 1.5 mm thick (See page 58)
⑥ Concrete ring
⑦ FDT connection tape for FDT vapour control layer PE
⑧ Rainwater outlet fixings
⑨ Grating
⑩ FDT VarioGully roof outlet with warm roof attatchment
⑪ Welding
⑫ Rhenofol collar
⑬ FDT protection layer
⑭ Drainage layer
⑮ Filter layer
⑯ Vegetation mat

Data sheets

Product information

Accessories

Roofing membrane Rhenofol® CV

Rhenofol CV
The roofing membrane for mechanically fixed roof build ups.

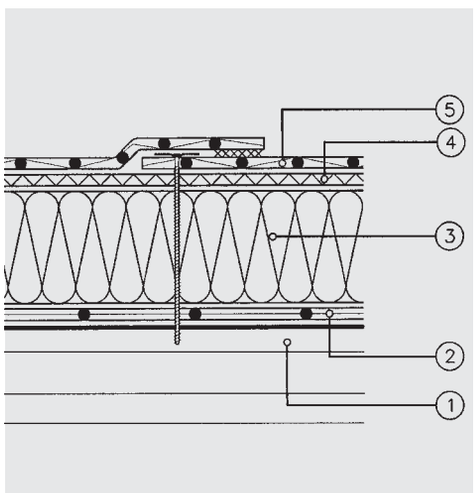
Rhenofol CV is a product made of non-rigid polyvinyl chloride (PVC-P), a synthetic fibre reinforced roofing membrane.
Owing to the outstanding material characteristics, roofing membranes Rhenofol CV are suitable for single-ply application.
Seam overlaps can be practically sealed with solvent or hot air welding.

Quality assurance

Rhenofol CV is subject to constant in-house and external quality control. The in-house quality assurance system for the whole company has been certified according to DIN ISO 9001, the world's most strict quality standard, and is constantly monitored by TÜV CERT.

Range of application

Rhenofol CV is used for waterproofing in mechanically fixed build ups without ballast, especially for lightweight roofs. Used in conjunction with FDT standing seam profiles a simulated metal welted-seam roof can easily and economically be produced.



Rhenofol CV, mechanically fastened

① Corrosion-protected profiled steel decking
② FDT Vapour control layer PE
③ Thermal insulation layer acc. to specification
④ FDT glass fleece 120 g/m²
⑤ Rhenofol CV, mechanically fastened

Material properties

- Roofing membrane according to EN 13956.
- Weather resistant.
- Resistant to UV-radiation.
- Resistant to flying sparks and radiant heat according to DIN 4107 resp. to V ENV 1187, confirmed by official test certificates.
- Building materials class B2, DIN 4102 resp. class E, EN 13501-1.
- Resistant to standard exhaust gas from industrial and heating plants.
- Outstanding resistance to natural ageing.
- Not resistant to bitumen and tar containing materials; organic solvents such as benzene, toluene, hydrogechlorides; fats, oils, such as oily cements and forming oils. Not compatible with rigid polystyrene foam.
- Hail resistant acc. to SIA 280.

Roofing membrane Rhenofol® CV

Properties	EN standard	Value	Unit
Tensile strength	EN 12311-2 (A)	≥ 1000	N/50 mm
Elongation	EN 12311-2 (A)	≥ 15	%
Tear resistance	EN 12310-2	≥ 200	N
Joint peel resistance	EN 12316-2	≥ 150	N/50 mm
Joint shear resistance	EN 12317-2	≥ 250	N/50 mm
Resistance to impact ø 10 mm	EN 12691	≥ 500	mm
Resistance to static load	EN 12730 (B)	20	kg
Hail resistance; SIA 280	EN 13583	passed	
Dimensional stability	EN 1107-2	≤ 0.2	%
Water tightness	EN 1928 (B)	≥ 400	kPa
Foldability at low temperatures	EN 495-5	- 30	°C
UV exposure	EN 1297	5000	h
Water vapour properties; µ	EN 1931	18000	
Reaction to fire	EN 13501-1	class E	
External fire performance	ENV 1187 DIN 4102-7	$B_{roof}(t1)$	
Thermal conductivity	DIN 52612	0.16	W/mK

Forms of supply

Colour	Thickness	Width	Length	Weight
	mm	m	m	kg/m²
light-grey	1.2	2.05	20	1.47
light-grey	1.2	1.50	20	1.47
light-grey, anthracite, white[1)]	1.2	1.03	20	1.47
light-grey	1.2	0.68	20	1.47
light-grey	1.5	2.05	15	1.85
light-grey, anthracite[1)]	1.5	1.50	20	1.85
light-grey	1.5	1.03	20	1.85
light-grey	1.5	0.68	20	1.85
light-grey	1.5	0.50	20	1.85
light-grey	1.8	2.05	15	2.25
light-grey	1.8	1.50	15	2.25
light-grey	1.8	1.03	15	2.25
light-grey	2.0	1.50	15	2.48

[1)] Other colours on request

Roofing membrane Rhenofol® CG

Rhenofol CG
The roofing membrane for loose laid application under ballast, e. g. gravel or paving slabs on terraces, concrete on parking decks or with green roof system.

