PROTAN

Protecting values

# Protan Exposed Membrane Roof

System Specification

# Protan Exposed Membrane Roof

Roof constructions, where the waterproofing membrane is used as the top layer, designed to withstand wear from weather conditions, including rain, UV-radiation, wind load and warm and cold temperatures, are normally referred to as «exposed roofs». An exposed roofing system is typically made up of a structural deck, vapour control layer, thermal insulation and a polymeric single ply roofing membrane.
Single ply roofing membranes for exposed roofs are mostly designed with a polyester reinforcement, which gives them strength to resist direct exposure to local wind loads. The wind forces are transmitted to the supporting deck either by mechanical fasteners, (screw and metal washer or non-thermal bridging plate), or by vacuum suction to a totally air sealed and load bearing supporting deck. Another alternative is a glassfibre reinforced roofing membrane designed for fully adhering to the underlay.

Protan Roofing Membranes «Protan SE, EX and EXG», including «Protan GX» fulfill technical properties required for exposed applications, such as resistance to wear, tensile strength, tear strength and puncture resistance. They are UV-resistant, resistant to spread of flame, have good water vapour properties and are flexible and workable even in cold temperatures. An added benefit from Protan Roofing Membranes is the anti-slip surface for safe application and use.
The various types of insulation and underlays on which the membrane is installed, can have different requirements, e.g. as migration barriers and/or protection or levelling layers. These can either be installed separately before the membrane is installed, or as in the case of Protan EX, EXG and GX membranes, the separation layers are pre-laminated to the reverse side.

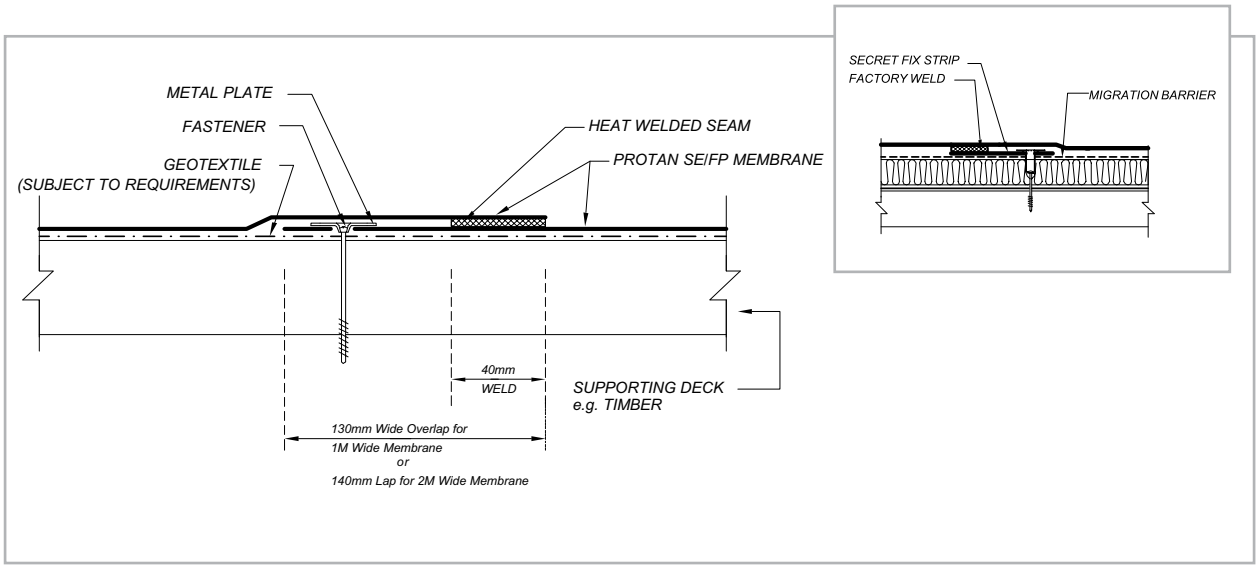
All Protan membranes are hot air weldable.
The strength of the welded joint is as strong as the membrane itself. Generally, longitudinal laps are welded using a semi-automatic welding machine, which optimises the temperature, speed and pressure at which the two membrane surfaces are fused. End laps and details are carried out using hand-held hot air guns. Additional welding can be carried out at any time during the membrane's life.