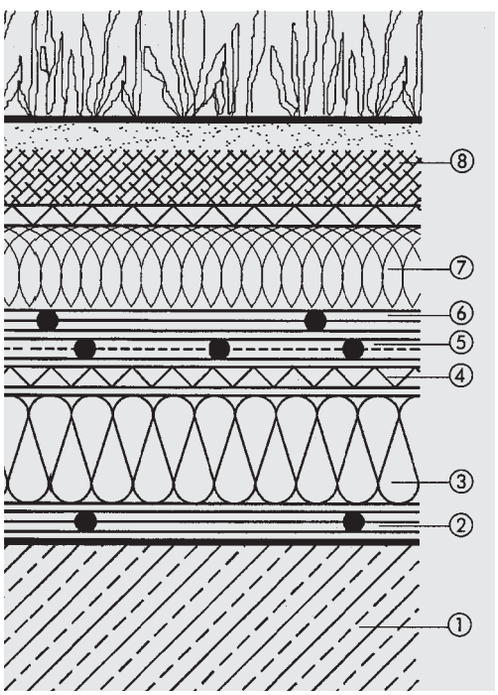
Rhenofol CG is a product made of non-rigid polyvinyl chloride (PVC-P), a roofing membrane with glass reinforcement.
Due to the outstanding material characteristics, Rhenofol CG roofing membranes are ideal for single-ply application. Seam overlaps can be easily sealed with solvent or hot air welding.

Quality assurance

Rhenofol CG is subject to constant in-house and external quality control. The in-house quality assurance system for the whole company has been certified according to DIN ISO 9001, the world's most strict quality standard, and is constantly monitored by TÜV CERT.

Range of application

Rhenofol CG is used for waterproofing in loose laid appplications under ballast with gravel or paving slabs, e. g. on terraces or parking decks or under green roof systems.



Example:
green roof, sealed with Rhenofol CG, loose laid with ballast.

① Reinforced concrete
② FDT vapour control layer PE
③ Thermal insulation layer acc. to specification
④ Separation layer FDT synthetic fleece 300 g/m²
⑤ Rhenofol CG 1.5 mm/1.8 mm
⑥ PE separation layer 0.2 mm thick
⑦ Combined drainage, filter and protection layer
⑧ Vegetation mat

Material properties

- Roofing membrane according to EN 13956.
- Non shrinking according to EN 1107-2 testing.
- Weather resistant.
- Resistant to UV-radiation.
- Resistant to root and rhizome penetration according to FLL testing, tested at 1.5 mm and 1.2 mm thick roofing membranes.
- Building materials class B 2, DIN 4102, resp. class E, EN 13501-1.
- Resistant to standard exhaust gas from industrial and heating plants.
- Outstanding resistance to natural ageing.
- Not resistant to bitumen and tar containing materials; organic solvents such as benzene, toluene, hydrogen chlorides; fats, oils, such as oily cements and forming oils.
  Not compatible with rigid polystyrene foam.
- Hail resistance acc. to SIA 280.

Roofing membrane Rhenofol® CG

Properties	EN standard	Value	Unit
Tensile strength	EN 12311-2 (A)	≥ 600	N/50 mm
Elongation	EN 12311-2 (A)	≥ 200	%
Tear resistance	EN 12310-1	≥ 150	N
Joint peel resistance	EN 12316-2	≥ 150	N/50 mm
Joint shear resistance	EN 12317-2	≥ 250	N/50 mm
Resistance to impact	EN 12691	≥ 500	mm
Resistance to static load	EN 12730 (B)	20	kg
Resistance to root penetration; FLL-testing	prEN 13948	passed	
Hail resistance; SIA 280	EN 13583	passed	
Dimensional stability	EN 1107-2	≤ 0.05	%
Water tightness	EN 1928	≥ 400	kPa
Foldability at low temperatures	EN 495-5	- 30	°C
UV exposure	EN 1297	5000	h
Water vapour properties; µ	EN 1931	18000	
Reaction to fire	EN 13501-1	class E	
Durability of water tightness to weathering	EN 1296 EN 1928	passed	
Thermal conductivity	DIN 52612	0.16	W/mK

Forms of supply

Material	Colour	Thickness	Width	Length	Weight
		mm	m	m	kg/m²
Rhenofol CG	light-grey	1.2	2.05	20	1.54
		1.5	2.05	15	1.88
		1.8	2.05	15	2.28
		2.0	2.05	15	2.53

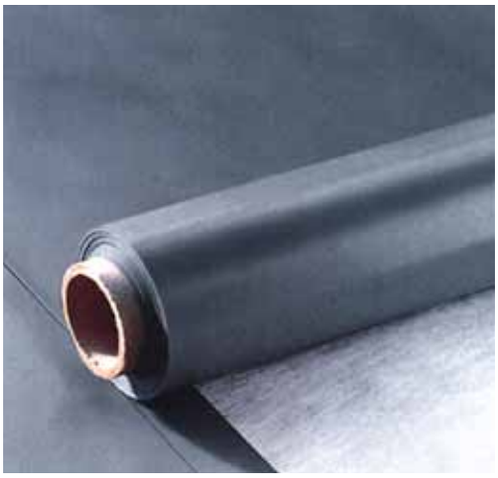
Waterproofing membrane Rhenofol® C

Rhenofol C

Rhenofol C is a product made of non-rigid polyvinyl chloride (PVC-P), un-reinforced waterproofing membrane.
Due to the outstanding material characteristics, Rhenofol C waterproofing membranes are ideal for single-ply application. Seam overlaps can be easily sealed with solvent or hot air welding.

Quality assurance

Rhenofol C is subject to constant in-house and external quality control. The in-house quality assurance system for the whole company has been certified according to DIN ISO 9001, the world's most strict quality standard, and is constantly monitored by TÜV CERT.



Range of application

For detail works with Rhenofol CV/CG roofing membranes and for waterproofing foundations according to DIN 18195

Material properties

- Waterproofing membrane according to DIN EN 13967.
- Weather-resistant, even without additional surface protection.
- Resistant to UV-radiation.
- Resistant to root penetration according to FLL testing, tested at 1.5 mm thick roofing membranes.
- Building materials class E, EN 13501-1.
- Resistant to standard exhaust gas from industrial and heating plants.
- Not resistant to bitumen and tar containing materials, organic solvents such as benzene, toluene, hydrogen chloride, fats, oils such as oily cement and forming oils.
  Not compatible with rigid polystyrene foam.
- Outstanding resistance to natural ageing.

Waterproofing membrane Rhenofol® C

Properties	EN standard	Value	Unit
Tensile strength	EN 12311-2 (B)	≥ 17	N/mm²
Elongation	EN 12311-2 (B)	≥ 350	%
Tear resistance	EN 12310-1	≥ 300	N
Joint shear resistance	EN 12317-2	≥ 200	N/50 mm
Resistance to impact	EN 12691	≥ 500	mm
Resistance to static load	EN 12730 (B)	20	kg
Resistance to root penetration; FLL testing	prEN 13948	passed	
Dimensional stability	EN 1107-2	≤ 2.0 along ≤ 0.5 across	% %
Water tightness	EN 1928	≥ 400	kPa
Foldability at low temperatures	EN 495-5	- 40	°C
Water vapour properties; μ	EN 1931	18000	
Reaction to fire	EN 13501-1	Class E	
Durability of water tightness to weathering	EN 1296 EN 1928	passed	
Thermal conductivity	DIN 52612	0.16	W/mK
Linear coefficient of thermal expansion		1.6 x 10^{-4}	K^{-1}

Forms of supply

Material	Colour[1)]	Thickness	Width	Length	Weight
		mm	m	m	kg/m²
Rhenofol C	light-grey	1.5	2.05	15	1.88
		1.5	1.03	15	1.88
Rhenofol C	white[1)]	1.2	2.05	15	1.52
for pre-cut parts	light-grey	1.2	2.05	15	1.52
(e. g. collars)	anthracite	1.2	2.05	15	1.52

[1)] Other colours on request

FDT vapour control layer PE

FDT vapour control layer PE

Made of polyethylene foil (PE).
Works as diffusion retarding layer.

Material properties

- Highly vapour-retardant.
- Good stability characteristics.
- Building materials class E, EN 13501-1.
- Compatible with bitumen.
- Not resistant to UV-radiation.

Range of application

- For non air-conditioned rooms (e.g. living rooms and offices or similar rooms without suspended ceiling).
- In loosely laid or mechanically fastened layer build-ups with roofing membranes Rhenofol.
- For roofs with higher fire protection requirements pursuant to the industrial building code and DIN 18234 "Fire safety of large roofs for buildings".

Physical data

Properties	Testing according to DIN	Value	Unit
Tensile strength	53455	17	N/mm^2
Elongation at break	53455	450 – 550	%
Thermal conductivity	52612	0.35	W/m x K
Water vapour diffusion resistance coefficient µ	53122	400 000	(air = 1)
Air space width equivalent to water vapour diffusion (s_d = µ x s)		100	m

Forms of supply

Material	Colour	Nominal	Width	Length
FDT vapour control layer PE	green	0.25 mm	4 m	25 m
FDT connection tape for FDT vapour control layer PE			80 mm	12 m
FDT seam tape, fibre reinforced	grey	1 mm	15 mm	25 m

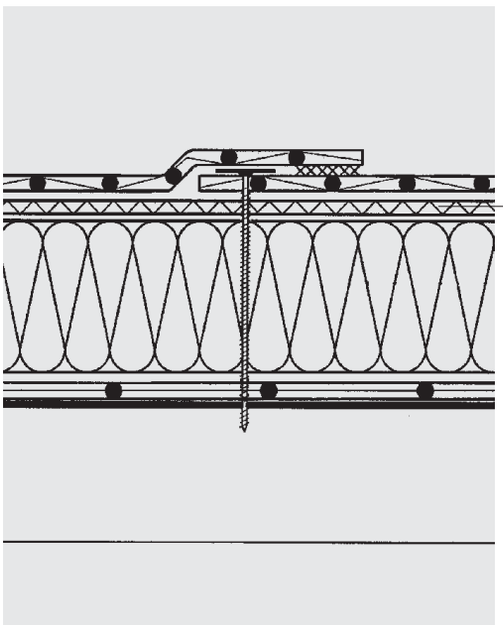
FDT glass fleece 120 g/m²

Material properties

- Building materials class E, EN 13501-1.
- Resistant to rotting
- Not alkali-proof and not resistant to UV radiation

Range of application

- As a separation layer against interaction between roofing membranes Rhenofol and incompatible materials such as rigid polystyrene foam boards.
- As a fire retardant layer in mechanically fastened layer build-ups with roofing membranes Rhenofol, to meet the fire protection requirements with regard to flying sparks and radiant heat.



FDT glass fleece in mechanical fastening on rigid polystyrene foam.

Physical data

Properties	Value	Unit
Nominal thickness	0.7	mm
Nominal weight	120	g/m²
Tensile strength	along 400 across 260	N/50 mm
Elongation at break	< 2	%

Forms of supply

Material	Colour	Width m	Length m	Weight kg/roll
FDT glass fleece	white	2.00	100	approx. 26

FDT synthetic fleece 300 g/m²

FDT synthetic fleece 300 g/m²

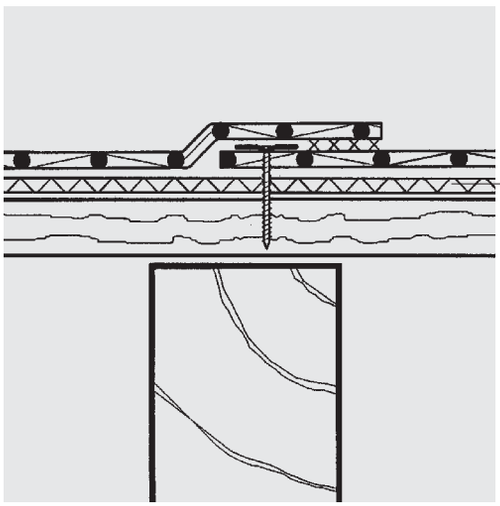
Is a highly tear-resistant laminated synthetic fleece made of 70 % polypropylene and 30 % polyethylene.