The success of exposed roofs using single ply roofing systems is mainly due to the fact that the owner, architect or designer gets enormous flexibility and freedom of design, without loss of waterproofing integrity. The membranes are the perfect solution for roofs which include multiple penetrations on flat, sloped and curved roofs. They are available in several standard colours and can also be manufactured in special design colours. Architectural Triangle or Omega-shaped profiles, hot air welded to the roofing membrane, provide a very successful imitation of traditional metal roofing systems at a much reduced cost and without membrane penetration or detailing difficulties.

In this System Specification for Exposed Membrane Roofs, information about the most common systems for installing exposed roofs is given. System types include -

- Protan Standard Overlap System for mechanical installation
- Protan Secret Fix System for mechanical installation
- Protan Fully Adhered System
- Protan Vacuum Roofing System

There can be considerable increased profitability in evaluating roofing systems against each other.
Several factors influence the choice of roofing systems and for guidance. Protan has listed each system with respect to its advantages/limitations for different site situations.



| Site situation | Standard Overlap System | | Secret Fix System | Fully Adhered System | Vacuum **) | Pre-fabricated Sheets |
|---|---|---|---|---|---|---|
| | *1 x 20 m* | *2 x 20 m *)* | *2 x 15 m* | *2 x 15 m* | *2 x 20m* | *Made-to-measure* |
| *Large roof surfaces* | *0* | + | + | *0* | + | + |
| *Small roof surfaces* | + | *0* | + | + | *0* | *0* |
| *Steep roofs* | + | + | + | *0* | *0* | - |
| *Many penetrations/details* | + | *0* | *0* | *0* | *0* | - |
| *Fast installation required* | *0* | + | *+/0* | + | + | + |
| *Low capacity deck* | + | + | + | + | + | *0* |
| *High capacity deck* | *0* | + | + | *0* | + | + |
| *Difficult access* | + | *0* | *0* | *0* | *0* | *0* |
| *Profile covering* | + | *0* | - | + | *0* | - |
| *Wind-exposed installation* | + | *0* | + | + | + | *0* |

*+ = Suitable 0 = Conditionally suitable - = Less suitable*
**) Not suitable in light weight concrete **) Requires air tight substrate*

# Supporting Deck

The following is a list of recommendations for roof deck materials according to ETAG 006.

***Reinforced concrete***
Where a roof slab of reinforced concrete is designed as the deck, which will directly support the waterproofing, the slab should be laid to provide adequate drainage falls and adequate provision should also be made for drying out the slab. A concrete surface, which is not adequately smooth or does not provide even drainage falls, should be screeded. The surface of the concrete should be finished with a wood float to provide a reasonably smooth surface free from ridges and hollows.

***Profiled metal decking***
Metal decking does not provide a continuous supporting surface for the application of waterproofing membranes and therefore must always be used in conjunction with a continuous support e.g. insulation material. The metal decking should not be less than 0,70 mm thick.