Material properties

- Building materials class E, EN 13501-1.
- Resistant to rotting.
- Not resistant to UV-radiation.
- Resistant to all natural acid and alkaline solutions that can be found in the soil.
- Resistant to drilling.

Range of application

- As a protection layer against uneven substrates.
- As a protection layer against non-standard gravel.
- As a separation layer, to prevent interaction between incompatible materials such as Rhenofol roofing membranes and rigid poly-styrene foam boards.



FDT synthetic fleece as a protection layer on timber board cladding.

Physical data

Properties	Value	Unit
Nominal thickness	1.6	mm
Nominal weight	300	g/m²
Tensile strength	650	N/50 mm
Elongation at break	20	%

Forms of supply

Material	Colour	Width m	Length m	Weight kg/roll
FDT synthetic fleece 300 g/m²	white	2.25	50	approx. 36

FDT protection layer

FDT protection layer

protects the roof membrane against mechanical damage. The membrane is a 1.8 mm thick, highly perforation-resistant protection layer, made of PIB, with polyester fleece backing.

Range of application

With roof build-ups with synthetic roofing membranes:

- As a separation layer with non-standard gravel.
- As a protection layer terraced areas such as roof terraces with paving slabs, green roofs and parking decks.

Properties

- Protection of the membrane against mechanical damage.
- The fleece backing provides reliable cushioning separation from the waterproofing layer.
- Membrane width of 2.05 m means economical application.

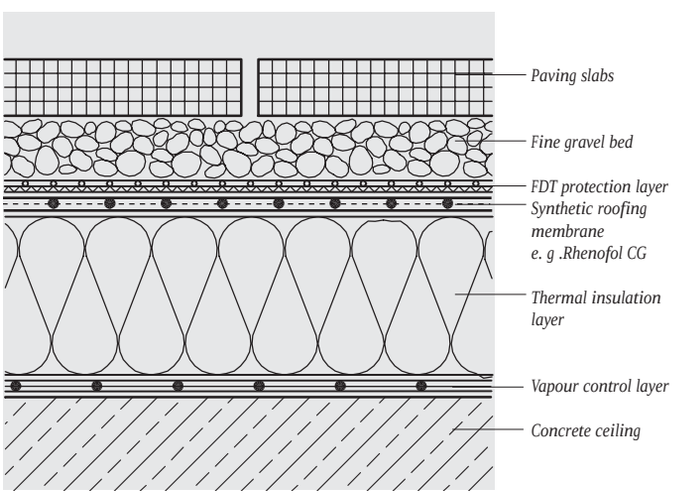
Application instructions

The FDT protection layer is loose laid with the fleece side down.
Depending on the specific application, the seams can be connected in different ways:

- with 80 mm seam overlap without sealing.
- for easy sealing of the seams, the FDT protection layer has no fleece backing along the whole length of one edge.
- with 50 mm seam overlap and sealing by hot-air welding or connected using Rhepanol sealing tape. The seams must be sealed if used as protection layer under screed or slabs in a bed of mortar.

The FDT protection layer is not designed for weather exposure and must always be covered.

At the perimeters of the roof FDT protection layer is applied to the upstand where ballast (gravel or paviours) may butt up against the vertical membrane. The protection layer should extand at least 250 mm over the field membrane.



Forms of supply

Colour	Width m	Length m	Thickness mm	Weight kg/m²
black, lower side white	2,05	20	1,8[1)]	1,0

[1)] including fleece backing

Rhenofol® walkway tile

Rhenofol walkway tile

The Rhenofol walkway tile is a product made of non-rigid polyvinyl chloride (PVC-P), DIN EN 13956, non-compatible with bitumen (NB), with polyester fabric (PG) reinforcement (V), application type DIN V 20000201 DE/E1 - PVC-P-NB-V-PG
The structured surface ensures a safe grip, even on sloped and wet areas. Furthermore, the tile provides for good load distribution.

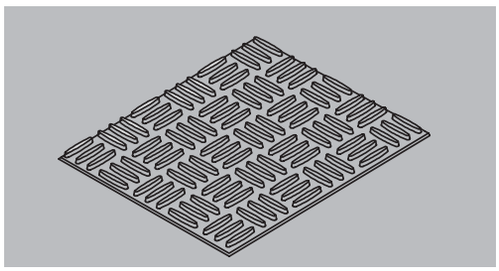
Range of application

Rhenofol walkway tiles are used for protecting the waterproofing and for marking the maintenance walkways on roofs covered with Rhenofol.

Application instructions

- Direct installation on new, clean and dry Rhenofol roof areas.
- Fixing with Rhenofol paste, to be applied on the roof area in approx. 2 cm beads around the tile approx. 3 cm from the edge. Then the Rhenofol walkway tile is put into place and its outer edges are waterproofed with Rhenofol paste.
- Alternatively, hot-air welding is also possible. The welding must be watertight around the whole slab to prevent forming of water pockets.
- In the case of old and soiled roof areas, the seam areas must be cleaned with Rhenofol thinner D.
- No additional measures required to keep the slabs in place.

Note:
If installing the tiles perpendicular to the slope, at low sloped areas ≤ 10° allow for approx. 2 cm joint spacing for water drainage.



Material properties

- Material as for Rhenofol roofing membranes (PVC-P).
- Resistant to UV radiation and weathering.
- Fire performance: building material class E, EN 13501-1.
- Dimensional stability after warm storage (6 h, 80 °C): < 0.2 %.
- Slide prevention and load distribution.
- Meets the requirements of DIN 4426 "Safety requirements for workplaces and accesses" on sloped flat roofs up to 20°.

Product information

Colour:	grey; slight deviations in colour are possible
Surface:	structured, rib height 4 mm
Lower side:	plain
Length/Width/Thickness:	800/600/9 mm
Tolerance:	± 5 mm
Weight:	approx. 8.3 kg/m^2 or 4 kg/tile
Forms of supply:	100 units/pallet or 48 m^2/pallet

Rhenofol® standing seam profile

The **Rhenofol standing seam profile** is a hollow profile made of the same raw material as the roofing membrane, for installation on Rhenofol CV.

Length 4 m.

Range of application

For aesthetic standing seam replicas on sloped roofs with Rhenofol.

Properties

- Flexible standing seam profile for perfect fitting to the building geometry.
- Cutting with standard tools.
- Simple installation with handheld hot-air welder and special hand roller with guide for Leister Triac/PID.

Application instructions

- The application direction is always from the ridge to the eaves.
- Do not install through valley areas, as this may impede rainwater drainage.
- The positioning is done along the seam or in the middle of the membrane

Forms of supply

Product name	Farbe	Forms of supply
Rhenofol standing seam profile	light-grey	180 m/box*
Rhenofol standing seam profile	anthracite	180 m/box*
Rhenofol standing seam profile	red-brown	180 m/box*

*the box contains special plugs for butt joints

FDT gravel stop profile

Application

The FDT gravel stop profiles are high-quality stainless steel elements with an attractive design. The gravel stop profiles consist of 60 mm and 100 mm high and 2 m long sections - with cut-outs for unhindered rain-water drainage. Compensation of thermal elongation is provided for. The Rhenofol holders are fixed to the roof finishes with a piece of roofing membrane. The stainless steel clamp serves as a joint connection and for stiffening the FDT gravel stop profile above the holder.

Range of application

Eaves side trim for gravel-ballasted roofs or terraces with paving slabs in a fine gravel bed.

Properties

Outstanding static properties due to special holders

Application instructions

The holders are installed after laying of the membranes. The holders must only be positioned on membrane which is fully welded to laminated metal strips or drips which must be mechanically fastened to the substrate.

Processing

Processing (cutting) of the gravel stop profiles can be done with standard cutting tools such as sheet shears.

Transportation and storage

The FDT gravel stop profiles are factory-packed in cardboard boxes, with 10 profiles of 2 m length each, including the necessary holders and clamps. The boxes must be stored horizontally in a dry place.

Forms of supply

Product name	Forms of supply
Package of Rhenofol gravel stop profiles, grey or black	10 units at 2 m each incl. holders and clamps

Additional items as required:
Rhenofol holders and clamps
Gravel stop profile 2 m, stainless steel silver
Internal corner for gravel stop profile, stainless steel silver
External corner for gravel stop profile, stainless steel silver

Connection and seam tape, solvent-welding agent, contact adhesive, thinner, paste preformed corners, collar/framing ring, laminated metal sheet

Product name	Properties	Range of application
FDT connection tape	Special adhesive on backing film.	Connection of FDT vapour conrol layer PE seams and flashing to various substrates.
FDT seam tape	Butyl adhesive, fibre reinforced.	For sealing the FDT vapour control layer PE, in the overlap.
Rhenofol solvent-welding agent THF	Solvent Tetrahydrofuran (THF).	For connecting Rhenofol roofing membrane seams and as thinner for Rhenofol paste.
Rhenofol-Contact Adhesive 20	Transparent synthetic rubber based contact adhesive.	For bonding Rhenofol roofing membranes to concrete, timber, steel etc.
Thinner D	Colourless solvent.	Thinner for Rhenofol-Contact Adhesive 20 and to be used as cleaning agent.
Sealant A/S	Acrylate or synthetic rubber base.	For flashings with wall connection profile and against roof lights.
Rhenofol paste	Stabilised non-rigid PVC solution.	For securing seam edges at Rhenofol roofing membranes.
Rhenofol internal corner 90°	Preformed Rhenofol C detail.	For sealing internal corners at Rhenofol roofing membranes.
Rhenofol external corner 90°	Preformed Rhenofol C detail.	For sealing external corners at Rhenofol roofing membranes.
Rhenofol external corner for roof lights	Preformed Rhenofol C detail.	For sealing roof light corners at Rhenofol roofing membranes.
Rhenofol collar loose/ fixed flange	Preformed Rhenofol CV detail.	For all standard rainwater outlets with screw connections.
Rhenofol C framing ring	Preformed Rhenofol C detail.	For flashing against loose/fixed flange rainwater outlets at Rhenofol sealings.
Rhenofol standing seam profile	PVC-P profile.	For decorative imitation of standing seam profiles on Rhenofol CV.
Rhenofol laminated metal sheet	Hot-dip galvanised metal sheet with Rhenofol C backing and lower protective lacquer coating.	For forming profiles for flashings and cappings and for fixation. May be cut and bent like galvanised metal sheets.

Welding paste system: welding paste SB, Rhenofol CV strips, Rhenofol CV sets, welding paste system accessories

Product name	Properties	Range of application
Rhenofol welding paste SB	Paste-like solvent mixture consisting of THF and non-rigid PVC.	For a position-stable connection of roofing membranes Rhenofol CV with mechanically fastened Rhenofol CV sets or strips.
Rhenofol CV strip	Rhenofol CV strip material, 10 cm or 15 cm wide and 50 m long.	For linear fastening of Rhenofol CV with welding paste system. Amount and arrangement of the strips according to the FDT wind uplift calculation.
Rhenofol CV sets	Disc made of Rhenofol CV with a diameter of 18 cm.	For point fastening of Rhenofol CV with welding paste system. Amount and arrangement of the sets according to the FDT wind uplift calculation.
Welding paste system accessories:		
FDT PE container cover		For installing the stirring mechanism, for covering the container and preventing sparks falling into it from possible electrostatic charge.
FDT stirrer		For connecting to a drilling machine for stirring the welding paste.
FDT plastic funnel		For easy discharge of the stirred welding paste into the PE bottle.
FDT PE bottle		For easy application of the welding paste onto the sets or strips.