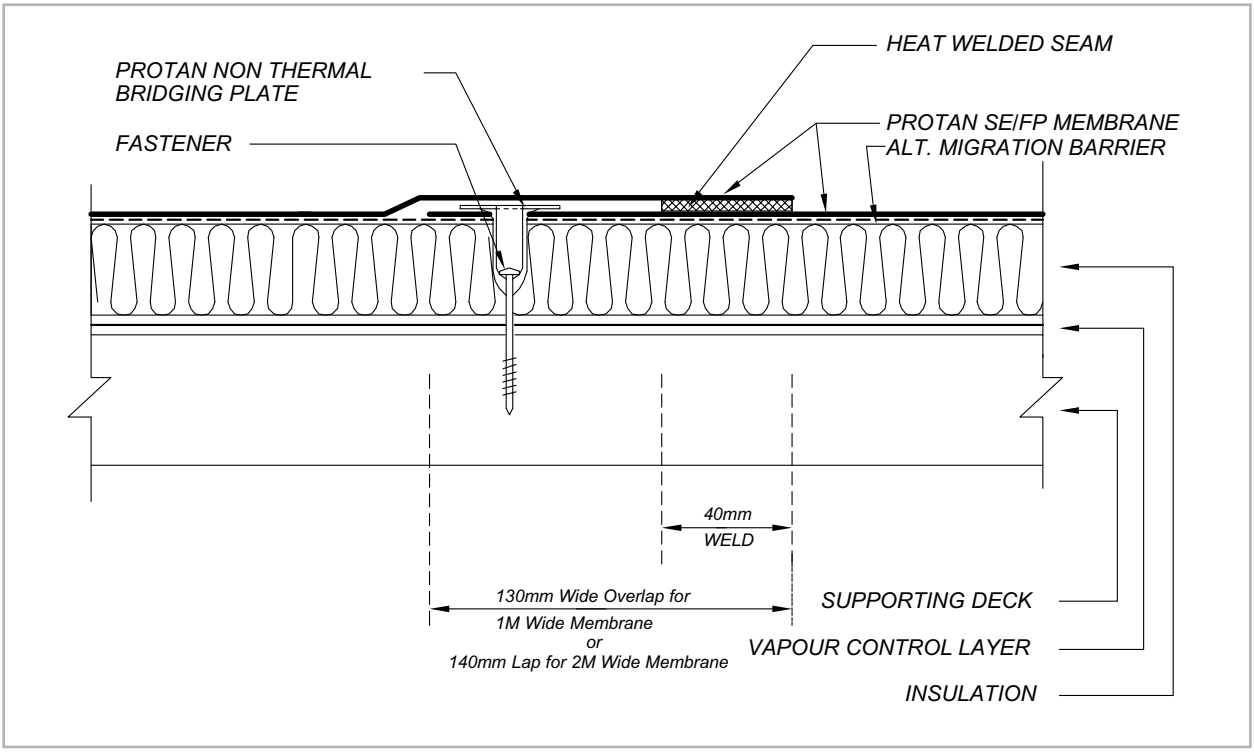
***Timber boarding, including OSB***
Roof decks of timber boarding should be designed using naturally durable timber, or timber pre-treated against infestations by wood boring insects or fungal decay. Any method of pre-treatment should be compatible with the construction components. Boarding should not be less than 19mm nominal thickness, planed, closely clamped together with tongued and grooved joints or closely butted and secured by nailing with non-protruding nail heads.

***Plywood***
Roof decks of plywood should be specified as «water boil proof», (WBP), bonded veneer plywood, and durable or treated with a compatible preservative and should not be less that 19mm nominal thickness. Plywood for roof decks may be square edged or tongue and groove.

# Protan Standard Overlap System for mechanical installation

The Standard Overlap System is based on the application of rolls of Protan SE in standard widths, fixed along its longitudinal edge and overlapped by the adjacent sheet.

Each longitudinal side-lap is 130mm wide with 1m wide material, and 140mm wide with 2m wide material. The edge of the lap is welded using semi-automatic hot air welding equipment to produce a 20 - 40mm wide homogeneous seam. The welds are stronger than the membrane itself. Each roll is pre-marked to help the installer achieve good alignment.

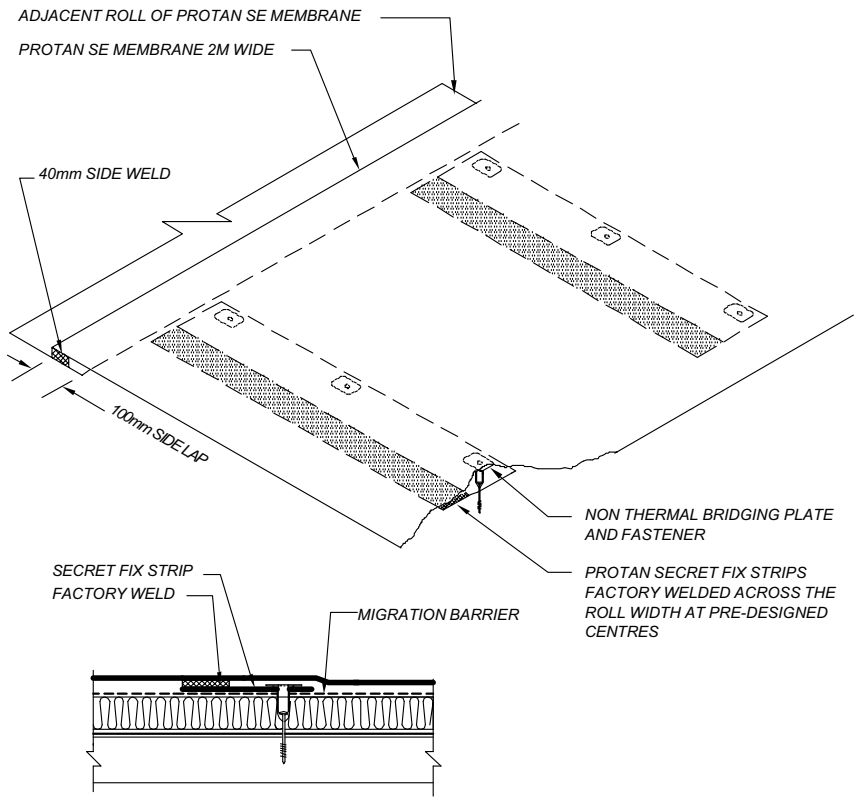



Mechanical fixings and tube washers should be fixed within the laps at appropriate centres, in accordance with local wind standards. The fixings are placed on pre-marked lines at a distance of minimum 30mm in from the longitudinal edge.