Tools

Product name	Properties	Range of application
Rhenofol membrane cutter	With 4 spare blades	For easy and safe cutting of Rhenofol.
Rhenofol silicon pressure roller	4 cm wide	For pressing on the Rhenofol roofing membranes to be connected during hot-air welding.
FDT metal pressure roller, small	1 cm wide	For rolling on Rhenofol preformed details during hot-air welding, also at difficult access areas.
FDT teflon pressure roller,	3 cm wide	For rolling on Rhenofol preformed details and membrane seams during hot-air welding.
FDT PE sandbag	Empty	For applying pressure to solvent welding seams.
FDT PE bottle	Contents 0.5 l	For Rhenofol paste.
FDT scissors	25 cm	High-quality reinforced solid metal scissors. For easy cutting of Rhenofol.
FDT brush	5 cm	To be used also for precoating.

FDT VarioGully roof outlet

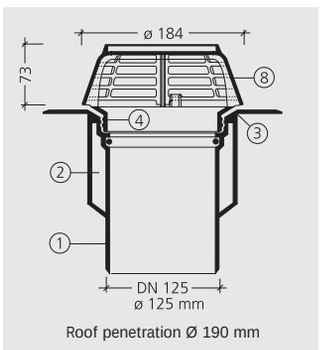
- FDT VarioGully is a proven flat roof rainwater outlet according to EN 1253 and DIN 19599, which is regularly tested by the external testing institute LGA Bavaria.

Properties

- Made of rigid PVC, with increased impact strength, including gravel and leaf guard and can be used without additional elements with any layer thickness from 35 to 240 mm.
- In case of heatable FDT VarioGully options, the heater unit is doubly protected by the two integrated safety systems (heat monitoring relay and fuse). Connection via safety transformer 230/24 V (10 W per outlet).

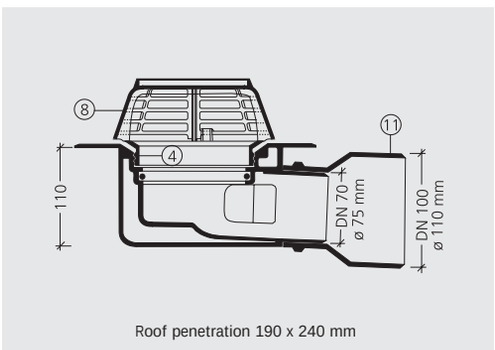
Range of application

- In warm and cold roof structures in vertical and angled version.
- Corresponding warm roof upstands are available for insulation material thicknesses from 35 to 160 mm and 160 to 240 mm.[1)] Direct connection to all vapour control membranes or roofing membranes, or with separately preformed collar.
- If used as an emergency outlet for draining off 100-year rainfall, instead of the screw ring the emergency outlet socket is installed at the FDT VarioGully or the warm roof upstand.



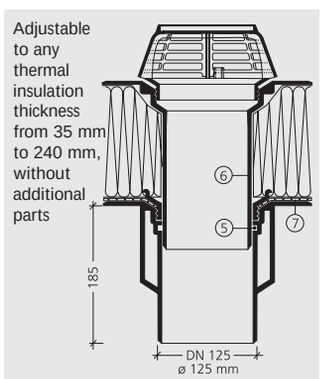
Roof penetration Ø 190 mm

FDT VarioGully vertical, DN 125
without reducer
Roof penetration Ø 190 mm

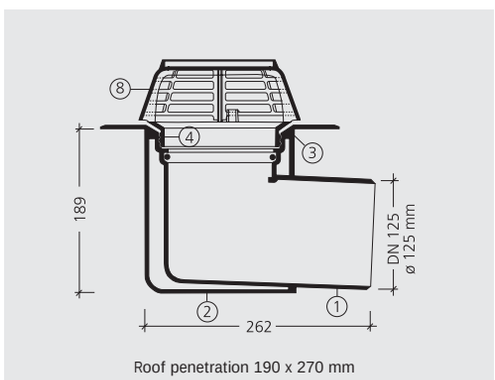


Roof penetration 190 x 240 mm

FDT VarioGully angled, DN 100
extremely flat, overall height 110 mm,
with transition piece DN 70/100
Roof penetration 190 x 240 mm

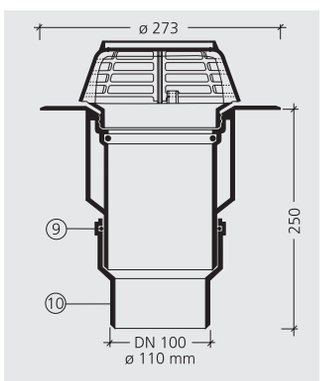


FDT VarioGully vertical, DN 125
with warm roof upstand,
without reducer



Roof penetration 190 x 270 mm

FDT VarioGully angled, DN 125
overall height 189 mm
Roof penetration 190 x 270 mm



FDT VarioGully vertical, DN 100
with reducer DN 125/100

① Discharge socket DN 125
② Insulating sleeve
③ Sealing ring
④ Screw ring
⑤ Roll ring
⑥ Warm roof upstand
⑦ Vapour control layer collar[2)]
⑧ Leaf guard
⑨ Roll ring DN 125
⑩ Reducer DN 125/100
⑪ Transition piece DN 70/100

[1)] Other insulation material thicknesses on request.

[2)] Not part of the FDT VarioGully delivery.

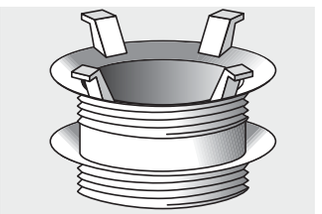
FDT VarioGully refurbishment, accessories for FDT VarioGully roof outlet: FDT emergency overflow socket, FDT leaf guard

FDT VarioGully refurbishment

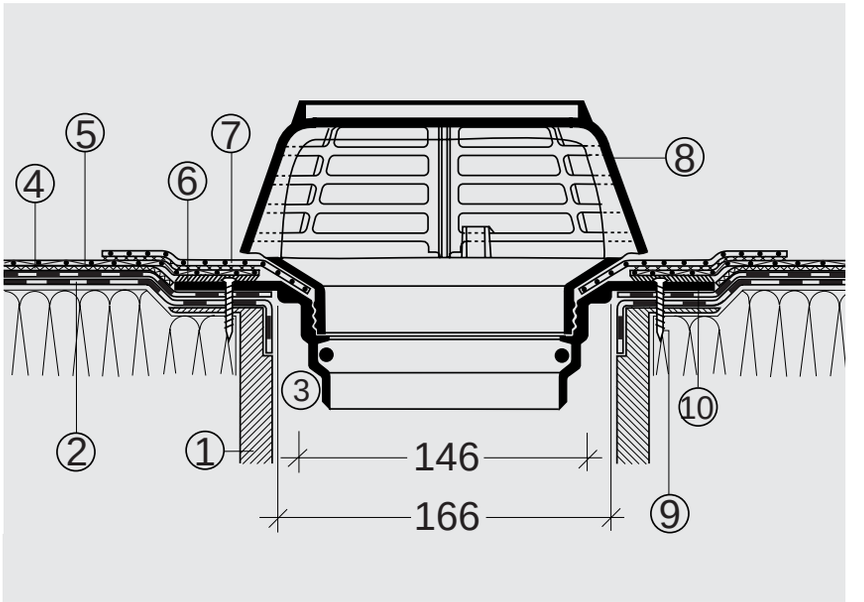
- Ensures installation in the existing old roof without backflow.
- Supplied complete with screws and sealing cord.
- To be used with old roof outlets up to DN 150, depending on the diameter of the run-in area.

Accessories for FDT VarioGully roof outlet:

FDT emergency overflow socket



- Ensure simple conversion of the FDT VarioGully into an emergency overflow
- Socket is 40 mm high

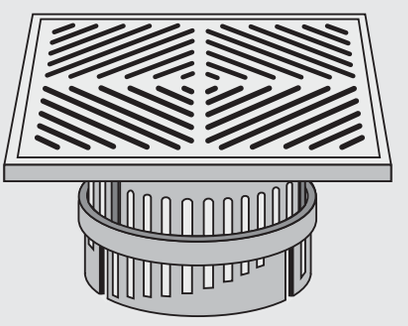


① Existing old roof rainwater outlet
② Existing layer build-up
③ FDT VarioGully refurbishment
④ FDT synthetic fleece 300 g/ m²
⑤ Roofing membrane Rhenofol CV
⑥ Rhenofol solvent welding agent (THF)
⑦ Rhenofol collar
⑧ FDT leaf guard
⑨ Mechanical fastening (4 fast./rainwater outlet)
⑩ Sealing cord

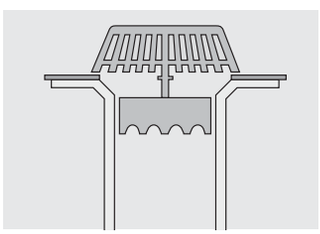
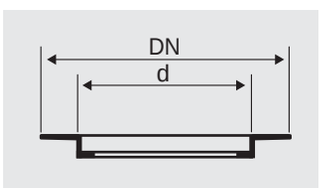
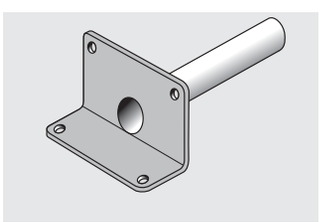
FDT leaf guard

Made of aluminium with lift ring. For application on flat roofs with paving slabs or on inverted roofs.
The installation height of 67 to 90 mm can be adapted to the terrace structure in steps of 3 mm. With a slab height of 90 mm or more, additional lift rings will be necessary. Every additional lift ring gives 36 mm more height.

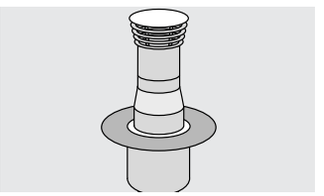
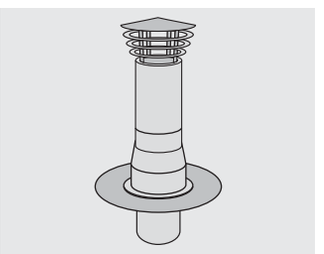
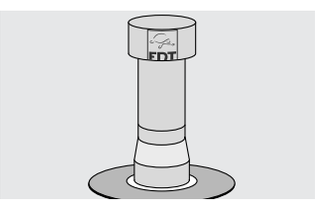
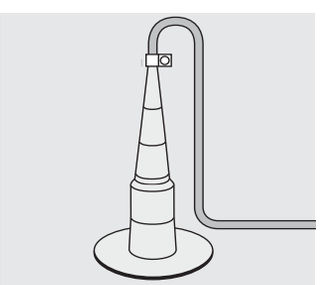
Grid size: approx. 200 x 200 mm.