Generally, 1m wide rolls are used on applications designed for high wind uplift, perimeter areas, and roofs containing a lot of plant/penetrations. 2m wide rolls are normally used on low uplift designs and on the central zones of most applications.
A combination of 1m wide rolls in perimeter zones and 2m wide rolls in central zones is commonly used on low uplift designs.

# Protan Secret Fix System for mechanical installation

Protan Secret Fix System has been designed to minimise wind uplift, in that fasteners are more evenly spread across the roof. The fasteners are not installed along the longitudinal seams, as with the standard overlap system, thus spreading forces more evenly across the membrane. Secret Fix System uses 2m wide Protan SE membrane with extra strength strips, 130mm wide, factory-welded to the underside at regular centres, which maximise the fastener loadings. Normally, the strips are incorporated transverse to the roll length with centres varying from 400mm to 1200mm. Adjacent rolls have 100mm overlaps and 40mm welds produced on-site using semi-automatic hot air welding equipment. Larger pre-fabricated membrane sheets with longitudinal strips can also be made for special designs. The welds are stronger than the membrane itself.




This system minimises the on-site fabrication with the advantage of being able to install 2m wide membranes in all zones of the roofing surface, thus increasing the installation speed. The strips have higher pull out value than the regular Protan SE membrane, which makes it a good alternative to the Standard Overlap System in areas of high wind design value.

It's design also aids in the installation process e.g. there is never more than 1200mm of membrane rolled out at any time. This makes it an ideal system for installation in windy areas.

Fabrication of Secret Fix Strips is carried out in a factory-controlled environment, using the latest high-frequency welding techniques. This process ensures that the peel strength of each strip is extremely high.
The type of fixings and tube washers used depend on the substrate requirements and they are located within the strips at regular intervals. Centres of strip and fasteners are designed in accordance with local wind standards.

Secret Fix System can be installed on the total roofing surface or in combination with the Standard Overlap System.

# Protan Fully Adhered System

Protan Adhered Systems to secure the membranes against wind uplift are used to a greater extent in warmer parts of Europe. Adhered systems are especially suited to buildings with concrete decks, hollow pot decks, thin concrete elements, light weight concrete and wooden decks, where there may be difficulties in fixing. Alternatively it may be used on refurbishment jobs with additional insulation or where mechanical fixing is not desirable (e.g. areas of high internal humidity such as swimming pools).

The Protan Fully Adhered System will typically consist of a supporting deck, vapour control layer, thermal insulation and Protan GX membrane. In «warm roof» constructions, a vapour control layer must be installed between the supporting deck and the thermal insulation. Compact, adhered constructions depend upon the laminar strength and interaction between the materials in the build-up layers, if delamination is to be prevented.

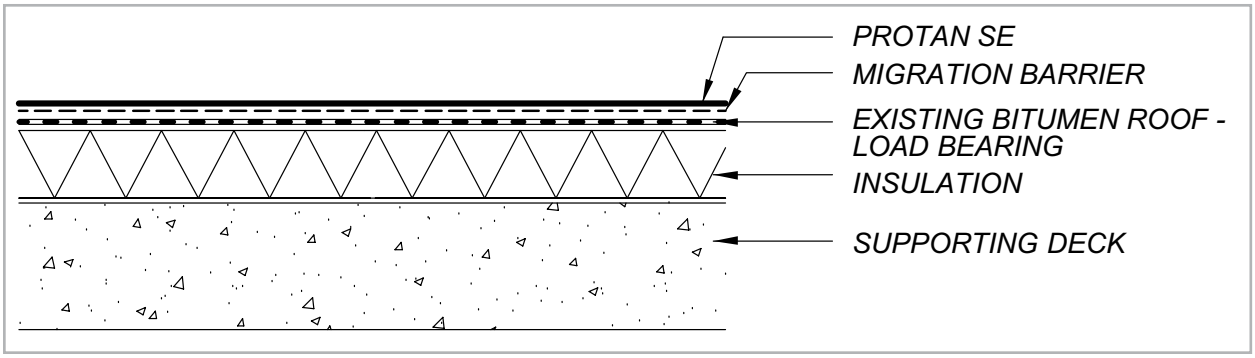
The vapour control layers will generally be bitumen based and adhered to the substrate. The thermal insulation will then be either adhered to the vapour control layer with bitumen adhering compound or a synthetic adhesive, or mechanically fastened to the substrate according to the insulation manufacturers specification.