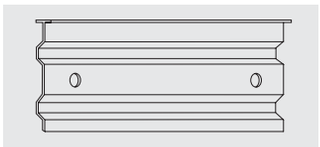
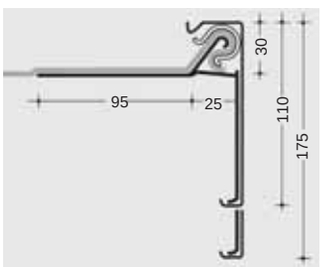
FDT rainwater outlet and accessories
FDT through wall outlet and
FDT weir overflow

Product name	Dimensions in mm		Properties/application
FDT rainwater outlet (RWE)	Outer diameter d		Easy-to-install built-in element. An ideal solution e. g. when it comes to upgrading a roof during refurbishment. The FDT rainwater outlet can be installed in the existing opening in no time at all. Length: 315 mm
Rhenofol-RWE 50	50		
Rhenofol-RWE 56	56		
Rhenofol-RWE 63	63		
Rhenofol-RWE 75	75		
Rhenofol-RWE 95	95		
Rhenofol-RWE 110	110		
Rhenofol-RWE 125	125		
Rhenofol-RWE 140	140		
Rhenofol-RWE 160	160		
FDT leaf guard			The leaf guard is suitable for all rainwater outlet (RWE) and can be cut to size to fit the corresponding diameter.
FDT lip seals for:	Pipe diameter		The FDT lip seals are used for safe installation of RWEs preventing backflow directly into the downpipe or old rainwater outlets
Rhenofol-RWE 95	DN 100		
Rhenofol-RWE 95	DN 125		
Rhenofol-RWE 125	DN 150		
Rhenofol-RWE 160	DN 200		
FDT through wall outlet	Outer-diameter d		When waterproofing e. g. terraces, canopies and garages, the FDT through wall outlet can be installed for collecting and draining heavy precipitation. Length: 480 mm
Rhenofol water spout 50	50		
Rhenofol water spout 75	75		
Rhenofol water spout 110	110		
FDT emergency overflow	Outer-diameter d		When installed in a sufficient number, FDT emergency overflows provide complete drainage of the rainwater from the whole roof or individual roof areas. Two types are available: a sink-type (see fig.) for larger roof areas or with a pipe for smaller roof areas (no fig.)
Rhenofol emergency overflow 63	63		
Rhenofol emergency overflow 75	75		
Rhenofol emergency overflow 110	110		
Rhenofol emergency overflow 600 x 100			
Rhenofol emergency overflow special type			

FDT flat roof vent pipe, FDT refurbishment vent pipe, FDT cold roof vent, FDT lightning conductor, FDT post support

Product name		Properties/application
FDT flat roof vent pipe DN 100		Made of rigid PVC with increased impact strength. With removable cap and bearing ring. Ready for installation with integrated Rhenofol collar.
FDT refurbishment vent pipe for DN 100		Made of rigid PVC with increased impact strength. With removable cap and ready-to-install integrated collar. For flashing against vents (pipe diameter DN 100) in the case of roof refurbishment with Rhenofol.
FDT cold roof vent DN 100		Made of rigid PVC with increased impact strength. Vent cross section of 88 cm². Weather cap can be removed for maintenance. Ready for installation with integrated Rhenofol collar.
FDT Rhenofol lightning conductor		With Rhenofol collar. For flashing against lightning protectors and for penetrations from Ø 8 mm up to Ø 53 mm.
FDT post support		With Rhenofol collar. For flashing against penetrations from 14 mm up to 50 mm With stainless steel clamp for roof anchors Ø 14 - 16 cm. Height 12 cm.

FDT wall connection profiles
FDT edge trim profile

Product name		Properties/application
FDT aluminium wall connection profile Economy		Rigid aluminium profile in punched 3 m sections. For fixing Rhenofol and Rhepanol roofing membranes at vertical surfaces. Fastening with 5 fasteners per metre, hole diameter 8 mm.
FDT aluminium wall connection profile Classic		Highly rigid aluminium profile in punched 4 m sections with slot for hooking up metal sheets. For fixing Rhenofol and Rhepanol roofing membranes at vertical surfaces. Fastening with 5 fasteners per metre, long hole 6.2 x 8 mm.
FDT edge trim profile 110/175		Consisting of an extruded aluminium mounting rail and roll-formed stove enamel cover (colour: silver metal grey, similar to RAL 9007, other RAL colours on request), as well as plastic clamps for fixing roofing membranes up to 5 mm thickness. Roofing membranes ≥ 1.5 mm thick must be folded back once in the clamping area.

BBA BRITISH BOARD OF AGRÉMENT
TECHNICAL APPROVALS FOR CONSTRUCTION

Designated by Government to issue European Technical Approvals

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CI/SfB (47) Ir2

Agrément Certificate No 98/3491
Third issue*

RHENOFOL CV PVC ROOF COVERING SYSTEM
Revêtement d'étanchéité
Dachabdichtungen

Product

- THIS CERTIFICATE RELATES TO THE RHENOFOL CV PVC ROOF COVERING SYSTEM, A POLYESTER MESH REINFORCED PVC ROOF WATERPROOFING MEMBRANE.
- The membrane is for use as a mechanically fixed waterproof covering on flat roofs with limited access.
- The system is installed only by trained and approved contractors.
- The membrane is manufactured in Germany by Flachdach Technologie GmbH & Co KG.

Regulations

1 The Building Regulations 2000 (England and Wales)

The Secretary of State has agreed with the British Board of Agrément the aspects of performance to be used by the BBA in assessing the compliance of roof waterproofing membranes with the Building Regulations. In the opinion of the BBA, the Rhenofol CV PVC Roof Covering System, if used in accordance with the provisions of the Certificate, will meet or contribute to meeting the relevant requirements.

Requirement B4(2) External fire spread
Comment: Data obtained from tests to BS 476-3 : 1958 indicate that on suitable substructures the use of the system will enable a roof to be unrestricted under the requirements of these Regulations. See section 11.1 of this Certificate.

Requirement C4 Resistance to weather and ground moisture
Comment: Tests for water resistance on the membrane, including joints, indicate that the system meets this Requirement. See section 8.1 of this Certificate.

Requirement Regulation 7 Materials and workmanship
Comment: The system is acceptable. See section 13.

Readers are advised to check the validity of this Certificate by either referring to the BBA's website (www.bbacerts.co.uk) or contacting the BBA direct (Telephone Hotline 01923 665400).

eswa
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