Once adhered to the substrate with the use of approved adhesive, all overlapping joints in the membrane will be hot air welded, forming a seam stronger than the membrane itself.

The Adhered membrane must be mechanically fastened at the perimeters, at all penetrations and at direction changes, with Protan Steel Bar to avoid possible peeling of the membrane from the substrate at these vulnerable areas.

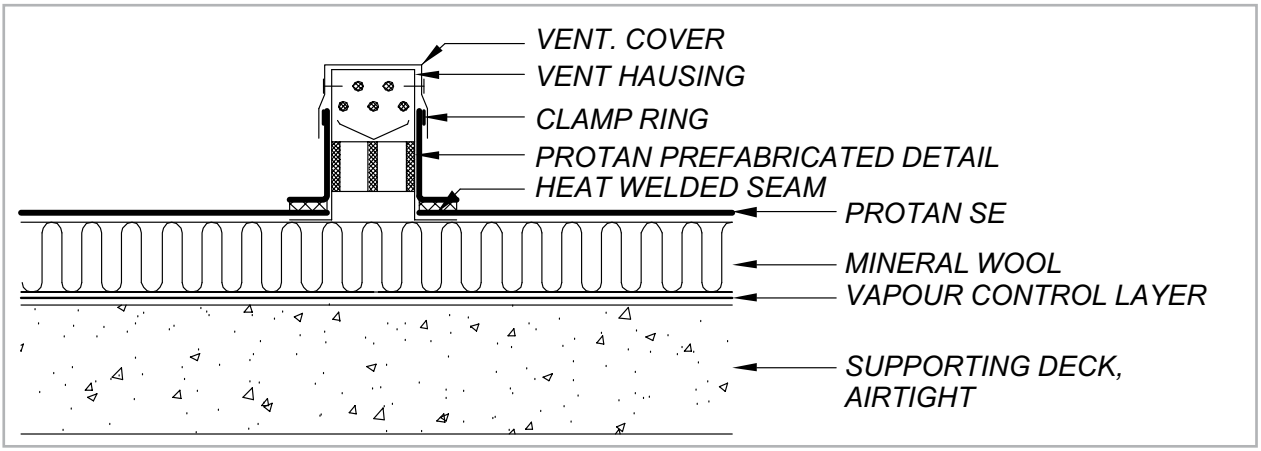
Protan GX is a membrane, which can be adhered to roofs of practically any shape or configuration and are designed to fulfil high aesthetic requirements over slightly uneven substrates – the 300 g/m˝ fleece hiding insulation board or plywood joints and other similar unevenness.

Correctly installed, the Adhered Protan GX membrane will provide a vertical adhesion resistance of approximately 10 kN/m˝. The limiting factor in the wind uplift resistance of a completely adhered roofing assembly may be the bituminous adhesive used to adhere the thermal insulation to the vapour control layer. The vertical adhesion resistance of bituminous adhesives will not exceed 2.5 kN/m˝. Alternatively, the thermal insulation may be mechanically fastened to the substrate independently to resist wind uplift, and the membrane adhered to the insulation. The number of fasteners required by the system will be determined according to local wind uplift design.



# Protan Vacuum Roofing System

A roofing membrane in contact with a completely airtight and load-bearing underlay will, when subjected to a wind load, transmit the wind forces to the underlay as suction and there will be no movement of the membrane.
Protan Vacuum Roofing System forms the basis for an optimal roofing membrane system in terms of both technical and economic considerations.
Airflow causes negative pressure to form over the roof, causing the air volume between the roofing membrane and the airtight underlay to expand. It expands most where the negative pressure is greatest i.e. in corner and edge zones. In order to evacuate this positive pressure and any losses from air leaks, vacuum vents are installed where the negative pressure is expected to be greatest. The vents have one-way valves, which let air out, but not in.




A correctly designed and installed vacuum roof «sucks» itself firmly to the substrate.
Sudden gusts of wind can be seen as «rippling» over the surface. In a few seconds, the pressure equalises and the vacuum effect comes into play.

The key rules for vents for ordinary flat roofs are:
- Two vents in each corner (internal and external)
- One vent at each 15m along free perimeters
- Normally no vents required along higher adjacent buildings

For pitched and curved roofs, the vents are also installed on either side of the ridge.
Other roof shapes must be evaluated and dimensioned individually.

***Airtight substrate:***
Protan Vacuum Roofing system requires an airtight, load-bearing layer.
For renovation, this means underlays where the existing roofing membrane is still considered to be sufficiently intact and with sufficient anchoring (Mechanically attached or Adhered) to the supporting system. An ideal renovation underlay is old bitumen felt with or without supplementary insulation. The old bitumen underlay must be carefully inspected for airtightness and load transferring capacity. Some cracks and bubbles can be accepted provided that they are levelled and sealed.

For new roofing, the requirement for airtightness is even more critical. The supporting deck shall be both sufficiently airtight and sufficiently strong to transmit the wind suction forces from the roof. If positive pressure, which presses up against the roof from the inside occurs, the roof construction must be dimensioned to withstand this loading. Concrete decks which are inherently airtight, apart from joints and grooves, must be fully sealed. The same applies to fibreboard underlay.

On metal deck (corrugated steel without sealing), the construction must include a separate airtight layer with load bearing capacity such as a mechanically fixed Protan Vapour Barrier or a fully adhered and sealed bitumen vapour barrier. The vapour barrier and Protan Roofing Membrane, must be sealed by clamping them together at all joints and penetrations.
Insulation between the roofing membrane and the airtight underlay has conditionally no significance for the vacuum effect and function. On renovation applications with additional insulation, mineral wool with minimum board thickness of 50mm, is recommended.

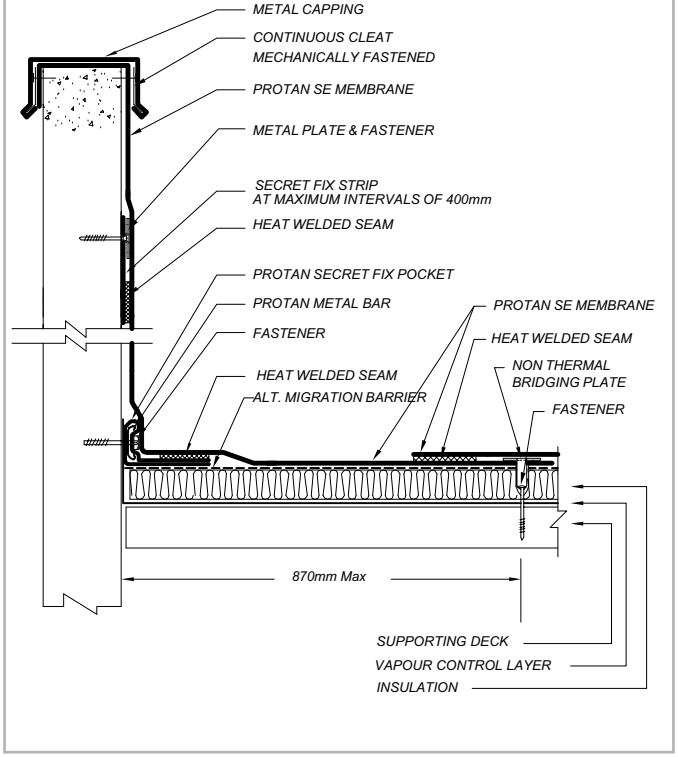
Applicators must be specially trained and approved by Protan for installing vacuum roofs.

When re-roofing without additional insulation - use Protan EX. Using separate fleece, the fleece must be fixed to the underlay either by point adhesion or by mechanical fixing.

**NOTE:** In order to evaluate the suitability of a particular building, a Protan Technical Representative must assess it beforehand.

# Parapets

Parapets of exposed roofs are normally mechanically fixed at the change of angle with Protan Steel bar. Protan SE is used for the mechanically fixed applications either with a secret fix strip or with the Protan Secret Fix Pocket welded to its underside. Several detail drawings are given for parapet solutions.
In some application areas it is alternatively advisable to use Protan Contact Adhesive.
For these applications Protan G 1,5mm is used. Other alternative solutions should be agreed with Protan Technical Services Department.





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